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World Investment Report

2005 Transnational Corporations and the Internationalization of R&D

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This Report is dedicated to the memory of Sanjaya Lall

PREFACE

The globalization of production is reshaping the international economic landscape. With that, the conventional wisdom of developed countries as capital and technology exporters and developing countries as importers is gradually giving way to a more complex set of relationships. The geography of international investment flows is changing. Developing countries are emerging as outward investors, and their importance as recipients of foreign direct investment in more knowledge-intensive activities is increasing. The *World Investment Report 2005*, focusing on the internationalization of research and development by transnational corporations, illustrates some of these changes.

As global competition intensifies, transnational corporations are internationalizing even the most knowledge-intensive corporate functions, such as research and development. Until recently, this trend was limited almost exclusively to developed countries. Today, corporations in industries such as automobiles, electronics, biotechnology and pharmaceuticals are establishing research and development facilities in selected developing countries. They do this to enhance their efficiency, to access expanding pools of scientists and engineers, and to meet the demands of increasingly sophisticated markets in these countries.

These recent trends have important implications for the international division of labour. The traditional view, of more complex production activities being undertaken in the North and simpler ones in the South, is less and less a true reflection of the reality. Firms now view parts of the developing world as key sources not only of cheap labour, but also of growth, skills and even new technologies. As transnational corporations are the dominant players in the creation of new technologies, it matters where they undertake their research and development. Currently, only a few developing countries attract such activities on a significant scale. Most low-income countries are not participating in global research and development networks, and consequently do not reap the benefits that they can generate.

The internationalization of research and development by transnational corporations has important implications for policy-making. The *World Investment Report 2005* stresses the need for coherent national policies – particularly in the areas of science, technology and innovation, education and investment – to ensure greater benefits from this evolution. For many countries, however, this is a daunting task, which will necessitate the full support of the international community.

Kofi A. Annan
Secretary-General of the United Nations

New York, July 2005

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ABBREVIATIONS

AGOA	African Growth and Opportunity Act (of the United States)
ASEAN	Association of South-East Asian Nations
BERD	business enterprise research and development
BIT	bilateral investment treaty
CARICOM	Caribbean Community
CEMAC	Communauté économique et monétaire d'Afrique centrale (Economic and Monetary Community of Central Africa)
CIS	Commonwealth of Independent States
COMESA	Common Market for Eastern and Southern Africa
DTT	double taxation treaty
ECOWAS	Economic Community of West African States
EFTA	European Free Trade Association
EIU	Economist Intelligence Unit
EPA	economic partnership agreement
ESCWA	Economic and Social Commission for Western Asia
EU	European Union
FDI	foreign direct investment
FTA	free trade agreement
FTAA	Free Trade Area of the Americas
GATS	General Agreement on Trade in Services (WTO Agreement)
GDP	gross domestic product
GERD	gross expenditure on research and development
ICSID	International Centre for Settlement of Investment Disputes
ICT	information and communications technology
IIA	international investment agreement
IPA	investment promotion agency
IPR	intellectual property right
ISDS	investor-State dispute settlement
LDC	least developed country
M&A	merger and acquisition
MERCOSUR	Mercado Común del Sur (Southern Common Market)
MFN	most favoured nation
MSTQ	metrology, standards, testing and quality (system)
NAFTA	North American Free Trade Agreement
NAICS	North American Industry Classification System
NEPAD	New Partnership for Africa's Development
NIE	newly industrializing economy
NIS	national innovation system
NSB	National Science Board (United States)
OBM	own brand manufacture
ODM	own design manufacture
OEM	original equipment manufacture
R&D	research and development
RTA	regional trade agreement
SACU	Southern African Customs Union
SADC	Southern African Development Community
SAARC	South Asian Association for Regional Cooperation
SCM	subsidies and countervailing measures (also a Uruguay Round Agreement)
SEE	South-East Europe
SIC	Standard Industrial Classification
TNC	transnational corporation
TRIPS	Trade-related Aspects of Intellectual Property Rights (WTO Agreement)
UNDP	United Nations Development Programme
UNICI	UNCTAD Innovation Capability Index
UNIDO	United Nations Industrial Development Organization
USPTO	United States Patent and Trademark Office
WTO	World Trade Organization

OVERVIEW

END OF THE DOWNTURN

Led by developing countries, global FDI flows resumed growth in 2004...

On account of a strong increase in foreign direct investment (FDI) flows to developing countries, 2004 saw a slight rebound in global FDI after three years of declining flows. At $648 billion, world FDI *inflows* were 2% higher in 2004 than in 2003. Inflows to developing countries surged by 40%, to $233 billion, but developed countries as a group experienced a 14% drop in their inward FDI. As a result, the share of developing countries in world FDI inflows was 36%, the highest level since 1997. The United States retained its position as the number one recipient of FDI, followed by the United Kingdom and China.

Many factors help to explain why the growth of FDI was particularly pronounced in developing countries in 2004. Intense competitive pressures in many industries are leading firms to explore new ways of improving their competitiveness. Some of these ways are by expanding operations in the fast-growing markets of emerging economies to boost sales, and by rationalizing production activities with a view to reaping economies of scale and lowering production costs. Higher prices for many commodities have further stimulated FDI to countries that are rich in natural resources such as oil and minerals. In some developed as well as developing countries, increased inflows in 2004 were linked to an upturn in cross-border merger and acquisition (M&A) activity. Greenfield FDI continued to rise for the third consecutive year in 2004. Provided economic growth is maintained, the prospects for a further increase in global FDI flows in 2005 are promising.

FDI *outflows* increased in 2004 by 18%, to $730 billion, with firms based in developed countries accounting for the bulk ($637 billion). In fact, almost half of all outward FDI originated from three sources: the United States, the United Kingdom and Luxembourg in that order. Developed countries as a group remained significant net capital exporters through FDI; net outflows exceeded net inflows by $260 billion. While FDI outflows from the European Union (EU) declined by 25%, to $280 billion (a seven-year low), most other developed countries increased their investment abroad. In the case of the United States, outflows increased by over 90%, to $229 billion, a record high.

The stock of FDI in 2004 is estimated at $9 trillion. It is attributed to some 70,000 transnational corporations (TNCs) and their 690,000 affiliates abroad, with total sales by foreign affiliates amounting to almost $19 trillion. Ranked by foreign assets, General Electric (United States) remained the largest non-financial TNC worldwide, followed by Vodafone (United Kingdom) and Ford Motor (United States). Among the top 100 TNCs worldwide, four companies, led by Hutchison Whampoa (Hong Kong, China), are based in developing economies.

The pace at which the top 100 TNCs are expanding internationally appears to have slowed down. Although their sales, employment and assets abroad all rose in absolute terms in 2003, their relative importance declined somewhat as activities in the home countries expanded faster. Japanese and United States TNCs are generally less transnationalized than their European counterparts. The top 50 TNCs based in developing economies, with a shorter history of outward expansion, are even less transnationalized, but the gap between TNCs from developed and developing countries is shrinking in this respect.

International investment in services, particularly financial services, continued to grow steadily, accounting for the bulk of the world FDI stock. The services sector accounted for 63% of the total value of cross-border M&As in 2004, with financial services responsible for one-third of the value of cross-border M&As in this sector. For the first time, this year's *WIR* ranks the top 50 financial TNCs. Large TNCs dominate world financial services, not only in terms of total assets but also in terms of the number of countries in which they operate. Citigroup (United States) tops the list, followed by UBS (Switzerland) and Allianz (Germany). Financial TNCs from France, Germany, Japan, the United Kingdom and the United States accounted for 74% of the total assets of the top 50 financial TNCs in 2003.

Low interest rates, higher profits and the recovery of asset prices, principally in developed countries, contributed to an upturn in M&As, including cross-border M&As; their value shot up by 28% to $381 billion. These transactions played an important part in the continued restructuring and consolidation process of many industries, especially in the developed world. The largest M&A deal in 2004 was the acquisition of Abbey National (United Kingdom) by Santander Central Hispano (Spain), valued at $16 billion. In developing countries, cross-border M&As accounted for a more modest share of overall FDI activity, although firms from these countries were increasingly involved in M&As, including some high-profile cases. The upswing in FDI flows to developing countries was mainly associated with greenfield investments notably in Asia. China and India together accounted for about a half of all new registered greenfield (and expansion) projects in developing countries in 2004.

In terms of the three main forms of FDI financing, equity investment dominates at the global level. During the past decade, it has accounted for about two-thirds of total FDI flows. The shares of the other two forms of FDI – intra-company loans and reinvested earnings – were on average 23% and 12% respectively. These two forms fluctuate widely, reflecting yearly variations in profit and dividend repatriations or the need for loan repayment. There are notable differences in the pattern of FDI financing between developed and developing countries; reinvested earnings are consistently more important in the latter.

FDI continues to surpass other private capital flows to developing countries as well as flows of official development assistance (ODA). In 2004, it accounted for more than half of all resource flows to developing countries and was considerably larger than ODA. However, FDI is concentrated in a handful of developing countries, while ODA remains the most important source of finance in a number of other developing countries. This is particularly the case for most least developed countries (LDCs) even though FDI flows have surpassed ODA for individual countries in that group.

Countries continue to adopt new laws and regulations with a view to making their investment environments more investor friendly. Out of 271 such changes pertaining to FDI introduced in 2004, 235 involved steps to open up new areas to FDI along with new promotional measures. In addition, more than 20 countries lowered their corporate income taxes in their bid to attract more FDI. In Latin America and Africa, however, a number of policy changes tended to make regulations less favourable to foreign investment, especially in the area of natural resources.

At the international level, the number of bilateral investment treaties (BITs) and double taxation treaties (DTTs) reached 2,392 and 2,559 respectively in 2004, with developing countries concluding more such treaties with other developing countries. More international investment agreements were also concluded at the regional and global level, potentially contributing to greater openness towards FDI. The various international agreements are generally becoming more and more sophisticated and complex in content, and investment-related provisions are increasingly introduced into agreements encompassing a broader range of issues. There is also a rise in investor-State disputes, paralleling the proliferation of international investment agreements.

...with the Asia and Oceania region the largest recipient as well as source of FDI among developing countries.

The upturn in global FDI was marked by significant differences between countries and regions. *Asia and Oceania* was again the top destination of FDI flows to developing regions. It attracted $148 billion of FDI, $46 billion more than in 2003, marking the largest increase ever. East Asia saw a 46% increase in inflows, to reach $105 billion, driven largely by a significant increase in flows to Hong Kong (China). In South-East Asia, FDI surged by 48% to $26 billion, while South Asia, with India at the forefront, received $7 billion, corresponding to a 30% rise. FDI inflows to West Asia grew even more, rising from $6.5 billion to $9.8 billion, of which more than half was concentrated in Saudi Arabia, the Syrian Arab Republic and Turkey. China continued to be the largest developing-country recipient with $61 billion in FDI inflows.

The Asia and Oceania region is also emerging as an important source of FDI. In 2004 the region's outward flows quadrupled to $69 billion, due mainly to dramatic growth in FDI from Hong Kong (China) but also to increased investments by TNCs from other parts of East Asia and South-East Asia. Most of these investments are intraregional, taking place especially among the economies of East and South-East Asia. However, interregional investment from Asian economies also increased. For example, a key driver of Chinese outward FDI was the growing demand for natural resources. This has led to significant investment projects in Latin America. Indian TNCs also invested large amounts in natural resources in other regions, primarily in African countries and the Russian Federation. Asian investment in developed countries is on the rise as well: the past year in particular has seen a few sizeable acquisitions of United States and EU firms by Chinese and Indian TNCs – such as the acquisition by Lenovo (China) of the personal computers division of IBM (United States).

The growth of both inward and outward FDI flows in Asia and Oceania is being facilitated by various policy changes at the national and regional levels. For example, the Association of Southeast Asian Nations (ASEAN) and China signed an agreement to establish a free trade area by 2010, and several Asian countries signed free trade agreements with the United States.

FDI rebounded in Latin America following four years of decline ...

Following four years of continuous decline, FDI flows to Latin America and the Caribbean registered a significant upsurge in 2004, reaching $68 billion – 44% above the level attained in 2003. Economic recovery in the region, stronger growth in the world economy and higher commodity prices were contributing factors. Brazil and Mexico were the largest recipients, with inflows of $18 billion and $17 billion respectively. Together with Chile and Argentina they accounted for two-thirds of all FDI flows into the region in 2004. However, FDI inflows did not increase in all the countries of Latin America. There were notable declines in Bolivia and Venezuela, mainly linked to uncertainty regarding legislation related to oil and gas production. In Ecuador the completion of the crude oil pipeline construction explained the decrease in FDI inflows. A number of countries modified their legislation and tax regimes to increase the State's share in revenues from non-renewable natural resources. It is still too early to assess the impact of these changes on the volume of FDI. Significant projects remain under development and additional ones were announced during 2004.

The sectoral composition of inward FDI to parts of Latin America and the Caribbean appears to be changing. For several countries of the region, natural resource and manufacturing industries became more popular FDI destinations than services in 2004. In Argentina, Brazil and Mexico, manufacturing attracted more FDI than services. FDI in Mexico's maquiladora industry surged by 26% in response to growing demand in the United States after three consecutive years of decline. The completion of most privatization programmes, coupled with financial difficulties facing foreign investors in the aftermath of the recent financial crisis and the ensuing economic stagnation in some countries, reduced the attractiveness of the services sector for FDI in Latin America. Firms in that sector suffered the most from the impact of the economic crisis, facing serious problems in reducing their large foreign-currency liabilities while at the same time being unable (owing to the non-tradability of their activities) to shift towards export-oriented production. In Central America and the Caribbean, however, renewed privatization activity made services the largest FDI recipient sector. In the Andean Community, high oil and mineral prices sustained the position of the primary sector as the main recipient of FDI flows.

... remained stable in Africa ...

FDI flows to Africa remained at almost the same level – $18 billion – as in 2003. FDI in natural resources was particularly strong, reflecting the high prices of minerals and oil and the increased profitability of investment in the primary sector. High and rising prices of petroleum, metals and minerals induced TNCs to maintain relatively high levels of investment in new exploration projects or to escalate existing production. Several large cross-border M&As were concluded in the mining industry last year. Despite these developments Africa's share in FDI flows worldwide remains low, at 3%.

Angola, Equatorial Guinea, Nigeria, Sudan (all rich in natural resources) and Egypt were the top recipients, accounting for a little less than half of all inflows to Africa. While FDI inflows to the last three rose, those to South Africa, another important FDI recipient, fell. LDCs in Africa received small amounts: around $9 billion in total in 2004. Most investment in Africa originated from Europe, led by investors from France, the Netherlands and the United Kingdom, and from South Africa and the United States; together these countries accounted for more than half of the region's inflows. FDI outflows from Africa more than doubled in 2004, to $2.8 billion.

A renewed wave of FDI-friendly measures and initiatives at national and international levels has sought to facilitate and attract more FDI to the African continent. At the national level, many measures focused on liberalizing legal frameworks and improving the overall environment for FDI. However, failure to move rapidly on economic and social policies important for attracting and retaining FDI, and a weak emphasis on capacity building, have hampered the ability of many countries in the region to attract FDI, in particular in manufacturing. Thus far, international market-access measures and initiatives targeting African countries (such as the United States' African Growth and Opportunity Act) overall have not been very successful in increasing FDI. In order to realize the potential for increased FDI and to derive greater benefits from it, African countries generally need to develop stronger industrial and technological capabilities.

The need for international support to Africa's development has been stressed in several recent initiatives. For example, the Commission for Africa (established by the United Kingdom) released a report in March 2005 recommending a substantial increase in aid to Africa: an additional $25 billion per year to be implemented by 2010. It also proposed several measures that could help the continent attract more FDI and enhance its benefits for development. Specifically the report called for donors to double their funding for infrastructure, adopt a 100% external debt cancellation, support an Investment Climate Facility for Africa under the New Economic Partnership for Africa's Development (NEPAD) initiative, and create a fund that would provide insurance to foreign investors in post-conflict countries in Africa.

... and increased in South-East Europe and the CIS for the fourth consecutive year.

FDI inflows to South-East Europe and the CIS, a new group of economies under the United Nations reclassification, recorded a fourth year of growth in 2004, reaching an all-time high of $35 billion. This was the only region to escape the three-year decline (2001-2003) in world FDI flows, and it maintained robust growth in inward FDI in 2004 (more than 40%). Trends in inward FDI to the two subregions have differed somewhat, however, reflecting the influence of various factors. In South-East Europe, FDI inflows started to grow only in 2003. Led by large privatization deals, these inflows nearly tripled, to $11 billion in 2004. In the CIS, inflows grew from $5 billion in 2000 to $24 billion in 2004, benefiting largely from the high prices of petroleum and natural gas. The Russian Federation is the largest recipient of FDI inflows in the region.

By contrast, FDI inflows to developed countries continued to decline.

FDI flows into developed countries, which now include the 10 new EU members, fell to $380 billion in 2004. The decline was less sharp than in 2003, possibly suggesting a bottoming out of the downward trend that started in 2001. The decline pertained to many major host countries in the developed world. However, there were some significant exceptions; the United States and the United Kingdom recorded substantial increases in inflows mainly as a result of cross-border M&As. Meanwhile, investment outflows from developed countries turned upwards again in 2004 to reach $637 billion.

FDI flows into the EU as a whole fell to $216 billion – the lowest level since 1998. However, the performance of individual EU members varied, with Denmark, Germany, the Netherlands and Sweden registering the most significant declines. To some extent the persistence of the downward FDI trend in the EU reflected large repayments of intra-company loans and repatriation of earnings in a few members. At the same time, FDI inflows into all the 10 new EU countries increased, attracted by high rates of economic growth, the availability of skilled human resources at competitive costs and reduced uncertainty with regard to the regulatory framework for FDI following EU accession. Flows into Japan surged by 24% to $8 billion, while those to other developed countries (Israel, New Zealand, Norway and Switzerland) declined.

Further increases in FDI are expected.

Prospects for FDI worldwide appear to be favourable for 2005. For 2006, global FDI flows can be expected to rise further if economic growth is consolidated and becomes more widespread, corporate restructuring takes hold, profit growth persists and the pursuit of new markets continues. The continued need of firms to improve their competitiveness by expanding into new markets, reducing costs and accessing natural resources and strategic assets abroad provides strong incentives for further FDI in developing countries in particular. Also, the improved profitability of TNCs is likely to trigger greater M&A activity, which should also push up the levels of FDI in developed countries.

Surveys of TNCs, experts and investment promotion agencies (IPAs) undertaken by UNCTAD corroborate this relatively optimistic picture, as do the findings of other recent surveys. In the UNCTAD surveys, more than half of the responding TNCs as well as experts and four-fifths of the IPAs expected short-term (2005-2006) growth in FDI flows; very few predicted a decline of FDI in the near future. The competitive pressure on firms, continued offshoring of services, ongoing liberalization and the growth of TNCs from emerging markets were identified as factors that should lead to more FDI.

At the same time, there are grounds for caution in forecasting FDI flows. The slowdown of growth in some developed countries, along with structural weaknesses and financial and corporate vulnerabilities in some regions, continue to hinder a strong recovery of FDI growth. Continuing external imbalances in many countries and sharp exchange-rate fluctuations, as well as high and volatile commodity prices, pose risks that may hinder global FDI flows.

There is some variation in the FDI prospects of individual regions. In view of the improved economic situation in Asia and Oceania, its important role as a global production centre, its improved policy environment and significant regional integration efforts, the prospects for FDI flows to that region are strongly positive. According to the TNCs, experts and IPAs surveyed by UNCTAD, the region's outlook for FDI is bright. FDI inflows to Latin America and the Caribbean are expected to increase in 2005-2006 as most of the driving forces behind FDI growth in 2004 are set to continue. Prospects are also positive for Africa, partly as a result of higher commodity prices and Africa's natural resource potential. One out of four TNC respondents expected that inflows to Africa would increase in 2005-2006, suggesting more cautious optimism vis-à-vis this region.

FDI inflows into South-East Europe and the CIS are expected to grow further in the near future, based on the expectation that their competitive wages, in particular in South-East Europe, could attract an increasing number of efficiency-seeking or export-oriented projects, while the natural-resource-rich CIS countries could benefit from continued high oil and gas prices.

Despite the decline in 2004, prospects for renewed growth in both inward and outward FDI flows for developed countries in 2005 remain positive, underpinned by forecasts of moderate economic growth and a strong pick-up in corporate profits. Already, during the first six months of 2005, cross border M&As in developed countries increased significantly. For the largest recipient country – the United States – prospects for FDI are good, although the inflows may not reach the high levels recorded in 2004.

R&D INTERNATIONALIZATION AND DEVELOPMENT

TNCs are internationalizing R&D, including in developing countries...

WIR05 focuses on the internationalization of research and development (R&D) by TNCs. This is not a new phenomenon. When expanding internationally, firms have always needed to adapt technologies locally to sell successfully in host countries. In many cases, some internationalization of R&D has been necessary to accomplish this. However, it was traditionally the case that R&D was reserved for the home countries of the TNCs. By contrast, now a number of new features are emerging in the internationalization process. In particular, for the first time, TNCs are setting up R&D facilities outside developed countries that go beyond adaptation for local markets; increasingly, in some developing and South-East European and CIS countries, TNCs' R&D is targeting global markets and is integrated into the core innovation efforts of TNCs.

Consider the following illustrations. Since 1993 when Motorola established the first foreign-owned R&D lab in China, the number of foreign R&D units in that country has reached some 700. The Indian R&D activities of General Electric – the largest TNC in the world – employ 2,400 people in areas as diverse as aircraft engines, consumer durables and medical equipment. Pharmaceutical companies such as Astra-Zeneca, Eli Lilly, GlaxoSmithKline, Novartis, Pfizer and Sanofi-Aventis all run clinical research activities in India. From practically nothing in the mid-1990s, the contribution by South-East and East Asia to global semiconductor design reached almost 30% in 2002. STMicroelectronics has some of its semiconductor design done in Rabat, Morocco. General Motors (GM) in Brazil competes with other GM affiliates in the United States, Europe and Asia for the right to design and build new vehicles and carry out other core activities for the global company. There are many such examples.

In theory, the internationalization of R&D into developing countries is both expected and unexpected. It is expected for two reasons. First, as TNCs increase their production in developing countries, some R&D (of the adaptive kind) can be expected to follow. Second, R&D is a form of service activity and like other services (*WIR04*), it is "fragmenting", with certain segments being located where they can be performed most efficiently. Indeed, according to a survey of Europe's largest firms conducted in 2004 by UNCTAD and Roland Berger, all service functions – including R&D – are now candidates for offshoring. It is unexpected in that R&D is a service activity with very demanding skill, knowledge and support needs, traditionally met only in developed countries with strong national innovation systems. Moreover, R&D is taken to be the least "fragmentable" of economic activities because it involves knowledge that is strategic to firms, and because it often requires dense knowledge exchange (much of it tacit) between users and producers within localized clusters.

It is clear that, to date, only a small number of developing countries and economies in transition are participating in the process of R&D internationalization. However, the fact that some are now perceived as attractive locations for highly complex R&D indicates that it is possible for countries to develop the capabilities that are needed to connect with the global R&D systems of TNCs. From a host-country perspective, R&D internationalization opens the door not only for the transfer of technology created elsewhere, but also for the technology creation process itself. This may enable some host countries to strengthen their technological and innovation capabilities. But it may also widen the gap with those that fail to connect with the global innovation network.

...with important implications for innovation and development.

Innovative activity is essential for economic growth and development. Moreover, sustainable economic development requires more than simply "opening up" and waiting for new technologies to flow in. It demands continuous technological effort by domestic enterprises, along with supportive government policies. With the increasing knowledge-intensity of production, the need to develop technological capabilities is growing. Greater openness to trade and capital flows does not reduce the imperative of local technological effort. On the contrary, liberalization, and the open market environment associated with it, have made it necessary for firms – be they large or small in developed or developing countries – to acquire the technological and innovative capabilities needed to become or stay competitive.

R&D is only one source of innovation, but it is an important one. It takes various forms: basic research, applied research and product and process development. While basic research is mainly undertaken by the public sector, the other two forms are central to the competitiveness of many firms. In the early stages of technological activity enterprises do not need formal R&D departments. As they mature, however, they find it increasingly important to monitor, import and implement new technologies. The role of formal R&D grows as a firm attempts significant technological improvements and tackles product or process innovation. For complex and fast-moving technologies it is an essential part of the technological learning process.

But the process of acquiring technological capabilities is slow and costly. Technical change and advanced science-based technologies in many industries call for more high-level skills and intense technical effort. These require better infrastructure, not least in information and communication technologies (ICTs). They also require strong supporting institutions, as well as stable and efficient legal and governance systems. Finally, they require access to the international knowledge base, combined with a strategy to leverage this access for the benefit of local innovation systems. The cumulative forces that are increasing the gap between countries with respect to innovation make the role of policy increasingly important at both the national and international levels.

There are large differences in countries' capabilities to innovate and benefit from the R&D internationalization process. According to a new measure of national innovation capabilities – the UNCTAD Innovation Capability Index – the differences appear to be growing over time. Developed countries fall into the high capability group, as do Taiwan Province of China, the Republic of Korea and Singapore, along with some of the economies of South-East Europe and the CIS. The medium capability group comprises the remaining economies in transition, most of the resource-rich and newly industrializing economies and two sub-Saharan African economies (Mauritius and South Africa). The low capability group contains most of the sub-Saharan African countries as well as several countries in North Africa, West Asia and Latin America. Among developing countries, South-East and East Asia are the leaders in innovation capability, while the position of Latin America and the Caribbean has deteriorated over time and has been overtaken by North Africa and West Asia.

The innovative capabilities of a country are directly relevant to its attractiveness as a host country for R&D by TNCs, as well as to its ability to benefit from such R&D. The quality of R&D performed abroad depends on local capabilities of the host country. The same applies to the resulting externalities in terms of how much local firms and institutions are able to absorb and learn from exposure to best practice R&D techniques and skills. Whether or not R&D deepens over time, and how far it spreads over different activities, are the result of an interactive process between the TNCs and local actors in the host economy, and this process is in turn affected by the institutional framework and government policies of the host country.

TNCs are the drivers of global R&D.

Global R&D expenditure has grown rapidly over the past decade to reach some $677 billion in 2002. It is highly concentrated. The top ten countries by such expenditure, led by the United States, account for more than four-fifths of the world total. Only two developing countries (China and the Republic of Korea) feature among the top ten. However, the share of developed countries fell from 97% in 1991 to 91% in 2002, while that of developing Asia rose from 2% to 6%. Similarly, there has been a rise in innovation outputs (as measured by the number of patents issued). For example, between the two time periods of 1991-1993 and 2001-2003, the share of foreign patent applications from developing countries, South-East Europe and the CIS to the United States Patent and Trademark Office, jumped from 7% to 17%.

TNCs are key players in this process. A conservative estimate is that they account for close to half of global R&D expenditures, and at least two-thirds of business R&D expenditures (estimated at $450 billion). These shares are considerably higher in a number of individual economies. In fact, the R&D spending of some large TNCs is higher than that of many countries. Six TNCs (Ford, Pfizer, DaimlerChrysler, Siemens, Toyota and General Motors) spent more than $5 billion on R&D in 2003. In comparison, among the developing economies, total R&D spending came close to, or exceeded, $5 billion only in Brazil, China, the Republic of Korea and Taiwan Province of China. The world's largest R&D spenders are concentrated in a few industries, notably IT hardware, the automotive industry, pharmaceuticals and biotechnology.

The R&D activities of TNCs are becoming increasingly internationalized. This trend is apparent for all home countries, but starts from different levels. In the case of United States TNCs, the share of R&D of their majority-owned foreign affiliates in their total R&D rose from 11% in 1994 to 13% in 2002. German TNCs set up more foreign R&D units in the 1990s than they had done in the preceding 50 years. The share of foreign to total R&D in Swedish TNCs shot up from 22% to 43% between 1995 and 2003.

Reflecting the increased internationalization of R&D, foreign affiliates are assuming more important roles in many host countries' R&D activities. Between 1993 and 2002 the R&D expenditure of foreign affiliates worldwide climbed from an estimated $30 billion to $67 billion (or from 10% to 16% of global business R&D). Whereas the rise was relatively modest in developed host countries, it was quite significant in developing countries: the share of foreign affiliates in business R&D in the developing world increased from 2% to 18% between 1996 and 2002. The share of R&D by foreign affiliates in different countries varies considerably. In 2003 foreign affiliates accounted for more than half of all business R&D in Ireland, Hungary and Singapore and about 40% in Australia, Brazil, the Czech Republic, Sweden and the United Kingdom. Conversely, it remained under 10% in Chile, Greece, India, Japan and the Republic of Korea. Other indicators, such as the rising number of R&D alliances and growing patenting activity, similarly confirm the increased internationalization of R&D activities in developing countries.

Their R&D is growing particularly fast, though unevenly, in developing countries…

The share of host developing countries in the global R&D systems of TNCs is rising, but unevenly. Only a few economies have attracted the bulk of the R&D activity. Developing Asia is the most dynamic recipient. In the case of R&D expenditures by majority-owned foreign affiliates of United States TNCs, for example, the share of developing Asia soared from 3% in 1994 to 10% in 2002. The increase was particularly noticeable for China, Singapore, Hong Kong (China) and Malaysia. In the foreign R&D activities of Swedish TNCs the share of countries outside the Triad more than doubled, from 2.5% in 1995 to 7% in 2003. Survey findings and other data for Germany and Japan support the growing importance of developing countries and some economies in transition as locations for TNCs' R&D.

Official statistics generally suffer from time lags, and may not fully capture the pace of R&D internationalization. More recent data on FDI projects indicate that the expansion of R&D to new locations is gaining momentum. Of 1,773 FDI projects involving R&D worldwide during the period 2002-2004 for which information was available, the majority (1,095) was in fact undertaken in developing countries or in South-East Europe and the CIS. Developing Asia and Oceania alone accounted for close to half of the world total (861 projects). A survey of the world's largest R&D spenders conducted by UNCTAD during 2004-2005 also shows the growing importance of new R&D locations. More than half of the TNCs surveyed already have an R&D presence in China, India or Singapore. In South-East Europe and the CIS, the Russian Federation was the only significant target economy mentioned by the responding firms as hosting R&D activities.

In the same survey, as many as 69% of the firms stated that the share of foreign R&D was set to increase; only 2% indicated the opposite, while the remaining 29% expected the level of internationalization to remain unchanged. The momentum appears to be particularly strong among companies based in Japan and the Republic of Korea, which until recently, have not been internationalizing their R&D to any large extent. For example, nine out of ten Japanese companies in the sample planned to increase their foreign R&D, while 61% of European firms stated such intentions. A further shift in terms of R&D locations towards some developing, South-East European and CIS markets is also envisaged. China is the destination mentioned by the largest number of respondents for future R&D expansion, followed by the United States. In third place is India, another significant newcomer location for R&D. Other developing economies mentioned as candidates for further R&D by some respondents include the Republic of Korea, Singapore, Taiwan Province of China, Thailand and Viet Nam. Very few respondents indicated any plans to expand R&D to Latin America or Africa. The Russian Federation was also among the top 10 target locations.

Another new and notable trend in the internationalization of R&D is the emergence and fast growth of foreign R&D activities of developing-country TNCs. This trend is driven by the need to access advanced technologies and to adapt products to major export markets. Some of these TNCs are targeting the knowledge base of developed countries, while others are setting up R&D units in other developing economies.

...and the type of R&D undertaken varies by region.

The R&D conducted in different locations varies considerably by region and economy. For example, in 2002, three-quarters of the R&D of United States majority-owned foreign affiliates in developing Asia were related to computers and electronic products, while in India over three-quarters of their R&D expenditure went into services (notably related to software development). In Brazil and Mexico, chemicals and transport equipment together accounted for over half of all R&D by United States foreign affiliates.

Moreover, TNCs carry out different types of R&D abroad. Foreign affiliates of TNCs may undertake *adaptive R&D*, which ranges from basic production support to the modifying and upgrading of imported technologies. *Innovative R&D* involves the development of new products or processes for local, regional or (eventually) global markets. *Technology monitoring* units are established to keep abreast of technological development in foreign markets and to learn from leading innovators and clients there.

While it is difficult to quantify R&D by type, among developing host economies the evidence points to the predominance of Asia in innovative R&D for international markets. R&D activities in selected Asian economies such as China, India, the Republic of Korea and Taiwan Province of China are becoming increasingly important within the global R&D networks of TNCs. Examples include the Toyota Technical Center Asia Pacific in Thailand, Motorola's R&D network in China and Microsoft's sixth global research centre in Bangalore, India. Some of the innovative R&D conducted there is at the cutting edge. The semiconductor industry is an example. One of the earliest to move production into developing countries, it has also been among the first to move advanced design to selected developing economies in Asia. Some of the design is done by foreign affiliates and some by local firms. A few firms from the Republic of Korea and Taiwan Province of China, and to a lesser extent from China and India, for instance, are now at the technology frontier of design work.

TNCs have so far located limited R&D in Latin America and the Caribbean. Relatively little FDI in Latin America and the Caribbean is in R&D-intensive activities; when it is, the R&D conducted is mostly confined to the adaptation of technology or products for local markets, called "tropicalization" in the Latin American context. Some important exceptions exist in Brazil and Mexico in particular. In Africa, the R&D component of FDI is generally very low; with the exception of some countries such as Morocco and, especially, South Africa, R&D by TNCs is virtually non-existent. This is partly because of weak domestic R&D capabilities, and in many cases the absence of institutional mechanisms that create sufficient incentives for investors to devote resources to R&D.

In some of the new EU members, foreign affiliates have emerged as important R&D players. In the Czech Republic, Hungary and

Poland, R&D by foreign affiliates is often linked to manufacturing, mostly in the automotive and electronics industries. Some foreign affiliates also conduct "innovative" R&D for regional or global markets.

The process is driven by new push and pull factors, and is facilitated by enabling technologies and policies...

The need to adapt products and processes to key host-country markets has always been an important motive for TNCs to internationalize R&D. The need to tap into knowledge centres abroad to source new technologies, recruit the best skills and monitor the activities of competitors is also well known in the literature. However, the recent surge of R&D by TNCs in selected developing host economies also reflects the quest for cost reduction and for accessing expanding pools of talent in these locations. It can be seen as a logical next step in the globalization of TNC production networks. It also resembles the international restructuring that has taken place in export-oriented manufacturing and ICT-based services through which TNCs seek to improve their competitiveness by exploiting the strengths of different locations.

R&D internationalization to new locations outside the Triad is driven by a complex interaction of push and pull factors. On the push side, intensifying competition, rising costs of R&D in developed countries and the scarcity of engineering and scientific manpower along with the increasing complexity of R&D, reinforce the imperative to specialize as well as to internationalize R&D work. On the pull side, the growing availability of scientific and engineering skills and manpower at competitive costs, the ongoing globalization of manufacturing processes, and substantial and fast-growing markets in some developing countries increase their attractiveness as new locations.

The expanding pool of talent in selected developing countries and economies in South-East Europe and the CIS is very important in this context – notably in science-based activities – especially for companies that fail to find a sufficient number of skilled people in their home countries. In recent years, there has been a dramatic increase in the number of people enrolled in higher education in developing countries and economies in transition. In 2000-2001 China, India and the Russian Federation together accounted for almost a third of all tertiary technical students in the world. In addition, more scientists and engineers are staying in, or returning to, China and India to perform R&D work for foreign affiliates or local firms or to start their own businesses. In Bangalore, for example, some 35,000 non-resident Indians have lately returned with training and work experience from the United States. Reflecting the growing importance of the human resource factor, both developed and developing countries are now adopting new policy measures to attract skills from abroad.

The internationalization of R&D is also facilitated by improvements in ICT and associated cost decreases, new research techniques that allow greater "fragmentation" of R&D and better information on research capabilities that are available worldwide. At the same time, overall improvements in host-country investment climates have all contributed to creating a more enabling framework. Important policy developments relate, for example, to intellectual property rights (IPR) protection, reform of public research activities, infrastructure development, and investment promotion efforts specifically targeting R&D-related FDI and R&D incentives.

There are some fundamental reasons why the current trend towards R&D internationalization is set to continue. First, the competitive pressure on firms is likely to remain intense, forcing them to innovate more. Second, the need for greater flexibility in R&D in response to rapid technological change requires sizeable numbers of research staff with a range of specializations, and it necessitates locating R&D activities where such pools of researchers are available. Third, ageing populations in many developed countries are likely to result in an insufficient supply of specialized, up-to-date skills, forcing TNCs to look elsewhere for fresh talent. Fourth, through cumulative learning processes involving local enterprises and institutions, the developing countries that take part in the internationalization of R&D will progressively enhance their own ability to conduct more R&D. At present however, it appears that only a few developing countries led by China and India and some economies of South-East Europe and the CIS, can effectively meet the conditions required to participate.

...and has important implications for both host and home countries.

The creation of knowledge is a driver of economic growth, but no single country can produce all the knowledge needed to stay competitive and to grow in a sustained manner. Countries are therefore eager to connect with international networks of innovation. Outward and inward FDI in R&D are two ways of doing so. R&D internationalization opens up new opportunities for developing countries to access technology, build high-value-added products and services, develop new skills and foster a culture of innovation through spillovers to local firms and institutions. FDI in R&D can help countries strengthen their innovation systems and upgrade industrially and technologically, enabling them to perform more demanding functions, handle more advanced equipment and make more complex products.

At the same time these benefits do not appear automatically, and unwanted effects can also arise. The main concerns in economies hosting FDI in R&D relate to the potential downsizing of existing R&D when FDI involves takeovers of domestic firms, unfair compensation to local firms and institutions collaborating with TNCs in the area of R&D, the crowding out of local firms from the market for researchers, a race to the bottom in attracting R&D-related FDI and unethical behaviour by TNCs. There may also be tensions between TNCs and host-country governments, in that the former may seek to retain proprietary knowledge while the latter seek to secure as many spillovers as possible.

A key determinant of the development impact on a host economy is its absorptive capacity. Indeed, technological capabilities in the domestic enterprise sector and technology institutions are necessary not only to attract R&D but also to benefit from its spillovers. Other determinants are the type of R&D conducted, and whether the R&D is linked to production. The more a TNC interacts with a host developing country's local firms and R&D institutions, and the more advanced the country's national innovation system (NIS), the greater the likelihood of positive effects on a host economy.

R&D internationalization also has implications for home countries – both developed and developing. It can help a country's TNCs improve their competitiveness by accessing strategic assets and new technologies, acquiring unique knowledge at competitive prices, increasing specialization in their R&D, reducing costs, increasing flexibility and expanding their market shares. By extension, the improved competitiveness of TNCs often has positive impacts on their home economies. Foreign R&D can generate opportunities and spillovers in the home economy to the benefit of local firms and the home economy as a whole.

At the same time, the transnational expansion of R&D may give rise to concerns in home countries, especially with regard to the risk of hollowing out and the loss of jobs. These concerns resemble those voiced in connection with the general debate on services offshoring. The trend is so new that any assessment must be tentative. However, it does seem that protectionist measures to limit the expansion of R&D abroad will not effectively address these concerns as they would risk undermining the competitiveness of the country's enterprises. Rather, to turn the internationalization process into a win-win situation for host and home countries alike, policies aimed at advancing the specific innovation capabilities and the functioning of the NIS are key.

Appropriate policy responses are needed at the national level...

Enterprises are the principal agents of innovation. However, they do not innovate and learn in isolation, but in interaction with competitors, suppliers and clients, with public research institutions, universities and other knowledge-creating bodies like standards and metrology institutes. The nature of these interactions, in turn, is shaped by the surrounding institutional framework. The complex web within which innovation occurs is commonly referred to as the "national innovation system". Its strength can be influenced by government intervention.

A number of policy and institutional areas need to be addressed to attract FDI in R&D, to secure the benefits that it can generate and to address potential costs. The starting point is to build an institutional framework that fosters innovation. Particular policy attention is needed in four areas: human resources, public research capabilities, IPR protection and competition policy. Efforts to secure an adequate supply of human resources with the right skills profile involve educational policies – not least at the tertiary level – and measures to attract expertise from abroad. For public R&D to contribute effectively to the NIS, it is essential that it links with enterprise R&D and that public research institutes promote the spin-off of new companies. The attractiveness of a location for conducting R&D may increase if the IPR regime is more effective, but a strong IPR regime is not necessarily a prerequisite for TNCs to invest in R&D. The policy challenge is to implement a system that encourages innovation and helps to secure greater benefits from such activity, notably when it involves TNCs. At the same time, in order to balance the interests of producers and consumers, IPR protection needs to be complemented by appropriate competition policies.

Efforts in these areas need to reflect the comparative advantage and technological specialization of each country as well as the development trajectory along which a country plans to move. FDI policy is also vital to promote the desired forms and impacts of FDI. Selective policies in this area can include targeted investment promotion, performance requirements and incentives along with science and technology parks.

IPAs can play an important role in a country's strategy to benefit from R&D internationalization by TNCs. It can potentially serve two prime functions. The first is to communicate and market existing investment opportunities, for example, through targeted promotion, based on a careful assessment of the locations' strengths and weaknesses and a good understanding of the relevant locational determinants. If a location is unlikely to be able to offer the conditions needed to attract R&D by TNCs, an IPA may be better off focusing on its policy advocacy function. It may draw the attention of other relevant government bodies to areas that are important for making a location better equipped to benefit from R&D by TNCs.

In a global survey of IPAs conducted by UNCTAD, a majority of the respondents were found already to target FDI in R&D. A large majority of IPAs in developed countries actively promote FDI in R&D activities (79%), and 46% of those based in developing countries do so as well. The highest percentage (94%) was noted for IPAs in Asia and Oceania. Conversely, a minority of IPAs in Africa promote it actively, and only 11% of the IPAs in Latin American and the Caribbean do so.

Finally governments need to pay attention to more focused policies aimed at boosting the capabilities of the domestic enterprise sector, notably through industry-specific and small and medium-sized enterprise policies.

The various objectives of education, science and technology, competition and investment policies can be mutually reinforcing. Whether a country tries to connect with global networks by promoting inward FDI, outward FDI, licensing technology, the inflow of skills or through any other mode, policies need to be coherent with broader efforts to strengthen the NIS. The stronger the NIS, the greater is the likelihood of attracting R&D by TNCs and of benefiting from spillover benefits generated by such R&D. In essence the policies pursued need to be part of a broad strategy aimed at fostering competitiveness and development.

Indeed, the emphasis on policy coherence may be one of the most striking lessons learned from those developing countries that are now emerging as more important nodes in the knowledge networks of TNCs. In most of these countries, the starting point has been a long-term vision of how to move the economy towards higher value-added and knowledge-based activities. The success of some Asian economies is no coincidence; it is the outcome of coherent and targeted government policies aimed at strengthening the overall framework for innovation and knowledge inflows. In some form (and to varying degrees), they have actively sought to attract technology, know-how, people and capital from abroad. They have invested strategically in human resources, typically with a strong focus on science and engineering; invested in infrastructure development for R&D (such as science parks, public R&D labs, incubators); used performance requirements and incentives as part of the overall strategy to attract FDI in targeted activities; and strategically implemented IPR protection policies.

For many developing countries at the lower end of the UNCTAD Innovation Capability Index any expectation of a major influx of R&D by TNCs would be unrealistic in the short term. However, that is not an excuse for a lack of action. Rather, countries should consider how to begin a process through which economic and technological upgrading could be fostered. The creation of innovative capabilities is a path-dependent and long-term task. For latecomers, ensuring that a process aimed at strengthening their NIS gains momentum is an essential first step.

For home countries, current trends accentuate the need to rely even more on the creation, diffusion and exploitation of scientific and technological knowledge as a means of promoting growth and productivity. Rather than regarding R&D internationalization as a threat, home countries should seize opportunities arising from it. It is important to explore new ways of collaborating with the new R&D locations (e.g. through joint research programmes and careful attention to the benefits and costs of outsourcing and R&D-related outward FDI). Countries should also try to remove bottlenecks and “systemic inertia” in their NISs to be better positioned to benefit from R&D internationalization. They may also see the need to specialize more in areas where they hold a competitive edge to strengthen existing world-class centres of excellence and build new ones.

...taking developments at the international level into account.

Policy-making at the national level also has to consider developments in international investment agreements at various levels. Many international agreements give special attention to investment in R&D activities. Key issues relate to the entry and establishment of R&D-related FDI, the treatment of R&D performance requirements (whether by restricting or explicitly permitting them), incentives encouraging investment in R&D activities, and the movement of key personnel.

In general, international investment agreements confirm the importance of policies that seek to facilitate FDI in R&D. While most countries welcome FDI in R&D, many governments do not allow foreign companies to draw on certain kinds of public R&D support. Many bilateral agreements also state explicitly that governments are free to apply R&D requirements as a condition for receiving preferential treatment (e.g. an incentive). A small number of agreements prohibit the use of mandatory performance requirements in the area of R&D.

Most international investment agreements do not have provisions that specifically protect R&D-related FDI; they protect FDI in general. Related provisions include the definition of investment, the free transfer of returns arising from R&D activities and the application of the national treatment and most-favoured-nation standards to foreign investors.

The protection of IPRs at the international level and minimum standards set by international treaties are of particular relevance for R&D-related FDI. The most important instrument in this area is the WTO Agreement on Trade-related Aspects of Intellectual Property Rights (TRIPS). Some recent agreements at the bilateral and regional levels have extended the minimum standards set in the TRIPS Agreement. The protection of IPRs enshrined in these agreements is intended to encourage the development of proprietary knowledge; but at the same time, it limits the policy space of States in an area that is directly relevant to R&D activities. For developing countries it is therefore important to understand and make use of the flexibilities contained in the TRIPS Agreement. There is also a clear need for additional technical assistance to facilitate the implementation of IPRs in a development-friendly manner.

Some international investment agreements also encourage home countries to support the strengthening of NISs in developing countries, by promoting outward R&D-related investment in developing countries. In addition, international cooperation agreements in the areas of science, technology and innovation help create an enabling framework for R&D internationalization by facilitating the flow of information, the formation of alliances, the pooling of financial resources, the improvement of access to technological expertise, matchmaking and the establishment of private-public sector partnerships.

But there is scope for more cooperation to foster policy formulation and stronger innovation systems in developing countries. One key area is human resource development. The international community could play a more active role in this area, for example, by supporting the strengthening of the local educational infrastructure and by making educational opportunities to developing countries available in developed countries. Home countries could contribute to the improvement of the institutional framework for innovation in developing countries by assisting in the establishment of technical standards and certification systems through access to and provision of testing equipment for standard setting and quality assessment. Similar steps could be taken with regard to the implementation of IPR systems and through R&D collaboration between institutions in developed and developing countries.

Policies at the international level have direct implications for the ability of developing countries to formulate their R&D policies and to create the conditions that will enable them to benefit from the internationalization of R&D by TNCs.

Geneva, September 2005

Supachai Panitchpakdi
Secretary-General of UNCTAD

PART ONE

END OF THE DOWNTURN

CHAPTER I

GLOBAL TRENDS: FDI FLOWS RESUME GROWTH

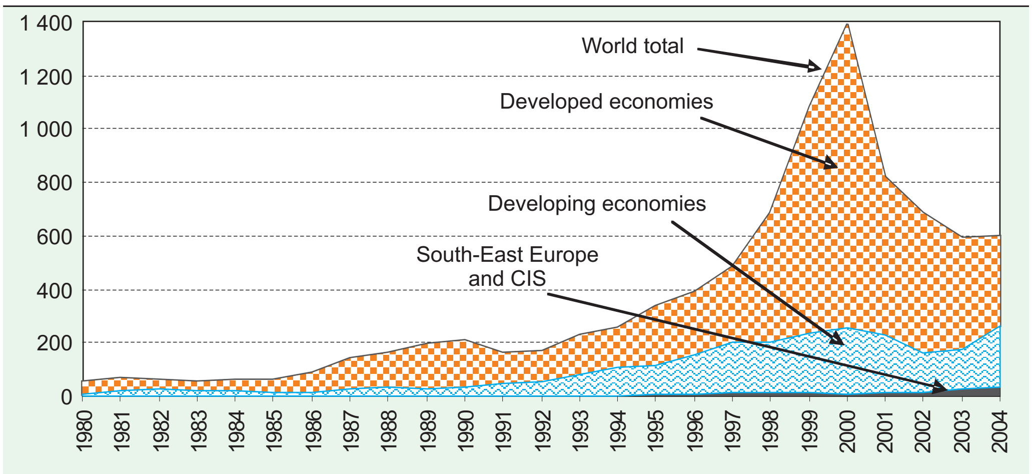
A. Signs of recovery

Global FDI inflows rose modestly in 2004 following large declines in their value in 2001 (41%), 2002 (13%) and 2003 (12%). At $648 billion in 2004, they were 2% higher than in 2003. This growth reflected increased flows to developing countries as well as to South-East Europe and the Commonwealth of Independent States (CIS) (figure I.1), which more than offset the decline (for the fourth year in a row) in flows to developed countries. The difference between inflows to developed countries and developing countries shrank to $147 billion – a significant narrowing of the gap compared with previous years.[1] The United States was the largest recipient in 2004, ahead of the United Kingdom and China as well as Luxembourg,[2] the top FDI recipients in 2003.

Cross-border mergers and acquisitions (M&As) – key modes of global FDI since the late 1980s – started to pick up in 2004 following three years of decline. Greenfield FDI continued to rise for a third consecutive year, strengthening the likelihood of a reversal of the global downward trend in flows. Data on the financing components of FDI show that the overall magnitude and trends of FDI in both developed and developing countries are determined to a significant extent by equity investment. However, fluctuations in other components can occasionally influence annual FDI flows to individual countries as in the case of Germany in 2004. The degree of transnationality – a measure of the relative economic importance of foreign affiliates in total economic activity – continued to rise for host economies as international production maintained growth.

Figure I.1. FDI inflows, global and by groups of economies, 1980-2004

(Billions of dollars)



Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics).

1. Overall analysis

a. FDI inflows and outflows

Global inflows of FDI rose in 2004 for the first time in four years. Notwithstanding statistical problems in FDI data collection and reporting that make comparisons of FDI between countries and regions difficult (box I.1), a number of observations can be made regarding FDI flows by region and sector.

Developed countries – a category now defined to include also the 10 new European Union (EU) countries (box I.2) – saw FDI inflows

Box I.1. Problems with FDI data

The analysis of FDI trends in Part One of *WIR* is largely based on FDI flow data collected from national balance-of-payments statistics. Values of FDI flows in national currencies are converted to United States dollars to calculate global FDI flows and compare FDI inflows to and outflows from different countries and country groups. Balance-of-payments data on FDI flows[a] are available for most countries for many years with a short time lag.[b] But there are some problems with these data that have to be kept in mind when interpreting them. Many countries still deviate one way or another from the recommendations of the International Monetary Fund (IMF) and the Organisation for Economic Co-operation and Development (OECD) in their collection, definition and reporting of FDI data (IMF/OECD 2004).

FDI is an investment involving a lasting interest by a home-economy entity in an enterprise in a host economy. For data collection purposes, FDI has been defined as involving an equity stake of 10% or more in a foreign enterprise. FDI has three components: equity capital, intra-company loans and reinvested earnings. Different countries have different recording practices relating to these three components. Some countries deviate from the suggested 10% threshold value for foreign equity ownership. Most countries report long-term intra-company loans, but not all countries record short-term loans and trade credits (annex B, Definitions and sources). Some countries are still not able to report reinvested earnings, as the data are not easily available from company reports or balance-of-payments surveys; those that report often do so with a considerable time lag. Out of 34 developed economies, only Greece did not report reinvested earnings at all in 2003, and 78% of developing countries reported such data that year.

Differences in how countries measure and report FDI complicate the interpretation of FDI trends for the following reasons:

- Bilateral discrepancies between FDI flows as reported by home and host countries can be quite large. The following table on FDI flows to China as reported by China (the host) and by a number of the investing (home) countries highlights this problem (box table I.1.1). Thus global FDI inflows and outflows differ. In 2004 for example, global FDI outflows were 13% higher than global FDI inflows. This imbalance is due to various factors such as: different methods of data collection by host and home countries, different data coverage of FDI (i.e. all three components of FDI may not be included), different time periods used for recording FDI transactions, and different

Box table I.1.1. FDI flows to China as reported by China and by the investing economy
(Millions of dollars)

Economy	2000 As reported by China	2000 As reported by investing economy	2001 As reported by China	2001 As reported by investing country	2002 As reported by China	2002 As reported by investing economy
France	853	324	533	166	576	563
Germany	1 041	819	1 213	976	928	887
Hong Kong, China	15 500	46 361	16 717	8 496	17 861	15 938
Japan	2 916	937	4 348	2 161	4 190	2 608
Malaysia	203	40	263	82	368	81
Netherlands	790	56	776	388	572	156
Thailand	204	9	194	11	188	16
United Kingdom	1 164	620	1 052	953	896	1 135
United States	4 384	1 817	4 433	1 912	5 424	924

Source: UNCTAD FDI/TNC database (www.unctad.org/fdistatistics).

/...

Box I.1. Problems with FDI data (concluded)

treatment of round-trip investments and of FDI in special-purpose entities.

- As recording practices change over time, time series data on FDI flows have structural breaks. For example, Japanese data on FDI flows started to include reinvested earnings (in addition to the other components) only in 1996, the same year German FDI flows began to cover short-term, intra-company loans.

Furthermore, to facilitate a comparative analysis of worldwide FDI, data on flows in various currencies are converted into a single currency, the United States dollar, and growth rates of dollar-denominated FDI flows may diverge from growth rates of FDI flows in national currencies.[c] In 2004 for instance, the United States dollar depreciated against most currencies of the developed countries. Therefore the 9% decline in the dollar value of FDI inflows into developed countries using constant exchange rates was smaller than the decline in FDI inflows calculated with current exchange rates. Similarly, as FDI flows are expressed in nominal or current prices of a country, the conversion of these flows into constant prices yields different results (box table I.1.2).

Box table I.1.2. FDI inflows to developed countries in various prices, 1980-2004

(Billions of dollars and per cent)

Year	In current exchange rates and prices[a]	Percentage change	In constant exchange rates[b]	Percentage change	In real prices [c]	Percentage change
1980	46.6	39.0	55.8	81.1	46.4	13.3
1981	45.9	-1.6	49.9	-10.7	45.3	-2.3
1982	31.8	-30.6	30.9	-38.0	32.6	-28.1
1983	32.9	3.6	30.6	-1.1	35.1	7.8
1984	40.6	23.2	35.5	16.1	44.0	25.1
1985	42.5	4.6	35.9	1.1	46.7	6.3
1986	70.1	65.0	70.5	96.4	75.6	61.9
1987	115.6	64.9	129.1	83.1	113.8	50.6
1988	133.6	15.6	158.5	22.7	125.7	10.4
1989	163.3	22.2	187.5	18.3	151.4	20.5
1990	172.1	5.4	206.4	10.1	146.8	-3.1
1991	117.1	-32.0	141.2	-31.6	101.6	-30.8
1992	112.6	-3.9	138.9	-1.6	101.6	0.0
1993	144.0	27.9	171.8	23.7	138.6	36.4
1994	151.8	5.4	183.5	6.8	142.3	2.7
1995	218.7	44.1	273.5	49.1	186.3	30.9
1996	234.9	7.4	281.7	3.0	203.2	9.0
1997	284.0	20.9	317.3	12.6	261.8	28.8
1998	503.9	77.4	525.6	65.7	491.6	87.8
1999	849.1	68.5	891.1	69.5	844.8	71.9
2000	1 134.3	33.6	1 134.3	27.3	1 134.3	34.3
2001	596.3	-47.4	555.1	-51.1	618.6	-45.5
2002	547.8	-8.1	512.0	-7.8	568.2	-8.1
2003	442.2	-19.3	451.1	-11.9	416.0	-26.8
2004	380.0	-14.1	410.3	-9.0	331.4	-20.3

Source: UNCTAD.

[a] FDI inflows to developed countries calculated by converting FDI inflows in national currencies and in current prices into dollar values on the basis of the annual average exchange rate of the respective currencies against the dollar.

[b] Calculated by using the real effective exchange rate of the United States dollar (base year 2000).

[c] FDI inflows to developed countries calculated by using the import price indices of industrialized countries with 2000 as the base year (as reported by the IMF), as a proxy for constant prices.

Source: UNCTAD.

[a] The IMF's *Balance of Payments Manual* (fifth edition, 1993) and the *OECD Benchmark Definition of Foreign Direct Investment* (third edition, 1995) provide agreed guidelines for compiling FDI flows. Both of them are now being revised. New methodologies and definitions of FDI are scheduled to be released in 2008.

[b] In the case of FDI stock, reliable data are available for considerably fewer countries because they are normally based on company surveys.

[c] For example, if the currency of country A devalues by 10% against the dollar while FDI inflows in national currency are constant, then FDI inflows into country A expressed in dollar terms would drop by 10%.

fall by another 14% (to $380 billion) in 2004, despite economic recovery in many countries and subregions, returning investor confidence and improved corporate earnings (chapter II). After the significant fall of 2001-2003, the further decline brought FDI inflows to developed countries to just 30% of their peak level of $1.1 trillion in 2000. The decline was particularly marked in the EU, where FDI fell by 36% to reach its lowest level since 1996. This decline was concentrated in a few members. Denmark, Germany, the Netherlands and Sweden alone accounted for 86% of the total decline that was spread over 10 countries. Other developed countries in Western Europe (particularly Norway, Switzerland) also experienced a fall (of

Box I.2. Changes in geographical groupings used in *WIR05*

Major changes in the classification of groups of economies have been introduced in the *World Investment Report* beginning this year following the reclassification of some countries by the United Nations Statistical Office (UNSO). The EU now has 25 members, including the 10 countries that became new members on 1 May 2004. Eight countries (the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia) have been reclassified from Central and Eastern Europe (CEE) to EU, and Cyprus from West Asia to EU. Malta has now been reclassified from “other developed countries” to EU. These ten countries are now included among the “developed countries”. All references to the EU in *WIR05* refer to the new classification (i.e. the EU following the accession of the new members); growth rates have been calculated on the basis of adjusted series unless stated otherwise. For the purpose of analysis in *WIR05*, EU-15 refers to the group of countries that were members of the EU before 2004 and EU-10 to the 10 new EU members.

After the reclassification of the eight EU-accession countries as developed countries instead of CEE, the rest of the CEE countries, along with countries formerly in the group Central Asia (under developing countries) are now classified by UNSO under South-East Europe in a new grouping comprising South-East Europe and the Commonwealth of Independent States (CIS) (box table I.2.1). The CIS was created in December 1991 and includes all of the republics that were part of the former USSR, except the Baltic States.

In addition to the reclassifications mentioned above, the nomenclature used for the developing Pacific Island countries classified in previous WIRs under the Pacific subregion of the Asia-Pacific region is changed to “Oceania” in order to bring WIR usage in line with that of other UNCTAD publications. The country composition of the subregion and region remains the same as in previous WIRs.

Box table I.2.1. Reclassification of country groupings in *WIR05*

Old classification	New classification: New EU countries (classified under “developed countries”)	New classification: South-East Europe (SEE) and Commonwealth of Independent States (CIS): SEE	New classification: South-East Europe (SEE) and Commonwealth of Independent States (CIS): CIS
Former Central and Eastern Europe			
Albania		Albania	
Belarus			Belarus
Bosnia and Herzegovina		Bosnia and Herzegovina	
Bulgaria		Bulgaria	
Croatia		Croatia	
Czech Republic	Czech Republic		
Estonia	Estonia		
Hungary	Hungary		
Latvia	Latvia		
Lithuania	Lithuania		
Republic of Moldova			Republic of Moldova
Poland	Poland		
Romania		Romania	
Russian Federation			Russian Federation
Serbia and Montenegro		Serbia and Montenegro	
Slovakia	Slovakia		
Slovenia	Slovenia		
TFYR Macedonia		TFYR Macedonia	
Ukraine			Ukraine
Central Asia (Developing countries)			
Armenia			Armenia
Azerbaijan			Azerbaijan
Georgia			Georgia
Kazakhstan			Kazakhstan
Kyrgyzstan			Kyrgyzstan
Tajikistan			Tajikistan
Turkmenistan			Turkmenistan

Source: UNCTAD.

66%) in their combined inflows. Conversely, FDI flows to the United States rose for the first time since 2000, to more than three times their 2003 level; however, they too were at about one-third of their peak level of 2000. The United Kingdom was another developed country that received large FDI inflows in 2004 – nearly four times their 2003 level. Flows to Australia, Japan and New Zealand also rose.

In contrast to developed-country inflows, flows to *developing countries* rose by 40% (to $233 billion) in 2004. As a result, their share in world FDI inflows reached 36% – the highest since 1997. While flows to Africa remained virtually unchanged, all other regions and subregions experienced a significant increase:

- *Africa* attracted constant but relatively high levels of FDI inflows at $18 billion, following an increase of 39% in 2003.
- Inbound FDI to the *Asia-Oceania region* reached $148 billion, up from $101 billion.[3]
- FDI flows to *Latin America and the Caribbean* rose by 44% (to $68 billion) after four years of consecutive decline.

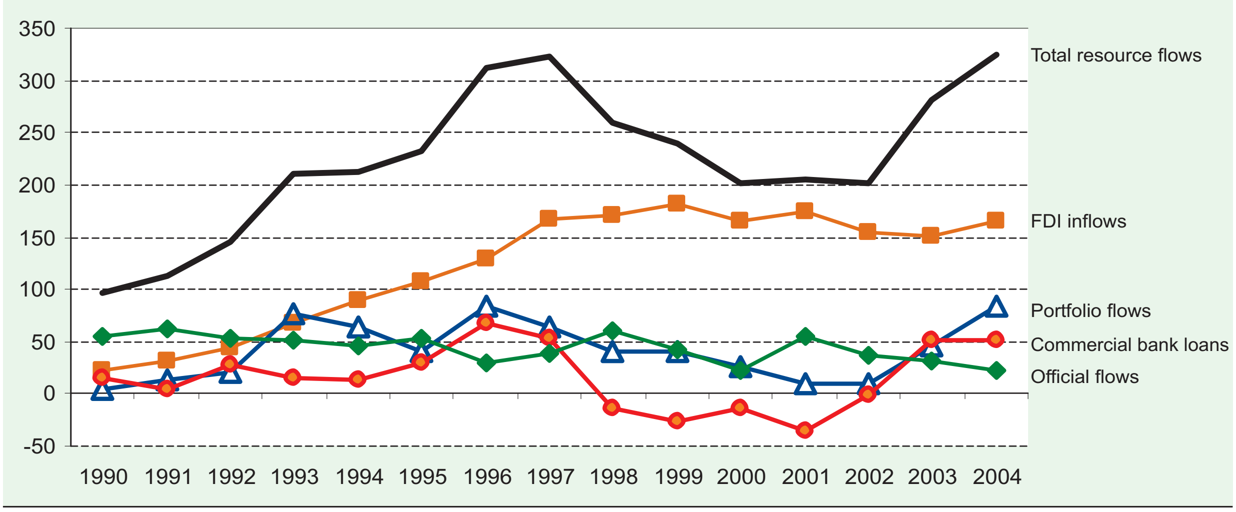
FDI flows to developing countries remain concentrated: the top five recipients, China, Hong Kong (China), Brazil, Mexico and Singapore, in that order, accounted for over 60% of total flows.

FDI inflows to the least developed countries (LDCs)[4] also rose, by 3% in 2004, to reach $11 billion, the highest level ever for these countries. Thirty-five of the 50 LDCs received higher inflows. FDI growth in this group in 2004 was largely due to an increase in flows to such countries as the Democratic Republic of the Congo, Myanmar and Equatorial Guinea; they experienced growth rates of 470%, 91% and 16% respectively (annex table B.1). (Flows to the major oil-producing countries in this group had risen considerably in 2003; for example, flows to Angola and Sudan doubled.) However, FDI flows to LDCs still remain low; in spite of the rise registered in 2004, their share in world and developing-country FDI inflows was no more than 2% and 5% respectively. Nonetheless, the shares of FDI inflows in gross fixed capital formation are more significant for the LDCs as a group than for other developing countries: 20% vs. 10% in 2002-2004 (annex table B.3).

In the new regional category of *South-East Europe* and the *CIS*, FDI flows amounted to $35 billion in 2004 compared with $24 billion in 2003 (chapter II). In the Russian Federation alone FDI grew from $8 billion to $12 billion.

Of all capital flows to developing countries, FDI continued to be the largest component and is increasing (figure I.2): it accounted for 51% of all resource flows to developing countries and has been several times larger than official flows in recent years.

Figure I.2. Total resource flows[a] to developing countries[b], by type of flow, 1990–2003
(Billions of dollars)



Source: UNCTAD, based on World Bank 2005a.

[a] Defined as net liability transactions of original maturity of greater than one year.

[b] The World Bank classification is used here. It differs from UNCTAD's classification in that it includes CEE countries under developing countries.

Unsurprisingly, there was no marked change in the sectoral distribution of FDI in 2003-2004. FDI in the services sector continued to grow, particularly in financial services (annex tables A.I.4-A.I.7). Services accounted for 63% of the total value of cross-border M&As in 2004 compared to 54% in 2003 (annex table B.5) and one-third of M&As in services were in financial services. In the primary sector, FDI, driven by rising demand for various commodities, particularly oil, started to grow significantly in some regions in 2004, especially in mining and oil-related industries in Africa and Latin America (chapter II).

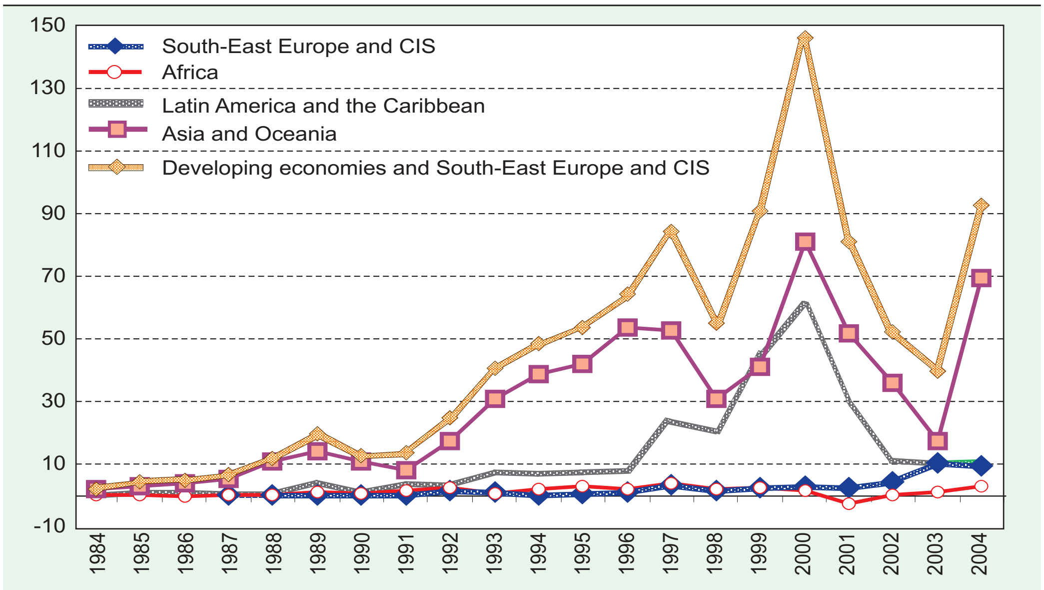
In terms of corporate functions there was a large increase in FDI as seen in the number of newly established regional headquarters: in 2004 more than 350, of which nearly 60% were established in developing countries. A noteworthy development is the continued growth of FDI in research and development (R&D), a phenomenon that is extending increasingly to developing countries (chapter IV). For instance, the number of foreign greenfield investment projects in R&D rose from 516 in 2003 to 642 in 2004 (annex table A.I.3).[5] The increase was higher in the case of host developing economies, which received 429 new R&D projects in 2004 compared with 316 in 2003. The increasing internationalization of TNCs' R&D activities and the implications of this, particularly for developing countries, are the special focus of Part Two of this *WIR*.

FDI *outflows* increased in 2004 by 18% to $730 billion, of which $637 billion were from developed countries. These countries remain significant net capital exporters through FDI: outflows exceeded inflows of developed countries by nearly $260 billion. While FDI outflows from the EU declined by 25% to $280 billion (a seven-year low), those from most other developed countries increased in 2004. FDI outflows from the United States increased by 90%, to $229 billion, its highest amount ever, and from Canada and Switzerland by 121% and 67% respectively (to $47 billion and $25 billion).

While developed countries remain the major source of FDI, outflows from developing countries have also risen, from a negligible amount in the early 1980s to $83 billion in 2004 (figure I.3).[6] The outward FDI stock from developing countries reached more than $1 trillion in 2004, with a share in world stock of 11% (annex table B.2). A number of notable M&As were undertaken recently by firms from developing countries (especially Asian firms), including in developed countries (chapter II). Developing countries are beginning to recognize the importance of such investment for their firms' competitiveness and their economies' performance. A few of them even invest relatively

Figure I.3. FDI outflows from developing economies, and South-East Europe and CIS, by group of economies, 1984-2004

(Billions of dollars)



Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics).

more abroad than some developed countries (*WIR04*). For example, the ratio of FDI outflows to gross fixed capital formation was 25% for Singapore in 2002-2004 compared to 8% for the United States (annex table B.3). This rise of FDI from developing economies' TNCs has taken place largely in the context of government policies that have paid little attention to outward investment, have been restrictive or have not been actively supportive.[7]

b. Modes of FDI entry

Firms may enter host economies through greenfield investments or M&As.[8] The choice of mode is influenced by industry-specific factors. For example, greenfield investment is more likely to be used as a mode of entry in industries in which technological skills and production technology are key. The choice may also be influenced by institutional, cultural and transaction cost factors (*WIR00*), in particular, the attitude towards takeovers, conditions in capital markets, liberalization policies, privatization, regional integration, currency risks and the role played by intermediaries (e.g. investment bankers) actively seeking acquisition opportunities and taking initiatives in making deals.

In 2004, *cross-border M&As* rose by 28%, to $381 billion (annex tables B.4-B.5), amidst an overall expansion of total (cross-border plus domestic) M&As by nearly 50%, to over $2 trillion. The number of cross-border deals reached some 5,100 – 12% higher than the previous year. An increase in the number of mega cross-border deals (with transaction values exceeding $1 billion) contributed to the growth in the value of cross-border M&As (table I.1). The largest deal in 2004 was the acquisition of Abbey National (United Kingdom) by Santander Central Hispano (Spain) for $15.8 billion (annex table A.I.1), almost the same value as that of the largest deal in 2003 but only one-thirteenth of the largest deal ever (the Vodafone-Mannesmann deal in 2000).

Cross-border M&As rose more markedly at the domestic and regional levels than at the global level. For instance, between companies of the EU-15 such deals increased in value by 57% to $99 billion, accounting for 57% of the value of all cross-border deals in that region in 2004 (as compared with 52% in 2003).

In addition to low interest rates in major economies and rising corporate profits, the recovery of asset prices since 2003 (as reflected in the rise in stock exchange indices) contributed to the rise in M&As. Indeed, partly as a result of increased stock prices, the number of cross-border deals using stock swaps rose from 123 to 161 in 2004 (close to the number of such deals in 1999), accounting for 16% of the total value of cross-border M&As.[9]

The growth in the value and number of cross-border M&As in 2004 was largely due to transactions taking place among developed-country firms: their value rose by 29%. In developing countries – where such transactions are normally less common, as fewer companies attract foreign investors and restrictions continue to be imposed on M&As – cross-border M&As also rose in 2004 by 36% in value, to reach $55 billion, two-thirds of the peak reached in 2001 (annex table B.4). There was a significant rise in cross-border M&A purchases in China and India, with a doubling of value in both countries, to record highs of $6.8 billion and $1.8 billion respectively. For the first time, China became the largest target country for cross-border M&As in developing countries.

Greenfield FDI, for its part, expanded from an estimated 9,300 projects in 2003 to 9,800 projects in 2004.[10] As in 2003, developing and

Table I.1. Cross-border M&As with values of over $1 billion, 1987-2004

Year	Number of deals	Percentage of total	Value ($ billion)	Percentage of total
1987	14	1.6	30.0	40.3
1988	22	1.5	49.6	42.9
1989	26	1.2	59.5	42.4
1990	33	1.3	60.9	40.4
1991	7	0.2	20.4	25.2
1992	10	0.4	21.3	26.8
1993	14	0.5	23.5	28.3
1994	24	0.7	50.9	40.1
1995	36	0.8	80.4	43.1
1996	43	0.9	94.0	41.4
1997	64	1.3	129.2	42.4
1998	86	1.5	329.7	62.0
1999	114	1.6	522.0	68.1
2000	175	2.2	866.2	75.7
2001	113	1.9	378.1	63.7
2002	81	1.8	213.9	57.8
2003	56	1.2	141.1	47.5
2004	75	1.5	199.8	52.5

Source: UNCTAD, cross-border M&A database.

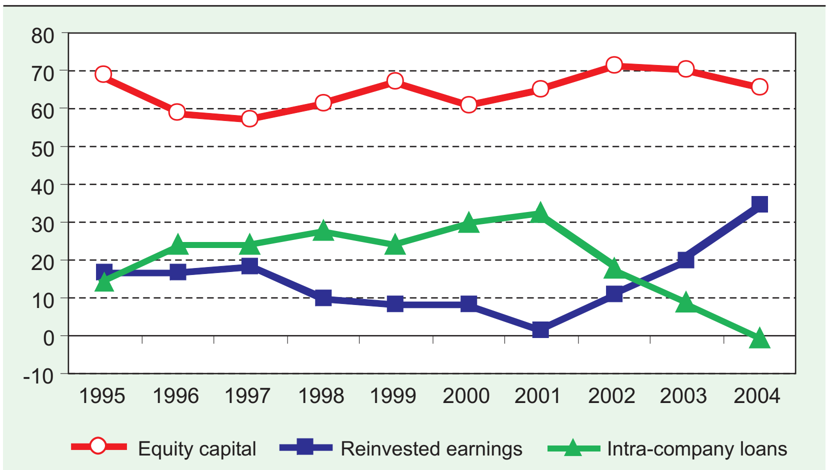
transition (South-East Europe and the CIS) economies attracted a larger number of greenfield investments than developed countries. This illustrates the tendency for developing countries to receive more FDI through greenfield projects than through M&As; greenfield investment is the key driver behind the recent recovery of FDI. However, in developing countries such investment is somewhat concentrated geographically: based on some 4,800 projects for which information was collected in 2004, for instance, only 11 economies[11] received more than 100 greenfield investments each in 2004 (annex table A.I.2). This concentration is in line with that of FDI as a whole in developing countries (chapter II). As in the case of M&As, China and India attracted significant numbers of such FDI projects, together accounting for nearly half of the total number in developing countries. Recent liberalization measures in India and strong economic growth in China, combined with increased liberalization after its accession to WTO (chapter II), contributed to this trend. Three-fifths of all greenfield projects in the world were in the services sector (annex table A.I.3).

c. Components of FDI flows

FDI is financed by TNCs through equity capital, intra-company loans and/or reinvested earnings.[12] The availability of data on each component of FDI flows varies by country: between 66 and 110 of the 212 economies for which FDI flows are reported provided data on all of these three components for the period 1995-2004.[13] Equity capital is the largest component of FDI financing. Worldwide, its share in total inflows fluctuated between 58% and 71% during the period 1995-2004; the higher shares were registered during the recent decline in world FDI flows (figure I.4). During the same period, intra-company loans, on average, accounted for 23%, and reinvested earnings for 12%, of world FDI inflows. The latter two components are much less stable. The share of reinvested earnings in FDI financing reached a low of 2% of worldwide FDI inflows in 2001, but it has been rising substantially since then. The share of intra-company loans, on the other hand, has fallen continuously and significantly (figure I.4).

The lion's share of FDI flows to developed countries comprises *equity capital* (around 67% of total FDI flows over the period 1995-2004) (figure I.4). Its importance varies by country and over time. For instance, the average share of equity capital in annual FDI flows was 85% in the United States, 78% in Germany and ranged between 50% and 70% in Finland, Norway, Switzerland and the United Kingdom. In contrast, in Ireland and the Netherlands the shares were only 23% and 35%, respectively, during that period. Equity capital was also the most important component of FDI flows to developing countries in 1995-2003, but to a lesser extent than for developed countries: its share in total FDI flows fluctuated between 49% and 67%. In 2004 it fell to only 29%.[14] Here again there are substantial differences between countries. In the case of

Figure I.4. Share of different financing components in world FDI inflows, 1995-2004
(Per cent)



Source: UNCTAD, based on national sources and IMF *Balance of Payments Statistics*, CD-ROM, June 2005.

Note: Based on data only for countries for which all three components of FDI inflows were available. This number ranges from 66 to 110 economies and it accounts for an average of 87% of total FDI inflows.

some host economies such as Brazil, inward FDI relied heavily on equity capital, while in some others like Hong Kong (China), the share of equity was only 28% during the period 1998-2004, with reinvested earnings and intra-company loans assuming greater importance.

In a number of countries the share of equity capital in FDI financing has also varied substantially over time. This reflects more the volatility of the two other components of FDI – reinvested earnings and, especially, intra-company loans – than that of equity capital. In the United States, for instance, the contribution of equity capital to FDI inflows varied from a low of 58% in 1997 to a high of 153%[15] in 2003 (72% in 2004), in Germany, from 27% in 1998 to 168%[16] in 2003 (70% in 2004) and in Argentina, from 72% in 1996 to 282%[17] in 2002 (53% in 2004).

As noted above, the share of *intra-company loans* in worldwide FDI inflows has fallen sharply since 2001 (figure I.4). This is mainly due to developments in a few large developed economies, such as the repatriation by TNCs of large amounts of credit from their affiliates in Germany ($10.1 billion in 2003 and $57.4 billion in 2004) and the United States ($31.7 billion in 2003 and $17.8 billion in 2004) (chapter II), resulting in negative flows of intra-company loans to the two countries in those years. Australia, Japan, the Netherlands and Portugal also experienced negative inflows of intra-company loans due to large-scale repatriations of such loans, but to a smaller extent than Germany and the United States. Similar trends have occurred in some developing economies. In Hong Kong (China), for instance, foreign TNCs withdrew credits of nearly $10 billion in 2002 and $3 billion in 2003, but resumed lending to their Hong Kong affiliates in 2004.

The share of intra-company loans differs between host countries. During the period 1995-2004 they contributed 40-50% of inward FDI flows in Germany[18] and France but less than 10% in Argentina, Australia and Switzerland. This variation can be explained partly by differences in the structural features of the host and home economies. Cross-border, intra-company loans often depend on the financial management of TNCs, which is in turn influenced by taxes and interest-rate differentials as well as by the characteristics of home- and host-country capital markets. For instance if the interest on a loan is received in a low-tax home country but the interest payment is deductible (as cost) in a high-tax host country, TNCs can save on their global taxes by using intra-firm lending.[19]

Empirical studies on FDI in the United States (Desai, Foley and Hines 2004, Altshuler and Grubert 2003) and Germany (Ramb and Weichenrieder 2004) have highlighted the role of tax differentials in intra-company lending across borders: low taxes in the United States compared to those in the home countries of foreign TNCs investing in the United States were found to reduce the incentive to finance FDI in the United States through intra-company loans. On the other hand, foreign TNCs were found to react to the high German tax rate by preferring intra-company loans to equity financing for their investments in Germany (chapter II).

As far as *reinvested earnings* are concerned (i.e. foreign affiliates' earnings not distributed as dividends to the parent company) their share in FDI flows has grown recently in all groups of economies. In developed countries as a group, it rose to 15% of FDI inflows in 2003 – more than double the average of the previous ten years. In 2004, the corresponding share was 33%, mainly due to negative flows of intra-company loans. As with other components of FDI inflows, the importance of reinvested earnings differs from country to country (table I.2). While most developed countries received positive FDI inflows in the form of reinvested earnings in 2003, France and Germany recorded negative reinvested earnings.[20] In the case of France, this seems to be a temporary phenomenon. In Germany, however, negative reinvested earnings of foreign affiliates have been registered for many years. This does not necessarily mean that affiliates of foreign TNCs located in Germany have been enduring sustained losses; data show that over a period of 30 years, aggregated dividends have been higher than the aggregated profits of all reporting foreign affiliates.[21] In principle, the distribution of large dividend payments by foreign affiliates in Germany reduces their retained profits, which can help reduce the taxes they pay in Germany (chapter II).

In developing countries the picture is slightly different, with reinvested earnings being more prominent: these earnings accounted for about 30% of FDI flows, on average, during the period 1995-2004, reaching 36% in 2003. Such earnings are therefore becoming crucial to sustained flows of FDI to developing countries, which is why a number of countries have

Table I.2. FDI inflows to the top 20 economies, ranked by size of different financing components, 2003

	Equity capital		Reinvested earnings		Intra-company loans	
Rank	Economy	Billions of dollars	Economy	Billions of dollars	Economy	Billions of dollars
1	United States	87.0	Ireland	19.4	France	27.7
2	Luxembourg	80.9	Hong Kong, China	16.0	Spain	14.2
3	Germany	45.7	United Kingdom	12.2	Italy	8.8
4	China	37.4	China	7.2	Luxembourg	6.4
5	Belgium	26.2	Russian Federation	7.1	Belgium	5.9
6	France	17.0	Canada	6.7	Mexico	5.8
7	Netherlands	14.6	Australia	5.7	Switzerland	5.3
8	Spain	13.0	Netherlands	5.2	Sweden	3.2
9	Brazil	9.3	Italy	4.8	Angola	2.8
10	Switzerland	8.3	Luxembourg	3.7	Russian Federation	2.8
11	Portugal	7.7	Switzerland	2.9	United Kingdom	2.8
12	Japan	7.6	Malaysia	2.8	China	2.5
13	Ireland	6.0	Mexico	2.3	New Zealand	2.3
14	United Kingdom	5.4	Finland	2.3	Ireland	1.5
15	Poland	4.6	Czech Republic	2.2	Norway	1.4
16	Austria	4.4	Hungary	2.1	Austria	1.3
17	Thailand	4.1	Chile	1.9	Ecuador	1.3
18	Azerbaijan	3.3	Nigeria	1.9	Venezuela	1.2
19	Argentina	3.0	Spain	1.9	Chad	1.0
20	Israel	2.9	India	1.8	Kazakhstan	0.9

Source: UNCTAD (www.unctad.org/fdistatistics) and UNCTAD's own estimates.

introduced fiscal incentives to encourage reinvestment of earnings by foreign affiliates.

d. Factors contributing to the recovery

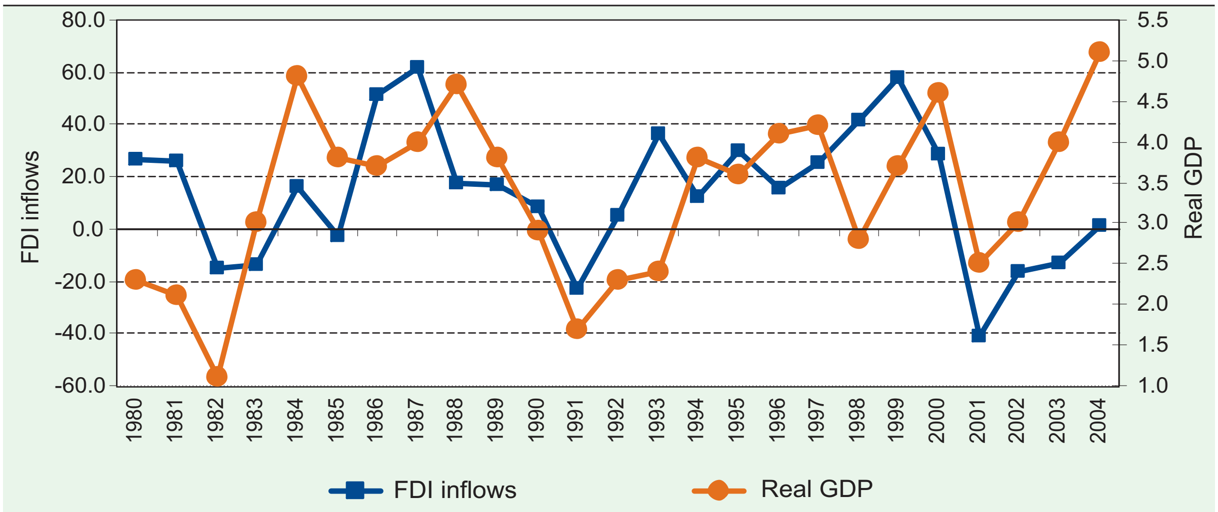
The recovery of FDI flows in 2004 is the result of favourable developments with respect to the macro, micro and institutional factors determining these flows.

Macroeconomic factors. After the sharp slowdown in 2001, global economic growth recovered gradually in 2002 and 2003. In 2004, world economic growth reached 5.1%, the strongest growth rate since the mid-1980s (figure I.5). As in the past, improved economic growth helped many countries attract more FDI (*WIR03*).

Most of the countries and regions with high economic growth rates recorded a sharp increase in FDI inflows in 2004. A number of developing countries in Asia, Africa and Latin America experienced a generally strong economic growth and, partly as a result, received significantly higher FDI inflows. This was also the case in the United Kingdom, the United States and the new EU member countries, which registered growth rates in 2004 of 3.1% (2.2% in 2003), 4.4% (3.0% in 2003) and 4.9% (3.7% in 2003) respectively (chapter II).[22] In contrast, several EU countries that grew at slower rates than the developed countries mentioned above, saw declining or stagnating FDI inflows.

The sharp increase in FDI inflows into the United States and some other countries (e.g. China) may also have been driven by the weakening dollar, which made investment in the United States – and in other countries with exchange rates pegged to the dollar – less costly for foreign investors. This is similar to the wave of FDI inflows into the United States in the 1980s in reaction to the dollar's weakness (Froot and Stein 1991). The declining dollar also improved the price competitiveness of companies located in these countries, therefore attracting efficiency-seeking FDI. The dollar's depreciation boosted their exports, which further stimulated FDI flows.[23] Rising exports are often accompanied by increasing FDI for improving distribution and marketing facilities for exports and for meeting the specific needs of exporters (Blomström, Lipsey and Kulchycky 1998, Pfaffermayer 1996, Egger 2001).

Figure I.5. Growth rates of world FDI inflows and GDP, 1980-2004
(Per cent)



Source: UNCTAD, based on UNCTAD FDI/TNC database (www.unctad.org/fdistatistics) for FDI and International Monetary Fund, *World Economic Outlook Database*, April 2005 for GDP.

Country risks, overall, declined worldwide in 2004[24] and business and consumer confidence increased.[25] The gradual decline of risk may have contributed to the recovery of FDI flows, although the empirical evidence for this is mixed (Moosa 2003, chapter 5).[26]

Microeconomic factors. Strong economic growth as well as large-scale restructuring and consolidation of business brought many companies back firmly to profit-making in 2004. Corporate profitability in the large economies improved even more.[27] Increased profits and favourable financing conditions have helped expand investments abroad. In addition, as many as 48 out of 49 major stock exchanges recorded rising share prices in 2004, which eased the financing of investments.[28] Increasing stock market values produce positive wealth effects and facilitate takeovers, especially through stock swapping. Higher stock market valuations also boost the value of cross-border M&As.

The recovery of FDI flows in many regions of the world was also influenced by fast rising commodity prices, at a rate of 11% for four years in a row.[29] Consequently, by 2004 such prices reached a record high. The higher prices and supply shortages induced TNCs to invest in new exploration and production facilities, especially in Africa and Latin America. Rising incomes of producers of oil, gas and other raw materials contributed to increasing FDI by TNCs in those industries.

Institutional factors. The process of privatization has come to an end in many developing and transition economies, and hence did not contribute much to FDI in 2004. But two other relatively new developments did. Private individual and institutional equity investors (as distinct from TNCs) gained significant importance in FDI. The value of cross-border M&As by private equity companies[30] rose from an estimated $69 billion in 2003 to $107 billion in 2004, accounting for 28% of all cross-border M&As, up from 23% in 2003.[31] Another development was the liberalization of FDI in real estate, traditionally closed to foreign investment in many countries (chapter II). In Germany[32] and Poland, for instance, liberalization and privatizations played a major role in attracting FDI into real estate. FDI in real estate grew rapidly worldwide in 2004, helped also by the rise in real estate prices: for example, the value of cross-border M&As in real estate tripled to $30 billion.[33]

e. The importance of TNC activities in the world economy

The universe of TNCs is large, diverse and expanding. By the early 1990s, there were an estimated 37,000 TNCs in the world, with at least 170,000 foreign affiliates. Of these, 33,500 were parent corporations based in developed countries. By 2004 the number of TNCs had risen to some 70,000 with at least 690,000 foreign affiliates, almost half of which are now located in developing countries (annex table A.I.8).

The role of TNCs in the world economy has thus continued to grow, as reflected in the expansion of FDI stock and in the operations of foreign affiliates (table I.3). Sales, value added (gross product), assets, employment and exports of foreign affiliates have all resumed an upward trend since 2002.

The degree of transnationality of host countries stagnated during 2000-2002 in both developed and developing countries according to the transnationality indices for host economies (figure I.6). This reflects the decline of FDI flows in these regions during that period. There are also significant differences in the degree of transnationality of different countries. The most transnationalized economies in 2002 were Belgium and Luxembourg, among developed countries, and Hong Kong (China), among developing economies (figure I.7) – positions held by those economies since this index was developed in 1996 (*WIR99*). While India has been catching up in inward FDI, it still ranks near the bottom in 2002. The transnationality of host countries depends on the

Table I.3. Selected indicators of FDI and international production, 1982-2004
(Billions of dollars and per cent)

Item	Value at current prices (Billions of dollars)				Annual growth rate (Per cent)						
	1982	1990	2003	2004	1986-1990	1991-1995	1996-2000	2001	2002	2003	2004
FDI inflows	59	208	633	648	22.8	21.2	39.7	-40.9	-13.3	-11.7	2.5
FDI outflows	27	239	617	730	25.4	16.4	36.3	-40.0	-12.3	-5.4	18.4
FDI inward stock	628	1 769	7 987	8 902	16.9	9.5	17.3	7.1	8.2	19.1	11.5
FDI outward stock	601	1 785	8 731	9 732	18.0	9.1	17.4	6.8	11.0	19.8	11.5
Cross-border M&As [a]	..	151	297	381	25.9 [b]	24.0	51.5	-48.1	-37.8	-19.6	28.2
Sales of foreign affiliates	2 765	5 727	16 963 [c]	18 677 [c]	15.9	10.6	8.7	-3.0	14.6	18.8 [c]	10.1 [c]
Gross product of foreign affiliates	647	1 476	3 573 [d]	3 911 [d]	17.4	5.3	7.7	-7.1	5.7 [d]	28.4 [d]	9.5
Total assets of foreign affiliates	2 113	5 937	32 186 [e]	36 008 [e]	18.1	12.2	19.4	-5.7	41.1 [e]	3.0 [e]	11.9 [e]
Exports of foreign affiliates	730	1 498	3 073 [f]	3 690 [f]	22.1	7.1	4.8	-3.3 [f]	4.9 [f]	16.1 [f]	20.1 [f]
Employment of foreign affiliates (thousands)	19 579	24 471	53 196 [g]	57 394 [g]	5.4	2.3	9.4	-3.1	10.8 [g]	11.1 [g]	7.9 [g]
GDP (in current prices) [h]	11 758	22 610	36 327	40 671	10.1	5.2	1.3	-0.8	3.9	12.1	12.0
Gross fixed capital formation	2 398	4 905	7 853	8 869	12.6	5.6	1.6	-3.0	0.5	12.9	12.9
Royalties and licence fee receipts	9	30	93	98	21.2	14.3	8.0	-2.9	7.5	12.4	5.0
Exports of goods and non-factor services [h]	2 247	4 261	9 216	11 069	12.7	8.7	3.6	-3.3	4.9	16.1	20.1

Source: UNCTAD, based on its FDI/TNC database (www.unctad.org/fdi statistics), and UNCTAD estimates.

[a] Data are available only from 1987 onward.

[b] 1987-1990 only.

[c] Based on the following regression result of sales against FDI inward stock (in millions of dollars) for the period 1980-2002: Sales = 2 003.858+1.87288*FDI inward stock.

[d] Based on the following regression result of gross product against FDI inward stock (in millions of dollars) for the period 1982-2002: Gross product = 622.0177+0.369482*FDI inward stock.

[e] Based on the following regression result of assets against FDI inward stock (in millions of dollars) for the period 1980-2002: Assets = -1 179.838+4.177434*FDI inward stock.

[f] For 1995-1998, based on the regression result of exports of foreign affiliates against FDI inward stock (in millions of dollars) for the period 1982-1994: Exports = 357.6124+0.558331*FDI inward stock. For 1999-2004, the share of exports of foreign affiliates in world exports in 1998 (33.3 per cent) was applied to obtain the values.

[g] Based on the following regression result of employment (in thousands) against FDI inward stock (in millions of dollars) for the period 1980-2002: Employment = 16 552.15+4.587846*FDI inward stock.

[h] Based on data from the International Monetary Fund, *World Economic Outlook*, April 2005.

Note: Not included in this table are the values of worldwide sales by foreign affiliates associated with their parent firms through non-equity relationships and the sales of the parent firms themselves. Worldwide sales, gross product, total assets, exports and employment of foreign affiliates are estimated by extrapolating the worldwide data of foreign affiliates of TNCs from Austria, Finland, France, Germany, Italy, Japan, Portugal, Sweden, Switzerland and the United States for employment; those from Austria, Finland, France, Germany, Italy, Japan, Portugal and the United States for sales; those from Japan and the United States for exports; those from the United States for gross product; and those from Austria, Germany and the United States for assets, on the basis of the shares of those countries in worldwide outward FDI stock.

extent to which TNCs are expanding their foreign activities in various locations. The next section looks at the universe of the largest TNCs, which play an important role in that process.

2. The largest TNCs

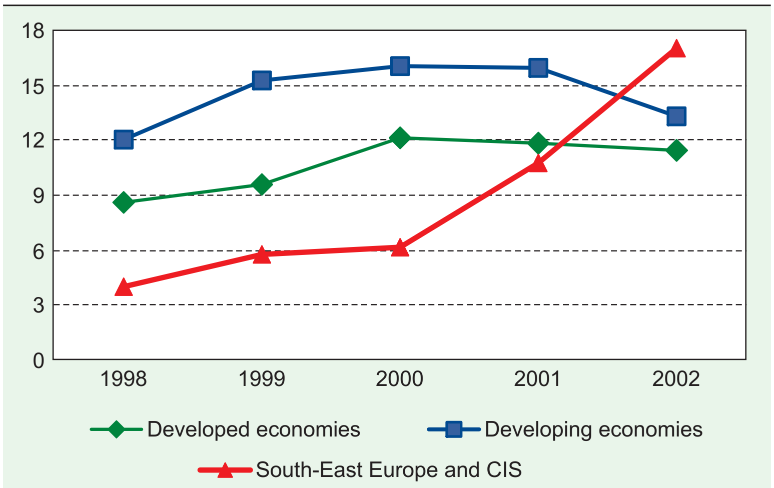
TNCs are mainly based in developed countries, and are increasingly being established in developing countries as well. This section looks at developments among the largest TNCs: the 100 largest non-financial TNCs worldwide and the 50 largest ones from developing economies ranked by foreign assets. It also includes an analysis of the ten largest TNCs from South-East Europe and the CIS (also ranked by foreign assets), and, for the first time in the *WIR*, an analysis of the transnationalization of the 50 largest financial TNCs worldwide ranked by total assets.

a. The world's top 100 TNCs

The 100 largest TNCs play a major role in international production; they account for 12%, 18% and 14%, respectively, of the estimated foreign assets, sales and employment of all TNCs in the world. Following a slowdown in their expansion in 2000, they resumed growth in 2002. In 2003, their assets and sales, both foreign and total, grew significantly (table I.4). Overall, the rankings in the top 100 list in 2003 (the latest year for which data on the top TNCs were available) were fairly similar to those in 2002 (annex table A.I.9). The top 10 companies maintained almost the same order as in 2002, General Electric and Vodafone heading the list each with foreign assets of about $250 billion. Despite the overall stability at the top of the list, there were 15 newcomers, including some manufacturing firms such as BAE Systems, Robert Bosch and United Technologies, as well as some petroleum and mining companies, like Petronas, Statoil and Rio Tinto.

Over the past decade or so, a number of new companies from the services sector have joined top rankings on the list, yet some companies in traditional industries have remained in the highest rankings. In the petroleum industry, for instance, Shell and ExxonMobil, which were numbers one and two, respectively, in 1992, are still among the top 10 TNCs. Motor vehicle companies like Ford, General Motors and Toyota are also still among the top 10. Globally, 10 of the top 20 companies in 2003 were already in the top 20 in 1992.

Figure I.6. Transnationality Index of host countries,[a] by group of economies, 1998-2002



Source: UNCTAD.

[a] Average of four shares: three-year average of FDI inflows as a percentage of gross fixed capital formation; FDI inward stock as a percentage of GDP; value added of foreign affiliates as a percentage of GDP; and employment of foreign affiliates as a percentage of total employment. Data cover 73 economies: 22 developed countries, 32 developing countries and 19 countries which are classified under Central and Eastern Europe.

Note: For each group of economies, the weighted average is used. For details, see the note in figure I.7. For the country composition of each group of economies, see also figure I.7.

The three industries dominating the list are motor vehicles, petroleum and electrical/electronic equipment with 11, 10 and 9 entries each. Together, more than half of the 30 leading companies listed among the top 100 were in these industries. A large group of new TNCs has emerged in recent years in service industries that are relatively new to FDI – notably, telecommunications, electricity, water and postal services – many of which were former State-owned monopolies. In 2003, TNCs in these industries accounted for almost 20% of the top 100 firms. The two companies that climbed the most in the rankings in 2003, Suez (11th) and Deutsche Telekom (14th), operate in service industries.

The largest TNCs remain geographically concentrated in a few home countries. The United States dominated the list with 25 entries. Five

Figure I.7. Transnationality Index of host economies, 2002

(Per cent)

Source: UNCTAD estimates.

[a] Average of four shares: FDI inflows as a percentage of gross fixed capital formation for the past three years, 2000-2002; FDI inward stock as a percentage of GDP in 2002; value added of foreign affiliates as a percentage of GDP in 2002; and employment of foreign affiliates as a percentage of total employment in 2002.

[b] Only the economies for which data for all of these four shares are available were selected. Data on value added are available only for Belarus, Czech Republic, Finland (2001), France (2001), Hungary (2000), Ireland (2000), Italy (1997), Japan (1999), the Netherlands (1996), Norway (1998), Poland, Portugal, Sweden (2000), the United Kingdom (1997), the United States, China, India (1995), Malaysia (1995), Singapore (2000), Taiwan Province of China (1994) and the Republic of Moldova. For Albania, the value added of foreign owned firms was estimated on the basis of the per capita inward FDI stocks and the corresponding ratio refers to 1999. For the other economies, data were estimated by applying the ratio of value added of United States affiliates to United States outward FDI stock to total inward FDI stock of the country. Data on employment are available only for Austria (2001), the Czech Republic, Denmark (1996), Finland (2001), France (2001), Germany, Hungary (2000), Ireland, Italy (1999), Japan (2001), the Netherlands. For Albania, employment of foreign-owned affiliates was estimated on the basis of their per capita inward FDI stock, and the corresponding ratio refers to 1999. For the remaining countries, data were estimated by applying the ratio of employment of Finnish, German, Japanese, Swedish, Swiss and United States affiliates to Finnish, German, Japanese, Swedish, Swiss and United States outward FDI stock to total inward FDI stock of the economy. Data for France, the Netherlands, Norway, Sweden and the United Kingdom refer to majority-owned foreign affiliates only.

Note: The simple average refers to the simple mean of the indices of the individual countries within each group, while the weighted average takes into account the weight that each country has in each the four shares (as explained in footnote a above).

Table I.4 Snapshot of the world's 100 largest TNCs: assets, sales and employment, 2002, 2003
(Billions of dollars, thousand of employees, per cent)

Variable	2002	2003	% change
Assets			
Foreign	3 317	3 993	20.4
Total	6 891	8023	16.4
Foreign as % of total	48.1	49.8	1.7[a]
Sales			
Foreign	2 446	3 003	22.8
Total	4 749	5 551	16.9
Foreign as % of total	51.5	54.1	2.6[a]
Employment			
Foreign	7 036	7 242	2.9
Total	14 332	14 626	2.1
Foreign as % of total	49.1	49.5	0.4[a]

Source: UNCTAD/Erasmus University database.
[a] In percentage points.

countries (France, Germany, Japan, the United Kingdom and the United States) accounted for 71 out of the 100, while the EU alone accounted for 50. Four companies are from developing economies, Hutchison-Whampoa of Hong Kong (China) being the largest among them (16th).

b. The top 50 TNCs from developing economies

Since UNCTAD began publishing the list of the top 50 TNCs from developing economies in 1995, these companies have expanded their activities abroad. In 2003 their foreign assets climbed to $249 billion from $195 billion in 2002 (table I.5). As in 2002, the five largest TNCs accounted for almost half of the total foreign assets of the top 50. With foreign assets of $59 billion, Hutchison Whampoa (Hong Kong, China) continues to hold the leading position, with 25% of the total foreign assets of the top 50. Singtel (Singapore), Petronas (Malaysia), Samsung Electronics (Republic of Korea) and Cemex (Mexico) remained, in that order, in the next four positions. Although the top TNCs remained the same, 14 newcomers also entered the top 50 list in 2003 mainly from Asia (annex table A.I.10).

Asia has reinforced its dominance in the top 50 with 39 enterprises on the list. The other 11 enterprises came from South Africa (4), Mexico (4) and Brazil (3). Hong Kong (China) and Singapore remained the most important home economies, with ten and nine entries in the list respectively. Taiwan Province of China, with eight companies in the top 50, became the home economy with the third largest contingent of TNCs on the list largely owing to its electronics companies. The growing significance of this economy was mainly at the expense of South Africa, which had four companies listed in the top 50 in 2003 compared to seven in 2002.

The top 50 TNCs operate in a wide range of industries, the most important being electrical/electronic equipment and computers (mainly companies from Asia), followed by food and beverages. Other relatively significant industries for the top 50 include petroleum (6 TNCs), telecommunications (3), transportation (3), utilities (3) and hotels (3).

Four companies in the top 50 list (Hutchison Whampoa, Singtel, Petronas and Samsung) are also among the world's top 100 TNCs discussed above. It is likely that in the future more TNCs from developing economies will enter the list of the top 100, since outward FDI from these countries is expanding. Meanwhile, though, there remains a large gap in size between TNCs from the developed and developing groups. For instance, the total foreign assets of all the top 50 TNCs from developing economies in 2003 was barely equal to those of General Electric, the world's largest TNC.

In 2003, the assets, sales and employment, both foreign and total, of the largest TNCs from developing economies registered a large increase over previous years. However, the share of the foreign component of the three indicators declined. Moreover, when comparing the three ratios for the TNCs from developing economies with those from developed countries it is clear that the degree of internationalization of the former is lower (table I.5), as discussed in the following section.

c. Transnationality of the top TNCs

The degree of transnationality (or the importance of foreign as compared with the total activity of TNCs) stagnated during 2001-2003, for both the world's top 100 TNCs and the top 50 TNCs from developing countries, according to UNCTAD's Transnationality Indices (TNIs)[34] (figure I.8). An analysis of the TNI of the 100 largest TNCs suggests that the TNI, measured

Table I.5. Snapshot of the top 50 TNCs from developing countries: assets, sales and employment, 2002, 2003
(Billions of dollars, thousands of employees, per cent)

Variable	2002	2003	% change
Assets			
Foreign	195.2	248.6	27.4
Total	464.3	710.9	53.1
Foreign as % of total	42.0	35.0	- 7.0[a]
Sales			
Foreign	140.0	202.2	45.9
Total	308.4	512.5	66.1
Foreign as % of total	45.4	39.9	- 5.5[a]
Employment			
Foreign	713.6	1 077.2	50.9
Total	1 503.3	3 096.6	106.0
Foreign as % of total	47.5	34.8	- 12.7[a]

Source: UNCTAD/Erasmus University database.
[a] In percentage points.

Table I.6. Average TNI values for the world's largest TNCs, 2002, 2003
(Per cent)

Variable	2002	2003
Top 100 TNCs	57.0	55.8
United States	43.8	45.8
United Kingdom	70.4	69.2
Japan	43.6	42.8
France	69.0	59.5
Germany	46.9	49.0
Small European countries	88.5	72.2
Top 50 TNCs	49.2	47.8

Source: UNCTAD/Erasmus University database.
Note: A simple average value is used. It is the sum of the TNI values of all the companies, divided by the total number of companies.

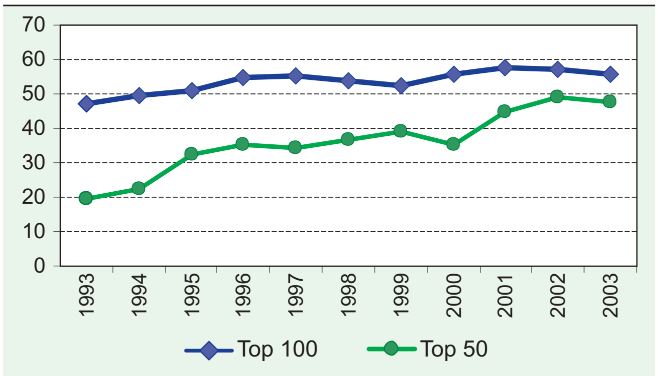
as the simple average value of the TNIs of all the TNCs on the top 100 list, decreased again in 2003, from 57 to 55.8 (table I.6). However, if the value of the TNI is based on global figures for the assets, sales and employment of the top 100 (a weighted average), its value rose slightly in 2003, by 1.5 percentage points, suggesting that the degree of transnationality of the top quartile of the largest TNCs has recovered faster than that of the bottom quartile. This reflects the fact that TNCs are focusing more on their domestic markets at a time of worldwide economic slowdown of their activities, and that the largest TNCs are able to recover faster than the average-sized TNCs.

Of the top 100, firms from Japan and the United States are, on average, less transnationalized than their European counterparts (table I.6). Firms from small European economies have the highest average TNI, partly reflecting the need to go abroad to compensate for smaller home markets. Except in 2003, the TNI of the top 50 TNCs from developing countries has increased substantially over the past decade, and has been catching up with that of the world's largest TNCs (figure I.8).

The sales-to-assets ratio is an indicator of capital efficiency. The ratio of sales-to-employment shows the value of sales per employee, and provides an indication of labour productivity, which may in turn indicate differences in the types of activities and technologies involved. A comparison of the sales-to-assets ratio for the top 100 TNCs worldwide and for the top 50 from developing economies shows a marginal difference. On the other hand, the indicator of labour productivity shows a much higher value for the world's 100 largest TNCs compared with the 50 largest TNCs from developing countries (table I.7). It should be noted that these ratios are highly dependent on the industry composition of the top 100 and top 50, and that the indicators differ across sectors of activity much more than between firms within the same sector.

The geographic spread of a company's operations and interests is captured by the Internationalization Index, the ratio of the number of foreign affiliates to the total number of affiliates: it shows that, on average, 66% of the affiliates of the top 100 TNCs are located abroad (annex table A.I.9). Like the TNI, the Internationalization Index is highest for top TNCs from small economies (such as Finland, Spain and Switzerland) and for the pharmaceutical industry. On average, the top TNCs have affiliates in 39 foreign economies. Ranking TNCs by the number of host countries shows that firms from European countries rank high, with affiliates in an average of 71 host economies.[35] The host country most favoured by these 100 largest TNCs is the Netherlands, where 91 of the 100 have at least one affiliate, followed by the United Kingdom and Canada. Among developing countries, Brazil hosts the largest number of affiliates of the top 100 TNCs (75), followed by China, with 60.

Figure I.8. Average TNI[a] of the 100 largest TNCs in the world and of the 50 largest TNCs from developing countries, 1993-2003



Source: UNCTAD/Erasmus University database.

[a] A simple average (for definition, see table I.6).

Table I.7 Measures of efficiency and productivity of the world's top 100 and developing countries' top 50 TNCs, 2002, 2003

	Top 100		Top 50	
Measure	2002	2003	2002	2003
Sales/assets	68.9	69.3	66.4	72.0
Sales/employment[a]	0.33	0.38	0.21	0.16

Source: UNCTAD/Erasmus University database.

[a] In millions of dollars per employee.

The Internationalization Index also shows that, on average, 49% of the affiliates of the top 50 TNCs are located abroad (annex table A.I.10). This index is highest for TNCs from Hong Kong (China), the Republic of Korea and Singapore, and for those in the electrical/electronics industry. On average, the top 50 TNCs have affiliates in 13 host economies, which is much less than those of the top 100 TNCs, though the East Asian firms at the top of the 50 list come close (with an average of 36 host economies) to their counterparts from developed countries.

d. The top 10 TNCs from South-East Europe and the CIS

During 2002-2003 the 10 largest non-financial TNCs from South-East Europe and the CIS continued to expand both at home and abroad in terms of assets, sales and employment (table I.8). Firms in natural resources and transportation dominate the list. The largest TNC, Lukoil, ranks within the top 10 of the largest TNCs from developing countries (annex table A.I.11).

Russian TNCs dominate the list, but on average they are less transnationalized than the top 50 TNCs from developing economies. The simple average TNI for the top 10 (36.6) is also much lower than that for the top 50. Although the sales-to-assets ratio is high, the ratio of sales to employment is much lower than for TNCs from developing economies.

e. The world's top 50 financial TNCs

During the past decade or so, deregulation of financial services in Europe and North America, technological change and competitive pressures have contributed to the creation of financial conglomerates that provide banking services, mortgages, all lines of insurance, asset management, and treasury and securities services. According to *Fortune*, the largest financial services companies by revenues did not rank among the top 50 of the world's biggest corporations in 1989. In 2003, the largest financial services company from Germany (Allianz) ranked 11th, and 13 financial groups from the Triad (EU, Japan and the United States) were listed among the top 50 corporations in the world in terms of revenues.[36]

The rise in the value of the assets of financial TNCs in the 1990s is mainly attributed to growth through M&As. The growth of transnational financial conglomerates is not confined to developed economies: foreign participation in the financial sectors of emerging markets also increased rapidly during the 1990s particularly in Latin America, the new EU member countries and South-East Europe. Mexico alone accounted for about 50% of the cumulative FDI flows in financial services in Latin America and the Caribbean region from 1990 to 2003. The new EU members and countries in South-East Europe became major recipients of FDI flows in the financial industry when privatizations and preparations for EU membership took place in the second half of the 1990s. The proportion of cross-border M&As in the financial sectors of Asia has been small compared to other regions (BIS 2004).

Large groups dominate world financial services, not only in terms of total assets but also in terms of the number of countries in which they operate.[37] This year, for the first time, *WIR*

Table I.8. Snapshot of the top 10 TNCs from SEE and CIS: assets, sales and employment, 2002, 2003
(Billions of dollars, thousands of employees, per cent)

Variable	2002	2003	% change
Assets			
Foreign	8.4	12.0	43.6
Total	42.7	48.9	14.6
Foreign as % of total	19.7	24.6	4.9[a]
Sales			
Foreign	14.5	24.9	72.0
Total	23.7	44.1	86.3
Foreign as % of total	61.2	56.5	-4.7[a]
Employment			
Foreign	19.1	39.9	108.4
Total	382.3	469.0	22.7
Foreign as % of total	5.0	8.5	3.5[a]

Source: UNCTAD/Erasmus University database.
[a] In percentage points.

introduces a list of the top 50 largest financial TNCs. These are ranked by total assets since data on foreign assets, foreign sales or foreign employment are not available.

TNCs from five countries (France, Germany, Japan, the United Kingdom and the United States) dominate the list, accounting for 70% of all companies in the top 50 and 74% of their total assets. However, there are companies from seven different countries in the top 10, accounting for 34% of total assets. In addition, the top 10 companies account for only 26% of total employment (annex table A.I.12).

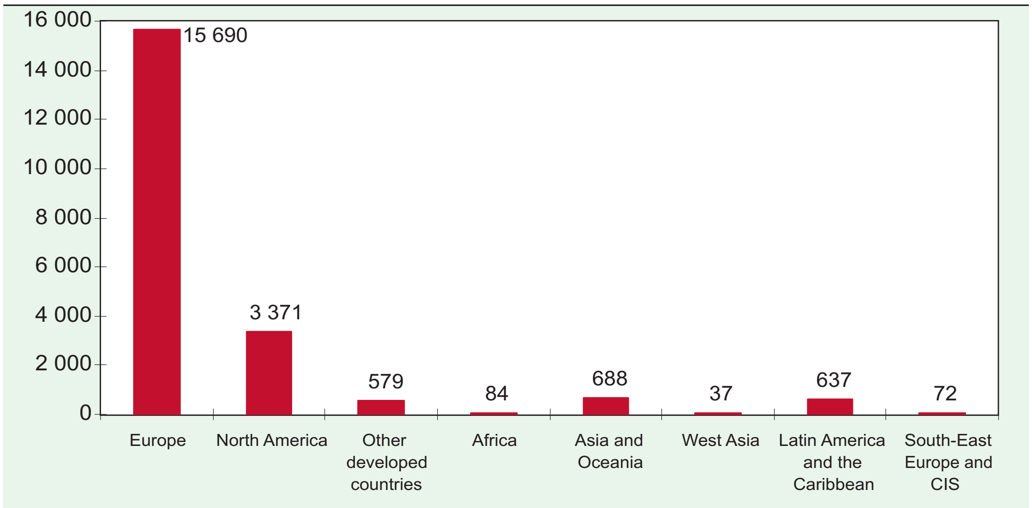
The degree of transnationality of financial TNCs can only be measured by the physical spread and location of their operations. The Internationalization Index shows that, on average, 46% of the affiliates of the top 50 financial TNCs are located abroad. The index is highest for financial groups from Switzerland that face domestic growth constraints due to the small size of the domestic market, amd have built up strong competitive advantages over a long period of time. The top 50 financial TNCs have, on average, affiliates in 25 countries. The largest share of affiliates is in Europe (figure I.9). There is a strong correlation between the size of a company and its transnationalization: the top 10 companies on the list have, on average, 58% of their affiliates located abroad in 44 countries, while the average for the whole group of affiliates is 43% in 25 host countries.

3. FDI performance and potential

The UNCTAD Inward FDI Performance[38] and Potential[39] Indices, as well as the Outward FDI Performance Index,[40] showed some noticeable changes for individual countries in 2004, reflecting uneven developments of FDI inflows and improvements in general economic performance (annex tables A.I.13-A.I.14).

The Inward FDI Performance Index for developing countries as well as the transition economies of South-East Europe and the CIS

Figure I.9. Distribution of foreign affiliates of the 50 largest financial TNCs, 2003



Source: UNCTAD, based on *Who Owns Whom* database (London: Dun & Bradstreet).

improved in 2004,[41] notably in South, East and South-East Asia, South-East Europe and the CIS (table I.9). However, it worsened in developed countries compared to 2003, although as a group they were well ahead of developing countries (table I.9). The United States, where FDI inflows rose by 69% in 2004, had a lower Performance Index and ranked at 114th out of 140 countries in the world, due to its lower FDI flows in 2002-2003; these are taken into account in the 2004 index (see annex table A.I.13 for rankings of all 140 countries). Denmark, the Netherlands, Portugal and Sweden fell by more than 30 positions in the country rankings (figure I.10). With large negative FDI inflows in 2004, Denmark fell by nearly 100 positions and was ranked second from the bottom. The top position in 2004 was held by Azerbaijan due to large oil-related FDI flows relative to the small size of its economy. In 2004, Tajikistan rose the most in the country rankings to 19th in the world (table I.10), reflecting a significant increase of FDI inflows in mining in 2002-2004 (annex table B.1).

In contrast to the changes in rankings by the Inward FDI Performance Index (see annex table A.I.13 for rankings of all 140 countries), there were almost no changes in the Inward FDI Potential Index rankings of the top ranked countries between 2002 and 2003[42] (table I.11). This reflects the stability of the structural variables comprising the Index. In other words, this index shows how the structural variables move in relation to each other. Comparing the rankings by the Potential Index with those of the Performance Index gives an indication of how each country performs against its potential. Countries in the world can be divided into the following four categories: front-runners (countries with high FDI potential and performance); above potential (countries with low FDI potential but strong FDI performance); below potential (countries with high FDI potential but low FDI performance); and under-performers (countries with both low FDI potential and performance (table I.12). The data for this categorization are limited to 2003 (due to unavailability of the 2004 data for the Potential Index), the last year of the global FDI downturn period. As in past years, there are no significant changes in the first and last groups, with many developed and newly industrializing economies in the former and many LDCs or poor developing countries in the latter. The second and third groups also include mostly the same countries as in the previous year. The question remains for the above-potential countries as to how they can continue to sustain their FDI performance at levels comparable with those of the past while addressing structural problems (i.e. FDI potential). The concern for the below-potential countries, on the other hand, is how they could raise their FDI performance to match their potential.

Performance in FDI outflows relative to the size of economies as measured by the Outward FDI Performance Index (annex table

Table I.9. Inward FDI Performance Index, by region, 1990, 2003, 2004[a]

Region	1990	2003	2004
World	1.000	1.000	1.000
Developed countries	1.022	0.947	0.891
Western Europe	1.310	1.837	1.625
European Union	1.310	1.866	1.647
Other Western Europe	1.307	1.261	1.175
North America	1.129	0.474	0.402
Other developed countries	0.290	0.202	0.372
Developing countries	0.977	1.187	1.353
Africa	0.731	1.253	1.226
North Africa	0.847	0.925	1.031
Other Africa	0.650	1.508	1.360
Latin America and the Caribbean	0.898	1.394	1.523
South America	0.741	1.399	1.648
Other Latin America and the Caribbean	1.302	1.386	1.359
Asia and Oceania	1.075	1.092	1.306
Asia	1.063	1.092	1.306
West Asia	0.141	0.415	0.478
South, East and South-East Asia	1.312	1.230	1.482
South Asia	0.115	0.320	0.418
East and South-East Asia	1.735	1.444	1.729
East Asia	1.193	1.523	1.821
South-East Asia	3.104	1.180	1.423
Oceania	7.358	0.936	0.795
South-East Europe and CIS	0.955 [b]	1.254	1.787
South-East Europe	0.835 [b]	2.273	3.064
CIS	0.981 [b]	1.044	1.533

Source: UNCTAD.

[a] Three-year moving average, using data for the three years ending with the year in question.

[b] As most of the countries in this region did not exist in their present form before 1992, the period for the index is 1992-1994.

A.I.14) shows some changes in country positions in 2004 as compared with those in 2003. There are three newcomers to the list of the top 20 outward investment economies: Australia, Austria and Estonia (table I.13). However, Denmark, Finland and Ireland are no longer in the list, unlike other small economies that rank relatively high. Denmark and Finland also fell in ranking on the Inward FDI Performance Index in 2004.

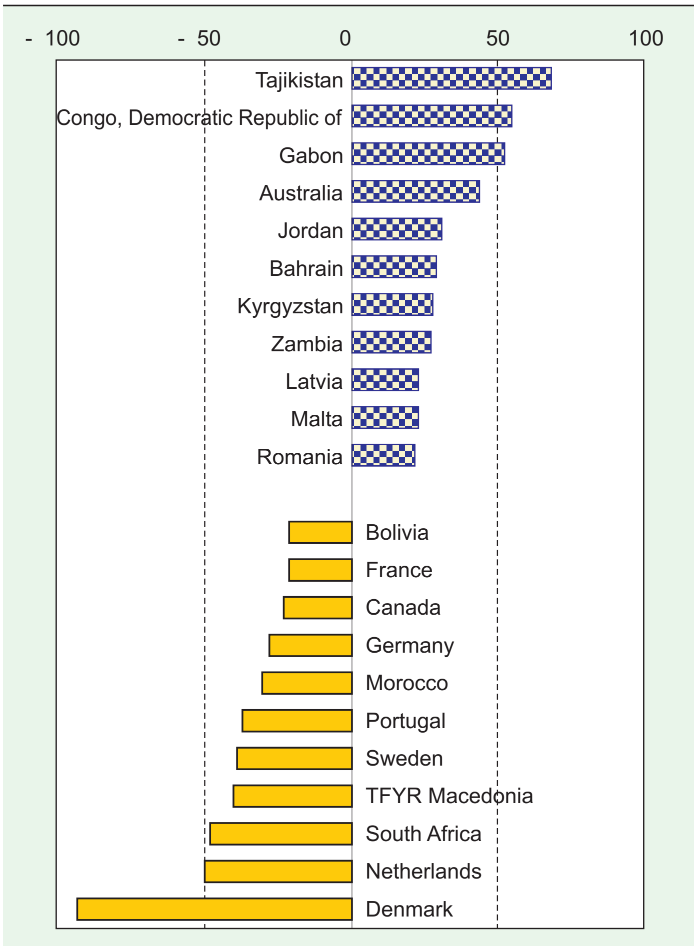
B. Policy developments

1. National policy changes

With a view to upgrading or enhancing their ability to attract and benefit from FDI, countries are continuing to adopt measures intended to improve their investment climates.

Figure I.10. Largest gains and losses in inward FDI performance, 2003-2004[a]

(Changes in country ranking)



Source: UNCTAD, based on annex table A.I.13.

[a] Three-year moving average, using data for the three years ending with the year in question.

In 2004, both the number of national policy measures affecting FDI and TNCs that were introduced and the number of economies involved in the process increased. A total of 271 new measures were adopted by 102 economies (table I.14).

The vast majority (87%) of regulatory changes tended to make conditions more favourable for foreign companies to enter and operate. Most of these measures implied further liberalization of investment regimes; 95 involved new promotional efforts (including various types of incentives) and 37 greater investor protection. In terms of regional distribution, Asia and Oceania accounted for 30% of the new measures, followed by the transition economies (22%), Africa (21%), developed countries (14%) and Latin America and the Caribbean (13%).

While the trend towards more welcoming policies for FDI continued, 36 were less favourable in 2004 – an unusually high share. This is the highest number reported since UNCTAD started monitoring changes in national laws in 1991. In Latin American and the Caribbean countries, as many as 24% of all changes were unfavourable, and the share was also relatively high in Africa (19%). In terms of their nature, 11 involved less promotional efforts (e.g. making incentives less generous), 9 involved new restrictions to FDI entry and establishment, while 5 affected the operations of foreign investors. The relatively high incidence of such measures may reflect the growing disappointment of many developing countries in the ability of liberalization, generous incentives and promotion to attract the level of FDI inflows that is commensurate with their potential.

An area in which many changes were undertaken in 2004 was corporate taxation. Reflecting the growing competition for FDI (as well as the need to stimulate investment generally), significant reductions in corporate income tax rates were noted in many countries.[43] According to UNCTAD's findings, about 20 economies reduced their corporate income tax rates during 2004 (table I.15) – nine were developed economies, five transition economies and six developing economies. From a regional perspective, developed countries as a group showed the most significant reduction in their average

Table I.10. Rankings by the Inward FDI Performance Index, 2004 [a]

1	Azerbaijan	36	Tanzania, United Republic of	71	Ukraine	106	Thailand
2	Belgium and Luxembourg	37	Mali	72	Macedonia, TFYR	107	Paraguay
3	Brunei Darussalam	38	Zambia	73	El Salvador	108	Egypt
4	Angola	39	Syrian Arab Republic	74	New Zealand	109	Korea, Republic of
5	Ireland	40	Australia	75	Poland	110	Oman
6	Gambia	41	Botswana	76	Iceland	111	Turkey
7	Hong Kong, China	42	Albania	77	Kyrgyzstan	112	India
8	Singapore	43	Bolivia	78	United Kingdom	113	Zimbabwe
9	Mongolia	44	Nigeria	79	Mexico	114	United States
10	Congo	45	China	80	France	115	Burkina Faso
11	Kazakhstan	46	Hungary	81	Portugal	116	Libyan Arab Jamahiriya
12	Bulgaria	47	Latvia	82	Argentina	117	Myanmar
13	Georgia	48	Jordan	83	Israel	118	Germany
14	Cyprus	49	Spain	84	Malta	119	Malawi
15	Trinidad and Tobago	50	Viet Nam	85	Guinea	120	Guatemala
16	Estonia	51	Costa Rica	86	Venezuela	121	Saudi Arabia
17	Jamaica	52	Bahamas	87	Côte d'Ivoire	122	Bangladesh
18	Sudan	53	Honduras	88	Russian Federation	123	Madagascar
19	Tajikistan	54	Uganda	89	Austria	124	Rwanda
20	Congo, Democratic Republic of	55	Finland	90	Lebanon	125	Taiwan Province of China
21	Chile	56	Malaysia	91	Ghana	126	South Africa
22	Armenia	57	Gabon	92	Papua New Guinea	127	Kenya
23	Mozambique	58	Dominican Republic	93	Sweden	128	Niger
24	Ethiopia	59	Lithuania	94	Canada	129	Greece
25	Slovakia	60	Slovenia	95	Algeria	130	Iran, Islamic Republic of
26	Moldova, Republic of	61	Switzerland	96	Sri Lanka	131	Sierra Leone
27	Bahrain	62	Brazil	97	Benin	132	Yemen
28	Czech Republic	63	Qatar	98	Italy	133	Haiti
29	Panama	64	Peru	99	Belarus	134	Japan
30	Nicaragua	65	Morocco	100	Philippines	135	Nepal
31	Guyana	66	Togo	101	Senegal	136	Indonesia
32	Namibia	67	Tunisia	102	Pakistan	137	Cameroon
33	Croatia	68	Netherlands	103	Norway	138	Kuwait
34	Ecuador	69	Colombia	104	United Arab Emirates	139	Denmark
35	Romania	70	Uruguay	105	Uzbekistan	140	Suriname

Source: UNCTAD, based on annex table A.I.13.

[a] Three-year moving average, using data for the three years ending with the year in question.

corporate tax rate from 29.7% to 26.5% (KPMG 2005). Among individual economies, Romania made the largest tax cut, from 25% to 16%, followed by Uruguay and Bulgaria. Only three countries reported increased rates (Germany, India and Viet Nam).

Corporate taxes may affect a country's international attractiveness in the eyes of foreign investors (OECD 2002a).[44] Studies show that location of FDI is becoming more sensitive to taxation, and that corporate income tax rates can influence a TNC's decision to undertake FDI, especially if competing jurisdictions have similar "enabling conditions". For instance, EU investors were found to increase their FDI positions in other EU member States by approximately 4% if the latter reduced their effective corporate income tax rates by one percentage point relative to the European mean (Gorter and Parikh 2003).

While policy changes overall are in the direction of more liberalization and deregulation, there are some differences between regions. FDI policy changes at the regional level are described in the analysis of regional trends in chapter II.

2. International investment agreements

The past year saw a further proliferation of international investment agreements (IIAs)[45] at the bilateral, regional and interregional levels. Several developments are worth noting in this context. First, the universe of bilateral investment treaties (BITs) and bilateral double taxation treaties (DTTs) continued to expand, albeit at a

Table I.11. Top 25 economies by the Inward FDI Potential Index, 1990, 2002, 2003 [a]

Economy	1990	2002	2003
United States	1	1	1
Norway	5	2	2
United Kingdom	3	3	3
Canada	2	5	4
Singapore	15	4	5
Sweden	6	7	6
Qatar	19	6	7
Germany	4	10	8
Belgium and Luxembourg	10	8	9
Ireland	27	9	10
Netherlands	8	11	11
France	7	15	12
Finland	9	12	13
Iceland	14	14	14
Hong Kong, China	20	13	15
Japan	13	16	16
Switzerland	11	18	17
Denmark	16	17	18
Australia	12	21	19
Korea, Republic of	21	19	20
Taiwan Province of China	22	20	21
United Arab Emirates	26	22	22
Israel	31	23	23
Austria	18	24	24
Spain	24	25	25

Source: UNCTAD, based on annex table A.I.13.

[a] Three-year moving average, using data for the three years ending with the year in question.

slower pace than in previous years. Second, international investment rules are becoming increasingly sophisticated and complex in content, and are also being formulated as part of agreements that encompass a broader range of issues (including trade in goods and services as well as the movement of other factors of production). Third, among the new BITs, some are re-negotiated treaties that replace earlier BITs between the same partners, either because the original treaty has reached its expiry date or because of changed circumstances. Fourth, South-South cooperation in the area of international investment policy is intensifying. And fifth, there is a marked rise in investor-State disputes. As a result of these developments, countries and firms have to operate within an increasingly complicated framework of investment rules that is both multilayered and multifaceted, with overlapping obligations and commitments as well as gaps in its coverage.

a. Bilateral investment treaties

The number of BITs worldwide has continued to expand over the past year, but at a slower pace than before. During 2004, 73 new BITs were concluded, 10 of which replaced earlier BITs, bringing the total number to 2,392 (figure I.11). However, this represents a slowdown in the conclusion of BITs since 2001. The largest number of the new BITs signed during 2004 was between developing countries, with 28 BITs or 38% of the total, followed closely by BITs between developed and developing countries with 27 of all BITs signed.

As of the end of 2004, the share of BITs signed between developed and developing countries in total BITs worldwide was 40%. BITs concluded among developing economies accounted for 25%, while those between developing and transition economies (South-East Europe and CIS) rose to 10% of the total (figure I.12). BITs typically are not concluded between developed economies because, with a few exceptions, investment relations between these countries are traditionally governed by other international instruments.[46] Developed countries dominate the list of economies with the highest number of BITs. Only two countries within the top ten are developing economies (figure I.13).

Within the South-South BITs universe, China, Egypt, the Republic of Korea and Malaysia have each signed more than 40 treaties with other developing countries. Each of these four countries has signed more agreements with other developing countries than with developed countries. The recent increase in developing-country BITs reflects a greater emphasis on South-South cooperation on investment, as well as the rise of outward FDI from developing countries (UNCTAD forthcoming a).

Not all BITs signed are in force (i.e. ratified and/or enacted). In fact, only about 70% of the 2,392 BITs signed by the end of 2004 were in force. For 46% of the BITs that had not entered into force, the time period since signature exceeded five years (i.e. longer than the average period of two to three years that it takes to ratify a BIT and for it to enter into force). This proportion is higher for BITs concluded by developing economies: 51% of them exceed the five-year span. The same ratio for BITs concluded by LDCs is 33% (UNCTAD forthcoming b). This

Table I.12. Matrix of inward FDI performance and potential, 2003[a]

	High FDI performance	Low FDI performance
	Front-runners	Below potential
High FDI potential	Bahamas, Bahrain, Belgium and Luxembourg, Botswana, Brazil, Brunei Darussalam, Bulgaria, Chile, China, Costa Rica, Croatia, Cyprus, the Czech Republic, Denmark, Dominican Republic, Estonia, Finland, France, Hong Kong (China), Hungary, Ireland, Israel, Kazakhstan, Latvia, Lithuania, Mexico, the Netherlands, Panama, Portugal, Qatar, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland, Trinidad and Tobago, Tunisia and Viet Nam.	Argentina, Australia, Austria, Belarus, Canada, Germany, Greece, Iceland, Islamic Rep.of Iran, Italy, Japan, Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Malaysia, Malta, New Zealand, Norway, the Oman, the Philippines, Poland, the Republic of Korea, the Russian Federation, Saudi Arabia, Taiwan Province of China, Thailand, Ukraine, United Arab Emirates, the United Kingdom and the United States.
	Above potential	Under-performers
Low FDI potential	Albania, Angola, Armenia, Azerbaijan, Bolivia, Colombia, Congo, Ecuador, Ethiopia, Gambia, Georgia, Guyana, Honduras, Jamaica, Mali, Mongolia, Morocco, Mozambique, Namibia, Nicaragua, Nigeria, Peru, Republic of Moldova, Romania, Sudan, Syrian Arab Republic, TFYR Macedonia, Togo, Uganda, the United Republic of Tanzania and Zambia.	Algeria, Bangladesh, Benin, Burkina Faso, Cameroon, the Democratic Republic of the Congo, Côte d'Ivoire, Egypt, El Salvador, Gabon, Ghana, Guatemala, Guinea, Haiti, India, Indonesia, Kenya, Kyrgyzstan, Madagascar, Malawi, Myanmar, Nepal, Niger, Pakistan, Papua New Guinea, Paraguay, Rwanda, Senegal, Sierra Leone, South Africa, Sri Lanka, Suriname, Tajikistan, Turkey, Uruguay, Uzbekistan, Venezuela, Yemen and Zimbabwe.

Source: UNCTAD.

[a] Three-year moving average, using data for the three years ending with the year in question.

Table I.13. Outward FDI Performance Index for the 20 leading investor economies, 1990, 2003, 2004[a]

Rank	Economy	1990	2003	2004
1	Belgium and Luxembourg	2.740	22.331	20.070
2	Panama	7.800	9.479	9.791
3	Hong Kong, China	3.451	3.526	7.002
4	Azerbaijan	..	3.313	6.535
5	Iceland	0.067	1.937	5.604
6	Bahrain	0.588	2.244	3.774
7	Singapore	2.961	5.792	3.526
8	Sweden	4.649	2.499	2.870
9	Switzerland	3.525	2.485	2.786
10	Spain	0.439	2.390	2.649
11	Netherlands	3.965	4.623	2.627
12	Cyprus	0.037	1.915	2.282
13	Canada	0.926	1.835	2.014
14	United Kingdom	3.034	1.822	1.799
15	Portugal	0.165	1.800	1.697
16	France	1.890	2.097	1.574
17	Austria	0.609	1.205	1.431
18	Australia	0.970	1.347	1.380
19	Botswana	0.069	1.824	1.332
20	Estonia	..	1.172	1.123

Source: UNCTAD.

[a] Three-year moving average, using data for the three years ending with the year in question.

Notes: Economies are ranked in descending order of their performance index in 2002-2004.

reflects, among other things, the fact that the formal requirement for the ratification and enactment of BITs varies from country to country according to their constitutions and legislative procedures. In some countries, for example, the ratification of a treaty may require the enactment of an implementing legislation, which in turn may require major adaptations of relevant legislation. In other countries, ratification and entry into force of international treaties takes place only after a certain number of treaties ready to be ratified have been accumulated. Non-ratification may also be due to lack of coordination and communication within the government, changes in government and/or changes in government policy, political upheaval, civil unrest or war, or a deliberate policy choice of the government.

It is important to note in this context that the signature of a treaty itself has legal implications for its parties. According to Article 18 of the Vienna Convention on the Law of Treaties, "A State is obliged to refrain from acts which would defeat the object and purpose of a treaty when: (a) it has signed the treaty or has exchanged instruments constituting the treaty subject to ratification, acceptance or approval, until it shall have made its intention clear not

Table I.14. National regulatory changes, 1991-2004

Item	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Number of countries that introduced changes in their investment regimes	35	43	57	49	64	65	76	60	63	69	71	70	82	102
Number of regulatory changes	82	79	102	110	112	114	151	145	140	150	208	248	244	271
of which:														
More favourable to FDI [a]	80	79	101	108	106	98	135	136	131	147	194	236	220	235
Less favourable to FDI [b]	2	-	1	2	6	16	16	9	9	3	14	12	24	36

Source: UNCTAD database on national laws and regulations.

[a] Includes liberalizing changes or changes aimed at strengthening market functioning, as well as increased incentives.

[b] Includes changes aimed at increasing control, as well as reducing incentives.

to become a party to the treaty; or (b) it has expressed its consent to be bound by the treaty, pending the entry into force of the treaty and provided that such entry into force is not unduly delayed".

Two issues arise. The first concerns the applicability of the substantive provisions of a treaty even though not ratified. The second issue concerns the availability of recourse for an investor or a government to international arbitration. While the case law on this matter is limited,[47] it appears that it could be difficult for an investor or a government to invoke consent to arbitration under a treaty that has not yet entered into force.

Table I.15. Changes in corporate income tax rates in selected economies, 2004
(Per cent)

Economy	1 January 2004	1 January 2005
Decrease		
Albania	25.00	23.00
Austria	34.00	25.00
Barbados	33.00	30.00
Bulgaria	19.50	15.00
Czech Republic	28.00	26.00
Denmark	30.00	28.00
Finland	29.00	26.00
France	34.33	33.83
Greece	35.00	32.00
Israel	36.00	34.00
Japan	42.05	40.69
Korea, Republic of	29.70	27.50
Latvia	19.00	15.00
Mexico	33.00	30.00
Netherlands	34.50	31.50
Romania	25.00	16.00
Singapore	22.00	20.00
Switzerland	24.10	21.30
Turkey	33.00	30.00
Uruguay	35.00	30.00
Increase		
Germany	38.29	38.31
India	35.875	36.5925
Viet Nam	26.00	28.00

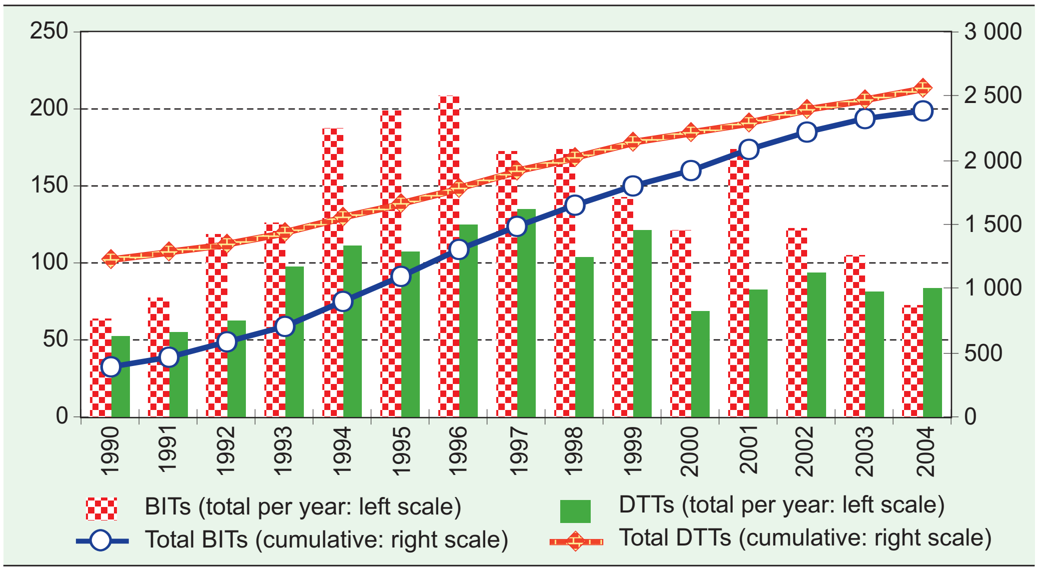
Source: UNCTAD, based on national sources and KPMG, 2005.

It is also worth noting that countries are increasingly renegotiating their existing BITs. While BITs generally provide for tacit renewal after their expiration, in some cases countries undertake re-negotiation of these agreements, either to obtain stronger commitments or because of the need to make existing BITs comply with the parties' commitments made under other investment agreements.[48] In such cases, the new BIT supersedes the earlier one. The trend towards renegotiation accelerated in the late 1990s and continued at an increasing pace thereafter, reaching 34 renegotiated BITs by the year 2000, and over 85 renegotiations by 2004.

Some of the BITs concluded most recently may have been influenced in some respect by the experience in the application and implementation of the investment chapter of the North American Free Trade Agreement (NAFTA) and of a few other IIAs. The United States-Uruguay BIT (2004) and – to a lesser degree – the BIT between Japan and the Republic of Korea (2002) reflect this phenomenon. In particular, some recent BITs (and BIT models) deviate from the traditional open-ended asset-based definition of investment, with a view to striking a balance between maintaining a comprehensive investment definition, on the one hand, and excluding from coverage those assets that are not intended by the parties to fall under an agreement's protective wings, on the other.[49]

Furthermore, some recent BITs include significant revisions to the wording of various substantive treaty obligations. For instance, drawing on the implementation legacy of the

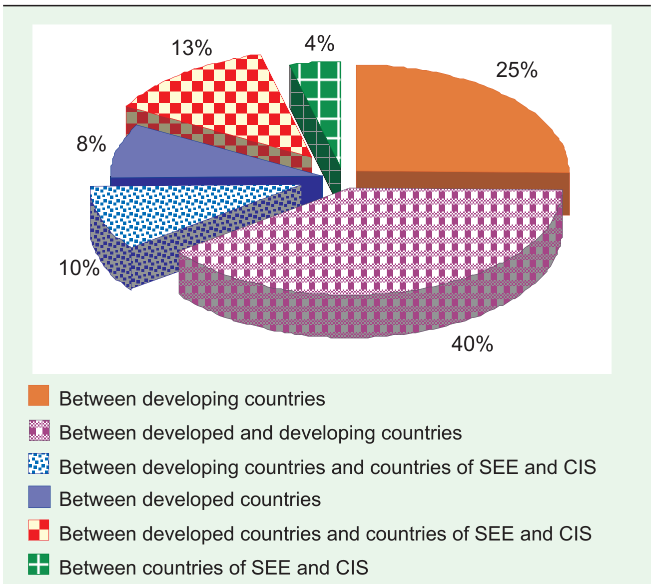
Figure I.11. Number of BITs and DTTs concluded, cumulative and annual, 1990-2004



Source: UNCTAD, BIT/DTT database (www.unctad.org/iia).

investment chapter of NAFTA, the new model BITs of Canada and the United States elaborate the language and clarify the meaning of provisions dealing with absolute standards of protection. This is notably the case with the meaning of the minimum standard of treatment concept in accordance with international law and the concept of indirect expropriation.[50]

Figure I.12. Total BITs concluded, by country group,[a] end 2004



Source: UNCTAD, BIT/DTT database (www.unctad.org/iia).

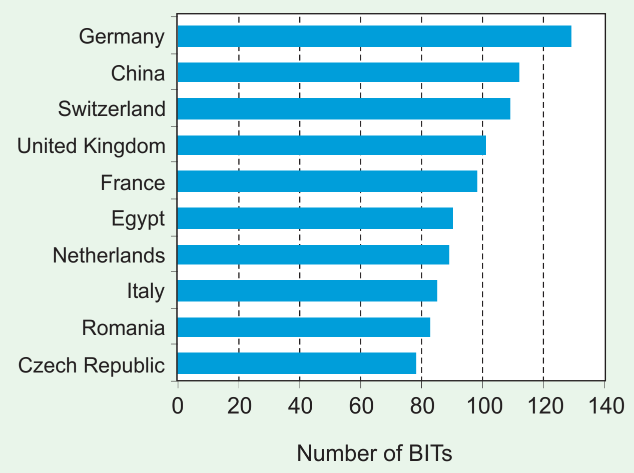
[a] Due to the accession of ten countries to the EU on 1 May 2004, the BITs previously signed by those countries have been added to the BITs involving developed countries.

Note: SEE: South-East Europe.

Some new BITs also address a broader set of issues, including not only specific economic aspects such as investment in financial services, but also other issues where greater policy space for host-country regulation may be sought. In this regard, language is sometimes included to clarify that the investment protection and liberalization provisions cannot be pursued at the expense of the protection of key public policy objectives such as health, safety, the environment and the promotion of internationally recognized labour rights.

Finally, some recent BITs have made significant innovations regarding investor-State dispute settlement procedures, in an effort to secure greater transparency in arbitral proceedings, including open hearings, publication of related legal documents and the possibility for representatives of civil society to submit "*amicus curiae*" (i.e. "friends of the court") briefs to arbitral tribunals. In addition, other very detailed provisions on investor-state dispute settlement are included in order to provide for more legally oriented, predictable and orderly conduct at the different stages of the ISDS process. Thus, for example, the Canadian BIT model includes specific standard waiver forms to facilitate the filing of waivers as required by Article 26 of the Agreement for purposes of filing an ISDS claim. The United States-Uruguay BIT, on the other

Figure I.13. Top 10 signatories of BITs, end 2004



Source: UNCTAD, BIT/DTT database (www.unctad.org/iia).

hand, not only provides for a special procedure available at the early stages of the ISDS process aimed at discarding frivolous claims or to seek interim injunctive relief, but also envisages the possibility to set up a mechanism for appellate review, in order to foster a more consistent and rigorous application of international law in arbitral awards. A number of these procedural issues have also been taken up in the debate about changes to ICSID's rules and regulations.[51]

b. Double taxation treaties

In 2004, 84 new DTTs were concluded between 79 countries. This represents a continued growth of DTTs, albeit at a slightly slower pace compared to 2003. The total number of DTTs rose to 2,559 by the end of 2004 (figure I.11). Austria set the pace by concluding ten new DTTs, Azerbaijan concluded six, while South Africa and Lithuania each concluded five. Unlike in the case of BITs, the top ten economies in terms of number of DTTs signed are all developed economies (figure I.14).

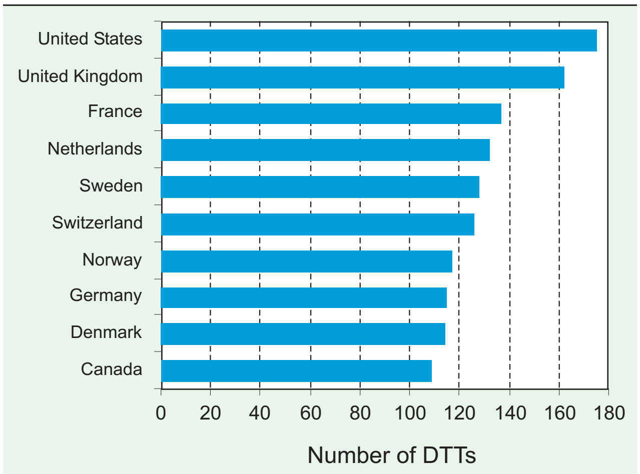
As of the end of 2004 about 39% of all DTTs were concluded between developed and developing countries. DTTs among developed countries accounted for 29%, another 19% involved countries in South-East Europe and the CIS and the remaining 13% were concluded among developing economies (figure I.15).

As far as developing-country DTTs are concerned, a trend can be observed that is similar, but less pronounced, than that of BITs regarding increasing South-South investment cooperation. Although the first South-South DTT was concluded as early as 1948 (by Argentina and Peru), such DTTs proliferated only during the second half of the 1990s. During the 1990s, 156 new DTTs were signed between 69 developing countries, bringing the total number of South-South treaties to 256 by the end of 1999. Growth persisted until 2004, with the number of South-South DTTs reaching 345 between 90 countries.

c. Other international investment agreements

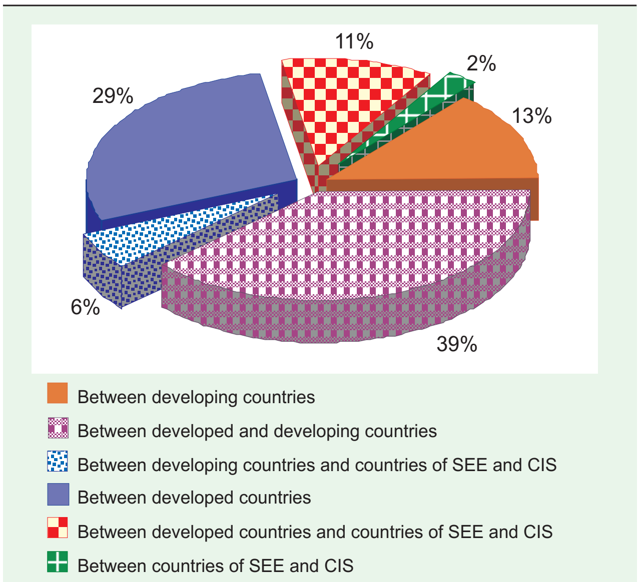
Besides BITs and DTTs, international investment rules are increasingly being adopted as part of bilateral, regional and interregional agreements that address trade and investment transactions. These agreements contain, in addition to a range of trade liberalization and promotion provisions, commitments to liberalize, protect and/or promote investment flows between the parties. They respond to the increasing global competition facing national economies for resources and markets. The number of such agreements has been growing steadily, and by April 2005 exceeded 212 (209 at the end of 2004). The large majority of these agreements (about 87%) were concluded since 1990 (figure I.16). In 2004 and early 2005 at least 32 new agreements were concluded and about 66 others were under negotiation or consultation (annex tables A.I.15 and A.I.16). Until the late 1980s, investment facilitation through these agreements remained confined mainly to intraregional

Figure I.14. Top 10 signatories of DTTs, end 2004



Source: UNCTAD, BIT/DTT database (www.unctad.org/iia).

Figure I.15. Total DTTs concluded, by country group,[a] end 2004



Source: UNCTAD, BIT/DTT database (www.unctad.org/iia).

[a] Due to the accession of ten countries to the EU on 1 May 2004, the DTTs previously signed by those countries have been added to the DTTs involving developed countries.

Note: SEE: South-East Europe.

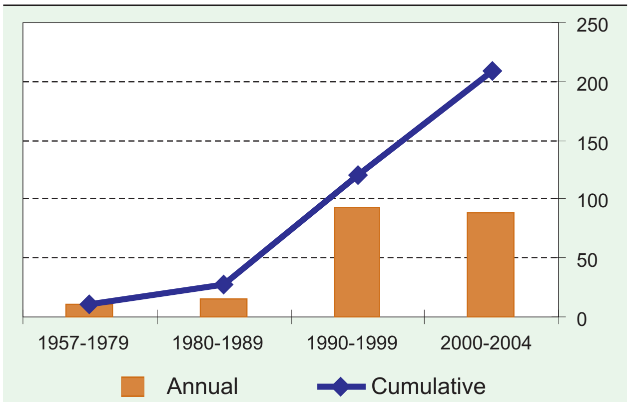
processes, with some exceptions (e.g. early agreements between the European Community and developing countries). Since 1990, countries and groups located in different regions have begun to conclude trade and investment agreements with one another, with the result that interregional agreements now account for more than half of the total, and for about 49% of the 182 concluded since 1990.

The growth of IIAs (other than BITs and DTTs) is partly the result of two important qualitative changes that took place during the 1990s. First, these agreements, which previously had been used mainly by countries at similar levels of development, started to be concluded between developed and developing countries: by April 2005, 81 had been signed (77 since 1990) and 39 were under negotiation (annex table A.I.16). Second, there has also been a dramatic increase in such agreements between developing countries since the 1990s. By April 2005 at least 70 of them had been signed (59 since 1990) and another 24 were under negotiation, suggesting that developing countries are increasingly pursuing development strategies based on cooperation among themselves.

Compared to BITs, these other IIAs show far more variation in their scope, approach and content. Moreover, they increasingly encompass a broader range of economic transactions, including, notably, trade in goods and services, investment and capital flows, as well as movement of labour. The more issues that are addressed, the more complex the agreement, and the greater the likelihood of overlaps and inconsistencies between provisions**.** At the same time, their greater variation presents an opportunity for experimenting with different approaches to promoting international investment flows that better reflect the special circumstances of countries at different levels of economic development and in different regions. A number of patterns have emerged concerning investment provisions in recent IIAs, though with many significant variations.

With respect to investment liberalization, IIAs other than BITs and DTTs have typically followed two main approaches. One is to provide for actual liberalization subject to a list of country exceptions (negative list approach). This approach is typical of most agreements signed between countries of the Western Hemisphere following the NAFTA model. The second approach is to provide for the progressive abolition of restrictions to the entry, establishment and operation of investment. This pattern has been followed notably in the agreements between the European Community and third countries, as well as by the members of the Association of South-East Asian Nations (ASEAN) in the Framework Agreement on the

Figure I.16. The growth of international investment agreements other than BITs and DTTs, 1957-2004
(Number)



Source: UNCTAD (www.unctad.org/iia).

ASEAN Investment Area and several agreements signed by ASEAN members with third countries. Under the latter approach, the level of liberalization sought varies considerably. While some agreements commit to achieving full liberalization of investment by a particular date (e.g. the ASEAN Investment Area), others aim at completing the process of investment liberalization in several stages (e.g. the Europe Association Agreements signed by the European Community with Central European countries). Still others establish a framework for future negotiations to liberalize investment (e.g. the Euro-Mediterranean Agreements signed between the European Community with countries in Northern Africa and the Middle East; the African Economic Community; the ASEAN Agreement with China).

The more recent agreements that provide for investment protection in addition to liberalization, concluded by countries such as Chile, Japan, Singapore, Morocco and the United States, are more comprehensive, detailed, and, for the most part, more rigorous than prior NAFTA-style agreements. While these agreements address many of the same topics, they also deal with additional issues, or modify the NAFTA approach to these issues on the basis of accumulated experience. They typically deal extensively with trade in services, while separate chapters or provisions are devoted to topics such as competition policy, government procurement, intellectual property rights, labour, environment, trade and investment in particular industries, temporary entry for business persons, and transparency.

On the other hand, other recent agreements have remained narrow in their coverage of investment issues, limiting themselves to establishing a framework for cooperation on investment promotion. Recent examples include the free trade agreements signed between the members of the European Free Trade Association (EFTA) and Central European countries, bilateral agreements between Canada and countries in various regions, as well as a number of framework agreements on trade and investment relations between the United States and countries in Africa and the Middle East. The cooperation provided for under the latter type of agreements is typically aimed at creating favourable conditions for encouraging investment, notably through the exchange of information. It is also common for such agreements to set up consultative committees, or a similar institutional arrangement involving the parties, to follow up on the implementation of negotiated commitments and to discuss and study possible obstacles to market access for trade and investment.

d. International investment disputes

A new and significant development is the rise of investor-State disputes. These involve the whole range of investment activities and all kinds of investments, including privatization contracts and State concessions.[52]

Numerous IIAs allow investors to choose between the arbitral proceedings of the World Bank Group's International Centre for Settlement of Investment Disputes (ICSID) (including ICSID's Additional Facility) and ad hoc arbitration procedures, using arbitration rules of the United Nations Commission on International Trade Law (UNCITRAL) for example. Other institutional facilities available for use are the International Chamber of Commerce (ICC) Court of Arbitration in Paris, the Stockholm Chamber of Commerce Arbitration, the London Court of International Arbitration and various regional arbitration centres, particularly in Singapore and Cairo. However, only ICSID provides a list of cases. And even under ICSID, decisions of the tribunals have not all been made public. While this situation may gradually be changing, it is not possible to know the actual number of cases to date, nor is it possible to learn about the legal issues or factual circumstances they encompassed.

The cumulative number of treaty-based cases brought before ICSID and other arbitration fora has been rising dramatically over the past five years, reaching 171 known claims by December 2004 and at least 183 by June 2005.[53] At least 57 governments – 36 of them of developing countries, 12 of developed countries and 9 of South-East Europe and the CIS – are involved in investment treaty arbitration. Argentina leads them all with 40 claims, 37 of which relate at least in part to that country's financial crisis. Mexico has the second highest number of known claims (15), most of them falling under NAFTA and a handful under various BITs. The United States has also faced a sizeable number (10), all of them pursuant to NAFTA. Poland (7 claims), Egypt (6) and the Russian

Federation (6) also figure prominently, along with nine countries that have each faced four claims: Canada, Chile, the Czech Republic, the Democratic Republic of Congo, Ecuador, India, Kazakhstan, Ukraine and Venezuela.

This rise in investment disputes poses a particular challenge for developing countries. The financial implications of the investor-State dispute-settlement process can be substantial, both from the point of view of the costs of the arbitration proceedings and the awards rendered. Information about the level of damages being sought by investors tends to be patchy and unreliable. Even ascertaining the amounts sought by foreign investors can be difficult, as most of the cases are still at a preliminary stage and, under the ICSID system, claimants are not obliged to quantify their claims until after the jurisdictional stage has been completed. Claims proceeding under other rules of arbitration are also difficult to quantify. It is, nonetheless, clear that some claims involve large sums.[54] Furthermore, even defending against claims that may not ultimately be successful costs money. A cursory review of cost decisions in recent awards suggests that the average legal costs incurred by governments are between $1 million and $2 million including lawyers' fees, the costs for the tribunal of about $400,000 or more, and the costs for the claimant, which are about the same as for the defendant.[55]

The surge in investment disputes arising from IIAs and the costs incurred from these disputes signify that governments that decide to enter into IIAs need to be judicious in negotiating such agreements. They also need to follow the developments of disputes in order to be sensitive to actions that could trigger litigation. Furthermore, it is important to review experiences in implementing international commitments in IIAs and to draw lessons from them.

C. Prospects: further FDI growth expected

Economic growth, continuing liberalization of investment policies and trade regimes, and increased competition among firms are likely to drive the global expansion of TNC activity. Following slow growth or recession during 2002-2003, the world economy has entered a period of recovery. Projections indicate that world real GDP, which grew by 5.1% in 2004, will increase more moderately, by 4.3% in 2005 and 4.4% in 2006 (IMF 2005). The rate of growth is likely to slow down in developed countries from 3.4% to 2.6% in 2005 and 3.0% in 2006, while still registering a high level in developing countries of above 6% during 2005-2006. Estimates by the United Nations and the World Bank corroborate these projections (UNDESA-UNCTAD 2005, World Bank 2005a). With the substantial increase registered in the rate of world economic growth since 2003, and moderate downward adjustments in projected growth, FDI flows should continue to rise, at least over the next couple of years.

Meanwhile, the slowdown of growth in some developed countries and structural weaknesses, along with financial and corporate vulnerabilities in some regions, continue to hinder a strong recovery in FDI. Continuing external imbalances in some countries and sharp exchange rate fluctuations, as well as high and volatile commodity prices, pose additional risks that may also limit global FDI flows.

Looking at prospects by sector, FDI is expected to pick up in natural resources, reflecting high demand for such resources partly stemming from China's growing economy and the opening up of new and potentially profitable opportunities, for instance in the oil and gas industries. Announcements abound, for example, two Japanese general trading companies, Ito Chu and Mitsui, plan to invest jointly a total of $3 billion in iron ore in Australia with BHP Billiton (Australia), while Rio Doce (Brazil) and Rio Tinto (Australia) plan to expand their production capacities in Brazil.[56] The anticipated increase in the offshoring of services also augurs well for FDI in that sector. One exception is telecommunications: in the United States alone, a reduction of more than $2 billion in investment in that industry is expected in 2006, in order to rationalize investment after the merger boom.[57] For developing countries overall, FDI inflows in telecommunications are now well below their historical highs in the 1990s (World Bank 2005b). Prospects for FDI in manufacturing are positive overall, especially as regards investment in special economic zones, encouraged by a variety of incentives offered by most developing countries.

The need for private financing of infrastructure in developing countries remains stronger than ever, with new modalities of investment (e.g. public-private partnerships that are gaining in popularity). A recent study by the World Bank, the Japan Bank for International

Cooperation (JBIC) and the Asian Development Bank, for example, estimated that the infrastructure financing needs of developing countries in Asia will exceed $1 trillion over the next five years.[58] It is likely that countries will seek to attract FDI to meet at least part of these needs.

Trends in cross-border M&As also point to increased investment activity. M&As, which account for the largest proportion of FDI flows to developed countries, rose in 2004 and are expected to do so again in 2005. Almost 40% of the United States tax and finance executives and senior professionals participating in a survey undertaken by KPMG in 2004 predicted that the number of worldwide M&A transactions would exceed 30,000 in 2005.[59] Nearly 90% of respondents indicated that their company expects to complete at least one merger or acquisition in 2005, compared with roughly 70% who said so in 2004. In developing countries, greenfield FDI is expected to increase as a proportion of all FDI, as investment channelled via privatization is declining, and because several countries (e.g. India) are actively seeking this form of investment via regulatory reforms and incentives.

Outward investment by TNCs based in a number of developing countries is likely to grow further. Like their counterparts in developed countries, these TNCs are in search of resources, markets and technology, driven by the same factors that determine FDI in countries with a long history of outward investment (UNCTAD 2005a). In some countries, government policies seek to encourage this trend.

On the policy front, liberalization is continuing, and has intensified in key developing economies such as China and India. China, whose transition period in the context of the WTO is coming to an end, has introduced legislation opening up several new industries to FDI (chapter II). India has also been opening up important industries, such as telecommunications, construction and real estate, to FDI (chapter II). At the same time privatization continues to wind down in many countries, especially in Latin America and the transition economies of South-East Europe and the CIS; moreover, recent privatization deals have also been smaller in size. While this reduces FDI potential via this channel, it may lead to expansion and sequential investment.

At the international level, the continued trend towards greater liberalization, in particular, the pursuit of negotiations on a number of bilateral, regional and international agreements (chapters I.B and II), may facilitate increased flows in years to come. On the trade front, eligibility under the African Growth and Opportunity Act (AGOA) has been extended to 37 countries in Africa, while the Central America Free Trade Agreement (CAFTA) is awaiting ratification and the free trade agreement (FTA) between the Southern Common Market (MERCOSUR) and the Andean Pact was signed in 2004.

A number of specific policy developments in 2005 are also likely to have an impact on the size and direction of FDI flows. First, a one-off tax amnesty on foreign earnings awarded by the United States has already led to announcements of the repatriation of sizeable funds by several United States TNCs (chapter II). Had these earnings been reinvested, they would have been counted as part of FDI outflows for 2005. This repatriation of earnings by firms from the United States, the largest outward investor in 2004, is likely to lead to a substantial decline in United States FDI outflows. While the exact magnitude of the repatriation is difficult to predict, it will be a force holding back global FDI flows.

Second, the value of the dollar will have an effect on all cross-border financial flows by TNCs, be they in the form of equity, earnings or loans. It is not certain at the time of writing how the dollar exchange rate will develop. For foreign-based TNCs, a dollar depreciation means that United States assets become cheaper. For foreign affiliates of United States-based TNCs, this means that it is a good time to repay intra-firm dollar-denominated debt or repatriate foreign earnings. The appreciation of the United States dollar that started in 2005, if continued, will mean the opposite. In any event, the net impact will depend on the relative magnitudes of the currency fluctuations.

Third, a likely outcome of the tsunami disaster is increased investment, both domestic and foreign, in infrastructure in the affected countries over the next few years. During the reconstruction phase, foreign and domestic investors are expected to be called upon to participate in tenders for the rebuilding of large infrastructure projects such as seaports and power utilities. In both Indonesia and Sri Lanka, for example, public-private partnerships, including some with foreign investors, are expected to play an important role in the rebuilding of infrastructure and in the revival of the tourism industry.[60] Complemented by foreign aid and grants from multilateral and regional development banks, these partnerships will boost foreign investor involvement in post-tsunami reconstruction.

A number of surveys confirm promising prospects for FDI flows in 2005, and even beyond, although respondents do not seem to be as optimistic as they were last year. This is the case, for instance, with the *McKinsey Global Survey of Business Executives Confidence Index* (McKinsey 2005). This report revealed optimism among the more than 9,300 business executives from 130 countries surveyed; however their views were less positive than a year ago. The *CEO Briefing 2005* compiled by the Economist Intelligence Unit found that competition for global offshoring is intensifying, with 57% of executives viewing offshoring as a critical force reshaping the global marketplace in 2005, up from 51% in 2004 (EIU 2005a). As regards Japanese TNCs, the annual survey undertaken by JBIC found that about half of the manufacturing firms surveyed in 2004 would strengthen and expand foreign operations in the following three years and that 5% would reduce them (compared to 42% and 7%, respectively, in the 2003 survey) (JBIC 2005).

A survey undertaken by UNCTAD (box I.3) also points to increased world FDI flows in the near future.[61] Expectations, however, vary by region, being more positive for developing regions such as Asia and Oceania than for other regions (chapter II examines regional prospects separately). In the longer term, FDI is poised to continue its upward trend, although it may be some time before FDI flows reach levels comparable to those of the late 1990s.

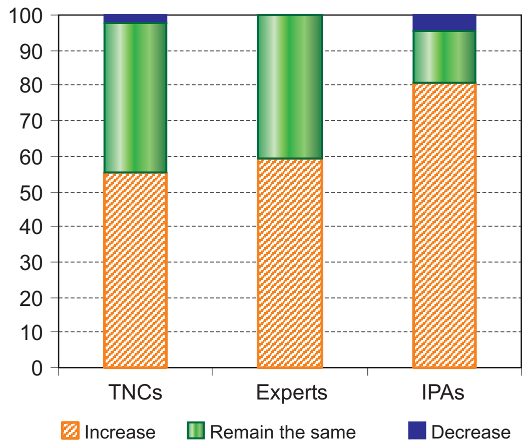
Box I.3. FDI prospects: results of UNCTAD's survey

The overall findings of the 2005 UNCTAD survey[a] on FDI prospects is that prospects for FDI in 2005-2006 are promising, although forecasts are not as optimistic as in the 2004 survey (*WIR04*, p. 32). More than half of the responding TNCs and experts as well as four-fifths of the IPAs expected short-term (2005-2006) growth in FDI flows, while almost all the remaining respondents expected FDI levels to be stable (box figure I.3.1). Only a small fraction expected that FDI would decrease in the immediate future.

Prospects for FDI vary significantly by industry:[b]

- In the primary sector, FDI in mining and petroleum is expected to increase: over two-thirds of the IPA respondents, and a slightly lower percentage of the experts, expected improved FDI prospects. This is not surprising, since demand for natural resources is forecast to remain strong (chapter II). Expectations regarding FDI in agriculture were less upbeat, with less than half of the IPAs and only a quarter of the experts forecasting improved prospects. This might be due to ongoing trade disputes in agriculture, lack of further liberalization in this area, and the fact that the sector as a whole has traditionally attracted less FDI.
- In manufacturing, expectations are high for increased flows in electrical and electronic products, machinery and equipment, and metals and metal products. A majority of respondents (IPAs as well as experts) expected a growth of FDI in these industries. On the other hand, there is less optimism regarding prospects for FDI

Box figure I.3.1. Prospects for global FDI flows: responses of TNCs, experts and IPAs, 2005-2006
(Per cent)



Source: UNCTAD (www.unctad.org/fdiprospects).

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Box I.3. FDI prospects: results of UNCTAD's survey

flows in textiles and clothing, rubber and plastic products, non-metallic minerals or media and publishing.

- The FDI outlook for the services sector continues to be more positive than that for the manufacturing and primary sectors. A majority of the respondents – experts as well as IPAs – expected improved prospects in most service industries. The industries expected to be at the forefront of FDI growth in services include computing/ICT, public utilities (such as the generation and distribution of electricity, water and gas), transportation and tourism-related services.

In terms of the investment locations selected as the most attractive, four of the top five countries ranked by the percentage of responses from experts and TNCs combined, are in the developing world. China is considered the most attractive location by 85% of TNCs and experts (box figure I.3.2). India's high ranking, albeit with 30% fewer responses than China's, is even more remarkable, given that FDI flows to the country have been modest until recently. The United States, Germany, the United Kingdom and Canada (in the ranking by TNC responses) only made it to the lower half of the top ten rankings.

Box figure I.3.2. Most attractive global business locations: responses of experts and TNCs[a]

Responses from experts

1. China (85%)
2. United States (55%)
3. India (42%)
4. Brazil (24%)
5. Russian Federation (21%)
6. United Kingdom (21%)
7. Germany (12%)
8. Poland (9%)
9. Singapore (9%)
10. Ukraine (9%)

Responses from TNCs

1. China (87%)
2. India (51%)
3. United States (51%)
4. Russian Federation (33%)
5. Brazil (20%)
6. Mexico (16%)
7. Germany (13%)
8. United Kingdom (13%)
9. Thailand (11%)
10. Canada (7%)

Source: UNCTAD (www.unctad.org/fdiprospects).

a Countries are ranked according to the number of responses that rated each as the most attractive location.

Views on the risks for global FDI differ among the three groups of respondents to the 2005 survey (box figure I.3.3). Judging from the rates of response, TNCs and FDI experts consider protectionism and slow growth in developed countries to be the major threats. Indeed, every TNC respondent felt that potential trade friction could undermine FDI growth in 2005-2006. The fact that TNCs and experts regarded protectionism as a major risk for global FDI growth is also evident from other parts of the survey. For example, the lowest number of respondents expected an "increase" in FDI in industries recently affected by trade disputes, such as textiles and agriculture.

In contrast, IPAs were more concerned about the financial instability of major economies and the volatility of raw material prices than about any other factors listed. This difference could well be due to the fact that a larger proportion of IPA respondents are from developing countries. It also explains why "political instability and civil war" is the third greatest concern of IPAs according to the percentage of respondents, while the other two groups of respondents rank it last.

Countries employed a variety of measures to attract FDI in 2004 (box figure I.3.4). The overwhelming majority of them plan to adopt further FDI policy measures in 2005-2006. Over 95% of responding IPAs expect to employ new and different policy measures to compete for FDI, including additional incentives, further liberalization and other promotion measures. This suggests that global and regional competition for FDI is increasing and will continue to do so in the future. Furthermore, given the limited resources at their disposal, most countries intend to use much more targeted approaches to investment promotion.

The positive outlook for global FDI in the short term is driven largely by the potential of specific regions, primarily developing regions along with South-East Europe and the CIS. UNCTAD surveys at the regional level find that FDI growth is being led by developing economies rather than by developed countries. FDI prospects in each of the individual regions are discussed in chapter II.

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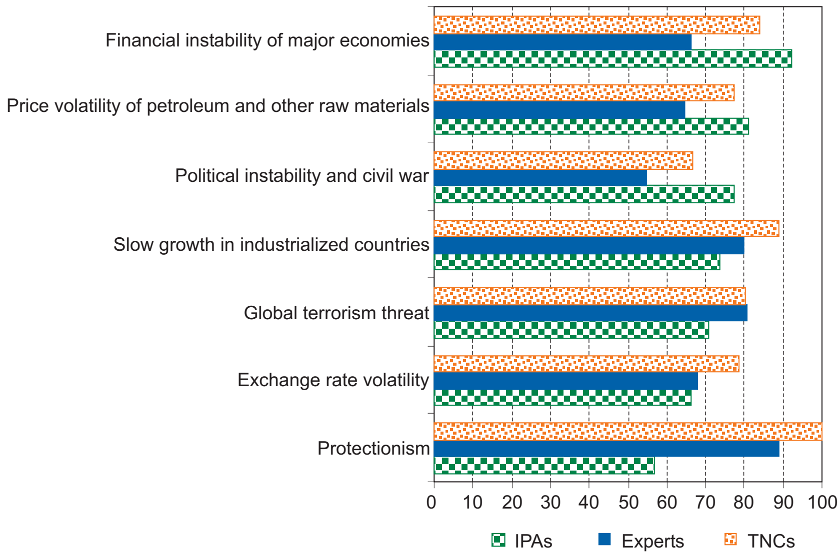
Box I.3. FDI prospects: results of UNCTAD's survey (concluded)

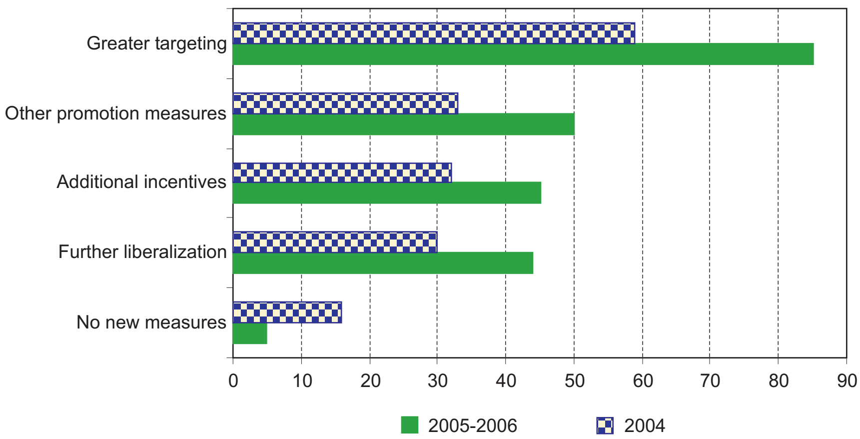
Box figure I.3.3. Major risks to global FDI flows,[a] 2005-2006
(TNC, expert and IPA respondents)



Source: UNCTAD (www.unctad.org/fdiprospects).

[a] Percentage of respondents that considered each factor as important or very important.

Box figure I.3.4. Investment policy measures to attract FDI: responses by IPAs



Source: UNCTAD (www.unctad.org/fdiprospects).

Source: UNCTAD (www.unctad.org/fdiprospects).

[a] UNCTAD's survey on FDI prospects analyses expected future patterns of FDI flows at the global, regional, national and industry levels based on the perspectives of global investors, host countries and international FDI experts. The 2005 *Survey of FDI Prospects for 2005-2008* involved IPAs of 109 countries, 81 of the largest TNCs (ranked by the size of their foreign assets) from developed, developing and transition economies as well as 74 international investment experts. Their replies are based on their perceptions.

[b] Only IPAs and FDI experts were questioned about the prospects for FDI by industry, since TNCs are generally not well placed to provide forecasts for industries other than their own.

Notes

1 In 2000 for instance, the gap between developed and developing country FDI flows was $881 billion.

2 Luxembourg was the largest recipient of FDI inflows in the world in both 2002 and 2003 due to massive FDI in special purpose entities (holding companies) that was transhipped to other countries (for details on this kind of FDI, see *WIR03*, p. 69).

3 The fact that Central Asia is now excluded from the region (box I.2) had a small effect (-$10 billion).

4 Countries are designated by the United Nations as "least developed" on the basis of national income per capita, human assets and economic vulnerability. This category included 50 countries as of May 2005. For more details see UNCTAD 2004a.

5 The figures refer to the number of primary activities of the projects.

6 The data must be interpreted with caution. They are over-stated for some economies, as they include round-tripping (which may, for example, be around 25% in the case of Hong Kong, China); investment by foreign affiliates of (typically) developed-country TNCs established in developing economies (investment that is particularly large in economies such as Cyprus, Hong Kong (China), Mauritius, Singapore and a number of tax havens); and capital flight. On the other hand, other factors may lead to under-reporting of outflows. Moreover, firms from some developing economies are not allowed to transfer funds from their home countries, but rather need to raise them locally or in international markets; in that case, the extent of their international production activities is not reflected in FDI statistics.

7 Some countries, however, are relaxing their policies on outward investment and are encouraging their firms to go abroad as international players. The 9th session of the Commission on Investment, Technology and Related Financial Issues of UNCTAD, 7-11 March 2005, noted important aspects of the links between outward FDI and the competitiveness of firms in developing countries as well as the role host- and home-country governments can play. See UNCTAD, "Emerging FDI from developing countries", note prepared by the UNCTAD secretariat for the Commission on Investment, Technology and Related Financial Issues, TD/B/COM.2/64, 4 February 2005.

8 Greenfield investment refers to investment in new facilities and the establishment of new entities through entry as well as expansion, while M&As refer to acquisitions of, or mergers with, existing local firms. For both, data used in *WIR* are original data collected by private firms (OCO Consulting for greenfield investments and Thomson Financial for cross-border M&As). Data on greenfield FDI from OCO Consulting's LOCOmonitor database (www.locomonitor.com) include new and expanding FDI projects worldwide, both announced and realized. The data are available from 2002 onwards. For an explanation of the data on cross-border M&As used in *WIR*, see annex B, "Definitions and sources".

9 Data from UNCTAD's cross-border M&A database.

10 Information from OCO Consulting, LOCOmonitor website (www.locomonitor.com).

11 Brazil, China, Hong Kong (China), India, Malaysia, Mexico, the Republic of Korea, Singapore, Thailand, the United Arab Emirates and Viet Nam. Bulgaria also received more than 100.

12 For definitions of each of these components of FDI, see "Definitions and sources" in Annex B of *WIR05*.

13 For developed countries, almost all of the FDI inflows over the period 1995-2004 can be broken down into the three components of FDI financing, whereas only 54% of total FDI inflows into developing countries can be classified under these three categories.

14 Based on data for 31 countries that account for about 38% of the total FDI flows to developing countries.

15 More than 100% due to negative figures for the other components.

16 More than 100% due to negative figures for the other components.

17 More than 100% due to negative figures for the other components.

18 The sum of the shares of equity capital and intra-company loans is more than 100% because of negative reinvested earnings.

19 Thus, if a parent company in the United States gives a loan to a foreign affiliate located in Germany the interest income of the parent firm (received from the affiliate located in Germany) is taxed in the United States at a low tax rate, whereas the interest payment of the German affiliate can be deducted from its revenue, lowering its taxed profits in Germany.

20 Reinvested earnings represent additions to a direct investor's stake in its foreign affiliates. In the balance of payments they are recorded, therefore, as FDI inflows into the host county of the foreign affiliates (with a positive sign). If foreign affiliates' activities result in losses, the direct investor's equity claims on the foreign affiliates decrease. The losses are recorded under reinvested earnings in the balance of payments, but with a negative sign as it indicates a reduction or disinvestment of accumulated FDI.

21 Data from Deutsche Bundesbank, *Balance of Payments Statistics*.

22 IMF 2005. The data on growth rates of the new EU members are obtained from Eurostat (www.eurostat.cec.eu.int).

23 The volume of world trade in goods and services in 2004 grew by nearly 20%, much faster than in 2002 and 2003 (5% and 16%, respectively) (table I.3; IMF 2005), and well above the long-term trend.

24 According to PRS Group/International Country Risk Guide, the average of the composite risk ratings (based on three factors – political, financial and economic risks) of some 150 countries improved from 69 in 2003 to 71 in 2004, and is expected to be 73 in 2005 and 78 in 2009.

25 Many indicators in 2004 show more favourable business and consumer sentiments than in 2003: in the United States, for example, the Personal Consumption Expenditure Price Index of the Department of Commerce and the Consumer Sentiment Index of the University of Michigan were up by 6% and 8.6% respectively; for the EU, the Economic Sentiment Indicator was up by 9.1%, the Industrial Confidence Indicator by 64% and the Consumer Confidence Indicator by 25%, all of the European Commission;

and in Japan, the Business Conditions Diffusion Index was up by 97% and the Consumer Confidence Index by 17%.

26 The country risk is also one of the 12 variables used by UNCTAD for constructing the FDI Potential Index.

27 For example, net profits of Japanese firms reached a record high in the year ending March 2005 (31% larger than in fiscal year 2003 for all firms listed in the stock markets – *Nihon Keizai Shimbun*, 1 June 2005) while those of the 500 largest firms in terms of sales of the United States and Europe improved by 12% and 71% respectively in 2004 (*source*: UNCTAD, based on data from Thomson One Banker).

28 Data from the World Federation of Exchanges (www.fibv.com).

29 Based on the Reuters-CRB-Index of 17 raw materials.

30 Investment, commodity and exchange firms and dealers.

31 Cross-border investments of private equity funds that lead to an ownership of 10% or more are in most cases recorded as FDI even if private equity funds do not always have the motivation for a lasting interest or a long-term relationship with the acquired enterprise. The figures in the text refer to these investments.

32 In Germany, for instance, public communities and public entities also sold houses and apartments because of budgetary problems.

33 Data from UNCTAD cross-border M&A database.

34 The Transnationality Index is calculated as the average of the following three ratios: foreign assets to total assets, foreign sales to total sales and foreign employment to total employment.

35 UNCTAD's calculations, based on data from Dun & Bradstreet, *Who Owns Whom* database.

36 *Fortune*, 26 July 2004, pp. F1-F10.

37 According to the Wall Street Journal Market Data Group, the top 30 companies represented 60% of total assets of the top 100 largest public financial companies in 2003, and the top 50 almost 77%.

38 The UNCTAD Inward FDI Performance Index is a measure of the extent to which a host country receives inward FDI relative to its economic size. It is calculated as the ratio of a country's share in global FDI inflows to its share in global GDP.

39 The UNCTAD Inward FDI Potential Index is based on 12 economic and structural variables measured by their respective scores on a range of 0-1 (raw data available on www.unctad.org/wir). It is the unweighted average of scores on the following: GDP per capita, the rate of growth of GDP, the share of exports in GDP, telecoms infrastructure (the average of telephone lines per 1,000 inhabitants, and mobile phones per 1,000 inhabitants), commercial energy use per capita, the share of R&D expenditures in gross national income, the share of tertiary students in the population, country risk, exports of natural resources as a percentage of the world total, imports of parts and components of electronics and automobiles as a percentage of the world total, exports in services as a percentage of the world total, and inward FDI stock as a percentage of the world total. For the methodology for building the index, see *WIR02*, pp. 34-36.

40 The UNCTAD Outward FDI Performance index is calculated in the same way as the Inward FDI Performance Index: the ratio of a country's share in global FDI outflows to its share in world GDP.

41 A three-year moving average is used. Thus the data used for calculating the 2004 index are for those of 2002, 2003 and 2004.

42 Because of late availability of the data used for the Potential Index, the most recent available year is always one year behind that for the Performance Index.

43 It should be noted that a reduction of the tax rate does not necessarily signify a lowering of the overall tax burden. For example, a widening of the tax base or less generous rules on depreciation may counteract a lower rate.

44 Corporate tax incentives may be provided in a number of ways, including tax holidays, statutory corporate income tax reductions, enriched capital cost allowances, investment tax credits, reductions of withholding tax on dividends and the extension of imputation relief to non-resident shareholders (OECD 2000).

45 IIAs include bilateral treaties for the promotion and protection of investment (or bilateral investment treaties), treaties for the avoidance of double taxation (or double taxation treaties), other bilateral and regional trade and investment agreements as well as various multilateral agreements that contain a commitment to liberalize, protect and/or promote investment.

46 The number of BITs involving developed countries also increased due to the accession of ten countries to the EU on 1 May 2004, whereupon the earlier BITs signed by these countries began to be counted as developed-country BITs. For the same reason, the total number of BITs signed between transition economies and between these and developed and developing countries shows a corresponding reduction.

47 See the case of Ceskoslovenska Obchodni Banka, A.S. v. the Slovak Republic, Decision on jurisdiction, 24 May 1999, available at (www.worldbank.org/ICSID/cases).

48 BITs signed by Central European countries prior to their accession to the EU in 2004 have been affected by these countries' EU membership. In these circumstances, the United States and the European Commission signed a Memorandum of Understanding (MoU) in September 2003 concerning the applicability and the preservation of BITs concluded between the United States and the new EU members or countries candidates for accession (see *WIR04*, box II.20). A similar exercise is currently taking place with Canada. In addition, Finland renegotiated its BITs with China, Egypt and Ukraine.

49 For example, in the new Canada model BIT (2004), the open asset-based definition of investment was replaced by a comprehensive, but finite, definition of investment. The recently negotiated BIT between the United States and Uruguay, on the other hand, opted to define the term "investment" in economic terms. Such a definition covers, in principle, every asset that an investor owns and controls, but with the qualification that such assets must have the "characteristics of an investment" such as "the commitment of capital or other resources, the expectation of gain or profit, or the assumption of risk". This approach is complemented by the explicit exclusion of several kinds of assets from

the category of covered investment under the agreement (e.g. certain debt instruments).

50 For instance, the new treaty models make clear that an adverse effect on the economic value of an investment does not *per se* establish that an indirect expropriation has occurred. It is further stated that, except in rare circumstances, non-discriminatory regulatory actions by a Party aimed at protecting legitimate public welfare objectives, such as public health, safety, and the environment, do not constitute indirect expropriations.

51 See the ICSID website, www.worldbank.org/icsid.

52 For an analysis in the rise of treaty-based investment disputes, see UNCTAD forthcoming c.

53 UNCTAD database on investor-State dispute-settlement cases.

54 For instance, the Czech Republic's payout of some $270 million plus substantial interest in the Lauder case; the recent award in CSOB v Slovakia (29 December 2004) of $824 million plus an additional $10 million as partial contribution to CSOB's costs; or Occidental's 2002 award against Ecuador of $71 million plus interest.

55 Preliminary results of a CEPMLP/Dundee research project on economic analysis of transnational dispute management.

56 *Nihon Keizai Shimbun*, 21 March 2005.

57 *Nihon Keizai Shimbun*, 17 February 2005.

58 "East Asia needs $1 trillion for infrastructure over next five years" (www.worldbank.org).

59 "Economic confidence will drive M&A activity through 2005, according to KPMG survey", www.biz.yahoo.com.

60 See interview with Sri Lanka's tourism minister in "Plans to bring back the tourists", *FDI Magazine*, 7 February 2005 (www.fdimagazine.com).

61 As far as developing and transition economies (according to the IMF's classification) are concerned, the International Monetary Fund's *World Economic Outlook* (April 2005) estimates FDI flows will increase to $217.4 billion in 2005 and to $222.3 billion in 2006 (www.imf.org). The Institute of International Finance (March 2005) forecast an increase in FDI in 29 emerging markets in 2005, to $148.2 billion from $138.3 billion in 2004 (www.iif.com). The World Bank's *Global Development Finance 2005* (April 2005) projected an annual growth rate of 9% for FDI flows to developing countries (or low-income and middle-income countries according to the World Bank's classification) (nominal value) over the next two years (www.siteresources.worldbank.org).

CHAPTER II

REGIONAL TRENDS: DEVELOPING REGIONS LEAD RISE IN FDI

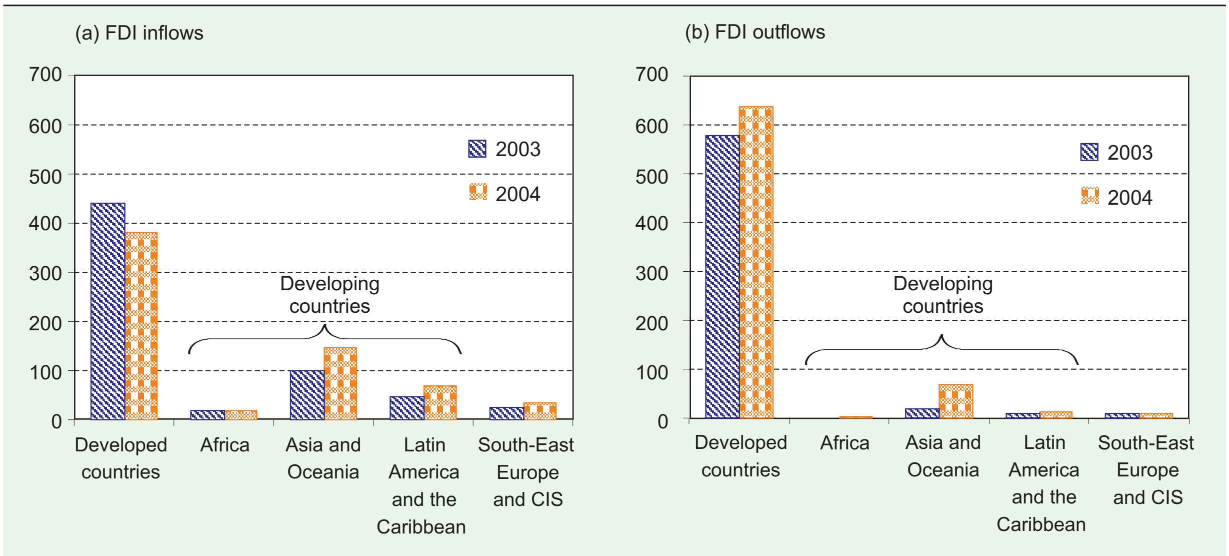
Introduction

As chapter I shows, FDI inflows to developed countries dropped again in 2004, a decline that was offset by rising flows to developing countries and South-East Europe and the Commonwealth of Independent States (CIS) (figure II.1). Not only did this put an end to the downturn that had begun in 2001, it also represented the highest ever level of investment flows to these countries. Increases were noted for all developing regions except Africa where FDI inflows remained stable at a high level. As in 2003, the continued decline of inflows to developed countries was due primarily to large repayments of intra-company loans by foreign affiliates in some host countries, particularly Germany and the Netherlands. France and Luxembourg, both major recipients of FDI in 2003, received less of it in 2004, while inflows to the United Kingdom and the United States recovered. The Russian Federation accounted for the bulk of the higher flows to South-East Europe and the CIS, a new country grouping (box I.2).

Developed countries remain the main sources of FDI globally (figure II.1). As in the case of inflows, the United States and the United Kingdom, in that order, accounted for the largest shares of FDI outflows in 2004. France and Germany also ranked among the top four home economies. Developing economies, particularly those from Asia, are emerging sources of FDI; in 2004 Asia and Oceania contributed more than four-fifths of outward FDI from developing countries.

Figure II.1. FDI flows by region, 2003, 2004

(Billions of dollars)



Source: UNCTAD (www.unctad.org/fdistatistics) and annex table B.1.

A. Developing countries

1. Africa: FDI inflows remain buoyant, sustained by investments in primary production

In 2004, Africa's FDI inflows remained at the relatively high level reached in 2003 ($18 billion) (figure II.2), following a 39% increase in 2003.[1] High prices for minerals such as copper, diamonds, gold and platinum, and particularly for oil, along with the consequent improved profitability of investment in natural resources encouraged TNC investment in the region. Cross-border M&As in the mining industry increased to more than three times their 2003 value. Inflows rose in 40 out of the 53 countries in Africa and fell in 13, including in some of the region's top FDI recipients such as Angola, Morocco and Nigeria. The five top home countries of FDI for Africa in 2004 were France, the Netherlands, South Africa, the United Kingdom and the United States, together accounting for well over half of the flows to the region. Although inflows in 2004 were relatively high, Africa's share in world FDI inflows remained small at 3%. Continued high demand for commodities, a more stable policy environment and increasing participation in infrastructure networks by African TNCs are expected to boost FDI in Africa in 2005. At the same time, FDI outflows from African countries more than doubled in 2004.

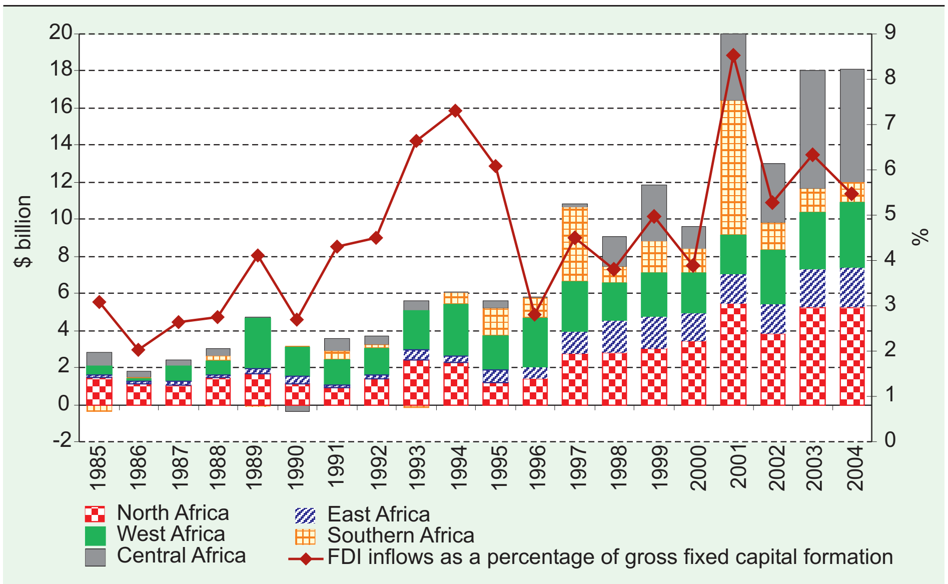
a. Trends: FDI continues to flow, mostly to natural resources

The level of FDI flows to Africa remained virtually unchanged in 2004, at $18 billion. Most of the inflows were in natural-resource exploitation, spurred by rising commodity prices.[2] The profitability of natural-resource exploitation in the region increased,[3] which also induced TNCs to engage in cross-border M&As in the primary sector. This further pushed up FDI inflows (see annex table A.II.1 for major cross-border M&A deals).

Still, Africa's share of world FDI flows was only 3% in 2004. Over the past ten years this share has risen by less than one percentage point. On a per capita basis, FDI inflows to Africa rose from $8 in 1995 to $20 in 2004, but this represented only about half of the per capita FDI inflows to China, for example, which stood at $46 in 2004. FDI inflows accounted for 5.5% of Africa's gross fixed capital formation in 2004 (figure II.2).

Among the different subregions, North Africa[4] attracted the highest inflows in 2004, with all the countries in the subregion, except the Libyan Arab Jamahiriya, on the list of the top 10 host countries for FDI in Africa (figure II.3).

Figure II.2. Africa: FDI inflows and their share in gross fixed capital formation, 1985-2004



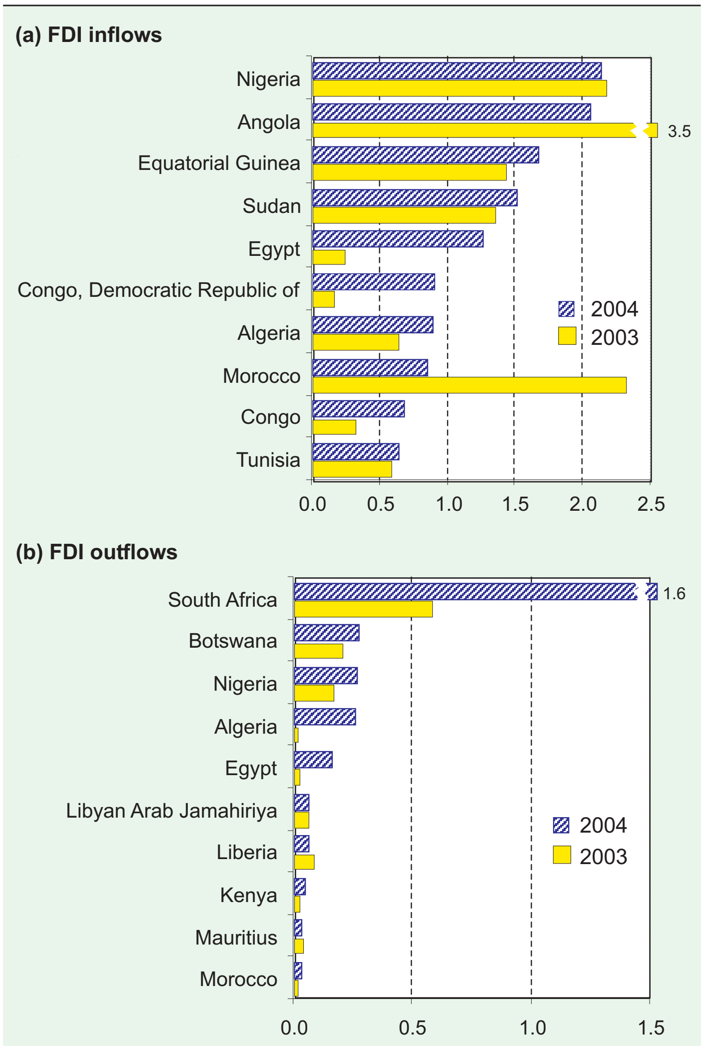
Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics) and annex tables B.1 and B.3.

The subregion attracted 29% of Africa's total inflows, particularly in oil and gas. Sudan topped the list, mainly as a result of FDI in petroleum from China, India and Malaysia. Investment links have also been established with several members of the CIS (e.g. the Russian Federation) and with some Gulf countries. Oil and natural gas exploitation also contributed to inflows to Algeria and Egypt. Inflows to Morocco declined by more than half to $0.9 billion in 2004 because of a slowdown in the privatization of the country's public enterprises. In Tunisia inflows were stable.

East Africa[5] and West Africa[6] also received higher inflows in 2004, but they declined in Central Africa[7] and Southern Africa.[8] While FDI flows to South Africa fell, most of the small host economies received higher inflows. However, as in previous years, such flows remained below the $0.1 billion level in 2004 (table II.1), especially in the natural-resource-poor and least developed countries (LDCs). In countries long affected by political conflict such as Burundi and Somalia, there were virtually no inflows until 2003, with a few exceptions. In many of these LDCs, the size of the domestic market is small and some of the market-access initiatives put in place to encourage investment in export-oriented industries have been constrained by the lack of appropriate human and other resources. Marking a change in this regard, Coca-Cola opened a new bottling plant worth $8.3 million in Mogadishu, Somalia in 2004, the largest single investment in that country since 1991.[9]

Figure II.3. Africa: FDI flows, top 10 economies,[a] 2003, 2004

(Billions of dollars)



Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics) and annex table B.1.

[a] Ranked on the basis of the magnitude of FDI flows in 2004.

Rising oil prices contributed to relatively high levels of FDI inflows to the major oil-producing African countries, especially Sudan and Equatorial Guinea (figure II.3). Although FDI inflows decreased in Angola and Nigeria, the levels, nevertheless, remained high in those two countries.[10] These four countries, together with Egypt, were the top recipients of FDI to Africa in 2004. With over $1 billion each in inflows, their combined total amounted to $8.6 billion (or a little under 50% of Africa's total inflows), while the top ten host countries accounted for 69% in 2004.

As a result, the composition of FDI inflows to Africa in 2004 (as well as in 2003) was significantly tilted towards natural resources, particularly in the petroleum industry. The share of this industry exceeded 60% of total inflows in Angola, Egypt, Equatorial Guinea and Nigeria, four of the five largest host countries in Africa (figure II.4). It has also accounted for the largest share of FDI in Algeria, the Libyan Arab Jamahiriya and Sudan in recent years. In South Africa as well, a major transaction in the oil industry dominated FDI inflows in 2004: Tullow Oil Plc of the United Kingdom merged with Energy Africa Ltd of South Africa, resulting in a $0.5 billion investment.

In some countries efforts to diversify the economy, and in some cases to reduce dependence on the hydrocarbons industry by opening up new industries to foreign participation, are beginning to pay off. In 2004, for example, there were sizeable

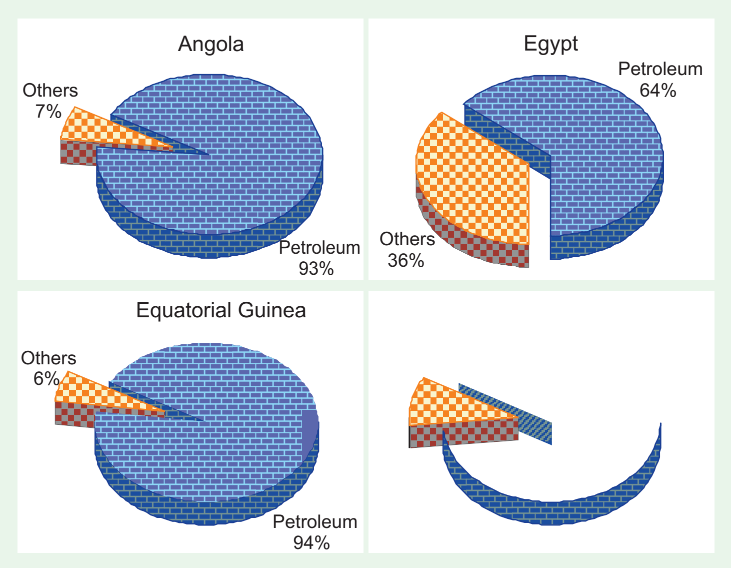
Table II.1. Africa: country distribution of FDI inflows, by range, 2003, 2004

	2003	2004
Range	Economy [a]	Economy [a]
More than $2.0 billion	Angola, Morocco and Nigeria	Nigeria and Angola
$1.0-1.9 billion	Equatorial Guinea and Sudan	Equatorial Guinea, Sudan and Egypt
$0.5-0.9 billion	South Africa, Chad, Algeria, Tunisia and United Republic of Tanzania	Democratic Republic of the Congo, Algeria, Morocco, Congo, Tunisia, South Africa and Ethiopia
$0.1-0.4 billion	Ethiopia, Botswana, Mozambique, Congo, Egypt, Mauritania, Uganda, Gabon, Zambia, Côte d'Ivoire, Democratic Republic of the Congo, Namibia, Libyan Arab Jamahiriya, Ghana and Mali	Chad, United Republic of Tanzania, Côte d' Ivoire, Zambia, Gabon, Mauritania, Namibia, Uganda, Mali, Ghana, Mozambique, Libyan Arab Jamahiriya and Guinea
Less than $0.1 billion	Kenya, Guinea, Mauritius, Seychelles, Senegal, Benin, Lesotho, Togo, Zimbabwe, Burkina Faso, Gambia, Eritrea, Cape Verde, Madagascar, Niger, Djibouti, Malawi, Sao Tome and Principe, Rwanda, Guinea-Bissau, Central African Republic, Sierra Leone, Liberia, Comoros, Cameroon, Somalia, Burundi and Swaziland	Senegal, Swaziland, Mauritius, Benin, Gambia, Togo, Seychelles, Zimbabwe, Sao Tome and Principe, Lesotho, Botswana, Kenya, Madagascar, Burkina Faso, Djibouti, Eritrea, Cape Verde, Liberia, Niger, Malawi, Rwanda, Somalia, Guinea-Bissau, Sierra Leone, Burundi, Comoros, Cameroon and Central African Republic

Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics) and annex table B.1.
[a] Listed in order of the magnitude of FDI inflows for each respective year.

investments in the telecommunications industry in Algeria.[11] In Morocco a 16% stake of Maroc Telecom (MT) was sold to Vivendi, which was due to be paid in early 2005.[12] In Egypt, liberalization and privatization have prompted FDI in a range of industries such as cement, telecoms and tourism. In Sudan, inflows of FDI from China are expected for the building of a new power plant and a refinery north of Khartoum and for the refurbishing of a long-neglected railway system. In Tunisia, FDI inflows in the manufacturing industry constituted 39% of total flows to the country, and in recent years, they have also gone to major infrastructure projects in energy and telecommunications.

Figure II.4. Share of petroleum in FDI inflows to four major African countries, 2004



Source: UNCTAD, based on national sources and official communications.

About 63% of the cross-border M&As in Africa in 2004 were related to mining activities, up from 13% in 2003 (table II.2). Greenfield FDI inflows to natural resources also increased marginally (annex table A.I.3). For instance, Gold Fields (South Africa), Junior Orezone Resources (Canada) and Riverstone Resources (Canada) increased their investment in the Essakan gold joint venture in Burkina Faso. Reefton Mining of Australia enlarged its diamond activities in Namibia. In addition, West Africa Gold Inc. (now Great West Gold Inc.) of the United States expanded its investment in gold, platinum and palladium extraction in Mali. About a third of all registered greenfield FDI projects were in manufacturing and nearly half were in the services sector (annex table A.I.3).

Notwithstanding growing interest among Asian investors, most of Africa's FDI inflows originate mainly from developed countries (Western Europe, the United States) and South Africa. The top five home countries for FDI flows to Africa are France, the Netherlands, South Africa, the United Kingdom and the United States, which together accounted for more than half of total inflows to Africa in 2003.

FDI outflows from Africa more than doubled, to $2.8 billion in 2004. Most of these outflows, about 57%, were the result of cross-border acquisitions by TNCs from South Africa, following an increasingly liberalized outward investment policy in that country. For instance, AngloGold (South Africa) purchased Ashanti Goldfields (Ghana) which has major FDI projects in Guinea, the United Republic of Tanzania and Zimbabwe, and Gold Fields (South Africa) acquired IAMGOLD (Canada). In another deal, Allied Technologies (South Africa) acquired the Econet Wireless Group of Botswana. TNCs from some other African countries are also investing within and outside the region. Examples include the expansion of the operations of Orascom Telecom Holding (Egypt) into Iraq and other Asian countries, and the expansion of production by Oriental Resources of Nigeria in Chad. Algeria, Egypt, Nigeria and South Africa together accounted for 81% of the FDI outflows from Africa in 2004 (annex table B.1).

b. Policy developments: efforts to stabilize the environment for FDI inflows

In terms of policy changes, there was a further wave of FDI-friendly measures and initiatives at the national, regional and global levels to attract more FDI into African countries in 2004. Most of these measures focused on liberalizing legal frameworks and improving the investment climate.

Egypt, the Libyan Arab Jamahiriya and Mauritius introduced at least four policy changes each. Among the countries implementing policy reform, Algeria, the Democratic Republic of the Congo, Egypt, Ghana, Madagascar, Mauritania, Mauritius, Senegal, the United Republic of Tanzania and Uganda generally simplified aspects of their FDI regulations, including through the establishment of more transparent FDI regimes. Nigeria implemented reforms allowing foreign banks to merge with local commercial banks. The Democratic Republic of the Congo and the United Republic of Tanzania reduced the levels of tax and royalty payments. Other specific changes included the adoption in *Egypt* of an antitrust law as part of a concerted drive to improve the country's business environment, and the

Table II.2. Africa: distribution of cross-border M&A sales, by sector and industry, 2003, 2004
(Millions of dollars and per cent)

Sector/industry	2003 Value	2003 %	2004 Value	2004 %	Growth rate in 2004 (%)
Primary	**828**	**12.9**	**2 918**	**63.5**	**252**
Mining	828	12.9	2 918	63.5	252
Manufacturing	**5 066**	**78.8**	**1 144**	**24.9**	**-77**
Food, beverages and tobacco	1 657	25.8	46	1.0	-97
Wood and wood products	3	-	-	-	-
Printing, publishing and allied services	-	-	10	0.2	-
Oil and gas; petroleum refining	3 130	48.7	1 076	23.4	-66
Chemicals and chemical products	110	1.7	-	-	-
Stone, clay, glass and concrete products	-	-	-	-	-
Metals and metal products	166	-	-	-	-
Machinery	-	-	4	0.1	-
Miscellaneous manufacturing	-	-	9	0.2	-
Services	**532**	**8.3**	**533**	**11.6**	-
Electricity, gas and water distribution	329	5.1	19	0.4	-94
Hotels and restaurants	-	-	33	0.7	-
Trade	2	-	44	1.0	2 059
Transport, storage and communications	2	-	331	7.2	16 472
Finance	89	1.4	65	1.4	-27
Business activities	107	1.7	25	4.9	-76
Community, social and personal service activities	3	-	15	0.3	497.5
All industries	**6 427**	**100.0**	**4 595**	**100.0**	**-28**

Source: UNCTAD, cross-border M&A database (www.unctad.org/fdistatistics).

announcement by the Central Bank of *Zimbabwe* of a new guarantee to pay back the entire capital within three months if investors decided to leave.[13]

Some noticeable national policy and institutional changes are also taking place in the petroleum industry, the main attraction in several African countries for FDI inflows in 2004 (box II.1), in an attempt to enhance the favourable impact of oil revenues on national development.

In Kenya, the Government completed a bidding process to privatize Kenyan Telkom. However, FDI policy in Kenya appears to have become stricter in some areas (box II.2).

Many African countries also stepped up their investment promotion efforts in 2004. For example, Egypt initiated a number of measures including the simplification of investment procedures; it is also reviewing the fiscal regime. In addition, it is restructuring the General Authority for Investment and Free Zones (GAFI). Similar efforts are under way in Morocco regarding the Investment Directorate. A number of countries, including Egypt, Morocco and Tunisia, are trying to promote their countries as investment destinations through the organization of investors' meetings and annual conferences.

Box II.1. Africa: several producer-countries seek to improve policies and management of the petroleum industry

Several African petroleum-producer countries adopted or proposed new policies and institutional changes with respect to petroleum exploration and exploitation in 2004. Some of these changes aim at improving the management of the oil industry in order to enhance the benefits to the local economy. Others aim at creating a better environment for production activities in the oil industry. Major new policies and institutional changes have included the following:

- The Government of *Angola* proposed a new legislation requiring oil companies to route all their payments through the domestic banking system. This measure is expected to lead to a large influx of FDI-related foreign exchange into Angola, sharply boosting transactions and revenue for domestic banks and increasing the banking sector's ability to offer credit to domestic enterprises.
  The legislation also sets out requirements on the procurement of goods and hiring of services by oil companies operating in Angola. Oil companies are expected to:
  - hold competitive tenders to contract the supply of goods and the provision of support services for their operations;
  - ensure that Angolan companies benefit from preferential treatment in competitive tenders for services and goods. Domestic firms should be awarded the relevant contract when their bid is no more than 10% higher than the bids submitted by foreign competitors. If the Angolan authorities enforce the order strictly, it will have a significant impact on the scope of services that may be directly provided by foreign contractors to oil operators. As a result, foreign service companies wishing to do business in Angola are likely to opt increasingly for structuring their businesses through joint ventures with local partners.
- The *Democratic Republic of the Congo* is reorganizing the corporate structure of its national oil company, Société Nationale des Pétroles du Congo (SNPC), into a holding company with seven affiliates. Of particular interest to investors is SNPC Refining, which is to be privatized.
- The Government of the *Libyan Arab Jamahiriya* adopted a new exploration and production-sharing agreement called EPSA-IV. The Government is intended to offer fresh incentives to foreign companies to invest in oil and gas exploration and development, and it will make the contracting process more efficient and transparent.
- In *Mali*, a new oil code was adopted in June 2004. The initial time span allowed for oil prospecting is four years, renewable for two further periods of four years each. The attribution of prospecting and exploration permits as well as their renewal is subject to the payment of fixed taxes. Permit holders are liable for the payment of charges on the production of oil and a tax of 35% on profits, but they benefit from tax exemption on petroleum products.
- In *Mauritania*, a bill proposing a simplified tax system for oil producers was adopted. The new text complements an act dating back to 1988 and defines the framework for the execution of contracts and the rights and obligations of all parties.

Source: UNCTAD, based on national sources.

Various bilateral, regional and multilateral treaties were also concluded, which complemented national regulations for promoting FDI. African countries concluded 33 new bilateral investment treaties (BITs) and 15 new double taxation treaties (DTTs) in 2004 (figure II.5). These brought the cumulative numbers of BITs and DTTs for the region to 615 and 404 respectively. In addition, the Libyan Arab Jamahiriya and India agreed on liberalizing visa regimes for business people from the two countries, and signed a bilateral investment promotion agreement in 2004. Tunisia concluded a free trade agreement (FTA) with members of the European Free Trade Area (EFTA), and Morocco concluded one with the United States. Egypt concluded a framework agreement with the Southern Common Market (MERCOSUR),

Box II.2. Kenya: UNCTAD's Investment Policy Review recommends an alternative approach to minimum capital requirements for FDI inflows

In the 1970s, Kenya was a prime location for FDI inflows in East Africa. However, deteriorating infrastructure and a poor track record of policies in the 1980s and 1990s discouraged inflows of FDI for about two decades. Inflows declined to one-fifth of those of neighbouring Uganda in 2004, and stood at $46 million. On a per capita basis, this represented $1.4 compared with Uganda's $8.5. As a result, Kenya is now among the developing countries that have attracted the least FDI relative to their size over the past decade. FDI inflows have nevertheless had a crucial impact on the development of the country's export-oriented horticulture industry, contributed to the revival of Kenya Airways and accelerated the development of the mobile telecommunications network in the country.

In 2002 the new Government indicated its interest in improving the investment framework so as to support private sector development and wealth creation. In 2004, the Parliament adopted an Investment Promotion Bill to promote and facilitate investment by assisting investors to obtain licences and providing other incentives for related purposes. Its two core incentives are entitlements to business licences for an initial period along with the allotment of six residence and work permits for foreign staff in FDI projects.

However, the new Act requires *all* foreign investors to have their projects screened and approved, and it imposes a minimum investment requirement of $500,000 on prospective foreign investors. This requirement was introduced to avoid the crowding out of small national investors, and to encourage only "serious" foreign investors into Kenya. However, this approach is unlikely to respond adequately to the country's legitimate concerns; it could even create a barrier to beneficial FDI inflows: almost 75% of foreign investment projects registered in 2000-2004 were worth less than $500,000. The minimum investment is likely to deter FDI in low-capital but knowledge-intensive service industries that could bring benefits to Kenya in some areas in which it has a comparative advantage. As a concrete example, Homegrown, which has evolved into Kenya's largest horticulture and floriculture company and a major source of employment and spillovers, started with an initial investment well below the current requirement of $500,000.

The *Investment Policy Review of Kenya* completed by UNCTAD in early 2005 recommends the adoption of an alternative approach to regulating FDI entry which would effectively lift the screening and minimum capital requirements and make investment certificates optional. Targeted protection to sensitive industries, in turn, could be considered, if deemed necessary. The Government of Kenya has recognized that the general restrictions imposed on FDI entry are likely to be counter-productive and has introduced a few key amendments to the Investment Promotion Act. If adopted by the Parliament, these amendments will remove the compulsory screening of FDI and the minimum capital requirement. In turn, optional investment certificates would remain a condition for specific incentives and be subject to a lower capital requirement of $100,000.

Like many other African countries, Kenya has not attracted significant FDI inflows into manufacturing and R&D activities. In this context, it might be useful to target FDI promotion efforts to attract FDI in projects in areas such as technological inputs, R&D activities, and processing and manufacturing activities. That would imply that projects that may initially have low initial financial capital values but bring, for example, valuable manufacturing and R&D inputs would be allowed to operate.

Source: UNCTAD forthcoming d.

and ratified the EU-Egypt Association Agreement (signed in 2001), which is expected to promote trade and exports, improve bilateral relations with the EU and encourage European investment in Egypt. Five economic and partnership agreements between the EU and regional groupings of African countries were being negotiated in 2004 (but have yet not been concluded).

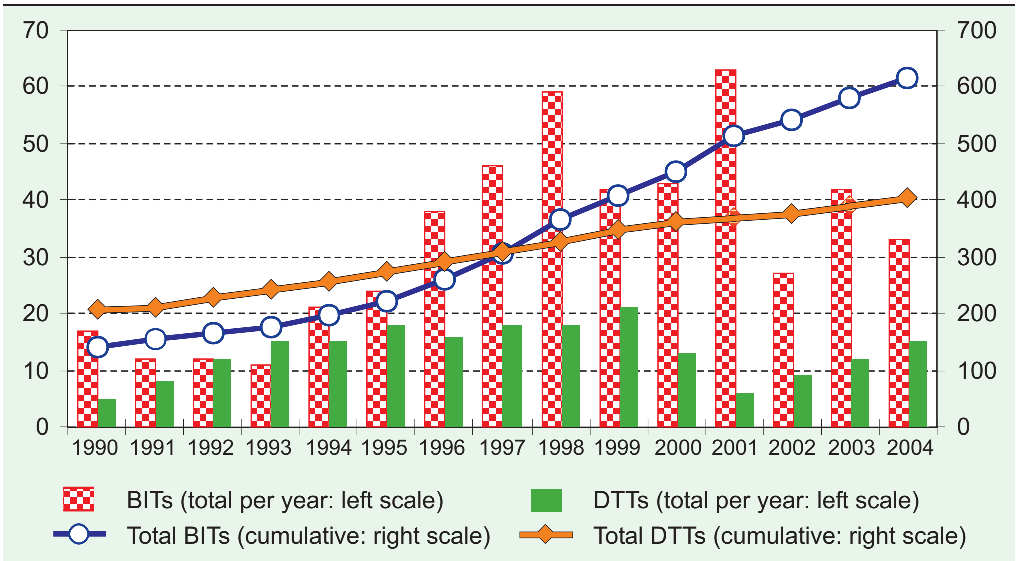
The Government of the United States amended key provisions of the African Growth and Opportunity Act (AGOA) in 2004 (box II.3) that allow more flexible rules of origin. From 2005, however, with the ending of the quotas limiting some countries' exports under the World Trade Organization's (WTO) Agreement on Textiles and Clothing (ACT), the preferential advantage provided by the AGOA may not suffice to attract FDI into textiles and clothing. There will be increased competition, especially from Asian countries, the exports of which were previously restricted by the quotas.

In 2004, the Multilateral Investment Guarantee Agency (MIGA) of the World Bank, through its guarantee programme, supported four new FDI projects in power generation, business services, banking and IT services, and undertook 28 technical assistance activities in the region.[14] At the same time, the African Trade Insurance Agency (ATI) – the region's only pan-African multilateral import and export credit and political risk guaranty agency[15] – adopted measures to protect foreign investors in Africa against trade risks. The region now has better market access (as a result of the Everything-but-Arms (EBA) initiative of the EU, Japan's 99% rule[16] for LDCs, AGOA and the Generalized System of Preferences (GSP)), and national policies are more stable. Despite these measures and efforts, African countries' capacity to target FDI strategically in manufacturing and services has been constrained by economic and social factors. Impediments range from small market size and poor regulation to meagre financial resources and low skills. The annual gross national income per capita, for instance, is around $500 in sub-Saharan Africa, and investment in sectors such as education remains insufficient.

The continued low levels of FDI in manufacturing in many African countries are explained by two main factors: a failure to move rapidly on developing economic and social policies that are important for FDI inflows (as well as on development in general); and years of reforms in the 1980s that placed insufficient emphasis on capacity building. As a result, the international market-access measures and initiatives provided for African countries have not been very successful in attracting FDI, particularly in manufacturing, given the lack of capacity to exploit FDI in a number of countries. The future of FDI in Africa's development lies in an integrated and genuine partnership between the private sector and governments to strengthen human resource capabilities, for example through training of the labour force (*WIR03*). Initiatives such as AGOA can only have a stronger impact

Figure II.5. Africa: BITs and DTTs concluded, cumulative and annual, 1990-2004

(Number)



Source: UNCTAD, BIT/DTT database (www.unctad.org/iia).

Box II.3. AGOA Acceleration Act 2004: some new key provisions

The United States has made AGOA a cornerstone of its policy of promoting trade and investment in Africa. In 2004, the United States Government enacted a law – the AGOA Acceleration Act of 2004 – that amended the original initiative. The law now has the following key features:

The Act extends the expiration of the programme from 2008 until 2015, and the third-country fabric provision is extended for three years, from September 2004 until September 2007, including a phase-down in year three. The cap of the third-country provision will remain at the full current level available in years one and two. In the third year, the cap will be phased down by 50%.

The law includes a statement of Congressional policy that textile and apparel provisions under the programme should be interpreted in a broad and trade-expanding manner to maximize opportunities for imports from Africa. This is accompanied by minor technical corrections to prevent restrictive interpretations by customs officials. The Act includes a modification of the rules of origin to allow use of non-AGOA products for all import categories and continued use of fabrics from AGOA countries – such as South Africa – which also become free trade partners with the United States.

The Act increases the de minimis rule from its current 7% to 10%. It states that apparel products assembled in sub-Saharan Africa, which would otherwise be considered eligible for AGOA benefits except for the presence of some fibres or yarns not wholly formed in the United States or the beneficiary sub-Saharan African country, will still be eligible for benefits as long as the total weight of all such fibres and yarns is not more than a certain percentage (currently 7%) of the weight of the article.

The Act also expands the current "folklore" AGOA coverage to include ethnic fabric made on machines, and supports many of the aims of the New Partnership for Africa's Development (NEPAD) initiative, including regional integration among African countries.

AGOA was intended to apply to 48 African countries, but by the end of 2004 only 37 had qualified.[a] To date, only 18 of these countries met the rules-of-origin requirements, creating the legal conditions required for taking advantage of the scheme. However, only seven countries attracted any FDI inflows.[b]

Source: "AGOA Acceleration Act for 2004 (AGOA III) summary", AGOA website (www.agoa.gov).

[a] The 37 African countries are: Angola, Benin, Botswana, Burkina Faso, Cameroon, Cape Verde, Chad, Congo, the Democratic Republic of the Congo, Djibouti, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, South Africa, Swaziland, the United Republic of Tanzania, Uganda and Zambia.

[b] For a description of progress with respect to exports and FDI in export-oriented production in some AGOA beneficiary countries, including Lesotho, Mauritius, Mozambique, South Africa, Swaziland, and Uganda, see *WIR04*, p.91, ff4. In Mali, a $12.5-million cotton-thread factory opened in February 2004. This facility is one of the sub-Saharan African plants outside South Africa capable of producing quality thread for use in manufacturing apparel for export under AGOA. Mauritians were among the investors. The factory created 200 new jobs (www.agoa.gov).

on FDI inflows if African countries implement development-oriented economic and social policies.

Africa's ability to industrialize successfully could weaken unless supported by strong domestic investment capacity, which is particularly important given the region's declining share of global FDI inflows in manufacturing. The scope for industrialization lies not just in improving its market access and the investment climate but, more significantly, in strengthening its domestic industrial capabilities. For the latter, governments may choose to use public policies and finance to attract the type of FDI they need in the manufacturing industries, as illustrated by some policies in South Africa (box II.4).

However, attracting FDI into the manufacturing sector in Africa is becoming difficult as competition grows from the other developing countries, particularly in Asia. Factors such as good physical infrastructure and appropriate human skill levels have become increasingly important in attracting FDI projects, especially as a number of international trade advantages such as those provided by the Multi-Fibre Arrangement (MFA), AGOA and others have already, or will eventually, come to an end. This scenario may, however, change with new initiatives for Africa such as those proposed by the renewed emphasis on the Millennium Development Goals by the United Nations and by the Commission for Africa that was set up in 2004 by the Government of the United Kingdom (box II.5).

c. Prospects: cautiously positive

The significant rise in commodity prices that started in 2004, and the resulting high profitability of investments, are expected to lead to further increases in FDI in Africa in 2005. Furthermore, the United States is expected to increase its share of oil imports from Africa from the current level of 18% to 25% by 2015.[17] Pressure on TNCs to access more petroleum resources, slash costs and take advantage of high prices is expected to set off a new wave of cross-border M&As in the region. United States and European TNCs (such as Chevron Corp. (United States) in Angola and Total (France) in Nigeria) are already expanding or planning to expand their investments. In the mining industry, significant projects are planned as well, for instance in diamond, copper and cobalt in the Democratic Republic of the Congo.[18]

In infrastructure projects, TNCs are also likely to invest in some African countries. Eskom of South Africa, for instance, is already involved

Box II.4. Attracting FDI to South Africa through Government development assistance programmes

South Africa's FDI flows over the past five years have fluctuated between $6.8 billion in 2001 and $600 million in 2004. Two of its current development assistance programmes, the National Industrial Participation Programme and the Foreign Investment Grant (FIG), were designed to use the government's financial capacity to attract FDI inflows to manufacturing projects, with some success.

The National Industrial Participation Programme is an offset scheme that requires a commitment by suppliers doing more than $10 million worth of business with the Government or the companies it owns to facilitate industrial development in the country.[a] Under the scheme, when the Government purchases goods or services in which the import content exceeds $10 million, the foreign suppliers incur an obligation to reinvest a portion of their profits from sales inside the country. Procurement programmes tied to this arrangement include the Government's strategic defence procurement package and purchases made by State-owned enterprises such as Telkom, South African Airways, Eskom, Transnet and Petro S.A. The programme is obligatory and is focused on the transport, energy, and information and telecommunications industries. About 125 FDI projects have so far been facilitated by this programme resulting in investments of $750 million and exports of $1.5 billion by the end of 2004.[b] The value of purchase obligations currently being monitored by the Department of Trade and Industry is approximately $14 billion, the bulk of which comes from the Government's strategic defence package. In 2003, the programme yielded a big offset package: an $8.7 billion commitment from aircraft supplier BAE Systems of the United Kingdom and Saab of Sweden.[c] The full offset obligations are due to be discharged over a period of seven years (by April 2011).

The FIG was created as a cash incentive scheme for foreign investors who invest in new manufacturing enterprises in South Africa. In the FIG programme, a foreign entrepreneur can be compensated for up to 15% of the costs of moving new machinery and equipment to South Africa, up to a maximum amount of 3 million rand ($0.5 million) per entity. The scheme aims at promoting FDI as well as enhancing the level of technology and overall economic growth in South Africa. It is open to foreign investors who hold at least 50% of the shares in the relevant company.

Source: Department of Trade and Industry website (www.dti.gov.za).

[a] "Jet-propelled investment", *FDI Magazine*, April/May 2005 (www.fdimagazine.com).
[b] Data from the Department of Trade and Industry. Even though South Africa has had successes with the offset programme, some of the past commitments did not materialize.
[c] "Jet-propelled investment", *op. cit.*

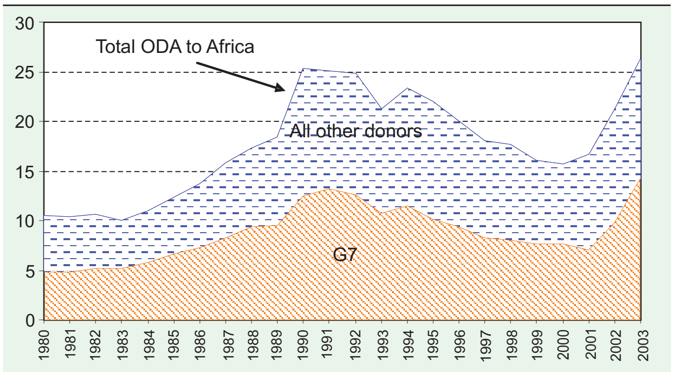
Box II.5. The Report of the Commission for Africa: recommendations to help boost investment

Africa is a major recipient of official development assistance (ODA) as a source of financing for development. After declining for much of the 1990s, ODA to the region has risen substantially in recent years, from $16 billion in 2000 to $26 billion in 2003 (box figure II.5.1). Most of the region's ODA comes from developed countries, with the United Kingdom being one of the major donor countries (box table II.5.1).

In 2004, the Prime Minister of the United Kingdom established a Commission for Africa "to define the challenges facing Africa, and provide clear recommendations on how to support the changes needed to reduce poverty" (Commission for Africa 2005, p. 1). Its Report, released in March 2005, recommends a substantial increase in aid to Africa – an additional $25 billion per year to be implemented by 2010 – emphasizing the need for innovative financial methods to secure funding.[a] It calls for changes by the recipients as well as donors in an integrated package focusing on governance and capacity building, peace and security, investment in people, growth and poverty reduction, and trade to ensure that aid is well spent. It proposes a "Marshall Plan" to pull Africa out of poverty, just as the Marshall Plan involving large amounts of aid from the United States enabled Europe to rebuild its industrial infrastructure after the Second World War.

Several of the report's recommendations are directly relevant to boosting both local and foreign investment in African economies. The Report notes that infrastructure and policy measures in Africa have not been adequate, nor have they been improved or expanded. It points out that private

Box figure II.5.1. Africa: ODA inflows, 1980-2003
(Billions of dollars)



Source: UNCTAD, based on OECD ODA/OA database.

investment cannot be expected to flow without decent transportation systems, a stable policy climate, human capital and reliable utilities.

The report underlines concrete priorities for the use of additional aid in areas that could encourage investment in the region. It calls for

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in the first phase of an infrastructure project to rehabilitate the Inga hydroelectric power station in the Democratic Republic of the Congo as part of the "Unified African Grid". In 2004, German investors had announced plans to build a computerized railway line from Rongai to Juba in Southern Sudan. Morocco might also receive increased FDI inflows in 2005 as a result of further privatization of public enterprises and the conclusion of an FTA with the United States.

Improving economic conditions in South Africa are encouraging FDI in the country's banking industry. The acquisition of 60% of ABSA (South Africa) by Barclays of the United Kingdom in 2005 may herald a wave of M&As and greenfield FDI in South Africa and in other countries in the region. Opportunities exist for FDI in key service industries in Africa, particularly telecommunications, electricity and transport. FDI inflows to processing and other industries in the manufacturing sector are expected to be small, going mainly to the Libyan Arab Jamahiriya, Nigeria, South Africa and Uganda.

A 2005 survey of international FDI experts, TNCs and investment promotion agencies (IPAs) undertaken by UNCTAD (box I.3) revealed cautious optimism concerning the prospects for FDI in Africa. Among the TNCs, one out of four respondents expected FDI inflows to Africa to increase in 2005-2006 (figure II.6). An equal number of TNCs believed that inflows would decrease. FDI experts and IPAs were more optimistic: one out of three FDI experts and nine out of 10 African IPAs expected FDI inflows to grow in 2005-2006. Experts and TNCs judge FDI

Box II.5. The Report of the Commission for Africa: recommendations to help boost investment (concluded)

donors to double their spending on infrastructure – from rural roads to regional highways, power projects and information and communications technologies (ICT) – and proposes a 100% external debt cancellation for African countries. The report recognizes the need to reverse years of chronic underinvestment in education (partly as a result of budget cuts made in order to comply with the IMF's structural adjustment programmes). It also calls on developed countries to support an Investment Climate Facility for Africa under the NEPAD initiative, and to insure foreign investors in post-conflict countries in Africa through a risk-bearing fund of the Multilateral Investment Guarantee Agency.

New ODA inflows into Africa, if allocated according to the priorities outlined in the report, could help improve the investment climate by providing opportunities for foreign firms to invest productively, creating jobs, and contributing to sustainable progress in reducing poverty while improving living standards in the region.

Box table II.5.1. Top 10 ODA donors to Africa, 2000-2003[a]

(Millions of dollars)

Donor country	2000	2001	2002	2003
United States	2 107	1 975	3 189	5 063
France	1 812	1 531	2 603	3 587
Germany	871	830	1 009	2 061
United Kingdom	1 151	1 204	1 048	1 508
Belgium	219	245	363	1 053
Netherlands	601	853	956	1 026
Italy	252	196	811	744
Japan	1 226	1 091	700	704
Sweden	399	352	409	683
Norway	339	325	452	581
G7[b] to Africa	7 638	7 044	9 748	14 184
All donors to Africa	15 732	16 691	21 261	26 318
Memorandum				
G7[b] to all recipients	167 773	153 514	184 551	223 633
All donors to all recipients	314 378	320 487	368 712	426 330

Source: UNCTAD, based on OECD, ODA/OA database.

[a] Ranked according to 2003 figures.

[b] Canada, France, Germany, Italy, Japan, the United Kingdom and the United States.

Source: UNCTAD, based on the United Kingdom, Commission for Africa 2005.

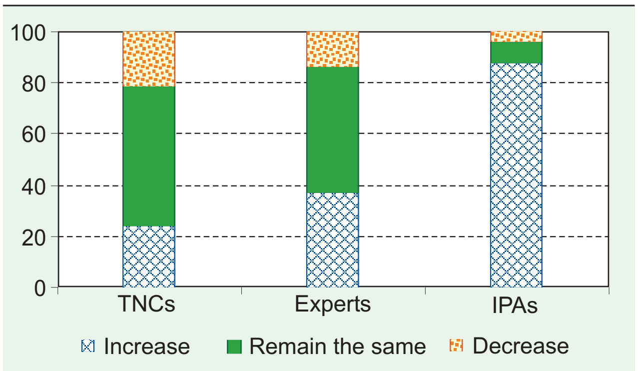
[a] At the end of the summit of the G-8 countries in Gleneagles, United Kingdom, in July 2005, the countries and other donors made substantial commitments to increase aid by a variety of means, including through traditional development assistance, debt relief and innovative financing mechanisms, which would lead to an increase in ODA to Africa of $25 billion a year by 2010.

prospects for North African countries to be more positive than those for sub-Saharan African countries.

FDI outflows from Africa are also poised for a rapid expansion in 2005. The major home sources of this expansion are likely to be South Africa, Egypt and Nigeria. For instance, several South African TNCs are committed to large projects inside and outside Africa, particularly in the Democratic Republic of the Congo and Western Asian countries. Orascom Telecom Holding of Egypt has offered to buy the Wind SpA phone company of Italy in 2005.[19] Oriental Energy Resources of Nigeria is seeking to acquire petroleum exploration rights in Angola.

Figure II.6. Africa: prospects for FDI inflows, 2005-2006

(Per cent of responses from TNCs, experts and IPAs)



Source: UNCTAD (www.unctad.org/fdiprospects).

2. Asia and Oceania: inflows at a record high

FDI inflows to Asia and Oceania reached a new high at $148 billion in 2004, registering the largest increase ever. The region's share of FDI inflows worldwide also increased from 16% in 2003 to 23% in 2004. Almost all parts of Asia and Oceania received higher flows than in 2003. FDI inflows also rose as a percentage of gross fixed capital formation (figure II.7). Outward flows from the region quadrupled to $69 billion, the second highest level ever, driven by FDI from most major economies, and particularly from Hong Kong (China). The policy environment for FDI continued to improve, and the prospects for FDI in and from the region remain promising.

a. Trends: strong growth in FDI flows

FDI flows to Asia and Oceania[20] increased by 46% in 2004; 34 out of 54 economies received higher flows than in 2003. However, they remain concentrated: the top 10 host economies (figure II.8) accounted for 92% of FDI inflows to the region.

The distribution of inflows by size changed significantly compared with 2003: a few large FDI-recipient economies saw an increase in the level of FDI flows, and the number of economies that received less than $100 million decreased (table II.3). Bangladesh, China, India, the Republic of Korea, Macao (China), Mongolia, Pakistan, Qatar, Singapore, the Syrian Arab Republic and Viet Nam received record levels of flows (annex table B.1).

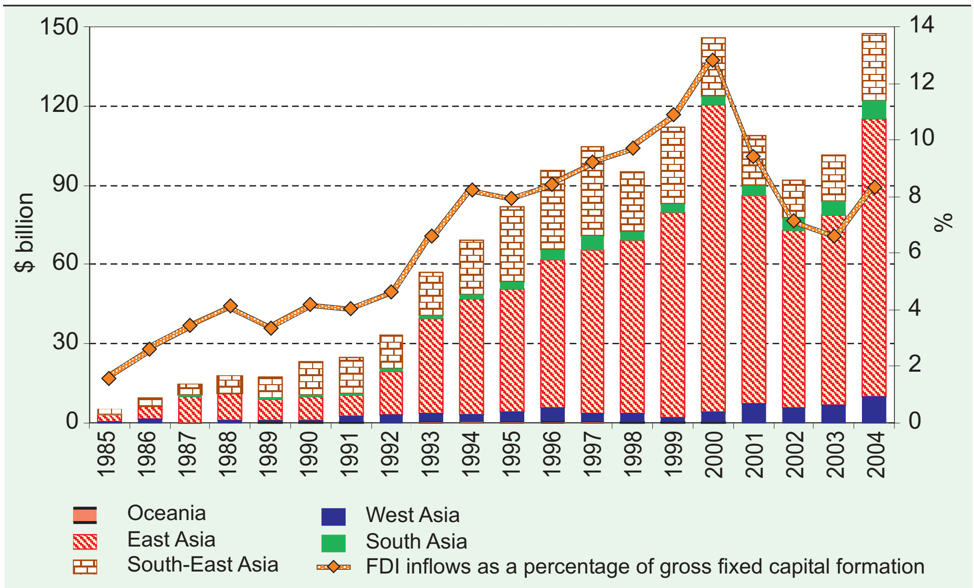
While greenfield investment remains the most important mode of FDI in the region, cross-border M&As increased from $22 billion in 2003 to $25 billion in 2004 largely due to transactions in East Asia (annex table B.4). The top three targets in terms of the value of cross-border M&A sales in 2004 were China, the Republic of Korea and Hong Kong (China) (figure II.9). The most significant increase took place in China, making the value of its cross-border M&A sales the largest in the region in 2004. The surge of M&As in China was driven largely by policy changes in that country.[21]

Cross-border M&As in Asia and Oceania primarily targeted service industries (and in particular financial services), which accounted for two-thirds of total cross-border M&A sales in 2004 (table II.4). Cross-border M&A sales almost doubled in the chemical industry, making it the largest recipient industry of cross-border M&As in manufacturing in the region.

In contrast to cross-border M&As, greenfield investment by TNCs concentrated on manufacturing followed by sales and marketing, retail and business services (annex table A.I.3). FDI in R&D, a relatively new area for TNC expansion in developing countries, has gained importance in recent years, accounting for 11% of all greenfield projects in Asia and in Oceania in 2004 (annex table A.I.3).

With a 46% increase in FDI inflows, East Asia remains the most important subregion for FDI inflows. However in terms of increase in inflows, the performance of West Asia (with a 51% increase) and South-East Asia (48%) was more impressive. FDI inflows to South Asia also increased, by 31%, to reach a record high. In contrast, Oceania witnessed a 54% decrease in flows.

Figure II.7. Asia and Oceania: FDI inflows and their share in gross fixed capital formation, 1985-2004



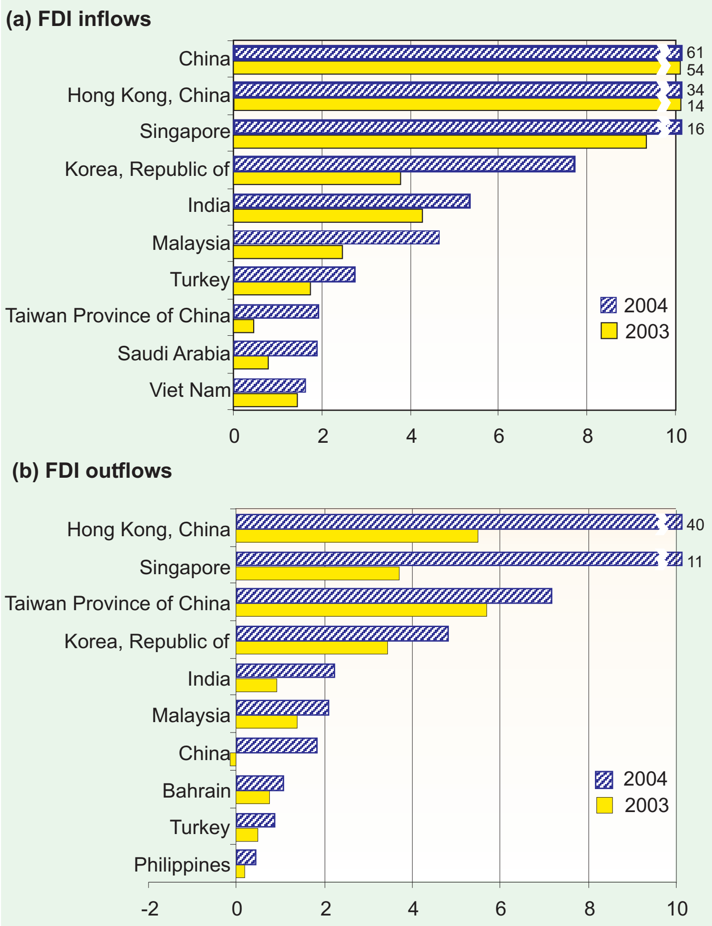
Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics) and annex tables B.1 and B.3.

- *East Asia*[22] accounted for the lion's share (71%) of FDI flows to Asia and Oceania. These rose from $72 billion in 2003 to $105 billion in 2004, mainly on account of higher FDI flows to Hong Kong (China), China and the Republic of Korea. FDI flows to Hong Kong (China) increased by 150%, to $34 billion, led by flows to the services sector. An increase in cross-border M&A transactions in the Republic of Korea, especially large-value ones, helped push that country's inflows to $8 billion.

  China was again the largest recipient of FDI, not only in the region but also among all developing countries worldwide, with flows reaching the highest level ($61 billion).[23] Strong economic growth, an improved policy environment and further opening up to FDI in certain industries – such as banking and other financial services – contributed to the increase. In 2004, five Chinese banks attracted $2.7 billion in FDI[24] and total FDI flows to the banking sector reached $3.8 billion. Investments by private equity and venture capital funds, especially from the United States, have become important sources of foreign investment in China.[25] The implementation of large-scale FDI projects also led to a significant increase in FDI in the automotive industry[26] and the semiconductor industry.

Figure II.8. Asia and Oceania: FDI flows, top 10 economies,[a] 2003, 2004

(Billions of dollars)

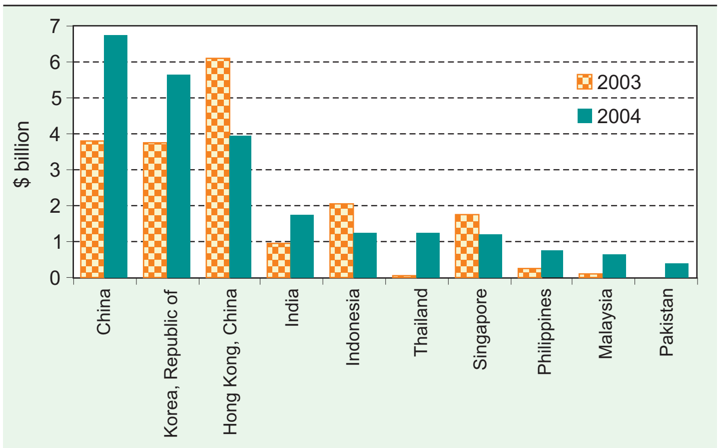


Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics) and annex table B.1.

[a] Ranked on the basis of the magnitude of FDI flows in 2004.

Figure II.9. Top 10 economies in terms of cross-border M&A sales in Asia and Oceania: 2003, 2004

(Billions of dollars)



Source: UNCTAD, cross-border M&As database (www.unctad.org/fdistatistics) and annex table B.4.

- *South-East Asia*[27] witnessed a further rise in flows from $17 billion in 2003 to $26 billion in 2004. The decline in repayments of intra-company loans by foreign affiliates in the subregion to parent firms helped, as did the increase in the level of cross-border M&As in the region (annex table B.4). Higher flows to Singapore, Malaysia, Indonesia, Myanmar, Viet Nam, the Philippines and Cambodia contributed to the subregion's increased FDI receipts. In Indonesia, the successful privatization of State assets and foreign acquisitions of private firms helped putting an end to the continuous period of negative FDI inflows that began in 1998. Acquisition by an investor group (led by Standard Chartered of the United

Table II.3. Asia and Oceania: country distribution of FDI inflows, by range, 2003, 2004

Range	2003 Economy [a]	2004 Economy [a]
More than $5 billion	China, Hong Kong (China) and Singapore	China, Hong Kong (China), Singapore, Republic of Korea and India
$2.0-4.9 billion	India, Republic of Korea, Malaysia, and Brunei Darussalam	Malaysia and Turkey
$1.0-1.9 billion	Thailand, Turkey, Viet Nam, and Syrian Arab Republic	Taiwan Province of China, Saudi Arabia, Viet Nam, Syrian Arab Republic, Thailand and Indonesia
$0.1-0.9 billion	Saudi Arabia, Qatar, Pakistan, Oman, Bahrain, Islamic Republic of Iran, Taiwan Province of China, Jordan, Macao (China), Lebanon, Philippines, Myanmar, Bangladesh, Sri Lanka, Democratic People's Republic of Korea, Mongolia and Papua New Guinea	Pakistan, Bahrain, United Arab Emirates, Qatar, Jordan, Macao (China), Myanmar, Islamic Republic of Iran, Philippines, Bangladesh, Iraq, Lebanon, Sri Lanka, Mongolia, Cambodia and Brunei Darussalam
Less than $0.1 billion	Cambodia, United Arab Emirates, Fiji, Lao People's Democratic Republic, Vanuatu, Nepal, Maldives, Tonga, Yemen, Iraq, Timor-Leste, Marshall Islands, Palau, Afghanistan, Nauru, Bhutan, Samoa, Tokelau, Tuvalu, New Caledonia, Solomon Islands, French Polynesia, Kuwait and Indonesia	Democratic People's Republic of Korea, Papua New Guinea, Vanuatu, Lao People's Democratic Republic, Maldives, Marshall Islands, Nepal, Tuvalu, New Caledonia, Palau, Tonga, Timor-Leste, Afghanistan, Bhutan, Samoa, Solomon Islands, Fiji, Oman, Kuwait and Yemen

Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics) and annex table B.1.
[a] Listed in order of the magnitude of FDI inflows for each respective year.

Table II.4. Asia and Oceania: distribution of cross-border M&A sales, by sector and industry, 2003, 2004
(Millions of dollars and per cent)

Sector/industry	2003 Value	2003 %	2004 Value	2004 %	Growth rate in 2004 (%)
Primary	**42**	**0.2**	**215**	**0.9**	**419**
Manufacturing	**7 401**	**34.2**	**8 125**	**32.7**	**10**
Chemicals and chemical products	1 248	5.8	2 392	9.6	92
Electrical and electronic equipment	943	4.4	1 691	6.8	79
Food, beverages and tobacco	1 276	5.9	1 652	6.7	30
Oil and gas; petroleum refining	1 757	8.1	614	2.5	-65
Motor vehicles and other transport equipment	1 312	6.1	516	2.1	-61
Other manufacturing	866	4.0	1 260	5.1	45
Services	**14 212**	**65.6**	**16 480**	**66.4**	**16**
Finance	6 052	27.9	10 947	44.1	81
Business activities	2 388	11.0	2 825	11.4	18
Electricity, gas, and water distribution	885	4.1	891	3.6	1
Transport, storage and communications	3 787	17.5	846	3.4	-78
Trade	481	2.2	426	1.7	-11
Other services	618	0.2	545	2.2	-12
All industries	**21 654**	**100.0**	**24 820**	**100.0**	**15**

Source: UNCTAD, cross-border M&As database (www.unctad.org/fdistatistics).

Kingdom) of a controlling interest in PT Bank Permata Tbk for $305 million is an example of such privatization (annex table A.II.1). The value of cross-border M&As in Malaysia, the Philippines and Thailand also rose significantly.

The rapid rise of FDI inflows to the subregion and the narrowing gap between flows to ASEAN members and China assuaged those concerned that China is crowding out FDI from its neighbouring countries. A recent study suggests that FDI in China did not crowd out FDI inflows to South-East Asian countries during 1992-2001 (Zhou and Lall 2005).[28] This was based on the fact that there is little competition between countries in market- and resource-seeking FDI and that efficiency-seeking, export-oriented FDI in China may have been so far complementary to that in South-East Asian countries.

- FDI inflows to *South Asia*[29] also climbed in 2004 for the fourth consecutive year. Inflows to India – at a record level of $5 billion – were encouraged by an improving economic situation and a more open FDI climate. Cross-border M&As in India rose in 2004 as the telecommunications, business process outsourcing and pharmaceutical industries saw an increase in large deals. Improved investment environments and the privatization of assets in Pakistan and Bangladesh contributed to higher FDI flows to those countries. Improvements in the regional political situation also played a role. In Afghanistan, investors from 25 countries have set up operations (Eedes 2005).[30]

- FDI inflows to *West Asia*[31] increased from \$6.5 billion in 2003 to \$9.8 billion in 2004.[32] Countries such as Bahrain, Jordan, Saudi Arabia, Turkey and the United Arab Emirates saw a sharp rise in inflows (box II.6). While high oil prices might have influenced oil-related FDI, it is difficult to assess precisely their impact on FDI in the region. Efforts by a number of countries to promote non-oil investment in their economies contributed, to some extent, to the subregion's improved FDI flows (box II.6), as illustrated by developments in the Islamic Republic of Iran (box II.7).
- *Oceania*[33] witnessed a sharp fall in FDI inflows, from \$146 million in 2003 to \$67 million in 2004. This was mainly caused by the significant decline of flows to Papua New Guinea (from \$101 million to \$25 million) and Fiji (from \$23 million to -\$9 million). Flows to Vanuatu and Tuvalu rose to \$22 million and \$9 million respectively.

Box II.6. FDI flows to West Asia increased but remain concentrated

In 2004, FDI flows to West Asia rose by 51%. This increase was spread unevenly among the economies of the subregion, and FDI inflows were concentrated in particular in Turkey, Saudi Arabia and the Syrian Arab Republic in that order; the three countries together accounting for 59% of total inflows. The Triad was the main source of FDI flows to West Asian countries. South Africa was another relatively significant source of investment, while intraregional investment from within Asia also contributed to the upward trend. The growth in FDI inflows in 2004 largely reflected an increase in some large-scale greenfield investments by international oil and gas firms, as well as cross-border M&As in business and financial services, mining (including oil and gas) and manufacturing.

The relatively low importance of FDI in West Asian economies is reflected in the ratio of FDI flows to gross fixed capital formation: at 4.9%, it is below the developing-country average not to mention that of South, East and South-East Asia. This is partly due to the economic structure of the West Asian economies, the size of their markets, the importance of oil revenues to some of them and the overall level of political uncertainty affecting the subregion. Indeed, a difficult geopolitical situation in parts of the subregion heightens the risk perceptions of investors, while sanctions imposed on several countries in West Asia have impeded their integration into the world economy (Yousef 2005).

The primary sector remains dominant in terms of inward FDI stock, but FDI in manufacturing and services is rising in some countries such as Bahrain, the Islamic Republic of Iran, Saudi Arabia, Turkey and the United Arab Emirates. For instance, the number of cross-border M&As and greenfield FDI projects in the subregion between 2002 and 2004 were larger in business services and in manufacturing, including the oil refining industry, than in natural resource extraction (box figure II.6.1). Greenfield FDI projects in manufacturing were mainly in the chemical (28% of total manufacturing), automotive (28%) and food and drink (19%) industries. Large oil firms such as Chevron, ExxonMobil and Royal Dutch Shell Group announced large investments in the chemical and energy industries, especially in liquefied natural gas-related projects. Finally, spurred by the liberalization of regulatory restrictions on real estate investment, FDI in real estate and construction also increased, particularly in Bahrain, Jordan, Lebanon and the Syrian Arab Republic (UNDESA and UNCTAD 2005). This has been bolstered by the robust oil prices of the last few years and significant developments in the tourism sector. Bahrain, Dubai (part of the United Arab Emirates), and Qatar are the leading markets for intraregional FDI in real estate and tourism-related construction.[a]

The ICT industries have also attracted FDI following, in particular, efforts by some countries, in the context of their "e-Government Strategy", to attract FDI flows to such industries. For example Dubai Internet City, a free trade zone, has attracted a large number of companies such as Canon, Cisco Systems, Compaq, Dell, IBM, Microsoft, Oracle, Siemens and Sony Ericsson. In 2004, the Dubai International Financial Centre, a financial free zone allowing full foreign ownership, a zero tax rate and freedom to repatriate capital and profits without restrictions, was established as an onshore capital market.

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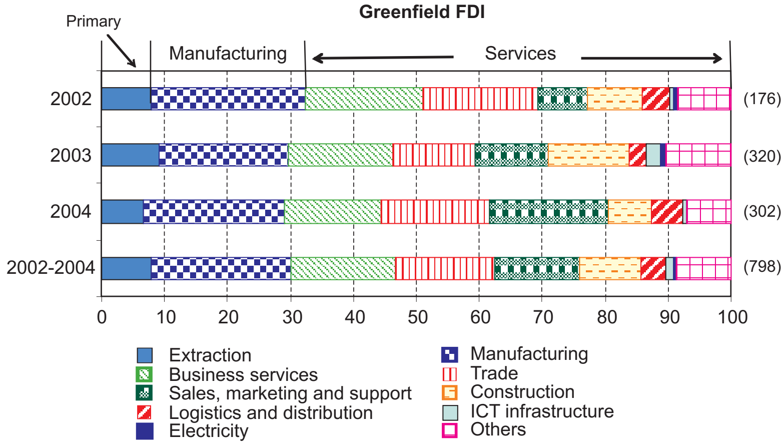
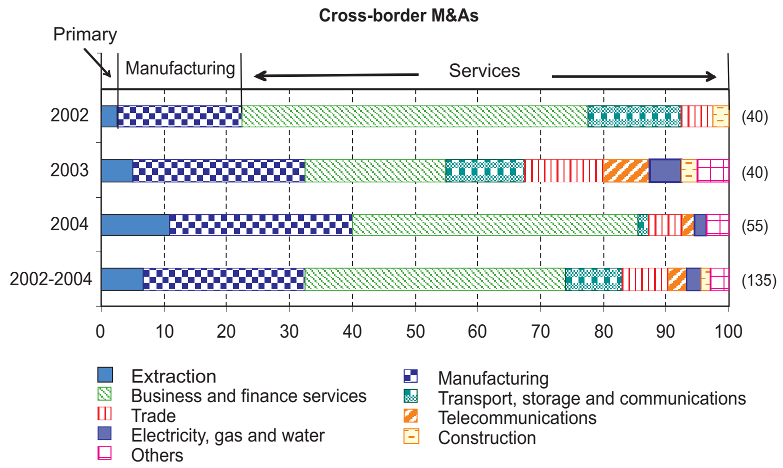
Box II.6. FDI flows to West Asia increased but remain concentrated (concluded)

Box figure II.6.1. Industry distribution of numbers of greenfield investment projects and cross-border M&A deals in West Asia, 2002-2004

(Per cent)





Source: UNCTAD, cross-border M&A database (www.unctad.org/fdistatistics) as well as data from OCO Consulting, LOCOmonitor website (www.locomonitor.com).

Note: With regard to greenfield investments the industry refers to the key business function or the primary activity of each project. Figures in parentheses show the number of projects/deals.

Countries in West Asia continue to pursue economic and regulatory reforms to improve their investment environment. However, despite a series of liberalization efforts, the past decade has not seen large increases in the activities of the private sector in West Asia. The subregion is partly affected by a low "level of freedom" (UNDP 2002, p. 27) and by weaknesses in competitiveness, in particular as regards the countries' ability to absorb new technologies (Lopez-Claros 2004, Blanke and Lopez-Claros 2005). Significant efforts to implement financial, administrative and judicial reforms would be necessary for the subregion to enhance its attractiveness to investors and increase FDI inflows, in keeping with its size and economic significance. In this process, regional initiatives and international cooperation and assistance could play an important role.[b]

Source: UNCTAD.

[a] "How long can the Middle East real estate boom last?", *AME Info*, 4 December 2004, www.ameinfo.com, "Desire for diversity drives building boom", *FDI Financial Times Business*, 10 December 2004 (www.fdimagazine.com).

[b] For instance, international institutions like OECD, the United Nations Development Programme (UNDP) and the World Bank are already involved in assisting the reform process in the West Asia's and North Africa's 19 economies. This includes an initiative developed by the governments of these countries on "Governance and Investment for Development", which was approved by the OECD Council on 10 November 2004 (www.oecd.org).

Intraregional FDI flows in Asia and Oceania have grown over the years, encouraged by regional integration efforts, the expansion of production networks and the relocation of production to lower cost areas within the region. Intraregional FDI accounted for an estimated 46% of total flows to the region in 2002.[34] Significant intraregional FDI flows took place between East and South-East Asia, in particular from Hong Kong (China) to the more developed South-East Asian countries such as Singapore and Malaysia, from Taiwan Province of China and the Republic of Korea to less developed countries such as the Philippines and Viet Nam, and from Singapore to China and Hong Kong (China). These flows are also important within East Asia – originating largely from Hong Kong (China), Taiwan Province of China and the Republic of Korea and

Box II.7. Recent trends in FDI inflows in the Islamic Republic of Iran

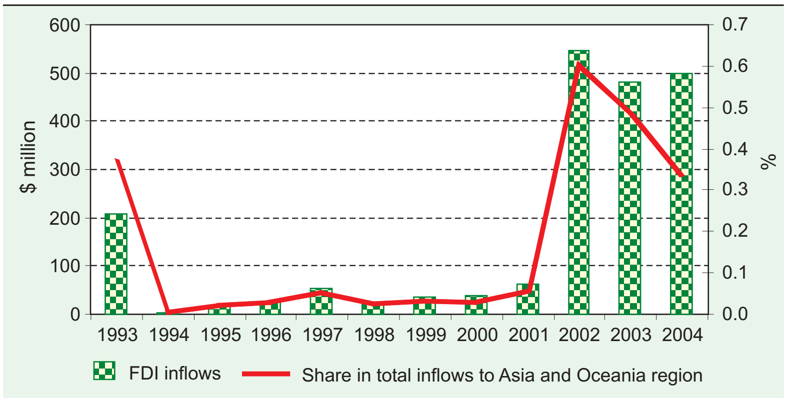
Although there were large increases in FDI flows to the Islamic Republic of Iran following the adoption of its new FDI law of 2002, such flows remain modest, amounting to $0.5 billion on average over the period 2002-2004 (box figure II.7.1). Although the presence of foreign investors in the country is indeed on the rise, it is not fully captured by data on FDI inflows. This is because a large number of projects with foreign participation are not covered by FDI statistics compiled on a balance-of-payments basis as they involve low levels of equity or non-equity arrangements.[a]

In the past few years, the Islamic Republic of Iran has enjoyed strong GDP growth due in part to high oil prices and to the implementation of regulatory reforms under the country's third Five-year Development Plan, 2000-2005 (IMF 2004). The main goal of the reforms is to diversify the country's economic structure. Efforts have been directed towards fostering private sector development and growth, including through financial sector reform, privatization, further trade liberalization and improvements in the business climate (box II.8). In 2002, the country enacted a foreign investment law, the Foreign Investment Promotion and Protection Act, which is more liberal than the former law of 1955 (Law on the Attraction and Protection of Foreign Investment).

In the non-oil and gas sector, FDI inflows went into a wider range of industries (including service industries, chemicals and machinery) in 2002-2004 than in previous years. For example, no FDI was recorded in the tourism, telecommunications and electricity generation and distribution industries in 1999-2001, while these industries accounted for over 60% of flows in non-oil and gas industries in 2002-2004.[b]

Approved data, however, show a different picture of foreign presence in the country from that based on actual data (box figures II.7.1 and II.7.2). The value of foreign investment approved by the Organization for Investment, Economic and Technical Assistance of Iran (OIETAI)[c] increased significantly after 2002 (box figure II.7.2). Data from OIETAI include FDI as well as various types of non-equity arrangements, referred to as "indirect" investments.[d] Foreign participation in projects in the oil and gas upstream activities and in national projects that are normally closed to FDI can be implemented only through contractual schemes, including buy-back arrangements (Islamic Republic of Iran, OIETAI 2004). Under the buy-back arrangements, as applied especially to the oil and gas industries, investors receive payments over a fixed period of time, rather than

Box figure II.7.1. FDI inflows to the Islamic Republic of Iran and its share in total inflows to Asia and Oceania, 1993-2004



Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics) and annex table B.1.

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targeting particularly China. FDI flows within South-East Asia are also significant, with Singapore and Malaysia as the main sources of intraregional investment in that subregion. Although intra- and inter-regional FDI flows are much smaller in other subregions including South Asia, India is emerging as a key investor from that subregion.

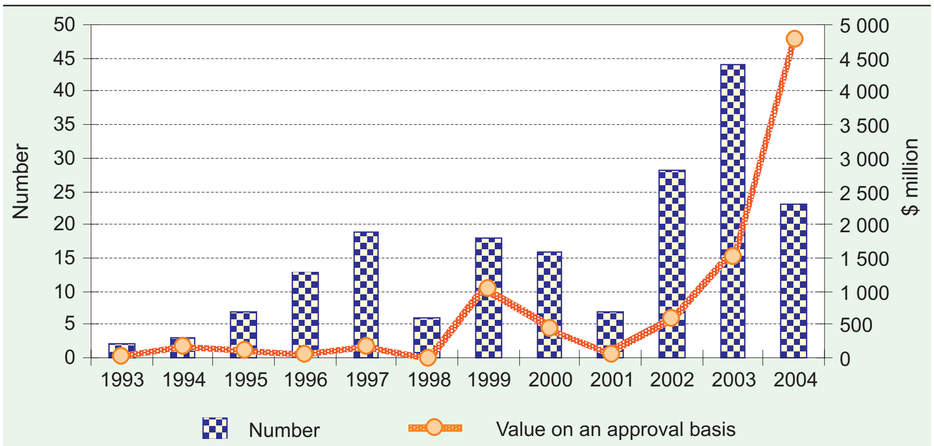
Outward FDI flows from Asia and Oceania grew to $69 billion (annex table B.1), driven by stronger outflows from most major economies in the region (figure II.8). Supportive government policies have played a role.[35] Outward FDI from Hong Kong (China) witnessed the most significant increase, jumping from $5 billion in 2003 to $40 billion in 2004. FDI from Singapore and the Republic of Korea also rose sharply, as did flows from China and India. For most developing Asian economies, FDI outflows are directed primarily at locations within the region. However, FDI outflows from Asia to other developing regions are increasing. For instance, in 2004, Latin America became the largest destination for Chinese investment, accounting for half of the total outflows from China due to

Box II.7. Recent trends in FDI inflows in the Islamic Republic of Iran (concluded)

equity shares, in return for their outlay on the goods and services required for the execution of the projects.[e] As the Iranian Constitution currently prohibits the granting of petroleum rights on a concessionary or equity ownership basis, the Government supports buy-back arrangements as a way of attracting foreign capital and services in oil and gas industries (Islamic Republic of Iran, Chamber of Commerce, Industries and Mines, undated).

Political uncertainty in the region, however, is casting a shadow over the country's foreign investment climate and future growth. The escalation of international political tensions is an additional obstacle to attracting foreign investments to the Islamic Republic of Iran. This may affect FDI flows to the country for the next few years.

Box figure II.7.2. Number and value of foreign investments[a] approved under the foreign investment laws of 1955 and 2002 in the Islamic Republic of Iran, 1993-2004



Source: UNCTAD, based on Islamic Republic of Iran, OIETAI 2004.

a Includes, under the FDI law of 2002, FDI and foreign indirect (non-equity) investments (such as buy-back financing arrangements and build-operate-transfer schemes).

Source: UNCTAD.

a For example, FDI is not allowed in upstream activities in the oil and gas industries.
b Based on information provided by OIETAI.
c OIETAI was established in 1975 as an affiliate of the Ministry of Economic Affairs and Finance, and is legally empowered to serve as an IPA of the country under the 2002 FDI law.
d The investment law of 2002 defines two types of foreign investments, FDI and foreign "indirect" investment.
e See www.petroleumiran.com.

massive investments in natural resources. The largest FDI transactions by Indian companies were also in the natural resource sector in other regions: in 2004, the Oil and Natural Gas Corporation decided to invest $1.1 billion in the Russian Federation and $660 million in Angola. Asian investments in developed countries are also on the rise as illustrated by the acquisition of IBM's personal computers division by Lenovo (China), and by investment in FLAG Telecom (United States) and Tyco Global Network (United States) by India's Reliance and VSNL industrial groups respectively, in 2004.

b. Policy developments: favourable measures continue

The policy environment for FDI in the region improved further over the past year (box II.8) as more countries introduced favourable policy measures with a view to increasing their economies' attractiveness for FDI. Countries also cooperated in promoting investment: the ASEAN Finance Ministers conducted investment road shows in the United States in September 2004 and the First Asia Summit is scheduled to take place in December 2005 in Malaysia to strengthen economic cooperation and encourage intra-regional trade and FDI flows.

At the international level, countries of Asia and Oceania signed 33 new BITs in 2004 (figure II.10), accounting for 45% of the world total and bringing that region's total to 956. Afghanistan concluded its first BIT in that year (with Turkey), while China and the Republic of Korea added six and four new treaties, respectively, to their already long BIT lists. In West Asia, Lebanon concluded eight BITs, of which six were with African countries. Asian countries also signed 26 DTTs in 2004, bringing the total number of DTTs involving countries of this region to 870. The Islamic Republic of Iran was the most active in that respect, concluding four new DTTs.

Box II.8. Some changes in national policies on inward FDI in Asia and Oceania in 2004-2005

In *China* in 2004, several important policy changes took place. The Catalogue for the Industrial Guidance of FDI was revised in November to take into account commitments made by China in the context of its accession to the WTO. A number of industries have been added to the "encouraged" category, while some have been re-categorized from "encouraged" to "permitted" in order to control overheating investment of the domestic economy. China is further opening its services sector to foreign investment, for example by liberalizing rules on FDI in financial services, distribution services, media and education. In particular, stringent qualifications, ownership restrictions and geographical limitations previously imposed on FDI in distribution services (such as wholesale, retail and franchising) have been removed. Meanwhile, the National Economy and Social Development Plan 2005 emphasized the need to improve the quality of FDI by encouraging it in high-technology industries, advanced manufacturing, modern services and agriculture, and environmental protection. The plan encourages the establishment of R&D centres, regional headquarters and bases of advanced manufacturing. It also welcomes the participation of foreign investors in the reform of State-owned enterprises.

In *India*, the Indian Investment Commission was charged with the responsibility of wooing private investors, both domestic and foreign. The Foreign Investment Promotion Board will become a one-stop service centre and facilitator for FDI. In 2004, foreign-equity ceilings in aviation services, private banks, non-news print publications and the petroleum industry were adjusted upwards.

In early 2005, the Government of *Indonesia* adopted the Jakarta Declaration outlining the Government's vision for infrastructure development, and underscoring its commitment to removing bureaucratic impediments to private investment. It also introduced a one-stop investment service.[a] A number of other measures are contemplated such as abolishing the requirement for foreign affiliates to sell part of their shares to local investors after a certain number of years of operation and removal of the 30-year limit on the validity of business licences for foreign investors.

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Box II.8. Some changes in national policies on inward FDI in Asia and Oceania in 2004-2005 (concluded)

In the *Republic of Korea*, the Korea Trade-Investment Promotion Agency and its investment arm, Invest Korea, began to construct the Invest Korea Plaza in 2004, which will provide incubating facilities during initial investment stages and offer easy settlement services for foreign investors, in addition to existing one-stop services. Newly initiated corporate town projects as well as more free trade zones were launched in 2005. There has also been growing attention in recent years to attracting FDI in R&D (see Chapter VII).

In December 2004, the *Philippines* adopted a measure allowing the establishment of wholly-owned foreign affiliates in natural-resource-related activities.

In *Thailand* in 2004, the Board of Investment launched new investment packages for specific industries including the agro-industry, the high-end clothing (fashion) industry, the automotive industry, the ICT industry (in particular the hard disk drive industry) and high value-added services. The Skills, Technology, and Innovation tax privilege scheme was introduced to raise the technology levels and innovative capabilities of firms, while introducing special privileges to promote investment in the four northeastern provinces.

In *West Asia*, most of the economies are making efforts to liberalize their FDI regimes and improve their investment climate (annex table A.II.2). All countries in the region (except for Qatar) have already established IPAs. In *Saudi Arabia's* negotiations for membership in the WTO have accelerated the country's liberalization of its FDI regulatory framework. Since 2003, *Turkey* has been implementing a series of investment-related reforms as well as a privatization programme in line with its planned negotiations on accession to the EU. In *Bahrain* and *the United Arab Emirates*, a noteworthy development is the liberalization of the real estate sector, a sector that is driving an intraregional investment boom both in construction and tourism development projects. Further liberalization in the financial sector in *Lebanon* may encourage large capital inflows, including from the Lebanese diaspora.

In *Oceania*, the amendment to the Foreign Investment Act in *Fiji* in 2004 applied the principles of the Convention on the Settlement of Investment Disputes, to which Fiji is a party. This amendment also provides for non-discrimination on grounds of nationality among foreign investors.

Source: UNCTAD.

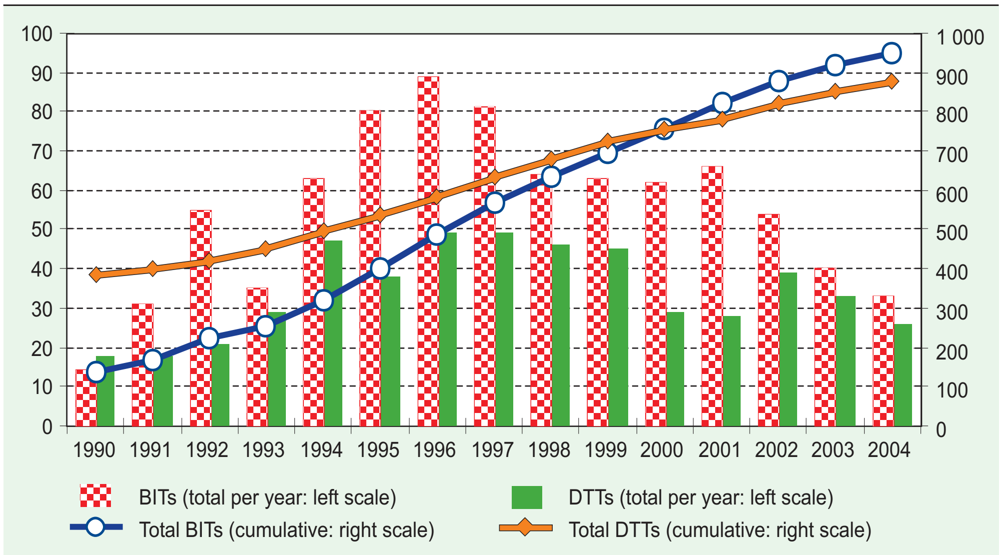
[a] It takes 151 days in Indonesia to start a business due to the long process of obtaining a licence, compared with 33 days in Thailand, 30 days in Malaysia, 56 days in Viet Nam, 50 days in the Philippines and 41 days in China (World Bank 2005d).

An increasing number of countries in 2003-2004 also signed or negotiated bilateral and regional FTAs that include investment provisions. ASEAN and China signed an agreement paving the way for establishing the world's largest free trade zone by 2010. ASEAN also concluded a Framework Agreement with India in October 2003 and a similar process is underway with Japan (box II.9). Members of the South Asian Association for Regional Cooperation (SAARC) are considering signing a regional agreement for the promotion and protection of FDI within the SAARC region.

In West Asia, a number of FTAs with FDI provisions at both bilateral and regional levels were signed or are under negotiation. Bahrain and Jordan each signed an FTA with Singapore in 2004; Bahrain (2004) signed an FTA with the United States with a view to preparing for the United States-Middle East Free Trade Area by 2013. At the regional level, the Gulf Cooperation Council (GCC) signed a Framework Agreement on Economic Cooperation with India in August 2004 to pave the way for a future FTA with India. The GCC is also in negotiations with China for a similar agreement. Lebanon signed an FTA with EFTA in 2004 and a draft agreement to establish a free trade area with the GCC. The GCC may also sign an FTA with the EU before the end of 2005. Finally, the Aghadir Agreement signed in February 2004 by Egypt, Jordan, Morocco and Tunisia is a crucial step towards the creation of a subregional free trade zone.

Figure II.10. Asia and Oceania: number of BITs and DTTs concluded, cumulative and annual, 1990-2004

(Number)



Source: UNCTAD, BIT/DTT database (www.unctad.org/iia).

c. Prospects: increasingly bright

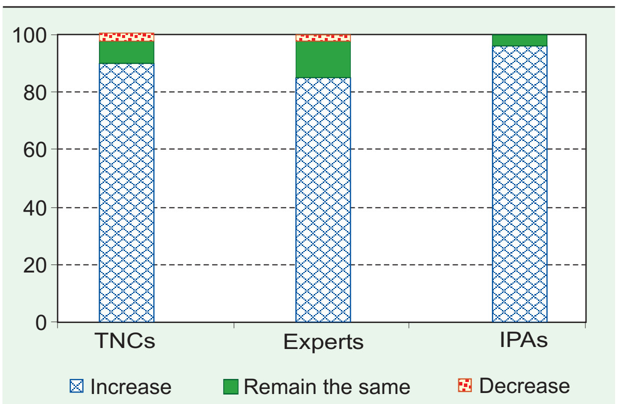
In view of the improved economic situation in the region, a better policy environment, and significant regional integration efforts, the prospects for FDI flows to Asia and Oceania in 2005 are highly positive: 85% of international experts, 90% of TNCs and 96% of IPAs responding to UNCTAD's 2005 survey (box I.3) anticipated increased FDI flows to Asia (figure II.11). This is even more optimistic than in the past, and is corroborated by a number of other surveys and reports (A.T. Kearney 2004, IIF 2005, PriceWaterhouseCoopers 2005, JBIC 2005). The recent increase in cross-border M&As in countries such as China, India and the Republic of Korea supports this optimistic assessment of FDI prospects in the region. However, flows are likely to remain concentrated in a few economies.

In 2003-2004 the increase in global demand for electronics and textiles augurs well for FDI in the region. FDI in ICT, as well as offshoring and outsourcing activities will continue to rise as services TNCs are driven by pressures to keep costs down. Many countries in the region will benefit because of their skills, cost and infrastructure advantages for such activities. Services FDI, encouraged by liberalization policies in industries such as finance, will continue to rise, thereby increasing the share of this sector in FDI flows to the region.

- East Asia is expected to receive the largest share of inflows, led by a further increase in flows to China. In this country, for instance, FDI will continue to rise in services, in particular in the banking industry. Large-scale foreign investments are expected in China's four largest State-owned banks before their initial public offerings.[36] Cross-border M&As are expected to rise in service industries in other countries. For example in finance in the Republic of Korea, Standard Chartered (United Kingdom) acquired Korea First Bank in 2005.

Figure II.11. Asia and Oceania: prospects for FDI inflows, 2005-2006

(Per cent of responses from TNCs, experts and IPAs)



Source: UNCTAD (www.unctad.org/fdiprospects).

- FDI flows to South-East Asia should increase in 2005 for the third consecutive year. Japanese companies foresee that demand in their host country markets in ASEAN will expand, leading to higher profits in 2005.[37] Japanese manufacturers view Viet Nam in particular as a promising location for production. Agreements between Japan and ASEAN as a group, or its member countries individually, are expected to strengthen FDI relationships between Japan and countries in the subregion (box II.9). Intra-regional investment will also continue to rise as the region integrates further. FDI in natural resource-related activities is expected to rise significantly in the Philippines.
- In South Asia, flows to India should continue to increase, especially in steel, telecommunications, infrastructure and finance. In India, the Government aims to attract $150 billion in the next decade by setting up special economic zones, science parks and free trade and warehousing zones.[38] Bangladesh will receive increased inflows as compared to 2004 primarily because of an increase in FDI from India. Flows to Pakistan are expected to increase partly as a result of privatization, especially in the telecommunications industry. Finally, the end of the textiles and clothing quotas should benefit countries such as Bangladesh, India and Pakistan in attracting more textiles-related FDI (UNCTAD 2005b).
- The global oil markets will largely determine the West Asia's economic outlook in 2005. Although oil production and prices may not remain at their present high levels (UNDESA and UNCTAD 2005), FDI in the subregion should rise in 2005, notably in the production and distribution of petroleum and liquefied natural gas. While FDI growth per se will be modest, foreign presence could rise as a result of non-equity contractual arrangements. Significant efforts by Turkey in the investment area will continue, including privatization in oil refining and telecommunications in the next few years.
- In the Oceania subregion 2005 is likely to be a year of recovery in FDI flows. Countries such as Samoa will experience higher FDI flows as a result of relatively large M&A deals including the acquisition by Virgin Blue (Australia) of a stake in the country's State airline in 2005.

Box II.9. FTAs and economic partnership agreements between ASEAN or ASEAN member countries and Japan: implications for FDI

Following the 2002 Agreement between Japan and Singapore for a New Age Economic Partnership, recent negotiations between other ASEAN member countries (in particular, Malaysia, the Philippines and Thailand) and Japan also cover a broad range of provisions on investment, movement of personnel, intellectual property rights (IPRs) and competition policies. According to the Japan External Trade Organization (JETRO) survey released in April 2005, on Japanese-affiliated manufacturers operating in six ASEAN countries (Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam) and India, some 60% of the companies surveyed expect that FTAs or economic partnership agreements (EPAs) between Japan and the region where they operate will benefit their business activities.[a] On a country basis, more firms operating in Indonesia and Thailand than in other countries expect that such agreements will have favourable effects. Few respondents, however, expect improvements in their business activities as a result of FTAs or EPAs between China and Japan or between China and ASEAN: only 22%, for instance, foresee favourable effects from the EPA between China and ASEAN.

In another survey – the 2004 survey on overseas business operations of Japanese manufacturing companies by the Japan Bank for International Cooperation (JBIC) – 72% of all respondents expect to benefit from the conclusion of FTAs with Japan (JBIC 2005).

Source: UNCTAD.

[a] Information from JETRO, "Japanese business sentiment in Asia improved in April", press release of 21 April 2005 (www.jetro.go.jp).

Prospects for FDI outflows from Asia and Oceania are also promising and should lead to increased intraregional FDI. An increasing proportion of the growth in outward FDI will be from Chinese, Indian and Korean firms, including through large-scale overseas M&As. The internationalization of Chinese enterprises will continue, including through investments outside Asia. In particular, significant Chinese investments are planned in natural resources (mainly in Latin America), steel (in Brazil in particular)[39] and real estate (for example, in the Russian Federation).[40] China is set to become a major foreign investor in Latin America (box II.13). Chinese investments in developed countries will also increase, as suggested by the recent bid made by CNOOC to acquire the United States oil firm, Unocal Corp.[41] Recent appreciation of the Chinese currency may contribute further to the increase in Chinese outward FDI.

3. Latin America and the Caribbean: FDI inflows rebound

Following four years of continuous decline, FDI flows to Latin America and the Caribbean registered a significant upsurge in 2004. Economic recovery in Latin America – after half a decade of economic stagnation – and stronger growth of the world economy were the main reasons for the rebound. High prices of primary commodities also played a role. At the same time the sectoral composition of inward FDI is showing signs of change in some parts of the region. In the MERCOSUR subregion, the manufacturing sector has re-emerged as the leading recipient of FDI inflows. Policy changes, particularly those related to extraction activities, could also affect FDI in some countries. Overall, FDI inflows in Latin America are projected to strengthen further in 2005.

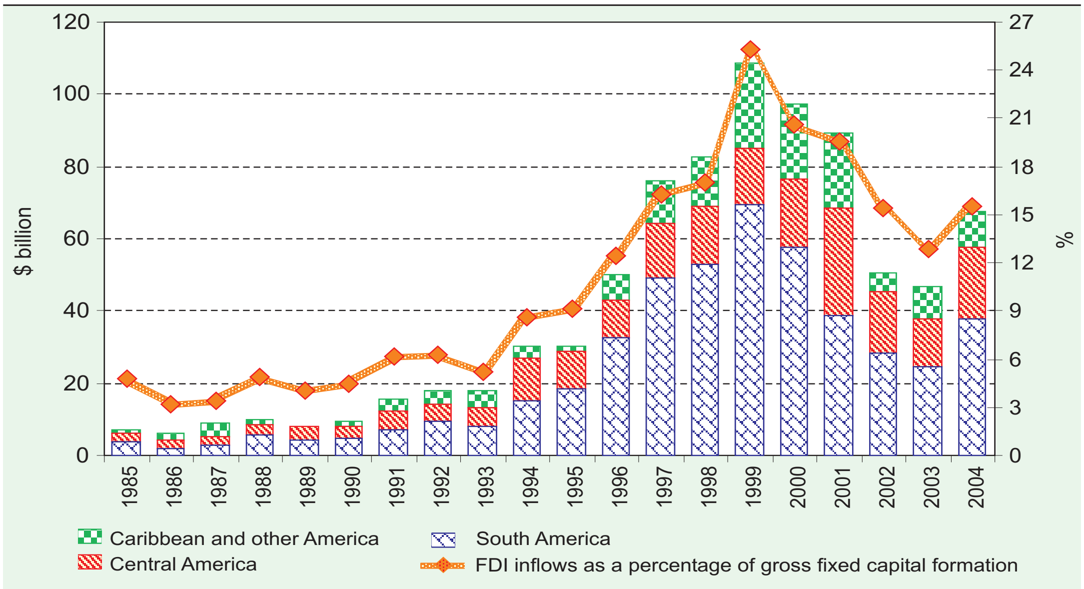
a. *Trends: a resurgence of FDI inflows in many countries*

In 2004, *FDI inflows* into Latin America and the Caribbean rose for the first time in five years (figure II.12). They reached $68 billion, 44% more than in 2003. However, they were still far below their average of the second half of the 1990s when large-scale privatizations and cross-border acquisitions of private firms triggered an FDI boom. FDI as a percentage of gross fixed capital formation increased from 13% in 2003 to 15.5% in 2004 (figure II.12). Brazil and Mexico consolidated their positions as the largest recipients of FDI in the region (figure II.13 and table II.5). The steepest rises were seen in Argentina (125%), Brazil (79%) and Chile (73%). In Central America and the Caribbean, FDI inflows rose by 32%, to $30 billion, owing mainly to a sharp increase in flows to Mexico. The situation was different in the Andean Community where total inflows remained unchanged from 2003, although the trend varied for different countries: FDI inflows rose in Colombia and Peru by 53% and 37%, respectively, while they fell in Venezuela, Ecuador and Bolivia.

A combination of internal and external factors contributed to the strong increase in FDI inflows to Latin America and the Caribbean in 2004:

- Strong economic growth in most of the countries in the region resulted in a significant increase in domestic demand, which attracted market-seeking FDI.
- Exchange rates remained at levels that favour competitiveness, although some currencies appreciated during 2004.[42] This stimulated FDI in export activities and in market-seeking activities in manufacturing.
- The boom in demand for commodities, especially in China, helped fuel FDI in minerals in Argentina, Brazil, Chile and Peru, as well as in oil and gas in Colombia, Peru and Trinidad & Tobago. It also had an indirect impact on FDI in other related activities such as the manufacture of trucks, farm machinery and extraction and exploration machinery, mainly located in MERCOSUR and dominated by TNCs.
- Windfall profits from higher commodity prices have increased reinvested earnings of resource-seeking TNCs in countries like Chile where undistributed corporate profits are subject to a lower tax rate than distributed dividends (17% instead of 35-42%). In Chile, reinvested earnings of foreign affiliates amounted to $6.2 billion in 2004, corresponding to 82% of total inward FDI. These earnings were mainly generated by foreign affiliates in the mining sector, a sector that benefited from higher mineral prices.

Figure II.12. Latin America and the Caribbean: FDI inflows and their share in gross fixed capital formation, 1985-2004



Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics) and annex tables B.1 and B.3.

- The continued recovery of the United States economy had positive effects on export-oriented FDI in the manufacturing sector in Mexico and Central America.
- Cross-border M&As made a strong comeback in the region with an increase of 109% in total value, their first upturn since 2000 (table II.6).

The decline in FDI inflows to Bolivia, Ecuador and Venezuela, most of which target hydrocarbon activities, is due to changes in oil and gas contracts in Venezuela, delays in adopting a new hydrocarbon law in Bolivia, and to the completion of the Crude Oil Pipeline (OCP) construction in Ecuador in 2003 that had previously been associated with significant amounts of FDI.

FDI outflows from Latin America grew at a modest 3.6% in 2004, their first increase since 2000, reaching $11 billion, most of which came from Brazil ($9.5 billion). The $4 billion acquisition of the controlling shares of the brewer, Ambev (Brazil), by Interbrew (Belgium),[43] as well as unusual amounts of intra-company loans by Brazilian companies explains this high level of FDI from Brazil. Among the other 10 largest outward-investor countries in the region, only Mexico and Costa Rica increased their FDI outflows in 2004 (figure II.13).

The sectoral distribution of FDI in Latin America varies by subregion and country, and is changing. The services sector has lost importance as a recipient of FDI in Argentina and Brazil since 2001. In Brazil, it was overtaken by the manufacturing sector in 2004, for the first time since 1996 (figure II.14). In Argentina, FDI inflows to services reached negative values in 2002 (figure II.15). In Mexico, FDI flows to the manufacturing sector recovered in 2004 and surpassed those in services for the first time since 2000. Conversely, in Central America and the Caribbean, the recent privatizations of public utility services in a number of countries contributed to the growing importance of services as recipients of FDI. In the Andean Community, high oil and mineral prices sustained the position of the primary sector as the main recipient of FDI inflows.

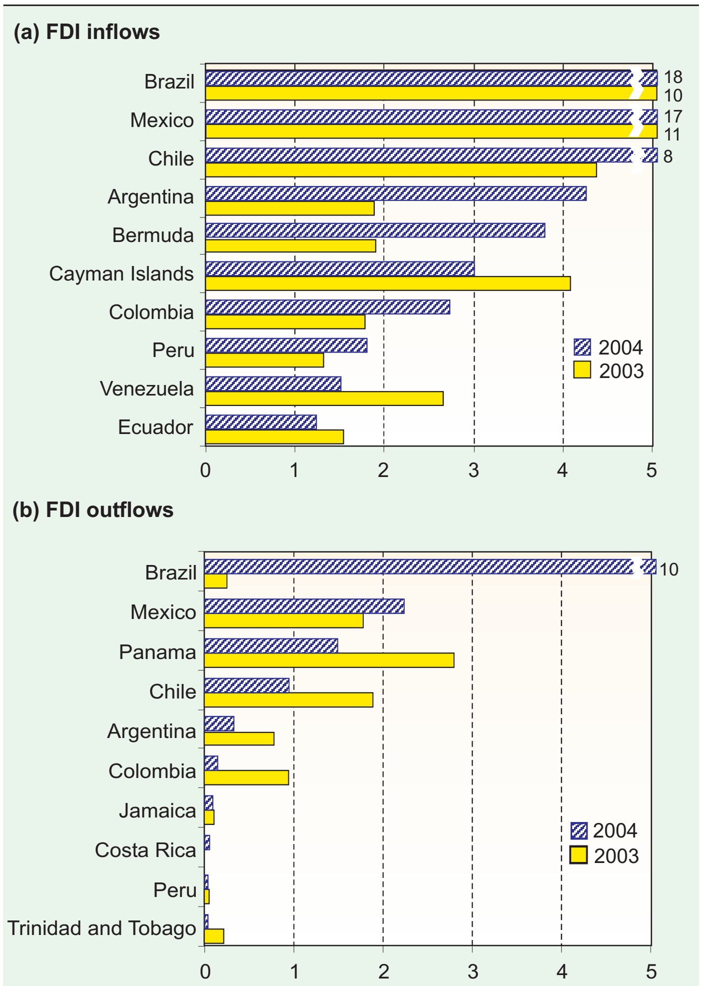
Several factors are behind the declining flows of FDI into services in Argentina and Brazil:

- the completion of most of the privatization programmes;
- strategic changes of some parent companies facing financial difficulties; and
- economic stagnation (1999-2003), devaluations and the rise of regulatory conflicts, which have made this sector less attractive to FDI since the early 2000s.

These factors provoked a number of divestments by foreign companies in the services sector, particularly in the telecoms, electricity,

Figure II.13. Latin America and the Caribbean: FDI flows, top 10 economies,[a] 2003, 2004

(Billions of dollars)



Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics) and annex table B.1.

[a] Ranked on the basis of the magnitude of 2004 FDI flows.

banking and retailing industries (ECLAC 2003, 2004b). The service firms suffered most from the impact of the economic crisis. They faced serious difficulties in reducing their large foreign-currency liabilities incurred during their expansion phase. Because of the non-tradability of their activities they were often unable to refocus their strategy towards export-oriented production to take advantage of devalued currencies as some TNCs in manufacturing did.

In the case of Mexico, manufacturing began losing importance as a recipient of FDI in the early 2000s (figure II.16) for two main reasons: first, the emergence of the financial sector as an increasingly attractive area for FDI owing to the removal of all remaining market-share limitations on foreign ownership of national banks in December 1998; and second, the significant drop in FDI flows to the *maquila* industry during 2001-2003 due to a downturn in demand from the United States and rising competition from China. The strong recovery of FDI in the manufacturing sector in 2004 (by 64%), exceeding that in services, reflected new investments in the *maquiladora* industry, some large-scale M&A transactions[44] and improved domestic demand.

As in other regions, resource-seeking FDI into Latin America and the Caribbean was stimulated in 2004 by the high prices

Table II.5. Latin America and the Caribbean: country distribution of FDI inflows, by range, 2003, 2004

Range	2003 Economy [a]	2004 Economy [a]
More than $10 billion	Mexico, and Brazil	Brazil and Mexico
$5.0-9.9 billion	..	Chile
$1.0-4.9 billion	Chile, Cayman Islands, Venezuela, Bermuda, Argentina, Colombia, Ecuador and Peru	Argentina, Bermuda, Cayman Islands, Colombia, Peru, Venezuela, Ecuador, Panama and Trinidad and Tobago
Less than $1 billion	Trinidad and Tobago, Panama, Jamaica, Dominican Republic, Costa Rica, Uruguay, Honduras, Nicaragua, Bolivia, Aruba, Antigua and Barbuda, El Salvador, Bahamas, Guatemala and Saint Lucia, Grenada, Saint Kitts and Nevis, Barbados, Belize, Saint Vincent and the Grenadines, Paraguay, Anguilla, Guyana, Dominica British Virgin Islands, Haiti, Montserrat, Turks and Caicos Islands, Cuba, Suriname and Netherlands Antilles	Jamaica, Dominican Republic, Costa Rica, El Salvador, Uruguay, Honduras, Nicaragua, Bahamas, Belize, Guatemala, Aruba, Paraguay, Bolivia, Saint Lucia, Antigua and Barbuda, Anguilla and British Virgin Islands, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Barbados, Guyana, Grenada, Puerto Rico, Dominica, Haiti, Montserrat, Cuba, Netherlands Antilles and Suriname

Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics) and annex table B.1.

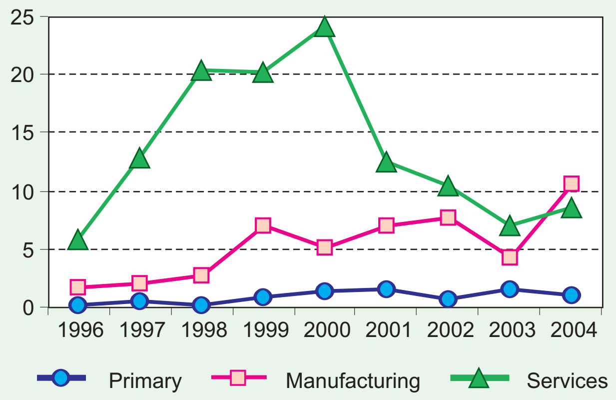
[a] Listed in order of the magnitude of FDI inflows for each respective year.

Table II.6. Latin America and the Caribbean: distribution of cross-border M&A sales, by sector and industry, 2003, 2004
(Millions of dollars and per cent)

Sector/industry	2003 Value	2003 %	2004 Value	2004 %	Growth rate in 2004 (%)
Primary	**518**	**4.3**	**1 022**	**4.0**	**97**
Agriculture, forestry and fishing	45	0.4	26	0.1	-42
Mining	473	3.9	996	3.9	111
Manufacturing	**4 294**	**35.5**	**7 718**	**30.5**	**80**
Food, beverages and tobacco	1 175	9.7	4 182	16.5	256
Wood and wood products	220	1.8	348	1.4	58
Oil and gas; petroleum refining	1 490	12.3	1 070	4.2	-28
Chemicals and chemical products	192	1.6	631	2.5	229
Stone, clay, glass and concrete products	-	-	634	2.5	-
Metals and metal products	964	8.0	195	0.8	-80
Electrical and electronic equipment	113	0.9	565	2.2	403
Other manufacturing	141	1.2	93	0.4	-35
Services	**7 273**	**60.2**	**16 544**	**65.4**	**127**
Electricity, gas, and water distribution	334	2.8	190	0.8	-43
Hotels and restaurants	97	0.8	387	1.5	297
Trade	-	-	489	1.9	..
Transport, storage and communications	**2 731**	22.6	8 209	32.5	201
Finance	4 003	33.1	6 275	24.8	57
Business activities	62	0.5	744	2.9	1 099
Other services	46	0.4	250	1.0	444
All industries	**12 085**	**100.0**	**25 284**	**100.0**	**109**

Source: UNCTAD, cross-border M&As database (www.unctad.org/fdistatistics).

Figure II.14. FDI inflows by sector in Brazil, 1996-2004
(Billions of dollars)



Source: UNCTAD, based on data from Banco Central do Brazil.

of commodities. As discussed below, some countries have changed their taxes and legislation concerning non-renewable natural resource activities, specifically in the non-oil mining industry in Chile and Peru, and in the oil industry in Argentina, Bolivia and Venezuela, in order to increase the State's share in natural resource revenues. So far these changes do not seem to have had a major effect on FDI in non-oil mining. In 2004, $774 million – more than one-fifth of global exploration resources in non-oil mining – was invested in Latin American countries (Chaparro 2005). Moreover, significant non-oil mining projects in Argentina, Brazil, Chile and Peru have been announced since 2004 (annex table A.II.3).

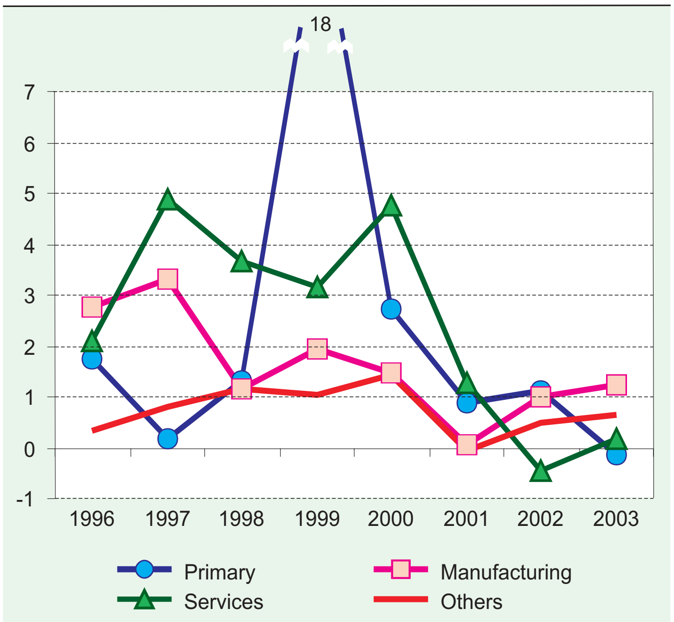
In oil and gas, TNCs have held back investing in Argentina, Bolivia and Venezuela pending the adoption of new regulations. However, high oil prices and the need for TNCs to maintain their reserve levels in a context of dwindling exploration opportunities elsewhere, are likely to sustain their interest in the region. As in the case of non-oil mining, significant projects and investment plans have been announced by TNCs in the hydrocarbons industry in Latin America since 2004 (annex table A.II.3).

Agricultural exports from Latin America and the Caribbean countries also enjoyed unusually strong growth in 2004. Overseas sales – particularly of soya beans but also of meats – were at record levels in Argentina and Brazil, notably as a result of strong demand from China. Some TNCs (e.g. Cargill (United States) and Bunge (United States)), have been positioning themselves to profit from this export boom.[45]

In manufacturing, TNCs registered higher sales than in 2003 in South America due to the region's economic recovery and the growth of

Figure II.15. FDI inflows by sector in Argentina, 1996-2003

(Billions of dollars)

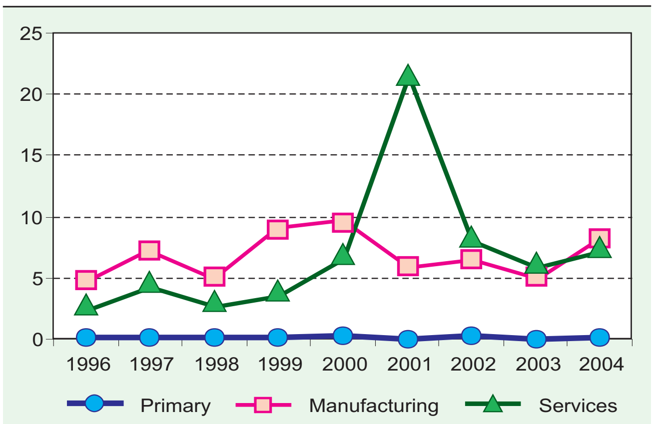


Source: UNCTAD, based on data from Instituto Nacional de Estadística y Censos (INDEC), Argentina.

Note: The steep rise in FDI inflows to the primary sector in Argentina in 1999 is due to the acquisition of the State-owned petroleum company, YPF (Argentina), by Repsol (Spain) for $15.2 billion.

Figure II.16. FDI inflows by sector in Mexico, 1996-2004

(Billions of dollars)



Source: UNCTAD, based on Secretaría de Economía de México, *Informe Estadistico Trimestral Sobre el Comportamiento de la Inversión Extranjera Directa en México,* Comisión Nacional de Inversiones Extranjeras, www.economia.gob.mx.

Note: The marked increase in FDI inflows to the services sector in 2001 was due to the acquisition of the Mexican bank Banamex-Accival by Citigroup (United States) for $12.5 billion.

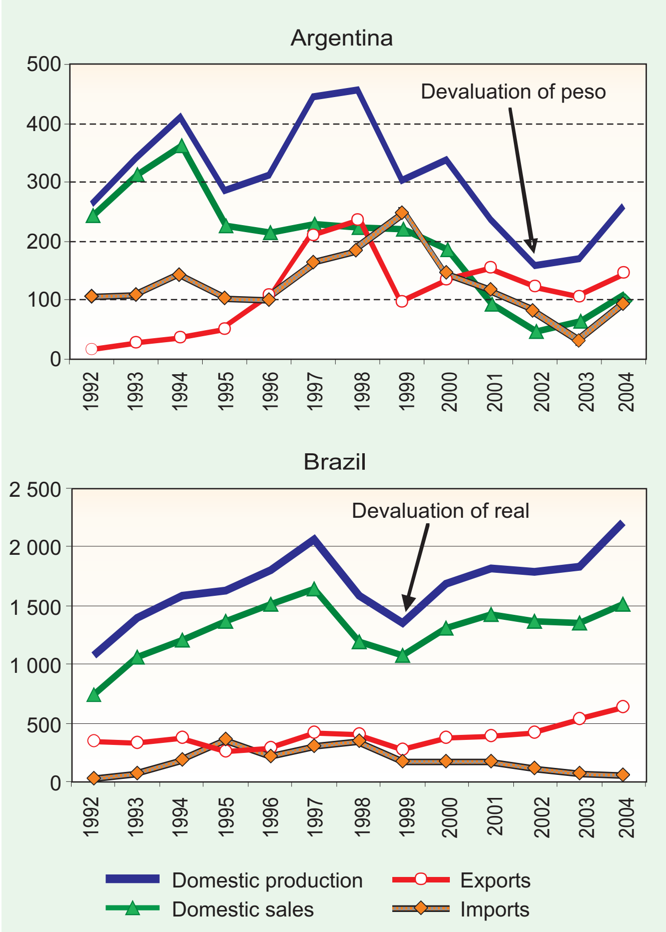
external demand. Investments by foreign companies were the most buoyant in the automotive, steel, food and beverage, and sugar refining industries. It was a boom year for the car industry in MERCOSUR: in Argentina – where the automobile industry had experienced poor performance since 1999 – production and export of vehicles jumped by 54% and 35% respectively (in units) in 2004, while domestic sales doubled. In Brazil, where the scale of automobile production is much larger than in Argentina, production, exports and domestic sales rose by 21%, 20% and 11% respectively (figure II.17). Car manufacturers announced important investment projects in 2004, mainly in Brazil, but also in Argentina, notably export-oriented projects in compact cars (annex table A.II.4). In Brazil, however, the industry's expectations have subsequently been adjusted downwards, mainly because of the continued strength of the country's currency, relatively high interest rates and declining sales abroad during the first few months of 2005.[46] FDI in the automobile industry that targeted the MERCOSUR market during the 1990s is shifting towards export-oriented production for markets outside MERCOSUR (box II.10).

The recovery of United States demand and the devaluation of the currencies in the dollar zone (i.e. currencies which move more or less in conjunction with the dollar) have also increased the interest of carmakers in investing in Mexico. According to the Mexican automotive industry association, carmakers are planning to invest some $5.5 billion in the country between 2004 and 2007.[47] In fact several TNCs have already started, or have announced, new projects in the country (annex table A.II.4). The conclusion of an FTA with Japan is also likely to improve Mexico's position as a recipient of FDI in the automotive industry. This agreement, scheduled for implementation in spring 2005, is part of Mexico's strategy of reducing its heavy dependence on the United States market. It is expected to raise Japanese FDI in the automotive industry to an estimated $1.3 billion per year up to 2015.[48]

Strong global demand is encouraging investment in Brazil's steel industry. The Brazilian Steel Industry (IBS) predicts investment (foreign and domestic) of $13 billion in 2005-2010, most of it in the form of new outlays.[49]

Figure II.17. Automotive industry in Argentina and Brazil: production, domestic sales, exports and imports, 1992-2004

(Thousands of units)



Source: UNCTAD, based on Asociación de Fábricas de Automotores (ADEFA), www.adefa.com.ar/; Associação Nacional dos Fabricantes de Veículos Automotores (Anfavea), www.anfavea.com.br/.

TNCs in the food and beverages industry of Latin America have benefited from growing exports and higher purchasing power in domestic markets, with consumers increasingly basing their buying decisions on brands, rather than prices, and returning to premium brands. This behaviour has boosted business for producers of well-known branded foods – where TNCs have a strong presence. Some firms have announced new investments,[50] while others have been engaged in acquisitions in search of stronger market position. In beverages, for instance, the most notable deal is the merger between AmBev (Brazil) and Interbrew (Belgium) (mentioned earlier), and in foods it is the acquisition by Arcor (Argentina) of a majority stake (51%) in Danone's (France) cookie and biscuit activities in South America.

Sugar refining in Brazil is becoming attractive to investors mainly because of the shift of car manufacturers in that country towards flex-fuel vehicles that run on sugar-cane-based alcohol as well as petrol.[51] Foreign and local companies are reported to be planning investments of some $3 billion in Brazil's sugar-cane-based ethanol industry.[52]

FDI in the *maquiladora* industry in Mexico surged in 2004, with a 26% increase, after three consecutive years of decline, as United States demand picked up. *Maquila* exports were 13% higher than in 2003 and employment levels rose for the first time since 2000, registering a 5% increase. However, there is still some way to go to recover the 300,000 jobs that were lost between end 2000 and end 2003 (figure II.18). Employment trends were uneven across industries. Labour-intensive industries such as textiles and clothing, footwear and toys continued to witness a decrease in employment, while the electrical and electronic products industry registered the biggest rise (8% growth).[53] Some attribute the upsurge in the electrical and electronics industry to the return of some enterprises that had moved to China after that country entered the WTO in 2001. Motorola, for example, inaugurated its new plant in Nogales in April 2005. Others point to the relocation of some United States firms to Mexico in response to the challenge posed by Asian competitors.

In Central America and the Caribbean, FDI in manufacturing is concentrated in labour-intensive activities, mainly in the apparel industry, where TNCs have set up assembly operations for exports almost exclusively to the United States. Six countries are important export platforms in this respect: Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras and Nicaragua. The removal of textiles and clothing quotas in January 2005 has raised concerns about the future of the apparel industry in the six countries.[54] Some fear that the impact could be similar to that of the entry of China into the WTO in 2001, which, combined with the slowdown in United States demand, led to the stagnation of United States apparel imports from Central America (figure II.19) (UNCTAD 2005b).[55] Competition exists not only with China, but with other Asian countries such as India, Bangladesh and Turkey. The industry could survive if Central American and Caribbean

Box II.10. MERCOSUR: FDI in the automobile industry is targeting broader export markets

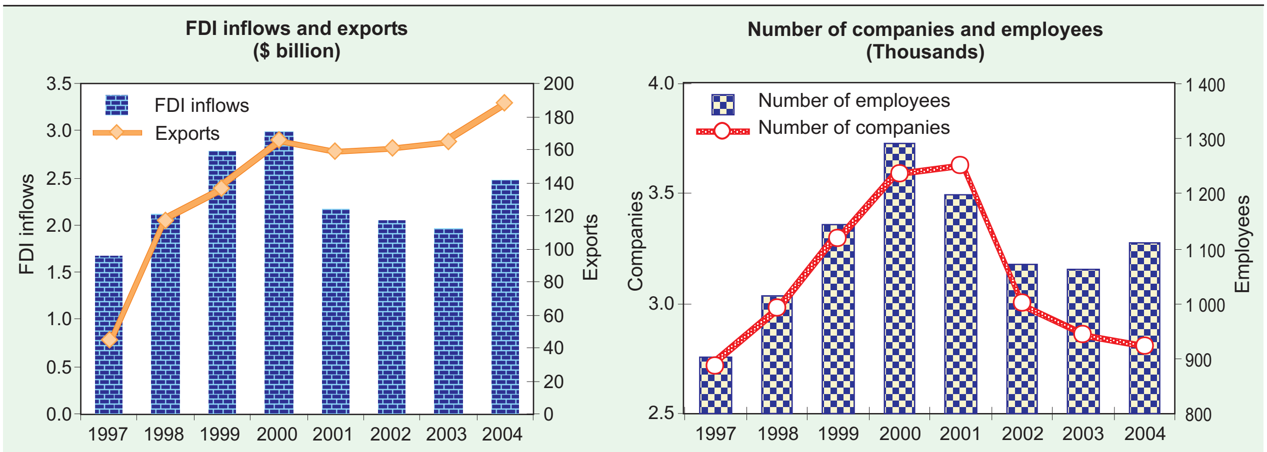
During the 1990s, TNCs made large market-seeking investments in the automotive industry in Brazil and Argentina. By the early 2000s, an estimated $20-25 billion was invested – divided roughly four-to-one between Brazil and Argentina. The economic crises suffered by countries in the MERCOSUR subregion from the second half of the 1990s until 2003 severely affected the automotive industry and disrupted initial strategies aimed at the expanding MERCOSUR market.

The devaluation of the Brazilian real in 1999 and of the Argentinean peso in 2002 improved the export competitiveness of the two countries and encouraged TNCs in the automobile industries to use their capacity increasingly to produce for export markets outside MERCOSUR. At the same time, TNC producers reorganized their Latin American production networks: MERCOSUR affiliates specialized in small, low-cost vehicles with high fuel economy directed towards consumers with lower purchasing power, while Mexican affiliates focused on more expensive models, targeting consumers with high purchasing power, mainly in the United States (ECLAC 2004b).

Bilateral agreements between MERCOSUR member countries and Mexico, which entered into force in January 2003, supported this new export strategy through the reduction of tariffs and implementation of import quotas. Significant increases of automobile exports from Argentina and Brazil to Mexico have been registered since then, making Mexico the main destination of MERCOSUR countries' vehicle exports, followed by the United States and Chile.

Source: UNCTAD, based on ECLAC 2004b; "Latin America: Industry forecast: Getting up to speed", *Business Latin America*, 17 May 2004 (London: EIU); Asociación de Fábricas de Automotores (ADEFA), www.adefa.com.ar/; Associação Nacional dos Fabricantes de Veículos Automotores (Anfavea), www.anfavea.com.br/; United Nations Comtrade database; La Razón, www.larazon.com.

Figure II.18. *Maquila* industry in Mexico, 1997-2004



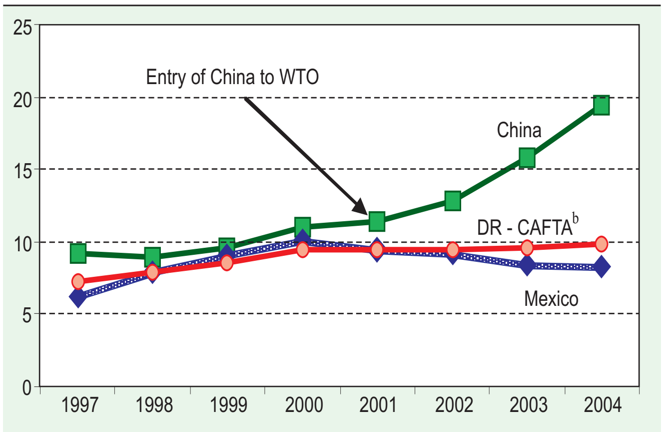
Source: UNCTAD, based on Instituto Nacional de Estadística, Geografía e Informática (INEGI) of Mexico.

countries carefully evaluated their competitive advantages over the Asian countries (box.II.11) while building a strategy to go beyond the *maquila* model and diversify their export markets.

In service-related activities, asset divestments by foreign firms that had begun in the early 2000s are continuing, for example, Royal Ahold (Netherlands) and Carrefour (France) in the retail industry as well as Bellsouth and AT&T in the telecom industry have sold part or all of their assets in the region. These withdrawals have given opportunities to competitors – including Latin American TNCs (e.g. Chilean retailer Cencosud, the Mexican telecom company Telmex)[56] – to expand. Other withdrawals are envisaged in telecom, electricity, gas and water activities.[57]

Figure II.19. United States imports of apparel and textile products[a] from selected countries and regions, 1997-2004

(Billions of dollars)



Source: UNCTAD, based on data from the United States International Trade Commission, www.usitc.gov.

[a] Includes textiles and fabrics (NAICS-313), textile mill products (NAICS-312) and apparel and accessories (NAICS-315).

[b] The signatory countries of DR-CAFTA with the United States comprise: Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras and Nicaragua.

b. Policy developments: some changes in the area of natural resources

FDI has received favourable treatment in most Latin American countries as part of a broader free-market and liberalization policy put in place in the 1990s. This includes preferential treatment through, for instance, special tax regimes,[58] debt-to-equity swap mechanisms[59] and access to investor-State dispute settlement mechanisms.

To a large extent, policy-makers sought to target a large volume of FDI on the assumption that it would make a vital contribution to economic development. This led to the view, shared by a number of experts, that "in recent years the region's FDI policies have focused almost exclusively on attracting FDI, with no concern for selecting or channelling it according to national developmental priorities. That is, FDI policies tended to reflect short-term macroeconomic priorities much more than the requirements for productive development".[60]

The deterioration of the economic situation during the period 1999-2003, reflected by the stagnation of the regional economy and increase in unemployment and poverty, led to widespread disenchantment with the results of the economic reforms related to FDI promotion and privatization.[61] The discontent has in some cases had repercussions at the policy level. In public utility services, several recent initiatives were either cancelled or suspended, such as in water services in Bolivia, telecommunications in Paraguay and electricity in the Dominican Republic, Ecuador and Peru. In Argentina, the relationship between the Government and the privatized enterprises – now foreign affiliates of TNCs – had deteriorated since the end of the "convertibility" regime in January 2002. The incentives used in that country to attract FDI during the 1990s turned out to be unsustainable when economic conditions changed. To address the deepest economic recession the country had ever known, the authorities implemented a series of measures that proved successful in restoring economic recovery and growth. However, some of these measures led a significant number of foreign firms – mainly public utilities – to resort to international arbitration (box II.12).

In natural resource activities, social and political pressures, fuelled by the strong rise in commodity prices, are pushing governments in some countries of Latin America and the Caribbean to modify their tax regimes and change existing legislation:

- In *Argentina*, taxes on oil exports were increased from 20% to a range of 25-45%, depending on the level of the international price of oil. Moreover, after an energy shortage attributable to insufficient investment in the oil industry – entirely privatized in the 1990s and mainly comprising foreign affiliates – the Congress approved a bill, introduced by the Government in October 2004, to create a State-owned petroleum company Energía Argentina Sociedad Anónima (ENARSA).[62] The latter has formed joint ventures with Petróleos de Venezuela (PDVSA), Lukoil (Russian Federation), Sinopec (China) and Brazil's Petrobrás to explore offshore areas.
- In *Bolivia* – where petroleum activity was privatized in the 1990s – a new Hydrocarbon Law was approved in May 2005 by both the Parliament and the Senate. It increases taxes on oil production from 18% to 50% and requires producers to accept new contracts based on State ownership of well-head gas in line with the results of a referendum in July 2004.[63]

Box II.11. Can the apparel industry in Central America and the Caribbean compete with Asia for the United States market?

The high level of competitiveness of Asia's apparel industry stems not only from lower wages, but also from the reorganization of that industry into an integrated system of production that encompasses all phases, from inputs to completed products. The integrated system of production in Asia has boosted the development of a strong regional cluster in textiles and apparel. It offers rapid and cheap access to a vast supply of specialized inputs for the industry (fibres, yarns and fabrics) as well as access to diversified export markets. The competitive advantage of the Central American and Caribbean countries in the industry has, by contrast, been derived from a combination of factors, including low wages,[a] export processing zones and preferential access to the North American market – characteristics that make them well suited to final product assembly (ECLAC 2004b). The apparel industry in Central America is specialized in catering to a single export market – that of the United States. Exports are, moreover, strongly dependent on a production-sharing mechanism.[b] This mechanism has led foreign apparel firms operating in these countries to use expensive United States inputs, while keeping domestic value added low (ECLAC 2004b).

Central American countries have two advantages over Asia: geographic proximity to the United States, which offers the opportunity to deliver goods faster than China or other Asian countries can do, and to respond quickly to changes in United States market conditions and special demands; and duty-free access to the United States market for textile and apparel exports under the United States-Caribbean Basin Trade Partnership Act (CBTPA), provided the yarns, fabrics and threads are imported from the United States.

In 2004, Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua and the United States signed the United States-Dominican Republic-Central America Free Trade Agreement (DR-CAFTA).[c] The commercial part of this agreement transforms the unilateral United States concessions of the CBTPA into preferential treatment by each party for goods imported from any other party. It relaxes the rules of origin by extending the agreement to regional inputs and making it more flexible for some specific products; but, generally, it fails to secure tariff preferences for exports within the DR-CAFTA region that use cloth and materials from third countries outside the region. The latter would have allowed the region to import competitive inputs, including from Asia, and to compete better with Asian final producers no longer restricted by quotas.

Source: UNCTAD, based on IADB 2004, ECLAC 2004b, Quinteros 2004, UNCTAD 2005b.

[a] There are some exceptions: for example, the Costa Rican apparel industry uses a qualified workforce and is specialized in niche markets.

[b] The production-sharing mechanism allows imports incorporating United States-made components to enter the United States either free of duty or at reduced duties.

[c] At the time of writing this report, DR-CAFTA had been ratified by Guatemala and El Salvador and still needs to be ratified by each of the other parties before it can enter into force.

Box II.12. The need to weigh the costs and benefits of incentives to FDI: the experience of Argentina

Argentina's privatization of public utility firms is an example of the need for policy-makers to weigh carefully the costs and benefits of incentives for FDI. At the beginning of the 1990s, a programme to privatize public utility firms was launched, which set bidding conditions that made it necessary for interested local firms to associate with foreign ones and offered incentives such as a debt-to-equity swap mechanism. Further incentives were added shortly after privatization: some taxes were reduced or eliminated and new clauses were introduced to the contracts in which utility rates were denominated in dollars and indexed to the United States' inflation index. During the same decade, Argentina signed 54 BITs to provide security and guarantees for investors.

Problems began to surface when economic conditions in the country deteriorated. Economic contraction, massive withdrawals of banking

/...

Box II.12. The need to weigh the costs and benefits of incentives to FDI: the experience of Argentina (concluded)

deposits and a rapid decline in international reserves forced the Government in January 2002 to abrogate the convertibility law that fixed the peso's exchange rate at par with the United States dollar. The trebling of the value of the dollar in local currency that resulted, in the context of deep economic recession, led the Government to transform all the dollar-denominated contracts into national-currency-denominated contracts, including those signed with public utility firms. The periodic adjustments of public utility tariffs based on foreign inflation indices were also eliminated.

In the following months a number of foreign investors resorted to arbitration by the International Centre for Settlement of Investment Disputes (ICSID) and other fora. Indeed, 37 out of the 40 arbitration cases to which the Argentine Government is party (as of June 2005) were registered after the 2002 emergency measures were introduced, and are related, at least in part, to the financial crisis. A majority of these cases were launched by public utility firms claiming breach of contract and violation of treaty guarantees provided under BITs, such as fair and equitable treatment or guarantee against (indirect) expropriation.

Argentina has stated that "it has not offered any guarantee concerning the maintenance of the convertibility system and in case of devaluation of its currency, because the Government could not have assumed an obligation to follow any specific economic or exchange policy since it can freely modify those policies."[a] In Argentina's view, its actions had been rendered necessary by an imminent economic, financial and social crisis in the country, and it thus referred to a state of necessity. Argentina has also contended that "the emergency measures adopted by the Government are to be considered as economic policy regulatory measures that do not give right to compensation. They were instrumented through legislative acts of general scope, non-discriminatory, and therefore applicable to both Argentine and foreign nationals without any distinction. They are temporary in nature and oriented at the protection of public welfare interests, with a view to normalize the life of the country, to guarantee the continuity of public utilities and to keep rates for customers at an affordable level."[a]

At the same time, the Government has been negotiating gradual tariff increases with privately-owned public utilities provided that international claims are withdrawn. At least one complainant – the energy company Pioneer Natural Resources (United States) – withdrew its complaint in April 2005, and negotiations with other energy firms such as AES (United States), Gas natural BAN (Spain) and Edesur (Spain) are reported to be at an advanced stage.

An ICSID tribunal rendered a first award in the long list of pending cases on 12 May 2005. The tribunal ordered Argentina to pay $133.5 million plus interest in compensation to CMS[b] on the grounds of breach of contract and violation of the BIT between Argentina and the United States. The tribunal rejected Argentina's arguments based on a state of necessity as well as the investor's contention that it had suffered an indirect or regulatory expropriation of its investment.

At the time of writing this report, it is not known whether Argentina or CMS will initiate any of the procedures established in Chapter IV, Section 5 of the ICSID Convention[c] in relation to this award. Some officials have mentioned, however, that considering the scope of ICSID arbitration awards, their validity could be challenged in Argentina's Supreme Court.

Source: UNCTAD, based on ICSID 2005, IISD 2005, Azpiazú 2004, Bouzas and Chudnovsky 2004, Alfaro 2004, "La española Gas Natural Ban retira su demanda contra la Argentina", *Clarín*, 15 March 2005; "AES retiró su demanda en el Ciadi y se acelera el acuerdo", *La Nación*, 15 Abril 2005, ", "Acuerdo del Gobierno y Edesur para subir tarifas", *La Nación*, 12 June 2005, and communication from the Mission of Argentina to the United Nations office in Geneva.

[a] Official communications from the Government of Argentina.
[b] The tribunal also decided that after the payment of the compensation CMS will transfer its assets in its Argentinean affiliate to the Argentinean State, provided the latter makes the payment of an additional $1.1 million. The tribunal gives Argentina a period of one year in which to accept such a transfer (ICSID 2005).
[c] Section 5 of Chapter IV deals with the "interpretation, revision and annulment of the award".

- In *Chile*, the Congress approved a law in May 2005 creating a tax of 5% on the operating profits of non-oil mining groups with an aggregate annual output of 50,000 tonnes or more of fine copper equivalent. The new tax, effective in January 2006, will be deposited in a fund to finance innovation and R&D activities generally so as to prepare for the time when mining resources are exhausted.
- In *Peru* the Congress approved a bill to charge royalties ranging between 1 and 3% on non-oil mining outputs.
- In *Venezuela*, the Government increased royalties on extra-heavy oil from 1% to 16.67% in October 2004. Later, in April 2005, it announced that 32 oilfield operating contracts with foreign oil companies, which account for almost one-quarter of total oil production, would be cancelled by the end of the year and renegotiated under new terms. Income taxes and royalty levels will be higher, and Venezuela's State-owned oil company, Petróleos de Venezuela (PDVSA), will hold a majority share in the ventures. To be allowed even to enter into talks for new deals, operators may have to pay compensation for underpaying their income tax, which the Government is claiming they have been doing since 2000. [64]

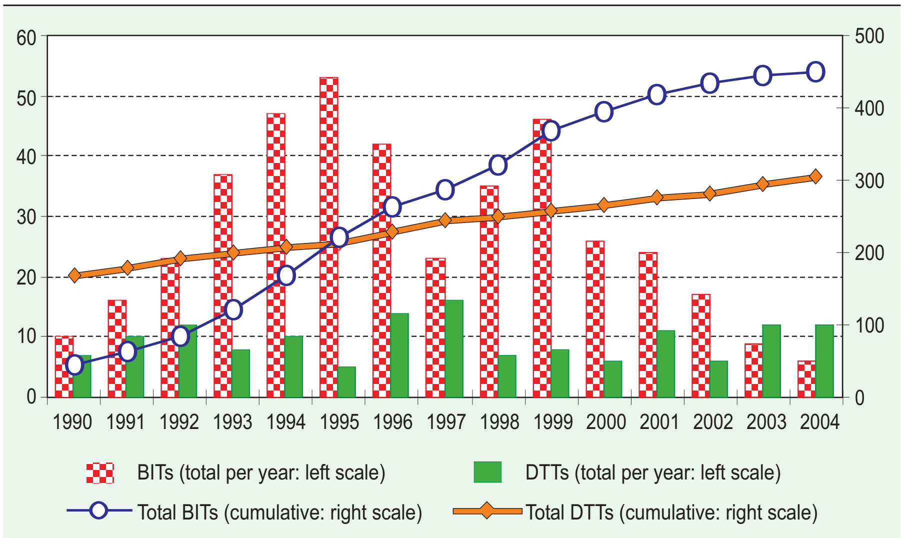
These policy changes show growing concern in Latin America and the Caribbean countries regarding the impact of FDI on their economies, in particular in the area of natural resources. It does not mean, however, that openness to FDI in the region is being reversed. For instance, a number of policy changes that can have a favourable impact on FDI also took place in these countries in 2004, including a new investment promotion regime in Argentina for investments in capital goods in manufactures and infrastructure;[65] a new industrial and innovation policy in Brazil that gives incentives to investments in targeted sectors (ECLAC 2005); measures to end monopolies in mobile telecommunications in Barbados and in the telecom sector in Cayman Islands; removal of limitations to foreign ownership in the transport industry in Guatemala; and a reduction of the corporate income tax rate (for both foreign and local firms) in Barbados, Mexico and Uruguay.

At the bilateral level, Latin American countries signed 12 DTTs and 6 BITs during 2004 (figure II.20). Among the latter, the BIT signed between Uruguay and the United States was the first agreement based on the new United States model BITs text. The total number of BITs and DTTs involving Latin American countries reached 451 and 306 respectively at the end of 2004.

At the regional level, an FTA between Central America, the Dominican Republic and the United States of America (DR-CAFTA), the Free Trade Agreement between the Caribbean Community (CARICOM) and Costa Rica as well as one between Mexico and Japan for the Strengthening of Economic Partnership (all three

Figure II.20. Latin America and the Caribbean: number of BITs and DTTs concluded, cumulative and annual, 1990-2004

(Number)



Source: UNCTAD, BIT/DTT database (www.unctad.org/iia).

with substantive investment disciplines) were concluded. Other agreements with investment provisions signed in 2004 include the Partial Reach Agreement for Economic, Trade and Investment Promotion between Argentina and Bolivia as well as the Comprehensive Economic Cooperation Agreement between Chile and India.

c. Prospects: growing opportunities

FDI flows to Latin America and the Caribbean are expected to rise further in 2005-2006 as most of the driving forces behind FDI growth in 2004 still exist. The macroeconomic environment in the region has improved, and economic growth is expected to remain robust in 2005 (around 4%) (IMF 2005, UNCTAD 2005c). After a prolonged period of economic stagnation (1999-2003), investments are required that will help modernize and expand production capacity and to remove infrastructure bottlenecks mainly in energy roads and ports to meet growing internal and external demand. In addition, the economic recovery in Argentina and the successful restructuring of its external debt have removed a source of macroeconomic instability in the Southern Cone region.

UNCTAD's 2005 survey (box I.3) also shows positive prospects for FDI in Latin America and the Caribbean, though the outlook is less optimistic than for countries in Asia and Oceania or South-East Europe and the CIS. The majority of IPAs in Latin America and the Caribbean, along with two out of five FDI experts and one out of three TNCs, expect FDI to the region to increase, while about half the FDI experts and two out of three TNCs expect it to remain at the same level (figure II.21).

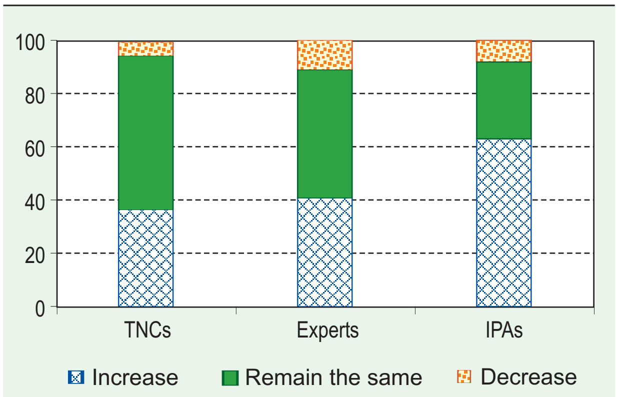
FDI is likely to grow unevenly across sectors and subregions. In the *primary* sector, where projects are concentrated in the South American countries, FDI inflows should continue to be attracted by relatively high levels of commodity prices driven by strong world demand. Taxes and legislative changes aimed at increasing the State's share in natural resource revenues have not prevented TNCs from announcing important projects in 2004 and 2005. Higher prices and the entry of new investors seem to be improving the bargaining position of governments. Growing demand for resources such as oil, copper, iron ore and soybeans is increasing developing-country firm's interest as well in investing in Latin America (as noted in the previous section on Asia and Oceania). For example, high profile visits with public statements of large investment plans, and the signature of several cooperation agreements, accompanied by the actual launching of new projects, have raised expectations of a substantial increase in Chinese investments in the region in coming years (box.II.13).

In *manufacturing*, the Governments of Argentina and Brazil have shown interest in developing supportive policies, with incentives directed to specific areas identified as priorities. At the same time, there is risk of a slowdown in investment projects in Brazil due to the continued strength of the currency and high interest rates.[66] In the case of FDI in the *maquiladora* industries of Mexico, Central America and the Caribbean, prospects are mixed. Economic growth in the United States is expected to register a moderate slowdown, but should nonetheless remain at 3-3.5% in 2005 (IMF 2005, UNCTAD 2005c). Of greatest concern to those industries is increasing competition from Asian countries. However, as far as the automobile industry is concerned, investment projects launched or announced in 2004 and 2005 in Mexico would guarantee significant FDI flows into the industry (and hence into the manufacturing sector as a whole) in the short term.[67]

In *services*, DR-CAFTA is expected to facilitate FDI in Central America, mainly by United States and Mexican firms, although the ratification of the agreement is still uncertain.[68]

Figure II.21. Latin America and the Caribbean: prospects for FDI inflows, 2005-2006

(Per cent of responses from TNCs, experts and IPAs)



Source: UNCTAD (www.unctad.org/fdiprospects).

Box.II.13. China's new investment interest in Latin America

China's interest in Latin America is a fairly new phenomenon that has developed along with the steady increase of its imports – mostly of natural resource products – from the region. China's imports from Latin America rose more than fivefold between 2000 and 2004, reaching $20.2 billion; this increased the region's share in total Chinese imports from 2.1% to 3.6%.[a]

The visit of the President of China to Brazil, Argentina, Cuba and Chile in November 2004, accompanied by some 200 Chinese business people, demonstrates the growing interest of Chinese TNCs in Latin America. In a speech to the Brazilian Congress during this visit, it was announced that China would invest $100 billion in Latin America over the next 10 years, particularly in railways, oil exploration and construction projects in Argentina; a nickel plant in Cuba; copper mining projects in Chile; along with steel mill, railway and oil exploration projects in Brazil. This reflects the new Chinese strategy in Latin America of securing access to natural resources through FDI.

While Chinese companies already own stakes in minerals operations in Ecuador, Peru and Venezuela, among others, China intends to expand its trade and investment activities in the region. Moreover, the country has signed 14 cooperation protocols with Brazil and 19 with Venezuela. In addition, China and Chile announced in 2004 that they would be negotiating a bilateral free trade agreement.

Source: UNCTAD, based on "Abren la puerta para negocios con China por US$ 20.000 millones", *Clarín*, 16 November 2004, "Brazil/Argentina: China's long-term commitments", *Business Latin America* (London: EIU), 15 November 2004; "Brazil: Lula's China commitments", *Business Latin America* (London: EIU), 7 June 2004, "Brazil: China appeal", *Business Latin America* (London: EIU), 17 May 2004, Dumbaugh and Sullivan 2005.

[a] Data from United Nations COMTRADE database.

In the Southern Cone countries, privatizations are likely to be modest due to the near-completion of the process. However, the consolidation of the subregion's economic growth is likely to revive the interest of foreign investors, particularly leading Latin American TNCs that would like to continue expanding regionally.

As regards FDI outflows from the region, a further increase can be expected in the coming years. Leading Latin American TNCs are expected to continue to expand, principally to neighbouring countries and regionally, though global expansion is also likely to increase. This is in line with the growing transnationalization of firms from developing countries in recent years.

In conclusion, the recovery of economic growth in Latin America, higher demand for commodities and policy support to manufacturing activities in some countries are opening up new business opportunities for foreign investment in the region. These opportunities are somewhat different from those that prevailed during the peak period for FDI in the 1990s; they are likely to be more in manufacturing, construction and natural resources, than in the services sector, and to involve the creation of new assets more than the acquisition of existing ones. Moreover, they are expected to engage new actors, such as Chinese firms, and to give more prominence to Latin American TNCs. Finally, as most of the drivers behind the resurgence of FDI in the region relate to developments in the Southern Cone, FDI is expected to be more buoyant in South America than in Mexico, Central America and the Caribbean in 2005 and beyond.

B. South-East Europe and the CIS: FDI rises for the fourth year in a row

1. Trends: FDI inflows sharply up

FDI *inflows* to South-East Europe and the CIS, a new regional grouping of economies introduced in this *WIR* (box I.2), recorded their fourth year of growth in 2004, reaching an all-time high of $35 billion (figure II.22). Trends in inward FDI to the two subregions differ somewhat, however, reflecting the influence of divergent factors. In South-East Europe, FDI inflows started to grow only in 2003, and within two years, led by large privatization deals, they nearly tripled, to $11 billion. In the CIS, inflows grew from $5 billion in 2000 to $24 billion in 2004, driven largely by high prices of petroleum and natural gas. FDI inflows into the region are expected to grow further over the next few years.

Of the 19 countries in the group, 16 received higher flows than in 2003. Inflows remain concentrated in a few economies. In 2004, the top 10 destinations accounted for 95% of flows to the region (figure II.23). The Russian Federation alone, with its large natural and human resources, accounted for more than one-third of the group's total inflows. The oil economies of Azerbaijan and Kazakhstan accounted for another quarter. The two South-East European countries (Bulgaria and Romania) expected to join the EU in 2007 together accounted for more than one-fifth of the regional total and for more than 70% of the South-East European subtotal.

The distribution of FDI inflows by size among the region's economies remained stable in comparison with that in 2003: only Romania moved to a higher bracket of FDI inflows and Serbia and Montenegro to a lower one as compared with 2003 (table II.7).

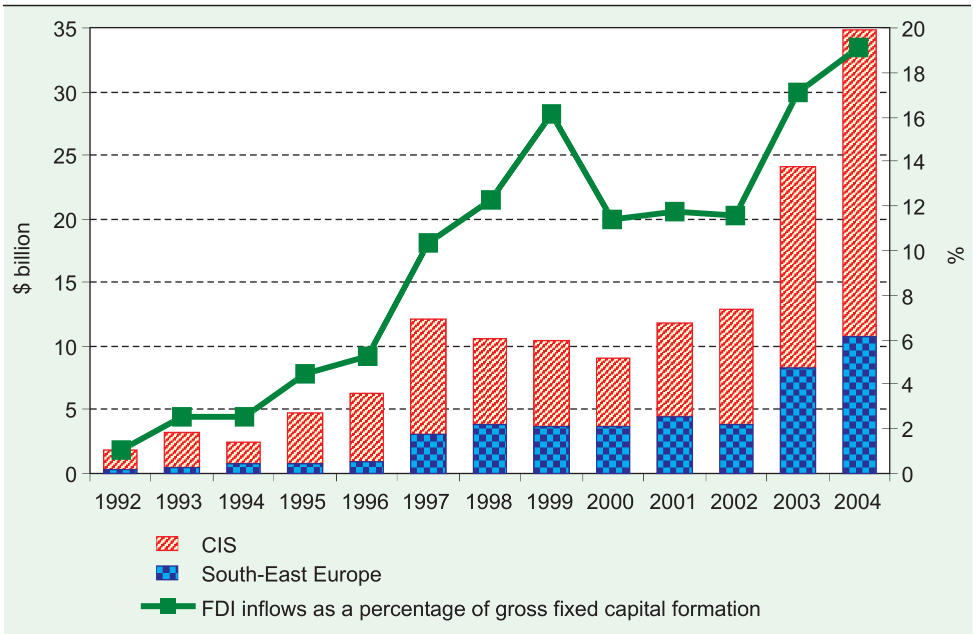
In South-East Europe, as in previous years, the EU candidate countries, Bulgaria and Romania, were the main recipients of inward FDI in 2004. Romania alone attracted more FDI than the five countries on the western side of the subregion (Albania, Bosnia and Herzegovina, Croatia, TFYR Macedonia, Serbia and Montenegro) together. With the exception of Croatia – the only upper middle-income economy of South-East Europe and the CIS – the low levels of inward FDI reflect GDP per capita levels that are even lower than in Bulgaria and Romania, combined with a post-conflict situation that has had a negative impact on infrastructure and has made potential investors cautious.

In *Romania*, the record level of inflows ($5 billion) was partly a result of the privatization sale of the oil company, Petrom, to OMV (Austria). Inflows were also important in greenfield and expansion projects, particularly in the automotive industry and in services. In *Bulgaria* in 2004, Telekom Austria acquired the telecom operator MobilTel, while Viva Ventures (United States) took majority control of the Bulgarian Telecommunications Company (BTC). The power industry also received major investments in 2004 from Austria, the Czech Republic and Germany.

The industry composition of FDI inflows in South-East Europe is affected by these major transactions (annex table A.II.5). The

Figure II.22. South-East Europe and CIS: FDI inflows and their share in gross fixed capital formation, 1992-2004

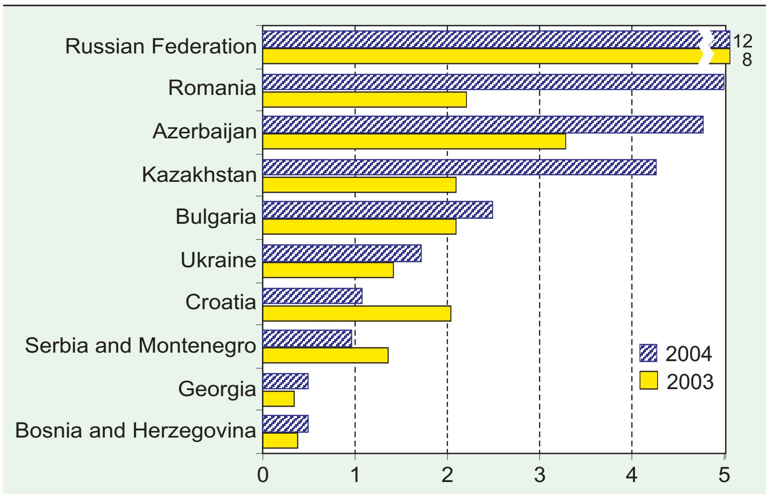
(Billions of dollars and per cent)



Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics) and annex tables B.1 and B.3.

Figure II.23. South-East Europe and CIS: FDI inflows, top 10 recipients,[a] 2003, 2004

(Billions of dollars)



Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics) and annex table B.1.

[a] Ranked on the basis of the magnitude of 2004 FDI inflows.

manufacturing sector dominated inflows only in Romania in 2003 and 2004.[69] The sector also took a sizeable share of FDI in Bulgaria, although the share declined in 2004. Within services, trade and telecommunications played particularly important roles as a result of recent privatization deals.

In the CIS, four countries, the Russian Federation, Azerbaijan, Kazakhstan and Ukraine, in that order, together accounted for 93% of the subregional total of FDI inflows in 2004. In the first three countries, FDI was driven by projects in natural resources (especially petroleum and natural gas) and related activities,[70] while in Ukraine (the second largest country in area on the European continent after the Russian Federation) it was more broad-based: besides oil companies such as Lukoil (Russian Federation) and Regal Petroleum (United Kingdom), the list of companies with major FDI projects in 2004 in Ukraine included manufacturers of consumer goods, construction materials, retailing and telecommunications firms (annex table A.II.5).

In the *Russian Federation,* petroleum and natural gas extraction attracted large investments from TNCs in 2004, especially in the Russian Far East island of Sakhalin. Inflows also rose as some round-tripped Russian capital returned from Cyprus and Luxembourg.[71] In *Azerbaijan*, a combination of high oil prices and prospects of an imminent opening of the pipeline linking the Azeri capital, Baku, to the Turkish Mediterranean port, Ceyhan, prompted a rise in FDI in petroleum in 2004.[72] In *Kazakhstan*, a surge in FDI led to a 16% rise in oil and gas output in 2004. The country attracted both global petroleum firms and independent oil companies.[73] It also attracted large FDI projects in other natural resources such as aluminium in 2004.

The industry composition of cross-border M&As has changed from year to year. In 2003, petroleum refining (part of coke, petroleum and nuclear fuel) alone accounted for 82% of cross-border M&A sales receipts (table II.8). This is mainly due to the acquisition of the Tyumen Oil Company (TNK) of the Russian Federation by BP (reported in *WIR03*, p. 62). In 2004, services accounted for close to two-thirds of the M&A

Table II.7. South-East Europe and CIS: country distribution of FDI inflows, by range, 2003, 2004

Range	2003 Economy [a]	2004 Economy [a]
Above $5.0 billion	Russian Federation	Russian Federation and Romania
$1.0-4.9 billion	Azerbaijan, Romania, Bulgaria, Kazakhstan, Croatia, Ukraine and Serbia and Montenegro	Azerbaijan, Kazakhstan, Bulgaria, Ukraine and Croatia
Less than $1.0 billion	Bosnia and Herzegovina, Georgia, Albania, Belarus, Armenia, Turkmenistan, TFYR Macedonia, Republic of Moldova, Uzbekistan, Kyrgyzstan and Tajikistan	Serbia and Montenegro, Georgia, Bosnia and Herzegovina, Albania, Tajikistan, Armenia, Belarus, TFYR Macedonia, Republic of Moldova, Turkmenistan, Uzbekistan and Kyrgyzstan

Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics) and annex table B.1.

[a] Listed in order of the magnitude of FDI inflows for each respective year.

Table II.8. South-East Europe and CIS: distribution of cross-border M&A sales, by sector and industry, 2003, 2004
(Millions of dollars and per cent)

Sector/industry	2003 Value	2003 %	2004 Value	2004 %	Growth rate in 2004 (%)
Primary	**94**	**0.8**	**32**	**0.3**	**-66.3**
Agriculture, hunting, forestry and fishing	10	0.1	4	0.04	-57.8
Mining, quarrying and petroleum	83	0.7	27	0.3	-67.3
Manufacturing	**10 997**	**88.7**	**3 827**	**38.1**	**-65.2**
Food, beverages and tobacco	743	6.0	241	2.4	-67.5
Textiles, clothing and leather	1	0.01	-	-	-
Wood and wood products	0.2	-	-	-	-
Publishing and printing	24	0.2	-	-	-
Coke, petroleum and nuclear fuel	10 177	82.1	3 238	32.2	-68.2
Chemicals and chemical products	1	0.01	23	0.2	2228
Non-metallic mineral products	-	-	167	1.7	-
Metals and metal products	48	0.4	156	1.6	228.7
Machinery and equipment	3	0.03	-	-	-
Motor vehicles and other transport equipment	0.2	-	1	0.01	419.5
Services	**1 304**	**10.5**	**6 188**	**61.6**	**374.6**
Electricity, gas and water	26	0.2	851	-	3164
Trade	128	1.0	9	0.1	-92.8
Hotels and restaurants	4	0.03	-	-	-
Transport, storage and communications	677	5.5	4 919	49.0	626.3
Finance	423	3.4	347	3.5	-18.0
Business services	46	0.4	30	0.3	-34.0
Health and social services	-	-	2	0.02	-
Community, social and personal service activities	-	-	31	0.3	-
All industries	**12 395**	**100.0**	**10 047**	**100.0**	**-18.9**

Source: UNCTAD, cross-border M&As database (www.unctad.org/fdistatistics).

sales, with telecommunications accounting for the largest deals.

After two years of growth (2002-2003), FDI *outflows* from South-East Europe and the CIS declined slightly in 2004. This was due to the slowdown of outward FDI by Russian TNCs, which alone represent about 99% of the regional total. This slowdown, in turn, is mostly the result of a changing relationship between the Government and the business sector that has prompted firms to slow down their expansion abroad.

Projects abroad by Russian firms often target other CIS countries: for example, Lukoil Oil Company signed a $1 billion natural gas deal in Uzbekistan in 2004 to be financed over 35 years. Lukoil will own 90% of the joint venture formed for this purpose.[74] Outside the CIS, Norilsk Nickel completed in 2004 the acquisition of its stake in South Africa's Gold Fields (*WIR04*, p. 74). While traditionally Russian outward FDI has been driven by firms based in natural resources (chapter I and annex table A.I.11), the industry base for outward FDI is broadening to include other activities such as telecommunications.

2. Policy developments: diversity in policy approaches

FDI patterns in individual South-East European and CIS countries reflect not only natural-resource endowments and other location-specific economic factors, but also diversity in policy approaches to inward FDI. In Bulgaria and Romania, the prospect of joining the EU in 2007 is prompting rapid adoption of the EU's *acquis communautaire*, increased efforts towards improving the business environment and the completion of large privatization deals. Other South-East European countries are following these two in varying degrees.

In the CIS, policies relating to FDI and privatization are diverse. So is the approach towards the treatment of FDI in natural resources. In the area of privatization, for example, the Russian Federation and Ukraine follow divergent strategies, despite the fact that in both countries the main challenge is to tackle the consequences of earlier deals, which led to insider ownership of key resources (Bevan and Fennema 2003, Nureev and Runov 2003, Puffer and McCarthy 2003, Shlapentokh 2004).

In the Russian Federation, authorities have adopted a two-pronged approach towards firms privatized in the early 1990s. This strategy has important implications not only for inward but also for outward FDI. The Russian strategy on post-privatization has, on the one hand, tried to increase de facto the Government's influence over these firms. On the other hand, the authorities have used, or are planning to use, direct measures to take back State control of some key companies. For instance, in June 2005 the Government increased its stake in Gazprom, the country's largest natural gas producer, from 39.27% to 50.01%. In the oil industry, following an audit that identified $28 billion in unpaid taxes, authorities took back control of the core extraction company of the second largest Russian corporation – and a large outward investor – Yukos.[75]

There is a danger that these actions could send contradictory signals to foreign investors. On the one hand, the weakening of opposition to foreign shareholding in local companies (mostly informally) and the direct acceptance of foreign minority shareholding (e.g. BP-TNK) are signs of opening up. The evolution of the tax system towards flat and lower taxes could also encourage foreign investors. In 2002, corporate income tax ("profits tax") was set at a flat 24%, while the Government eliminated the previously widespread use of tax concessions and special favourable tax regimes (OECD 2004a, p. 33). On the other hand, there are measures that could discourage inward FDI. Liberalization of foreign equity investment in key companies is advancing slowly. Limitations on foreign ownership in Gazprom and United Energy Systems had been originally set at 20% and 25%, respectively, in the late 1990s. These limits are to be raised gradually. Moreover, foreign ownership could be de facto limited to 49% by domestic regulations on natural resources, such as the decision in February 2005 of the Ministry for Natural Resources of the Russian Federation to restrict new tenders for oil and metal deposits to companies that are at least 51% Russian-owned. This prevents not just foreign affiliates but also joint ventures from exploiting new oil reserves in the country. This rule could also potentially affect Russian oil firms in which the combined foreign portfolio and direct ownership might reach 50%.

In the fiscal area, "…although the new Tax Code significantly clarifies the roles and powers of tax inspectors and tax bodies, and grants greatly expanded rights to taxpayers, tax enforcement remains political and often arbitrary" (OECD 2004a, pp. 34-35). In this context, the extension of tax audits from Yukos to the BP-TNK joint venture[76] has been interpreted as a negative sign by foreign investors (IIF 2004). In the latest investment climate survey of the country, as many as 75% of the firms surveyed considered the interpretation of regulations by authorities as unpredictable (World Bank 2005e, pp. 23 and 246).

In Ukraine, the new Government that came to power at the end of 2004 seems to be opening its doors wider to foreign investors. In February 2005, the authorities decided to revise earlier privatizations by annulling the results of unlawful insider deals and putting the shares of the companies concerned on sale again. The list of firms that could be re-privatized this way includes key companies such as the steelmaker Kryvozyzhstal, the metallurgical conglomerate Ukrrudrpom, the Petrovsky Steel Plant, the Nikopol Ferroaloys Plant, the Dzerzhinsky Metal Plant, the chemical factory Azot Severodonetsk and the Nikolaev aluminium plant.[77]

The Russian Federation and other CIS countries also diverge with regard to the regulation and treatment of FDI in natural-resource extraction. Azerbaijan, Kazakhstan and Turkmenistan not only apply fewer limits on the foreign ownership of oil and gas, but also levy lower taxes and royalties on oil than does the Russian Federation. For instance, in 2004, firms in Kazakhstan paid $1.5-$2 of royalties per barrel of oil compared with $6-$7 in the Russian Federation, and investors were offered tax stability clauses (Dashevsky and Loukashov 2004, p. 13).

With respect to the international framework for investment, South-East European and CIS countries signed 17 new BITs in 2004 (figure II.24) bringing the total number of BITs involving this group of countries to 642. This increase was the lowest level registered since 1991. In 2004, 29 new DITs were concluded bringing the total to 494.

3. Prospects: continuing growth

FDI inflows to South-East Europe and the CIS are expected to grow further in the near future based on the expectation that, with their competitive wages, South-East Europe (especially the two countries in the subregion that are expected to join the EU in 2007), and Ukraine from the CIS will attract an increasing number of efficiency-seeking or export-oriented projects. At the same time, high oil and gas prices will continue to encourage FDI in the natural-resource-rich CIS countries. In both groups, FDI inflows may be affected positively by improvements in the business environment.

In South-East Europe (and partly also in Belarus, western Russia and Ukraine in the CIS), the eastward expansion of the EU in 2004 created major transportation and logistical advantages, as these countries became immediate neighbours of the EU. This "new frontier" (UNCTAD 2003a, p. 17) could potentially become a magnet for efficiency-seeking investment. It is not yet certain, however, if new greenfield projects could compensate for the drop in privatization-related inflows once the current wave of large privatization deals is completed.

Adding to the "new frontier" status of the countries mentioned are the advantages offered by low labour costs, which are even lower than those of the new EU members that joined the EU in 2004 (figure II.25). Gross wages in Bulgaria and Romania are comparable with those of India and China. However, to exploit this advantage these South-East European countries would also need to offer similar levels of labour productivity. The forecast that their textile, garment and footwear industries in 2005 would be negatively affected by competition from China (Hunya 2005) suggests that currently this is not the case.

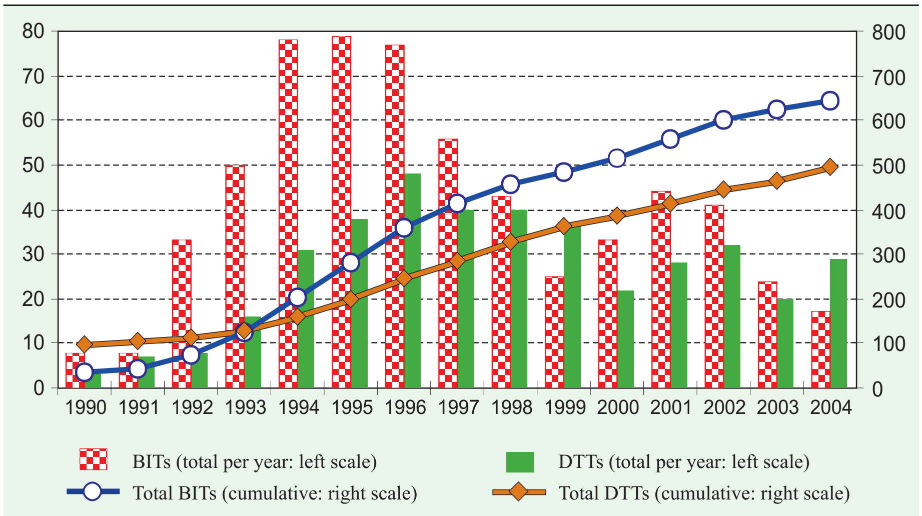
In the natural-resource-rich economies of the CIS it is not simply the volume of inward FDI that will matter in the future, but rather, their success with diversification into new activities. In this respect, Kazakhstan and the Russian Federation have slightly broader natural resource bases and downstream activities than do Azerbaijan or Turkmenistan. Prospects for diversifying FDI inflows away from natural resources are not necessarily promising, however. What makes diversification difficult is the adverse impact of the "Dutch disease"[78] on production costs in other industries: as large oil and gas exports lead to a real appreciation of the local currency, production costs in manufacturing, expressed in dollars, increase to internationally uncompetitive levels.

The CIS also includes countries, such as Kyrgyzstan, the Republic of Moldova, Tajikistan and Uzbekistan, where GDP per capita is comparable with that of the poorest countries of the world. Some of these countries suffer from conflict situations and other political uncertainties. These conditions make it difficult to overcome marginalization through various strategies, including attracting and leveraging inward FDI.

On balance, the prospects for FDI inflows to South-East Europe and the CIS in 2005 and 2006 are deemed positive by FDI experts, TNCs and IPAs alike (box I.3). In all three groups nine out of ten respondents believe that FDI flows to

Figure II.24. South-East Europe and CIS: number of BITs and DTTs concluded, cumulative and annual, 1990-2004

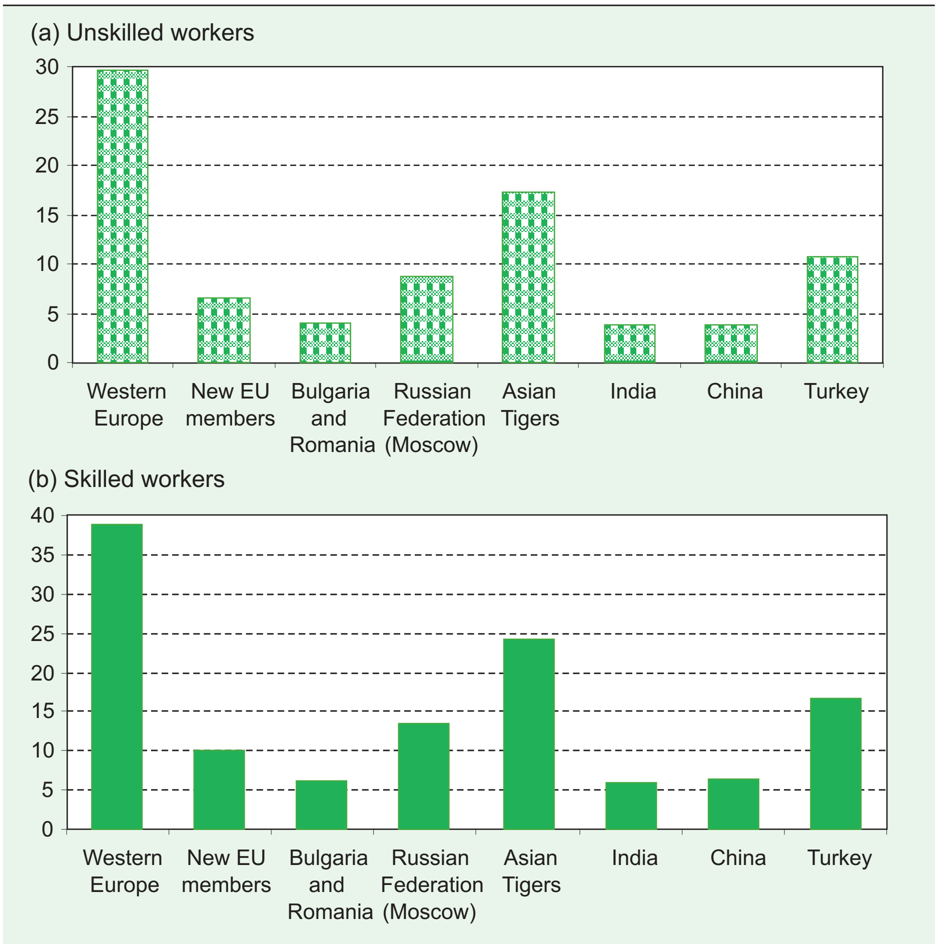
(Number)



Source: UNCTAD, BIT/DTT database (www.unctad.org/iia).

Figure II.25. The wage ladder: gross pay per annum in selected economies, 2004

(Median, thousands of dollars)



Source: UNCTAD, based on Mercer Human Resource Consulting, "2005 international geographic salary differential report", www.mercerhr.com.

Note: Asian Tigers include Hong Kong (China), the Republic of Korea, Singapore and Taiwan Province of China.

the region will increase in 2005-2006 (figure II.26).

A comparison with other surveys is not straightforward because, with the exception of the Russian Federation, other surveys do not monitor South-East Europe and the CIS. Moreover, surveys looking at the Russian Federation from different angles present contradictory results. For instance, on the one hand the A.T. Kearney *FDI Confidence Index* (A.T. Kearney 2004) noted a decline in confidence in the Russian Federation in the aftermath of the Yukos case, although consumer-related industries (retail trade and food and beverages) still seemed to have a positive outlook; on the other hand, the latest survey of Japanese manufacturing TNCs (JBIC 2005) raised the ranking of the Russian Federation to the 6th most promising location for TNCs in the next three years compared to its 10th position in the previous survey.

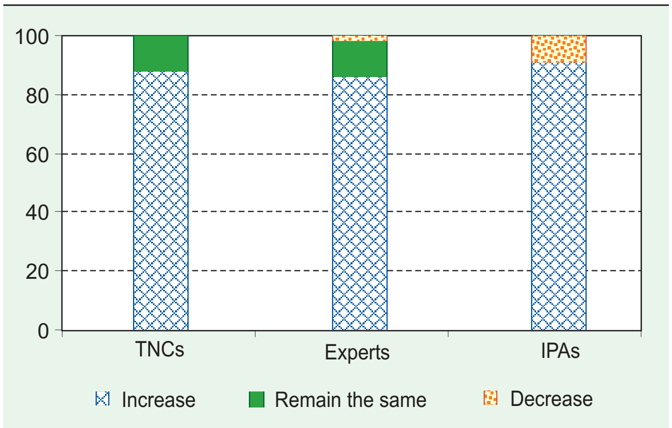
Outward FDI in South-East Europe and the CIS is expected to recover, as the fundamental reason for Russian firms (the principal outward investors in the region) going abroad – to control the value chain of their resources – remains unchanged, and the State is expected to give the green light to foreign expansion once again.

C. Developed countries: uneven performance

Total FDI inflows to developed countries declined by 14%, to $380 billion, in 2004. Since their peak in 2000, inflows to those economies as a group have plummeted by two-thirds, falling in some major recipient countries. On the one

Figure II.26. South-East Europe and CIS: prospects for FDI inflows, 2005-2006

(Per cent of responses from TNCs, experts and IPAs)



Source: UNCTAD (www.unctad.org/fdiprospects).

hand, such flows rose significantly in Australia, the United Kingdom and the United States, as well as in all of the ten new EU-accession countries now classified as developed countries (box I.2). On the other hand, total flows to the EU-15 countries declined by 40% from their 2003 level, due mainly to relatively low economic growth rates in that region and to large-scale repayments of intra-firm credits by foreign affiliates to their parent firms abroad in some major host countries (e.g. Germany, the Netherlands, Sweden). Other developed countries, such as Israel, Norway and Switzerland, also recorded lower FDI inflows. Outflows of FDI from the developed countries increased modestly in 2004.

1. Trends: a turnaround in many countries

FDI inflows to developed countries declined from $442 billion in 2003 to $380 billion in 2004. The decline (14%) was less pronounced than in 2003 (19%). Eight countries reported FDI inflows of more than $10 billion (table II.9), and inflows into more than half of the developed countries – including the 10 EU-accession countries – increased. This, together with a number of factors discussed below, suggests that FDI inflows to developed countries may be bottoming out and that a gradual recovery is finally under way.

There was a significant rebound in FDI inflows to *North America*: these nearly doubled in 2004 (figure II.27). This was due to an increase in inflows to the United States, from $57 billion in 2003 to $96 billion in 2004 (figure II.28), making that country the largest FDI recipient worldwide for the first time since 2001, ahead of the United Kingdom, China and Luxembourg. Reinvested earnings accounted for most of the increase, rising from $1.5 billion in 2003 to $45 billion in 2004. Net repayments abroad of intra-company debt by foreign affiliates in the United States decreased by 44%, so that the inflows due to this component stood at -$17.8 billion in 2004 as compared with -$31.7 billion in 2003. Favourable economic growth prospects and high corporate profits contributed to the increase in FDI flows to the United States. In the finance and insurance services industry, FDI inflows increased to $31.8 billion in 2004 due to consolidation in the industry and to the expansion of European banks into the United States market. Spurred by financial deregulation and globalization, European financial firms have been looking to new markets; the three largest cross-border M&A deals in 2004 took place in this industry (annex table A.I.1). Besides market-seeking FDI in services and in manufacturing, the United States attracted FDI in chemicals and electrical equipment,[79] industries that are typically export-oriented, and benefited from the decline in the value of the United States dollar. Overall FDI inflows to the United States manufacturing sector reached $19.4 billion in 2004, a substantial increase compared with the $0.3 billion of the year before. The main home countries for FDI in the United States in 2004 were the EU countries ($41.4 billion), Canada ($31.8 billion) and Japan ($16.1 billion). In contrast to the FDI upswing in the United States, FDI inflows to Canada in 2004 stagnated (at nearly $7 billion).

FDI inflows to the United States amounted to 0.8% of its (nominal) GDP in 2004. Inflows, however, remained smaller than outflows. The deficit in the current account was again mostly financed by portfolio capital inflows. Since 2002, the net balance of FDI inflows and the current-account balance have moved together into the red (figure II.29).

FDI flows into the *EU* fell by 36% to $216 billion. However there were large differences between trends in FDI inflows to the EU-15 and to the ten new EU member countries:

- In the EU-15, total FDI inflows declined by 40%, to $196 billion in 2004, the lowest

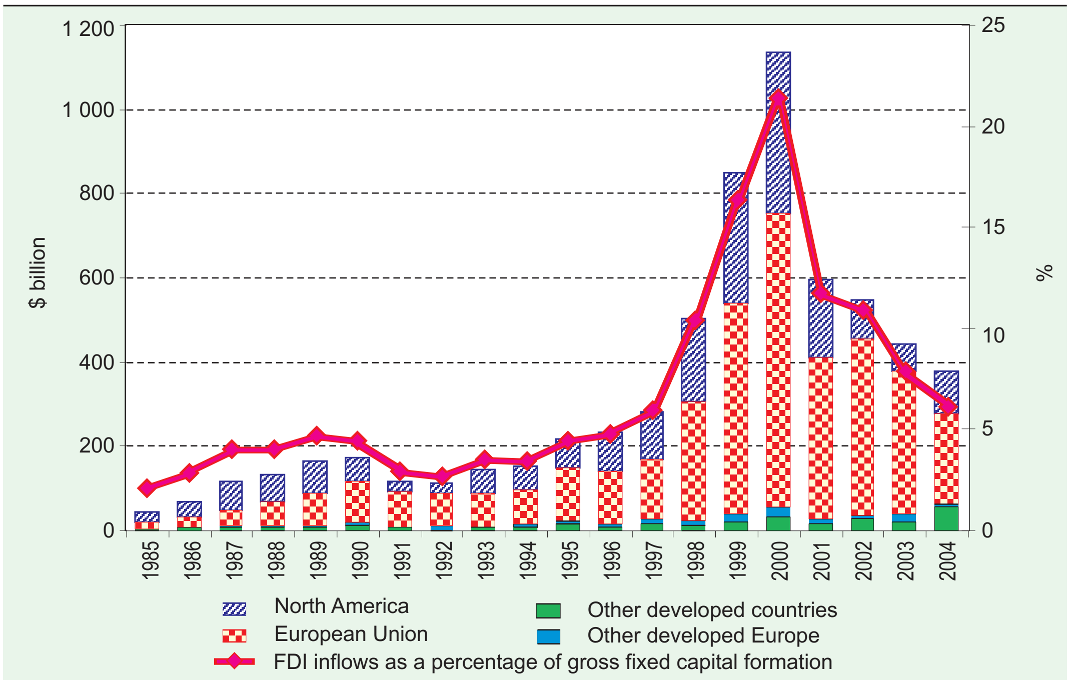
Table II.9. Developed countries: country distribution of FDI inflows, by range, 2003, 2004

Range	2003 Economy [a]	2004 Economy [a]
More than $50 billion	Luxembourg and the United States	the United States, the United Kingdom and Luxembourg
$10-49 billion	France, Belgium, Spain, Germany, Ireland, the United Kingdom, the Netherlands, Switzerland and Italy	Australia, Belgium, France, Spain and Italy
$1-9 billion	Austria, Australia, Portugal, Canada, Japan, Poland, Israel, Norway, Finland, Denmark, New Zealand, Hungary, the Czech Republic, Sweden and Cyprus	Ireland, Japan, Canada, Poland, Austria, Finland, Switzerland, the Czech Republic, Hungary, New Zealand, Norway, Israel, Greece, Cyprus, Slovakia and Portugal
Less than $1 billion	Estonia, Slovakia, Greece, Slovenia, Iceland, Latvia, Malta, Lithuania and Gibraltar	Estonia, Lithuania, Latvia, Slovenia, Malta, Iceland, Gibraltar, Sweden, the Netherlands, Denmark and Germany

Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics) and annex table B.1.
[a] Listed in order of the magnitude of FDI inflows for each respective year.

level since 1998.[80] A sharp fall in flows to three EU-15 countries, Germany, Luxembourg and the Netherlands, alone accounted for 95% of the total decline. FDI inflows turned negative in the Netherlands where foreign investors reduced their FDI stock by $4.6 billion (compared to inflows of $19.3 billion in 2003). The downturn was primarily due to intra-company debt repayments[81] and to a change in the system of compilation of balance-of-payments statistics introduced in April 2003 (see annex B, "Definitions and sources"). Low economic growth also contributed to the decline. FDI inflows into Luxembourg fell by 37%, to $57 billion (less than half its average inflows in 2002-2003), primarily because fewer special purpose entities were established.

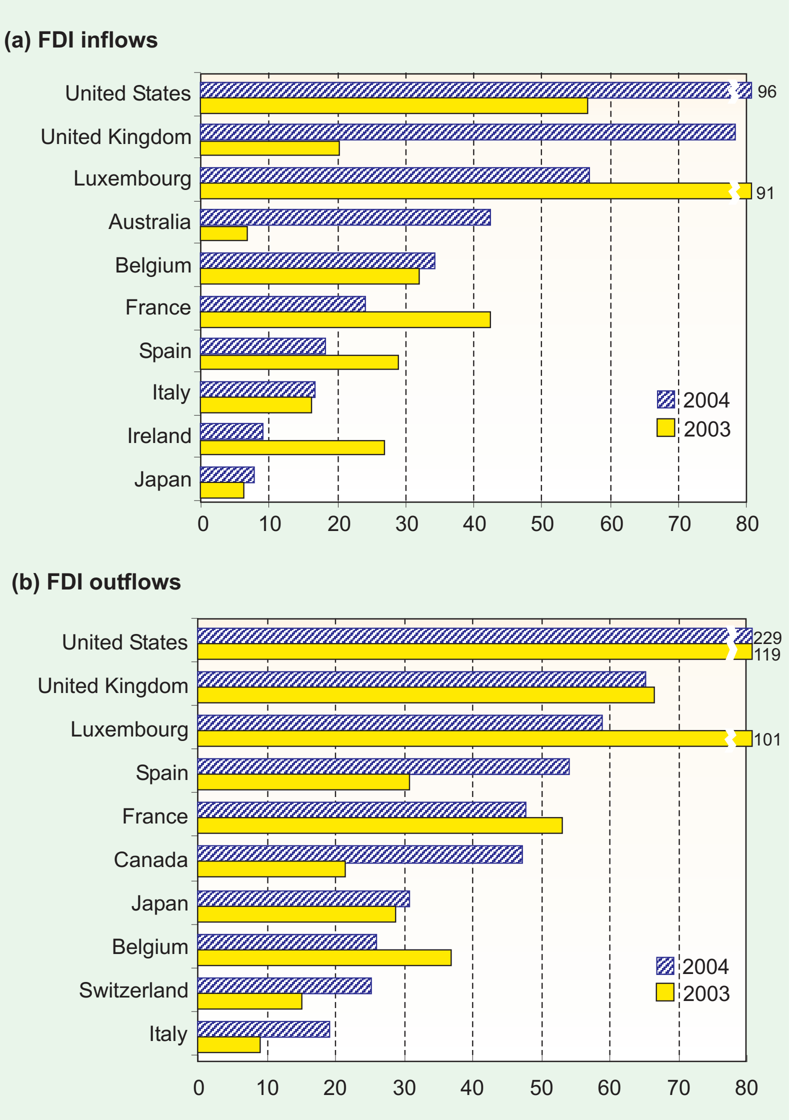
Figure II.27. Developed countries: FDI inflows and their share in gross fixed capital formation, 1985-2004



Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics) and annex tables B.1 and B.3.

Figure II.28. Developed countries: FDI flows, top 10 economies,[a] 2003, 2004

(Billions of dollars)



Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics) and annex table B.1.

[a] Listed on the basis of the magnitude of 2004 FDI flows.

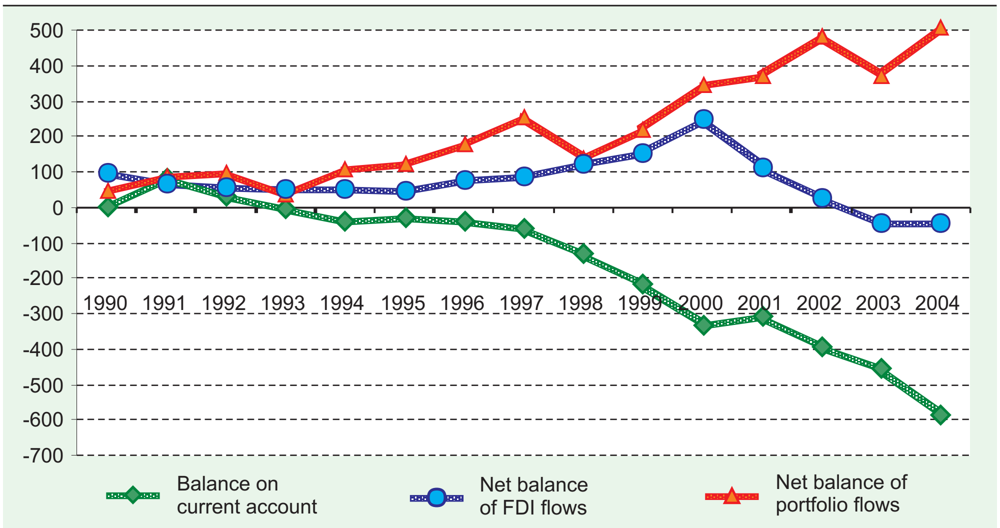
In Germany, negative FDI inflows of $39 billion were recorded as a result of lower inflows of equity capital and large repatriations of intra-company loans resulting from tax changes (box II.14). Investment by private equity funds played a growing role in FDI inflows to Germany,[82] in particular in the chemicals industry. As in Germany and the Netherlands, FDI inflows to Denmark also turned negative, largely as a result of repatriations of equity capital caused by the economic slowdown and repayment of cross-border intra-company loans by foreign affiliates of Danish TNCs. France,[83] Ireland[84] and Spain,[85] countries with relatively large FDI inflows in the recent past, also experienced a substantial decline (ranging between 37% and 66%) in inflows in 2004. Similarly FDI inflows into Sweden and Austria fell, but to a lesser extent.

Whereas the great majority of EU-15 countries attracted less FDI, the United Kingdom became the second largest recipient of FDI worldwide in 2004, as inflows surged from $20 billion to $78 billion. This was the third largest FDI inflow ever to that country, exceeded only by that registered in the peak years of 1999 ($88 billion) and 2000 ($119 billion). Increased flows from the United States partly explain this rise. As a result, the position of the United States – which already accounted for 39% of the total inward FDI stock of the United Kingdom in 2003 – as a leading source of FDI in the United Kingdom strengthened further.[86] Both cross-border M&As and greenfield investments contributed to the increase. The value of some cross-border M&A deals was extremely high. For instance, Santander Central Hispano, Spain's largest bank, bought Abbey National at a price of $16 billion, Europe's biggest ever cross-border merger in banking (annex table A.I.1).

Quarterly and even annual FDI figures are very volatile. They are often influenced by a single large transaction or random movements of individual components of FDI flows that are not necessarily related to changes in the fundamental determinants of FDI. A medium-term examination of the 2002-2004 period, for instance, provides a better picture of the FDI performance of the EU-15 countries. France and the United Kingdom received relatively high FDI inflows during that period (on average $38.6 billion and $41 billion per year respectively). The United Kingdom experienced relatively strong economic growth during these years of 3%, which is higher than that in the euro area (IMF 2005). In France, the Government

Figure II.29. Current-account balance, net balance of FDI flows[a] and net balance of portfolio flows[b] in the United States, 1990-2004

(Billions of dollars)



Source: UNCTAD, based on data from FDI/TNC database (www.unctad.org/fdistatistics) and United States Bureau of Economic Analysis (www.bea.doc.gov).

[a] FDI inflows less FDI outflows.

[b] Foreign securities of United States-owned assets abroad, less United States Treasury securities, and securities other than Treasury securities of foreign-owned assets in the United States.

has been actively promoting FDI inflows in recent years (*WIR04*, p. 87). In contrast, Italy and Germany, due to weak economic growth and relatively rigid labour markets, attracted considerably less FDI ($16 billion and $13 billion, respectively, on average). Part of Italy's weak performance may be attributed to structural problems such as high labour and energy costs. Other economies that performed well over the 2002-2004 period were Belgium ($27 billion per year in FDI inflows on average), Spain ($30 billion) and Ireland ($22 billion), although FDI flows have been decreasing for the latter two countries.

- FDI inflows into the 10 *EU-accession countries* (which were previously classified under Central and Eastern Europe (see box I.2)) rose by 69% in 2004, to $20 billion, with Poland, the Czech Republic and Hungary, in that order, receiving the largest FDI inflows. Reinvested earnings accounted for more than half of the FDI flows to these countries, whereas equity investments in new projects and privatization sales were the dominant forms of FDI in Slovakia, Latvia and Lithuania (Hunya 2005). With the rising FDI inflows, the share of inward FDI in gross fixed capital formation in the 10 new EU countries grew from 11% in 2003 to 16% in 2004 (annex table B.3), which is higher than the EU-15 average. FDI stock in relation to economic size, as measured by stock as a percentage of GDP, is also higher for these countries (39%) than for the EU-15 (31%) (annex table B.3).

  As in the past, the EU-15 countries were the major investors in the 10 new EU countries. A recent study shows that the largest investors in these countries were Germany and the Netherlands, which together accounted for 40% of the inward stock, followed by Austria and France (Hunya 2005). It should also be noted that a significant share of FDI flows to the new countries is undertaken by foreign affiliates operating in the EU-15.

  Lithuania, Latvia and the Czech Republic experienced the largest increase in inward FDI flows in 2004 among the 10 new EU members. Flows to Lithuania more than quadrupled (to $773 million); they more than doubled in Latvia ($647 million), the Czech Republic ($4.5 billion) and Hungary ($4.2 billion); and Slovakia ($1.2 billion) received 68% higher inflows than in 2003, mainly due to the privatization of three electricity distributors.[87] Inflows to Cyprus increased marginally ($1.1 billion) in 2004.

The 10 new EU countries accounted for only 9.4% of FDI inflows to the EU-25 in 2004. Whether their share in EU-25 inward FDI flows will increase in the future remains an open question. But a number of structural characteristics make them attractive locations for further FDI (box II.15).

FDI inflows into the *other developed countries* shrank by 66% in 2004. Israel, Norway and Switzerland in particular received less investment. Japan, on the other hand, recorded 24% higher FDI inflows in 2004 ($7.8 billion). In January 2003, Japan announced its goal of doubling inward FDI within five years. This would require average inflows of more than $15 billion per year, considerably higher than what Japan has received over the past two years. In order to achieve this goal, a large number of measures in five priority areas were proposed in 2004 (*WIR04*, p. 82); one of the most important ones was the introduction of a measure to allow cross-border equity swaps. However, in 2005, there was a move to delay the legislation that would allow this scheme after a controversial deal took place between Livedoor (Japan) and Nippon Broadcasting System. It should also be noted that much of recent FDI in Japan has been in the form of distress funds (funds used to purchase companies experiencing substantial financial difficulties) from foreign institutional investors,

Box II.14. What lies behind the negative FDI inflows to Germany in 2004?

In 2004, Germany experienced negative FDI inflows (–$38.6 billion) for the first time since 1992. This was caused mainly by a large drop in the equity capital component of FDI and by a net repayment of cross-border intra-company loans by foreign affiliates in Germany for the second year in a row (box table II.14.1).

Intra-company loans have played a substantial role in financing FDI in Germany, accounting for an average of about 47% of FDI flows over the past 30 years.[a] Such loans are relatively volatile. Their movements depend on a variety of factors related to the financial management of individual companies. In 2003, the repayment of loans by foreign investors was partly due to a revision of the German Corporation Tax Act (Körperschaftssteuergesetz) that was intended to encourage foreign companies to transform corporate loans to their German affiliates into equity capital. It should have been no more than a change in the mode of FDI financing, but according to the Deutsche Bundesbank, the addition to equity was much lower than the repayment of credits, which resulted in a net reduction in FDI flows to Germany (Deutsche Bundesbank 2005, p.42). Increased repayment of intra-company loans by German affiliates of foreign firms in 2004 (46 billion euro) can also largely be explained by a single transaction (of an estimated 20 billion euro) where the German affiliate of a foreign enterprise in the telecoms industry used the sales proceeds from its reduced participation in an affiliate abroad to repay loans to a non-German affiliate of the group (Deutsche Bundesbank 2005, p. 41). Furthermore, the improved profitability of companies located in Germany may have motivated repayment of loans by German affiliates to their parent companies abroad.[b] The low value of the United States dollar may also have played a role by facilitating the repayment of dollar-denominated debt.

Box table II.14.1. FDI inflows to Germany by financing component, 2002-2004
(Billions of euros)

Year	Equity capital	Reinvested earnings	Intra-company loans	Total
2002	35.9	-7.1	25.1	53.7
2003	40.5	-7.4	-8.8	24.2
2004	21.6	-6.4	-46.2	-31.1

Source: UNCTAD, based on data from Deutsche Bundesbank, *Balance of Payments Statistics.*

Source: UNCTAD.

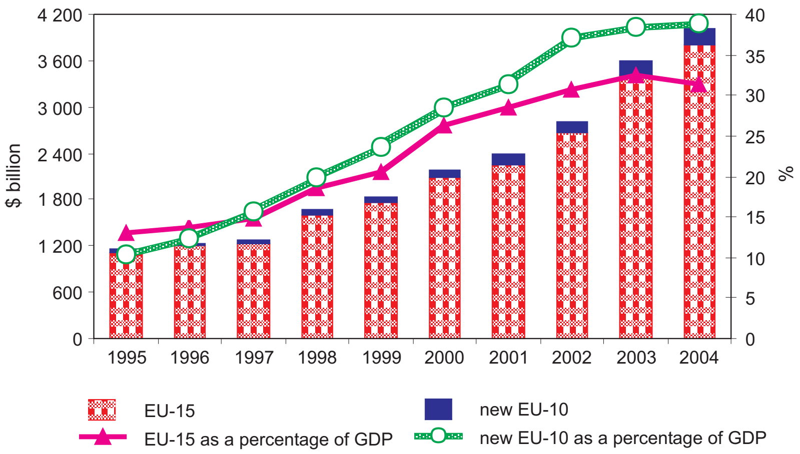
[a] In the same period, the share of equity capital in financing FDI inflows in Germany was 70% and the share of reinvested earnings -17%. The continued losses (after dividend payments) registered by foreign affiliates, that led to negative reinvested earnings, can be explained in part by relatively high German taxes on such earnings.

[b] A recent study of the financing patterns of foreign FDI in Germany found statistically significant effects of the profitability of foreign affiliates on the volume of intra-company loans (Ramb and Weichenrieder 2005).

Box II.15. EU accession and its impact on FDI in the new member countries

Inward FDI stock in the 10 new EU member countries at the end of 2004 reached $230 billion. Within the ten years 1995-2004, this stock grew fivefold, nearly twice as fast as world FDI stock. Heading the list of top host countries in the group are relatively large countries such as Poland ($61 billion in FDI stock), Hungary ($60 billion) and the Czech Republic ($56 billion). Together they accounted for more than three-quarters of the total inward FDI stock of the new EU member countries. Inward FDI stock per capita in the 10 new EU countries amounted to $3,079 at the end of 2004, and inward FDI stock in relation to nominal GDP reached nearly 39%, as compared with $9,790 and 31% for the EU-15 average (box figure II.15.1). On a per capita basis, the small Mediterranean countries, Cyprus and Malta, lead the country rankings. Both countries have followed market-oriented economic policies for a long time and have reached relatively high income levels.

Box figure II.15.1. Inward FDI stock as a percentage of GDP in the EU-15 and EU-10 accession countries



Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics).

There are three main trends emerging in FDI inflows to the new EU countries: first, new EU member States are increasingly attracting FDI into activities that require higher skills such as precision engineering, design and R&D (chapter IV). This quite often involves upgrading existing facilities and focusing on export-oriented manufacturing, particularly in the automotive and machinery industries (Hunya 2005).[a] Second, small and medium-sized enterprises from the EU-15 are beginning to invest in the new EU member States. Prior to 2004, these companies were discouraged from investing in these countries because of the political and economic risks, and because stringent border controls made just-in-time delivery impossible. These obstacles have diminished since May 2004.[b] Third, consolidation of some industries and restructuring of certain TNC operations are taking place in the new EU member countries.

The main motives of foreign investors to invest in the 10 new EU members remain similar to those of the pre-accession phase (*WIR03*, pp. 64-66, *WIR04*, pp. 75-78). For market-seeking investors it is the strong economic growth of new EU member countries in 2004: their real GDP grew by 5.5%, more than double the EU-15 average (IMF 2005); and their favourable growth prospects continue to be very attractive. For efficiency-seeking investors, competitive unit labour costs are particularly important. In 2000, wages in the then-accession countries reached one-fifth of the level of the EU-15, while in productivity there was only a one-to-three difference (*WIR04*, p. 77). According to one estimate, average wages in new EU members in 2020 will still be 60% lower than the EU-15 average (box table II.15.1).[c] In the new EU member States, corporate taxes are lower than in the EU-15: rates were 20%, on average, for the former compared to 31% for the latter. However, a simple comparison of tax rates is not sufficient for assessing the relative tax burdens in each country (*WIR04*, p.77). Other elements (such as the tax base, or specific tax regimes) need to be taken into account.

Additionally, full membership of the EU in May 2004 implied the adoption of the full body of EU laws (the *acquis communautaire)* that should reduce risk premiums for investors (*WIR04*, p.77), while accession to the customs union has lowered transaction costs. Access to EU Structural Funds (that are intended for basic infrastructure development, human resource development, competitiveness and enterprise development, rural development and environmental protection) can contribute to an improvement of the business environment

/...

a somewhat peculiar feature of inward FDI into Japan.[88] FDI inflows into some smaller economies outside the North American and EU regions – such as New Zealand and Iceland – remained stable.

FDI flows to Australia increased to a record $43 billion in 2004, resulting from a growth of equity investment, from $2.3 billion in 2003 to $35.5 billion in 2004, and a significant (56%) rise in M&A deals. These were driven by strong demand for Australia's natural resources, the privatization of State-owned assets and liberalization of the media industry.

There was an impressive surge in FDI inflows from developing countries to the United Kingdom and Japan – rising by 120% and 56% respectively during the period 2002-2003. In the United Kingdom, investment from Latin America accounted for the bulk of the increase in FDI originating from developing countries. In Japan, investment from developing Asia more than quadrupled during this period. For developed countries as a group, flows from developing countries remain volatile, rising and falling sharply from year to year.

Box II.15. EU accession and its impact on FDI in the new member countries (concluded)

(*WIR04*, p.77). In addition, the full membership in the European Monetary Union envisaged by the end of this decade is expected to lead to falling interest rates in the coming years, which would improve financing conditions in these countries.[d]

However, despite entry into the EU and the expected burst of investor interest, risks persist in the new EU member countries. A recent survey has shown that corporate investors perceive poor infrastructure, corruption and the gradual erosion of low-cost advantage as leading threats to the competitiveness of the ten new EU members (A.T. Kearney 2004, p.21). EU reforms are expected to bring infrastructure investments and give regulatory stability to the EU single market, but the economic and social costs of adjustment are also expected to be high. Rising incomes may erode wage competitiveness. EU law will likely add a new layer of regulations and may undermine new members' relative FDI advantages in areas such as taxes and labour costs. These factors could also push investors further East and South outside the new EU.

Box table II.15.1. Convergence of wage levels in the EU: a projection, 2004, 2020
(Average of EU-15=100)

Country	2004	2020
Poland	29	40
Czech Republic	25	38
Hungary	31	38
Slovakia	18	36
Slovenia	44[a]	55
Cyprus	48[b]	61
Estonia	20	36
Lithuania	23	34
Latvia	19	33
EU-15 average	100	100

Source: UNCTAD, based on Rottmann and Jost 2004, and Mercer Human Resource Consulting, *2005 Inter-National Geographic Salary Differential Report* (www.mercerhr.com).

Note: Under the assumption of a convergence rate of 1.5% per year.

[a] 2002.
[b] 2001.

Source: UNCTAD.

[a] According to one study, foreign affiliates generated 70% of manufactured exports in the Czech Republic, Hungary, Poland and Slovakia in 2001 (Hunya 2004, *WIR02*). On the other hand, the importance of services in inward FDI overall continues to rise (annex tables I.4 and I.6).

[b] Ernst & Young's *European Investment Monitor* shows a substantial increase in the number of projects in the new member States after accession, both in absolute terms and relative to Western Europe.

[c] It is assumed that the convergence rate, the rate at which the wage gap between the EU-15 and the ten EU accession countries declines, is 1.5% per year. The convergence rate between rich and poor countries in Western Europe in the period 1963-2000 was 1.1% (Sinn and Ochel 2003).

[d] In order to join the European Monetary Union new EU member countries have to fulfil several convergence criteria such as low inflation rates, low long-term interest rates that reflect low inflation expectations, stable exchange rates and two fiscal criteria (a current deficit lower than 3% of GDP and an outstanding deficit smaller than 60% of GDP). This convergence process should lead to falling interest rates in these countries.

There are some notable changes in the sectoral pattern of FDI in the developed countries. Overall, the importance of services in inward FDI continues to rise (annex tables A.I.4 and A.I.6). The industries in developed countries with the largest cross-border M&A deals in terms of value were construction, health and social services, and business activities, followed closely by electrical and electronic equipment, and textiles and clothing (table II.10 and annex table A.I.1). Furthermore, the real estate industry has recently witnessed an impressive surge in M&As.

FDI *outflows* from developed countries increased by 10% in 2004 to $637 billion, stimulated by high economic growth rates and rising corporate profits in many parts of the world. Such outflows exceeded inflows of developed countries by $148 billion per annum, on average, during the period 2002-2004, thus maintaining the dominant position of developed countries as net providers of FDI. As in the past, the largest share of outflows from developed countries was directed towards other developed countries.

In 2004, the United States was by far the largest source of FDI worldwide, recording its largest outflows ever ($229 billion), followed by the United Kingdom ($65 billion), Luxembourg ($59 billion) and France ($48 billion) (figure II.28). In addition there was a marked increase in FDI outflows from the new EU member countries such as Poland (311%), Lithuania (606%) and Latvia (201%). For most developed countries, FDI outflows exceeded inflows. The countries in which FDI outflows exceeded FDI inflows the most were: the United States ($133 billion), Canada ($41 billion), Germany ($31 billion), Japan ($23 billion), Spain ($36 billion) and Switzerland ($21 billion). The 10 new EU countries were all net importers of FDI capital in 2004, as in previous years.

Until the 1970s the vast majority of developed-country FDI abroad was resource- or market-seeking in nature. In the 1980s and 1990s,

Table II.10. Developed countries: distribution of cross-border M&A sales, by sector and industry, 2003, 2004
(Millions of dollars and per cent)

Sector/industry	2003 Value	2003 %	2004 Value	2004 %	Growth rate in 2004 (%)
Primary	**6 232**	**2.5**	**2 791**	**0.9**	**-55**
Agriculture, forestry and fishing	1 287	0.5	1 205	0.4	-6
Mining	4 945	2.0	1 587	0.5	-68
Manufacturing	**101 954**	**41.7**	**114 187**	**36.2**	**12**
Food, beverages and tobacco	24 746	10.1	17 774	5.6	-28
Textiles, clothing and leather	648	0.3	1 511	0.5	133
Wood and wood products	2 528	1.0	3 101	1.0	23
Printing, publishing and allied services	11 812	4.8	8 853	2.8	-25
Oil and gas; petroleum refining	7 713	3.2	9 110	2.9	18
Chemicals and chemical products	21 377	8.7	38 741	12.3	81
Rubber and miscellaneous plastic products	1 319	0.5	557	0.2	-58
Stone, clay, glass and concrete products	2 652	1.1	4 161	1.3	57
Metals and metal products	6 862	2.8	3 947	1.2	-42
Machinery	3 829	1.6	6 491	2.1	70
Electrical and electronic equipment	4 354	1.8	10 741	3.4	147
Motor vehicles and other transport equipment	4 417	1.8	3 082	1.0	-30
Measuring, medical and photo equipment; clocks	8 018	3.3	5 815	1.8	-27
Miscellaneous manufacturing	1 681	0.7	303	0.1	-82
Services	**136 240**	**55.7**	**198 872**	**63.0**	**46**
Electricity, gas and water distribution	14 336	5.9	22 848	7.2	59
Construction firms	911	0.4	3 138	1.0	245
Hotels and restaurants	3 946	1.6	4 103	1.3	4
Trade	12 572	5.1	25 476	8.1	103
Transport, storage and communications	27 527	11.3	21 909	6.9	-20
Finance	44 222	18.1	64 149	20.3	45
Business activities	20 961	8.6	51 636	16.3	146
Public administration	55	-	3	-	-95
Health and social services	1 085	0.4	2 722	0.9	151
Educational services	77	-	67	-	-12
Community, social and personal service activities	10 547	4.3	2 818	0.9	-73
All industries	**244 426**	**100.0**	**315 851**	**100.0**	**29**

Source: UNCTAD, cross-border M&A database (www.unctad.org/fdistatistics).

developed-country firms increasingly sought to take advantage of cost differences in different production locations by building up global production networks to produce for regional and world markets (efficiency-seeking FDI). In recent years, another kind of trend in FDI from developed countries has emerged as companies also engage in R&D activities abroad (see Part Two). Most FDI in R&D by developed-country firms is targeted to other developed countries. The United States is the largest host country for FDI – both greenfield and M&A – in R&D, followed by the United Kingdom. In the case of greenfield FDI in R&D, Ireland and Spain also figure as large recipients in addition to Canada, France, Germany and Japan. But lately, developing countries like China and India are becoming increasingly important as hosts for R&D activities by developed-country TNCs (chapter IV.C).

2. Policy developments: diverging tendencies

Many developed countries have further liberalized their FDI rules and continue to conclude bilateral and regional agreements. The number of national regulatory changes in 2004 exceeded that in 2003 by 20%, rising from 48 to 60. Most of the changes were investor-friendly. The proliferation of BITs and DTTs continued, with 39 BITs and 53 DTTs involving a developed country (figure II.30) concluded in 2004. This brought the total number of BITs and DTTs involving developed countries to 2,014 and 1,464, respectively, at the end of 2004. Belgium-Luxembourg, Finland, Sweden and Switzerland were the most active with respect to BITs, concluding five new BITs each. Despite an overall attitude that is friendly towards FDI, fears of job losses and decreasing corporate tax payments have led to attempts and measures in some developed countries (e.g. the United States) to encourage companies to invest more at home. Others have undertaken a number of reforms. In Germany, for example, several measures were adopted to reform the labour market.[89] Furthermore, in 2004 France and Germany launched an initiative to set minimum corporate tax rates in Europe to avoid excessive tax competition among EU member States. However, this initiative requires unanimous approval by the EU members. The corporate income tax was reduced in a number of EU-15 and other developed countries such as Austria, Canada, Denmark, Finland, Greece and Portugal (chapter I).

Further liberalization with respect to FDI in real estate was undertaken in a number of developed countries, including the 10 new EU countries. For example in Poland, permit requirements for investment in real estate were abolished through an amendment to the real estate law. This may partly explain the 10% increase in FDI inflows to the real estate industry in Poland in 2004.[90] In Germany, the regulation of real estate has been partly liberalized, which has led to the selling of property by public entities as a way of reducing the fiscal deficit. Similarly, in Italy the introduction of a new tax regime for real estate investment funds may have led to some large M&A deals in the real estate industry in 2004.[91] Further deregulation and privatization of State-owned assets were reported in Canada (petroleum industry),[92] Italy (electricity industry and media activities), the Netherlands and Hungary (electricity industry) as well as in Lithuania (stock exchange).

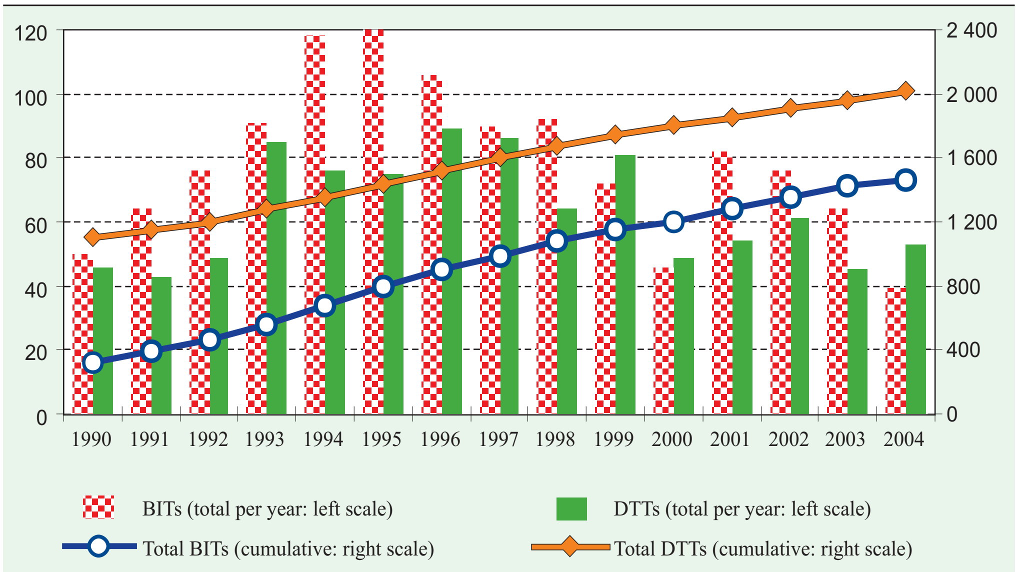
3. Prospects: positive overall

FDI prospects for *developed countries* in 2005 are favourable both for inward and outward flows, underpinned by the forecast of continuing relatively high GDP growth (2.6%), a strong pick-up in corporate profits and a renewed enthusiasm for cross-border M&As (IMF 2005, ECB 2004). The significant increase in cross-border M&As in the first half of the year in developed countries could signal higher FDI flows in 2005. The situation will, however, differ among countries and subregions according to different growth prospects and risk factors.

For the *United States*, economic growth prospects for 2005 are encouraging – although growth in 2005 may prove somewhat weaker than in 2004. Recent data releases suggest buoyant corporate profitability, an increase in export growth rates (ECB 2005), strong business and consumer confidence (IMF 2005), and an increase of 15% in cross-border M&As transactions in the first half of 2005. This may trigger further increases in inward FDI in the United States, although significant imbalances in the economy are a potential concern.

FDI outflows from the United States in 2005 may be held back by recent legislation (the Homeland Investment Act passed in November

Figure II.30. Developed countries: number of BITs and DTTs concluded, cumulative and annual, 1990-2004



Source: UNCTAD, BIT/DTT database (www.unctad.org/iia).

2004) that lowers the tax on repatriated foreign earnings of United States firms.[93] This law, which provides a one-time tax break on corporate foreign profits, is likely to reduce FDI outflows from the United States significantly in 2005, given that over 60% of outward FDI flows (2001-2004) are in the form of reinvested earnings. United States holdings abroad worth approximately $400-600 billion could potentially be eligible for this tax relief and $100-150 billion of them are expected to flow back to the United States instead of being reinvested or held by foreign affiliates of United States TNCs.[94] Indeed, a number of United States TNCs have already planned to repatriate a significant amount of foreign profits (table II.11), which would finance some M&A deals within the United States. It would also help finance the United States trade deficit, estimated to be around $600 billion in 2005, and may contribute to a strengthening of the United States dollar.[95]

For the EU-15, a marginal rise in FDI inflows is expected, partly as a result of an upswing in cross-border M&A activity in the first half of 2005 and healthy corporate profits (IMF 2005). For the euro area, there is a consensus among a number of forecasts that annual GDP growth will average 1.2-1.6% in 2005.[96] Some countries such as the United Kingdom and the new EU members should attract high market-seeking FDI inflows as robust economic growth is expected in 2005 (IMF 2005). Privatization should also contribute to higher FDI inflows in some large economies.[97] On the other hand, some countries – notably Germany and Italy – are expected to suffer from low economic growth rates. Nevertheless, according to a recent survey (Ernst & Young 2005), Western Europe is the most attractive region for FDI.

Competitive pressures in some industries are driving firms, especially in the EU, to seek economies of scale and scope through cross-

Table II.11. Expected repatriation of profits from United States affiliates abroad to their parents, selected TNCs, 2005

TNCs	Profits to be repatriated to parent firms
3M	1.0
Bristol Myers Group	9.0
Coca-Cola	6.1
Dell	4.1
Eli Lilly and Company	8.0
ExxonMobil	-
General Electric	-
IBM	8.0
Intel	6.0
Johnson & Johnson	11.0
Kellogg	1.0
Oracle	3.1
Pepsico	7.5
Pfizer	29.0
Procter & Gamble	10.7
Schering-Plough	9.4

Source: UNCTAD, based on various newspaper accounts.

border M&As. Thus outflows from EU-15 countries in these industries are expected to increase. In addition, improved corporate profits are likely to encourage EU firms to expand into new markets, especially in Asia and in the new EU member countries. A survey of German firms by the Deutsche Industrie- und Handelskammertag, for instance, shows that 40% of respondent German companies plan to continue investing abroad (DIHK 2005a).

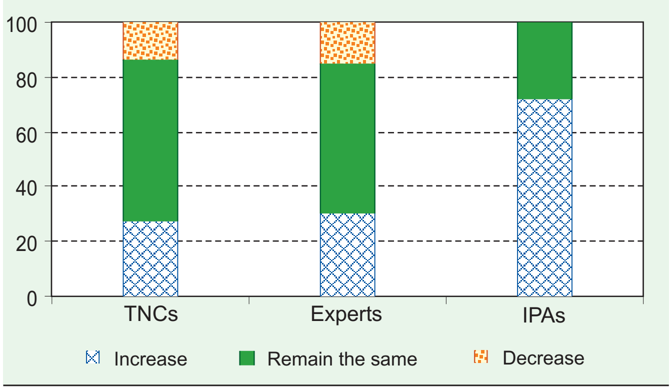
For the 10 new EU member States, FDI prospects look good. As of March-April 2005 these countries were considered to be, after Western Europe, the second most attractive locations for FDI. This is mainly due to the high priority accorded to them by European TNCs (Ernst & Young 2005, p. 9). Although new EU members continue to show solid growth, FDI in these countries is dependent on the health of the European economy as a whole. Consequently, deceleration of growth in the EU-15 might curtail investments at home and abroad (Hunya 2005).

For *Japan* the rise in FDI inflows is likely to continue, supported by economic growth and improving structural features of the Japanese economy. As far as outflows are concerned, a survey by JBIC in late 2004 indicated that 47% of Japanese manufacturing TNCs that responded to the survey plan to strengthen and expand their foreign activities, while another 46% expect to maintain their current level of activities over the following three years (JBIC 2005). In the services sector, for example, Japanese banks are returning gradually to foreign markets by establishing affiliates abroad for the first time, following a continuous three-year decline in FDI projects in banking since 2001. For *Australia*, privatization of State-owned assets is expected to boost FDI inflows further.

UNCTAD's 2005 survey of top TNCs, FDI locational experts and IPAs (box I.3) shows that 60% of TNCs and experts expect FDI inflows to remain the same in 2005-2006 while about one-third of them expect such flows to increase (figure II.31).[98] Looking ahead, FDI flows to major developed countries have risen in the first quarter of 2005, indicating favourable FDI prospects for developed countries as a whole. For example, FDI flows in the United States, the United Kingdom, France, Germany and Australia rose by 81%, 41%, 15%, 109% and 30% respectively.

Figure II.31. Developed countries: prospects for FDI inflows, 2005-2006

(Per cent of responses from TNCs, experts and IPAs)



Source: UNCTAD (www.unctad.org/fdiprospects).

Notes

1 Major revisions have been made to the 2003 data on FDI inflows to the top host African countries, with the combined inflows to Angola and Nigeria in that year rising by up to $6 billion after the revision. According to the revised data, total FDI inflows to Africa were $18 billion in 2003 (annex table B.1).

2 Oil prices, for instance, soared above $50 a barrel, up from $22 in 2003. Gold prices rose to above $400 per ounce in 2004 as against $280 in 2003, while copper prices rose by 90% (Kitco Bullion Dealers (www.kitco.com)). Prices also rose for diamonds and platinum.

3 The Royal Dutch /Shell Group of Companies in Nigeria, for instance, reported an annual net income for the year ending 31 December 2004 of $18.2 billion, 38% higher than in the previous year (www.allafrica.com).

4 Algeria, Egypt, the Libyan Arab Jamahiriya, Morocco, Sudan and Tunisia.

5 Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Reunion, Rwanda, Seychelles, Somalia, the United Republic of Tanzania, Uganda, Zambia and Zimbabwe.

6 Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone and Togo.

7 Angola, Cameroon, Central African Republic, Chad, Congo, Democratic Republic of the Congo, Equatorial Guinea, Gabon and Sao Tome and Principe.

8 Botswana, Lesotho, Namibia, South Africa and Swaziland.

9 Source: *Coca Cola Newsletter* (www.inboxrobot.com/news/CocaCola).

10 In 2001-2002 FDI flows to Nigeria were, on average, $1.7 billion per year and to Angola $1.9 billion (www.unctad.org/fdistatistics).

11 Egypt's Orascom is the major telecoms operator in Algeria (*WIR04*, pp. 46-47). Also, Kuwait's National

mobile telecoms company (AlWatanya) invested $400 million there in 2004 (*source*: Economist Intelligence Unit, *Algeria 2004 Country Report*).

12 Source: Economist Intelligence Unit, *Morocco 2004 Country Report*.

13 Information is from the EIU's country reports (www.eiu.com).

14 Source: MIGA (www.miga.org).

15 ATI was established by the Common Market for Eastern and Southern Africa (COMESA) Summit of Heads of State in May 2000 and launched in August 2001.

16 In 2001, Japan established categories of products for which preference is granted to LDCs, as a result of which about 99% of individual products (some 360 items, including all the textile and clothing products) from LDCs are imported duty-free and quota-free.

17 Source: "Sub-Saharan oil growing "force" on world markets", *Mail&Guardian* (www.mg.co.za), 6 July 2005.

18 Sources: *IPAWorld* (www.ipaworld.com), 24 June 2004; *Mining News* (www.miningnews.net), 19 August 2004 and www.numsa.org.za.

19 Source: "TLC: Egypt's Orascom plans new acquisitions in Italy", *Euro-Mediterranean Network* for *Culture and Social Dialogue*, 11 July 2005, www.ansamed.info.

20 Following a reclassification, Asia and Oceania (previously Asia and the Pacific) includes a total of 61 countries and territories. On the one hand, eight countries in Central Asia that were included as part of the region in previous *WIRs* are now reclassified under the CIS. Cyprus, formerly under West Asia, is now reclassified under the EU (box I.2). On the other hand, ten additional countries and territories in Oceania (formerly Pacific islands) and Timor-Leste are now classified under Asia and Oceania. Data are available for 54 countries and territories in the region.

21 Three regulations promulgated by the China Securities Regulatory Commission in 2002 provide procedural provisions for the acquisition of listed companies. In addition, the "Interim Provisions on the Utilisation of Foreign Investment to Restructure State-owned Enterprises" adopted in 2002 include provisions for foreign M&As of State-owned enterprises (excluding listed companies and financial institutions). The "Interim Provisions on Mergers and Acquisition of Domestic Enterprises by Foreign Investors" adopted in 2003 include more detailed provisions for the acquisition of domestic firms.

22 Includes China, Hong Kong (China), the Democratic People's Republic of Korea, the Republic of Korea, Macao (China), Mongolia and Taiwan Province of China.

23 The FDI flow data reported by China's Ministry of Commerce (MOFCOM), and used by UNCTAD in recent *WIR*s, are gathered on a gross basis (recording only credit transactions) rather than a net (credit less debit) or balance-of-payments basis. Thus divestments, capital withdrawals and repayment of debt to foreign parent firms are not included. Data on inward FDI stock are revised as reported by MOFCOM (see annex B, Definitions and sources, for details).

24 For example, HSBC (United Kingdom) invested $1.7 billion for a 20% stake in the Bank of Communication. By the end of 2004, a total of 10 Chinese banks had foreign ownership (*Source*: data from China Banking Regulatory Commission).

25 Some recent large investment projects by private equity funds include: Texas Pacific Group, General Atlantic and New Bridge Capital's investment in Lenovo ($350 million), Carlyle and Prudential Financial's investment in China Pacific Life Insurance ($400 million) and New Bridge Capital's investment in Shenzhen Development Bank ($160 million) (*Source*: data from various newspaper accounts).

26 This is illustrated by the FAW-Toyota ($2.5 billion) and DMC-Nissan ($2 billion) joint ventures.

27 Comprises ASEAN member countries (Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Viet Nam) and Timor-Leste.

28 Other, similar studies reached the same conclusion. See for instance Cheong 2000 and Chantasasawat et al. 2003.

29 Includes Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka.

30 In September 2002, the Afghan Government passed the Law on Domestic and Foreign Private Investment that includes investor-friendly incentives to attract foreign investment. Wholly owned foreign affiliates are also allowed to be established. Firms from China, France, Germany, the Islamic Republic of Iran, the Netherlands, Pakistan (Afghan expatriates), Turkey, the United Kingdom and the United States have already invested in Afghanistan. Major investments during 2004 and early 2005 include those by Universal Guardian (United States) in business services, Heidelberger (Germany) in business machines and equipment, Home Essentials (Hong Kong, China) in consumer products and a Coca-Cola bottling plant ($40 million). In financial services, Standard Chartered Bank (United Kingdom), Habib Bank (Pakistan) and Arian Bank (Islamic Republic of Iran) are major foreign-owned banks (*BBC Morning South Asia*, 14 July 2004 and *Nihon Keizai Shimbun*, 21 March 2005).

31 Includes Bahrain, the Islamic Republic of Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, the Palestinian Territory, Qatar, Saudi Arabia, the Syrian Arab Republic, Turkey, the United Arab Emirates and Yemen.

32 Including the data from Bahrain, Oman, Saudi Arabia and the Syrian Arab Republic, where a survey on inward FDI was undertaken for the first time in 2004, with technical assistance from the Economic and Social Commission for West Asia (ESCWA) and UNCTAD. See, for example, the Saudi Arabian General Investment Authority (SAGIA), "SAGIA initiates first major FDI survey in Kingdom", 14 July 2004 (www.sagia.gov.sa). In June 2005 SAGIA released a report entitled "Foreign direct investment survey report", detailing information on inward FDI (both flows and stock).

33 American Samoa, Cook Islands, Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, the Federated States of Micronesia, Nauru, New Caledonia, Niue, Northern Marina Islands, Palau, Papua New Guinea, Samoa, the Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, Wallis and the Futuna Islands.

34 Data from UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics).

35 In October 2004, for instance, the National Development and Reform Commission and the Export-Import Bank of China jointly promulgated a circular to encourage overseas investment projects in the following four areas: (i) resource exploration projects that can mitigate the domestic shortage of natural resources, (ii) projects that can promote the export of domestic technologies, products, equipment and labour, (iii) overseas R&D centres that can utilize internationally advanced technologies, managerial skills and professionals, and (iv) M&As that can enhance the international competitiveness of Chinese enterprises and accelerate their entry into foreign markets. A preferential credit policy encourages investment in these key projects supported by the State.

36 In 2005, for instance, Bank of America signed an agreement to invest $2.5 billion in China Construction Bank for a 9% stake.

37 As a result, Japanese manufacturers planning to "expand business operations in ASEAN" within the next two years increased to 57% in the 2004 survey from 54% in the 2003 survey. Source: JETRO, "JETRO releases its survey of Japanese manufacturers in ASEAN and India", *Press Release*, 6 April 2005, www.jetro.go.jp).

38 See "Ratan Tata to head Investment Commission", *Economic Times*, 14 December 2004 (www.economictimes.indiatimes.com).

39 In January 2004, Baosteel signed a framework agreement with Arcelor and CVRD to build a steel plant in Brazil. The total investment will be $8 billion.

40 A group of Shanghai developers plans to invest over $1.2 billion in a project in Saint Petersburg (www.people.com.cn, 18 October 2004).

41 Given the large sums of "Chinese dollars", which are still rapidly accumulating, these and other developments suggest that China is looking to acquire corporate equities in the United States, rather than remaining merely a large holder of United States Treasury bonds.

42 In terms of real effective exchange rates, national currencies appreciated in 2004 in countries like Brazil (4%), Chile (6.9%), Colombia (8.4%), Guatemala (1.9%) and Paraguay (5.1%), but they remained at lower levels than in 2000, except in the case of Guatemala. Between 2000 and 2004 the five largest depreciations in national currency occurred in Argentina (55%), Uruguay (37%), Venezuela (30%), Brazil (23%) and Jamaica (16%) (calculations based on data in ECLAC 2004a).

43 Interbrew acquired 100% of Braco S.A., a Brazilian holding company with a 52.8% voting interest and 21.8% financial interest in AmBev. The operation was registered as both inward and outward FDI because the former shareholders of Braco S.A. (Brazil) received shares of Inbev from Interbrew (Belgium). Inbev is the new group that resulted from the operation, and is headquartered in Belgium.

44 For instance, the Swiss cement company Holcim acquired the remainder of its Mexican affiliate, Holcim Apasco, for $750 million.

45 In 2004, Cargill (United States) completed an acquisition in the meat industry in Argentina for $70 million, and announced an acquisition in Brazil for $130 million. It is also spending $200 million in Argentina for a new soya-processing plant and a private port to handle exports (*Business Latin America*, 8 March 2004 (London: EIU)). Dreyfus (France), Archer Daniels Midland and Bunge (both United States) are expanding their capacities in Argentina ("Argentina: soya's heady days", *Business Latin America*, 23 February 2004 (London: EIU)).

46 "Brazilian car parts suppliers cut back", *Business Latin America*, 23 May 2005 (London: EIU).

47 *Business Latin America*, 19 January 2004 (London: EIU).

48 *Nihon Kaizai Shimbun*, 24 February 2005, and ECLAC 2005.

49 Source: "Siderurgia investirá US$ 13 bilhões até 2010", IBS, www.ibs.org.br. Among foreign investors, Arcelor (Luxembourg), plans to invest $3 billion by 2008, after having invested more than $1 billion in 2004; Nippon Steel (Japan) plans to build a fourth high-blast furnace worth $600 million at Usiminas; and China's largest steel producer, Shanghai Baosteel Group, is planning to set up a joint-venture steel mill in Brazil with CVRD, which will involve investments of $1-1.4 billion in its first stage (*Business Latin America*, 24 May 2004 and 13 September 2004 (London: EIU); Arcelor press releases, 29 June 2004 and 20 December 2004, www.arcelor.com; "Baosteel Moves To Secure Brazilian Iron Ore Sources With JV", *China Business Strategy*, 4 February 2004, www.china-ready.com.

50 Fonterra (New Zealand) plans to build a new milk-processing plant in Chile and to expand its dairy exports, mostly to Latin America, from its Soprole affiliate there. Meanwhile, the joint venture of its Dairy Partners Americas (DPA) with Nestlé (Switzerland) is expanding its activities from Brazil, Argentina and Venezuela to Ecuador, Colombia and Trinidad and Tobago. ("Latin America: Industry forecast: Redeeming brands", *Business Latin America*, 10 May 2004 (London: EIU)).

51 Volkswagen, Fiat, General Motors and Ford Motor have launched a range of 40 flex-fuel models since the mid-2003. Renault (France) launched its first flex-fuel model in November 2004, and PSA Peugeot Citroën (France) will follow suit in June 2005 ("Brazil: refined drive", *Business Latin America*, 13 December 2004 (London: EIU)).

52 Source: "Brazil: refined drive", *Business Latin America*, 13 December 2004 (London: EIU) and "Latin America: Industry forecast: Trading back-up", *Business Latin America*, 13 December 2004 (London: EIU).

53 Information from Instituto Nacional de Estadística Geografía e Informática (INEGI) of Mexico.

54 In these six countries, the apparel industry accounts for a significant share of total manufacturing employment (generating around 500,000 jobs), and has been responsible for most of the growth of their manufactured exports since the mid-1980s (IADB, 2004).

55 Fourteen textile firms are reported as having already closed in Guatemala in the first 49 days of 2005, with 3,426 job losses (*Lapress*, 10 March 2005, www.lapress.org).

56 In the retail industry, Royal Ahold sold its assets in Argentina and Brazil, while Carrefour withdrew from Chile and announced in March 2005 its retreat from Mexico. Cencosud (Chile) bought Royal Ahold's assets

in Argentina after acquiring in 2003 the company's assets in Chile, and Walmart (United States) purchased Royal Ahold's Bompreço chain in Brazil. In the telecom sector, Telmex (Mexico) acquired AT&T Latin America, which gave it a region-wide reach in the fixed-line segment.

57 Electricité de France (EDF) is considering the sale of its majority stake in Edenor, one of Argentina's biggest electricity distributors ("Argentina govt not concerned over EDF's withdrawal - cabinet chief Messenger", *Yahoo! Finance*, 27 April 2005); Worldcom is in negotiations to divest itself of its controlling stake in Embratel, Brazil's long-distance telephone company; British Gas (United Kingdom) is in negotiations with Emgasud (Argentina), for the sale of its Argentinean affiliate Metrogas ("Un grupo argentino, cerca de MetroGas", *Clarín*, 5 May 2005); and the water company Uragua (Spain), announced in November 2004 its intention to leave the Uruguayan market ("Uruguay: Vázquez's investor nod", *Business Latin America*, 18 April 2005 (London: EIU)).

58 For example, in Chile, foreign investors and Chileans with residence abroad can invest through the Foreign Investment Statute known as Decree Law 600 that offers some tax advantages for foreign investors. They are provided with a stable tax horizon. Indeed, the decree allows investors to lock into the tax regime prevailing at the time an investment is made (Chile Foreign Investment Committee, "FDI in Chile, regulations and procedures", www.cinver.cl).

59 In Chile, the debt-to-equity swap mechanism was limited to foreigners or Chileans with residence and domicile abroad. In Mexico, foreign companies were given priority in terms of eligibility for investment under the debt-for-equity conversion programme.

60 ECLAC press releases, "Latin America will have to design and implement better foreign direct investment policies", 9 January 2002, available at www.eclac.cl, quoting the Regional Seminar on FDI Policies in Latin America: "Evaluating the Old, Contemplating the New", jointly organized by ECLAC and UNCTAD, and held at ECLAC headquarters in Santiago, Chile, 7-9 January 2002.

61 Surveys implemented by Latinobarometro in 17 Latin American and Caribbean countries indicate that the general public has increasingly turned against the privatization process, with the percentage of respondents dissatisfied with the process rising from 43% in 1988 to 75% in 2004. (LatinoBarometro 1998-2000, 2003, 2004, www.latinobarometro.org).

62 ENARSA will be the vehicle for companies wanting to enter the energy market or to obtain government incentives for investing in exploration and production. In May 2005, the Government presented before Congress a package of fiscal incentives featuring tax breaks for hydrocarbon companies that invest in exploration and production. To be eligible for these benefits the firms will have to work in partnership with the new State energy company ("Argentina: official investment push", *Business Latin America*, 30 May 2005 (London: EIU)).

63 TNCs oppose this law, claiming that it is in violation of their contracts, and they are threatening to take their case to international tribunals. It is also opposed by civil society groups (native Indian groups, labour unions, teachers, miners and coca-leaf farmers), which are pressing for the nationalization of Bolivia's energy industry and greater indigenous rights, among other demands. The growing tensions led the President to resign in June 2005.

64 *Avances de la Nueva PDVSA*, 15 April 2005, www.pdvsa.com.

65 To benefit from these fiscal incentives, investment projects must be approved by the authorities following public bids. A number of foreign firms such as Repsol-YPF, Peugeot Citroen, General Motors Argentina, Volkswagen Argentina, Cargill and Louis Dreyfus are among those that won the bids. ("Grandes inversiones en marcha están vinculadas a los subsidios estatales", *Clarín*, 15 May 2005).

66 To compensate for the effects of high interest rates and a strong currency, Brazilian officials pledged in May 2005 to grant incentives to exporters and software manufacturers to boost medium- and long-term foreign sales and investments ("Lula offers exporters tax breaks", *Business Latin America*, 30 May 2005 (London: EIU)).

67 In a 2004 survey by the Japan Bank for International Cooperation, for example, Brazil and Mexico were ranked 8th and 10th in the world, respectively, among the top destinations of Japanese automobile TNCs for the next three years (JBIC 2005).

68 DR-CAFTA is currently before the United States Congress. Opponents to the agreement are concerned about its potential to undermine the domestic sugar and apparel industries, the impact on the United States trade deficit and the differences prevailing in labour and environmental protection laws between the United States and the other signatory countries (*Bloomberg*, 3 May 2005, www.bloomberg.com, and Economist Intelligence Unit, *Viewswire*, 13 May 2005, www.viewswire.com). The agreement is also opposed by civil society groups in the Dominican Republic and the Central American countries, where the issues of greatest concern include the provisions on investment, services, and government procurement that might lead to or extend privatizations. There are also concerns about the impact of the free access of United States agricultural products to Central American markets on the Central American agricultural sector, which is the source of half of local employment.

69 The main activity of the oil company Petrom is petroleum products and this is registered as part of manufacturing.

70 The FDI statistics for Turkmenistan, another natural-resource-rich country of the region, are incomplete and may underestimate the extent of investment in oil and natural gas there. Sources other than balance of payments indicate that foreign firms in that industry have invested large sums ("2005 Investment Climate Statement – Turkmenistan", Washington, D.C.: United States Department of State, www.state.gov).

71 In 2004, Cyprus was the largest source of foreign investment in the Russian Federation, and Luxembourg was third (Russian Federation, State Statistical Service, *Current Statistical Survey: Quarterly Magazine*, No. 1 (52), 2005). As noted in *WIR00* (p. 65), most FDI coming from Cyprus is actually round-tripping Russian

capital. See also Pelto et al. 2003. Similarly, Luxembourg is a source of "trans-shipped" FDI (*WIR04*, p. 69).

72 The strategic importance of the Baku-Tbilisi-Ceyhan pipeline lies in the fact that it is the first alternative route outside the Russian Federation for transporting Caspian oil to Western Europe. The construction of the pipeline has been accompanied by an intense debate on its environmental and human rights impact (Shelley 2005, pp. 107-109).

73 Global firms include such as the BG Group (United Kingdom), Agip (Italy), Chevron Corp. (United States), ExxonMobil (United States), Lukoil (Russian Federation) and BP (United Kingdom). Independent companies are incorporated and listed abroad, despite the fact that all of their oil exploration and extraction takes place in Kazakhstan. Petrokazakhstan (Canada), the largest independent oil company operating in Kazakhstan, is the second largest foreign-owned petroleum producer there (Dashevsky and Loukashov 2004, p. 38). There are other independent oil firms in the country such as Chaparral Resources (United States), Nelson Resources (Bermuda) and Transmeridian Exploration (United States), BMB Munai (United States), Aurado Energy (Canada) and EMPS (United States).

74 "OAO Lukoil: oil company, Uzbekistan sign $1 billion natural gas deal", *Wall Street Journal*, 17 June 2004. p. 1.

75 As Yukos could not pay its tax arrears, its assets were seized and put on auction. At one auction in December 2004, the Yuganskneftegaz oil extraction affiliate of Yukos was sold to a financial company, which in turn was taken over by the State-owned Rosneft company three days later ("Kremlin-owned firm buys Yukos asset", *Wall Street Journal*, 23 December 2004. p. A.3; "Rosneft buys Yukos unit's mysterious new owner" *International Herald Tribune*, 24 December 2004, p. 13).

76 "TNK-BP faces dollars 87m back-tax bill", *Financial Times*, 12 November 2004. p. 16. In April 2005, the tax arrears claim on BP-TNK was increased from less than $100 million to almost $1 billion ("Putin gives big oil the cold shoulder", *Fortune*, 16 May 2005, p. 32.)

77 "Ukraine trims privatisation check", *BBC News*, 21 February 2005, www.news.bbc.co.uk, and "Daily news and analysis", *MFK Investment Bank* (Kiev), 16 February 2005, mimeo.

78 The term "Dutch disease" is named after the effects on the economy of natural gas discoveries in the Netherlands, and is most commonly applied to exchange rate appreciation caused by massive exports by the natural resource extractive industries, leading to high production costs (including wages) in other manufacturing activities.

79 FDI inflows to the chemicals industry more than doubled to $7.5 billion and they also rose in the electrical equipment industry, from -$6.5 billion in 2003 to $1 billion in 2004. This industry accounted for more than one-fifth of total United States exports in 2003 (data from United States Department of Commerce, www.bea.gov.doc and annex table A.I.1).

80 In 2004, the euro appreciated substantially against the United States dollar. This appreciation alone resulted in a 4% decline in the dollar value of FDI inflows into the euro-zone countries.

81 Total FDI inflows were negative as the net repayment of intra-company debt ($13 billion) by foreign affiliates in the Netherlands was larger than inflows of equity investment ($2.8 billion) and reinvested earnings ($5.7 billion) combined.

82 Germany became the world's third largest private equity market by value after the United States and the United Kingdom in 2004. "German business welcomes the private equity "locusts", *Financial Times*, 5 May 2005. Carlyle, Kohlberg Kravis Roberts and Goldman Sachs are typical foreign equity investors active in the German market. (For a brief description of private equity companies and their cross-border investments, see chapter I, footnotes 30 and 31).

83 FDI inflows to France fell by nearly half, from $42 billion in 2003 to $24 billion in 2004, due primarily to divestment in equity capital linked to cross-border M&As and a sizeable reduction in intra-company loans. In 2004, inward equity investment flows to France fell by 67% and intra-company loans (which are recorded in the category "other types of inward investment") fell by 37%.

84 In Ireland, FDI inflows fell sharply from $27 billion in 2003 to $9 billion in 2004. This is largely explained by a fall in inward equity investment, by $5.7 billion in 2004, combined with a sizeable decline ($8.8 billion) in reinvested earnings.

85 In Spain, FDI inflows have been declining over the last couple of years owing to the diminishing impact of a special corporate income tax regime (Law 43/1995, last amendment 2000) of which companies have already taken advantage. Also, Spain's traditional low-labour-cost advantage, which had successfully attracted manufacturing investors, might be eroded with the enlargement of the EU to include countries with even lower labour costs. This may affect FDI inflows adversely. For example, Samsung withdrew from Spain and relocated its affiliate to lower cost Slovenia.

86 In 2004, 40% and 43% of cross-border M&A sales, in terms of value and number respectively, in the United Kingdom were concluded with United States firms/investors (data from United Kingdom, National Statistical Office).

87 The Government sold a 49% stake of Zapadoslovenska Energetika to Germany's EON Energie, a 49% stake in Stredoslovenska Energetika to Electricité de France and a 49% stake in Yvychodoslovenska Energetika to Germany's RWE Plus (www.slovakia.org).

88 Out of 88 cross-border M&As completed in Japan in 2004, almost one-third were undertaken by either asset management companies (fund managers) or security brokers (e.g. Carlyle Group (United States), Lone Star Fund (United States), Morgan Stanley (United States).

89 For example, a new immigration law approved in July 2004 makes it easier for companies to attract and keep highly qualified foreign employees, and for foreign investors to gain permanent resident status in Germany by investing one million euros and creating ten new jobs.

90 The largest FDI-related investment – $800 million by Apollo Rida (United States) in Poland in 2004 – was in real estate (Polish Information and Foreign Investment Agency).

91 For example, Fondo Immobilli Pubblici was acquired by a United Kingdom Investor group for $1.9 billion and New Real SpA was acquired by Excelsia Otto (Germany) for $1.7 billion in 2004 (annex table A.I.1).

92 In 2004, the Government of Canada sold all Petro Canada shares in a global offer, making this the fifth largest global privatization of the decade (Department of Finance, Canada, www.fin.gc.ca).

93 Under the Act, corporate taxes on dividends to the parent firm are taxed at a one-off effective tax rate of 5.25%, available for one of two tax years, as opposed to the previous rate of 35% under certain conditions. This is aimed at boosting job creation and R&D in the United States.

94 Estimated by Deutsche Bank (www.db.riskwaters.com).

95 *Financial Times*, 31 Jan 2005, p.17.

96 *European Central Bank*, June 2005, p. 68.

97 For instance Terna (Italy's national power grid), Snecma (France's national maker of aircraft engines), Electricité de France (EDF) and Gaz de France (GDF) have gone or are expected to go to initial public offerings in 2005.

98 The survey did not include the 10 new EU accession countries.

PART TWO

R&D INTERNATIONALIZATION AND DEVELOPMENT

INTRODUCTION

Bridging the technology gap between countries is necessary to foster sustainable economic development. Technology is advancing faster than ever before. Developing countries that fail to build capabilities enabling them to participate in the evolving global networks of knowledge creation risk falling further behind in terms of competitiveness as well as economic and social development. While international technology transfer can bring important knowledge to an economy, that alone is not enough. Using new technologies efficiently requires creating additional absorptive capacity, while a continuous effort has to be made to keep up with technical change. This is particularly true given the fact that wages tend to rise as a country develops, facilitating the entry of lower cost competitors in the market. While actions of both domestic enterprises and the government are essential to build technology capabilities in developing countries, TNCs can also play a role.

One of the main reasons why developing countries promote inward FDI is indeed to link up to the global technology and innovation networks led by these firms. In terms of creating new technology and diffusing it internationally, TNCs are world leaders in many industries. They account for the bulk of global business expenditures on R&D. They dominate new patents and often lead innovation in management and organization. Establishing links with their innovation and production networks can help countries enhance their technological capabilities and enable them to compete better in international markets.

Technological capabilities are difficult to acquire. The rapid pace of technical change and the growing importance of science-based technologies in many industries call for more advanced and diverse skills and intense technical effort. These require better infrastructure, not the least in information and communications technologies. They also require strong supporting institutions as well as stable and efficient legal and governance systems. Moreover, they require access to the international knowledge base, combined with a strategy to leverage this access for the benefit of local innovation systems. The cumulative forces that are increasing the gap between countries with respect to innovation performance make the role of policy increasingly important at all levels – national and international.

The manner in which TNCs allocate their R&D activities internationally is significant in this context. R&D is among the least internationalized functions of TNCs. Traditionally, when R&D internationalization took place, both home and host countries were found in the developed world. To the extent that TNCs undertook R&D in developing countries, they did so almost exclusively to adapt products and processes to local conditions. These stylized facts have begun to change.

These changes manifest themselves in several ways. First, the degree of R&D internationalization by firms is rising in all key home countries as part of the overall trend towards the offshoring of services (*WIR04*). German TNCs, for example, set up more foreign R&D units during the 1990s than they did during the preceding 50 years (Ambos 2005). Second, R&D internationalization is now growing fastest in some host developing countries, notably in Asia. Third, the drivers of R&D internationalization are changing. The process is no longer driven only by the need for local adaptation or to tap into established knowledge centres. In response to increasing competition, TNCs now relocate segments of R&D so as to access foreign pools of research talent, reduce R&D costs and speed up the process of technology development. Fourth, R&D in some developing countries now goes well beyond local adaptation and involves complex stages of R&D on a par with work undertaken in the developed economies. Fifth, developing-country firms are also setting up R&D units abroad. These trends have become apparent only in the past few years and are likely to continue.

This new phenomenon is partly expected and partly unexpected. It is expected in two ways. First, in most cases R&D undertaken abroad supports production. As TNCs increase production in developing countries, some R&D (of the adaptive kind) can be expected to follow. Second, R&D is a form of service activity. Many other services are fragmenting in a process whereby certain segments are located in countries with lower wages and appropriate skills. It is not surprising that R&D is following suit. Indeed, the survey of Europe's largest firms conducted in 2004 by UNCTAD and Roland Berger showed that all service functions – including R&D – are now candidates for offshoring (*WIR04*). It is unexpected in that R&D is a service activity with very demanding skill, knowledge and support needs — traditionally only met in developed countries with strong national innovation systems. Moreover, R&D is taken to be the least "fragmentable" of economic activities because it involves knowledge that is strategic to firms, and because it often requires dense knowledge exchange (much of it tacit) between users and producers within localized clusters. A home-country bias in R&D activities "reflects the linguistic and geographic constraints imposed by person-embodied exchanges and transfers of tacit knowledge" (Patel and Pavitt 2000, p 218).

The extent to which developing countries connect with the internationalizing R&D networks of TNCs depends in particular on the strength of their national innovation systems. This in turn is dependent on policies, the quality of institutions (including both organizations and the rules governing innovation activities), the quality of human resources and the production and innovative capabilities of enterprises. Innovation reflects an intense interaction between firms and other actors in the public and private sectors. Innovation in developing countries is often carried out on the shop floor, in process or product engineering, quality control, procurement, distribution and overall management. However, a significant part also involves technical effort in R&D laboratories separated from production. R&D-based innovation is greater the more advanced, fast changing and large-scale the technology involved, but it is needed even if it does not aim to push forward frontiers of knowledge.

Part Two of *WIR05* reviews recent trends in the internationalization of R&D by TNCs. It begins in chapter III by looking at the links between R&D, innovation and development, and considers the levels of innovative capabilities among countries around the world. Large gaps in this area prevail between countries — gaps that limit the ability of many of them to take part in the global networks of knowledge creation and diffusion. Addressing these gaps is a major development challenge; it is also essential to ensure that the internationalization of R&D by TNCs benefits larger parts of the world.

Chapter IV identifies the main players (firms and countries) in the R&D internationalization process. The analysis is confined to R&D due to data constraints, but, where available, other qualitative information related to innovation, notably in services, is also considered. Chapter V discusses the changing drivers and determinants of R&D internationalization. Chapter VI reviews the implications of R&D internationalization for host and home economies, recognizing the difficulties involved in assessing the impact of this phenomenon. The last two chapters (VII and VIII) focus on policy implications at the national and international levels. They place particular emphasis on the need to promote interaction between TNCs and domestic players (firms and institutions) in national innovation systems.

CHAPTER III

INNOVATION, R&D AND DEVELOPMENT

A. Innovation matters for all countries

Innovative activity and capabilities are essential for economic growth and development. A recent report identifies science, technology and innovation as essential to achieving the Millennium Development Goals (UN Millennium Project 2005, Sachs and McArthur 2005). This is true for the industrialized countries that are at the technology frontiers, as well as for developing countries that need to catch up in terms of technology.

Given the large gap between the developed and developing countries in terms of technological advancement, the latter continue to rely heavily on technology transfer from the former in their development process. However, sustainable economic development requires that countries do more than simply "open up" and passively wait for new technologies to flow in. It demands active, continuous technological effort by enterprises, along with government policies that help firms attract technologies, use them effectively and innovate. Technology requires efforts to absorb and adapt; it has strong "tacit" elements that cannot be embodied in equipment or codified in instructions or blueprints. Tacit knowledge can only be transferred effectively if the recipient develops capabilities to learn and incorporate the knowledge. It must seek new information, experiment with the technology, find new ways of organizing production and train its employees in new skills. It involves not just the enterprise itself but also interaction with other firms and institutions.

The development of technological capabilities has always been necessary for the effective use of new technologies; all the more so today. Greater openness to trade and capital flows does not reduce the need for local technological effort – on the contrary. Technologies are changing more rapidly, falling transport costs and liberalization are intensifying competition, and TNCs are seeking locations with strong capabilities to produce efficiently. Moreover, it is not just export-oriented manufacturing that needs to be competitive; manufacturers selling to domestic markets have to compete against imports. Export-oriented services and primary activities need to use new technologies to remain competitive in world markets. The development of new capabilities applies to both technical functions and managerial ones: organizational and marketing innovation is as important as technical innovation to growth and competitiveness (Teece 2000).

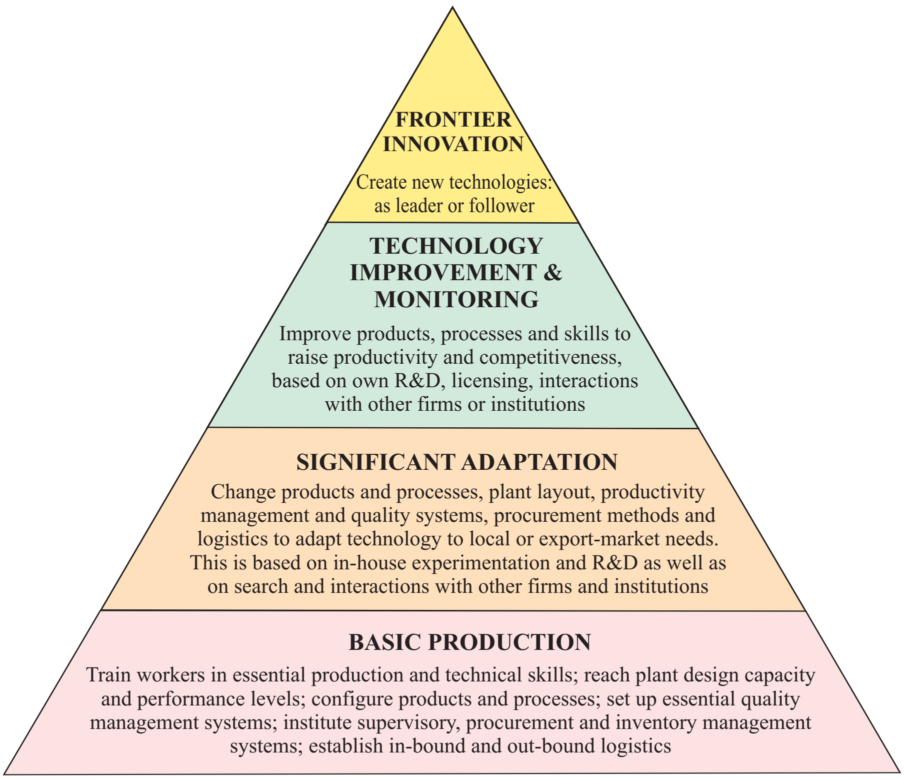
Technological innovation means the introduction of new products, processes or services into the market.[1] Innovation does not necessarily mean pushing the frontiers of knowledge, particularly in a developing-country context. Rather, innovations can be *new to the user* but not necessarily *new to the world*.[2] The nature of innovation – and of required capabilities – varies greatly between activities according to their technological complexity, the creation of new technology being at one extreme and the use of existing technologies at the other.[3] Figure III.1 shows an illustrative pyramid, with the least complex technological functions (in terms of innovative efforts) at the base, and the most demanding ones at the top.[4] While these categories are generic activities in all three sectors – primary, manufacturing and services – they can be adapted to different technologies to take account of particular machinery, process, product and organizational characteristics.

- The starting point is the acquisition of basic production capabilities to absorb and use existing technology. This sounds easy but it is not, at least in order for capabilities to match relevant global best practice and for activity that goes beyond simple assembly. Reaching internationally acceptable levels of production efficiency and quality in complex activities is very demanding. Many enterprises fail to do this, even after years of operation, unless they invest sufficiently in collecting information, creating new skills and developing appropriate management structures.

- Absorption and adaptation of technology are particularly challenging if conditions are significantly different from those at the origin of the technology, and if local support and supply structures are weak.
- Adaptation, in turn, can grow into significant technological improvement and technological learning, with systematic efforts made to improve product and process performance. At this stage, many firms start monitoring international technological trends and selecting those technologies that can feed into their own efforts.
- Finally there is the frontier innovation stage, when firms design, develop and test entirely new products and processes.

Research and development (R&D) is one source of innovation (box III.1). In the early stages of technological activity, enterprises need not set up formal R&D departments. As they mature, however, it becomes increasingly desirable to monitor, import and implement technologies. R&D as a distinct activity may appear as early as the second level of complexity, where multifaceted technologies are involved or if local conditions demand significant adaptation. In a developing country, such R&D is feasible once the operation is fairly large scale and the necessary technical skills are available. The role of formal R&D then grows as the firm attempts significant technological improvements to introduce new products or processes. Firms that reach the highest level in the pyramid need not, however, be frontier innovators (technological "leaders") – their R&D may build on or improve upon innovations done elsewhere (technological "followers"). A specialized unit not involved in routine technical or production work is needed to monitor new developments outside the firm or country, assess their significance for the firm and master, adapt and improve on existing technologies.[5] *Formal R&D becomes an essential part of the*

Figure III.1. Stages of technology development by innovation effort



Source: UNCTAD.

technological learning process, especially for complex and fast moving technologies.

Empirical studies suggest a direct relationship between R&D and growth.[6] The long-term impacts on economic growth of public R&D and business R&D have been found to be strong and significant (Guellec and van Pottelsberghe 2004a). Business R&D undertaken in other countries also plays an important role. Moreover, increased domestic business R&D accentuates the positive impact of both public and foreign business R&D. In other words, business R&D (either domestic or foreign-funded) has both a direct impact on a country's economic growth and an indirect one through improved absorption of the results of public R&D and R&D performed in other countries.

Enterprises are the principal agents of innovation today, but they do not innovate and learn in isolation. They rely on intricate (formal and informal) links with other firms and with public research institutions, universities and other knowledge creating bodies like standards and metrology institutes. In undertaking innovation, they react to government policies on trade, competition, investment and innovation. They seek human resources for innovation from the education and training system, and they draw upon the financial system for funding innovative efforts. The complex web within which innovation occurs is commonly referred to as the "national innovation system" or NIS (Nelson 1993, Lundvall 1992b).

Most of the NIS literature focuses on frontier invention in industrialized countries, rather than on mastery and adaptation of technology that take place in developing countries. However, the innovation system concept is just as relevant for the latter (UNIDO 2003, Edquist and McKelvey 2001). Most learning, mastery and adaptive activity requires close and continuous interaction with other enterprises like suppliers, subcontractors, competitors and consultants, as well as with other actors such as public R&D institutes, universities,

Box III.1. Definition of R&D

R&D is only one component of innovation activities, but it represents the most developed, widely available, and internationally comparable statistical indicator of industrial innovation activities.

According to international guidelines, R&D (also called research and experimental development) comprises creative work "undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications" (OECD 2002b, p. 30).

R&D involves novelty and the resolution of scientific and technological uncertainty. It includes basic and applied research along with development (United States, NSB 2004):

- *Basic research.* The objective of basic research is to gain a more comprehensive knowledge or understanding of the subject under study without specific applications in mind. In industry, basic research is defined as research that advances scientific knowledge but does not have specific immediate commercial objectives.
- *Applied research.* The objective of applied research is to gain the knowledge or understanding to meet a specific, recognized need. In industry, applied research includes investigations to discover new scientific knowledge that has specific commercial objectives with respect to products, processes, or services.
- *Development.* Development is the systematic use of the knowledge or understanding gained from research directed towards the production of useful materials, devices, systems or methods, including the design and development of prototypes and processes.

For data collection purposes, the boundary between R&D and other technological innovation activities can be found in pre-production development activities (OECD 2002b). In practice, however, it is difficult to make the distinction. In technology-intensive industries distinguishing between "research" and "development" is especially difficult since much of the R&D work conducted involves close interaction between researchers in both the private and public sectors, often also including close collaboration with customers and suppliers (BIAC 2005, Amsden and Tschang 2003).

Source: UNCTAD and Moris 2005b.

the metrology, standards, testing and quality (MSTQ) system, small and medium-sized enterprise (SME) extension services, venture capital funds and export marketing or training institutions. A good supportive institutional infrastructure is therefore important for effective innovation. Incentive structures that foster entrepreneurship, risk-taking and innovation at the firm, industry and university level are also important.

As the internationalization of production deepens and communication costs decline, each NIS increasingly draws on knowledge created in other systems. Rapid technical progress and the rising costs and risks of innovation force innovators to seek centres of scientific excellence internationally. Global production networks – in which TNCs play the leading role – link together the productive activities that underly innovation. Parent companies are instrumental in such networks, providing the initial technology to their affiliates and helping them absorb, adapt and subsequently upgrade it. As a result, the innovation systems of more and more countries are becoming interlinked in a global network in which technological activity is international and information networks span the world.

From an economic development perspective it is becoming increasingly important to take part in this international exchange. Those countries that are in a position to do so stand a better chance of accessing new technologies at an early stage, as well as commercializing innovations developed in their own NIS. However, the capabilities needed for participating are unequally distributed among countries (see below), which increases the risk of a further widening of already large development gaps.

While there are different ways for countries to participate in the international exchange of innovation (box III.2), *WIR05* focuses on the role of TNCs in this process, with special emphasis on the internationalization of R&D. As noted above, R&D is not always necessary for innovation. Due to data limitations, however, the analysis in Part Two is confined to this particular type of innovative activity. The next two sections describe the global allocation of R&D and of innovative capabilities. Subsequent chapters

Box III.2. Different ways of internationalizing innovation

There are three main categories of innovation internationalization (box table III.2.1). In the first category, national enterprises and TNCs as well as individuals are engaged in the international commercialization of technology developed at home. The second category relates to domestic and international technical and scientific collaborations among private and public institutions, including domestic firms and TNCs, universities and research centres. International innovation by TNCs is the third category. The TNC is the only institution that, by definition, can control and carry out within its boundaries the process of innovation across the globe.

Box table III.2.1. Taxonomy of internationalization of innovation

Category	Actors	Forms
International exploitation of nationally produced innovations	Profit-seeking (national and transnational) firms and individuals	• Exports of innovative products • Cession of licenses and patents • Foreign production of innovative goods internally designed and developed
International techno-scientific collaborations	Universities and public research centres National and transnational firms	• Joint scientific projects • Scientific exchanges, sabbaticals • International flows of students • Joint ventures for specific projects • Production agreements with exchange of technical information and/or equipment
International generation of innovations	TNCs	• R&D and other innovative activities both in home and host countries • Acquisitions of existing R&D units or greenfield R&D investment in host countries

Source: adapted from Archibugi and Michie 1995, Narula and Zanfei 2004.

Source: UNCTAD.

focus on the internationalization of R&D, the trend towards increased R&D by TNCs in developing countries, the driving forces behind this phenomenon, potential impacts and policy implications.

B. Global R&D trends

1. R&D is geographically concentrated

Between 1991 and 1996, global R&D spending increased from $438 billion to $576 billion (an average annual growth of 4.4%; annex table A.III.2). The momentum of R&D spending continued throughout the late 1990s and the beginning of the new millennium. By 2002 it had risen to $677 billion,[7] corresponding to an average annual growth rate of 2.8% since 1996.

R&D expenditure is geographically concentrated. In 1996 and 2002, the ten largest spenders accounted for more than 86% of the world total, with their share marginally increasing over that period (table III.1). Eight of them are developed countries, of which the United States reported by far the largest amounts in both years. Only two developing countries are among the top ten: China and the Republic of Korea.

Table III.1. The 10 leading economies in R&D and business R&D spending, 1996 and 2002
(Ranked by their 2002 values, billions of dollars)

Total R&D				Business R&D			
Rank	Economy	1996	2002	Rank	Economy	1996	2002
	World	575.6	676.5		World	376.3	449.8
1	United States	197.3	276.2	1	United States	142.4	194.4
2	Japan	138.6	133.0	2	Japan	92.5	92.3
3	Germany	52.3	50.2	3	Germany	34.6	34.8
4	France	35.3	32.5	4	France	21.8	20.6
5	United Kingdom	22.4	29.3	5	United Kingdom	14.5	19.6
6	China	4.9	15.6	6	Korea, Republic of	9.9	10.4
7	Korea, Republic of	13.5	13.8	7	China	..	9.5
8	Canada	10.1	13.8	8	Canada	5.9	7.9
9	Italy	12.6	13.7	9	Sweden	6.6 [a]	7.3 [b]
10	Sweden	8.8 [a]	9.4 [b]	10	Italy	6.7	6.6
	Total	495.8	587.6		Total	334.7 [c]	403.4
	Share in world (%)	86.1	86.9		Share in world (%)	88.9	89.7
	Developing economies, South-East Europe and CIS	44.5	57.1		Developing economies, South-East Europe and CIS	20.4	31.9
1	China	4.9	15.6	1	Korea, Republic of	9.9	10.4
2	Korea, Republic of	13.5	13.8	2	China	..	9.5
3	Taiwan Province of China	5.0	6.5	3	Taiwan Province of China	2.9	4.0
4	Brazil	6.0	4.6 [e]	4	Russian Federation	2.6	3.0
5	Russian Federation	3.8	4.3	5	Brazil	2.7	1.9 [e]
6	India	2.1	3.7 [b]	6	Singapore	0.8	1.2
7	Mexico	1.0	2.7	7	Mexico	0.2	0.8 [b]
8	Singapore	1.3	1.9	8	Turkey	0.2	0.4
9	Turkey	0.8	1.2	9	Hong Kong, China	0.2 [d]	0.3
10	Hong Kong, China	0.7 [d]	1.0	10	Chile	0.1	0.2
	Total	39.1	55.4		Total	19.7	31.5
	Share in developing economies, South-East Europe and CIS (%)	88.0	97.0		Share in developing economies, South-East Europe and CIS (%)	96.4	98.7

Source: UNCTAD, based on annex table A.III.2.

a 1995.

b 2001.

c In 1996, Switzerland was the 10th largest spender on business R&D ($5.7 billion). Thus, the total of the top ten in that year was $340.4 billion.

d 1998.

e 2003.

The growth in global R&D is partly due to increased expenditures by the largest spenders. Between 1996 and 2002, the growth in the R&D expenditure of the United States (5.8% per year) was twice as high as the world average. Canada and the United Kingdom also showed fast expansion during that period. The expenditures of China rose at an average annual rate of more than 20% during the same period. This dynamism contrasts sharply with the trends of France, Germany and Japan, where R&D expenditures actually contracted in dollar terms.[8]

The combined share of developing economies, South-East Europe and the CIS in global R&D spending is on the rise, although from a very low level. In 1991 they accounted for only 2.5% of the world total (annex table A.III.2). By 1996 their share had reached 7.7%, and by 2002 it had increased further to 8.4% (figure III.2). This increase was concentrated mainly in South, East and South-East Asia (table III.2), which accounted for a dominant and growing share in R&D expenditure outside developed countries (more than two-thirds in 2002). With the exception of West Asia, the share of all other subregions in the grouping dropped between 1996 and 2002. The decline was the most pronounced in Latin America and the Caribbean, the share of which shrunk from 21% to 16% of the total for the countries included in table III.2. Africa's share also declined from 2.2% to 1.9%.

The concentration of R&D expenditures outside developed countries is high and rising. The ten largest R&D spenders of the developing economies, South-East Europe and the CIS in 2002 accounted for 97% of all R&D in these economies (table III.1). Reflecting the dynamics of South, East and South-East Asia, six of the top ten are from these subregions. In the majority of these economies, R&D expenditure grew fast during the period. Double-digit annual growth rates were recorded for China, India and Mexico. R&D expenditures contracted in dollar terms only in Brazil.

In today's world economy, enterprises (private and State-owned) account for the lion's share of global R&D. In 1991, they spent $292 billion on R&D (annex table A.III.2). That amount increased to $376 billion in 1996 and $450 billion in 2002 (figure III.2). In other words, in each of these years enterprises were responsible for two-thirds of global R&D spending; the remaining one-third was accounted for by governments, higher education institutions and non-profit private entities.

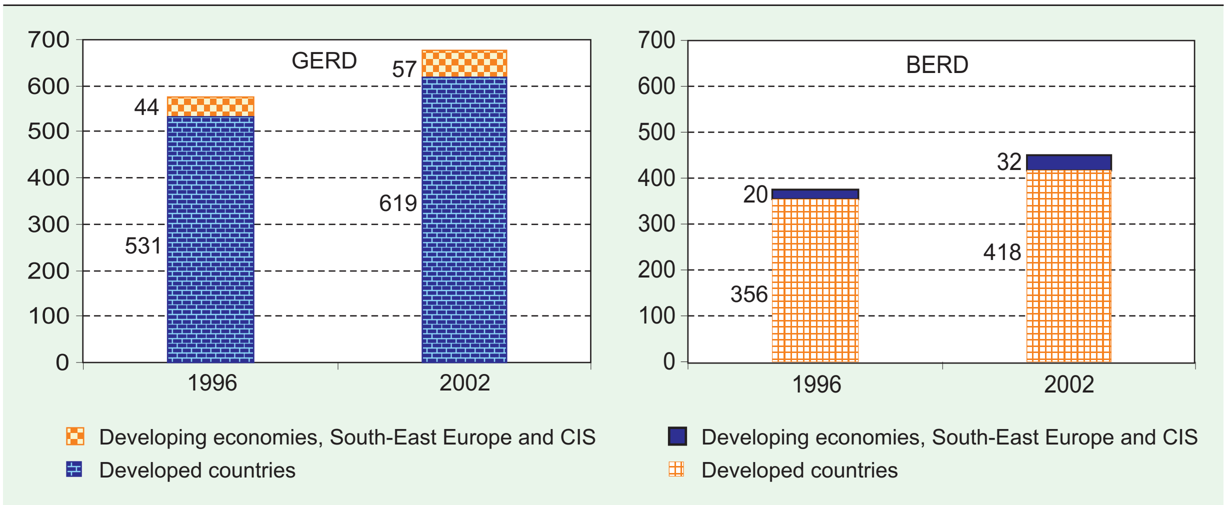
While the overall share was stable at the global level, the share of business enterprises in total R&D expenditure varied considerably by region and country (figure III.3). In the Triad – Japan, the United States and the EU – the share of enterprises was above 60% in 2002. Between 1996 and 2002 this share rose in Japan and the EU but not in the United States. In developing Asia, the share of enterprises rose rapidly over that period, reaching a level similar to that of the EU by 2002 (62%). Conversely, the share of enterprises in Latin America and the Caribbean was low and even declined in 1996-2002 (from 37% to 33%).[9]

Reflecting the dominant role of enterprise R&D in global R&D, the geographical patterns of the former show various similarities with those of the latter. R&D in the business sector is concentrated, just like total R&D. Both in 1996 and in 2002, the ten largest spenders on business R&D accounted for about 90% of the world total, their share marginally increasing over that period (table III.1). The list of the largest business R&D spenders is identical with that of the largest total R&D spenders; only the rankings vary. In a slight contrast to the global picture of total R&D, in business R&D only the spending of France, Italy and Japan declined in dollar terms in 1996-2002.

The share of developing economies, South-East Europe and the CIS in global business R&D spending is lower than in total R&D spending, reflecting a greater reliance on government R&D in these economies. Their share in the former reached only 5.4% in 1996 and 7.1% in 2002 (figure III.2). The top ten positions in terms of business R&D among the developing economies, South-East Europe and the CIS differ from those for total R&D only because data are not available from India, and the tenth place is thus taken by Chile (table III.1). Six of the ten economies are from South, East and South-East Asia. Another feature of the list of the largest business enterprise R&D spenders among the developing countries is its very high geographical concentration (the share of the largest ten is 99% of the group total in 2002), reflecting in part a lack of data reporting on business R&D in the majority of developing economies.

An output-based assessment of global innovation activities confirms the patterns observed above. Whereas developed countries

Figure III.2. Gross expenditure on R&D (GERD) and business enterprise R&D (BERD), by country group, 1996 and 2002
(Billions of dollar)



Source: UNCTAD, based on annex table A.III.2.

in 2003 still accounted for 83% of all foreign patent applications to the United States Patent and Trademark Office (USPTO), the share of developing countries and South-East Europe and the CIS has risen particularly fast. Between the periods 1991-1993 and 2001-2003, it jumped from 7% to 17% (annex table A.III.3). The annual average number of applications from these countries increased from around 5,000 to almost 26,000 between the two periods. South, East and South-East Asia showed by far the greatest dynamism, followed by South-East Europe and the CIS. Two economies (Taiwan Province of China, Republic of Korea) accounted for four-fifths of the total. They were followed distantly by India, China, Singapore, Hong Kong (China), the Russian Federation and Brazil. Asia accounts for more than 95% of the patents granted in the United States to recipients from developing, economies South-East Europe and the CIS. The share of patent applications from Latin America and Africa, on the other hand, fell from already low levels between the two periods (see also section IV.B.4).

Table III.2. Developing economies, South-East Europe and CIS: distribution of R&D, by region
(Per cent)

Region	1996	2002
South, East and South-East Asia	63.5	70.1
Latin America and the Caribbean	21.1	16.0
South-East Europe and CIS	11.2	9.6
West Asia	2.0	2.4
Africa	2.2	1.9
Total developing economies, South-East Europe and CIS	100.0	100.0

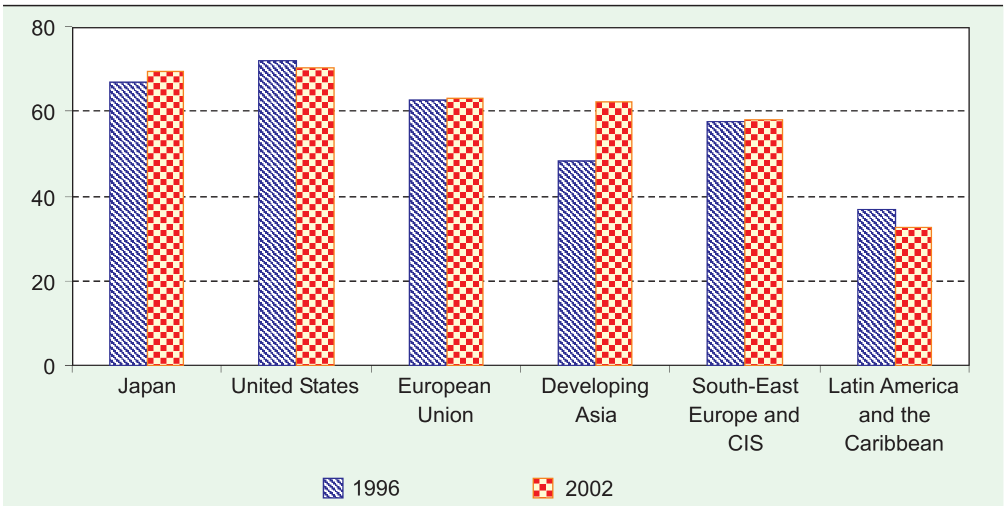
Source: UNCTAD, based on annex table A.III.2.

2. R&D by industry

Manufacturing firms have long conducted the bulk of business sector R&D in developed economies. In the United States, for instance, they accounted for 60% of company-funded R&D in 2001, with mining and extraction contributing only 0.5%, transportation 0.9% and utilities and construction 0.3% (United States, NSB 2004). However, the services sector also contributed significantly, with trade and other services together contributing 38% (see below). Within manufacturing, industries vary greatly in R&D intensity. For example, the OECD divides industries into four groups: *high technology*; *medium-high technology*; *medium-low technology* and *low technology* (table III.3).[10] The table is based only on the intensity of R&D; it does not necessarily depict the nature of the R&D conducted.[11]

R&D in services has traditionally been neglected in the literature, perhaps because of the assumption that services do not innovate or are primarily users of innovation in manufacturing (Howells, 2000; Tether 2004).

Figure III.3. Share of enterprise R&D in total R&D by country/region, 1996 and 2002
(Per cent)



Source: UNCTAD, based on annex table A.III.2.

Services do innovate in the broader sense in both processes (organizational change) and products (new services), but much of this innovation does not involve formal R&D. Data on this are therefore scarce, which makes empirical analysis difficult. This may be changing, however, as a result of new information and communication technologies (ICTs) and their growing role in service industries. The telecommunications and computer service industries have been investing in R&D for some time, and a new industry is now emerging that provides R&D services to manufacturers on a contractual basis (Tether 2002).

Data on services R&D are patchy. Published sources cover only a few industrialized countries up to 2000. However, they suggest that services R&D is rising in most economies, but that its share in total R&D varies greatly. Several countries showed substantial increases in services R&D from the early 1980s to the late 1990s; for instance, the shares of services in company-funded R&D increased by about 5 percentage points in France and Italy and 13 percentage points in Canada and the United Kingdom (United States, NSB 2004). The United States led the industrialized economies in terms of services R&D (box III.3). Interestingly, the R&D intensity of services (R&D as a percentage of sales) was higher than for manufacturing, though it also varied greatly by activity.

Table III.3. Classification of manufacturing industries by R&D intensity

Industry category	R&D intensity	Industries
High technology	>5%	Aircraft and spacecraft; pharmaceuticals; office, accounting and computing equipment; radio, television and communications equipment; medical, precision and optical instruments
Medium-high technology	1.5-5%	Electrical machinery and apparatus not elsewhere classified; motor vehicles, trailers and semi-trailers; chemicals excluding pharmaceuticals; railroad equipment and transport equipment not elsewhere classified; machinery and equipment not elsewhere classified
Medium-low technology	0.7-1.5%	Coke, refined petroleum products and nuclear fuel; rubber and plastic products; other non-metallic mineral products; building and repair of ships and boats; basic metals; fabricated metal products, except machinery and equipment
Low technology	<0.7%	Manufacturing, not elsewhere classified, and recycling; wood, pulp, paper, paper products, printing and publishing; food products, beverages and tobacco; textiles, textile products, leather and footwear

Source: United States, NSB 2004, Table 6-1.
Note: R&D intensity is direct R&D expenditures as a percentage of production (gross output).

3. Capability needs and benefits differ across activities

The efforts and capabilities required to master, adapt and create technologies, and thus to undertake R&D, differ. At the industry level, clothing manufacture is usually less complex in the range and depth of technical skills or information needed than making semiconductors. Within complex industries, technical processes may differ according to the speed of change and in the effort needed to create new generations of technology: steel technology today is more stable and less demanding in product innovation than electronics. Within any industry there can be differences according to product: in textiles, for instance, yarn spinning, a capital- and scale-intensive activity, requires more advanced technical skills than clothing manufacture. Finally, there are differences by function for any given product. In clothing, sewing is easier than designing new fashion products or managing an international supply chain.

There is a similar hierarchy of technical complexity in services, though it may be more difficult to define than in manufacturing. As noted in box III.2, some services now perform considerable R&D (indeed, the only output of contract research firms is research and development). Others do not conduct much formal R&D but innovate in terms of product development (e.g. new financial services by banks or new packages by tour operators) and management practices. In broad terms, service activities and functions can be ranked by the level of skills required – formal (education levels) or informal (employee training). In export-oriented services, for instance, the bottom end may include some call centres while the top end represents advanced R&D (*WIR04*).

Different types of R&D also yield *different benefits* in terms of adding value, learning, skill creation, productivity improvement, market growth and spillovers to other activities (chapter VI). Complex R&D activities generally call for, and so create, more advanced skills and knowledge than simple ones; they also yield higher value added. Activities associated with rapid technical progress offer better prospects for future productivity increase and enjoy faster growth than other activities.[12] Within a technology, advanced functions like design and development (as compared to basic production) provide higher value added and so higher wages. As innovation moves into higher functions, the NIS itself grows stronger and permits greater innovation in a more diverse range of activities.

The deepening of the industrial structure from simple to complex activities, and of innovative activities from simple to advanced functions, is a natural result of economic development, but accelerating and facilitating the process often requires active policies.[13] This applies not only to manufacturing but also to primary production (with the advent of biotechnology and genetic modification in agriculture), infrastructure and services (particularly those IT-based ones that are undergoing rapid offshoring, analysed in *WIR04*).

The R&D hierarchy for the manufacturing sector depicted above is actually a good representation of the industrialization process. Most developing economies start modern manufacturing with the simplest (low R&D) technologies: textiles, clothing, food-processing and wood products. Some move up the scale into heavy process industries (metals, petroleum refining) and metal products, providing basic intermediates. A few go on to become efficient users of "medium-high" technologies, making more advanced intermediate and capital goods (chemicals, automobiles, and industrial machinery). Even fewer develop competitive capabilities in high-technology industries like aerospace, micro-electronics or pharmaceuticals.

There is an important exception to this depiction, of special interest to this analysis. The "fragmentation" of production (i.e. the relocation of processes or functions across countries by TNCs to take advantage of differences in production and communication costs and skills) allows some countries without a strong R&D base to leapfrog to production in high-technology industries like electronics (Arndt and Kierzkowski 2001, Lall and Zhang 2004).[14] While developing countries generally start at the lowest level of technical complexity – final assembly – it *is* possible for them to move up the innovation ladder in electronics, taking on more demanding functions, handling more advanced equipment and making the more complex products.[15] For such science-based industries as biotechnology and some ICT-related industries, there may be limited need to locate the R&D activity in close proximity to production. As noted by one observer (Reddy 2000, p. 174): "because of their science base even theoretically trained personnel, with little or no industrial experience, can be employed for R&D functions in new technologies."

Box III.3. Services sector R&D in the United States

Service enterprises in the United States sharply increased their R&D spending and their share of total industrial R&D after the mid-1980s. Before 1983, service industries accounted for less than 5% of total industrial R&D; by 2002, their share reached 43%. The total value of R&D by services was $82 billion compared to $109 billion for manufacturing in 2002.

The amount of R&D by firms in service activities varied greatly (box table III.3.1). The leading performers were trade, scientific R&D services, software and computer systems design. With a combined R&D of $63 billion, they accounted for 77% of R&D by service firms.

The R&D intensity of service firms (R&D as a percentage of sales) is higher than that for manufacturing firms, though it also varies greatly by activity (box table III.3.2).

However, the classification of firms under service categories has to be treated with care. Companies are classified under various service activities on the basis of payroll, and the classification may be misleading as a result. This is particularly true of "trade". Thus, firms with a high payroll in sales and marketing are classified under "trade", and may include manufacturers with high marketing payrolls or diversified industrial conglomerates. One example of misclassification (noted by NSF) is that over $1 billion of biotech R&D in 2001 appears to have been performed by trading companies, when it is likely to have been performed by manufacturing companies.

Box table III.3.1. R&D spending by non-manufacturing activities in the United States, 2002
(Millions of dollars)

Total non-manufacturing	81 824
Mining, extraction and support activities	app. 700
Utilities	app. 100
Construction	164
Trade	app. 25 000
Information	17 870
Transportation and warehousing	app. 300
Newspapers, periodicals, books and databases	614
Software	12 927
Broadcasting and telecommunications	app. 1 600
Other information services	app. 2 600
Finance, insurance and real estate	1 903
Architecture, engineering, related services	4 159
Computer systems design, related services	11 983
Scientific R&D services	13 034
Other professional and scientific services	1 182
Management of companies and enterprises	148
Health-care services	app. 4 200
Other	app. 900

Source: United States, NSF (forthcoming), tables A-2, A-3. *Note*: Approximate (app.) figures are based on R&D funded by industry; data on federal funding of R&D are suppressed for confidentiality reasons, so that total R&D spending is also suppressed.

Firms in software and computer systems design and related services jointly spent $21 billion on R&D in 2002, raising their share of total United States company-funded R&D from 4% in 1987 to 12% in 2002.

Scientific R&D services, the leaders in R&D intensity in 2001, are provided by companies that perform R&D for other firms on a contractual basis, mainly in manufacturing. R&D by these firms more than doubled during 1997-2001, showing both the rising pace of innovation and the growing willingness of manufacturers to outsource R&D previously kept in-house (Jankowski, 2001).

Health-care services are tightly linked to the high-technology pharmaceutical industry. Firms in these services have traditionally done relatively little R&D, but there was a sharp increase in 2002. The financial services and insurance industry, along with broadcasting and telecommunications, does very little. However, formal R&D may not be the best way to measure innovation in these industries, as they are constantly designing and introducing new products and processes.

Box table III.3.2. R&D intensity: company and other (non-federal) R&D funds as % of net sales in R&D-performing firms

	2001	2002
All industries	3.8	3.6
Manufacturing	3.6	3.2
Non-manufacturing	4.0	4.1
Scientific R&D services	36.5	17.6
Software	19.3	21.4
Computer systems design, related services	16.5	14.3
Management of companies	7.8	7.6
Trade	6.2	5.0
Architectural, engineering, related services	5.2	5.3
Health-care services	4.1	15.1
Newspapers, periodicals, books, databases	2.7	2.8
Transportation and warehousing	2.4	0.5
Construction	1.4	0.6
Mining, extraction and support	1.3	3.2
Finance, insurance and real estate	0.7	0.6
Broadcasting and telecommunications	0.5	0.7
Information	4.4	4.0

Source: United States, NSF (forthcoming), table A-27.

Source: UNCTAD, based on information provided by NSF.

Some countries (Singapore among developing countries, Ireland among developed ones) have managed such upgrading rapidly; China appears set to follow suit. In other words, provided they have the absorptive capacity and appropriate policies and institutions in place, developing countries can take advantage of fragmentation to move up the technology ladder, both across activities and within them. The fragmentation of functions is proceeding even more rapidly in some services, as communication costs fall dramatically due to new information and communications technologies (*WIR04*). However, taking advantage of the potential of fragmentation requires countries to create knowledge and build local capabilities. As shown in the next section, the gap between the innovative capabilities of countries is very wide.

C. The innovation capability gap

1. Measuring innovation capabilities

In order for countries to connect with global networks of knowledge creation as well as to attract and benefit from R&D by TNCs, a certain basic level of innovative capabilities is needed. However, countries vary greatly in this respect, and in many cases the gaps between countries have been growing over time. In order to illustrate the current situation, *WIR05* introduces a new measure of national innovation capabilities: the UNCTAD Innovation Capability Index (UNICI). The UNICI measures two critical dimensions: (i) innovative activity (the *Technological Activity Index*) and (ii) the skills availability for such activity (the *Human Capital Index*). As it is not possible to measure national technological activity or skills directly, the indices use proxies. Since the data available even for the proxies are not complete (caveats are noted below) the indices should be interpreted with caution and seen mainly as broad indicators (box III.4).[16]

National innovative activity can be measured by its *inputs* or *outputs*. On the "input" side, the usual measures are R&D expenditures and/or employment. R&D is a narrow measure of innovation effort in that it does not capture informal technological effort; at the same time it is rather broad in that it includes defence and basic research that may not be relevant to the types of company R&D important for the present analysis.[17] Still, R&D data are the only ones available on a comparable basis across countries, and they provide an indicator of technical effort in complex activities (where the absorption of technologies requires formal R&D). As R&D expenditure data are more limited than R&D manpower data for a given year, only the latter appear in the index.

Innovation "outputs" are often proxied by patents (national or international) and scientific publications.[18] Data on patents taken out in the United States are singled out as they indicate that the innovation has reached a comparable level of novelty and is commercially valuable.[19] Patents are a better indicator of invention than of innovation, since they do not capture the commercial utility of the discovery; scientific publications are further removed from the market, though they do show the knowledge base on which technological activities depend.

The *human resource base for technological activity* is generally measured by educational enrolment. Enrolment data do not capture differences in the quality and relevance of the education; neither do they reflect skill development by learning on the job or other forms of employee training. Moreover, the available enrolment data are patchy and, in some countries, out of date. Again, they are the only data available for benchmarking skills and they do indicate differences in the education base on which technological capabilities are built.

These measures have to be normalized by economic size (say, population) to make them comparable across countries. However, where the absolute size of technological effort or skilled researchers matters (i.e. where there are minimum critical mass effects), it is also important to compare total values for economies. This is particularly relevant for the cross-border location of R&D (chapter V).

The components and variables of the UNICI are shown in table III.4. The three components of the Technological Activity Index are weighted equally while those making up the Human Capital Index are assigned different weights to capture the greater importance of high-level skills for innovation. The UNICI is calculated for 117 countries for the years 1995 and 2001. The starting year, 1995, was selected so as to include a large number of economies in South East Europe and the CIS.

The Technological Activity Index is shown in annex table A.III.4, with countries divided into four roughly equal groups. Its ranks were stable between 1995 and 2001 (with a correlation coefficient of 0.955). However, some countries changed ranks significantly. At the lower levels the changes generally arose from small shifts in one component, and so are difficult to interpret. At the higher levels they appear to be more clearly related to changes in technological effort. It should be noted that the Index does not capture the *absolute size* of the technological activities in each country, thus biasing the Index against countries like China or India with large rural populations, combined with large values for R&D spending. To the extent that the internationalization of R&D is affected by the absolute size of technological activity rather than its innovation intensity per capita, it is important to look at this factor as well (chapter V).

The Human Capital Index could be calculated for 119 countries.[20] The countries are grouped into three sets (annex table A.III.5). Most

Box III.4. Comparing the UNCTAD Innovation Capability Index with other indices

Various attempts have been made to benchmark national competitiveness and innovation, separately or together (all analysts accept innovation to be a vital ingredient of competitiveness).[a] A recent survey of many of the main indices found that they have several elements in common (Archibugi and Coco 2005).[b] All have variables for innovation inputs (R&D effort, measured by R&D spending or personnel), outputs (patents, nationally or in the United States) and human capital (different measures of education enrolment). Some also use scientific and technical journal articles, and some include variables for infrastructure (power and ICT). UNDP uses these infrastructure variables to capture technology diffusion (power for traditional technology and ICT for modern technology). The Rand index includes GDP per capita along with the number of universities and R&D institutions per capita. Some of these variables, like infrastructure, appear to be only remotely related to innovation; others, like GDP per capita, appear too broad to capture differences in technological capability.

The index which is probably closest to the UNICI is the Knowledge Index used by the World Bank (www.worldbank.org/kam). However, while the Knowledge Index encompasses 14 dimensions of knowledge capacities, the UNICI focuses on innovation capacity, drawing on a smaller set of variables. The UNICI weightings (especially with regard to human capital) are also different.

Broader competitiveness indices like the one calculated by the World Economic Forum (published in its annual *Global Competitiveness Report*) include subjective perceptions on the quality of innovation institutions, the strength of intellectual property protection, the aggressiveness of local enterprises in absorbing technology and the uniqueness of local product innovations.[c] These qualitative variables are not always reliable, however, as respondents from different countries may use different standards to answer the questions.

A merit of the UNICI is that it is based entirely on quantitative variables, and uses only those that are direct measures of technological activity and technical human capital. The technological activity component of the index uses R&D manpower,[d] patents taken out in the United States and scientific and technical publications (all deflated by population). The Human Capital Index uses literacy rates as the broadest indicator of skills, secondary enrolments as an indicator of workforce skills and tertiary enrolments as an indicator of high level skills. The components of the Technology Activity Index are not weighted, but those of the Human Capital Index are: higher levels of education are assigned higher weights because they are considered more important for technical and managerial innovation.[e]

Source: UNCTAD.

[a] See Archibugi and Coco 2004, IMD various years, Lall 2003, United States, NSB 2004, Porter and Stern 2001, UNIDO 2003, UNDP 2001, WEF various years.
[b] They discuss the UNDP index, their own ArCo index, the index developed by Lall and Albaladejo, 2002 and the Rand index (Wagner et al. 2001).
[c] For a detailed critique see Lall 2001b.
[d] The R&D manpower data were available for a larger number of countries than data for R&D spending.
[e] A simple weighting scheme of 1 for literacy, 2 for secondary enrolment and 3 for tertiary enrolment is used.

developed and some transition economies are in the leading group; this group also has four developing economies: the Republic of Korea, Taiwan Province of China, Argentina and Uruguay in that order. As with the Technological Activity Index, the Human Capital Index is stable over time, with a correlation coefficient of 0.973 between 1995 and 2001. Again, the absolute size of the skills availability is not captured by the index but is of importance for the international allocation of R&D internationalization (chapter V). The technology and skill indices are highly correlated (coefficients of 0.910 in 1995 and 0.889 in 2001), though technological effort and skill formation do not always go together.

2. The UNCTAD Innovation Capability Index

The *UNCTAD Innovation Capability Index (UNICI)* consists of the unweighted averages of the two indices mentioned above. Countries are divided into three groups: high, medium and low (table III.5). The high capability group in the UNICI comprises all developed countries (including the new EU members) as well as four developing and four South-East European and CIS countries (all from Europe). Three of the four developing economies are from South-East and East Asia; the fourth (Argentina) is from Latin America. The Asian ones combine strong technological and skill performance, while Argentina is weak in technology but somewhat stronger in skills. The economies in transition are in the top group mainly because of their skill base – their technological performance is relatively weak, with only one (the Russian Federation) in the high innovation group.

The "medium" capability group contains other South-East European and CIS economies as well as most resource-rich and newly industrializing economies (including China and two sub-Saharan African economies, South Africa and Mauritius). The "low" capability group has all the South Asian economies, one from South-East Asia (Indonesia), most sub-Saharan African economies and the remaining countries of Latin America, West Asia and North Africa. The rankings are in line with received knowledge about national capabilities. If some economies (like India) seem misplaced, the explanation lies in the use of total population as the deflator; while this is the correct way to construct the index, it can be misleading when minimum critical mass is important.

The unweighted regional averages for the UNICI are shown in table III.6. The developed countries are well in the lead, albeit with a slight decline in the average score. This does not mean that they are investing less in skills or innovation, but rather, that other countries are spending relatively more. The new EU members improved their scores during the period studied, approaching the levels of developed countries. The South-East and East Asia subregions are the clear leaders among developing regions, and their average score combined has improved over time. The West Asia and North African subregions also improved their performance, and overtook Latin America and the Caribbean, which had a deteriorating score between 1995 and 2001. South Asia also shows a lower score over time, mainly because of weaker technological performance by Pakistan and declining human capital performance by Sri Lanka. Sub-Saharan Africa improves its average score marginally but still lags behind all other regions.

Table III.4. Components of the UNCTAD Innovation Capability Index

Indices	Components	Weights attached
Technological Activity Index	R&D personnel per million population United States patents granted per million population Scientific publications per million population	All 3 components have equal weights
Human Capital Index	Literacy rate as % of population Secondary school enrolment as % age group Tertiary enrolment as % of age group	Weight of 1 Weight of 2 Weight of 3
UNCTAD Innovation Capability Index	Technological Activity Index Human Capital Index	Both indices have equal weights

Source: UNCTAD.

Table III.5. The UNCTAD Innovation Capability Index

	High					Medium					Low			
	1995		2001			1995		2001			1995		2001	
1	Sweden	0.957	Sweden	0.979	40	Uzbekistan	0.605	Jordan	0.595	79	Mongolia	0.321	Sri Lanka	0.317
2	Finland	0.947	Finland	0.977	41	Hong Kong (China)	0.593	Georgia	0.593	80	Tunisia	0.302	Botswana	0.315
3	Canada	0.947	United States	0.927	42	Cyprus	0.581	Chile	0.576	81	India	0.287	Algeria	0.312
4	United States	0.946	Denmark	0.926	43	Chile	0.581	Cyprus	0.566	82	Bolivia	0.283	Viet Nam	0.295
5	Australia	0.944	Norway	0.923	44	Slovakia	0.580	Uzbekistan	0.564	83	Honduras	0.279	India	0.285
6	Denmark	0.934	Australia	0.920	45	South Africa	0.579	Hong Kong (China)	0.563	84	Ecuador	0.279	El Salvador	0.279
7	Norway	0.929	Canada	0.907	46	Armenia	0.574	Lebanon	0.555	85	El Salvador	0.276	Zimbabwe	0.278
8	United Kingdom	0.914	United Kingdom	0.906	47	Costa Rica	0.555	Romania	0.554	86	Indonesia	0.276	Morocco	0.277
9	Netherlands	0.912	Belgium	0.894	48	Latvia	0.554	South Africa	0.548	87	Botswana	0.264	Indonesia	0.261
10	Belgium	0.911	Netherlands	0.888	49	Romania	0.554	Brazil	0.529	88	Namibia	0.261	Kenya	0.260
11	Japan	0.906	Japan	0.885	50	Lebanon	0.538	Armenia	0.526	89	Algeria	0.257	Syrian Arab Rep.	0.246
12	France	0.902	New Zealand	0.879	51	Kazakhstan	0.521	Kazakhstan	0.525	90	Oman	0.234	Oman	0.232
13	Germany	0.889	Switzerland	0.877	52	Kuwait	0.515	Uruguay	0.506	91	Paraguay	0.233	Dominican Republic	0.221
14	New Zealand	0.874	Iceland	0.876	53	Venezuela	0.504	Kyrgyzstan	0.500	92	Syrian Arab Rep.	0.225	Namibia	0.218
15	Switzerland	0.871	Taiwan POC	0.865	54	Moldova, Rep. of	0.497	Thailand	0.488	93	Viet Nam	0.218	Paraguay	0.213
16	Austria	0.852	France	0.863	55	Saudi Arabia	0.496	Saudi Arabia	0.476	94	Nicaragua	0.212	Nicaragua	0.179
17	Taiwan POC	0.852	Austria	0.852	56	Bahrain	0.485	Egypt	0.474	95	Kenya	0.173	Honduras	0.174
18	Iceland	0.835	Germany	0.850	57	Qatar	0.471	Kuwait	0.473	96	Guatemala	0.165	Nigeria	0.157
19	Ireland	0.829	Korea, Rep. of	0.839	58	Tajikistan	0.454	Costa Rica	0.472	97	Pakistan	0.160	Tanzania, United Rep. of	0.145
20	Korea, Rep. of	0.821	Spain	0.819	59	Mexico	0.454	Mexico	0.469	98	Zambia	0.150	Ghana	0.143
21	Spain	0.814	Ireland	0.814	60	Philippines	0.452	Malaysia	0.467	99	Nigeria	0.137	Uganda	0.140
22	Israel	0.808	Israel	0.804	61	Egypt	0.449	Bahrain	0.466	100	Cameroon	0.133	Pakistan	0.137
23	Russian Fed.	0.797	Slovenia	0.801	62	Peru	0.448	Venezuela	0.460	101	Ghana	0.131	Guatemala	0.135
24	Italy	0.781	Russian Fed.	0.788	63	Turkey	0.430	Peru	0.425	102	Côte d'Ivoire	0.129	Cameroon	0.134
25	Estonia	0.774	Estonia	0.775	64	Brazil	0.421	Philippines	0.423	103	Benin	0.118	Madagascar	0.133
26	Belarus	0.770	Singapore	0.748	65	Thailand	0.413	Moldova, Rep. of	0.413	104	Malawi	0.109	Yemen	0.130
27	Slovenia	0.763	Italy	0.746	66	Jamaica	0.394	Qatar	0.403	105	Bangladesh	0.109	Côte d'Ivoire	0.127
28	Greece	0.733	Portugal	0.746	67	Malaysia	0.393	Jamaica	0.395	106	Senegal	0.105	Bangladesh	0.121
29	Ukraine	0.728	Lithuania	0.742	68	Mauritius	0.390	Colombia	0.393	107	Uganda	0.081	Zambia	0.115
30	Singapore	0.719	Greece	0.737	69	Kyrgyzstan	0.370	Mongolia	0.391	108	Tanzania, United Rep. of	0.080	Benin	0.106
31	Poland	0.717	Poland	0.732	70	Colombia	0.367	Turkey	0.390	109	Yemen	0.079	Malawi	0.105
32	Hungary	0.705	Hungary	0.725	71	Dominican Rep.	0.357	Bolivia	0.367	110	Mauritania	0.070	Senegal	0.101
33	Portugal	0.704	Ukraine	0.705	72	China	0.354	Tunisia	0.365	111	Madagascar	0.065	Mauritania	0.068
34	Georgia	0.683	Latvia	0.705	73	Zimbabwe	0.351	Tajikistan	0.362	112	Djibouti	0.057	Eritrea	0.054
35	Bulgaria	0.671	Belarus	0.697	74	Iran, Islamic Rep. of	0.349	China	0.358	113	Haiti	0.055	Ethiopia	0.051
36	Lithuania	0.665	Czech Rep.	0.690	75	United Arab Emirates	0.346	Iran, Islamic Rep. of	0.346	114	Eritrea	0.047	Haiti	0.046
37	Czech Rep.	0.648	Argentina	0.685	76	Jordan	0.339	United Arab Emirates	0.326	115	Ethiopia	0.046	Mozambique	0.030
38	Argentina	0.640	Bulgaria	0.665	77	Sri Lanka	0.336	Mauritius	0.323	116	Angola	0.022	Djibouti	0.028
39	Uruguay	0.617	Slovakia	0.626	78	Morocco	0.324	Ecuador	0.319	117	Mozambique	0.018	Angola	0.019

Source: UNCTAD.

Note: The combined index is an unweighted average of the Technological Activity Index and the Human Capital Index.

Table III.6. Regional unweighted averages for the UNCTAD Innovation Capability Index

Region	1995	2001
Developed countries (excl. the new EU members)	0.876	0.869
The new EU members	0.665	0.707
South-East Europe and CIS	0.602	0.584
South-East and East Asia	0.492	0.518
West Asia and North Africa	0.348	0.361
Latin America and the Caribbean	0.375	0.360
South Asia	0.223	0.215
Sub-Saharan Africa	0.157	0.160

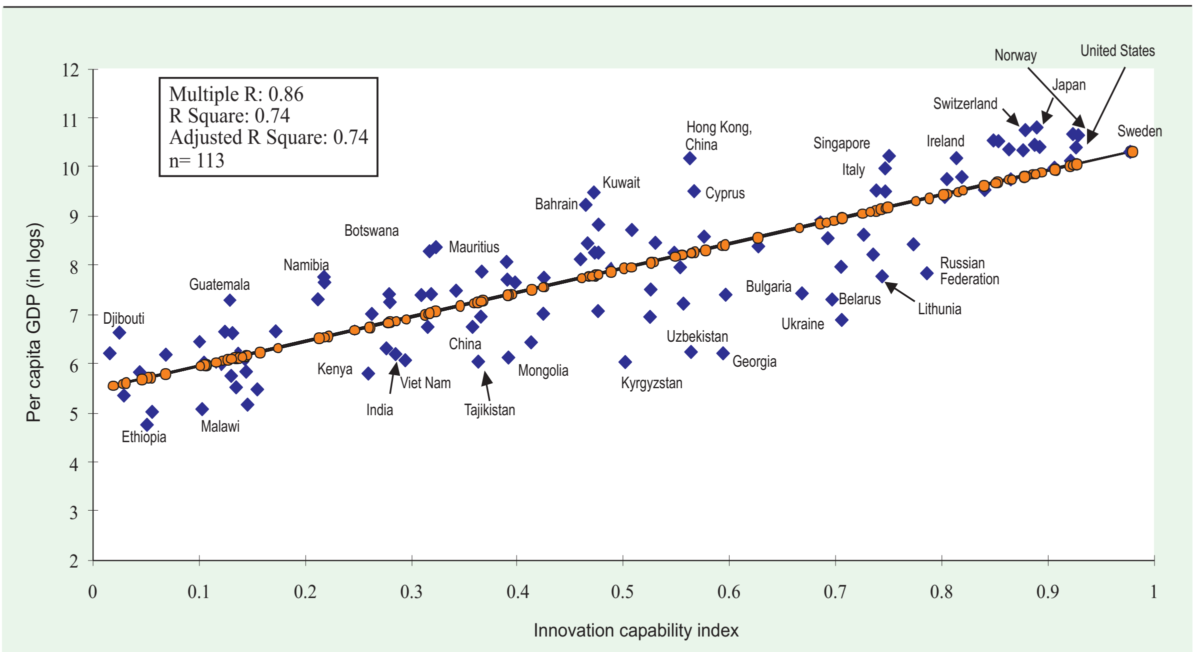
Source: UNCTAD.

Each of these three indices is highly correlated with income. In a regression analysis, the log of per capita income "explains" 75% of the variation in the Technology Activity Index in 2001, 66% of the variation in the Human Capital Index and 74% of the variation in the UNICI. As expected, technological activity, skills and incomes reinforce each other. The causal connections between the three are highly complex, and there are many possible feedback loops. For example, more technological activity leads to higher incomes, and higher incomes allow countries to invest more in innovation. However, it can be argued that the main causal link is likely to run from innovative activity and skills to incomes, and that innovative activity requires more advanced skills.[21]

Still, the indices do not rise uniformly with income levels. As the scatter diagram shows, there is a large variation around the regression line for the *UNCTAD Innovation Capability Index* (figure III.4).[22] Countries above the line have higher incomes than predicted by their innovation index value (i.e. scoring lower on the index than predicted by their incomes); those below the line score higher on the index than predicted by their incomes. Hong Kong (China) has the lowest composite innovation score in relation to its per capita income (presumably earning high income from service activities that do not require significant technological effort), followed by some small resource-rich economies. At the other end of the spectrum, various economies in transition have high composite scores relative to income, a result, as noted above, of their relatively strong performance in skill creation.

To sum up, there are large gaps between countries in terms of technological activity and human capital. The gap is not just between the developed and developing countries, but also within the developing and transition economies. In the developing world, innovative capabilities are highly skewed, with South-East and East Asia at the high end and sub-Saharan Africa at the low end of the spectrum. Within South-East and East

Figure III.4. Relationship between the UNCTAD Innovation Capability Index and log per capita GDP, 2001



Source: UNCTAD.

Asia, the three leaders (the Republic of Korea, Taiwan Province of China, Singapore) are well ahead of the other economies. Transition economies have large reservoirs of skills in relation to their income levels but seem to lag in technological effort.

While the Index suffers from the inevitable problems of finding the appropriate measures for technological effort and human capital, its use of hard statistics provides intuitively plausible results:

- Innovative capabilities differ greatly across countries, and the ranks are quite stable over the period considered. It is proving difficult for countries at the bottom to improve their position over time; there are cumulative forces at work that seem to reinforce the advantages of the leaders. It also suggests that significant change takes time to achieve.
- However, some countries have improved their ranking. Thus, while developed countries dominate the "high" group in the UNICI, that group also includes four developing economies and four economies in transition.
- The three leading developing economies have participated vigorously in the global production and innovation system, but each did so using different means to access technologies and build domestic capabilities.[23] Each invested heavily in education and skills development, since sustained progress in either strategy requires highly skilled human capital. Most fundamentally, in each case access to global technologies and to foreign markets was critical to sustained growth and upgrading.
- The main strength of the economies in transition, particularly those in Europe, lies in their human capital, rather than in technological activity, suggesting that there is scope for using the former to enhance the latter.
- South Asia and sub-Saharan Africa lag behind the other regions in innovation and, more particularly, in human capital creation.

What are the implications of these observations? The first, of course, is that innovative capabilities affect countries' ability to develop and raise living standards. In a globalizing world with rapid technical change, strong and growing innovative capabilities are essential to economic progress. This is as true of resource-based economies as of others, and it applies as much to services and agriculture as it does to manufacturing. As technological progress proceeds at an accelerating pace, and as the competitive pressure on firms intensifies, the demands made on countries' capabilities rise. This makes it more important than ever before to seek ways to bridge the gaps that exist.

Second, innovative capabilities are directly relevant to the location of internationally mobile R&D – the theme of *WIR05*. TNCs seeking R&D sites overseas look for adequate supplies of qualified technical manpower and innovative activity (chapter V). This is not to say that these are the only factors at work in their choices. Attracting global R&D, whether conducted in-house by TNCs or outsourced to local service providers, also needs such conditions as a stable and conducive investment climate, capable local firms, adequate ICT and other infrastructure, and intellectual property protection. But innovation capabilities – of the right quality and at the right cost – are clearly the *conditio sine qua non.*

Third, innovative capabilities also affect the scope for host-country benefits from internationalized R&D (chapter VI). The quality of R&D that is internationalized depends on local capabilities. The same applies to the resulting externalities, in terms of how much local firms and institutions are able to absorb and learn from exposure to best practice R&D techniques and skills. Whether or not R&D deepens over time, and how far it spreads over different activities, are almost entirely a function of the strength of the local skill and innovation system.

Finally, a word of caution. National innovative capabilities as measured above can be misleading where *minimum critical mass* considerations apply. While deflating technological effort and skill formation by the size of the economy is the right way to calculate a capability index, it skews the result against countries that have a large pool of employable skilled manpower with diverse skills, even with low rates of skill creation at the national level. Thus the absolute size of the stock of educated people has to be taken into account when considering the determinants of R&D location. This explains the relatively modest positions in the UICI rankings of China and India, two significant players in the recent increase in R&D internationalization by TNCs (chapter IV).

D. Conclusion

There is a co-evolution of economic development and technological complexity (by activity and function). The higher levels of skills and technological capabilities that accompany development permit countries to shift into more advanced activities and functions. More advanced activities and functions, in turn, yield higher value added, and allow countries to remain competitive despite higher wages. While this is a natural feature of the development process, countries can improve their innovative capabilities by appropriate policy interventions (chapter VII).

To summarize the main features of innovation highlighted above:

- Innovation is essential for economic development. Although in today's globalizing world economy developing countries can obtain new technology from other, more developed countries, they have to learn and innovate in order to use new technologies efficiently. As countries move up the development ladder and undertake more complex activities they need to upgrade their technological capabilities and undertake more advanced forms of innovation.
- The ways in which innovation takes place can be diverse, but an important source of innovation is through R&D. Formal R&D becomes essential at a certain stage, certainly in manufacturing, and increasingly in some kinds of modern services and agriculture.
- Enterprise innovation involves interactions with other firms and institutions: technology development is a systemic process. Given the externalities, coordination problems and public goods (basic research, testing, metrology) inherent in this process, government involvement is vital particularly in the early stages. In fact, without appropriate industrial, technology and education policies, R&D in the business sector is unlikely to take off (chapter VII).
- Business R&D is geographically and sectorally concentrated. While the bulk is undertaken in developed countries, R&D in some developing countries – especially in developing Asia – is expanding particularly fast. Most R&D takes place in manufacturing, but it is also growing in the services sector.
- Technological advances worldwide, especially in ICT, have created new opportunities for developing countries to participate in global knowledge networks once they have the necessary capabilities. At the same time, minimum entry levels are rising in terms of the capabilities required. The cumulative nature of capability building, together with scale and agglomeration economies, means that the successful early starters can continue pulling ahead of latecomers that are unable to reach the minimum entry levels. Policy intervention is necessary to reverse this trend.
- Innovation – and especially R&D – increasingly needs constant access to international knowledge. All "late industrializers" tapped technical knowledge and skills from the early starters, though in different ways. While there are various ways to link up with global knowledge networks, inward and outward FDI in R&D is perhaps the most direct way in which a country can connect with centres of knowledge in other countries.
- National innovation systems are becoming increasingly interdependent. The absence of local capabilities can effectively limit interaction between one system and the rest of the world, and thereby condemn the system in question to isolation from the mainsprings of technical change and competitiveness.

The extent to which developing countries can link up with global networks of learning and knowledge creation depends on their national innovative strengths. These strengths differ greatly, and the UNCTAD Innovation Capability Index shows that gaps between countries tend to persist over long periods. While the early stages of development necessarily have to involve nurturing indigenous innovative capabilities in the public as well as in the private sector, TNCs can play a role in strengthening an NIS (chapter VI). But foreign affiliates do not always undertake high-level technological activities in host countries. Many developing economies have long had FDI in resource extraction, manufacturing and services without foreign affiliates doing R&D. What is new is that the trend is for more TNCs to spread R&D to some developing countries, to a degree and in ways not seen before. The next two chapters map this process and discuss the factors that drive its internationalization and location.

Notes

1 According to the so-called Oslo Manual: "Technological product and process (TPP) innovation comprise implemented technologically new products and processes and significant technological improvements in products and processes. A TPP innovation has been implemented if it has been introduced on the market (product innovation) or used within a production process (process innovation). TPP innovations involve a series of scientific, technological, organisational, financial and commercial activities." (OECD 1997a, p. 31).

2 A large body of "evolutionary" literature on technology argues that there is no essential difference between absorbing, adapting and improving technologies and creating entirely new technologies (Nelson and Winter 1982, Metcalfe 1995). There is also a growing literature in this tradition which analyses technological activity in developing countries, see, e.g. Bell and Pavitt 1993, Dahlman et al. 1987, Katz 1987, Ernst et al. 1998, Lall1992 and 2001a, Nelson 1990, Radosevic 1999, UNIDO 2003.

3 Several authors have classified technical functions by innovativeness. See, for instance, Bell and Pavitt 1993, Hobday 2001, Figueiredo 2001, Ernst et al. 1998, Lall 1992.

4 A more detailed classification of functions by levels of technical complexity is provided in annex table A.III.1.

5 Even in developed countries, much R&D (Cohen and Levinthal 1989 estimate it at about half) is of this type; R&D has "two faces": learning and innovation.

6 For a survey, see Guellec and van Pottelsberghe 2004a.

7 Data for at least one year's total R&D spending over the period 1996-2002 are available for 93 economies, including all the major R&D performers (annex table A.III.2). Additionally, partial data are available from 57 economies on business enterprise spending on R&D.

8 In national currencies, however, R&D expenditures increased somewhat in these economies as well.

9 Data on business expenditures on R&D are not available for African countries.

10 For updated versions, see Hatzichronoglou 1997 and United States, NSB 2004.

11 For example, it is possible that low-technology industries engage in more complex or fundamental research than do high-technology sectors.

12 Data on 70 economies that account for 97% of global economic activity show that high-technology manufacturing output grew at 6.5% per annum over 1980-2001, while other manufacturing output grew at 2.4% (United States, NSF 2004).

13 Government efforts to tap such technological differences date back to the beginnings of industrial policy in the 15th century (Reinert 1995). Countries have long tried to move their productive structures from activities with decreasing returns to those with increasing returns – initially from primary production to manufacturing and later, within manufacturing, from low- to high-technology activities. In modern economic theory, conditions of diffuse externalities with coordination problems and other market failures lead to multiple equilibriums, and so require coherent government intervention to move from low to high growth equilibriums (Hoff and Stiglitz 2001).

14 Other high-technology activities (e.g. in aerospace, precision instruments and pharmaceuticals), may not be suited to fragmentation because of security concerns, specific skill needs, continuous processes of production or scale economies.

15 Foreign technology and R&D facilities can also be acquired through outward FDI.

16 The UNCTAD Innovation Capability Index draws on the World Bank (2004) for data on literacy rates, tertiary enrolment rates, technical publications, R&D and general data on population and GDP; UNIDO (2003) for enrolments in technical subjects; the UNESCO website (www.unesco.org) for researchers in R&D and enrolments at primary and tertiary levels; the USPTO website (www.uspto.gov) for patents in the United States; the Eurostat website (europa.eu.int/comm/eurostat) for R&D data; and the RICYT website (www.ricyt.org) for R&D in Latin America.

17 Even formal R&D data are deficient. Many developing countries do not collect or publish them, or they provide very outdated information. Some data may not conform to internationally accepted definitions of what comprises R&D. For the purposes of industrial innovation, the most important variable in R&D internationalization, the best measure would be R&D conducted by enterprises. However, data on this component of R&D are even scarcer in developing countries than on total R&D, and this measure was not used here for this reason.

18 Some studies also use total factor productivity (TFP) to measure the "output" of innovation. However, comparable TFP data are difficult to obtain and the results are subject to severe methodological and interpretational problems at the national level.

19 While there are potential biases associated with the use of USPTO data, it is the least biased indicator (Dernis et al. 2001). Data on Triadic patents – taken out at the European Patent Office, the Japanese Patent Office and the USPTO – can reduce the "home bias", and may capture the most commercially valuable patents (since taking them out involves substantial costs). However, the number of Triadic patents is relatively small (around 44,000 compared to some 180,000 for USPTO patents) (OECD 2004b). They may also be biased against developing-country firms that tend to focus on patenting in the United States, which is the largest export market for many of them.

20 This was two more than the Technological Activity Index, but the extra two were dropped for the combined Index.

21 There might be a reverse causality between per capita income and the UNICI. Richer countries are better able to support education and innovation. In addition, countries with oil resources consistently display a higher per capita income than the UNICI would predict. At the same time, in poorer countries, it is likely that a higher human capital index leads directly to higher income, which in turn leads to higher technological capabilities and a higher value in the UNICI.

22 Only countries deviating significantly from the line are mentioned in the chart.

23 Singapore relied heavily on FDI and insertion into the production (and later, R&D) networks of developed-country TNCs (chapter V); the other two have relied more on arm's length technology transfers by TNCs, using original equipment manufacture (OEM) contracts and licensing as well as developing local technological and R&D capabilities (Lall 2001a).

CHAPTER IV

R&D BY TNCs AND DEVELOPING COUNTRIES

TNCs are playing a major role in global R&D, not only through activities in their home countries but also increasingly abroad. The internationalization of R&D is not a new phenomenon. What is new is its faster pace in recent years and its spread to developing countries (albeit to only a few, mainly in Asia). Moreover, R&D activities in developing countries are no longer aimed at adapting technologies to local conditions only; they increasingly involve "innovative" R&D, including developing technologies for regional and world markets. At the same time, TNCs from developing countries are themselves investing in R&D abroad, primarily in order to access advanced technologies and research capabilities in developed countries, as well as to adapt products to new markets and tap sources of specialized expertise in other developing countries. This chapter maps these trends.

A. TNCs are dominant R&D players

TNCs account for a major share of global R&D. Indeed, with $310 billion spent in 2002 (United Kingdom, DTI 2004), the 700 largest R&D spending firms of the world – of which at least 98% are TNCs[1] – accounted for close to half (46%) of the world's total R&D expenditure and more than two-thirds (69%) of the world's business R&D (annex table A.III.2).[2] Given that there are an estimated 70,000 TNCs in the world (annex table A.I.8), this is a conservative estimate. It confirms earlier findings that in the mid-1990s TNCs already accounted for a very large share of the R&D expenditure of the Triad (Gassmann and von Zedtwitz 1999).[3]

In fact, the R&D spending of some large corporations is higher than that of many countries. In four TNCs (Ford Motor, Pfizer, DaimlerChrysler and Siemens), R&D spending exceeded $6 billion in 2003 (table IV.1). In another two (Toyota Motor and General Motors), it surpassed $5 billion. By way of comparison, in developing economies, South-East Europe and the CIS as a group, total gross expenditure on R&D (GERD) came close to or exceeded $5 billion in 2002 (the latest available year) only in China, the Republic of Korea, Taiwan Province of China and Brazil, in that order (table III.1). Even in large economies, such as India, Mexico and the Russian Federation, it remained well below the $5 billion mark. The same is true for such small, developed and R&D-intensive countries as Austria, Denmark and Finland (figure IV.1).

Over 80% of the 700 largest R&D spending firms come from only five countries: the United States, Japan, Germany, the United Kingdom and France, in that order (table IV.2). Only 1% of the top 700 are based in developing countries or South-East Europe and the CIS (table IV.1), although several have moved up the ranks since the late 1990s (United Kingdom, DTI 2004). Almost all these firms come from Asia, notably from the Republic of Korea and Taiwan Province of China (table IV.2), while only one is from Africa and two are from Latin America.

The 700 largest R&D spenders are concentrated in relatively few industries. In 2003, more than half of them were in three industries (IT hardware, automotive and pharmaceuticals/ biotechnology) (table IV.3).

Within each industry, the two largest R&D performing firms were responsible for very high shares. The two most concentrated industries

Table IV.1. The top 20 firms, by R&D expenditure in the world and in developing economies, South-East Europe and CIS, 2003

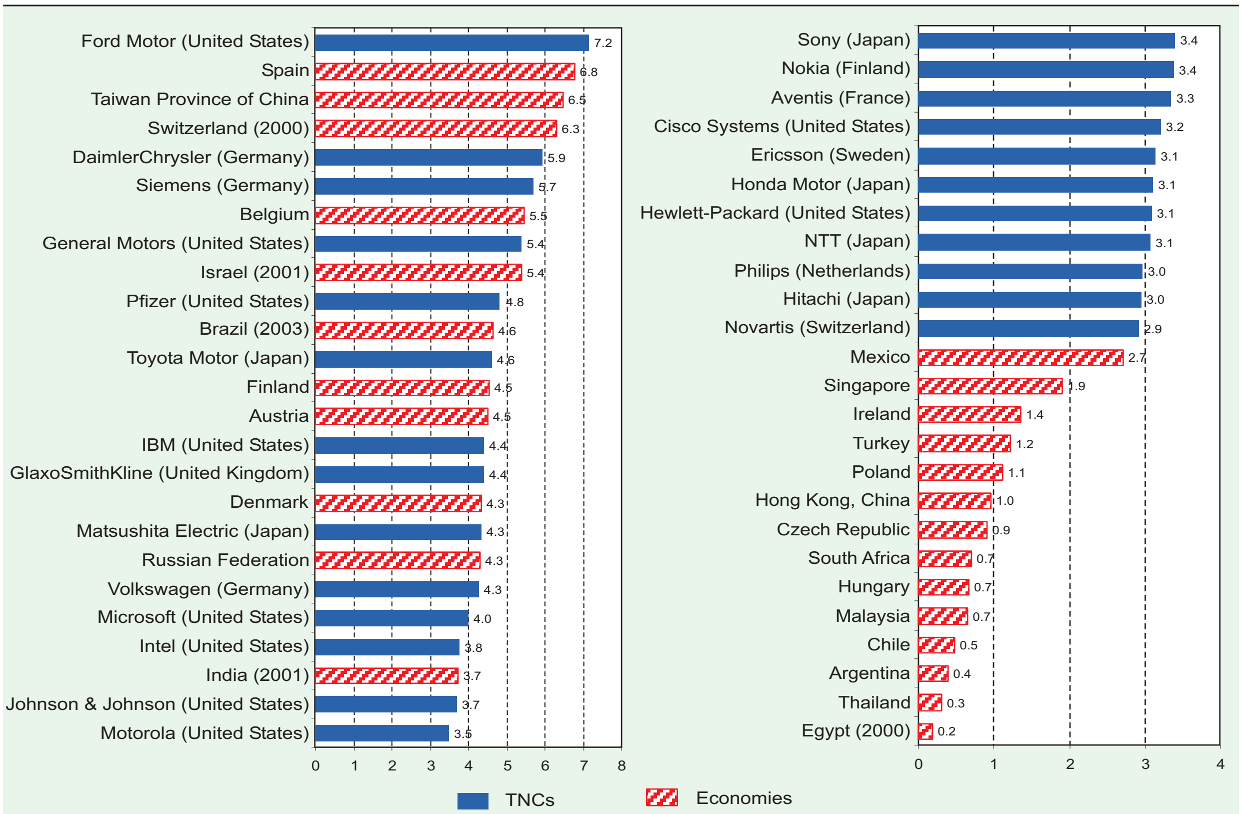
(Millions of dollars)

World				Developing economies, South-East Europe and CIS			
World rank	Corporation	Home economy	R&D spending	World rank	Corporation	Home economy	R&D spending
1	Ford Motor	United States	6 841	33	Samsung Electronic	Republic of Korea	2 740
2	Pfizer	United States	6 504	95	Hyundai Motor	Republic of Korea	734
3	DaimlerChrysler	Germany	6 409	110	LG Electronics	Republic of Korea	612
4	Siemens	Germany	6 340	178	Taiwan Semiconductor	Taiwan Province of China	342
5	Toyota Motor	Japan	5 688	219	PetroChina	China	265
6	General Motors	United States	5 199	255	Accenture	Bermuda	228
7	Matsushita Electric	Japan	4 929	258	Korea Electric Power	Republic of Korea	227
8	Volkswagen	Germany	4 763	267	KT	Republic of Korea	219
9	IBM	United States	4 614	298	Marvell Technology	Bermuda	197
10	Nokia	Finland	4 577	300	POSCO	Republic of Korea	196
11	GlaxoSmithKline	United Kingdom	4 557	317	Petroleo Brasileiro	Brazil	183
12	Johnson & Johnson	United States	4 272	328	SK Telecom	Republic of Korea	172
13	Microsoft	United States	4 249	337	China Petroleum & Chemical	China	167
14	Intel	United States	3 977	348	Winbond Electronic	Taiwan Province of China	158
15	Sony	Japan	3 771	349	Embraer	Brazil	158
16	Honda Motor	Japan	3 718	350	United Microelectronics	Taiwan Province of China	157
17	Ericsson	Sweden	3 715	486	Pliva	Croatia	99
18	Roche	Switzerland	3 515	516	Sasol	South Africa	91
19	Motorola	United States	3 439	518	AU Optronics	Taiwan Province of China	91
20	Novartis	Switzerland	3 426	585	Hyundai Heavy Industries	Republic of Korea	77

Source: UNCTAD, based on United Kingdom, DTI 2004.

Figure IV.1. R&D expenditure by selected TNCs and economies, 2002

(Billions of dollars)



Source: UNCTAD, based on annex table A.III.2 and United Kingdom, DTI 2004.

Table IV.2. Home economies of the 700 largest R&D spending firms of the world, 2003
(Number of companies and per cent)

Economy	Number of firms	Percentage of largest 700 R&D spenders
United States	296	42.3
Japan	154	22.0
Germany	53	7.6
United Kingdom	39	5.6
France	35	5.0
Switzerland	20	2.9
Sweden	15	2.1
Republic of Korea	10	1.4
Denmark	8	1.1
Taiwan Province of China	8	1.1
Netherlands	8	1.1
Canada	7	1.0
Belgium	6	0.9
Finland	6	0.9
Italy	6	0.9
Spain	4	0.6
Bermuda	3	0.4
Norway	3	0.4
Austria	2	0.3
Australia	2	0.3
Brazil	2	0.3
China	2	0.3
Ireland	2	0.3
Israel	2	0.3
Luxembourg	2	0.3
Croatia	1	0.1
Greece	1	0.1
Hong Kong, China	1	0.1
Liechtenstein	1	0.1
South Africa	1	0.1
Total	700	100.0

Source: UNCTAD, based on United Kingdom, DTI 2004.

Table IV.3. Industry breakdown of the 700 largest R&D performing firms, 2003
(Per cent)

Industry	Share of 700 companies' R&D expenditure	Share of two largest spenders within the industry
IT hardware	21.7	13
Automotive	18.0	21
Pharmaceuticals and biotechnology	17.5	18
Electronic and electrical	10.4	31
IT software and computer services	6.3	44
Chemicals	4.8	23
Aerospace and defence	3.9	35
Engineering	2.9	20
Telecommunications	2.2	58
Health-care products and services	2.2	33
Others	8.2	..

Source: UNCTAD, based on United Kingdom, DTI 2004.

were telecommunications (because of NTT) and software and computer services (because of Microsoft and IBM). The industry composition of the top R&D spenders varies by region (United Kingdom, DTI 2004, p. 5). Those in pharmaceuticals and health, electronics and ICT account for more than two-thirds of the R&D done by United States-based firms. German firms are concentrated in chemicals and engineering (64%), while Japanese firms are concentrated in electronics, ICT, engineering and chemicals (90%).

In sum, TNCs dominate global business R&D. A few countries, generally the largest R&D spenders, account for a major share of business R&D. Within those countries a relatively small number of enterprises dominate R&D activity. Most R&D is conducted by firms in the ICT, automotive and pharmaceutical industries.

B. R&D by TNCs is internationalizing

R&D is among the least internationalized segments of the TNCs' value chain; production, marketing and other functions have moved abroad much more quickly. However, some R&D has been undertaken abroad for a long time. In some form, R&D internationalization may date back to the earliest days of FDI; TNCs have always had to adapt technologies for selling in host countries, and in many cases some R&D has been necessary for this purpose (Safarian 1966, Brash 1966). There have also been cases of internationalization of basic research. In the years after the Second World War, Monsanto Chemicals (United States) expanded its centre for basic research in New Port, United Kingdom. Esso Petroleum Company's (United States) laboratories in the United Kingdom also performed basic research, and pioneered, among other inventions, a new synthetic lubricant for high-speed jet aircraft (Dunning 1958, p. 169). Firms from small developed home countries have conducted innovative ("asset-seeking") R&D abroad in other developed countries in order to tap other centres of innovation and overcome the constraints of their domestic economy (such as relatively small and/or specialized pools of knowledge and skills). Although the internationalization of R&D has lagged behind that of other activities, the share of foreign R&D in the total is rising steadily.

R&D between countries can be linked in several ways, involving flows in both directions and several types of actors. Through FDI, TNCs can set up new foreign affiliates or acquire existing firms that are already conducting R&D in host countries. Greenfield investments are more common than acquisitions of local enterprises with R&D capacity, though exceptions exist in countries with strong local firms (Brockhoff 1998, van Boehmer 1995, Håkanson and Nobel 1993a). TNCs can also contract R&D to service providers in host countries without acquiring an ownership stake. In some activities (such as in software or pharmaceuticals in India), arm's length contracts with local enterprises or research laboratories are increasingly common. Internationalization of R&D can also take the form of contracts between two non-transnational firms that are located in different countries. Finally, enterprises in two or more countries can enter into alliances to conduct R&D jointly.

1. A growing share of TNCs' R&D is performed abroad

Despite difficulties in data gathering, the available evidence gives a reasonable picture of the R&D being carried out by TNCs abroad. Patterns vary significantly according to home countries, as illustrated by the United States, Sweden, Japan and Germany, but the trend is clear: a growing share of R&D is undertaken abroad.

In the United Kingdom, the United States and some smaller European countries, TNCs started internationalizing R&D on a large scale in the 1980s and this trend was accelerated in the 1990s.[4] R&D expenditures by majority-owned foreign affiliates of United States TNCs increased every year from 1994 to 2002 (except in 2001), reaching a record $21 billion in 2002. This level represented 13.3% of those TNCs' total R&D, up from 11.5% in 1994 (Moris 2005a).[5] In terms of employment, 16% of the R&D workers of United States TNCs were in foreign affiliates in 1999, up from 14% five years earlier (table IV.4).[6] Following the international trend, Swedish TNCs have also expanded their R&D activities abroad over time. Between 1995 and 2003, R&D spending by the largest Swedish TNCs increased modestly, from $5.1 billion to $5.8 billion (table IV.5),[7] but the share of R&D outside Sweden shot up from 22% to 43%.

In other home countries such as France, Germany, Italy, Japan and Spain, internationalization of R&D started much later, sometimes focusing more on licensing than on FDI.[8] The R&D expenditure of Japanese TNCs abroad rose from $1.9 billion to $3.3 billion during the period

Table IV.4. Global employment, R&D employment, and R&D expenditures of United States TNCs, by domestic and overseas components, 1994, 1999, 2002

Item	Total employment	R&D employment	R&D expenditures	R&D expenditures per R&D employee	R&D employment intensity[a]
	(Thousands)		($ million)	($)	(%)
1994					
Total	24 273	727	103 451	142 338	3.0
Domestic operations (United States parent companies)	18 565	625	91 574	146 565	3.4
Overseas operations[b]	5 707	102	11 877	116 441	1.8
1999					
Total	30 773	770	144 435	187 505	2.5
Domestic operations (United States parent companies)	23 007	647	126 291	195 255	2.8
Overseas operations [b]	7 766	124	18 144	146 915	1.6
2002					
Total	..	..	159 119	..	..
Domestic operations (United States parent companies)	..	..	137 968	..	..
Overseas operations [b]	..	..	21 151	..	..

Source: UNCTAD, adapted from Moris 2005a, based on United States, National Science Foundation 2004.

[a] R&D employment intensity refers to the share of R&D employment in total employment.

[b] Majority-owned foreign affiliates.

Table IV.5. R&D expenditures of the 20 largest Swedish TNCs, 1995-2003
(Billions of dollars)

Item	1995	1997	1999	2001	2003
Total R&D expenditure by Swedish TNCs	5.07	6.06	5.45	5.86	5.81
R&D in Sweden	3.97	3.90	3.13	3.36	3.34
R&D abroad	1.11	2.17	2.31	2.50	2.47
In developing countries and economies in transition	0.03	0.07	0.10	0.15	0.18
Foreign share (%)	*22*	*36*	*42*	*43*	*43*

Source: UNCTAD, based on ITPS 2003 and 2005, and additional information provided by ITPS.

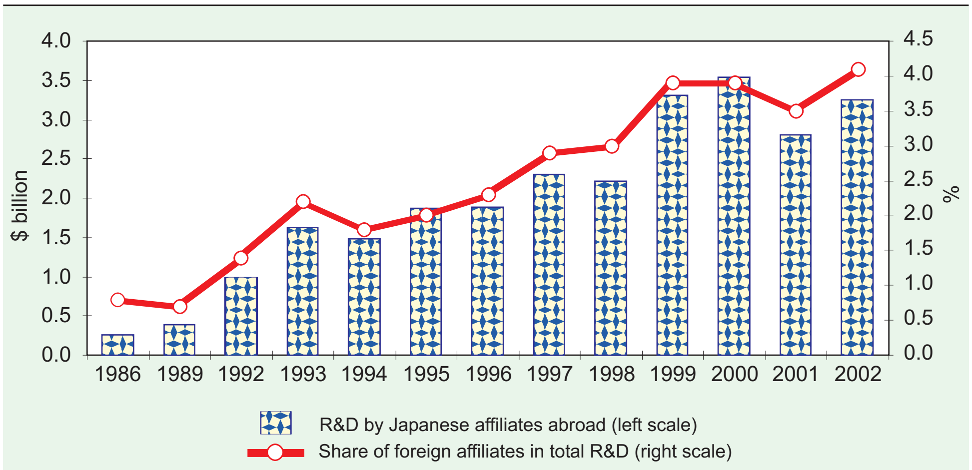
1995-2002 and its share in total Japanese R&D doubled from 2% to 4% (figure IV.2). Data from other home countries (e.g. Germany, box IV.1) are less comprehensive, although they are also indicative of the growing internationalization of R&D.

A number of surveys confirm the increased internationalization of R&D. One such survey founds that firms steadily increased their R&D spending abroad from 15% of their total R&D budget in 1995 to 22% in 2001 (Roberts 2001). Other recent studies also pointed to a trend towards increasing R&D abroad by TNCs from the Triad, especially European TNCs (Edler et al. 2002, von Zedtwitz and Gassmann 2002).[9]

A survey undertaken by UNCTAD from November 2004 to March 2005 of the world's largest R&D investors (box IV.2) suggests that the pace of R&D internationalization may be accelerating (section F). The average firm in the UNCTAD survey spent 28% of its R&D budget abroad in 2003,[10] including in-house expenditure by foreign affiliates and extramural spending on R&D contracted to other countries (figure IV.3). The share of R&D workers abroad in total R&D employees was similar.[11] Within this global picture, significant differences exist in the degree of internationa-lization of R&D of the various countries of origin (figure IV.3). Japanese and Korean TNCs displayed the lowest share of foreign R&D (15% and 2%, respectively; figure IV.3). North American TNCs were also below the average (24%). Conversely, European TNCs had high levels of R&D internationalization (41% on average).[12] Within Western Europe, companies from France, the Netherlands, Switzerland and the United Kingdom had the most internationalized R&D activities on average.

Due to the small size of the sample in the UNCTAD survey, only tentative conclusions can be drawn concerning industry-wide variations. The chemical and pharmaceutical industries were the most internationalized in terms of R&D (figure IV.4). The relatively low level of internationalization of R&D in the electronics and electrical industry (compared to chemicals and pharmaceuticals) partly reflects the strong presence of Japanese firms in that industry. Interestingly, the IT hardware industry's level of R&D internationalization was more

Figure IV.2. R&D expenditure by Japanese foreign affiliates abroad and its share in the total R&D spending of Japanese TNCs, 1986-2002
(Billions of dollars and per cent)



Source: UNCTAD, based on Japan, METI various issues.

Box IV.1. Foreign R&D affiliates of German TNCs

The number of foreign affiliates established or acquired abroad by German TNCs that carry out R&D as a primary or secondary business is small but growing, as is the outward FDI stock attributed to them (box table IV.1.1). Between 1995 and 2003 this stock rose from $43 million to $891 million, while employment by those affiliates grew from 2,000 to 11,000 during the same period. The R&D spending of German TNCs abroad rose by 130%, to $12 billion within the six-year period from 1995 to 2001.

Of the German TNCs, Siemens alone spent more than $6 billion on R&D in 2003 (table IV.1), accounting for about 7% of its sales (Sorg 2005). In 2004, of the 45,000 R&D employees of the company, 49% worked outside Germany. The number of R&D personnel in developing countries grew from 800 in 1994 (2% of the company total) to 2,700 (6%) in 2004, located in seven countries: Brazil, China, India, Malaysia, Mexico and South Africa (Sorg 2005).

A survey of 49 German TNCs accounting for two-thirds of Germany's privately funded R&D spending in that country, undertaken in 2000, concluded that internationalization of German R&D was the "phenomenon of the 1990s" (Ambos 2005, p. 401). In the 1990s, German firms established as many overseas R&D sites as in the previous 50 years combined. In 2000, the TNCs surveyed already had 134 R&D laboratories abroad (*idem*, p. 397). More than half of the foreign laboratories in pharmaceuticals, electronics and semiconductors spent more than 20 million per year, while those laboratories in the chemical and machinery industries generally had budgets of less than 5 million.

Box table IV.1.1. German R&D-related FDI abroad, 1995-2003

Year	FDI stock in R&D foreign affiliates abroad ($ million)	Number of R&D foreign affiliates	Employment of R&D foreign affiliates (Thousand)
1995	43.2	20	2
1996	83.8	25	2
1997	133.8	31	3
1998	199.6	55	5
1999	467.7	59	6
2000	647.7	89	9
2001	630.0	105	10
2002	934.3	73[a]	11
2003	891.4	78	11

Source: UNCTAD, based on Deutsche Bundesbank, unpublished data.

[a] Break in the series, not directly comparable with previous year.

Source: UNCTAD.

Box IV.2. Explanatory note on the UNCTAD survey on R&D internationalization

Between November 2004 and March 2005, UNCTAD conducted a survey aimed at establishing the current patterns of internationalization of R&D by the largest private R&D spenders. The population basis for the survey was the R&D Scoreboard published by the United Kingdom Department of Trade and Industry (DTI). Of the 700 top R&D spenders, UNCTAD contacted the leading 300 firms, which account for more than 85% of all R&D by the top 700. In addition, all companies in the DTI Scoreboard that were from developing, South-East European and CIS economies were invited to participate in the survey even if they fell outside the top 300. This brought the number of questionnaires sent out to 316.

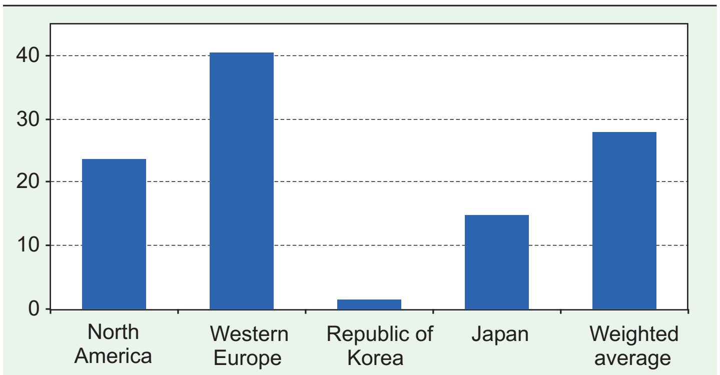
The response rate was 22% of the sample or 68 companies. The relatively low response rate was due to the fact that many firms are unwilling to participate in such surveys as they consider information concerning their R&D activities too strategically sensitive to be disclosed.

Some potential shortcomings should be borne in mind. First, the reporting of R&D may not always be done in the same way due to different notions of what R&D entails. Second, some respondents may have omitted smaller R&D activities. Third, the United States is underrepresented, although some of the largest United States R&D investors participated in the survey.

The industrial composition of the sample is broadly similar to that of the DTI R&D Scoreboard: IT hardware, automotive, pharmaceuticals, electronic and electrical and chemicals are 5 of the 6 main R&D investing industries. The software and computer services industry was underrepresented, mainly due to a low response rate by United States companies.

Source: UNCTAD.

Figure IV.3. Degree of R&D internationalization by home region or country in the UNCTAD survey, 2004-2005
(Per cent)



Source: UNCTAD survey.

pronounced in terms of R&D employees abroad than in terms of expenditure – possibly indicating that R&D abroad is undertaken with a view to reducing labour costs. The opposite was the case for the automotive industry – possibly suggesting the greater importance in that industry of market-seeking motives for foreign R&D.

2. The growing role of foreign affiliates in host-country R&D

The increasing internationalization of R&D by TNCs is also reflected in the growing role played by foreign affiliates in the R&D activities of many countries. In 1993, the R&D expenditure of foreign affiliates in host countries worldwide – the operations equivalent of inward FDI in R&D – amounted to about $29 billion (i.e. 10% of global business enterprise spending on R&D) (figure IV.5). Within a decade, by 2002, that spending had more than doubled to $67 billion or 16% of global business R&D.[13] This growth was more than twice as fast as that of global spending by enterprises on R&D, spending that grew by about 49% over the same period.

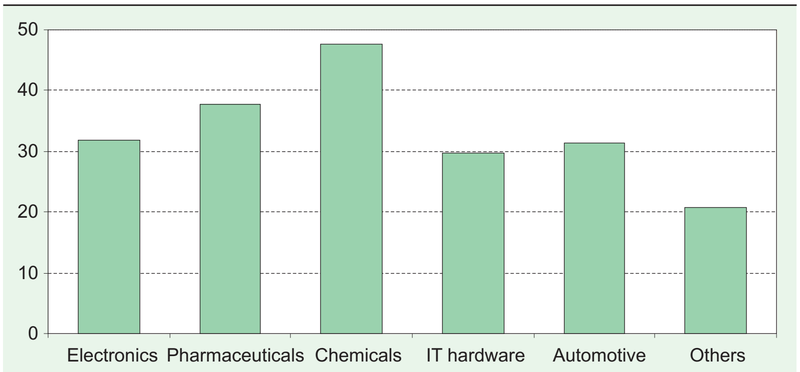
The share of foreign affiliates in host-country R&D varies by country. In 2003, it exceeded 50% in Ireland, Hungary and Singapore (figure IV.6), and 40% in five other countries (Brazil, the Czech Republic, Sweden, the United Kingdom and Australia in descending order). Conversely, it remained under 10% in the Republic of Korea, Japan, India,[14] Chile and Greece.

The share of foreign affiliates in the business R&D of developed countries is close to the world average and has been growing gradually, from 11% in 1996 to 16% in 2002 (annex table A.IV.1). In the four new EU members for which data were available, the share of foreign affiliates was already above the world average in 1996 (17%) and increased further, to 41%, by 2002.[15] In the developing countries for which data are available, the share of foreign affiliates rose faster than in developed countries (from 2% in 1996 to close to 18% in 2002, annex table A.IV.1).

In fact, more than two-thirds of the 30 countries for which data were available experienced a rise in the share of foreign affiliates in business R&D after 1995, and this rise was larger in developing countries (figure IV.6).[16] In the new EU member countries, as well as in Sweden and the United Kingdom, the share of foreign affiliates also rose rapidly as local high-technology firms were taken over by foreign TNCs[17] and new R&D facilities were located in these economies. The high share of foreign affiliates in the new EU member countries reflects not only the rising degree of penetration by foreign TNCs but also the low level of domestic R&D efforts (both total and business R&D; see also chapter III).

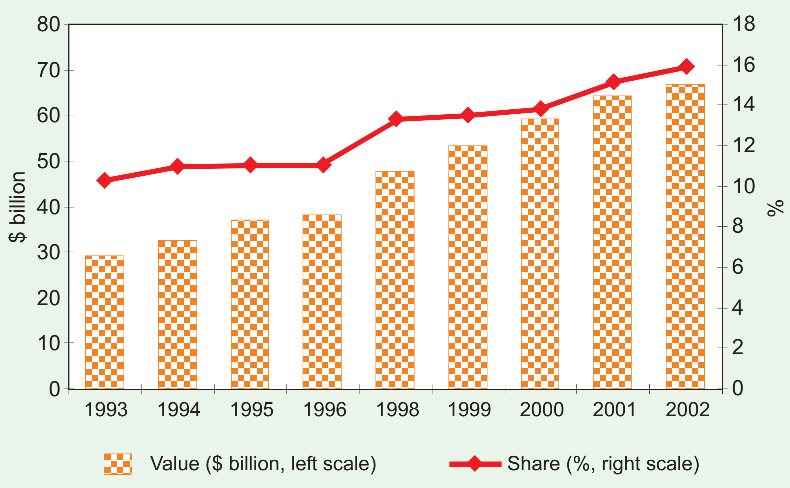
The large *number* of majority-owned foreign affiliates with R&D as their main activity (2,600 in 2004)[18] reflects the spread of the R&D activities that TNCs are conducting outside their

Figure IV.4. Degree of R&D internationalization by industry, 2004-2005
(Per cent)



Source: UNCTAD survey.

Figure IV.5. R&D expenditure by foreign affiliates, based on a sample of 30 economies, value and share in business R&D, 1993-2002
(Billions of dollars and per cent)



Source: UNCTAD, based on annex table A.IV.1.

home base (figure IV.7). Close to 70% of these affiliates are located in the Triad, but the map also indicates the presence of such activities in various developing economies, especially in Asia.

3. Growing use of strategic alliances

Another indication of a rise in the internationalization of R&D is the expansion of cooperative arrangements, such as strategic alliances, in R&D (Dunning and Narula 2005, p. 130). Since the 1980s firms have increasingly sought to undertake R&D activities through collaborative efforts, as evidenced by information from the MERIT/CATI database,[19] which contains data on nearly 10,000 strategic technology alliances of 3,500 parent companies for the period 1960-1998 (Hagedoorn 2002). Growth was steady in the early years of this period and accelerated from the 1980s onwards. Although collaborative activity in R&D is not a new practice – economic units have collaborated for decades – it has evolved incontestably towards direct strategic uses (Narula 2003, p. 110). The relative share of non-equity (contractual) partnerships in the total number of strategic alliances increased considerably over the same period. The geography of strategic alliances was dominated by intra-North American partnerships, followed by EU-North America and intra-EU alliances (Hagedoorn 2002).

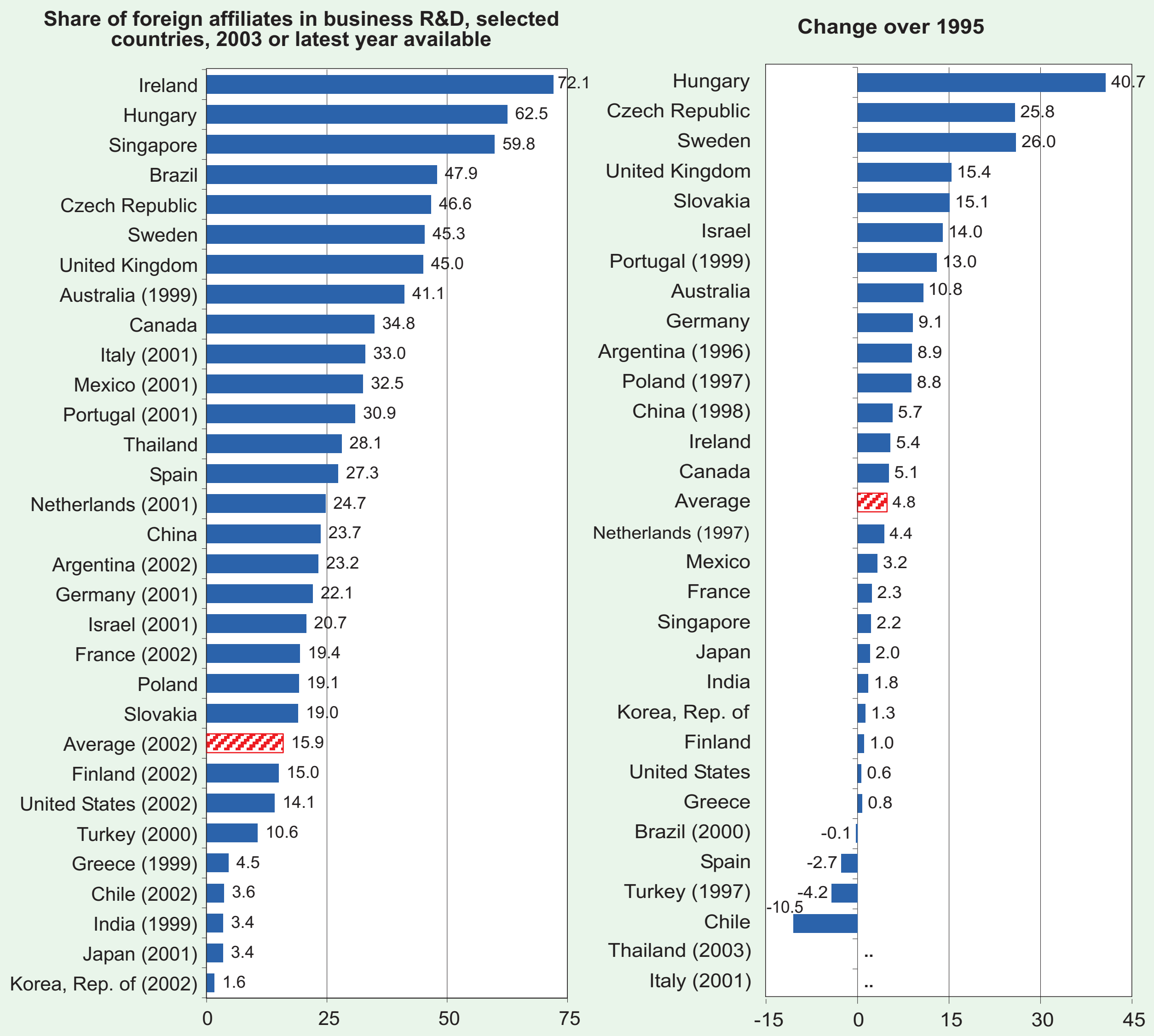
Data for a more recent period (1991-2001) show a doubling of new international technology alliances, from 339 to 602, and a growing dominance of non-equity forms within alliances.[20] Indeed, while the number of non-equity alliances increased from 265 in 1991 to 545 in 2001 (i.e. in more than 90% of the alliances) the number of equity-based partnerships declined from 74 to 57. United States firms continued to participate in a large majority of strategic alliances, although their share in the total of such alliances declined from 80% in 1991 to 73% in 2001. At the same time the participation of non-Triad firms increased from 4% to 14%.

Between 1991 and 2001, the industry composition of alliances shifted strongly from information technologies (whose share dropped from 54% to 28%) to pharmaceuticals and biotechnology (whose share increased from 11% to 58%). In the latter, there is a strong incentive for TNCs to form strategic alliances with other companies in the industry as well as with academic institutions, as no single company could possibly develop excellence in all the areas of research that may be required to develop a new drug. Moreover, there are strong pressures on pharmaceutical companies to reduce drug development costs and to share the risks involved.

C. The emergence of developing economies as locations for TNCs' R&D

Developed countries remain the main host locations of foreign R&D activities by TNCs,[21] but there is a clear trend towards locating more R&D activities to developing economies, South-East Europe and the CIS. This is confirmed by available national statistics as well as by corporate surveys and case studies. The kind of R&D being undertaken by TNCs in developing

Figure IV.6. Trends in R&D spending by foreign affiliates, selected economies, 1995-2003
(Per cent)



Source: UNCTAD's calculations, based on national sources and data provided from the OECD AFA database.

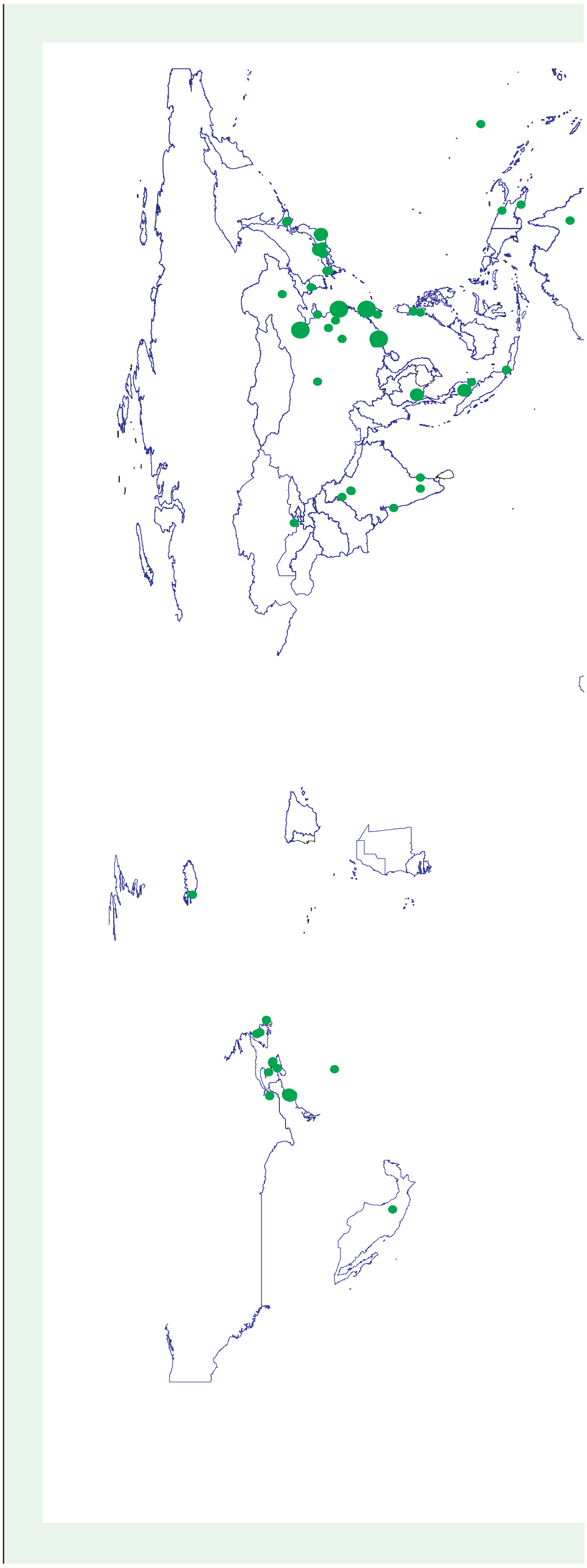
Note: In Argentina, Chile, Israel, the Republic of Korea and Mexico, the R&D expenditure of United States-owned affiliates has been used as a proxy for the R&D spending of all foreign affiliates. In India, the share of foreign affiliates in total R&D spending has been used as a proxy for their share in business R&D spending.

countries is also changing. While it has traditionally involved mainly product or process adaptation to meet local market demands, recent developments suggest that some developing, South-East European and CIS markets are emerging as key nodes in the global R&D systems of TNCs. At the same time, the extent to which developing countries participate in these systems varies considerably, and large parts of the developing world remain de-linked.

1. TNCs are expanding R&D to developing locations

Data on overseas R&D by TNCs from the United States show a decline in the share of some developed countries during the past decade.[22] In 1994 developed countries accounted for 92% of overseas R&D expenditures by United States TNCs (table IV.6), but by 2002 their share had dropped by 8 percentage points due to a

Figure IV.7. Worldwide location of majority-owned foreign affiliates engaged in R&D, 2004



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strong decline in the shares of the EU (by 11 percentage points) and Japan (by 3 percentage points). Not all developed economies have been losing ground, however. Rapid growth was observed in Canada and Israel and there was some growth in Switzerland.

The shares lost by developed countries were picked up by developing economies, almost exclusively in Asia. China, Singapore, Hong Kong (China), Malaysia and the Republic of Korea were among the main gainers of R&D shares. As a result, the role of developing countries as a whole increased, from 7.6% to 13.5%.

Table IV.6. R&D expenditure abroad by majority-owned foreign affiliates of United States parent companies, by selected region/country, 1994–2002
(Millions of dollars)

	Year									Share of total (%)	
Region/economy	1994	1995	1996	1997	1998	1999	2000	2001	2002[a]	1994	2002
Total	**11 877**	**12 582**	**14 039**	**14 593**	**14 664**	**18 144**	**20 457**	**19 702**	**21 151**	**100.0**	**100.0**
Developed economies	**10 975**	**11 891**	**13 152**	**13 510**	**13 545**	**16 113**	**17 791**	**16 720**	**17 844**	**92.4**	**84.4**
of which:											
Canada	836	1 068	1 563	1 823	1 750	1 681	2 332	2 131	2 345	7.0	11.1
EU[c]	8 271	8 852	9 386	9 691	10 058	11 900	12 472	11 578	b	69.6	58.8
Switzerland	191	242	190	230	223	231	286	392	405	1.6	1.9
Israel	96	97	169	208	141	389	630	726	889	0.8	4.2
Japan	1 130	1 286	1 333	1 089	962	1 523	1 630	1 507	1 433	9.5	6.8
Australia	230	287	409	369	290	294	349	286	329	1.9	1.6
New Zealand	7	9	16	18	15	9	8	10	6	0.1	-
Developing economies	**902**	**691**	**886**	**1 082**	**1 119**	**2 031**	**2 637**	**2 982**	**2 855**	**7.6**	**13.5**
Developing Asia	**408**	**283**	**318**	**393**	**336**	**1 400**	**1 949**	**2 391**	**2 113**	**3.4**	**10.0**
of which:											
China	7	13	25	35	52	319	506	b	646	0.1	3.1
Hong Kong, China	51	55	38	82	66	214	b	289	b	0.4	b
India	5	5	9	22	23	20	b	b	80	-	0.4
Indonesia	5	9	6	5	4	1	2	3	3	-	-
Korea, Republic of	17	29	34	41	29	101	143	157	167	0.1	0.8
Malaysia	27	21	23	32	30	161	218	b	b	0.2	b
Philippines	14	23	14	12	10	31	40	48	50	0.1	0.2
Singapore	167	63	88	73	62	426	551	755	589	1.4	2.8
Taiwan Province of China	110	61	75	84	55	122	143	139	70	0.9	0.3
Thailand	3	5	5	5	4	7	13	18	22	-	0.1
Latin America and the Caribbean	**477**	**389**	**546**	**663**	**748**	**613**	**663**	**562**	**b**	**4.0**	**3.2[e]**
of which:											
Argentina	21	22	42	43	56	26	38	43	24	0.2	0.1
Brazil	238	249	346	437	446	288	253	199	306	2.0	1.4
Chile	2	15	6	7	6	4	11	8	6	-	-
Colombia	8	9	9	12	11	6	10	11	10	0.1	0.1
Costa Rica	2	2	2	4	6	2	b	4	7	-	-
Mexico	183	58	121	126	191	238	303	248	284	1.5	1.3
Venezuela	17	25	9	11	14	40	22	24	42	0.1	0.2
West Asia and North Africa	**15**	**19**	**21**	**26**	**35**	**18**	**25**	**29**	**b**	**0.1**	**b**
Sub-Saharan Africa	**15**	**19**	**21**	**26**	**35**	**18**	**25**	**29**	**b**	**0.1**	**b**
of which:											
South Africa	14	17	18	22	30	14	21	24	b	0.1	0.1
Economies in transition[d]	**5**	**18**	**36**	**48**	**79**	**54**	**83**	**38**	**68**	**-**	**0.3**

Source: UNCTAD, adapted from Moris 2005a, based on data from United States Department of Commerce, Bureau of Economic Analysis, *Survey of U.S. Direct Investment Abroad*, www.bea.gov/bea.

[a] Estimates for 2002 are preliminary.
[b] Withheld to avoid disclosing operations of individual companies. Note that due to undisclosed data, shares do not add up to 100%.
[c] EU covers 12 countries for 1994 and 15 countries thereafter.
[d] Including new EU members.
[e] Based on data for countries listed below.

Note: Data are for majority-owned foreign affiliates of United States parent companies. Majority-owned affiliates are those in which the combined ownership of all United States parents is more than 50%.

Expenditures on R&D by affiliates of United States TNCs in developing economies are concentrated mostly in five countries: China, Singapore, Brazil, Mexico and the Republic of Korea in that order. They accounted for 70% of the total R&D expenditure of United States TNCs in developing countries in 2002. In contrast, Taiwan Province of China and India attracted relatively small amounts of their R&D. India, a major site for foreign R&D in recent years, accounted for only a small share of R&D spending by United States TNCs until 2002 according to official data, although more recently this share has risen.

In Latin America and the Caribbean, Brazil and Mexico have accounted for around 80% of R&D expenditures by United States TNCs in the region since 1994. In absolute terms, their growth has been modest compared to that in the major Asian economies, and the relative importance of Latin America and the Caribbean in the R&D of United States TNCs has fallen. Venezuela is a relatively significant host for United States TNCs' R&D, much of it concentrated in the petroleum industry. South Africa accounted for virtually all of the R&D by United States TNCs in Africa over the same period.

The rising share of developing economies is also noticeable in R&D employment by United States TNCs. Their share grew faster than that of developed countries over the period 1994-1999 although the EU still dominates. In particular, the share of R&D employment in developing Asia doubled from 4.1% in 1994 to 8.1% in 1999 (United States, NSF 2004). This figure is likely to increase further judging from data on R&D expenditures, which shows the share of developing Asia rose from 7.7% to 10% between 1999 and 2002 (table IV.6).

In 1999, the latest year for which R&D employment data are available,[23] the number of scientists and engineers employed full time for carrying out R&D for United States TNCs reached 770,300 (i.e. 3% of the total workforce of these firms in 1999). About 123,500 of them – or 16% – worked abroad in majority-owned foreign affiliates of those TNCs (table IV.7). Close to 16% of these employees abroad were employed in developing countries.

The R&D intensity of employment still remains low in developing economies compared to the developed countries. Among the developing economies, only Singapore and the Republic of Korea reached an R&D intensity similar to that of developed countries (table IV.7). R&D expenditures per R&D employee in the foreign affiliates of United States TNCs reached $146,915 in 1999, 26% up from 1994. Between 1994 and 1999 R&D expenditures per R&D employee increased at double digits in all developing host regions except Latin America.

The selection of developing countries as locations for R&D is gaining momentum in Europe as well. In the foreign R&D activities of Swedish TNCs (table IV.5), the share of developing countries and economies in transition (including the new EU members) increased rapidly, from 2.7% in 1995 to 7.2% in 2003. A survey of 1,554 German enterprises conducted in 2005 by the Deutsche Industrie- und Handelskammertag, the umbrella organization for German chambers of commerce, found that while foreign R&D units were most frequently located in other EU States, about a third of respondents conducted R&D in new EU member countries, South-East Europe or the CIS and 28% in Asia (DIHK 2005b).

In Japan, surveys carried out by the Japan Bank for International Cooperation (JBIC) confirm the trend that Japanese companies are changing their R&D strategies to become more international (table IV.8). The overall number of "R&D bases"[24] set up by the firms covered in the surveys increased by 70%, to 310, between 2000 and 2004, and that of "R&D bases" in developing countries more than tripled, to 134. The increase was most pronounced for China: its share of all R&D units rose from 7% to 22% between 2000 and 2004.

Official statistics do not necessarily capture the rise of developing-country locations over the past 2 to 3 years. Recent company surveys, however, indicate that the trend has gained momentum. In a 2004 survey, 70% of the responding firms stated that they already undertook R&D abroad, and that more R&D had recently been allocated to locations outside the developed countries (EIU 2004a). Similarly, recent information on new greenfield and expansion FDI projects involving R&D indicates a surge of developing destinations and service-related R&D (OCO Consulting, LOCOmonitor database).[25] Of the 1,773 FDI projects in R&D worldwide for which information has been collected for the period 2002–2004, the majority (1,095) were undertaken in developing economies, South-East Europe and the CIS. Developing Asia and Oceania alone accounted

Table IV.7. R&D employment by majority-owned foreign affiliates of United States TNCs by region/economy, 1999
(Thousand employees and per cent)

Region/economy	Total employment (Thousand)	R&D employment (Thousand)	R&D intensity (%)	Region/economy	Total employment (Thousand)	R&D employment (Thousand)	R&D intensity (%)
All economies	**7 765.8**	**123.5**	**1.6**	Thailand	102.3	0.1	0.1
Developed economies	**4 378.9**	**96.2**	**2.2**	**Latin America and the Caribbean**	**1 536.4**	**9.0**	**0.6**
of which:				of which:			
Canada	1 004.2	7.9	0.8	Argentina	93.8	0.3	0.3
European Union	3 167.4	80.8	2.6	Brazil	348.8	5.4	1.5
Japan	207.3	7.5	3.6	Chile	43.6	a	b
Israel	33.0	2.6	7.9	Colombia	43.9	0.1	0.2
Developing economies	**2 702.7**	**19.2**	**0.7**	Costa Rica	25.3	a	b
Developing Asia	**1 021.1**	**10.0**	**1.0**	Mexico	780.8	2.7	0.3
of which:				Venezuela	63.2	0.4	0.6
China	252.4	2	0.8				
Hong Kong (China)	93.8	1.2	1.3	**West Asia and North Africa**	**19.2**	**-**	**-**
India	62.2	0.2	0.3				
Indonesia	61.6	a	b	**Sub-Saharan Africa**	**126**	**0.2**	**0.2**
Korea, Republic of	46.1	1.0	2.2	of which:			
Malaysia	119.1	a	b	South Africa	55	0.1	0.2
Philippines	78.1	0.5	0.6				
Singapore	114.8	2.6	2.3	**Unspecified**	**684.2**	**8.1**	**1.2**
Taiwan Province of China	71.3	0.9	1.3				

Source: United States Bureau of Economic Analysis, *Survey of U.S. Direct Investment Abroad,* annual series, www.bea.gov/bea.
[a] Less than 50 employees.
[b] Withheld to avoid disclosing operations of individual companies.
Note: R&D employment intensity is R&D employment as a percentage of total employment. EU comprises the 15 members in 1999.

for close to half of the world total (861 projects). These data also suggest that the majority of new jobs created in greenfield FDI projects related to R&D also went to developing countries, mostly to India and China.

More than 90% of the above-mentioned new FDI projects involving R&D were initiated by TNCs from developed countries. The United States was the top source country, accounting for almost half of the world total, followed by the EU-15 and Japan. However, developing-country TNCs are also becoming more active in this area (see also section E). Of the 160 projects carried out by developing-economy TNCs, 151 originated in Asia, mainly in India, the Republic of Korea, Taiwan Province of China, China and Singapore, in that order.

A matrix of the home and host countries of R&D projects (table IV.9) reveals that the "traditional" pattern of developed-country

Table IV.8. R&D bases of Japanese manufacturing companies, by host region, 2000-2004
(Number of R&D bases)

Host region	2000	2001	2002	2003	2004
NIEs	16	15	30	21	25
ASEAN-4	10	18	21	18	29
China	13	19	28	29	67
Other Asia	2	2	2	3	6
North America	88	84	92	88	108
Latin America	2	1	1	0	4
EU-15	44	47	70	48	60
Central and Eastern Europe	1	1	3	3	3
South-East Asia and Oceania	-	4	6	6	8
Other countries	1	2	3	-	-
Total R&D bases	177	193	256	216	310

Source: UNCTAD, based on JBIC (various years), *Survey Report on Overseas Business Operations by Japanese Manufacturing Companies* (Tokyo: JBIC).
Note: ASEAN-4 consists of Indonesia, Malaysia, the Philippines and Thailand.
NIE (newly industrializing economies) consists of Hong Kong (China), the Republic of Korea, Singapore and Taiwan Province of China.

TNCs investing in other developed countries (well documented and analysed in the literature; von Zedtwitz 2005) accounted for less than one-third of the new R&D projects in 2002-2004. Meanwhile, the "modern" type of R&D expansion (developed-country TNCs investing in developing countries, South-East Europe and the CIS) has become significant (almost three-fifths of the cases). Examples include Intel's R&D laboratories in China and India (box IV.3), IBM's R&D in India, Microsoft's research laboratory in China and Fujitsu's development centre in Malaysia.

In turn, the other patterns of R&D-related FDI ("catch-up", whereby TNCs from developing economies conduct R&D in developed countries with the aim of catching up with developed-country TNCs; and "expansionary", whereby a TNC from a

Table IV.9. Greenfield FDI projects in R&D, 2002-2004
(Number of projects)

	Host economy			
Home economy	Developed	Developing	South-East Europe and CIS	Total
Developed	*"Traditional"*	*"Modern"*		
	612	953	40	1 605
Developing	*"Catch-up"*	*"Expansionary"*		
	63	97	2	162
South-East	*"Catch-up"*	*"Expansionary"*		
Europe and CIS	3	3	-	6
Total	678	1 053	42	1 773

Source: UNCTAD's calculations, based on the LOCOmonitor database (classification draws on von Zedtwitz 2005).

Box IV.3. Intel's R&D network in developing countries

Intel has over 20,000 R&D employees located in more than 30 countries. Some of the facilities are owned by the parent firm while others are managed in collaboration with universities or through venture-capital investments in technology-intensive companies.

Intel's R&D investments in developing and South-East European and CIS economies, especially in China, India and the Russian Federation, are growing faster than elsewhere. That expansion is motivated by the availability of an educated and skilled workforce with specific competencies in relevant areas. In these countries, Intel owns laboratories that conduct key research in a variety of fields; it has also signed a series of collaboration agreements with universities.

Intel China Research Centre (ICRC) in Beijing was established in 1998 as the company's first research lab in the Asia-Oceania region. ICRC has conducted applied research in the areas of human computer interface, computer architecture, future workloads and compilers and runtime. In early 2005, it had a staff of 75 researchers, most of whom hold a PhD or an MSc from Chinese universities. Among the research innovations that have emerged from ICRC are Open Research Compiler, developed jointly with the Chinese Academy of Science; Audio Visual Speech Recognition, a system using computer vision to assist speech recognition; and Microphone Array and audio signal processing technology. A second Chinese R&D laboratory with over 150 employees is operating in Shanghai developing software for Intel.

The Intel India Design Centre in Bangalore employs more than 800 employees and delivers software solutions to the company. In comparison, the Nizhny Novgorod (Russian Federation) software development centre is home to 340 specialists and engineers who are developing software tools and applications for Intel.

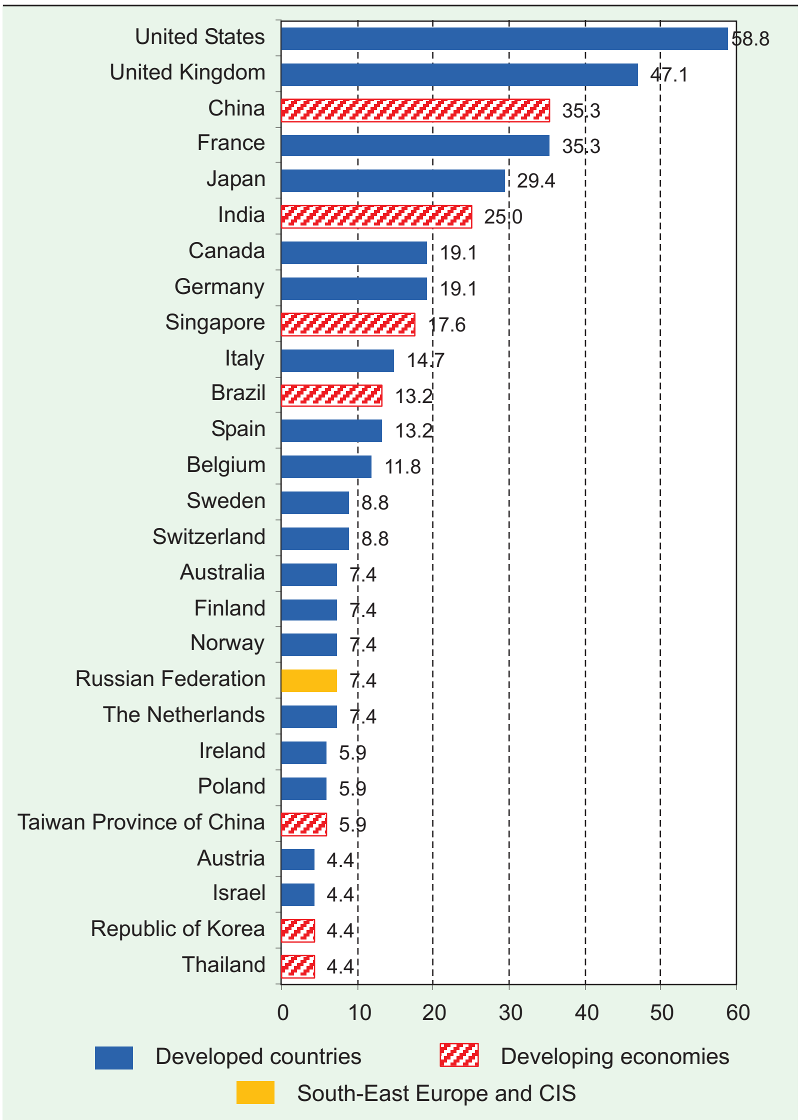
Cooperation with universities abroad is an important aspect of Intel's global strategy. The Intel Research Council, an internal group of technical experts, awards university research grants worldwide for projects in key areas. A final vector of Intel's global strategy is Intel Capital, Intel's strategic investment programme. Its mission is to make and manage financially attractive investments that support Intel's strategic objectives. Its overseas presence grew from less than 5% of the value of the deals in 1998 to about 40% in 2003. Of these overseas investments, about half were in companies based in Asia (including Japan) and the rest in Europe, Israel and Latin America.

Source: UNCTAD, based on information provided by Intel in March 2005.

developing country invests in R&D in another developing country to support either second-generation technology transfers or other local business activities) together accounted for less than one-tenth of the total.[26] Samsung's (Republic of Korea) laboratories in Europe, and Acer's (Taiwan Province of China) laboratories in the United States are examples of the "catch-up" type of R&D-related FDI, while Acer's R&D laboratory in China and Huawei's R&D centre in Bangalore illustrate the "expansionary" type (see also section E).

UNCTAD's survey of the largest R&D spenders among TNCs (referred to above) confirms the growing importance of developing-country locations. Although the majority of the R&D conducted abroad is in other developed countries (the United States and the United Kingdom being the two top destinations), a number of developing countries were also mentioned by the 68 respondents. The current location of their foreign R&D efforts in developing countries was reported as being, among others, China (3rd global destination), India (6th), Singapore (9th) and Brazil (11th) (figure IV.8).[27] Also, notably, a large number of other developing-country R&D locations (14 economies) were indicated by at least one of the

Figure IV.8. Current foreign locations of R&D in the UNCTAD survey, 2004
(Per cent)



Source: UNCTAD survey.

Note: Countries mentioned by two respondents include: the Czech Republic, Hungary, Indonesia, Malaysia, Mexico and Portugal. Economies mentioned by one respondent include: Argentina, Bulgaria, Denmark, Estonia, Greece, Hong Kong (China), Morocco, the Philippines, Saudi Arabia, Slovakia, South Africa, Turkey and Viet Nam.

respondents. In South-East Europe and the CIS, the Russian Federation and Bulgaria were the only target economies mentioned.[28]

The companies responding to the UNCTAD survey also answered questions related to international non-equity collaboration in the area of R&D. The most frequently mentioned location for such arrangements was again the United States, followed by the United Kingdom. China was in third place ahead of Germany, France and Japan. A roughly equal share of the responding companies had R&D collaboration with counterparts in the Russian Federation and in India. Other developing and South-East European and CIS economies mentioned included: Argentina, Brazil, Mexico, Morocco, Singapore, Taiwan Province of China and Tunisia. A recent survey of 104 TNCs (EIU 2004a) has also found that Europe and Asia are the most common locations of R&D (indicated by 34% and 30% of the respondents), followed by North America (17%).[29]

2. Foreign affiliates in patenting by developing economies

The role of TNCs in the R&D activities of a country can also be gauged from measures related to the output of R&D activities. The analysis in this section draws on information from the United States Patent and Trademark Office (USPTO).[30] As noted above (chapter III), the number of *patent applications* to the USPTO from developing economies and countries in South-East Europe and the CIS has risen dramatically in recent years (albeit from a low base), primarily due to increased research activities in Asia and Oceania (annex table A.III.3). A detailed analysis suggests that foreign companies play an important role in the patentable outputs of these countries, with some important exceptions.

In order to assess the role of TNCs it is necessary to distinguish between the "inventor" and the "assignee" of a patent. According to the patent law of the United States, the *applicant* in a patent application must always be the inventor. Therefore, patents are *granted* to an inventor or a group of inventors, but not to institutions. However, many patents or patent applications are *assigned* (i.e. transferred) to those other than the inventor(s), usually to institutions. The assignee then becomes the legal owner of the patent.[31]

The number of USPTO patents *granted* to inventors resident in the economies included in table IV.10 increased more than fourfold between 1993 and 2003.[32] The table shows that for the period of 2001-2003, many patents granted to inventors resident in these economies were *assigned* to entities (typically TNCs) based in other countries. Patents assigned to foreigners may be the output of R&D outsourced by foreign TNCs to scientists in the listed economies or the output of R&D conducted by inventors employed by foreign affiliates in these economies. Thus the share of patents assigned to foreigners in the total number of patents granted to residents in a country can be seen as an indicator of the role of foreign TNCs in the innovation activities of the economies (e.g. Guellec and van Pottelsberghe de la Potterie 2001, 2004b).

By this measure, foreign companies played a very small role in the patents granted by the USPTO to inventors in the Republic of Korea and Taiwan Province of China during the period 2001-2003; only 4% of them were assigned to foreigners (table IV.10). However, in most other economies in the table — including Brazil, China, India and the Russian Federation — a large share of the patents were assigned to foreign entities — ranging from 25% in Saudi Arabia to 86% in Kenya.[33]

While TNCs thus appear to own a large share of USPTO patents granted to inventors in developing economies and South-East Europe and the CIS, the number of patents that are owned by foreign affiliates located in these economies is generally small. USPTO data show that most patents *assigned* during the period 2001-2003 to entities in the economies listed in table IV.11 were owned by domestic enterprises or, in some economies, by public institutions, but only rarely by foreign affiliates. Only in Bulgaria and Brazil did foreign affiliates account for more than 20% of all patents assigned.[34] In India and Cuba, public research institutions accounted for the largest shares (68% and 84% respectively) of those countries' totals.[35] Public research institutions in Singapore, the Russian Federation and Ukraine also receive a significant proportion of the patents assigned by the USPTO.

Table IV.10. United States Patent and Trademark Office patents granted to residents of selected developing economies and countries in South-East Europe and CIS, 2001-2003
(Number of patents and per cent)

Region/economy	Patents granted to residents (a)	Patents assigned to foreign institutions (b)	The share of (b) in (a) (%)
Africa			
South Africa	428	126	29
Egypt	32	21	66
Kenya	21	18	86
Asia and Oceania			
Taiwan Province of China	20 414	889	4
Republic of Korea	12 195	482	4
China	1 543	979	63
Singapore	1 485	669	45
Hong Kong (China)	2 069	692	33
India	1 022	409	40
Malaysia	281	207	74
Turkey	101	71	70
Thailand	208	116	56
Philippines	108	92	85
Saudi Arabia	64	16	25
Indonesia	108	69	64
Latin America and the Caribbean			
Brazil	524	220	42
Mexico	409	215	53
Argentina	202	70	35
Bahamas	47	36	77
Bermuda	22	12	55
Cuba	21	-	-
Chile	54	27	50
South-East Europe and CIS			
Russian Federation	956	654	68
Ukraine	131	98	75
Bulgaria	34	16	47

Source: UNCTAD, based on information from the USPTO patent database.

Note: The patent count in tables in this section includes all types of patents, i.e. utility, design as well as plant patents. Column (a) lists the number of patents where at least one inventor is from a developing economy or a country in South-East Europe or the CIS. Column (b) lists the number of patents in (a) that are assigned to foreigners (usually institutions).

In sum, with the important exceptions of the Republic of Korea and Taiwan Province of China, foreign companies play a significant role in the innovation activities of those developing economies and countries in South-East Europe and the CIS that have expanded their patenting activities in the United States during the past decade. A large share of all patents granted to inventors in these economies is assigned to owners abroad, notably TNCs. However, since few foreign affiliates are owners of patents in these countries it would appear that TNCs tend to centralize the ownership of patents at headquarters.

D. Features of R&D undertaken in developing, South-East European and CIS markets

1. Industry composition of R&D by TNCs in developing countries

The industry composition of R&D by foreign affiliates differs by region and economy. For instance, three-quarters of R&D by United States affiliates located in Asia (excluding Japan)

Table IV.11. United States Patent and Trademark Office patents assigned to institutions in selected economies by the type of assignee, 2001-2003
(Number of patents)

Region/economy	Domestic firms	Foreign affiliates	Public institutions	Total
Africa				
South Africa	153	7	7	167
Egypt	3	-	4	7
Asia and Oceania				
Taiwan Province of China	11 621	118	947	12 686
Republic of Korea	9 829	562	761	11 152
Hong Kong (China)	1 251	89	87	1 427
Singapore	610	41	144	795
India	177	2	379	558
China	408	18	49	475
Malaysia	43	5	1	49
Saudi Arabia	35	-	4	39
Thailand	36	-	2	38
Indonesia	27	-	4	31
Turkey	24	-	-	24
Latin America and the Caribbean				
Brazil	191	54	9	254
Bermuda	140	30	-	170
Mexico	101	6	12	119
Bahamas	54	-	-	54
Argentina	27	5	1	33
Cuba	3	-	16	19
Chile	15	-	2	17
Panama	14	1	-	15
Uruguay	3	-	-	3
South-East Europe and the CIS				
Russian Federation	126	-	37	163
Ukraine	8	-	3	11
Bulgaria	7	2	-	9

Source: UNCTAD, based on information from the USPTO patent database.

Note: When patents are assigned to an individual, they are counted as “domestic firms”. The classification of assignees is according to the *Who Owns Whom* database and other sources. The *Who Owns Whom* database gives information on the “Ultimate Parent”. Foreign affiliates are those firms whose ultimate parent is in a different country.

were in computers and electronic products industries in 2002 (figure IV.9, see also annex table A.IV.2). In India, over three-quarters of affiliates’ R&D expenditures ($61 million) were in non-manufacturing industries in 2002, compared to only about 20% in 1999, probably reflecting a focus on software development in that country. On the other hand, chemicals and transportation equipment combined accounted for over half of all R&D by foreign affiliates of United States TNCs located in both Brazil (figure IV.9) and Mexico (Moris 2005a). These patterns are different from that of the aggregate for all host countries, in which transportation equipment was the top industry, followed by computers and electronic products, with chemicals and pharmaceuticals in third place (figure IV.9, annex table A.IV.2).

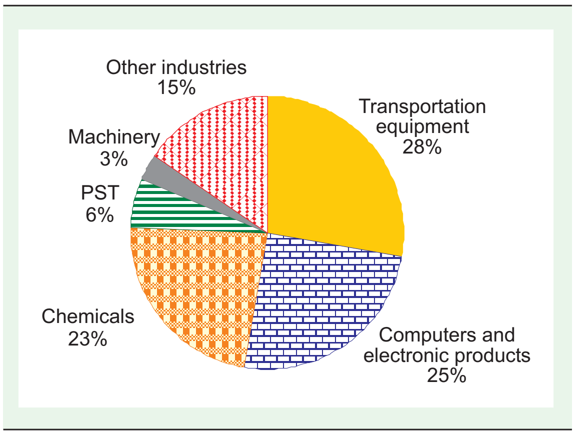
Overseas R&D by German TNCs shows similar patterns. In the electronics and semiconductor industries, both industries with a high percentage of production abroad, Asia was an above-average location in 2000, while R&D by the German chemical and pharmaceutical TNCs was heavily skewed in favour of North American locations. The remaining industries appeared to focus on Europe (Ambos 2005, p. 400).

The industry composition of recent greenfield R&D projects in 2002-2004, for which information was available, also shows a high share of information technologies (IT) and software in new projects in developing countries (39%), which may indicate a gradual shift of R&D towards services and in particular IT. [36] IT is gaining importance within R&D because, in more and more TNCs, the share of software

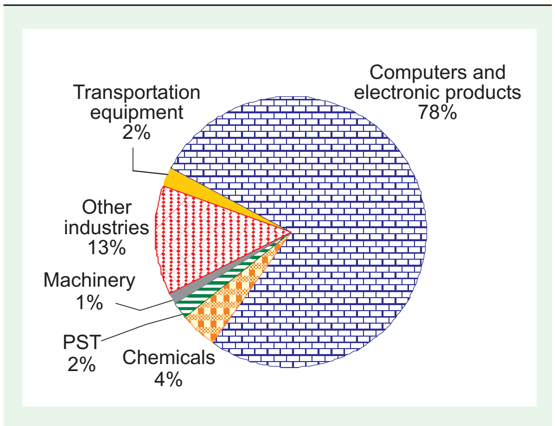
Figure IV.9. Industry composition of R&D by majority-owned foreign affiliates of United States TNCs, 2002

(Per cent)

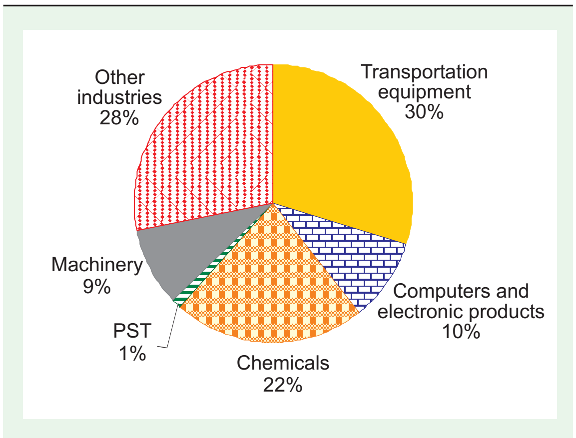
a. All host countries



b. Asia (excluding Japan)



c. Brazil



Source: UNCTAD, adapted from Moris 2005a, based on data from United States Bureau of Economic Analysis, *Survey of United States Direct Investment Abroad,* www.bea.gov/bea.

Notes: Data are preliminary estimates. PST refers to professional, scientific, and technical services. Data for transportation equipment for affiliates in Asia (excluding Japan) and Brazil are for 2001. Data for PST services for affiliates in Japan and Asia (excluding Japan) are for 2001.

development is taking up an increasing part of the R&D budget.[37]

2. Types of R&D

R&D carried out by TNCs in developing countries can be categorized in various ways (box IV.4). One relates to the types of R&D undertaken by TNCs' affiliates in host countries, reflecting the different technological functions assigned to foreign affiliates. The foreign affiliates may undertake:

- Adaptive R&D;
- Innovative R&D linked to production for local or regional markets;
- Global innovative R&D for new products or processes, or for basic research; and
- Technology-monitoring R&D.

There can be many varieties of *adaptive R&D*, ranging from basic production support to the upgrading of imported technologies. Not all TNC production abroad gives rise to formal R&D (as a distinct operation separate from routine engineering or initial plant design). Much depends on the size and growth of the local facility, the differences between local conditions and those for which the technology was designed, and the availability of local technical skills. The extent to which adaptive R&D evolves into *innovative* R&D depends even more on the availability of suitable technical skills along with supplier R&D capabilities (where this feeds into the R&D done by an affiliate) and institutional support (for testing or other specialized work). *Innovative R&D for local or regional markets* can evolve into *global innovative R&D* when the host economy is able to meet even more stringent skill and institutional needs. However, this evolution is not the only way for TNCs to launch R&D in developing countries. Some developing countries are attracting "pure" TNC R&D, not related to production (either for the domestic market or export-oriented). *Technology monitoring units* are another example of R&D. The main roles of technology monitoring units are to keep abreast of technological developments in foreign markets and to learn from leading innovators and consumers there (Roberts 2001).

It is difficult to quantify R&D according to the types identified above (the data are too limited). However, one study, undertaken in 1999 on 209 R&D performing firms from the Triad (Roberts 2001), found that the establishment of worldwide centres of excellence for a particular technology or discipline was the primary function of overseas R&D; it varied between a high of 47% for Western European TNCs and a low of 25% for Japanese firms (Roberts 2001, p. 30). Adaptation for local markets was a close second in Japan and the United States, and a distant second in Western Europe. Regional technical support activities and basic and/or applied research in other countries held third and fourth places respectively. In developing countries, while most R&D has traditionally been of an adaptive nature, recent trends suggest that more sophisticated activities are also expanding. A 2004 survey found that 22% of the respondents

Box IV.4. Taxonomy of R&D by foreign affiliates

Overseas R&D by TNCs is a multifaceted activity. For instance, it can be analysed in terms of the nature of the activity undertaken or in terms of the motives for undertaking R&D abroad. According to these two criteria, the typologies overlap considerably and distinctions are not always easy to draw; moreover, over time the distinctions can become increasingly blurred as R&D units evolve.

The following provides illustrations of the two typologies based on the nature of the R&D activity and on TNC motivations. Despite the fact that these two taxonomies are drawn from a large body of literature that has focused almost entirely on R&D by foreign affiliates in developed countries, they can also be applied, in most cases, to the developing countries that are emerging in the global R&D landscape.

Based on the nature of technological activity in foreign affiliates: This typology divides foreign affiliates doing R&D into four broad types (sometimes with sub-categories) on the basis of the kind of R&D undertaken (Pearce 1989, Nobel and Birkinshaw 1998, von Zedtwitz 2005).

- *Local adapters:* These are "market-seeking" R&D units for absorbing and adapting technologies, essentially to support product and process engineering departments in making existing technologies work more efficiently in new environments. They are also variously called "support units" and "technology transfer units".
- *Locally integrated laboratories*: Also called "indigenous technology units" and "international independent laboratories", these are more advanced than local adapters and are capable of independent innovation aimed primarily at local (and perhaps regional) markets. The units remain linked to local production and are usually a natural evolution from adaptive R&D.
- *International technology creater:* This is the most advanced type of innovative activity by foreign affiliates and places them on an equal level with core innovating centres in the home countries and in other developed countries. Also known as "internationally interdependent laboratories" or "global technology units", these facilities can do both research and development, and their output is typically aimed at global exploitation by the parent company. They may evolve out of locally integrated laboratories, and so retain tight links with production in the host economy, or they may be set up independently of local production to tap local innovation clusters and skills.
- *Technology scanning or monitoring unit:* This is normally a "business intelligence" function undertaken by an "asset-seeking" R&D unit

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Box IV.4. Taxonomy of R&D by foreign affiliates (concluded)

under the headings above, but in the absence of a separate R&D facility, scanning can also be done by another department of the TNC.

Based on TNC motivation**:** This typology groups affiliate R&D activities by the technological objectives of the parent company (Le Bas and Sierra 2002). Four types emerge:

- *Technology-seeking FDI in R&D:* The TNC seeks to offset areas of weakness in the home-country innovation system by setting up R&D facilities or acquiring local innovators in countries with complementary strengths. A number of R&D-related M&As in the United States in biotechnology, electronics and pharmaceuticals are of this type. Developing-country firms with technological ambitions also undertake such R&D investments or acquisitions.
- *Home-base (or asset-) exploiting FDI in R&D*: This essentially corresponds to the adaptive category in the typology above, where the main functions of the R&D are to absorb and adapt technologies transferred by the parent company so that the TNC can effectively exploit its technology assets.
- *Home-base (or asset-) augmenting FDI in R&D*: This is where TNCs undertake R&D in technologies in which they are strong at home and where the host country also has strengths. This has been called "strategic asset-seeking R&D" by TNCs. It aims not only to access foreign technological assets but also to capture the externalities created by host-country technology clusters (Dunning and Narula 1995). The distinction between this and technology-seeking FDI is not very strong, especially in the case of developed countries, as it hinges on an evaluation of the relative strengths of home- and host-country innovation systems.

There are other ways to classify foreign R&D. It is possible to categorize it, for example, by the organizational strategy of TNCs and by their R&D management practices. However, for the purposes of analysing the impact on developing countries, the relevance of these taxonomies is more limited.

Source: UNCTAD, based on the literature cited.

[a] Based on Archibugi and Iammarino 2002, Le Bas and Sierra 2002, Edler et al. 2002, Gassmann and von Zedtwitz 1999, Gerybadze and Reger 1999, Kuemmerle 1997, Medcof 1997, Nobel and Birkinshaw 1998, Pearce 1989 and 1999, Reddy 2000, Ronstadt 1977, Voelker and Stead 1999, von Zedtwitz 2005, and von Zedtwitz and Gassmann 2002.

were already conducting some applied research in overseas developing markets (EIU 2004a).

The following analysis looks at the salient features of TNC-controlled R&D in developing countries, beginning with the region where the magnitude of the phenomenon is the highest. It stresses that Asia has taken the lead among developing countries not only in terms of the number of projects and jobs created but also in terms of the types of R&D undertaken, including innovative R&D for local and global markets. Indeed, some R&D activities in some Asian developing countries in particular are now taking on a more sophisticated role within the global R&D networks of TNCs. The analysis of developing Asia is followed by those of Latin America and the Caribbean, and Africa respectively. An analysis of the economies in transition of South-East Europe and the CIS, and of the former economies in transition of the new EU members[38] is added at the end of the section because R&D-related FDI in those countries has grown fast, and in some respects the features of these economies with regard to skills and wage advantages are similar to the ones offered by various developing countries at comparable income levels.

a. Asia and Oceania: dynamic trends

The rise of developing Asia and Oceania has been the most dramatic development in the global landscape of R&D. Some economies in the region have been able to capture a broad range of R&D functions from TNCs, including innovative R&D and basic research. For example, electronics firms in Taiwan Province of China are attracting the outsourcing of complete product design (Engardio and Einhorn 2005). While most developing host economies do not offer the advanced design and production capabilities of Taiwan Province of China, the kind of work they conduct can also be quite sophisticated. Contract manufacturers like Flextronics (Singapore), for instance, set up R&D bases in some countries such as India and China in 2004 in order to provide state-of-the-art product development services (Engardio and Einhorn 2005). Meanwhile, pharmaceutical companies are seeking to cut the cost of bringing new drugs to the market by collaborating with biotech firms in India. Thus the dividing line between the kind of R&D that is suited for expansion in developing countries and that which is best kept at home – or in developed as opposed to developing countries – has become blurred.

China and India have been the main beneficiaries of this trend. Of the 885 R&D-oriented greenfield FDI projects announced in the region in 2002-2004, three-fourths (723) were concentrated in these two large economies. In China, some 700 foreign-affiliate R&D centres had been established by the end of 2004 (box IV.5). In India, more than 100 TNCs have established R&D facilities.[39] Microsoft launched its sixth global research centre in Bangalore in early 2005 after opening one in Beijing in 1998. Other such Microsoft R&D centres outside the United States are located in the United Kingdom and the Republic of Korea. In the case of Motorola (box IV.6), 6 of its 19 main R&D centres are located in developing countries: five in Asia (China, India, the Republic of Korea, Malaysia and Singapore) and one in Brazil. The number of large pharmaceutical TNCs that have a research presence in India in particular is growing fast. Astra-Zeneca inaugurated a large facility for research on tuberculosis in 2003 and subsequently expanded it to include pharmaceutical development. Pfizer started clinical research in India in 1995 and added a biometrics unit in 1998 along with a formulation development group in 2004. In addition, as of June 2005, Eli Lilly,[40] Sanofi-Aventis, Novartis and GlaxoSmithKline had clinical research units and Novartis and GlaxoSmithKline had biometrics centres in India (Mukherjee 2005).

FDI in R&D in Asia and Oceania flows not only to very large countries like China and India but also to other, smaller, economies in the region. Data on greenfield projects in 2002-2004 show that at least 16 other Asian economies received R&D-oriented FDI during the period of observation. Within this group, East and South-East Asian economies, especially Hong Kong (China), Malaysia, the Philippines, the Republic of Korea, Singapore, Taiwan Province of China, and Thailand, frequently appear on the radar screen of TNCs.

Those economies that traditionally have had a considerable presence of foreign affiliates in local innovation (e.g. Singapore) also have a large share of business R&D (figure IV.6). Over the past decade more than 100 TNCs, including Rolls Royce, Motorola, Philips, GE, Delphi, Eli Lilly, Hewlett-Packard, Matsushita, Sony, 3M and DaimlerChrysler, have located R&D laboratories in Singapore (Toh 2005, pp. 11-12). More recently, pharmaceutical TNCs such as Aventis, Merck, GlaxoSmithKline and Wyeth have set up R&D facilities there (annex table A.IV.3). In Thailand, the size of FDI in R&D was small over the period of 1995-1999 averaging $4.1 million per annum, although it accounted for an important part of business R&D (Intarkumnerd and Sittivijan 2005, pp. 4-5). By the period 2000-2004 both business R&D and R&D by foreign affiliates had increased substantially (the latter to $34 million per year).[41] The industry focus of R&D-related FDI in Thailand, too, shifted between the two periods, from metals and non-metal-working industry to machinery, transportation equipment (led by Japanese TNCs such as Toyota; box IV.7) and electrical appliances (especially hard disk drives).

The share of foreign affiliates in R&D expenditure in the Republic of Korea is still low (figure IV.6). It is only recently that TNCs have started investing in R&D in that country, in part as a response to more active government policies that welcome and encourage such FDI (chapter VII). As of December 2004 a total of 140 foreign-affiliate research institutes had been opened, 61 of which were established after 2000 (Republic of Korea, Ministry of Commerce, Industry and Energy 2005). Most foreign research institutes are now using their facilities to develop new products and processes, and in some recent cases they are performing innovative R&D activities for global innovation and production (box IV.8).

Some of the development work conducted in Asia is world-class, such as chip design in the semiconductor industry. This industry was one of the earliest to globalize production in developing countries, and has been among the first to move advanced design to selected developing economies including the Republic of Korea, Taiwan Province of China, and, more recently, to China, India, Singapore and Malaysia (annex to chapter V). Asia is not only undertaking

Box IV.5. The boom in R&D-related FDI inflows in China

R&D-related FDI inflows in China have surged in recent years. The accumulated R&D investment of TNCs in China had reached approximately $4 billion by June 2004 (estimated by the Ministry of Commerce), while the number of foreign-affiliate R&D centres, registered according to the eligibility criteria in place since the year 2000, reached 700 by the end of 2004. Although the first TNC R&D centre dates back to 1993, most of the known projects are recent (established after China's accession to the WTO in December 2001).

Most foreign-affiliate R&D centres are wholly-owned by their parent companies, although some of them are joint ventures (such as the one established by Lenovo and Intel in 2003). The majority of these centres still focus on adaptive innovations for the Chinese market. However, some do innovative R&D that is closely integrated with TNCs' global innovation networks, and thereby target global markets.

R&D-related FDI inflows have been concentrated in technology-intensive industries such as ICT, automotive and chemicals (according to the data of the Beijing Municipal Bureau of Statistics). The ICT industry, in particular, has witnessed a boom in R&D investment by TNCs (box table IV.5.1). Motorola (see also box IV.6), one of the largest foreign investors in China, had set up 15 local and global R&D centres in China by the end of 2004, with several others under construction. In addition to Motorola, major R&D investments have been made by Microsoft, Nokia, GE (box table IV.5.1) as well as IBM, Siemens, Nortel, Dupont, General Motors, Honda, Hitachi and Toshiba, to mention only a few (Sigurdson 2005a, p. 2).

Foreign-affiliate R&D centres in China are concentrated in large cities with strong technological bases and skilled human resources, particularly in Beijing and Shanghai (box figure IV.5.1). At the end of 2004, 189 centres were located in Beijing alone, with almost 60% of them in the ICT industry. Many of them followed on the footsteps of IBM, which established its wholly-owned R&D centre there in 1995. Within the capital, the Haidian District (where Zhongguancun Science Park is located) is home

Box table IV.5.1. Selected foreign affiliate R&D centres in the electronics and ICT industries of China, as of 2004

Company	Number of R&D centres in China	Location	Features
General Electric	1	Shanghai	• China Technology Centre, opened in Shanghai in 2003, is the third global R&D centre of the company after those in the United States and India. • Invested $640 million and centralized its previous by existing R&D units in China. • 500 R&D engineers (planned to increase to 1,200 in 2005).
Microsoft	5	Beijing Shanghai	• Invested $130 million. • Microsoft Research Asia (MRA), established in 1998, is the company's basic research facility in the Asia and Oceania region and the fifth largest research centre in the world. • MRA employs over 170 researchers.
Motorola	15	Beijing Shanghai Tianjin Suzhou Nanjing Chengdu	• The first TNC R&D centre in China (set up in 1990). • Total of 1,300 R&D engineers. • Invested $300 million in R&D in China until 2001. • Motorola China Research Institute (MCRDI) was established in 1999. • Will invest $500 million in a new R&D centre in Beijing.
Nokia	5	Beijing Shanghai Hangzhou	• Nokia China R&D Centre, established in 1998, employs 300 R&D engineers. • Hangzhou R&D Centre, established in 1998, employs 180 R&D engineers (will increase to 400).

Source: UNCTAD, based on company press information.

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more chip-related R&D; the levels of complexity of this R&D are also on the rise. A few firms from the Republic of Korea and Taiwan Province of China, and to a lesser extent from China and India, now develop cutting-edge technology.

In sum, the range of R&D activities undertaken by or for TNCs in Asia, mainly in information technology and pharmaceuticals, is surprisingly wide:

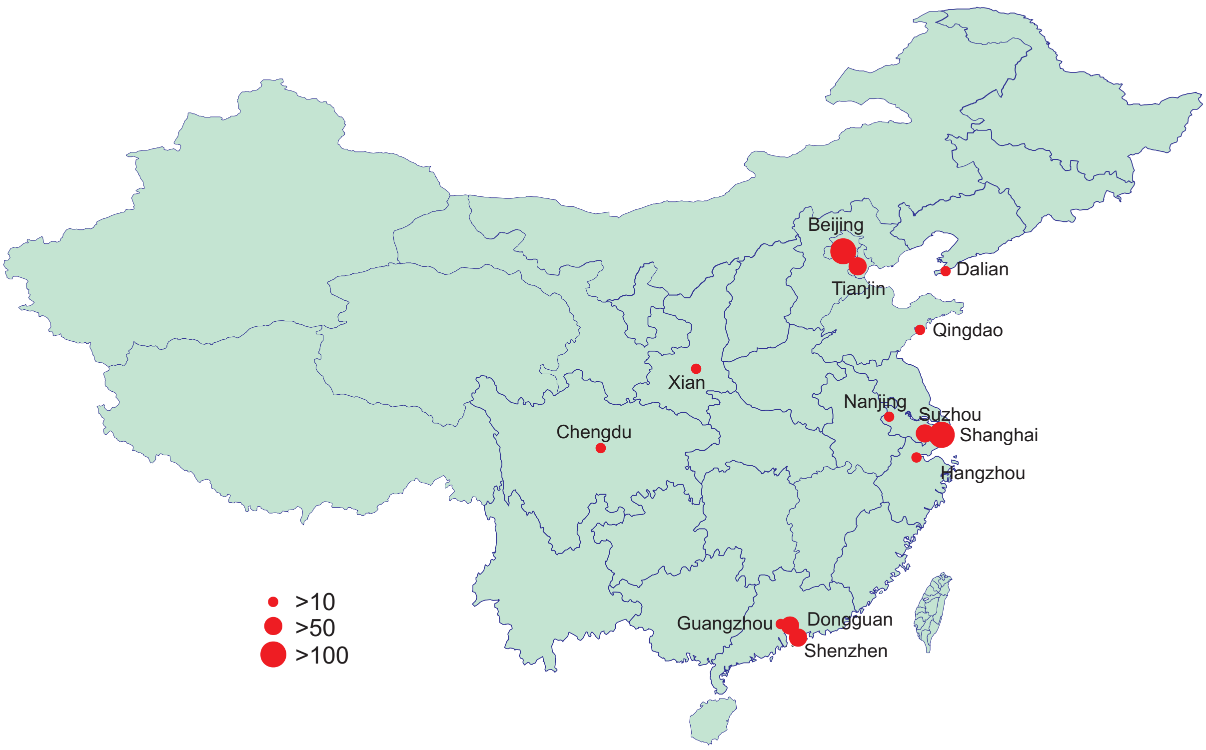
> "Today, the likes of Dell, Motorola, and Philips are buying complete designs of some digital devices from Asian developers, tweaking them to their own specifications, and slapping on their own brand names. It's not just cell phones. Asian contract manufacturers and independent design houses have become forces in nearly every tech device, from laptops and high-definition TVs to MP3 music players and digital cameras... While the electronics sector is furthest down this road, the search for offshore help with innovation is spreading to nearly every corner of the economy... [Boeing] is working with India's HCL Technologies to co-develop software for everything from the navigation systems and landing gear to the cockpit controls for its upcoming 7E7 Dreamliner jet. Pharmaceutical giants such as GlaxoSmithKline and Eli Lilly are

Box IV.5. The boom in R&D-related FDI inflows in China (concluded)

to 40 universities and 130 research institutes and is the capital city's R&D hub.

In Shanghai, over 140 TNC R&D centres have been established, of which 91 are in the Pudong New District. In addition, the Guangdong and Jiangsu provinces had accounted for 28% and 19% of the accumulated FDI inflows of China until 2003 (estimated by the Ministry of Commerce) and are home to more than 100 foreign-affiliate R&D centres. Some other regional economic centres in other coastal provinces such as Hangzhou in Zhejing province, Qingdao in Shandong province and Dalian in Liaoning province have also attracted important foreign-affiliate R&D centres (box figure IV.5.1). Finally, TNCs have also set up some R&D centres in a limited number of inland cities such as Xi'an and Chengdu.

Box figure IV.5.1. Location of foreign-affiliate R&D centres in China, 2004
(Numbers)



Source: UNCTAD.

Box IV.6. Motorola's R&D network

Telecommunications equipment manufacturer Motorola (United States) is the world's 19th largest R&D spending firm (table IV.1). As of end 2004 it operated major R&D centres (those with over 100 R&D staff) in 19 countries worldwide: two in North America, six in the EU-15, one in Poland, three in other developed countries, six in developing countries, including Brazil, China, India, the Republic of Korea, Malaysia and Singapore, as well as one in the Russian Federation (box figure IV.6.1).

The first overseas R&D centres were opened in 1950 in Canada and the United Kingdom, followed by various other European locations in 1960. Motorola began conducting R&D in developing countries fairly early, with operations in Singapore and Malaysia already in place in 1970. Most R&D centres concentrate on product development rather than on research. The latter is conducted in only five countries, three of them developed (the United States, the United Kingdom and Israel) and two of them developing: India and China.

The R&D activities of Motorola in China illustrate well the interaction between a TNC with a global network of R&D centres and a wide-ranging host-country R&D structure including business and government R&D units (Sigurdson 2005a). Motorola has also entered into a number of collaborative research agreements with local universities, which also explains the broad presence of its R&D centres in the country. Motorola originally focused on manufacturing in China. In the early 2000s, the company increased its R&D activities in China to be closer to the local market and to be more cost-efficient.

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teaming up with Asian biotech research companies in a bid to cut the average $500 million cost of bringing a new drug to market" (Engardio and Einhorn 2005, pp. 52-53).

b. Latin America and the Caribbean: limited R&D but with potential

TNCs have so far located only limited R&D in Latin America and the Caribbean. FDI there is rarely in R&D-intensive activities, and when it is, it mainly remains confined to adaptation of technology or products for local markets, called "tropicalization"[42] in the Latin American context (Cimoli 2001). Foreign affiliates play a relatively large role in business enterprise R&D in Brazil and Mexico, moderate in Argentina and low in Chile (figure IV.6).

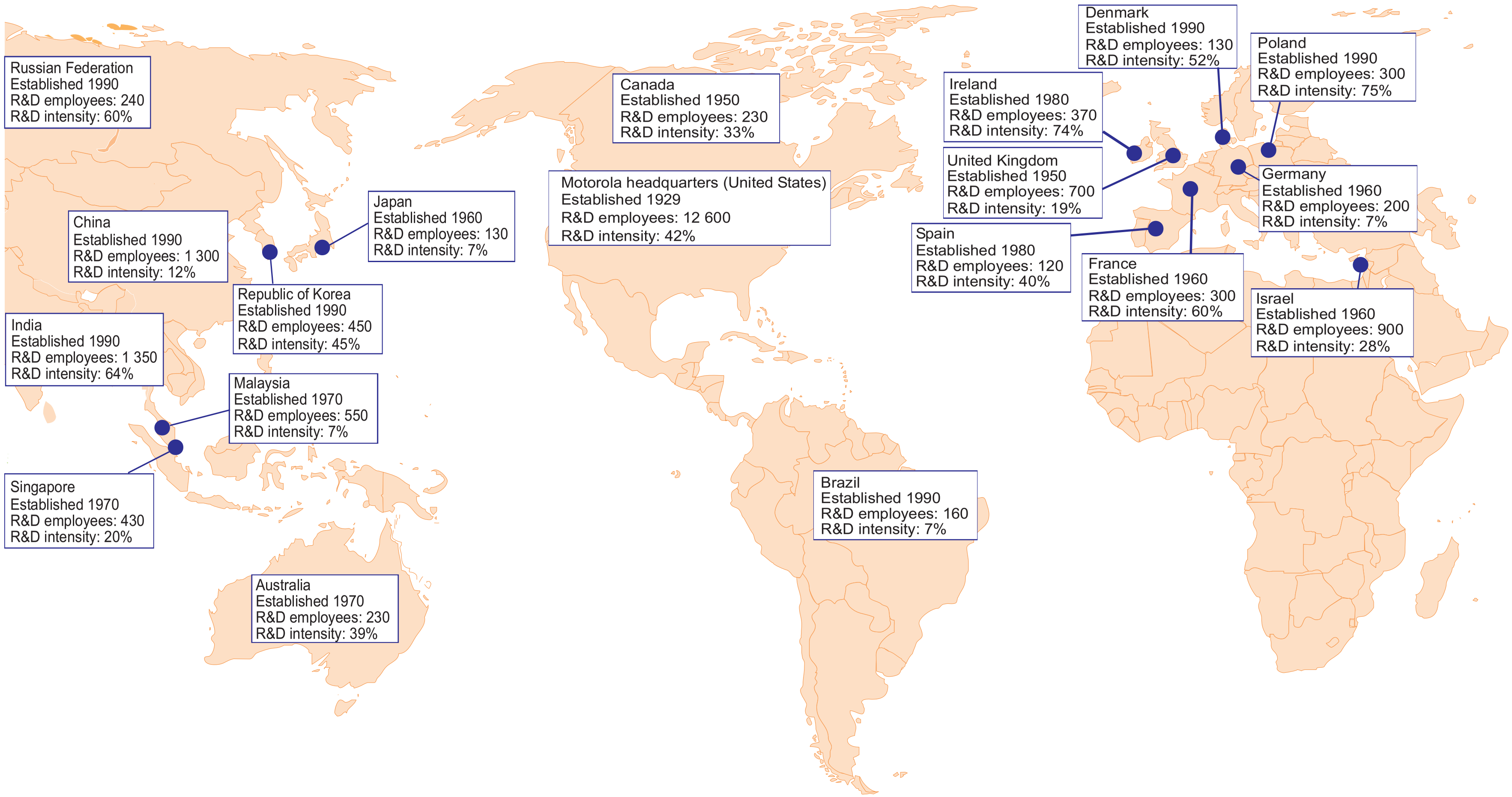
Employment data for the majority-owned foreign affiliates of United States TNCs show that, while the share of Latin America and the Caribbean in 1999 was about 20% of the worldwide total employment in such foreign affiliates, the share of the region in R&D employment of foreign affiliates was only 7% (table IV.7).[43] Most of this is in two countries: Brazil and Mexico (table IV.6).

In Brazil, adaptive R&D dominates, although some change has been noted in the strategies of some TNCs since the late 1990s. They include Brazilian affiliates in their strategy of globalization of R&D, upgrading their technological activities and giving them new R&D responsibilities (Costa 2005). This has occurred mainly in the auto parts and automotive industries (box IV.9) as well as in the electronics industry. In these industries some TNCs have reversed previous downsizing of local R&D activities,[44] following their loss of market share either locally or regionally (Costa 2005, Queiroz et al. 2003, Furtado et al. 2003, Consoni and Quadros 2003, Galina 2003). The pharmaceuticals industry displays a different pattern: few pharmaceutical TNCs do R&D in Brazil, despite the availability of local capabilities and public laboratories (Costa 2005, Furtado et al. 2003).

In Mexico foreign affiliates are active mainly in assembly work, relying on their parent companies for most R&D activities. Innovation in export-oriented TNCs appears to be confined to organizational and marketing activities rather than product and process technology (Abdel Musik 2004). A study of Mexico's Baja California electronics and automotive manufacturing cluster concluded that more than a quarter of the plants surveyed were engaged in R&D, one-fifth did

Box IV.6. Motorola's R&D network (concluded)

Box figure IV.6.1. Motorola's R&D network, 2004



Source: UNCTAD, based on information and data provided by Motorola.

product design, more than one-tenth had developed a patent and more than one-third had ISO 9002 Certification (Gerber and Carillo 2002). An example of R&D for global markets is found in the automotive industry of Mexico. For instance, Delphi Automotive (United States) has a technical centre in Ciudad Juárez employing 3,000 people, half of whom are engineers designing auto parts for global use. Examples of R&D for the regional market can be found in the country's banking industry (BBVA of Spain).

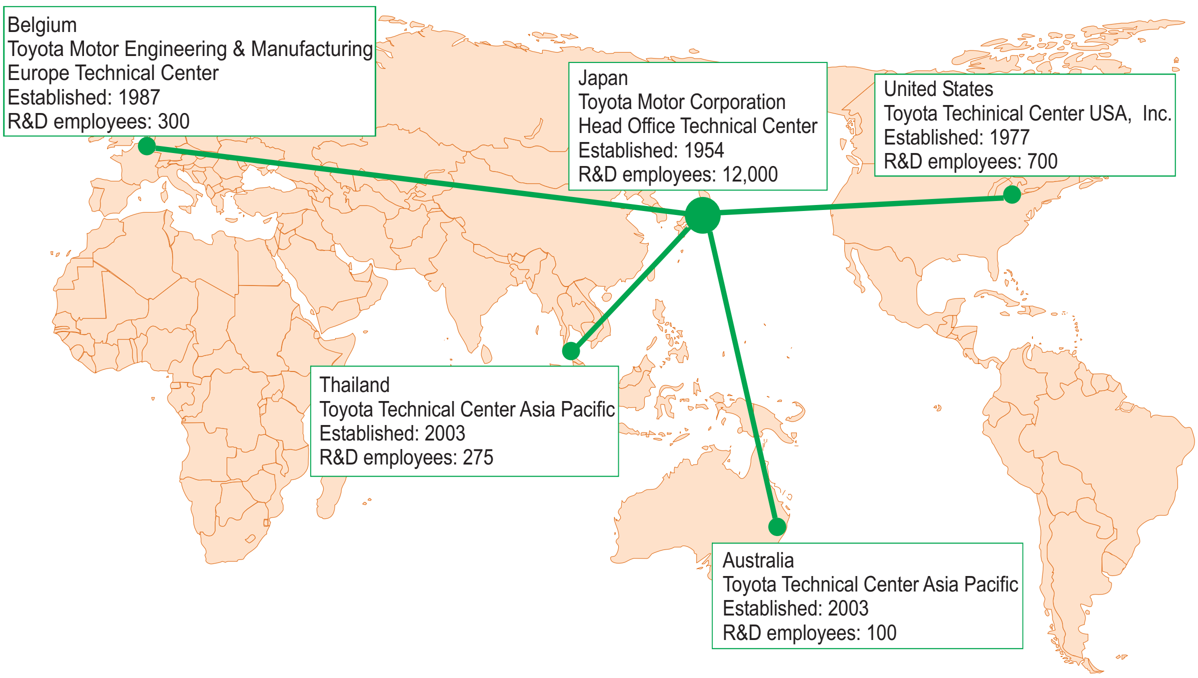
Box IV.7. Thailand in Toyota's global R&D network

Toyota Motor Corporation founded its fourth overseas R&D centre – and the first one in a developing country (box figure IV.7.1) – in Thailand in August 2003.[a] The "Toyota Technical Center Asia Pacific (Thailand)" was officially opened in May 2005. Toyota has invested 1.1 billion baht ($27 million) into this centre so far. During the two-year preparation for opening, almost all locally recruited engineers and scientists were sent to Japan for a training period of 6 to 12 months.

When it first opened, the "Toyota Technical Center Asia Pacific (Thailand)" employed 275 persons (including 32 Japanese), of which 250 were engineers and technicians (2% of Toyota's global R&D staff). The centre has both a regional mandate for Asia (excluding China) and a global one to carry out R&D for the parent corporation. It is in charge of projects in basic research, technology development, research on market conditions and design, along with testing and evaluation.

Thailand was chosen as a location for Toyota's Asian R&D centre for various reasons. The existence of a manufacturing and sales affiliate there was an important consideration, although there is no equity or administrative link between the two units. Other reasons include good local infrastructure, political stability, favourable geographical location, a skilled labour force and favourable government policies (including incentives). In the area of policies, outstanding issues include the eventual exemption from customs duties of materials (such as motor vehicles) imported for testing, and the provision of full licences for test-driving.

Box figure IV.7.1. Toyota's global R&D network, 2005



Source: UNCTAD, based on company interview conducted on 4 May 2005.

[a] The other overseas R&D centres are in the United States, Europe and Australia (see box figure IV.7.1).

Box IV.8. Innovative R&D by foreign affiliates in the Republic of Korea: Microsoft, Siemens and Philips

The Republic of Korea has recently attracted innovative R&D centres from a variety of major TNCs.

In March 2005, United States software maker *Microsoft* opened its Mobile Innovation Lab at the headquarters of its Korean affiliate, Microsoft Korea, in Seoul to develop technology for wireless devices. The company is committed to creating software programmes for next-generation mobile devices. Microsoft has plans to invest up to $30 million in this R&D centre over the next three years, and employ 30 researchers.

Siemens, the German electronics and information communications corporation, announced in June 2004 that it would invest $119 million in the Republic of Korea over five years. The investment was intended to establish a forward base of information communications and network equipment in the country and develop products for the world market. Siemens had invested $45 million by early June 2004 and had bought a 38.7% share of Dasan Networks (Republic of Korea), making it that company's largest shareholder. Siemens is developing Dasan Networks into an R&D centre and distributes communications and network equipment to world markets, including those in Europe, the United States and Asia.

In 1999, *Royal Philips Electronics* of the Netherlands acquired a 50% share of LG Electronics' LCD (liquid crystal display) division for $1.6 billion. The new joint-venture company plans to invest a total of $10 billion and build the LG-Philips Plant on a 408-acre site in Paju, Gyeonggi Province by 2006. Along with the production lines, LG-Philips plans to set up an R&D centre to develop technology for next generation TVs.

Source: UNCTAD, based on information provided by the Ministry of Information and Communication of the Republic of Korea, *Investment Opportunities in Broadband IT Korea, 2004*, www.mic.go.kr, www.investkorea.org.

Box IV.9. General Motors in Brazil: from tropicalization to global innovative R&D

General Motors has an important R&D centre at its Sao Caetano plant in southern Brazil. Established in the 1960s as a small unit to adapt ("tropicalize") GM autos and parts to Brazilian conditions, it became a large laboratory by the end of the 1980s, focusing on a variety of projects directed at the host-country market. By the late 1990s, GM Brazil had accumulated technical expertise in designing local versions of GM models such as the Opel Corsa sedan, the Corsa pickup and the Astra sedan. The continuous building up of the product development engineering team and local infrastructure permitted GM Brazil to go further through engagement in the Blue Macaw project, origin of its Celta model.

After 1996 the Brazilian automotive regime became increasingly open to parts imports while still protecting the assemblers with fiscal advantages and import tariffs. GM responded to those policies by streamlining its manufacturing process, whereby suppliers co-located their production of sub-assemblies for GM cars at the assembly plant in Rio Grande do Sul, thereby reducing GM's inventory holdings.

Concomitantly, GM also changed the mandate of its Brazilian R&D centre from local to international: GM Brazil was assigned responsibility for designing a new vehicle for global sales (the Meriva minivan). Instead of following the usual strategy of car makers, which consisted of designing a partial derivative of an already existing model, GM Brazil was given responsibility for a more complex project called "global derivative" consisting of designing a new vehicle for global rather than local application (Consoni 2004).

These additions to GM Brazil's portfolio of activities have meant expanded product and process development for both local and global applications. About 1,000 technical and hourly employees are now engaged in product development in Brazil, and about 500 in process engineering R&D work. The value of this activity is not large when considering GM's global R&D activities, although it has increased the responsibility and autonomy of the Brazilian R&D team significantly. Today, GM in Brazil competes with other GM affiliates in the United States, Europe and Asia for the right to design and build new vehicles and to carry out other core activities for the global company.

Source: UNCTAD, based on company interview.

c. Africa: generally marginal in R&D by TNCs

In Africa the R&D component of FDI is overall very small. With a few exceptions such as Kenya, Morocco and especially South Africa, R&D by TNCs is virtually absent. This is partly because of weak domestic R&D capabilities (chapter III) and, in many cases, the lack of institutional mechanisms that provide incentives for investors to devote resources to R&D (Oyelaran-Oyeyinka 2004a). This does not necessarily mean that innovation per se is absent from Africa but rather that such innovation is undertaken outside R&D laboratories.

In the South African auto industry – in which all assemblers are wholly or partly owned by their respective parent companies from Japan, Europe or the United States – firms spend 2.5% of their total sales on R&D (UNCTAD 2003b, p. 16). This is generally carried out in collaboration with the South African Bureau of Standards (SABS) and the engineering faculties of some of the leading universities.[45] Collaboration between SABS and the automotive foreign affiliates has led to the establishment of the EuroType Test Centre, a state-of-the-art laboratory that has made South Africa one of the world leaders in testing engines and catalytic converters. In the South African aerospace industry, BAE Systems of the United Kingdom contracted Aerosud South Africa as an exclusive supplier of leading-edge wing components for the Airbus A320 jetliners.[46] In health care, Innovex, a South African affiliate of Quintiles (United States), offers contractual services for clinical testing, health economics, marketing and sales.

North Africa provides some recent examples of FDI in R&D. Morocco has attracted R&D centres, especially in software and electronics: SQLI (France) set up an R&D platform in the country in 2003, Eolane Electronics Manufacturing Services (France) opened an R&D centre in the country in 2004 next to its manufacturing and distribution unit, and STMicroelectronics has had a chip design Centre in Casablanca since 2000 (box IV.10). In the automotive industry, Pininfarina/Matra (Italy) opened a 60-person R&D centre in Morocco in 2004, together with a test circuit. Other North African countries are less targeted by R&D,

Box IV.10. STMicroelectronics' design and software centre in Rabat

In 2000 STMicroelectronics (registered in the Netherlands and headquartered in Switzerland) located parts of its design activities in Morocco.[a] The Rabat Design Centre is part of a global network of 16 advanced R&D centres and 39 design centres in the Czech Republic, France, Germany, India, Italy, Morocco, Tunisia, the United Kingdom and the United States. Within this network, the primary mission of the Rabat Design Centre is to develop advanced system-on-chip products for digital TVs, DVD players and flat-screen displays, along with digital still and video cameras. The Rabat Centre currently employs 170 people, scheduled to grow to 700 by 2009.

In addition, the firm has established a training centre, the first of its kind in the country, to train teachers and students from engineering schools and to provide them with the necessary syllabus to enable them to make a valuable contribution to the innovation needs of the semiconductor industry. In 2001 it launched its first cooperative activity with the Mohammed V-Agdal University in Rabat, which included scholarships, exchange programme and sponsorship of microelectronics courses. It also established a design centre at the Mohammadia School of Engineers, within the Mohammed V-Agdal University.

STMicroelectronics chose Morocco as the location for the design centre for several reasons. These included a favourable educational and communications infrastructure, the availability of a rich pool of engineering talent, the proximity of Europe and competitive costs. Rabat was chosen specifically for its schools and universities that train engineers specialized in the computer/IT domain.

Source: STMicroelectronics.

[a] The presence of the seventh largest semiconductor producer in the world (49,000 employees worldwide) in Morocco dates back to 1952. Operations in Morocco were expanded in 1979 to carry out subsystem development, and again in 1997 to create a state-of-the-art "back-end" assembly and test plant.

though in Algeria the Jordanian pharmaceutical firm Hikma opened an R&D centre at its local factory in 2003, while Novell (United States) entered into a strategic alliance with Net-Skills, a local software firm (Marseille Innovation and ANIMA 2005).

The rest of the R&D-related FDI in Africa mirrors the resource-based orientation of the continent, focusing on petroleum exploration and exploitation and agriculture. In the petroleum industry, a number of TNCs[47] conducted some R&D in Algeria, Egypt, Morocco, the Libyan Arab Jamahiriya and Tunisia in 2004.[48] In agriculture, the United States-based Agro-Management Group developed pyrethrum flowers in Uganda, for the international market.[49] Kenya is also home to selected agricultural R&D projects carried out by and for TNCs and their affiliates (box IV.11).

d. A comparison with economies in transition

In the former transition economies that are now new EU member countries, foreign affiliates have become important R&D players since the mid-1990s (figure IV.6, box IV.12). This has happened partly through the early acquisition of flagship firms carrying out R&D such as Škoda Auto in the Czech Republic in 1991 and Tungsram in Hungary in 1990. In those instances the new owners decided to transform the local R&D laboratories of the acquired affiliates into specialized corporate R&D centres. The majority of the R&D privatized laboratories acquired by foreign investors in the acceding new EU member countries managed to adapt to the new environment of increased competition from imported technologies. An UNCTAD survey of privatization through FDI carried out in 1999[50] found that in the two years following the privatization deals, R&D expenditure increased by 13.6% in the sample firms (Kalotay and Hunya 2000, p. 53).[51]

In the new EU member countries, R&D by foreign affiliates has also expanded through greenfield projects. Of the 108 R&D projects initiated in the new EU, South-East Europe and the CIS taken together in 2002-2004, 66 were registered in the new EU member countries, with the Czech Republic, Hungary and Poland taking the lead. Information on key R&D affiliates in

Box IV.11. R&D by TNCs in agriculture: Kenya

Kenya is not a major player in global R&D. In agriculture, which generates a large share of its export earnings, R&D expenditures represented only slightly more than 1% of the total for developing countries in 2000.[a] Moreover, the private sector accounted for only 3% of total agricultural R&D expenditure in Kenya that year.[b]

There are however several agricultural/horticultural or related firms, including TNCs, conducting some form of R&D in Kenya. The known cases of R&D by TNCs in Kenya have followed different strategies. Some have decided to conduct in-house R&D. Examples include De Ruiter's, Regina Seeds, Fourteen Flowers (the Netherlands), Del Monte (United States) and Kordes & Söhne (Germany). Other TNCs such as East African Breweries (United Kingdom), Monsanto (United States) and Syngenta (Switzerland), have opted for collaborative arrangements with local and foreign partners. The Kenyan Agricultural Research Institute (KARI) carries out research on barley on behalf of the East Africa Breweries, and works for Syngenta to develop insect-resistant maize for Africa. Monsanto's involvement in Kenyan R&D is more indirect, as its project initiated originally in direct collaboration with KARI and the International Service for the Acquisition of Agri-tech Applications has been transferred to its United States non-profit partner, Donald Danforth Plant Science Center.[c]

Source: UNCTAD.

[a] CGIAR, ASTI Database (www.asti.cgiar.org/expenditures.cfm), and Beintema, N. and Phillip G. Pardey (2001). "Slow magic: agricultural R&D a century after Mendel", ASTI Initiative, IFPPI, mimeo.

[b] The share of private firms in Kenyan agricultural R&D may be higher, because the original sample was based on information available on only three firms.

[c] The non-profit Donald Danforth Plant Science Center is a partnership organization of the Monsanto Company and various United States-based academic research institutions.

these three countries in 2004 suggests a dominance of EU-15 investors, although the United States, Japan and some developing economies (India, the Republic of Korea) are also among the home countries. Most of these affiliates are linked to manufacturing sites, and hence are mainly in the automotive and electronics industries (including spare parts producers and telecom equipment manufacturers). Various affiliates on the list have "innovative" R&D mandates for regional or global markets.

In South-East Europe as well, foreign affiliates have gained a prominent role in R&D. In Romania, for example, Automobile Dacia (affiliate of French Renault) and Petrom (now affiliate of Austrian OMV) were the two largest R&D spenders in the country in 2003. In Bulgaria, Bulgarian Telecom (65% owned by Viva Ventures, United States) was the second largest R&D spender in the same year.

In the CIS, and the Russian Federation in particular, the entry of TNCs in R&D has remained at a low level and in most cases is limited to alliances or other contractual arrangements. Boeing (United States), Pratt & Whitney (United States), Airbus (France/Germany/Spain/United Kingdom) and Dassault (France) have been actively cooperating with the R&D institutes and laboratories of the Russian aerospace industry and the Russian Academy of Sciences since the early 1990s (Ivanova 2004, p. 151). For example, one of the leading Russian R&D centres, the Zhukovski Central Aerohydrodynamics Institute, has contributed to R&D on the Hermes air space system and the DASA Hypersonic vehicle, on commercial transporter A3XX and on Boeing's 757 and 777 aircraft (Ivanova 2004, p. 152). Outside the Russian Federation, Antonov, the leading Ukrainian aviation firm, signed in 2002 contracts to modernize Chinese aircraft in cooperation with Shanxi Aircraft Industry based on earlier Antonov designs (Yegorov 2004, p. 159).

R&D on a basis other than contractual ties is less frequent in the CIS. As a whole, there were only 30 greenfield R&D projects reported in the LOCOmonitor database for the CIS in 2002-2004, of which the Russian Federation alone accounted for 27. Compared to the science and technology base in the Russian Federation that number is small but could grow rapidly in the near future. One of the largest of the foreign-affiliate R&D

Box IV.12. R&D by foreign affiliates in the Czech Republic

As in most new EU member countries, the Czech R&D system underwent a major transformation during the transition from centrally planned to market economy. In this process, foreign affiliates have become important players in the national R&D system, accounting for nearly 47% of business expenditure on R&D in 2003 (figure IV.6) and for 30% of business R&D employment in 2002.

R&D activity of foreign affiliates is typically related to the presence of manufacturing plants in the country, although this trend might be changing as a consequence of several greenfield projects that have been attracted into strategic services recently. In pure R&D activities (stand-alone R&D laboratories, ISIC 73) foreign affiliates play a limited role, accounting only for 6.3% of employment in 2002. The R&D services industry received only 0.1% of total FDI inflow until the end of 2002 (more than 80% of which came from Germany).

In manufacturing, most of the business R&D is concentrated in medium-technology industries such as automobiles, which accounted for 68.2% of manufacturing-related R&D in 2002. Automotive production has a long tradition in the Czech Republic with Škoda Auto, taken over by Volkswagen in the early 1990s, as the main showcase. Foreign affiliates in the automotive industry are committed to the long-term upgrading of their overseas R&D, as their patenting record and their cooperation agreements with universities and R&D laboratories indicate. This contrasts with the case of electronics, another significant FDI recipient in the Czech Republic. Activities in that industry are driven primarily by local cost advantages, with limited investment in overseas R&D. In fact, in this industry the R&D intensity of foreign affiliates is substantially lower than that of domestic firms.

Source: UNCTAD, based on Srholec 2005.

centres of the Russian Federation was opened by Intel in 2000 (box IV.3). In another case, the European Aeronautic Defence and Space Company, the parent firm of Airbus (EADS, headquartered in the Netherlands), opened a 30-employee engineering centre in Moscow in 2003 together with the Russian Federation's Kaskol Group, an aerospace and defence conglomerate that controls the MiG producer in Nizhny Novgorod.[52]

E. Developing-country TNCs are also expanding R&D abroad

Another new trend whereby developing countries are connecting to global knowledge networks is the emergence and fast growth of foreign R&D activities by TNCs from developing economies. As the phenomenon is very recent, the top R&D spenders of developing countries are still relatively small (section A and table IV.1). However, some – almost all from Asia – have moved up in ranking on the list of the largest R&D-spending firms since the late 1990s. Moreover, the expansion of their R&D appeared to be on a relatively large scale in 2002-2004 (table IV.9).

Some developing-country TNCs such as the IT company, Ingenuity Solutions (Malaysia), have targeted the knowledge base of developed countries such as the United States, when investing in R&D abroad. Similarly, Bionova of Mexico acquired DNA Plant Technology of the United States in 1996 and, as a more recent example, the Singaporean firm Cordlife, acquired Cytomatrix (United States) in 2004.

There are also examples of South-South FDI in R&D. A number of firms from Malaysia, the Republic of Korea, Singapore, and Thailand have set up R&D activities in India related specifically to software development (Reddy 2000, pp. 97-103). In 2003 Samsung Electronics (Republic of Korea) announced plans to open R&D centres in China, India and the Russian Federation; LG (Republic of Korea) has expanded its R&D activities into India; and Bogasari International (Indonesia, food processing) chose Singapore, in part due to the country's favourable R&D incentive schemes for foreign investors.

The following section examines the cases of Chinese, Indian and Korean TNCs, which are among the most active developing-country firms establishing R&D activities abroad.

A recent study of large *Chinese TNCs* found that they operated 77 R&D units at the end of 2004, including a surprisingly high 37 units abroad (von Zedtwitz 2005). Of these foreign R&D units, 26 are located in developed countries, predominantly in the United States (11) and Europe (11), mostly serving as listening posts or in product design roles.[53] The remaining 11 units, located in developing countries, are typically small in size (e.g. just a handful of people in a small technology outpost in Pakistan and the Islamic Republic of Iran).[54] Two Chinese TNCs, Huawei[55] and Haier,[56] are illustrative of the trend of R&D units being located mainly in developed countries. Other Chinese companies from the electronics industry, such as ZTE and UTStarcom, have also established R&D centres in India aimed essentially at offshore software development.

Indian TNCs are also globalizing their R&D, focusing mainly on serving their customers in specific regional markets. The leading software firms have all invested abroad, mostly in developed countries. For example, Infosys, Wipro, Birlasoft (part of Aditya Birla Group) and HCL Technologies have operations in the United States. They are also moving into selected developing-country locations where they have major customers, especially China, South-East Europe and the CIS.[57] Some Indian software R&D affiliates are located in other developing regions (e.g. Tata has invested in Uruguay) as well as in new EU member countries (Hungary). Indian firms in other industries such as pharmaceuticals and chemicals are also investing in R&D abroad (box IV.13).[58]

TNCs from the Republic of Korea started establishing R&D affiliates abroad only in the 1990s. In 2005, a survey carried out by the Korea Industrial Technology Association identified 60 foreign R&D centres owned by Korean firms. The United States was the main target of such investment (17 R&D centres) followed by China (15), Japan (7), the Russian Federation (5) and Germany (5). The majority of R&D centres in China (12 of the 15) have been operating since 2000. Some of the Korean firms investing abroad in R&D also figure prominently on the list of the

700 largest R&D-spending companies of the world (table IV.1): these include Samsung Electronic (33rd in world ranking and the largest R&D spender in the developing world),[59] Hyundai Motor (95th) and LG Electronics (110th).

F. Prospects

In sum, TNCs are dominant players in global R&D, and their R&D is being increasingly internationalized, including in developing countries. The trend towards the greater involvement of developing countries in the R&D activities of TNCs is likely to accelerate, although, to date, the majority of developing countries remain excluded from this phenomenon. Whether R&D activities will spread to a growing number of developing countries remains an open question, and will largely depend on the policies pursued by these countries (chapter VII).

In the UNCTAD survey of the world's largest R&D-spending TNCs, as many as 69% of the responding firms stated that their share of foreign R&D is set to increase; only 2% indicated the opposite, while the remaining 29% expected the level of internationalization to remain unchanged (figure IV.10).[60] The momentum appears to be particularly strong among companies in Japan and the Republic of Korea, which have so far been less aggressive in terms of R&D internationalization. Nine out of ten Japanese companies in the sample and about 80% of the Korean firms planned to increase their foreign R&D, while 61% of European firms indicated similar intentions. This finding is corroborated by information provided by the Government of Japan: 95% of Japanese affiliates abroad plan either to expand their R&D activities (17%) or to maintain them (78%) at the same level as before, regardless of their location (Japan, METI 2004).

Box IV.13. Alexandria Carbon Black: Indian FDI in R&D in Egypt

The Aditya Birla Group is one of India's top TNCs. It has 72,000 employees worldwide and manufacturing units in Australia, Canada, China, Egypt, Indonesia, Malaysia, the Philippines and Thailand. In 1994 the company established the Alexandria Carbon Black (ACB) factory in Egypt. Owing in part to continuous product and process innovation, the ACB plant has grown to become one of the world's largest single carbon black plants.[a] It employs 300 persons in Egypt, 25 of whom work in its R&D centre.

The ACB plant has a sophisticated R&D centre with the latest analytical equipment. The centre has, among other things, developed a key grade of carbon black for providing critical properties to the final product. Other innovations include manufacturing process improvements to improve quality and increase efficiency, utilization of information technology to computerize processes, innovations in the area of packaging and environment management, as well as adopting total quality management and total productive maintenance.

The R&D centre provides various forms of technical support to domestic enterprises. Local companies can use the centre's analytical equipment, and it also provides training to employees of local companies. The training includes best practices in quality management, how to use sophisticated analytical equipment, statistical quality control tools and total productive maintenance. In order to upgrade the skills of the employees of its suppliers, the company also offers technical and managerial support. Some development work (e.g. related to improvements in raw material and packaging) has also been done in partnership with suppliers. Six major partnerships with suppliers have been forged in the areas of packaging, raw materials and manufacturing of sophisticated equipment. As a founding member of the Regional Geographical Committee of the Petro-Chemical Area, ACB also helps the adoption of best practices by local companies.

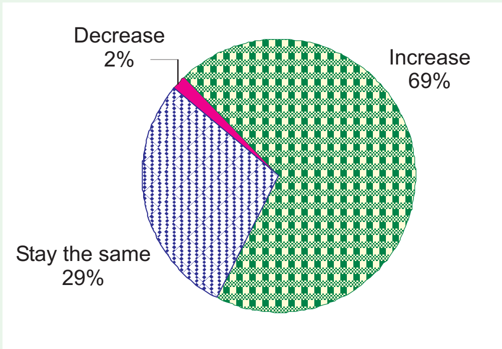
The R&D centre is closely collaborating with the parent company's Fundamental Research Institute in India. The Aditya Birla Group provides significant support to ACB in a number of areas, and members of ACB's technical team frequently travel to other carbon black units of the group to exchange experiences and learn from the others.

Source: UNCTAD, based on information provided by Alexandria Carbon Black in March 2005.

[a] Carbon black is a key raw material input mainly for the manufacture of tyres and other rubber products.

Figure IV.10. Prospects of TNCs locating R&D abroad, 2005-2009

(Per cent of responses)



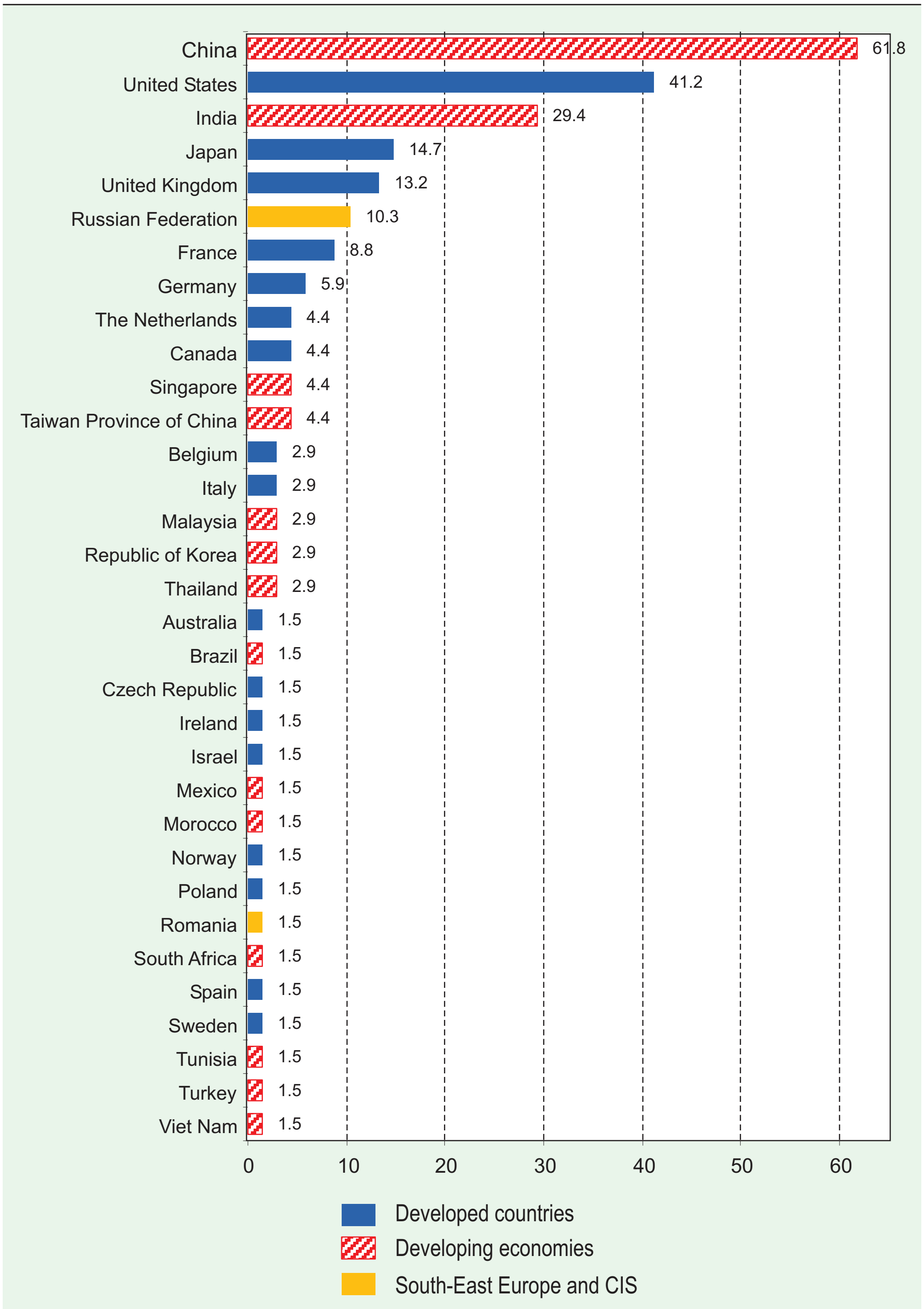
Source: UNCTAD survey.

A further shift towards some specific developing, South-East European and CIS markets is also expected (figure IV.11). In the above-mentioned UNCTAD survey, for instance, China was the R&D destination mentioned most often, followed by the United States. In third place was India, another significant newcomer location for R&D. The Russian Federation was also among the top 10 target locations for R&D expansion. Other developing economies that were mentioned as candidates for further R&D by at least 2% of the companies were the Republic of Korea, Singapore, Taiwan Province of China and Thailand. However, only a few respondents indicated possible plans for expanding R&D in Latin America and Africa. Another survey (EIU 2004a) reached similar conclusions, with the top 10 destinations for R&D expansion including three developing economies: China for R&D expansion (in first position), India (3rd) and Brazil (6th); and three others in the following ranks: Hong Kong, China (13th), Mexico and Singapore (both14th) (EIU 2004a).

* * *

This chapter has examined the dominant role of TNCs in global R&D along with the rise of some developing countries as locations chosen for TNC-led R&D. It has also analysed the shifts in the industry composition and the mandates of the R&D carried out abroad, especially in developing countries. In particular it has shown that R&D in some developing countries increasingly involves "innovative" activities. It has found that TNCs from developing countries are also investing in R&D abroad. The next chapter examines the drivers and determinants of the internationalization of R&D by TNCs, with the aim of determining the implications for development (chapter VI) and deriving some policy lessons (chapter VII).

Figure IV.11. Most attractive prospective R&D locations in the UNCTAD survey, 2005-2009
(Per cent of responses)



Source: UNCTAD survey.

Notes

1 Some pharmaceutical firms with no identified foreign affiliates pursue their internationalization through strategic alliances with TNCs. For example, Cell Genesys is in a technology alliance with Novartis (Switzerland). The latter is also a 5% shareholder of the former. Human Genome Sciences (United States) has strategic alliances with GlaxoSmithKline (United States), Takeda (Japan), Schering-Plough (United States), Sanofi-Synthelabo (France), Merck (Germany) and the Pharmaceutical Division of the Kirin Brewery (China). In another case, ICOS (United States) is a 50% owner of the Lilly ICOS joint venture formed with Eli Lilly (United States) for the global distribution of the drug Cialis.

2 In 2003, the R&D expenditure of the 700 largest spenders rose further, by more than 5%, to $327 billion.

3 In Sweden, the top 20 TNCs accounted for up to three-quarters of the total R&D expenditure in the late 1980s (Håkanson and Nobel 1993a). In Germany, only 49 firms accounted for two-thirds of the privately funded R&D spending in the late 1990s (Ambos 2005, p. 398).

4 Zander, 1994, Håkanson and Nobel 1993a, Pearce 1989, Dalton and Serapio 1995, von Zedtwitz and Gassmann 2002.

5 R&D expenditure data are for R&D activity regardless of the source of funding. The R&D data from the United States Bureau of Economic Analysis (BEA) defines R&D to include basic and applied research in science and engineering as well as the design and development of prototypes and processes. R&D expenses include wages and salaries, taxes, materials and supplies, depreciation, amortization, and allocated overhead and indirect costs, but exclude capital expenditures. R&D expenses also exclude routine product testing and quality control conducted during commercial production, geological and geophysical exploration, market research and surveys, and legal work pertaining to patents. BEA data used here exclude banks and other depository institutions. However, data on the distribution of overseas R&D in terms of basic, applied and development expenditures, along with their cost components (e.g. labour, equipment, taxes) are not available. Expenditure data are in current dollars (Moris 2005a). For further information and survey methodology, see http://www.bea.gov/bea/di/usdscrpt.htm.

6 R&D employment data from the United States BEA *Survey of U.S. Direct Investment Abroad* are available only every 5 years from benchmark surveys. The latest available data are for 1999.

7 In local currency, total R&D spending increased from 36 billion Swedish kronor to 47 billion Swedish kronor.

8 Granstrand 1999, Sachwald 2004a, Archibugi and Michie 1995, Archibugi and Iammarino 2002, Molero 1998.

9 Roberts (2001) and Edler et al. (2002) surveyed 209 Triad firms each; von Zedtwitz and Gassmann (2002) conducted a total of 290 interviews (over the period 1994-1998).

10 In order to eliminate the distortions caused by under- and over-representation, this has been calculated as a weighted average of responses using the regional distribution of the 316 questionnaires for weighting. Due to the over-representation of Western Europe in the responses, the unweighted average would have been 34%.

11 Not all firms answered both questions.

12 Previous studies (Roberts 2001, Edler et al. 2002, von Zedtwitz and Gassmann 2002), while finding that the Western European firms were the most internationalized, also noted that their lead over the United States TNCs was small. In the Edler et al. 2002 survey (p. 158), the European firms were estimated to spend one-third of their R&D budget abroad in 2001, followed closely by the North American firms (32%), and only very distantly by the Japanese firms (11%). In Roberts' (2001) survey, Western European firms were estimated to spend 35% of their R&D budget abroad, followed by the North American firms (33%) and the Japanese firms (10%). The discrepancy with the UNCTAD survey is due to the fact that the survey by Roberts treated intra-European and intra-North American R&D flows as domestic.

13 These are estimates based on data from 30 economies, which accounted for 99% of global business R&D in 2002. For more details, see the note in annex table A.IV.1.

14 The presence of India in this group may be surprising. The low share of foreign affiliates in total R&D spending in India may be due to various factors. One is that the latest statistics available are only for 1999 (i.e. the period before the take-off of many large projects). A second reason may relate to the definition of R&D: India specializes in software development, an industry that is not always categorized as R&D in statistics. Finally, many of the projects started in India have been of a non-equity nature, and hence are not reflected in FDI.

15 The share of foreign affiliates in the R&D of the transition economies of South-East Europe may be equally high, while that of the CIS is probably low.

16 Historical data were missing for two economies: Italy and Thailand.

17 Such as in the case of the merger between Sweden's Astra and the United Kingdom's Zeneca, the acquisition of the United Kingdom's Celltech by Belgian UCB, or the takeover of Škoda Auto by Volkswagen in the Czech Republic and Tungsram by GE in Hungary.

18 These foreign affiliates are engaged in commercial, physical and educational research (Standard Industrial Classification (SIC) code: 8731), commercial economics and biological research (SIC code 8732), non-commercial research (SIC code: 8733) and testing labs (SIC code: 8734) as their main activity.

19 Maastricht Economic Research Institute on Innovation and Technology, *Cooperative Agreements and Technology Indicators* (MERIT CATI) database.

20 Source: MERIT-CATI database.

21 Prior studies concluded similarly that R&D activities were not equally distributed around the world and tended to reside mostly in developed countries (Gassmann and von Zedtwitz 1999, Meyer-Krahmer and Reger 1999, Schmaul 1995, Archibugi and Iammarino 2002).

22 Information in this discussion related to the United States is based in part on a background paper prepared

by Francisco Moris (Moris 2005b) for *WIR05*.

23 Surveys are conducted at five-year intervals. The results for 2004 are not yet available.

24 R&D bases are key nodes of R&D, typically regrouping various affiliates. Hence the number of bases is lower than the number of foreign affiliates.

25 LOCOmonitor collects, validates and crosschecks real-time information on new (greenfield) and expansion FDI projects worldwide. Both announced and realized FDI projects are included. Each project identified is cross-referenced against multiple sources and the company website. Full global data collection started in 2002. Each FDI project is classified into one “key” business function (out of a list of 17, including R&D) and, if applicable, into additional business functions (following the same categorization). As a result, the number of projects whose “key” business function is R&D is smaller (1,489 over the period 2002-2004, annex table A.I.3) than the number of projects for which R&D is “any” business function (1,773 over the same period of time). The data presented in this Report refer to the second, broader definition of R&D. The usual caveat on completeness and accuracy of information applies.

26 The source of these categories is von Zedtwitz 2005.

27 The Edler et al. 2002 survey concluded in a similar way (pp. 159-160) that North America and Western Europe were the most attractive target regions for foreign R&D, while Japan’s attractiveness for R&D carried out by TNCs from abroad was well below the country’s science and technology potential. Among the developing regions and South-East Europe and the CIS, the “Asian Tigers” were mentioned by 23% of the firms surveyed. “Eastern Europe” (12%) and Latin America (10%) were far less important, while Africa was hardly mentioned.

28 Bulgaria was mentioned by only one respondent. The rest of South-East Europe and the CIS did not appear on the investment map for R&D.

29 Respondents indicated only regions and not individual countries.

30 For the analysis of the innovatory activities in developing countries, USPTO data are preferred over national patent data and those of other developed countries, since they are regarded as providing a more comparable and representative measure of such activities (chapter III).

31 USPTO glossary, www.uspto.gov/main/glossary/index.html.

32 The total number of USPTO patents granted increased by 70% in the same period.

33 For some patents, the USPTO database does not identify any assignees. In such cases, it is assumed that the inventor(s), to whom the patent is granted, remains the legal owner.

34 In 2003, 17 patents (13% of that year’s total) were granted to the Brazilian affiliate of Johnson & Johnson (United States), and five patents to the Brazilian affiliate of Dana Corporation (United States) for instance.

35 In India, the Council for Scientific and Industrial Research was the most important institute with 324 patents.

36 Data from the LOCOmonitor database.

37 For Ericsson (Sweden), over the past 40 years, R&D in telecommunications equipment production has shifted from hardware to software. Today, the company is spending 85% of its R&D budget on software development (Goldstein and Hira 2004).

38 In the new United Nations classification, the eight former Central and Eastern European economies in transition that joined the EU in 2004 are shown as part of the developed-country group, under the category of the EU-25 (box I.2). For analytical purposes, especially when drawing conclusions from the lessons of transition, their experience is shown here together with that of South-East Europe and the CIS.

39 These TNCs include Caterpillar, Cisco Systems, DaimlerChrysler, Du Pont, General Electric, General Motors, Hewlett Packard, IBM, Intel, Lucent, Microsoft, Motorola, Oracle, Philips, SAP and Texas Instruments. For instance, GE’s John F Welch Technology Center in India, with an investment of $80 million and 1,600 employees, is the company’s first and largest R&D centre outside the United States (LOCOmonitor database).

40 The R&D centre of Eli Lilly is its largest research facility in Asia and the third largest in the world.

41 Estimates by the Board of Investment of Thailand. An alternative source of information, the R&D/Innovation Survey of the National Science and Technology Development Agency for the year 2003, has estimated the R&D expenditure of majority-owned foreign affiliates to be about $40 million (about 28% of the total R&D expenditure of the private sector) in that year (Intarkumnerd and Sittivijan 2005, pp. 5-6), indicating that the Board of Investment may have underestimated the R&D expenditure of local firms.

42 The term “tropicalization” has been used in particular to denote the adaptation of automotive products to the local conditions and climate of Brazil (Kuntz 1999).

43 By comparison, the corresponding figures for foreign affiliates in developing Asia were 13% and 8%.

44 This happened with the car makers Ford and Volkswagen, and the telecom equipment supplier Alcatel (Costa 2005, p. 6).

45 At the University of Stellenbosch, for example, important work has been done on emission control and engine testing in collaboration with regulatory bodies in the EU.

46 Source: *BusinessDay* (www.bday.co.za/bday).

47 They include Burlington Resources, Amerald Hess Corporation, ConocoPhilips, Anardarko and Occidental Petroleum Corporation (Oxy) from the United States, and Woodside from Australia, BG Group from the United Kingdom, Repsol from Spain and Edison from Italy.

48 Their R&D focuses on integrated sedimentology, geochemistry, seismic interpretation, petrophysics, reservoir engineering and petroleum geology research (narg.web.mcc.ac.uk/home.html).

49 www.roncoconsulting.com/post-conflict/uganda.html.

50 The survey, conducted from January to June 1999, reviewed the pre- and post-privatization performance of 23 major companies selected from seven countries, of which five became new EU members in 2004 (the Czech Republic, Hungary, Latvia, Poland and Slovenia) and two are candidates for accession (Croatia and

Romania). The combined asset value of these large enterprises at the moment of their privatization exceeded $5 billion — 8% of the inward FDI stock of the seven countries in 1999 (Kalotay and Hunya 2000, p. 52).

51 Unpublished data of the Hungarian Central Statistical Office on the performance of foreign affiliates in 1992-1998 (reported in Kalotay 2000, p. 165) confirm the rising trend of R&D: over the period of observation, the R&D expenditure of foreign affiliates in Hungary increased from $6.3 million to $96.5 million, raising the R&D intensity of these firms (measured as a percentage of total sales) from almost nil to 0.4% of total sales.

52 EADS holds a 51% share in the venture. Komarov, Alexey, "EADS East Airbus-trained Russian engineers, data exchange network in place", *Aviation Week & Space Technology*, 159,6, 11 August 2003, p. 54.

53 Japan, with only two Chinese R&D units, seems to be somewhat underrepresented in the sample, probably due to the small sample size. However even in the complete database of 776 international R&D units, Japan has only 55 or approximately 7% of total foreign R&D laboratories (von Zedtwitz 2005).

54 One exception is Huawei's software laboratory in Bangalore (550 engineers in 2003, expected to grow to more than 2,000 by 2005). The value of that investment was almost $100 million, or about 7% of Huawei's overall R&D activities.

55 In addition to Bangalore, Huawei has also invested in Stockholm (Sweden), Moscow (Russian Federation) and Dallas (United States).

56 Haier operates ten small-scale research units abroad, which focus on technology monitoring and other R&D activities.

57 Jointly with GE for instance, TCS has established an R&D centre in Hangzhou, the capital city of Zhejiang province in China. Other top Indian IT services players such as Infosys, Satyam and Wipro have also invested in China.

58 For example, in 2003 the pharmaceutical firm Ranbaxy (India) set up a new plant in Abu Dhabi that will also conduct R&D.

59 The operations of Samsung Electronics are particularly R&D-intensive, accounting for 8% of revenues in 2003. Ten of its 16 R&D centres are located abroad (China, India, Israel, Japan, the Russian Federation, the United Kingdom, and the United States). Its global R&D network develops new technologies in digital media, telecommunications, digital appliances and semiconductors. The company also carries out joint R&D projects through strategic alliances with Sony, IBM, Hewlett-Packard and Microsoft.

60 Similar observations were made in another recent survey (EIU 2004a), in which more than half of the respondents were planning to increase their overseas R&D investment. And a DIHK survey conducted in 2005 found that nearly 20% of German companies planned to move R&D jobs abroad in the next three years (DIHK 2005b).

CHAPTER V

DRIVERS AND DETERMINANTS

The expansion of R&D by TNCs in some developing countries reflects changes in the drivers and determinants of R&D internationalization. In view of increased competitive pressures, shorter product life cycles and the need to innovate more at lower costs, firms are compelled to search for new ways of organizing their R&D. At the same time, some developing-country governments have been able to vastly improve the supply of relevant skills – often costing much less than comparative human resources elsewhere. R&D internationalization is not confined to TNCs from developed countries; developing-country firms are also setting up R&D activities abroad to access these foreign markets and centres of excellence.

This chapter analyses these trends from three perspectives: the changing drivers of R&D internationalization; the locational determinants; and factors affecting the mode of R&D internationalization. The annex to this chapter presents a case study of the expansion of chip design in Asia.

A. What drives the internationalization of R&D?

R&D is one of the least mobile of TNC activities; there are several reasons for its locational "stickiness" (Lall 1979). The complex and tacit nature of advanced technical knowledge makes it difficult and costly to fragment R&D and to locate the different segments in different places. Researchers often need face-to-face interaction to exchange information and ideas. Moreover, research skills tend to develop in a cumulative manner, so that centres that start early often retain or increase their lead; history shows that "centres of excellence" in technologies tend to survive for long periods. R&D also has extensive spillovers – ideas and people flow between innovating firms, with significant synergies – creating strong cluster or agglomeration advantages. Where reputable public research institutes and universities are present as part of the cluster, the advantages of a particular location are even greater.

These factors tend to anchor innovative activity in specific locations or clusters within an economy, mostly in the home country (Patel and Pavitt 1991). However, recent trends in R&D internationalization suggest that these factors are changing, leading to greater dispersion of R&D activities (box V.1). Although many TNC innovators still keep their core innovation activities in one location, most large companies, particularly those with multi-plant operations and diverse products, now have dispersed R&D units. What determines whether TNCs locate these units at home or abroad?

In general, TNCs prefer to retain R&D at home when the costs of communicating knowledge across national borders are high. These costs rise with geographical, economic, cultural and linguistic distance (Fisch 2003, Jones and Teegen 2001).[1] Moreover, TNCs are reluctant to locate R&D abroad when they want to maintain greater control over the innovation process and its outcome. Due to the risk of technology leakage, they are also reluctant to place R&D in locations where there are weak intellectual property rights (IPR) regimes. The size of the firm and the industrial structure also matter. Larger TNCs tend to have more far-flung operations as well as greater experience and organizational skills, thus finding it easier to set up R&D overseas. Small firms may have a greater need to tap into foreign R&D centres, but often lack the organizational resources to set up and manage dispersed R&D systems. Oligopolistic industries, with a small number of competing TNCs, may have firms trying to match each other's R&D activities in a kind of herd reaction.

Adaptive R&D to support foreign production and customize technologies to local conditions has been the main form of R&D abroad (see also chapter IV). Even today, local adaptation remains the dominant type of foreign R&D undertaken by TNCs (Edler et al. 2002, OECD and Belgian Science Policy 2005, Roberts 2001, Ambos 2005). But even local adaptive R&D in a foreign affiliate is economical only under certain conditions (Voelker and Stead 1999). The host economy must be sufficiently different from the home economy to make a major adaptive effort necessary; the scale of operations (a large domestic market or production aimed at export markets) must be sizeable enough; and the host country must possess the necessary human resources and institutional framework. TNCs from developing countries also undertake adaptive R&D abroad. For instance, Huawei Corporation of China has set up a large R&D facility in Bangalore, India, to undertake software design, while Indian software companies like Infosys and Satyam have set up development centres in China to adapt products to the local market.

Technology sourcing or monitoring is an increasingly important reason for TNCs to place R&D facilities in countries with centres of excellence that can serve as monitoring outposts to keep track of new technological developments (e.g. Cantwell and Janne 1999, Kuemmerle 1999, Patel and Vega 1999, Roberts 2001, Le Bas and Sierra 2002). Such R&D internationalization aims at augmenting the technological assets of the parent company. This is why many electronics and information technology firms have established R&D facilities in Silicon Valley and pharmaceutical R&D units cluster around Boston. Technology sourcing and monitoring have also become important drivers for R&D internationalization by enterprises from developing countries (chapter IV, von Zedtwitz 2005).[2]

Box V.1. The case for dispersing R&D from a centralized base

Enterprises practically always launch R&D near the headquarters and/or their main production facilities. The first step towards internationalizing R&D is to disperse it from one location to several, which involves overcoming the inherent costs of transferring tacit knowledge and coordinating research over distances. Firms have to weigh several internal and external factors before deciding whether to keep R&D centralized or to disperse it.

Internal factors concern scale economies in R&D, the need for close interaction between R&D and other corporate functions, along with the desire to control and manage the R&D process from headquarters (Gertler 2003, Fisch, 2003). In general, where R&D involves high minimum investment in equipment and personnel, or requires geographical proximity to headquarters or the main production plant in order to be effective, there is a strong case for centralization. The case is strengthened if communication costs are high and the company lacks the managerial and organizational skills to handle dispersed units.

However, centralization of R&D can also generate costs. Facilities over a certain size may lose flexibility and lose contact with parts of the firm located elsewhere.[a] Moreover, some decentralization is inevitable in a multi-plant firm to the extent that the R&D conducted is supporting production – production that is itself dispersed. New communication technologies and management practices are reducing the transaction costs of managing dispersed R&D units. In addition, new research methodologies permit greater codification of scientific knowledge and standardization of some R&D work, which facilitates the dispersal of R&D units (Patel and Pavitt 1991, Prencipe et al. 2003).

External factors affecting R&D location are the relative availability and cost of technical skills and knowledge institutions and the proximity of innovation clusters (Carrincazeaux et al. 2001, Cantwell and Janne 1999, Porter and Stern 2001).

Source: UNCTAD.

[a] There is also a need to separate research from development (von Zedtwitz and Gassmann 2002). Science-oriented research may have to be separated from engineering-oriented development work to improve efficiency. This is particularly the case in industries where product development is highly science-based, as in pharmaceuticals and biotechnology.

A study of over 200 TNCs from the United States, Europe and Japan identified nine reasons for internationalizing R&D (Edler et al. 2002). The three *most important motives* for the sample firms were to adapt foreign technologies to local markets, to access skilled research personnel and to learn from foreign lead markets and customers.[3] The four motives of *medium importance* were to take advantage of technologies developed by foreign companies, to keep abreast of foreign technologies, to support local production and to comply with local market-access regulations and pressures. Finally, the two *least important motives* were to take advantage of public R&D programmes in host countries and to evade an inappropriate R&D environment at home. This survey was conducted at the end of the 1990s and related to R&D offshoring in other developed countries. It more or less confirmed what previous studies of R&D internationalization had found (Mariani 2002, Jones and Teegen 2003, Roberts 2001).

The recent expansion of R&D outside the Triad (chapter IV) suggests that a new set of drivers – the *cost and the availability of research manpower* – has become increasingly important. Rising R&D expenditures, along with intensifying pressures to cut costs and to bring products quickly to the market, are forcing TNCs to look for ways to do research more quickly, outsource non-core work (see next section) and locate R&D in countries with low-cost and ample scientific manpower. This becomes even more important when companies fail to find a sufficient number of skilled people in their home base, especially in science-based activities. For example, it has been reported that the European Union lacks 700,000 scientists and engineers needed to meet its target of devoting on average 3% of GDP to R&D.[4] A study of R&D in Asia concluded that:

> "[o]ne main reason for offshore outsourcing is that very often there isn't enough talent in the company's own home country... the personnel available for specific tasks does not have the sufficient qualifications, where programmers and scientists from countries such as India do have the right qualifications and skills to match the outsourcers' needs" (Frost and Sullivan 2004, p. 8).

As the internationalization of manufacturing production and IT-based services reveals its cost advantages, firms are starting to apply the same principles to innovation. Many companies accept that, all else being equal, the cost and availability of researchers are now important drivers for internationalizing R&D, particularly in industries relying on new technologies. A survey of foreign companies' R&D activities in India noted that for companies in conventional technology industries, proximity to manufacturing and to the Indian market were the two main motives for undertaking R&D in India (Reddy 2000).[5] Conversely, for companies in new technology industries availability of R&D personnel and low costs of doing R&D topped the list. Moreover, for this category of companies a shortage of R&D personnel in the developed countries was perceived as a relatively important driver, whereas it was unimportant for companies in conventional industries. This observation is in line with the dominance of electronics, ICT and software industries among the globally oriented R&D labs that have been established in various Asian economies in the past decade (chapter IV).

Other recent surveys and media reports confirm the growing relevance of cost reduction and the importance of accessing talent pools abroad:

- A survey of German companies found that the lower cost of R&D manpower abroad was the second most important reason, after production support, to locate R&D abroad (DIHK 2005b).
- A survey of 104 senior executives noted that: "[in] industries where a constant stream of high-tech innovations is crucial to survival, companies will go wherever they must to access top R&D talent. A total of 70% of executives in the survey see the ability to exploit pools of skilled labour as a very important or critical benefit of globalized R&D, making this a more significant driver than cost control or the desire to accelerate innovation cycles" (EIU 2004a, p. 2). Moreover, more than half said that lower costs were an important benefit of globalized R&D. Cost benefits came from cheaper labour and lower land and office rents, as well as from favourable tax regimes.
- Cost reduction has been identified as one of the main drivers of expanding TNC R&D in China (Armbrecht 2003).
- In a survey of product engineering companies in California conducted by the Indian company, Wipro Technologies, the top reasons for outsourcing were to reduce

the time it takes from product development to sales ("time-to-market"), as well as overall R&D costs.[6]

- The need for cost reduction has also been an important driver for the offshoring of chip design to Asia (Ernst 2003, see also annex to this chapter).

Cost advantages derived from conducting innovative R&D in developing countries can be significant. A recent report on the pharmaceutical industry compared the cost structures of India with those of developed countries (Goldman Sachs 2005). It concluded that the cost of clinical development in India was 45%, drug manufacturing 30%, and R&D related to drug discovery only 12.5% of the corresponding work conducted in a developed country.

While costs matter, the expansion of innovative R&D in Asia has also been driven by various supply-oriented factors. Concerted efforts on the part of many of the countries in that region have increased the supply of skills, notably in the areas of science and engineering. In some cases, researchers, engineers and managers of the diaspora have returned to their home countries and brought with them new capital, skills, networks and their reputation. Policy interventions include new incentives to promote R&D, more effective IPR regimes, improved public research activities and the establishment of science and technology parks (chapter VII). For some industries such as electronics, the fact that manufacturing activities have already been globally organized is making it easier – and sometimes even necessary – to disperse R&D activities internationally. It is no coincidence that East and South-East Asia are over-represented among the "winners" in export competitiveness in the same product areas in which TNCs are scaling up their R&D work in the region.[7]

Finally, it is important to consider a few technical and organizational advances that are reducing the constraints to the cross-border exchange of knowledge and compelling firms to internationalize their R&D (Zanfei 2000, Ernst 2003). First, liberalization and technological progress have made competition more intense, forcing TNCs to invest more in R&D without allowing costs to spiral out of control. Companies that are unsuccessful in curbing development costs tend not to be rewarded by the stock market. Thus they look for more economical ways of boosting innovation. Second, advances in ICTs allow for faster, cheaper and denser information exchange across long distances. Third, in "new technology" industries the proximity to basic science makes it possible for countries that have an ample supply of scientists and engineers to host R&D work of TNCs, even if their industrial experience is otherwise lacking (Reddy 2000). Fourth, the "modularization" – or finer specialization of the R&D process into separate activities – of some types of R&D is allowing firms to fragment the development process (of products and services) to raise efficiency and cut costs (Baldwin and Clark 2000).

In summary, most R&D internationalization is driven by the need to adapt products and processes to local markets. However, the need to tap into foreign centres of excellence and source foreign technology is gaining in importance, especially in the case of R&D set up in developed countries. But to understand the expansion of innovative R&D units in some developing countries, it is necessary to consider a complex mix of driving forces encompassing demand factors, supply factors and various enabling factors. For TNCs, especially in new technology industries, developing economies offer new opportunities to reduce costs, access skills that are not readily available at home in sufficient supply or at attractive costs, and speed up the development of new goods and services.

B. Host-country determinants of R&D location

Given the pressures inducing TNCs to internationalize R&D and the factors making this possible, what determines *where* TNCs locate R&D in the developing world? The global map of R&D shows that its spread is uneven. R&D in host developing countries is mainly concentrated in Asia and in a few large economies in Latin America and the Caribbean. The present section relies on survey evidence from developed countries and qualitative evidence from developing ones. The picture that emerges is fairly clear and persuasive.

While some basic determinants are common, different types of R&D (chapter IV) – adaptive R&D, innovative R&D linked to production for local/regional markets, global innovative R&D for new product/process development or basic research, and technology monitoring – are attracted by different factors. The general investment climate – comprising, for example macroeconomic and social stability, security, transparency, administrative rules and regulations – is as important for R&D location as it is for FDI in general. Similarly, the type of R&D that may be attracted depends on the economic structure of the location, including the industrial structure, market size and growth, culture and language, natural resource endowments, living conditions and physical infrastructure. Most of these factors are "created", rather than natural, assets and therefore can be altered through government intervention. Hence, host-country policies play a significant role in determining a country's ability to participate in the international restructuring of R&D activities by TNCs (chapter VII).

Adaptive R&D is typically closely related to production and involves the adaptation of imported technologies. This is the dominant form of R&D by foreign affiliates in Latin America and in Africa (chapter IV). The location of such development work is determined by the need to support production and adapt technologies, to be near customers, to cooperate with local partners, to access markets, to improve the local "image" of a company, to launch a product simultaneously, to facilitate rapid scale-up in manufacturing and to overcome protectionist barriers against imports (von Zedtwitz and Gassmann 2002, p. 584). The larger the host market, the greater the need for local adaptation of goods and services. As national markets become regionally more integrated, some countries may become the preferred base for adaptation, not only for the local market but for the region as a whole. In this case, appropriate skills and other aspects of the national innovation system (such as the technical and economic infrastructure, proximity to suppliers/key customers) become more important. Depending on the industry, adaptive R&D needs technical and engineering skills that are specialized in the technologies used in production. Cost factors are likely to be of secondary importance.

Innovative R&D has emerged as a feature of some foreign affiliates in parts of South, East and South-East Asia as well as in some transition economies (chapter IV). Internationalization of such R&D for global markets is driven by the search for advanced skills in relevant areas of science-based technologies. Such R&D work can be intended for regional or global markets and is determined primarily by the quality of the national innovation system (NIS). In China, adaptive R&D has evolved into more advanced forms of innovation, with the local market serving as a test-bed for new products for regional or even global markets (Sigurdson 2005b; chapter IV). The precise features of a host country that are needed to attract innovative R&D depend on the industry and activity involved. Key determinants in host developing countries for attracting innovative R&D include a large pool of scientific and technical manpower, a well functioning NIS featuring strong public research institutions, science parks and an adequate system of IPR protection, and government incentives (von Zedtwitz and Gassmann 2002, Reddy 2000, Toh 2005).

The availability of the right kinds of scientific and engineering skills is probably the most critical factor in attracting innovative R&D, especially in new, science-based technology industries. The importance of researchers and scientists covering a broader range of disciplines is not new. What is new is that competitive pressures are forcing companies to pay greater attention to *wage costs* and *availability of scientists and engineers in large numbers*. With wage rates for skilled researchers in developing-country R&D locations significantly lower than those in developed countries, the attractiveness to TNCs is compelling. But wages *per se* are not the main location determinant. TNCs value the ability to set up a research facility rapidly and tap into an existing knowledge centre where they can find skilled researchers (often in the hundreds) at short notice. This gives a "critical mass" advantage to countries that combine low wages with good education systems that turn out large numbers of well-trained researchers. As their low ranking in the *UNCTAD Innovation Capability Index* (chapter III) shows, China and India are not the most attractive locations in terms of human resources normalized by population size. However, when TNCs need to recruit researchers in large quantities, these countries offer a growing body of skilled people at low cost.

The global distribution of tertiary enrolments has changed dramatically (box V.2).[8] Developing Asia has emerged as the main source of new university graduates, and this trend appears to be continuing. This is one of the main reasons why, for example, a growing number of TNCs are turning their attention to China and India for innovative R&D work. China is expanding its tertiary education system at an unprecedented rate.[9] The total number of students enrolled in tertiary education increased to more than 19 million in 2003, a 100% increase over 2000.[10] It has been estimated that the accumulated number of university graduates in China could exceed 120 million by 2020 (Sigurdson 2004). If realized, this expansion would pose a competitive challenge to other countries, developed and developing. India is expanding more slowly and the tertiary enrolment rate is relatively low (at around 10% of the age group), but the absolute numbers are large. Meanwhile Latin America, a richer region overall, lags behind in enrolments of engineers and scientists. This further constrains its R&D performance, inducing a significant number of its researchers to seek work in North America.

Of course, not all tertiary students are candidates for work in the R&D labs of TNCs. A recent analysis of the supply of skilled people in various developing countries and economies in transition (including the new EU members) found that only a small proportion of potential job candidates in "degree specific" occupations were qualified for work in TNCs (McKinsey Global Institute 2005).[11] The research, which was based on interviews with human resource managers in 83 TNCs, found large differences among the countries investigated. For example, while 50% of engineers in Poland and Hungary

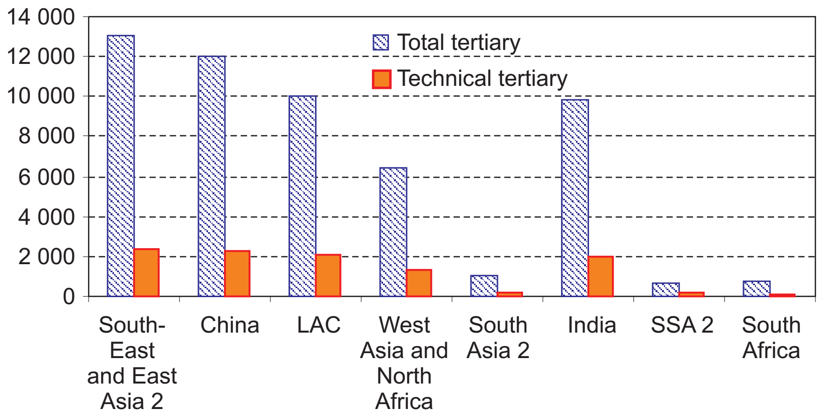
Box V.2. Tertiary enrolments by region and country

In 2000/01, developing countries accounted for 62% of global tertiary enrolments overall, and for 52% in technical subjects (pure science, engineering and mathematics and computing). Transition economies (including new EU members) accounted for 16% and 20%, and developed countries (excluding the 10 new EU members) for 22% and 28% respectively. Box figure V.2.1 shows the number of total and technical tertiary enrolments across developing regions. Box figure V.2.2 displays the shares of technical tertiary enrolments by region. The first figure also separates the main outliers from the totals of each subregion: China in South-East and East Asia, India in South Asia, and South Africa in sub-Saharan Africa. The data on technical enrolments are particularly important for R&D location as these are the primary skills involved in such work.

In tertiary technical enrolments, China, the Russian Federation and India led the world, ahead of the United States (which had the highest number of total tertiary enrolments in 2001) (annex table A.V.1). The Republic of Korea was fourth in the world in technical enrolments, which is impressive for a country of only 47 million people.[a] Indonesia, Mexico and Brazil followed among developing countries, Ukraine and Poland among transition economies, and Germany and Japan in the developed world. Both Germany and the United States saw a decline in the total number of tertiary students, while the number in Japan increased.

In tertiary technical enrolments, China accounted for 50% of the total for South-East and East Asia in 2001; it had more students than the whole of Latin America and the Caribbean (LAC) and sub-Saharan Africa combined. India accounted for 90% of the total for South Asia; it was slightly behind LAC as a whole but ahead of West Asia, North Africa and sub-Saharan Africa together. Some African countries have also expanded their tertiary

Box figure V.2.1. Total and technical tertiary enrolments across developing regions, 2000-2001
(Thousands)



Source: UNCTAD, based on annex table A.V.1.
Note: South-East and East Asia 2 excludes China. South Asia 2 excludes India. SSA 2 is sub-Saharan Africa excluding South Africa.

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were suitable to work for TNCs, the corresponding number for India was about 25%, and for China and the Russian Federation only 10%. The results underline the need to focus not only on quantity but also on quality in education programmes.

The agglomeration of R&D activity in a specific part of a country often reflects the concentration of skilled manpower in that location. For example, most software companies in India are located in the five states that account for nearly half the diploma-granting technical institutions in that country as well as for two-thirds of all diplomas awarded by private training institutions (D'Costa 2003 p. 216). In China, Beijing, Shanghai, Guangzhou and Shenzhen account for 85% of all R&D units set up by foreign companies in China, mainly because they are close to local universities and research institutions (Zhang 2005; box IV.5). Some 50 TNC R&D organizations have been set up in the Zhongguancun area of Beijing (Zhang 2005).

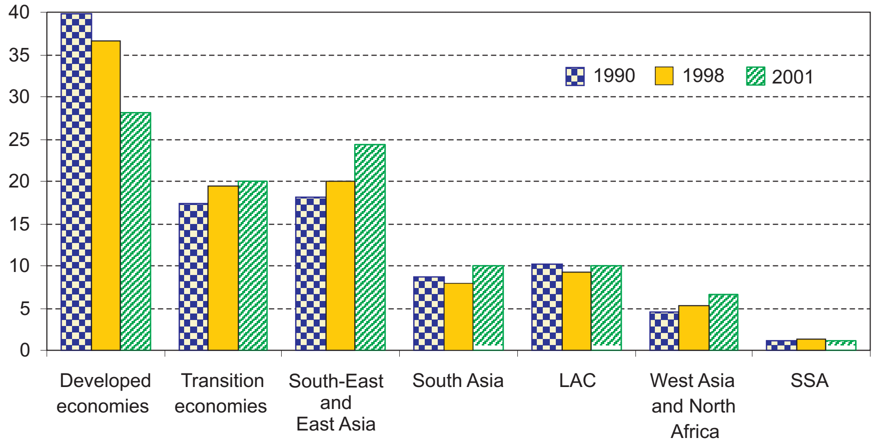
While the absolute number of skilled people plays an important role in R&D location, it is nevertheless possible for small economies with high levels of technical skill to attract global R&D as long as they also have a large TNC presence in technology-intensive activities and can offer specialized R&D competence. Ireland, Singapore and Hungary are good examples of small newcomer countries that have attracted a large TNC research presence.[12] By the same token, countries with large skill pools may not attract much TNC R&D if other conditions are not met, as is the case for Japan and the Russian Federation.

An important structural determinant of innovative R&D location is the strength of a country's NIS (see also chapters VI and VII). The NIS includes knowledge institutions (R&D labs and universities as well as standards, quality and metrology institutes) and other R&D performing enterprises (local or foreign), along with an institutional framework for R&D and innovation. A strong NIS, where knowledge institutions have

Box V.2. Tertiary enrolments by region and country (concluded)

education system rapidly, but from low levels. For example, in the United Republic of Tanzania the number of technical students increased from 1,000 to 6,000 between 1990 and 2000; in Ghana the corresponding rise was from 2,000 to 14,000; and in Egypt from 70,000 to 290,000. However, the number of people with tertiary education remains very small in most of Africa.

Box figure V.2.2. Shares of global technical tertiary enrolments
(Per cent of total)



Source: UNCTAD, based on annex table A.V.1.

Note: Transition economies here comprise South-East Europe and the CIS as well as the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia.

[a] In the Republic of Korea, as of 2004, 40% of people in the age group of 25-34 years were university graduates. Every year the country produces some 70,000 engineering graduates, which is equal to the number produced in the United States (KICOS 2004).

tight links with production enterprises and other firms that perform world class R&D, is a major draw to TNCs looking for new R&D locations. The presence of dynamic science parks can be an additional attraction to R&D that requires interaction with a diverse range of firms and institutions (chapter VII). Basic research calls for an even stronger NIS, featuring science institutions that are able to produce world-class research and publications and undertake contract research work for industry.[13]

The IPR regime is also part of this framework. Its role in attracting R&D by TNCs tends to differ by industry and type of R&D.[14] Adaptive and production support R&D may not require strong IPR protection, but it may be essential for other types of R&D (box V.3).[15]

Do government incentives help attract R&D by TNCs? The question is important especially in light of the increased use of R&D incentives around the world (section VII.C). In general, incentives are effective only when other,

Box V.3. IPR regimes and R&D location

IPR regimes are often mentioned as a factor that might influence the location of TNC R&D. However, the evidence is mixed. Surveys suggest that the role of IPR regimes in attracting FDI in general may be limited, but that it is an important factor for R&D-related FDI. Protection of intellectual property generally improves the environment for innovative R&D, but its role varies by industry (Maskus 2005). For industries in which technologies are easy to imitate, IPR protection may be essential for attracting international R&D; for other industries it may be a less important factor.

A study of IPR protection and FDI, using a sample of 94 firms from the United States, 45 firms from Japan and 35 from Germany found that IPR protection was not a critical locational determinant for most types of FDI, but that it did affect R&D-related investments. The percentage of firms stating that IPR protection is important was particularly high in the chemicals and pharmaceuticals industry (Mansfield 1994 and 1995).

Econometric analysis of United States TNCs found that IPR protection was a significant determinant of where foreign R&D activities were performed, but not a significant factor between different developing-country locations (Kumar 1996). It even suggested that a strong IPR regime could discourage TNCs from undertaking R&D in developing countries.[a] However, another study found that R&D spending by the affiliates of United States TNCs increased after IPR reform in host countries (Branstetter et al. 2004). This study also noted that the level and rate of change of non-resident patenting increased in the post-IPR-reform period, while there was no corresponding reaction in resident patent filings.

Some developing countries like Brazil, China and India have attracted significant amounts of FDI in R&D; despite being perceived as having relatively lax IPR regimes. There are four main reasons why IPR protection may have a limited impact on the location of TNC R&D:

- R&D may be conducted for a completely different market. For example, it has been noted that IPR issues for TNC R&D labs in China are mostly handled in the home country as these labs work on technologies aimed at world markets (Zhao 2004). Since a patent gives its assignee a monopoly on both production and sales, the TNC can protect its intellectual property by obtaining patents in the countries for which the product was developed rather than in the country where the R&D is undertaken.
- A technology may be highly firm-specific and thus of limited value to others. For example, if different technologies developed by a firm are complementary to one another and can only be used jointly, a particular innovation in the host economy may have little value on its own.[b] TNCs may structure their international R&D activities so that a foreign affiliate in a country with weak IPR protection undertakes only R&D with strong complementary elements.
- TNC R&D in a host economy may deal with technologies that are too advanced for local competitors to copy and use commercially.
- Certain types of technology involve tacit and uncodifiable elements that are difficult for outsiders to imitate without intimate knowledge gained by working with that specific technology.

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more important determinants are in place. By reducing costs, government incentives may induce TNCs to expand or deepen their R&D activities. However, if the necessary skills and research capabilities are lacking, incentives may induce firms merely to re-label routine technological activities and report them as R&D (chapter VII). Indeed, countries with ample and low-cost scientific skills are likely to attract international R&D without offering incentives.

A diverse industrial structure, with technologically complex activities, is likely to provide clusters with the skills and linked suppliers and buyers that can support innovative R&D. Countries with strong technological specialization tend to attract TNC R&D in similar areas, and TNCs tend to internationalize innovative (asset-augmenting) R&D to complement their strengths (Patel and Vega 1999, Le Bas and Sierra 2002, Guellec and van Pottelsberghe 2001 and 2004b).

The fact that developing Asia has emerged as the production base for many globally oriented industries (*WIR02*) has also led some TNCs to conduct more R&D in the region so as to be closer to their actual manufacturing activities (see annex to this chapter). In Malaysia, some foreign affiliates in electronics have obtained a mandate from their parent companies to design, develop, manufacture and market products for global markets. This has allowed them to undertake all stages of innovation. Toyota's decision to place one of its global R&D labs in Thailand was likewise facilitated by the presence of a relatively strong automotive cluster in that country (box IV.7). In the case of India, proximity to manufacturing has been an important driver for R&D by foreign affiliates in "conventional technology" industries, but not in new technology industries (Reddy 2000).

Finally, R&D with the aim of monitoring or sourcing technology is mainly drawn to countries boasting world class clusters of technological and industrial activity (Porter and

Box V.3. IPR regimes and R&D location (concluded)

The design of IPR regimes may play a less direct but nevertheless important role. For instance, providing effective means of IPR protection may act as a signalling device to international investors. Strengthening the regime may show that the country is willing to "play by the rules" and provide a hospitable investment climate. Internationalized R&D often involves activities where strong protection matters: pharmaceuticals and software – the two major areas of TNC R&D in India – are good examples.[c] For recent R&D investments in developing Asia by pharmaceutical companies such as Roche and GlaxoSmithKline the question of IPR protection was a key consideration.[d]

The role of IPR protection must of course be assessed not only from the perspective of attracting FDI in R&D. For example, many economies have taken advantage of their weak IPR regimes to build up indigenous technological capabilities. Imitation, copying and reverse engineering have been important sources of learning in much of East Asia. However, in the cases of the Republic of Korea (Kim 2003) and Taiwan Province of China, they have subsequently become innovators rather than imitators of new technology, and now need more effective IPR regimes to promote domestic innovation. At this advanced stage of their development, IPR protection is important for both local and international R&D. Even countries at lower levels of technology development like China and India are fostering local innovation and may benefit from stronger IPR protection (Lall 2003).

Source: UNCTAD.

[a] Sanyal 2004 reached the same conclusion.

[b] For example, Microsoft Research Asia developed AutoMovie for Movie Maker, Mobile HTML Optimizer for Front Page and the Ink Parsing technology for tablet PCs. These were considered major contributions to the Microsoft products, but alone they are of little value to potential imitators (Zhao 2004).

[c] It may be noted that India as of 1 January 2005, introduced the possibility to patent pharmaceutical products, reflecting obligations under the TRIPS Agreement. According to the Ministry of Commerce and Industry, this is intended to help the Indian pharmaceutical industry protect the results of its rising R&D efforts (www.pib.nic.in/release/).

[d] "Eastern rebirth of the life sciences", *Financial Times*, 10 June 2005.

Box V.4. Why are companies setting up R&D in China?

A recent study on R&D investment by major TNCs in China, conducted for the Industrial Research Institute in the United States highlights some of the perceived advantages of locating industrial R&D in China, many of which are the result of government policies (Armbrecht, 2003):[a]

- The supply of talented manpower exceeds demand, at least by foreign firms;
- Universities and research institutes are eager to get funding from private firms;
- The possibility of entering into IPR agreements with top Chinese universities;
- A large number of high-technology parks;
- Incentives; and
- The potential for cost reduction across all stages of the R&D value chain.

The study emphasized that while cost savings matter, TNCs expand R&D in China primarily for strategic reasons: to tap the vast pool of talent and ideas and to stay abreast of competitors in the increasingly sophisticated markets of China and Asia. It predicted a further increase in TNC R&D in China and argued that the focus of these R&D labs would shift from support and adaptation to full-scale R&D work using China's emerging technologies and talent pools.

The following taxonomy describes the evolution of TNC R&D in China (box table V.4.1). "Satellite" R&D laboratories, the least developed type, have relatively low strategic importance for the companies and are vulnerable to budget cuts by TNC headquarters, while "contract" R&D laboratories show vertical specialization within global innovation networks. Within the latter, China's role is presently confined to the provision of lower-cost skills, capabilities and infrastructure. While dense information flows link these labs with R&D teams at headquarters and at other affiliates, knowledge exchange remains tightly controlled and unequal. The highest stage – (more) "equal partnership" laboratories – is comprised of TNCs' R&D facilities that are charged with a regional or global product mandate. For these labs, barriers to knowledge exchange are lower and are eventually expected to give way to mutual knowledge exchange.

Satellite and contract laboratories still dominate TNC R&D in China (von Zedtwitz 2004, Gassmann and Han 2004, Li and Zhong 2003), but there are examples of (more) equal partnership arrangements, especially in the development of China's alternative standards in mobile telecommunications, open source software and digital consumer electronics (Ernst and Naughton 2005).

Box table V.4.1. Taxonomy of TNC R&D laboratories in China

Satellite laboratories	• Act as listening post to detect ideas, incentives and innovations that reflect local market characteristics • Adapt existing products and processes • Are vulnerable to budget cuts
Contract R&D	• Exploits lower cost skills, capabilities and infrastructure • Implements a specific module of a global research project • Closely interacts with R&D teams at headquarters and at other affiliates • Requires tight mechanisms to control IPR leakage • Has dense information flows, but unequal knowledge exchange
(More) equal partnership	• Full integration into TNC R&D strategy • Centre has regional or global product mandate • No barriers to fully-fledged knowledge exchange

Source: UNCTAD, based on Walsh 2003 and Ernst 2005.

Source: UNCTAD.

[a] The membership of the Industrial Research Institute includes more than 240 leading global manufacturing TNCs that perform over two thirds of the industrial R&D in the United States.

Stern 2001). Technology sourcing R&D is undertaken predominantly in developed countries. A study of the pharmaceutical industry in Europe and the United States noted that European pharmaceutical TNCs were more likely to set up such R&D in the United States than vice versa, possibly reflecting the size and profitability of the United States market, its scientific competence and the close links there between industry and university research (Ramirez 2003).

Many factors thus interact to determine the attractiveness of a site for FDI in R&D (see box V.4 for the case of China, box V.5 for the case of India), but the effective functioning of a country's NIS is critical (chapter VII). Most of the countries in Asia that have successfully attracted R&D by TNCs have applied deliberate

Box V.5. Why TNCs set up R&D in India

TNCs performed R&D in India already in the 1970s, but it was then limited to adaptation or product development for the Indian market. Such R&D was conducted mainly in response to government regulations and to certain unique characteristics of the Indian market. Since the mid-1980s the scope and characteristics of TNC R&D have changed.

Starting with Texas Instruments (1986) in semiconductor design, followed by Astra (1987) in biopharmaceuticals, more TNCs have set up globally oriented R&D units in India – mostly without local links to manufacturing activities. The 1990s saw the entry of TNCs in diverse industries: for example Motorola (telecommunications software), Microsoft (computer operating systems), STMicroelectronics (semiconductor design), Daimler-Benz (avionics systems) and Pfizer (biometrics). Since 2000, other entrants include Intel (semiconductor design), GE (e.g. aircraft engines, white goods and medical equipment) and Pfizer (veterinary medicines).

These TNCs were attracted for several reasons (Reddy 2000), the most important being the availability of qualified scientists and engineers.[a] For instance, in 2004, more than 340,000 students were admitted to bachelor degree education in engineering.[b] India annually produces about 120,000 chemists and chemical engineers.[c] A second attractive feature is the existence of internationally reputed R&D institutes such as the Indian Institute of Technology, Indian Institute of Science, Indian Institute of Chemical Technologies and Centre for Drug Research. Many of the TNC R&D units in India collaborate with these institutes and several TNCs that do not have an R&D presence in India outsource R&D to them.

Thirdly, several Indian firms have become global players and are forming R&D alliances or subcontractual relationships with other TNCs. The Indian software companies TCS, Wipro and Infosys, for example, have alliances with Ericsson, Nokia and IBM. Similarly, Indian pharmaceutical companies, such as Dr. Reddy Laboratories and Ranbaxy, have R&D alliances with Novo Nordisk, Novartis and GlaxoSmithKline.

In a survey conducted at the end of the 1990s, the availability of R&D personnel was ranked by TNCs as the most important reason for locating R&D in India (4.12 out of 5) (Reddy 2000). For TNCs in new technology industries this factor was even more important (4.31), followed by low costs of performing R&D in India (3.25). Conversely, for conventional industries, proximity to manufacturing (4.56) and to the Indian market (4.06) were more important reasons. Government incentives were relatively unimportant for both groups of companies (1.78).

The use of English as the business language and medium of instruction for technical and managerial education in universities is an added benefit. It facilitates communication of technical specifications and requirements between TNC headquarters and their Indian R&D units. In general, as regard the IPR regime, the first Indian Patent Law was enacted as early as 1856. In response to obligations under the WTO Agreement on Trade-related Aspects of Intellectual Property Rights (TRIPS Agreement), the Patent Act of 1970, which offered only limited protection to inventions in certain industries, has also been replaced and the revised IPR regime is now in compliance with the international regulatory framework.

Source: UNCTAD, based on Reddy 2005.

[a] See also "Silicon subcontinent: India is becoming the place to be for cutting-edge research, *New Scientist*, 19 February 2005. "Prescription for change: A survey of pharmaceuticals," *The Economist*, 18 June 2005.

[b] See www.nasscom.org (accessed 21 June 2005).

[c] See "Prescription for change: A survey of pharmaceuticals," *The Economist*, 18 June 2005.

policies to strengthen their innovation systems and create an environment that is conducive to such investment.

C. How to internationalize R&D

Once a firm decides to carry out R&D abroad, it has to make some choices: between internal and external modes of operations abroad, (i.e. whether to conduct the R&D at an affiliate or outsource it to an independent firm); and for internalized R&D, between establishing a greenfield facility and acquiring or merging with a host-country firm.

1. R&D outsourcing is growing

R&D internationalization can take the form of in-house work within foreign affiliates or outsourcing to independent local firms or research institutions in a host country. A company usually opts for keeping an activity in-house when strict control of that activity is crucial, when high transaction costs are involved, or when proprietary knowledge and information is sensitive, tacit, expensive to produce, complex or idiosyncratic yet easy to replicate (Dunning 1989). Moreover, the more strategic the service function is, and the closer it is to the core competence of a firm, the less likely it is to be outsourced to unrelated firms. R&D functions generally meet these criteria and therefore could be expected to be kept in-house.

Still, R&D outsourcing to foreign locations is growing within developed countries and is now common in some industries such as pharmaceuticals. Basic research has long been contracted out to public laboratories and universities; the recent trend is for *other* forms of research (traditionally performed in-house by manufacturing or service firms) also to be farmed out (Jankowski 2001, Engardio and Einhorn 2005). R&D services provided on a contractual basis constitute one of the fastest growing service industries in some developed countries, led by the United States.[16] As noted in chapter IV, R&D work is also increasingly being outsourced to firms in developing countries, especially in Asia.

What drives firms to outsource R&D? The main forces are the rising costs and risks of R&D, the growing complexity of innovation (calling for more diverse skills, knowledge and equipment) and intensifying competitive pressure to bring out new products more quickly (Howells 1997, Roberts 2001, Engardio and Einhorn 2005). New research methodologies that make tacit knowledge more codifiable also facilitate contracting R&D to other firms. The same applies to software that standardizes research and testing processes. By specializing in these activities, which often require expensive equipment and skills, contract R&D firms are able to reap economies of scale and scope while offering customized products to firms – rather like contract manufacturers in electronics manufacturing (*WIR 2000*). Their customers can reduce in-house laboratory staff and equipment while speeding up the process without losing control of core innovation.[17]

In some industries, product development is becoming so complex and multidisciplinary that firms with different specializations are required to handle the different stages (Pavitt 1999). This makes outsourcing these stages not only more attractive but also, in some cases, necessary (see annex to this chapter). In those industries, no firm, not even a global market leader like IBM, can mobilize all the resources, capabilities and knowledge it needs internally. In-house creation of new knowledge and capabilities needs to be supplemented by external knowledge sourcing. The increased dependence on external sources of technology is among the most important changes in technology management in recent years, especially in new technology industries (Roberts 2001). In some industries there are pressures to reduce in-house basic and applied research in order to focus primarily on product development and the absorption of external knowledge (Chesbrough 2003, Arora et al. 2000). This externalization of innovation does not stop at the national border – firms increasingly tap sources of knowledge overseas (Ernst 2002). Thus,

> “the speed, complexity, and multidisciplinary nature of scientific research, coupled with the increased relevance of science and the demands of a globally competitive environment, have … encouraged an innovation system increasingly characterized by networking and feedback among R&D performers, technology users, and their suppliers and

across industries and national boundaries” (United States, NSF 2004, volume I, p. IV-36).

The transformation of IBM (box V.6) shows that in an “open innovation system”, both the source and the use of knowledge can be external to the company. A firm can create ideas for both external and internal use, accessing ideas from the outside as well as from within. Firms can move to an open innovation system because of the increased mobility of knowledge (Chesbrough 2003).

There are similar trends in the pharmaceutical industry. The cost of bringing a new drug to market was around $800 million in 2004, rising to $1.7 billion if commercialization costs were included.[18] Firms see outsourcing as one way to reduce these costs. They currently outsource about 26% of their drug discovery and development; this could rise to 36% by 2008. Over 20% of the $5 billion annual expenditures on new drug development was paid to contract R&D companies and this share was set to increase (Malek 2000).

The growing number of R&D providers also facilitates outsourcing. The privatization of public research laboratories and increasing cost pressures on universities in many countries has induced companies to enter the market and set up spin-offs. Some large manufacturing firms have hived off their research arms into independent companies. In addition, new entrepreneurs with specialist knowledge, data, skills or equipment have also entered the market.

R&D outsourcing has its limits. Firms are unwilling to outsource the core of their technological advantage: contract R&D cannot replace all in-house R&D (Narula 1999, Engardio

Box V.6. From closed to open innovation: the case of IBM

Starting in 1964, when IBM bet its future on the development of the 360 product family as the global standard for mainframe computers, it pushed vertical integration to the extreme. It internalized practically all stages of the value chain: it developed the basic components, assembled them into subsystems, designed systems out of these components, manufactured the systems at its own factories, distributed and serviced the systems themselves, and even handled the financing of the systems (Flamm 1988, Ferguson and Morris 1993, Campbell-Kelly and Aspray 1996).

Over time, IBM abandoned this strategy. The recession of the early 1990s had exposed the weaknesses of the “closed” system of innovation. For the first time since 1946 the company experienced three years of declining revenues, shrinking profit margins, and even losses in 1991-1993 (Lazonick 2005, p. 38). In response IBM transformed itself from a hardware producer to a supplier of integrated solutions, with the objective of leveraging its broad portfolio of intellectual property (IP), not only to exclude rival firms but also to generate new and highly profitable sources of growth.

IBM had to go beyond its own R&D and find the best technologies wherever they existed, combining them into integrated solutions. An important facilitator was the adoption of open standards in a variety of areas, including the Linux operating system and the Java programming language. IBM realized that it could no longer exercise tight control over its component technologies, as specialized knowledge was spread across companies and countries. This led to a substantial decline in its in-house R&D intensity.

Furthermore, the focus of IBM’s innovation management shifted towards aggressive licensing of intellectual property. Since 1993 IBM has emerged as the leader in United States patent applications, up from 9th position in 1990 (Lazonick 2005, p. 40). Licensing of technology has been much more profitable for the company than sales of products in some areas. Its licensing revenues grew from $30 million in 1990 to $1 billion in 1998, generating more than 10% of its net profits, and to $1.9 billion by 2001. IBM also used its status as the leading patent holder in the United States to develop a new market for integrated solutions.

Source: UNCTAD, based on Ernst 2005.

[a] The share of R&D in IBM’s sales fell from an annual average of 9.8% during 1983-1992 to an average of 6.1% during 1994-2003 (IBM annual reports). Goldstein and Hira (2004) document IBM’s decline among the world’s top 50 R&D spenders.

and Einhorn 2005). Too much outsourcing can lead to a firm's loss of knowledge (and good researchers) and can create powerful competitors for the outsourcing firm. Another aspect is that IPRs may not always be enforceable, even with the most efficient legal systems. Managing and integrating R&D among different firms, with different work cultures and languages, can be extremely difficult. A distinction is emerging between "mission critical" R&D, kept in-house, and "commodity" R&D, which can be contracted out efficiently without damaging the competitiveness of the company. As stated by the head of Motorola in an interview: "You have to draw a line: core intellectual property is above it, and commodity technology is below".[19]

These distinctions are, however, changeable. R&D outsourcing is evolving rapidly. Enterprises may start by contracting out "commodity" R&D. If this succeeds, they may realize the benefits of greater specialization and learn how to manage better the contractual and integration process. With time they may develop trust in their collaborators and establish durable knowledge networks. This process can continue, pushing back the limits of what is acceptable at any given time. The emergence of new methodologies and competitive pressures may accelerate the push. Box V.7 lists the main determinants of R&D outsourcing.

Another way of externalizing R&D work is to establish a strategic alliance with competitors, suppliers or clients. Data show that as of 2001 (the last year for which data are available), cross-border R&D alliances had proliferated (chapter IV). To some extent the drivers for strategic R&D alliances resemble those that have led to increased outsourcing of R&D activities. Alliances can be seen as a way of sharing the risk involved in R&D, accessing complementary proprietary assets and coping with situations where patenting may not be an effective option (Dunning and Narula 2005, p. 133). R&D alliances tend to emerge when partner companies share complementary capabilities, and these alliances create a greater degree of interaction between the partners' respective paths of learning and innovation (Mowery et al. 1998, Cantwell and Colombo 2000, Santangelo 2000). Another reason to form an alliance in the area of R&D is to explore new technological developments more rapidly than what would be possible independently. Strategic alliances may here provide "an attractive organizational form for an environment characterized by rapid innovation and geographical dispersion in the sources of know-how" (Teece 1992, p. 20).

2. Greenfield versus acquisition

If a company opts for the internalized route to R&D internationalization, it still needs to decide whether to set up a new "greenfield" activity or to acquire one that already exists. The preferred mode here depends on several factors, including the purpose of the R&D, the availability of suitable targets, the competitive situation and other features specific to the industry. Greenfield investment tends to dominate in R&D expansion abroad (chapter IV).

Greenfield entry is the most common mode when setting up adaptive R&D abroad, as such R&D is closely attached to the production activity. However, if for example a company acquires a production unit with the aim of advancing its market position in the host-country market, some R&D activities may be included in the transaction. Such takeovers have contributed to the higher level of R&D internationalization of many companies (von Zedtwitz and Gassmann 2002). In this situation the R&D strategy of the acquiring firm, as well as the quality of the R&D work taken over, will influence whether or not R&D is centralized and moved to the parent company (or to a sister company), or whether it remains and perhaps expands in the host country (see also chapter VI).

In the case of technology-sourcing (or asset-seeking) FDI in R&D, acquisition may sometimes be the only way to access a foreign technology (or other attractions such as brand names and government contacts). Studies of foreign affiliates of Japanese TNCs have found that acquired units tend to have higher R&D intensity than greenfield establishments, possibly suggesting that technology sourcing has been an important driver for the acquisitions (Belderbos 2003).

If the sourcing strategy involves the establishment of a listening post in a foreign centre of excellence, many firms may prefer to set up a local company from scratch. In order to channel knowledge effectively to the parent, the R&D unit in the host economy needs to be well integrated with the rest of the TNC.

Most takeovers of R&D activities have been undertaken in developed countries. This is not surprising, as the number of target R&D units can be expected to be considerably larger in these countries. This also resembles the pattern prevailing for cross-border M&As in general (*WIR2000*). The higher the level of innovative capabilities in companies considered for acquisition, the more attractive the M&A option becomes. The predominance of developed countries in this area may also reflect similarities in specialization between firms in the home and host countries. TNCs seeking to invest in R&D abroad are more likely to choose acquisition if local firms with strong and similar competencies are available.

Finally, industry-specific features influence the choice of entry mode. A more concentrated market structure (globally or in any given market) may induce TNCs to acquire one of the lead players. Indeed, many mega mergers that have taken place in the pharmaceutical and automotive

Box V.7. The determinants of the make/buy decision in R&D

The following are the main determinants of whether a firm chooses to maintain R&D in-house or outsource it.

- *The tacit nature of the knowledge and the extent of coordination needed.* Segments of R&D where knowledge is highly tacit may be kept in-house if the cost of transfer and coordination is significantly higher than the potential benefits from outsourcing. However, the "separability" of processes may rise as knowledge becomes more codified, research methodologies evolve, technologies become standardized and coordination becomes easier.
- *The degree of outsourcing of manufacturing.* As companies specialize in core activities and outsourced production, there may be a parallel increase in the need for external sourcing of innovation.
- *The significance of the R&D to the company's core advantages.* Critical activities will not be outsourced so as to protect competitiveness, core skills and the company's reputation for innovation. The costs of losing an innovative edge may be huge for a market leader. The line between critical activities and others will, however, vary according to corporate strategy, the IPR regime and the level of trust between the principal and the contractors.
- *The need for specialized skills and equipment.* Where product innovation becomes very complex and modular, involving a broad range of skills and expertise (as in semiconductor design), it becomes impractical for a single firm to undertake R&D for all stages and functions. Product innovation then has to be "vertically disintegrated" among several enterprises (Ernst 2003).
- *The increasingly multidisciplinary and multi-technology nature of innovation.* "The increasing cross-fertilisation of technologies across disciplines and resultant broader portfolio of competences has become fundamental to the competitiveness of technology-based firms" (Narula 2001, p. 366). This is particularly true of manufacturing processes where several technologies interact, leading to a need to find external sources of knowledge and innovation.
- *The need for expensive routine engineering and testing.* This is a significant incentive for outsourcing, particularly where the facilities needed are capital-intensive. Outsourcing then becomes a way to cut fixed costs and reduce risk.
- *The need for rapid innovation.* In several fast-moving technologies, competitive success depends on the ability of firms to get products (or modifications) rapidly onto the market. The availability of contract research facilities that can respond at short notice is a major advantage.
- *The need to cut costs.* In many consumer goods industries like electronics, lead firms have to provide and constantly update a whole range of products. For example in the case of digital cameras, "to get shelf space at a Best Buy or Circuit City often means brand-name companies need a full range of models, from a $100 point-and-shoot digital camera with 2 megapixels, say, to a $700 8-megapixel model… competition can reduce hit products to cheap commodities within months. So they must get out the door fast to earn a decent margin… Such pressures explain outsourcing's growing allure. Take cell phones, which are becoming akin to fashion items. Using a pre-designed platform can save 70% of development costs off a new model." (Engardio and Einhorn 2005, pp. 56-57).

Source: UNCTAD.

industries have been motivated by a desire to achieve synergies in marketing and distribution, but also in R&D work. In industries characterized by oligopolistic competition, there may be strategic motives for firms to acquire technological assets of rivalling firms in a bid to pre-empt other firms (*WIR2000*). The M&A route is more attractive where speed in accessing the technology or innovative strengths in a host economy is an important consideration.

* * *

To sum up, the main driver for R&D internationalization by TNCs remains the need to adapt products and processes to conditions in host-country markets. However, the recent increase of R&D by TNCs in selected developing countries, especially in Asia, is driven by a complex set of factors:

- *pull factors*, such as a growing market, availability of large talent pools at favourable costs and developing Asia's emergence as a global production base in some industries;
- *push factors*, such as shortages of skills in specific categories in home countries, rising costs and complexity of R&D, greater competitive pressure that forces TNCs to innovate more without increasing costs;
- *policy factors*, such as host-country efforts to strengthen their NISs, to invest in education and to use targeted investment promotion and incentives;
- *enabling factors*, including advances in ICT, investment and trade liberalization, all of which make it easier for firms to restructure their operations internationally, while at the same time adding competitive pressure on firms to do so.

As a result, this new form of R&D internationalization can be seen as a logical next step in the increasingly globalized production systems of TNCs. The process greatly resembles the kind of international restructuring that has taken place in export-oriented manufacturing (*WIR02*) and services (*WIR04*) where TNCs seek to improve their competitiveness by exploiting the different locational advantages of countries. In the annex to this chapter the case of the semiconductor industry is used to illustrate how the interaction of the various factors has led to the growth of chip design in Asia. As noted in the next chapter, this trend offers important benefits to countries that are affected, but may also give rise to concerns.

Annex to chapter V

THE RISE OF CHIP DESIGN IN ASIA: A CASE STUDY

Chip design is a good example to illustrate the complex interaction of factors currently favouring the expansion of innovative R&D in developing countries (Ernst 2003, 2005a). Chip design not only creates the greatest value in the ICT industry while requiring highly complex knowledge, it also involves a generic technology that affects a large number of user industries, including high-value services. The chip industry was one of the earliest to globalize production and it has been one of the most dynamic in world trade. Now it appears that design and development work in this industry is following on the heels of manufacturing by moving towards Asia.

Chip design has recently moved from centres of excellence in the United States, Europe and Japan to sites in some developing countries, notably in South-East and East Asia. From practically nothing during the mid-1990s, this region's share of semiconductor design reached around 30% in 2002 (iSuppli 2003, p. 21). South-East and East Asia are now the fastest growing markets for electronic design automation tools, expanding by 36% in the first quarter of 2004 compared to 5% for North America (which has 60% of the world market), 4% for Europe, and -2 % for Japan (EDA Consortium 2004). Developing Asia is not only undertaking more chip-related R&D, but also the levels of complexity are rising in terms of the line-width of process technology (measured in nanometres), the use of analogue and mixed-signal design (substantially more complex than digital design), the share and type of system-level design (e.g. system-on-chip) and the number of gates used in these designs.

This section explores the main drivers behind the offshoring of chip design, drawing on interviews with 60 companies and 15 research institutions in the United States and Asia involved in designing integrated circuits, as well as systems (Ernst 2005). The sample includes global and regional carriers of chip design in Asia, including specialized research institutes and nine strategic groups of firms that participate in global design networks.[20] With the exception of some Chinese companies, all the sample firms are TNCs.[21] Their design activities are concentrated in a handful of clusters in Taiwan Province of China (Hsinchu and Taipei), the Republic of Korea (Seoul), China (Beijing, Shanghai, Hangzhou, Suzhou, Shenzhen), India (Bangalore, Hyderabad, Noida/New Delhi), Singapore and Malaysia. The TNCs interviewed emphasized the diversity of functions performed by their Asian design centres, from routine (engineering support, adaptation, listening posts for "technology marketing") to highly strategic tasks (global development mandates for specific IT products, components and services). The tasks assigned to a design centre depend on its locational characteristics, especially on the quality of the regional and national innovation systems.

The expansion of chip design in Asia has been the result of the synergistic effects of pull factors, policy factors, push factors and enabling factors.

1. Pull factors

The cost of employing a chip design engineer in Asia is much lower than in the United States – typically only 10-20% of the cost in Silicon Valley (table V.1). But this is not the only pull factor; demand factors are equally important. TNCs need to locate design near the rapidly growing Asian markets for communications, computing and digital consumer equipment in order to interact with the lead users of new products. China is already the world's largest market for telecom equipment (wired and wireless) as well as a critical test bed for the third- (3G) and next-generation wireless communication systems. It is also among the most demanding markets for computing and digital consumer equipment. As most of the equipment is produced in China, the country has become the world's third largest market for semiconductors, generating substantial demand for chip design. To the extent that China succeeds in setting alternative standards for 3G mobile communications, the need for undertaking chip design locally may increase to address the specific requirements of such standards. In this context all major global system companies in mobile communication systems are expanding their Asian chip design centres to establish their own designs as *de facto* standards in the region.

Table V.1. Annual cost of employing a chip design engineer, 2002
(Dollars)

Location	Annual cost[a]
United States (Silicon Valley)	300 000
Canada	150 000
Ireland	75 000
Republic of Korea	<65 000
Taiwan Province of China	<60 000
India	30 000
China (Shanghai)	28 000
China (Suzhou)	24 000

Sources: UNCTAD, based on PMC-Sierra Inc., Burnaby, Canada (for Silicon Valley, Canada, Ireland, India) cited in Ernst 2005.

[a] Including salary, benefits, equipment, office space and other infrastructure.

2. Policy factors

Policies cover a wide range of factors, such as incentives, regulations, infrastructure and education – all designed to attract R&D and other TNC innovative activities, including chip design, to particular locations (Ernst 2005, Armbrecht 2003, von Zedtwitz 2004, Walsh 2003).[22] TNCs interviewed expressed concern about obscure and unpredictably changing regulations in some Asian countries as well as weak IPR regimes.[23]

In terms of their home-country design activities, Asian firms interviewed acknowledged that policies had played a powerful catalytic role in building the critical infrastructure, supporting industries and design capabilities that allowed them to invest in and upgrade chip design (see also chapter VII).[24] The progress in chip design has owed much to concerted efforts by both governments and leading companies to establish new sources of innovation and global standards. In telecommunications, the four leading players in the Republic of Korea (Samsung, SK Telecom, KT, LG) are all trying to become major platform and content developers for complex technology systems, especially in mobile communications. These efforts build on considerable capabilities accumulated in public research labs (like the Electronics and Telecommunications Research Institute, ETRI), as well as in R&D labs of the *chaebol*, to develop complex systems. China's attempt to develop an alternative 3G digital wireless standard has created a powerful incentive to expand Asian electronic design activities.[25] Thus government procurement has been a powerful tool in driving innovation.

3. Push factors

A number of factors in developed countries are also greatly contributing to pushing firms to expand chip design in Asia. Three such push factors can be distinguished:

- Changes in the methodology and organization of chip design;
- More outsourcing and multiple design interfaces; and
- Changing skills requirements.

a. Changes in design methodology and organization

Since the mid-1990s growing pressures to improve design productivity, combined with increasingly demanding performance features of electronic systems, have produced turmoil in chip design methodology.[26] So-called "system-on-chip design" combines "modular design" [27] and design automation to move design from the individual component on a printed circuit board closer to "system-level integration" on a chip (Martin and Chang 2003). A key driver behind these changes has been a widening productivity gap between design and fabrication. While the productivity of chip fabrication grew at an annual compound rate of 58% from the 1980s until 1998, that of chip design reached only 21% (SIA 1999).

Chip design is also becoming increasingly complex. First, progress in manufacturing technology ("miniaturization") has made it possible to fabricate millions of transistors on a single chip. This increased complexity needs to be matched by a dramatic improvement in design productivity (ITRS 2004, pp. 13-14). Second, the convergence of digital computing, communication and consumer devices has raised the requirements for essential features of electronic systems – they need to become lighter, thinner, shorter, smaller, faster and cheaper, as well as more multifunctional and less power-consuming. These features are expected to continue to improve. At the same time companies are forced to speed up time-to-market as product life cycles have been reduced to only a few months for some products. Time compression is therefore key in designing chips for such systems.

These changes in methodology have increased complexity at two levels of chip design: on the chip ("silicon") and on the "system".[28] With growing design complexity, verifying at an early stage whether the design can be used to produce chips at acceptable yield and performance has become critical. Some 60-70% of all system-on-chip hardware design time now goes into verification, leaving only 30-40% for actual device development. This has inflated the cost of design. For instance, the overall development cost for complex system-on-chip design can be as high as $100 million, a cost level few design companies and chip users can afford.

b. More outsourcing and multiple design interfaces

Until the mid-1980s, system companies and integrated device makers did almost all their chip design in-house. Since then system-on-chip design has fostered vertical specialization in project execution, enabling firms to disintegrate the design value chain and disperse it geographically. This has given rise to complex, multilayered global design networks with variable configurations, depending on the needs of a specific project (box V.8).[29] Until the early 1990s, design networks retained a relatively simple structure. Over time, however, vertical specialization increased the number and variety of network participants, business models and design interfaces, bringing together design teams from companies that drastically differed in size, market power, location and nationality.

A possible network might be comprised of the following players: a Chinese system company for the definition of the system architecture; an electronic manufacturing supplier from Taiwan Province of China; a United States integrated device manufacturer; a European "silicon intellectual property" firm; design houses from the United States and Taiwan Province of China; foundries from Taiwan Province of China, Singapore and China; chip packaging companies from China; tool vendors for design automation and testing from the United States and India; and design support service providers from various Asian locations.

Box V.8. Global design networks: the key players

Three layers can be distinguished in global design networks:

- The *network core* encompasses five strategic groups of firms: the system company, which defines the concept, but may well outsource everything else. The *system-on-chip design* may take place within the "system company", an integrated device manufacturer, or a fabless design house (or a combination of these).[a] Finally, chip fabrication and assembly, may be outsourced to specialized suppliers.
- A secondary layer of the design network consists of *suppliers of tools* (for electronic design automation, electronic design automation; verification; and chip testing), silicon intellectual property licensors and design implementation services.
- The third layer may involve *system contract manufacturers* (both electronic manufacturers services and original design manufacturers).

Source: Ernst 2005.

[a] Fabless companies do not manufacture their own silicon wafers. Rather, they concentrate on the design and development of semiconductor chips.

Vertical specialization within design networks has transformed the structure and the competitive dynamics of the global semiconductor industry. It has also increased the organizational complexity of the networks. A typical system-on-chip design team now needs to manage at least six types of design interfaces with: system designers, silicon intellectual property providers, software developers, verification teams, electronic design automation tool vendors and foundry services (fabrication). These design communities are rarely located in the same place, which makes coordination difficult. As design teams become larger and geographically dispersed, more formal interfaces are necessary for effective communication between them.

With product life cycles often as short as a few months, system design requirements keep changing rapidly. Communication problems between hardware and software designers are particularly serious. Hence *proximity and face-to-face contact* become critical: global design networks increasingly need to locate in Asia those chip design stages that closely interface with local companies in mobile communications and digital consumer electronics. As most of the world's leading chip contract manufacturers ("foundries") are in Asia, this creates powerful pressures to locate important stages of chip design in this region. New processes and changes in design methodology require closer interaction between designers and process engineers.

c. Changing skills requirements

Geographic proximity (in the established centres of excellence in the United States or Europe) has sometimes been a disadvantage for design projects that require a large number of contributors with diverse knowledge sets and capabilities. For TNCs involved in chip design, it has become costly to bring together a large group of diverse design communities in one location and keep them there. This is another reason for TNCs to offshore chip design to Asia.

Meanwhile, skill requirements and work organization are growing in importance as push factors. Some TNCs interviewed expressed concern that the supply of scientists and engineers in the United States and Europe is inadequate. As noted above, some Asian governments have pursued policies that increase the availability of well-educated engineers, scientists and managers. Engineers in some Asian countries are trained to use the latest tools and methodologies, and the main electronics exporting countries in Asia have also set up training institutions dedicated to chip design. These efforts are especially advanced in India and East Asia.

The expansion of chip design in Asia appears also to have been influenced by a perceived inflexibility on the part of design engineers in the United States and Europe to adapt to a more structured ("automated") work organization (termed "innovation factory"). TNCs have likewise sought to lower design costs by increasing the workloads and capping the design engineers' salaries, which rose rapidly during the boom of the 1990s. Cost considerations clearly favour design work in Asia.

4. Enabling factors

Finally, new ICTs facilitate the internationalization of chip design. Coordinating specialized design networks in Asia vertically can involve high communication costs because of geographical distance combined with differences in levels of development and economic institutions (labour markets, education systems, corporate governance, legal and regulatory systems as well as IPR protection). New ICT-enhanced information management has helped reduce such costs, codify knowledge, enable remote control and allow more knowledge to be shared via audio-visual media.

A second enabling factor is the spread of "transnational knowledge communities", such as professional peer group networks, along with Asia's large diaspora of skilled migrants and "IT mercenaries". These networks help share complex design knowledge and provide experience and links with markets and financial institutions.

* * *

In sum, in the case of chip design a combination of pull, push, policy and enabling factors is creating a compelling case for TNCs to shift more of their design work to Asia. The trend is still at an early stage but is set to deepen. Over the past few years all interviewed TNCs made substantial investments in chip design in Asia and are planning further expansion.

Notes

1 "The establishment of international R&D networks and the management of transnational R&D projects are non-trivial and risky endeavours. The principal challenges are imposed by physical distance among R&D units, as well as between R&D units and corporate headquarters. Distance impacts communication in terms of frequency and quality, raises transaction costs, and introduces principal-agent related difficulties" (von Zedtwitz and Gassmann 2002, p. 570).

2 For example, the Chinese automobile manufacturer, Dongfeng Motors, has established listening posts in the United States, Germany, United Kingdom and France for the purpose of being close to major competitors and their technological bases (von Zedtwitz 2005).

3 Similar conclusions were drawn in another study of the largest R&D spenders. Adapting products to local requirements, learning from foreign lead markets and customers, keeping abreast of foreign technologies, and gaining access to skilled researchers and new talent were the major reasons for internationalizing R&D (Roberts 2001).

4 "Innovative Asia: how spending on research and development is opening the way to a new sphere of influence", *Financial Times*, 9 June 2005.

5 Conventional technologies included chemicals, pesticides, fertilizers, pharmaceuticals, engineering, hygiene and health-care products, and branded

consumer goods. New technologies included electronics, ICT, software, biotechnology and solar energy (Reddy 2000).

6 "Wipro: R&D budgets falling, interest in global outsourcing rising", *Information Week*, 1 April 2005 (www.informationweek.com/story/showArticle.jhtml?articleID=160401375).

7 For a review of changes in the export competitiveness of countries, see *WIR02*.

8 See annex table A.V.1 for data by country.

9 China's tertiary enrolment rate rose from 5% of the age group in 1995 to over 20% in 2004.

10 According to China, Ministry of Education 2004.

11 The professional groups included engineers, finance and accounting specialists, analysts, life science researchers and professional generalists.

12 Proximity to regional markets has been the most important factor attracting foreign R&D activities to Singapore. The second most important factor, however, has been the availability of personnel that can be sourced freely within the country and from abroad (Toh 2005, p. 16).

13 Public research institutes are traditionally averse to such contract work and have to be restructured, upgraded, and given "hard budget" constraints to change their orientation in order to respond to the shorter-term, practical needs of industry. This has been accomplished in India (chapter VII).

14 The connection between IPR regimes and the broader category of FDI is ambiguous.

15 See also chapter VII for a discussion of how developing countries may use IPR systems to benefit more from TNCs' internationalization of R&D.

16 In 2001, the United States contract R&D industry spent \$14.2 billion on R&D (about 7% of total industrial R&D and 20% of services R&D). Its R&D spending has been growing very rapidly, doubling over the period 1998-2001 (United States, NSF 2004). In the United Kingdom, the contract R&D industry accounted for £428 million of R&D in 2000, up from £142 million in 1992 (Morgan 2002). In 2000, contract R&D accounted for 22% of services R&D in the United Kingdom, about one-third in Canada, Germany and Sweden, 65% in Italy and 77% in the Russian Federation (United States, NSF 2004).

17 As noted in a study of DuPont's outsourcing of chlorofluorocarbons (CFC) research: "DuPont may have outsourced \$5 million of the \$400 million it spent on CFC research, but the company saved that amount many times over by not doing the research in-house" (Paul 1998, pp. 1-2).

18 See report by Ernst and Young at http://www.ey.com/global/content.nsf/International/Progressions:GlobalPharmaceuticalReport2004.

19 See Engardio and Einhorn 2005, pp. 53-54.

20 These are system companies; integrated device manufacturers (IDMs); providers of electronic manufacturing services and design services (the so-called ODMs, or "original-design manufacturers"); "fabless" chip design houses; "chipless" licensors of "silicon intellectual properties" (SIPs); chip contract manufacturers ("foundries"); vendors of electronic design automation tools; chip packaging and testing companies; and design implementation service providers.

21 Interviews were conducted with both parent companies and foreign affiliates of firms from the United States, Taiwan Province of China and the Republic of Korea, while for Chinese and Malaysian firms, interviews were conducted only with parent companies. In China the sample included State-owned enterprises, collective enterprises and private technology firms.

22 Most firms refer to aggressive incentives implemented in China. For example, in 2002-2003 chips designed by foreign and domestic companies in China were eligible for a 14% value-added tax (VAT) tax rebate, which lowered the effective tax rate to 3% from the nominal VAT of 17% on sales of imported and domestically produced chips. This policy created an artificial cost advantage for domestically designed chips, and was later abandoned.

23 More research is needed, however, on whether and how weak IPR regimes prevent TNCs from upgrading their design labs in Asia, or if other motivations override these concerns.

24 This supports earlier findings in the literature. See, for example, Shen 1999, Lu 2000, Naughton and Segal 2002, Mathews and Cho 2000, Hobday 1995, Ernst, Ganiatsos and Mytelka 1998, Ernst and O'Connor 1992, Ernst 1994 and 2000.

25 The TD-SCDMA standard was developed by Datang Telecom, a Chinese State-owned enterprise, and the Research Institute of the Ministry of Information Industry, with technical assistance from Siemens. To accelerate implementation, Datang has formed a series of collaborative agreements: a joint venture with Nokia, Texas Instruments, the Korean LG group and Taiwanese original design manufacturing suppliers; a joint venture with Philips and Samsung; and a licensing agreement with STMicroelectronics that will provide the Chinese company with access to critical design building blocks (Ernst and Naughton 2004).

26 "Design methodology" is the sequence of steps by which a design process will reliably produce a design as close as possible to the design target while maintaining feasibility with respect to constraints.

27 In "modular design", "parameters and tasks are interdependent within units (modules) and independent across them" (Baldwin and Clark 2000, p. 88).

28 "Silicon complexity" refers to malfunctions that result from the growing scale and density of the circuit and the introduction of new materials or design architectures. "System complexity" on the other hand increases with the transition to system-level design with "exploding" multiple functions, an in smart phones (ITRS 2002, pp. 82-83).

29 For instance, designing an embedded micro-controller for a mobile handset requires a different global design network configuration than the design of a graphic chip.

CHAPTER VI

DEVELOPMENT IMPLICATIONS

A. New development opportunities in the making

R&D is among the highest value-added activities undertaken by firms. Its internationalization affects the allocation of knowledge and human resources across countries and creates links between domestic actors and the R&D activities of TNCs. It deepens technology transfer – from simply transferring the *results* of innovation to transferring the *innovation process* itself. Until recently however, with the exception of some production support and adaptive R&D for local markets, FDI in R&D has been out of the reach of most countries outside the Triad. The new trend of TNCs setting up global R&D facilities in some developing countries is still in its infancy, but it is important. It has significant long-term implications for host and home countries alike (table VI.1).

Internationalization of R&D can benefit host developing countries in several ways. It can serve as a training ground by providing challenging, high-skill jobs to scientists and engineers. It can create new research skills and thereby help enhance human resources in a host country. It can bring in new knowledge and research know-how, and it can generate knowledge spillovers to domestic enterprises and other organizations, thus stimulating an R&D culture in a host economy. Growing R&D competence can, in turn, help host countries move up the value chain and into new areas of dynamic comparative advantage. In an increasingly technology-based setting this can be of immense benefit.

This does not mean that all developing countries are able to seize these opportunities and reap the benefits; TNC R&D is going to relatively few countries (chapter V). Nor does it mean that all its development benefits will materialize automatically. There are potential costs. The net outcome depends crucially on the type of R&D involved and on the economic context, including the host country's technological capacities, and policy and institutional framework (chapter VII).

Overseas investment in R&D also has economic implications for TNCs and their home countries. R&D in developing countries can enhance the innovative and productive efficiency of TNCs by allowing them to combine their technological strengths with foreign assets. They may be able to acquire new technological assets and thereby enhance their global competitiveness. The home economy may benefit from increased exports, reverse technology transfers and improved R&D efficiency of their firms. Developing home economies can reap similar benefits; indeed, the benefits to them may be even higher, because their enterprises can tap into global innovation centres by establishing an R&D presence.

At the same time, R&D internationalization may trigger concern in home countries. Some fear that, as lead firms expand their production and R&D activities abroad, the R&D of related and supplier TNCs may follow, thus leading to a "hollowing-out" effect. As firms restructure their R&D activities internationally, some knowledge workers may have to shift to new jobs, which could involve adjustment costs associated with creating new skills and employment opportunities. The entry of new locations as

Table VI.1. Potential implications of R&D internationalization by TNCs

	Potential benefits	Potential costs
Host country	Improved structure and performance of the NIS Contribution to human resource development (R&D employment, training, support to higher education, reverse brain drain effects) Knowledge spillovers Contributions to industrial upgrading	Downsizing of existing local R&D or losing control of technology Unfair compensation for locally developed intellectual property Crowding out in the labour market, potential harm to basic research Technology leakage Race to the bottom and unethical behaviour
Home country	Improved overall R&D efficiency Reverse technology transfers and spillovers Market expansion effects	"Hollowing out" of domestic R&D base Disappearance of certain R&D jobs Technology leakage

Source: UNCTAD.

potential hosts for mobile R&D activities also puts greater pressure on all countries to ensure that their national innovation systems (NISs) are competitive.

The implications of R&D internationalization for both host and home countries depend primarily on the extent to which it affects national innovative capabilities. The NIS approach is useful in examining the implications (Freeman 1987, Lundvall 1992b, Nelson 1993). It is based on the assumption that innovation and technology development result from complex interactions between enterprises, universities and research institutes, and government agencies. Enterprise R&D is an important, but not the only, component of the NIS: the ability of companies to innovate is intrinsically linked to the system in which they operate. Figure VI.1 provides a schematic diagramme of an NIS. In its traditional form the NIS comprises only domestic actors. However the boundary, components, and interactions between the main actors, change as R&D by FDI becomes integrated into the NIS (Liang 2004), opening up a new channel through which resources and learning can take place. If successful, this can help transform a traditional innovation (science and technology) system into one in which enterprises play a more important role. Since the TNCs that locate R&D overseas are often those engaged in high-technology activities like software, electronics and life sciences, this may also help host countries to shift into these knowledge-intensive, fast growing industries.

Different types of R&D (adaptive, innovative, technology-sourcing) have different implications for the NIS of host countries. Implications may also vary according to the *mode* through which the TNC internationalizes its R&D – whether by means of FDI (greenfield investment or acquisition), strategic alliances or subcontracting (outsourcing). Each mode creates connections to international knowledge networks, but the impacts on home and host countries differ. The impact also depends on the level of economic development of the host and home countries. There will be little or no impact on developing countries that lack the basic production and adaptive capabilities needed for new product development (chapter III). On the other hand, innovative R&D by TNCs can enable countries with some manufacturing capabilities to climb the value chain within existing industries and enter new industries. And it may help the more advanced developing countries to move from development-oriented work to applied research and eventually to basic research.

It is difficult to measure the impacts of R&D internationalization by TNCs. Conceptually, the implications for home and host countries can be examined in terms of their effects on the structure and performance of their NIS, human resources, knowledge spillovers and industrial upgrading. Broader effects (e.g. on income and, education) are also important but are beyond the scope of this report. The causal links between R&D internationalization and such aspects as productivity in home and host countries, export competitiveness and economic growth are hard to measure. The data are limited and mostly relate to developed countries. The phenomenon is still too new in developing countries to allow a full assessment, and the experience of developed countries may not offer valid insights since the drivers of R&D internationalization vary too much in the two cases (chapter V).

R&D spillovers – one of the key potential benefits – are particularly difficult to measure, and while more tangible indicators of knowledge creation or dissemination such as innovations, patents or citations exist, they are imperfect measures.[1] Finally, the counter-factual question raised in the chapter is: what are the implications of R&D internationalization by TNCs as compared with a situation in which such internationalization did not take place? This analysis does not aim to compare the implications of R&D through TNCs with those of R&D by other actors. Rather, it seeks to provide an assessment based mainly on case studies and conceptual analysis.

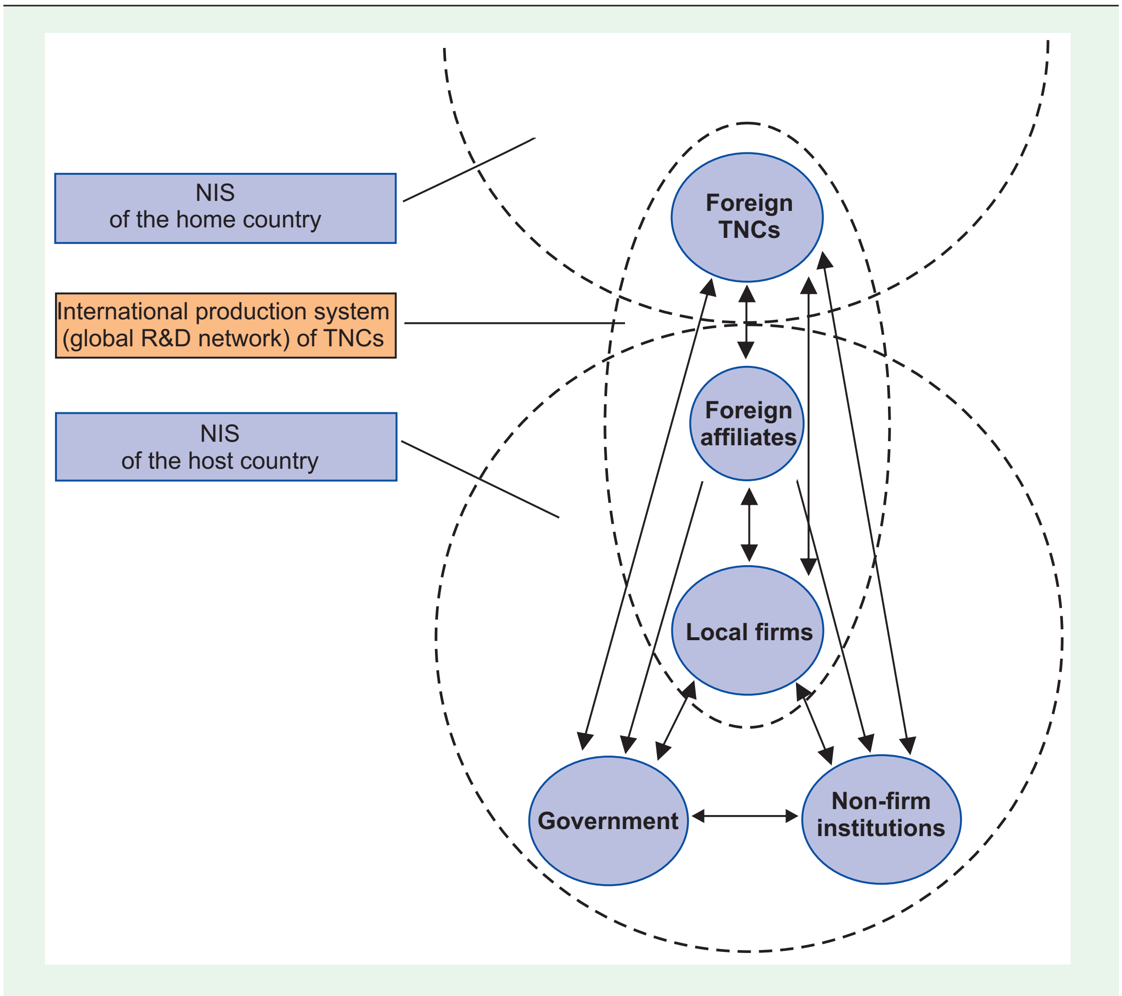
The following sections review the evidence of the impact of TNC activities in R&D internationalization. Section B considers potential host-country implications, while section C focuses on implications for home countries. Section D concludes with a discussion of the possible implications for countries that are not participating in the R&D internationalization process.

B. Implications for host countries

1. Effects on the structure and performance of an NIS

R&D-related FDI leads to structural changes in the host-country NIS (figure VI.1). Foreign affiliates conducting R&D become a part of the enterprise segment of the NIS and interact to varying degrees with local firms, science and technology (S&T) institutions and government agencies, adding to the complexity of the system.

Figure VI.1. National innovation systems and FDI in R&D: a schematic diagram



Source: UNCTAD, adapted from Liang 2004, p. 171.

They provide channels of resource-sharing between the TNCs and the host country, affecting learning and innovation in the latter. As TNCs allocate more R&D resources to the local economy, the NIS becomes increasingly linked with the global R&D network of the TNC and with corresponding innovation systems elsewhere.[2]

Enterprises are a core component of an NIS. In most developed countries they are the main innovators and the main implementers of new technologies in production. However, in developing countries, enterprises generally perform little R&D; the bulk of it is done in universities and government research institutes and is often de-linked from the productive sector. This weakens the economic impact of R&D on efficiency, growth and competitiveness.

R&D-related FDI can help overcome this absence of an innovative enterprise sector – a common weakness of developing-country innovation systems. Over time it is essential for enterprises to become lead R&D performers and for other knowledge institutions to supplement enterprise effort by undertaking basic research, applied research under contract and other technical services. TNCs bring well-developed methodologies and skills for conducting R&D. They also create demand for related services from local firms. For example, the business research culture introduced by foreign affiliates in India contributed to the development of some high-technology industries there. Texas Instruments, the first TNC to be allowed to establish a wholly owned software affiliate in India in 1986, not only inspired other TNCs to set up operations in India but also spurred the growth of the indigenous software and business services industry.[3] The influx of Texas Instruments and other foreign investors opened new job opportunities for Indian researchers in the interface between science and business.

Foreign affiliates usually maintain close technological linkages with the parent company and with sister companies. In a survey of 37 TNCs with R&D activities in India in 1995, all foreign affiliates conducting R&D (in both new and conventional technologies) had linkages with the parent firms' R&D in their home countries and 81% of R&D units in "new technologies" (mainly ICT, software and biotechnology) had linkages with parent firms' R&D worldwide (Reddy 2000). These *intra-firm linkages* are a channel through which foreign R&D resources (financial, human and knowledge) can enter a host country NIS and potentially diffuse further to other actors. These resources may be very expensive to purchase in the market – in some cases they may not be available at all.[4] Thus intra-firm linkages are potentially of great importance for the upgrading of the local innovation system.

However, the transfer of R&D resources between a parent TNC and its affiliates does not automatically lead to a diffusion of these resources within the host economy. Linkages between TNCs and domestic business entities are vital, and they only arise if the domestic firms have sufficient innovative capabilities. In economies such as the Republic of Korea and Taiwan Province of China, the upgrading from assembly to design, development and research was mainly based on domestic efforts rather than on the presence of foreign affiliates (chapter IV), although domestic enterprises and research institutes interacted with TNCs in other ways.

In other economies, the *relationships between foreign affiliates and domestic enterprises* are a core factor in the innovation system. Through such linkages, the transfer of resources can be channelled to local companies and so help improve their R&D efficiency. Some R&D activities of foreign affiliates are undertaken in direct collaboration with host-country firms. Vertical linkages related to R&D between foreign affiliates and their suppliers (*WIR01*) are particularly likely to generate spillovers because of the high degree of knowledge intensity and uncertainty of such activities. The outsourcing of R&D to local firms is another form of linkage. As R&D becomes increasingly complex, these linkages may becomes so important that they lead to the creation of formal partnership whereby the scope for learning and spillover benefits expands further. The likelihood of partnerships increases when companies have some complementary capabilities (Mowery et al. 1998, Santangelo 2000).

There are also potentially important implications from horizontal interactions between foreign affiliates and competing domestic firms. R&D by foreign affiliates adds R&D resources to host-country industrial clusters and may induce local firms to undertake more R&D to compete better. It may also show local competitors *how* to conduct R&D more effectively. The basic condition for this beneficial impact is the existence of a competitive and innovative domestic enterprise sector; this can ensure that local firms rise to the challenge posed by foreign affiliates rather than being crowded out by them (see also sections VI.B.4 and VII.D).

Foreign affiliates also *interact with knowledge institutions* such as local universities and public research institutes that undertake basic or applied research, produce R&D manpower and provide technical services to firms (chapter VII). Foreign affiliates may collaborate with these institutions (e.g. by providing financial support and conducting joint research projects) (box VI.1). Such collaboration can also benefit the R&D of other enterprises by raising the research capabilities of knowledge institutions, bringing them into contact with industrial work and promoting spin-offs.

Finally, by affecting the structure of the NIS and reallocating resources to more productive R&D, FDI in R&D may help enhance the overall efficiency of enterprise R&D in a host country. For example if the NIS initially has a strong focus on basic research, the entry of foreign affiliates conducting adaptive or innovative R&D could help activate underutilized knowledge potential (Manea 2002, Manea and Pearce 2001). R&D efficiency can also be improved if R&D by foreign affiliates is better managed, better equipped, and directed to more commercially feasible projects than that of other enterprises in an NIS. The most positive impact

Box VI.1. Collaboration between foreign affiliates and local universities: selected examples

The following are some examples of R&D collaboration between TNCs and local universities in host countries.

Microsoft Research Asia partners with academia and governments throughout the Asia Pacific region to foster innovative research, advance education and promote science and engineering. It pursues collaboration with local universities and relevant organizations through four avenues: research collaboration, curriculum innovation, talent fostering and science exchange. In research collaboration it has established joint research labs at Tsinghua University, Zhejiang University, Harbin Institute of Technology, Hong Kong University of Science and Technology and University of Science and Technology of China to cooperate with Asian academia. It conducts theme-based project funding to help research in specific areas.

Intel had more than 250 sponsored research projects under way at various international universities in early 2005. Its teacher training programme, launched in 2000, has offered training to more than 2 million classroom teachers in 30 countries, and the company collaborates with ministries of education or other government entities to adapt the curriculum in some countries.

Seagate Technology in Thailand cooperated with Khon Kaen University to open the Khon Kaen-Seagate Cooperation Research Laboratory for applied R&D in recording-head manufacturing technology. The lab uses system level technology and a systems research approach to broaden students' knowledge and expertise. The lab will also be a shared resource for both Seagate staff and students of Khon Kaen University who will be working together on projects. Cooperation between the industrial sector and universities offers opportunities to develop further and drive future growth in the hard disk drive and other related industries in Thailand.

In Brazil, the University of Campinas in Sao Paulo collaborates with a number of foreign affiliates in R&D. More than 250 partnership agreements with private companies and 60 agreements with public companies have been established at the university to date. Among participating foreign affiliates are *Ericsson* for the development of technology of fibreglass for optical amplifiers and *Motorola* for the development of professional capabilities in electronics-related areas. Other agreements involve foreign affiliates of *Aventis*, *Bayer*, *Compaq*, *Hewlett-Packard*, *IBM*, *Monsanto*, *Novartis*, *Roche* and *Tetra Pak* (UNCTAD forthcoming e).

In Rabat, Morocco, *STMicroelectronics* has established a training centre to train teachers and students from engineering schools and to provide a syllabus that will help them contribute to innovation activities in the semi-conductor industry.

Source: UNCTAD, based on company information.

on the NIS structure and efficiency may be achieved if the foreign affiliates initiate projects that would otherwise not have been carried out but that contribute to enhancing the specific strengths of the local NIS (Pearce 2004). However, such benefits are not automatic; local innovative capacities are among the most important determinants of their extent and diffusion. The ability to make commercial use of results generated through R&D in a host country depends on factors that can be influenced by government actions (chapter VII).

2. Human resource implications

While a good supply of highly skilled human resources can attract FDI in R&D (chapter V), FDI in R&D can also help in the development of such resources. TNCs generally have the most advanced capabilities for conducting R&D, and their affiliates can make significant contributions by transferring people with the necessary skills and methodologies to host countries. In addition, they can play a part in strengthening local human resources through in-house training, supporting local education and collaborating with local universities. They can also facilitate a "reverse brain drain" by attracting back skilled nationals working abroad.

Increased R&D employment. R&D employment by foreign affiliates is growing fast. For example, majority-owned foreign affiliates of United States companies increased their R&D staff by more than one-fifth during the period 1994-1999 (chapter IV). Most of these jobs were created in developed rather than developing countries, but the rate of growth in the latter has been even higher especially since 1999. There was a rapid increase in R&D employment in foreign affiliates, e.g., in China, the Czech Republic, India and Singapore, and recent survey data on FDI projects and TNC strategies suggest there will be further increases (chapter IV).

In China, for example, Motorola established the first foreign-invested R&D centre in 1990 and has so far hired a total of 1,300 engineers (box IV.6). Philips has some 700 R&D staff, which is set to increase to 1,300 over the next two years. GE's new global research centre in China was formally opened in 2003, hiring 500 researchers; it is expected to employ 1,200 by 2005.[5] There are similar figures in India, where, for instance, GE's global research centre in Bangalore employs around 2,400 people.[6] High levels of education are generally required for these jobs. For instance, in GE's laboratory in China, more than 80% of the engineers hold PhD degrees, and in Bangalore 60% of the employees have post-graduate qualifications in science. Also, foreign affiliates often offer better employment conditions: higher salaries, better working facilities and more sophisticated training (Zhang 2005).

Training. Many TNCs provide in-house training to their employees. Training undertaken by foreign affiliates conducting R&D can help develop new and advanced skills among local engineers and researchers. The types of training may range from on-the-job training to seminars and overseas training, including at the parent company. For example, almost all the 250 engineers and researchers recruited locally in Thailand at the Toyota Technical Centre Asia Pacific (Thailand) (box IV.7) had been sent to Japan for training. In some host countries the government has invited leading TNCs to help set up and run joint or cooperative training centres (chapter VII).

Supporting higher education. Some TNCs that undertake R&D in developing countries to tap pools of low-cost technical manpower support local universities and engage in curriculum development and talent fostering. They may help increase or upgrade training in specific skills. Others provide internship and fellowship programmes to high-performing students. Their research collaboration with local universities can offer a means of supporting higher education while simultaneously diffusing knowledge (section VI.B.3; box VI.1). However, host countries should ensure that national school and university curricula do not become overly directed towards the needs of particular firms. The potential contributions by TNCs should be balanced against the risk of becoming too "asset-specific" in their R&D and education focus.

Human resource spillovers. Spillovers take place when trained employees move to other firms or set up their own businesses. This is well documented from TNCs' production activities, such as in the electronics industry in Malaysia (Hobday 1995). Spillovers from R&D activity have not been analysed separately but are likely to be similar. Research personnel trained in leading TNC affiliates are bound to be highly prized by local firms seeking to launch R&D. These effects on human resource development may be greater when

R&D by TNCs is linked to local production than when it is conducted as a separate activity. For example, in India the main beneficiaries of electronics R&D by TNCs are probably the engineers directly engaged in research, whereas in China, where R&D is more often linked to production, larger spillovers may benefit local producers and exporters.

Brain-drain effects. In some developing countries the appearance of new career opportunities in foreign affiliates (and domestic firms that perform contractual R&D for TNCs) is contributing to a “reverse brain drain”. Many scientists, engineers and entrepreneurs who moved abroad to work in universities, R&D institutions and TNC labs are returning home to such countries as China and India. The returning diaspora often bring back knowledge of new research techniques and large-scale research management skills, in addition to their scientific knowledge. Some retain links with the firms or institutions abroad for which they worked: some become local managers of foreign affiliates or set up their own enterprises with contracts from abroad. This has happened in Brazil, China, India, the Republic of Korea, Singapore and Taiwan Province of China as well as in developed countries such as Ireland. For example, Zhongguancun Science Park in Beijing hosts 2,500 companies established by those returning from abroad (box VI.2). In Taiwan Province of China, many companies were established by people who had worked abroad for TNCs (Lin and Rasiah 2003).

The “reverse brain drain” may prove to be one of the most significant benefits of R&D internationalization. However, this benefit will accrue only to developing countries that have the skills, infrastructure and other requirements needed to attract R&D. It may be more difficult for other countries to encourage their best technical graduates to give up jobs in more advanced countries and return home (chapter VII).

3. Knowledge spillovers from R&D by TNCs

Given the nature of knowledge as a public good, it can be expected that the R&D activities of a foreign affiliate will generate some spillover benefits to other firms and institutions in a host economy. R&D activity builds upon the stock of knowledge, both explicit and tacit, in an enterprise. Some of the knowledge that TNC R&D creates may only benefit the TNC itself (if it is protected by patents or is so specialized that it cannot be transferred). However, some knowledge can “leak” out to and benefit the

Box VI.2. Reverse brain drain: the case of the Zhongguancun Science Park in Beijing

Zhongguancun Science Park, China’s first and largest science park and home to 40 universities and 130 research institutes, has attracted foreign as well as domestic R&D centres. By 2004, 41 foreign-invested R&D centres had been established by such leading TNCs as Hewlett-Packard, IBM, Intel, LG, Lucent, Microsoft, Motorola, Nokia, Nortel, Oracle, Samsung, Siemens, Sony, Sun Microsystems and Toshiba.

Returning members of the Chinese diaspora play an important role in these R&D centres. Some TNCs have appointed Chinese researchers who previously worked at their headquarters as heads or chief scientists of their R&D centres in Beijing. This has contributed to attracting back top Chinese scientists in specific areas, at least temporarily. For example, three consecutive directors of *Microsoft Research Asia* (box VI.1) were highly qualified Chinese scientists in computer science working with Microsoft in the United States. Although locally recruited researchers provide the main manpower for the activities of foreign-invested R&D centres, expatriate staff, particularly overseas Chinese, are a valuable complement with their knowledge and experience from working abroad. When some returning diaspora leave foreign affiliates and join local research entities or establish their own companies, they contribute further to the enhancement of local innovative capability.

For some returnees who decide to establish their own businesses, these foreign-invested R&D centres may also become important customers. In fact, out of the 14,000 high-technology firms located in the Park, 2,500 companies have been established by graduates returning from abroad.

Source: UNCTAD.

wider research community of a host country. With the establishment of foreign-invested R&D centres, tacit knowledge can be accessible locally to domestic entities.[7] Spillovers of tacit knowledge may be particularly valuable for a host country. Tacit knowledge plays a critical role in R&D but is difficult and costly to create locally.

There may be some tension between the interests of the host country and that of the TNC with regard to knowledge spillovers. While the former would seek to maximize the knowledge diffusion to other firms in the economy, the TNC often may want to minimize "leakages". Many compromises are possible (after all, the situation is very similar in the home country of the TNC). IPR protection can limit the loss to the firm, as can other strategies to limit the cost of spillovers (box VI.3).

Box VI.3. Protecting against the risks of technology leakage

While host countries see inward FDI as a means of building technological capabilities, TNCs are often reluctant to transfer technology or engage in local technological activity that may help local firms to become competitors. TNCs therefore try to limit the ability of local competitors to appropriate their proprietary technology by various means (box table VI.3.1).

TNCs may insist on *full ownership* of their affiliates, thus limiting access to knowledge by local firms that could otherwise be joint-venture partners. While local companies can still poach employees from foreign affiliates, their access to knowledge is likely to be more limited than if they were able to share ownership and thereby have their own people working on all activities in the foreign affiliates.

TNCs generally protect their *core competencies (technologies)* more than their non-core competencies, and are more willing to transfer the latter to foreign affiliates, outsource them or develop them in collaboration with local partners. This need not mean that non-core technologies are obsolete or of low value to the host country; they may be new and valuable but peripheral to the TNCs' core activities.

TNCs may transfer some core technology to foreign affiliates, which then work to improve their production through local process R&D. They may protect against its appropriation by *making the outcome and production dependent on the parent firm*, such as through local engagement in component production that has little value except if combined with other components that the TNC produces elsewhere. TNCs may decide to develop new technologies using a system of multiple locations in which no foreign affiliate has access to the full technological system.

TNCs may also transfer technology tacitly rather than explicitly, thus slowing its absorption by local employees and its re-transfer to a local partner. This gives the TNC more time to develop new competencies while slowing the affiliates' development of their own R&D capabilities.

Box table VI.3.1. Actions by TNCs to limit risk of spillovers in a host country

Action	Potential effect
Enter with wholly-owned operations	Reduces monitoring costs and risk of loss because of difficulty for outside companies to become sufficiently knowledgeable about the technology in order to appropriate it.
Transfer non-core technology of low value to transferer	Lower costs of loss to transferer from misappropriation, but transferees may be satisfied because of the asymmetrical value of the technology.
Transfer core (high value) but dependent (incomplete) technology	If appropriated, the value is low for the transferee because the technology can only be used in conjunction with complementary technologies held by the transferer.
Transfer technology in tacit rather than explicit form	Even if employees within the affiliate understand the technology, their transfer to another organization is slow because they must transfer it tacitly as well.

Source: UNCTAD, based on Cannice et al. 2003, 2004.

Knowledge spillovers can take place primarily through the mobility of labour, enterprise spin-offs and demonstration effects. If foreign affiliates are "embedded" in the host country NIS, with close interaction between foreign affiliates, domestic firms, universities and research institutions, the scope for spillovers increases (section VI.B.1).

As mentioned above, employee turnover is one of the principal ways in which technology and knowledge spill over to the domestic economy. This can be particularly valuable in developing countries, as this diffuses skills and experience that are difficult to gain in other ways. It is particularly significant for R&D, since tacit knowledge is embedded in the knowledge and experience of individuals rather than in hardware or capital equipment. The extent of such diffusion depends on whether domestic firms are as attractive employers as foreign ones. In developing countries, foreign affiliates often offer better salaries than local competitors.[8]

Local firms or institutions can, of course, improve their attractiveness. For example, a research director of a TNC R&D centre in China recruited a whole team of researchers back to the Chinese Academy of Science, in part by offering them the opportunity of doing independent research. "Examples of individual senior researchers leaving TNC R&D centres to join local companies are numerous, and it will continue to occur over the years" (Chen 2004, p. 37). In Malaysia, engineers who worked in local affiliates of TNCs like Motorola, Texas Instruments or Intel subsequently moved to R&D management jobs in local firms (Rasiah 1996).

Another channel for spillovers are "spin-off" firms or innovations from foreign affiliates. China Techfaith Wireless, China's largest independent R&D company for the design of mobile phones, was formed by a 14-person team that left Motorola China in July 2002. The spin-off was later listed in NASDAQ in May 2005.[9] Photonic Bridge, another R&D firm in China, was founded by a team of engineers and researchers from Lucent.

Knowledge spillovers are inherently difficult to measure. The few existing studies are based mainly on data related to R&D by foreign affiliates in developed countries. Studies based on patents citation data suggest that R&D spillover also takes place from foreign affiliates to local firms in the United States (Almeida 1996, Branstetter 2000).[10] Similarly, another study found that foreign R&D had a significant positive effect on domestic innovation in 147 geographic subregions of Europe, Canada and the United States (Peri 2004).

According to one study, R&D by foreign affiliates in Singapore has acted as "a window through which local Singaporean inventors tap into a much larger knowledge pool" (Hu 2004, p. 798). Inventors in Singapore relied more on patents from TNCs with a presence there than did inventors in other countries. This difference was particularly marked in computers and communications industries as well as in electrical and electronics industries – industries in which foreign affiliates play an important role in Singapore (Hu 2004).

Studies conducted in the EU under the Community Innovation Survey programme, however, do not provide strong evidence of spillovers from R&D by foreign affiliates. A survey of Belgian foreign and domestic R&D firms in manufacturing found no significant technology transfers from TNCs to the local economy (Veugelers and Cassiman 2004). While foreign affiliates in the survey were more likely than domestic firms to describe themselves as "innovative", acquire technology internationally and cooperate in R&D with local firms, they were less likely to be "locally networked" and to transfer technology to the local economy.[11] A similar picture emerged in France, where foreign affiliates used fewer local sources and cooperated less with local partners than did domestic firms (Sachwald 2004b). In Italy, foreign affiliates with asset-seeking innovation strategies were found to interact more with local firms and institutions than those with adaptive R&D strategies (Balcet and Evangelista 2005, box VI.4). A study of the productivity effects of inward and outward FDI in Swedish manufacturing found no evidence of R&D spillovers at the firm or industry level (Braconier et al. 2000).

Apart from paucity of data and methodological problems that might explain the apparent lack of evidence of spillovers, it has been suggested that spillovers between countries that are already technological leaders may in fact be limited (Braconier et al. 2000, p. 18). Indeed, a recent study confirms that the impact of inward FDI in R&D on innovation and productivity varies by the level of development of the host economy (AlAzzawi 2004). In newly industrializing economies, inward-FDI-induced R&D spillovers weighted by patent citations had potentially a strong positive effect on local innovation and productivity, especially if the FDI came from technologically leading countries. In developed countries on the other hand, inward-FDI-related R&D negatively affected local innovation but still had positive effects on domestic productivity (AlAzzawi 2004, p. 28): "FDI-induced R&D spillovers can be very important for less advanced economies. This is true both if innovation or productivity is our variable of interest. It seems that the further apart the source and recipient are in terms of level of technological advancement, the larger the

Box VI.4. Asset-seeking foreign affiliates create more local R&D linkages: the case of Italy

Foreign affiliates accounted for about 33% of all business enterprise R&D in Italy in 2001 (annex table A.IV.1). Their levels of interaction within the local NIS differs considerably according to their strategies — notably whether they seek to penetrate the Italian market based on imported technologies or to exploit local technological and human resources. Drawing on data from the third Community Innovation Survey for the period 1998-2000, a recent study assessed the technological contribution of foreign affiliates and their innovative activities (Balcet and Evangelista 2005).

A simple comparison with domestic firms suggests that foreign affiliates have a relatively high propensity to innovate, that they devote more resources to innovation and R&D activities, cooperate more with other firms and institutions, and establish formal technological linkages with other firms within the enterprise group to which they belong. However, much of this is explained by the fact that foreign affiliates are overrepresented in science-based and scale-intensive industries; it is also explained by their greater size. In fact when controlling for these factors, the propensity to innovate was lower in foreign affiliates. Affiliates did show a relatively high propensity to introduce new product innovations, to patent and to spend more on R&D. Meanwhile, external linkages with universities and R&D centres were less frequent and important for affiliates than for domestic firms.

Out of 535 manufacturing foreign affiliates contained in the Italian data-set, low-technology affiliates (which basically import the technology they need from abroad) and foreign affiliates with no innovative activities whatsoever accounted for 42% of the sample. Among the remaining 312 firms, most affiliates applied *adaptive* R&D and innovation strategies, mainly targeting the domestic market. There is thus a heavy concentration of adaptive, low-technology and non-innovative strategies among foreign affiliates in Italy.

In general, "adaptive affiliates" displayed weak external linkages, often involving intra-group technology transfers from headquarters. Local sources of knowledge such as universities and R&D centres were generally not perceived as important. Innovation (and also R&D) efforts of these affiliates were incremental and adaptive in nature. All types of industries were represented in this cluster in Italy.

About 50 affiliates were characterized as "asset-seeking". They had a higher level and scope of technological interactions with the external environment. Innovation activities were mostly undertaken in cooperation with other firms and institutions, such as universities and R&D centres. The most innovative *asset-seeking* affiliates had a strong internal commitment to innovation and R&D. The other *asset-seeking* affiliates depended more on knowledge, competencies and expertise absorbed from the external technological and scientific environment. The first type was strongly represented in science-based industries, whereas the industry composition of the other asset-seeking group was very mixed. Asset-seeking behaviour was found not only in science-based but also in medium-technology industries as well as in specific technological niches where Italian firms hold a comparative advantage. Such industries include mechanical engineering, home appliances and traditional industries like textiles and footwear.

The Italian case thus suggests that an "asset-seeking" pattern of internationalization can be pursued by different types of foreign affiliates, as long as the host country has accumulated a sufficient stock of sharable knowledge.

Source: UNCTAD, based on Balcet and Evangelista 2005.

potential positive spillover from knowledge flows on the recipient."

The experience of Italy (box VI.4) and the Czech Republic suggests that the situation may differ by industry. In the Czech automobile industry, for instance, TNCs helped create a sophisticated innovation system because of their long-term commitment to upgrading their R&D capabilities, patenting as well as cooperation with universities and R&D labs (Srholec 2005b).[12] The R&D intensity of both foreign and domestic firms in this industry was well above the national average, reaching levels similar to those of other automobile producing countries like France, Germany, Japan, Sweden and the United States. By contrast, TNCs in the Czech electronics industry largely undertook contract manufacturing, and invested little in R&D. The R&D intensity of foreign affiliates was substantially lower than that of domestic firms and below the average for manufacturing. For the economy as a whole, foreign ownership was found to have a significant *negative* impact on the propensity to conduct R&D (Srholec 2005b).[13] As in the other studies noted above, foreign affiliates were more likely to cooperate with non-affiliated firms abroad but less likely to cooperate with domestic firms and institutions.

4. Contributions to industrial upgrading

The internationalization of R&D may help host countries move up the value chain and enhance competitiveness. Industrial competitiveness involves four interrelated types of upgrading: *process upgrading*, *product upgrading*, *functional upgrading* (new mix of activities or different activities in the value chain) and *chain upgrading* (moving to a new value chain in products of higher technology intensity) (Kaplinsky and Morris 2001). Industrial upgrading usually follows the sequence from process upgrading through product upgrading and functional upgrading to chain upgrading (Gereffi 1999, Lee and Chen 2000).[14] R&D by TNCs can contribute to all four. The extent to which it contributes to *process* and *product upgrading* in host-country industries depends on where the results of the R&D are applied. Adaptive R&D and some innovative R&D directed towards the domestic market may contribute directly to process and product upgrading in domestic industry, while the impact of innovative R&D for global markets is likely to be more indirect.[15] For developing countries with relatively low levels of innovative capabilities, product and process upgrading of industries may be particularly important.

R&D by TNCs may lead to *functional upgrading* in domestic industries: from assembly work to R&D, design and other knowledge-based activities. Countries specializing in labour-intensive assembly are vulnerable to competition from countries with lower wages.[16] Economic rents in the value chain are increasingly to be found in areas outside production, such as R&D, branding and marketing. But developing countries that seek to move up along the value chain to R&D functions and other knowledge-based activities often encounter bottlenecks such as a lack of resources and local demand for these activities. By transferring resources to a host country, providing demand for R&D outcomes and stimulating the business innovation culture (sections VI.B.1 and VI.B.3), TNCs may help developing countries upgrade functionally towards higher value-added activities.

R&D by TNCs may contribute to *chain upgrading*, from simple value chains to those for products involving more advanced technologies. Traditionally, low-income developing countries were considered to have a comparative advantage only in low-technology industries. The emergence of a developing country as a destination for the global or regional R&D centres of TNCs can change the public perception of that country and help attract FDI in other knowledge-based activities as well. Indeed, countries that have begun to attract innovative R&D by TNCs may already benefit from "reputation effects" as more companies start considering them for future R&D expansion. Some developing countries have successfully built up more knowledge-intensive industries by leveraging R&D by TNCs. In China, for example, R&D by TNCs (box IV.8) and by domestic companies (such as Huawei and ZTE) have contributed significantly to the rapid upgrading of the Chinese telecom equipment industry – from central office switches to mobile telecommunications and other high-end equipment (Liang 2004). In Singapore, R&D by TNCs was a key factor in creating an innovation and industrial cluster around biomedical sciences such as pharmaceuticals and biotechnology (box VI.5). Rather than remaining as exclusively low-cost manufacturing locations, these two countries have leveraged their relatively well-educated populations and better innovation infrastructure to become centres of excellence for innovation.

R&D by TNCs can also contribute to the formation of industrial clusters at the regional level of a country. In the Pudong New District in Shanghai, for example, a complete value chain has emerged since 2000, partly as a result of FDI inflows. By 2003 some 25 specialized chip design companies, four contract manufacturers, 14 package and test companies, 22 equipment suppliers and some training and technical service providers were present in the area.[17] As of early 2005, there were 129 chip design companies in Shanghai employing 5,000 engineers and researchers.[18] Over time the cluster has made significant technological leaps in the area of integrated circuits and moved up the value chain,[19] and in 2004 sales of integrated circuits increased to above $2.4 billion, accounting for one-third of the national total. Government policies at the local level significantly assisted this process (section VII.D).

5. Potential concerns related to R&D internationalization

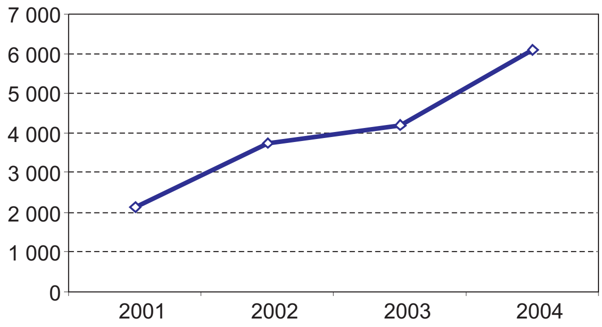
The potential costs of R&D internationalization for host countries depend on the type of R&D and its motive, the mode of TNC entry to conduct R&D and the strength of the host country's innovation system. The main concerns relate to the potential downsizing of R&D following cross-border M&As, unfair sharing of intellectual property resulting from local R&D, crowding out of local firms from the market for researchers, possible negative impacts of R&D fragmentation, a race to the bottom in attracting R&D-related FDI and unethical behaviour by TNCs (table VI.1). These are taken in turn below.

Box VI.5. R&D by TNCs in the biomedical science industry in Singapore

In the "Industry 21 Vision", a blueprint for Singapore's economic strategy in the 21st century, the biomedical sciences industry was identified as a key growth engine for the country.[a] Since this initiative was launched in June 2000, Singapore has demonstrated rapid progress in the upgrading of this industry within a relatively short time span. Based on both domestic efforts and FDI by TNCs, Singapore has built world-class capabilities across the entire value chain, from R&D to manufacturing in biomedical sciences and headquarters' services in the biomedical sciences industry. In manufacturing the overall output of the industry grew to $9.6 billion in 2004. The total value added of manufacturing in biomedical sciences was $6.1 billion (box figure VI.5.1), accounting for 21% of the country's total value added. Meanwhile, Singapore has successfully obtained patents and developed new products in the biomedical sciences.

TNCs have contributed to the biomedical sciences cluster in Singapore. They have played an important role in industrial upgrading through their R&D activities, ranging from basic research to clinical development. Pharmaceutical companies like Eli Lilly, Isis Pharmaceutical, Vanda Pharmaceuticals and Paradigm Therapeutics all conduct R&D in Singapore. Medical technology companies with an R&D presence include BD, Welch Allyn, Essilor, Siemens Medical Instruments, Bracco, Applied Biosystems and Fischer Scientific.

Box figure VI.5.1. Value-added of the biomedical sciences industry in Singapore
(Millions of dollars)



Source: EDB Singapore.

Source: UNCTAD, based on ISPE 2003 and information from Economic Development Board, Singapore.

[a] This covers biomedical sciences, pharmaceuticals and medical technology.
[b] For example, Eli Lilly invests $140 million in R&D and employs over 50 scientists and researchers.

Downsizing of existing R&D capacity and losing control of technology. The internationalization of R&D is partly the result of TNCs acquiring companies that perform R&D.[20] Such acquisitions may lead to a reduction of R&D activity as part of rationalization programmes. Similarly, strategic R&D activities may be relocated as a result of a takeover; this is of particular concern to technology leaders but it may also affect some developing countries or transitional economies that have special technological strengths.

A relevant factor here is whether acquiring and acquired firms are technologically complementary or competitive. For instance, a study of 62 firms in the EU found that there was a reduction in R&D activity after a merger when R&D activities were competitive (Cassiman et al. 2004). The remaining R&D became narrower in scope (or more focused) and its time horizon became shorter. Key employees tended to leave more often. These effects were stronger when the companies had been rivals before the merger.

In Latin America, R&D has rarely been the main reason for TNC entry, although many acquired State-owned and private enterprises were R&D performers. In many cases, R&D was subsequently downsized or closed entirely in a move to concentrate R&D activities at headquarters or elsewhere within the TNC network (Velho 2004, Cimoli 2001). In the automotive and pharmaceuticals industries in Brazil and Argentina, some TNCs downsized R&D but increased production (Velho 2004, Cimoli and Katz 2001). But not all takeovers have had the same outcomes. Two takeovers in the auto parts industry in Brazil are illustrative. When the domestic producer of shock absorbers, Cofap, was acquired by Magnetti Marelli (Italy) in the 1990s, the R&D team was maintained, mainly because of their high level of technological competence. Conversely, in the acquisition by Lucas Varity (United Kingdom) of Freios Varga, a brakes producer, the R&D was dismantled despite the competence that had been accumulated in the local firm. As an explanation for these diverse results, it has been proposed that brakes may require less local adaptation than shock absorbers (Costa 2005). Some companies – including Ford (United States), Volkswagen (Germany) and Alcatel (France) — have reversed previous decisions to close local R&D in order to boost their competitive position in the Brazilian market (Queiroz et al., 2003; Costa 2005). In China also there are concerns relating to the closure of R&D units in local firms that have entered into joint ventures with foreign firms.[21]

In Central and Eastern Europe, many companies were taken over by foreign TNCs as part of privatization programmes. An UNCTAD survey in 1999 covering 23 major privatized companies found that the average annual growth of R&D expenditure fell from 23% to 14% after privatization, and R&D intensity (R&D expenditure as a percentage of sales) diminished significantly (Kalotay and Hunya 2000).[22] It is possible that R&D expenditures were boosted before privatization to show better company performance before the sale, or that they were the continuation of previous non-market-oriented and overstaffed programmes (ibid., p. 55). In one prominent case, R&D activities were continued and expanded: GE's purchase of Tungsram in Hungary initially involved layoffs but later led to the company becoming GE's centre for lighting activities throughout the world, including R&D (ibid., p. 51).

The risks of R&D closure are likely to be smaller when FDI is undertaken to reap cost advantages from conducting R&D abroad or to access local technical skills and markets. Closures do not appear to have occurred to a high extent in R&D labs in developed countries such as the United Kingdom (Griffith et al. 2004). Similarly, a study of 35 companies privatized in eight European countries found that while R&D intensity decreased, R&D outputs (measured by the number and quality of patents) increased (Munari and Sobrero 2005). There have been several cases in the Canadian chemicals industry of TNCs reducing or closing local R&D after acquisition; Shell closed its R&D capacity in Oakville, and Diversey moved its R&D to Chicago (Rugman and D'Cruz 2003). However, there are also examples of R&D expansion: the Canadian affiliate of Uniroyal Chemical (United States) retained a key role in the parent company's global R&D, partly because of its high technical capacity.[23]

Unfair compensation for locally developed intellectual property. There may be concerns that local firms, universities or research institutes collaborating with TNCs on R&D do not receive fair compensation for intellectual property developed locally, either before or after partnering with TNCs. Due to unbalanced bargaining power, information asymmetry, market failures or institutional deficits, the contractual arrangements between TNCs and their local counterparts may not reflect a fair allocation of rights and responsibilities, to the disadvantage of local entities. This can lead either to unfair pricing of R&D inputs or to a biased allocation of ownership of the R&D outputs. Both issues are closely related to IPRs.

The ownership of intellectual property determines subsequent revenue flows in the form of patent fees or new product sales. On the one hand, host developing countries may fail to reap the long-term financial benefits of FDI in R&D when they do not have a fair share of ownership of, and related economic rents from, the resulting intellectual property. Lack of ownership of intellectual properties may also make a developing country dependent on TNCs for its technological progress. Moreover, a patent can be framed to cover intellectual property developed by local research partners even prior to collaboration with a TNC. This could be fair if the local partner has given its consent and is appropriately compensated. However, the legal implications of IPR protection may not be fully appreciated by firms and universities in developing countries. If unaccustomed to patenting they may find it difficult to strike an appropriate deal with their foreign R&D partners, particularly in host countries that lack an effective IPR system.[24] The main approach to address these concerns is to strengthen relevant domestic institutions (section VII.B) and the ability of domestic firms and R&D institutions to manage IPRs effectively.

Crowding out in the labour market and potential harm to basic research. When foreign affiliates enter a host location there may be concerns about local research entities finding it more difficult to attract or retain the best R&D staff, thus hampering their ability to innovate.[25] In China, for example, some observers have noticed a tendency for talented researchers to leave domestic companies and government labs to take up a career path in foreign affiliates' R&D units (Simon 2005, p. 12). Even if the NIS as a whole would benefit, it may represent an opportunity cost for individual local entities (research institutes, universities and enterprises). If the reallocation of human resources harms the manpower supply for basic research, the long-term efficiency of an NIS may also be negatively affected. Ultimately, what matters is the trade-off between the contributions of TNCs to the strengthening of the NIS on the one hand, and the loss of skilled personnel to local R&D, which may or may not lead to a stronger NIS as a whole. The evidence on this is scanty, and it is not easy to assess the net impact.

Possible negative impact of fragmentation of R&D by TNCs. TNCs increasingly divide their R&D activities into modules, allocating different tasks to different countries. Some may confine their R&D activities in developing host countries to low levels of skills or technology to protect valuable proprietary technology. This can deprive host countries of learning opportunities and reduce the spillover benefits. In Brazil, for example, there is concern that the fragmentation of R&D is leading to a downgrading of human capital in car production (Posthuma 2000). It has also been argued that fragmentation may bypass the development sequence and limit the extent of real roots within the local NIS, making the R&D activity rather footloose (Pearce 2004). On the other hand, fragmentation may enable more countries to participate in global R&D by TNCs. Moreover, economies of scale in research specialization could produce greater employment in research and attract R&D by other TNCs if the country develops a good reputation for efficient research.

Race to the bottom and unethical behaviour. As competition for FDI intensifies there is a risk that governments will compete in offering over-generous incentives to attract FDI. This could lead to losses in tax revenue or the lowering of regulatory standards (with associated damage to the environment or workers' welfare). One concern in this context is that TNCs tend to locate R&D in developing countries to take advantage of their relatively lax employment or social protection policies. In the pharmaceuticals industry, this could lead to the flouting of ethical or medical standards found in developed countries. TNCs may be tempted to conduct clinical trials on new drugs in developing countries where "the costs of conducting the trials are lower and human subjects can be recruited more easily."[26] The issue here may be one of poor regulatory frameworks in host countries or it may be chronic unemployment and poverty that make clinical subjects willing to take health risks that would be unacceptable in developed countries.[27]

Meanwhile, there has been progress in the international harmonization of standards for clinical trials. TNCs, which depend mainly on

Box VI.6. Clinical trials in India

Clinical trials – the approval process for new pharmaceutical products – are time-consuming, expensive and ethically difficult. They involve recruiting hundreds, often thousands, of people to volunteer for the testing of new medicines. India is an increasingly attractive destination for clinical research for pharmaceuticals groups looking for faster and more efficient ways to test drugs for western consumers.

India is well endowed with skilled R&D personnel. It also has a relative abundance of people with diseases that exist in developed countries (including up to 30 million people with heart disease, 25 million with type-II diabetes and 10 million with psychiatric disorders). This includes a large pool of what are called "treatment naive" patients who have not yet been exposed to other drugs on the market. In addition, Indian recruits are more likely to comply fully with the trial process, unlike in developed countries where a significant proportion of subjects drop out in order to seek second opinions.

It has been estimated that firms can reduce costs by 20-30% by moving these R&D activities to India. Savings come from hiring clinical researchers, nurses and IT staff at less than a third of wages in the West, in addition to differences in the costs associated with the patients. Reflecting this, it is estimated that the number of clinical research organizations based in India increased fourfold between 2001 and 2003. Indian firms, too, are participating in this new industrial activity.

One factor apparently underpinning the shift has been India's newly adopted guidelines on "good clinical practices", including the issue of "consent by the patients" in line with global norms. However, other commentators have questioned what "consent" can mean in a drug trial when patients are illiterate and might not adequately understand the experiment's true risks; by definition, the drugs being tested have unknown beneficial effects on the patient's illness or disease, and negative side effects are also unknown.

There are some factors holding back the development of clinical research in India, such as relatively slow approval processes. Another one is India's reverence for animals, which makes it difficult to use certain animals (like monkeys).

Source: "Evidence regarding R&D investments in innovative and non-innovative medicines", *Financial Times*, 14 October 2003; Love 2003, "Eastern rebirth of the life sciences", *Financial Times*, 10 June 2005.

developed-country markets for profits, increasingly have to carry out multi-centre and multi-ethnic clinical trials under the internationally agreed standards (box VI.6).

C. Implications for home countries

The home countries of TNCs also face benefits and costs when their firms expand R&D abroad. The benefits are that R&D abroad may lead to reverse technology transfers, lower costs and therefore increased R&D, leading to improved competitiveness of the TNCs (which can also benefit other firms in the home country). The costs are that R&D internationalization may lead to a "hollowing-out" of domestic innovation, lost research jobs and leakage of valuable proprietary technologies. The net outcome is difficult to predict. It depends on a range of factors: the motives for R&D internationalization, the degree to which the TNC is integrated in the NIS of home and host countries, and the levels of development of home and host countries.

1. Improved overall R&D efficiency

As R&D grows more complex, it tends to use a more diverse set of information, skills and knowledge. This set may not be available within a single firm, or even a technology leader, or within a single country. Where this is so, R&D internationalization may be necessary in order to conduct R&D efficiently by tapping a broader range of resources. The availability of research manpower or of a knowledge base abroad can accelerate new product development. Lower costs in developing countries can make R&D more economical. All these advantages to TNCs potentially feed into the technological performance of their home countries, and thus to their competitiveness and growth.

The efficiency gains for a TNC from tapping into the competitively priced pools of talent in Asia can be substantial. For example, a three-month, pre-clinical toxicology study on one compound might cost $850,000 in the United States but only $100,000 in India.[28] Similarly, the collaboration between PalmOne (United States) and HTC (Taiwan Province of China) on the Treo 650 smartphone helped reduce the development time of the product by several months while decreasing the number of defects by 50% (Engardio et al. 2005).

The internationalization of R&D can also allow home countries to retain and focus more on higher value added activities, offshoring less sophisticated or non-core innovative activities to developing countries (Reddy 2000). In the PalmOne case, resources in the United States were focused on software while the hardware development was shifted to HTC in Taiwan Province of China.[29]

2. Reverse technology transfer implications

An important potential benefit to the home country from R&D internationalization is reverse transfer of technology, whereby knowledge acquired by foreign affiliates through R&D (in-house, outsourced or collaborative) is channelled back to the home country. This knowledge helps both the TNC and the innovation system in which it operates. However, such reverse transfers are likely to be significant only if the host country is technologically advanced (Kogut and Chang 1991). Depending on the extent of diffusion at home, reverse transfers can improve the productivity of the TNC, its vertically related enterprises (suppliers and buyers), its competitors and the knowledge institutions with which it interacts.

TNCs from the Republic of Korea and Taiwan Province of China have long located R&D centres in the United States, Europe and Asia to gain access to new technologies (chapter V). Such technologies have been applied in the home country to develop new products and processes for global markets. More recently, companies from China and India have set up R&D units in the United States and Europe (chapter IV).

There are relatively few empirical studies of the extent to which productivity growth in home countries can be attributed to spillovers from overseas R&D, and most relate to developed countries. The evidence suggests that the extent of reverse technology transfers hinges on the purpose of the R&D. Studies of Japanese TNCs suggest that the scope for positive effects on the productivity of firms in the home country is large when foreign affiliates undertake "innovative" R&D that tap into advanced knowledge centres abroad (Todo and Shimizutani 2005). Adaptive R&D by foreign affiliates of Japanese TNCs, drawing on technology developed in Japan, served to improve productivity in the host country but did not contribute to enhanced productivity in the home country.[30]

TNCs from the United Kingdom that have R&D investment in the United States have benefited from reverse technology, and the effects were particularly important in the case of R&D units set up to source technology (Griffith et al. 2004). Meanwhile, foreign R&D by Swedish TNCs does not appear to have generated significant spillovers in the home country, either at the firm level or the industry level (Braconier et al. 2000, Fors 1997), possibly because much of this R&D is of the adaptive type drawing on technologies developed at home (Håkanson and Zander 1986, Håkanson 1992).

A cross-country study of 152,000 firms in 30 countries concluded that outward-FDI-induced R&D had a positive impact on the home country's level of domestic innovation as measured by patenting activity (AlAzzawi 2004). Such benefits were found in both developed countries and in the newly industrializing economies. However, productivity benefits were found for newly industrializing economies but not for developed countries, suggesting that overseas R&D may be particularly beneficial for less advanced home countries.

3. Market expansion implications

Whereas adaptive R&D does not seem to generate significant reverse knowledge transfers to the home economy, it may generate other positive effects such as promoting market expansion. Such R&D is typically performed to expand sales in a foreign market by adapting a TNC's products or processes to suit local preferences and requirements. With the expansion of markets abroad, demand for material, inputs and services procured in a home country for global operations is likely to increase.

In some cases products developed by local R&D cater exclusively to the local needs (Behrman and Fischer 1980, Bartlet and Ghoshal 1991), while in others an expanded product line as a result of local R&D may subsequently benefit sales in global markets as well (box VI.7). If local adaptive R&D evolves into innovative R&D because a host market becomes a test bed for product applications in the regional or global market, or because it reaches a certain size, the original adaptive R&D can open up opportunities for expansion in other countries as well (box VI.8).

4. Home country concerns

The expansion of R&D by TNCs in their foreign affiliates in the Triad, and, more recently, also in parts of the developing world, has given rise to some concerns even among the most advanced home countries. The fact that TNCs now consider a new set of locations as candidates for R&D activities has led some observers to call for government intervention to mitigate possible risks associated with this development. Concerns are related to the possible consequences of R&D abroad replacing domestic R&D, relating to a hollowing out of the home economy NIS and a loss of skills. A recent report from the American Electronics Association is illustrative:

> "As the United States takes its leadership for granted, countries around the world have caught on and are catching up. While we begin to close our doors to the best and the brightest minds, these talented individuals and the intellectual property and jobs they create here are lured elsewhere. As we cut funding for research and development (R&D) – a critical factor in the innovation that has driven our economy for a century – other countries are investing in R&D, scientific education, and high-technology infrastructure... Americans may be surprised if the next revolutionary technology is produced abroad, but we should not be" (American Electronics Association 2005, p. 5).

There may be cause for concern if TNCs reduce R&D at home due to perceived weaknesses in the home-country NIS. Given the rapid pace of technical change, such adjustments are often slower than the technological needs of firms, potentially resulting in "systemic inertia" (Narula and Zanfei 2004). Firms may then acquire the technology they need from foreign countries or invest in R&D abroad to draw on other countries' NISs (Narula 2002). The problem, however, lies not in TNCs seeking to retain their competitive position, but in the structural weaknesses of the domestic innovation system. The correct policy response would be to address structural weaknesses, not to prevent local firms from competing effectively.

It is easy to overstate the risks of R&D internationalization. Innovating firms rarely shut down their domestic R&D completely: this would

Box VI.7. Nestlé's R&D centre in Singapore

Nestlé (Switzerland) established an R&D centre in Singapore in 1979 as part of its global R&D network. Its main function was to develop Asian-style convenience foods that were specifically suited to the various cuisines, preparation techniques and eating habits within the Asia-Pacific region. The development of culturally sensitive products such as food and beverages requires local presence.

This R&D unit's main activities focused on creating new rice, cereal and noodle products for markets in Asia and the world; developing new flavours through fermentation and enzyme reactions; and bringing out new seasoning and cooking aids for the Asia-Pacific markets through traditional food ingredients, spices and herbs. It was able to draw upon scientific knowledge held within Nestlé's global R&D network as well as on the specific knowledge related to product development.

The R&D also contributed to the expansion of the knowledge base of Nestlé's global R&D network, relating to Asian cuisine and customer habits. For instance, when Nestlé's R&D unit in Sweden developed the frozen vegetable product "Taste of Asia", staff from Sweden went to Singapore to learn the cuisine. This product is now marketed all over Europe. Similarly, staff from the Singapore unit assisted in introducing Asian noodle production in Europe.

Source: Reddy 2000, pp. 138-143.

risk losing valuable technological links at home, presumably the original base for the firms' competitive advantages.

Weaknesses of the home country innovation system may arise from the shortage of good researchers, the rising cost of conducting R&D or the lack of a manufacturing base with which researchers can interact. In science-based industries in particular, R&D may require a critical mass of researchers in different disciplines (De Meyer and Mizushima 1989). If this critical mass is not available at home, TNCs have to locate R&D in countries that can offer a suitable pool of talent. Even if it is available, bottom-line considerations may lead them to do R&D abroad to lower costs or to interact with manufacturing facilities. As manufacturing is offshored, segments of innovative R&D have to move with it. These factors have been important in attracting chip design to East and South-East Asia, for example (chapter V).

A growing global supply of skilled people at lower costs is a strong incentive for TNCs to expand R&D abroad rather than at home. For some work categories this can lead to loss of research jobs at home as well as downward pressure on researchers' wages. At the same time, given the growing need for R&D to respond to increased competition in international markets and to keep up with new technologies, the

Box VI.8. Mobile telecommunications R&D by TNCs in China

Since the early 1990s, China's mobile telecommunications market has expanded rapidly to become the world's largest in terms of both network capacity and number of subscribers. Rapid infrastructure build-up has encouraged many telecom equipment makers to invest in local production in the country. These enterprises also engage in local R&D in China (box table VI.8.1), which has come to play an increasingly important role in new product development.

Box table VI.8.1. R&D by selected TNCs in mobile telecoms technology in China, 2004

Company	Number of R&D centres in China	Number of R&D employees in China
Motorola	15	1 300
Nokia	5	800
Ericsson	9	700
Siemens	4	..

Source: UNCTAD, based on Chinese newspaper accounts and information from companies.

Initially the main function of these R&D centres was to adapt technology developed by the parent company to the specific market requirements in China. However, since mobile telecommunications products are highly standardized and the size and sophistication of the Chinese market has been rapidly increasing, local adaptive R&D has evolved into global innovative R&D. For example, in the case of mobile handsets, the Nokia 3610 model, introduced to the Asia-Pacific market in 2002, was the first product developed entirely by the Nokia Product Development Centre in Beijing. Now every tenth mobile handset sold globally by Nokia has been designed in Beijing.[a] Examples of globally oriented R&D centres in China include Nokia China R&D Centre (1998), the Motorola China Research Institute (1999), Nortel China R&D Centre (2001), Ericsson China Central R&D Institute (2002) and Sony Ericsson's global R&D centre in Beijing (2004).

Many of the R&D centres have capabilities in the area of 3G technologies and now develop products for both the Chinese and global markets. Nine cities in China host 3G-related R&D centres owned by foreign TNCs or domestic companies (Huawei and ZTE), with emphasis on different global standards recognized by the International Telecommunication Union.[b] Although the Chinese Government has not granted 3G licences to telecom operators, 3G equipment developed and manufactured locally by both foreign TNCs and domestic firms has begun to supply the global market. In this way the R&D activities in China have helped the firms concerned expand their business in other locations as well, which in turn has had positive effects on their respective home countries.

Source: UNCTAD.

[a] "Ten percent of Nokia handsets are designed by its Beijing centre, which is developing products for market five years later", *West China Metropolitan News*, 17 September 2004.

[b] "3G R&D distributed in nine cities", *Southern Metropolitan News*, 16 November 2004.

increased internationalization of R&D may be paralleled by an increased demand for R&D skills in the home countries as well.

Even if it is the less sophisticated or non-core R&D activities that are offshored to developing countries, some researchers at home would have to be redeployed and some, at lower levels, might become redundant.[31] A long-term worry is that this might lead to “the disruption of the apprenticeship path”.[32] New entrants to R&D will need more advanced skills to keep ahead of competition from other countries. This process would entail adjustment costs and institutional changes to match education and training to needs for new skills.

The risk of technology leakage is another concern. If R&D abroad results in the successful imitation of TNCs’ technologies as well as of other technologies developed in the home country by foreign competitors, home countries may be worried that it may reduce the demand for their products in the short term. In the longer term, a home country may fear losing control over some key technologies, with an erosion of its strategic position in the global markets (OECD and Belgian Science Policy 2005).

It is important, however, to keep current developments in perspective. The volume of R&D that developing countries now attract is small from a global perception. While there are segments in which developing countries offer attractive conditions for R&D, this does not mean that they have developed technological capabilities to match those in developed countries (Reddy 2000). Although a larger share of high value-added, knowledge-intensive activities is becoming subject to globalization, there is a long way to go before it can be considered a serious competitive threat. It does however sharpen the need for countries at all levels of development to ensure that their innovation systems have the skills needed to stay abreast of the technology race.

D. Conclusions

The internationalization of R&D by TNCs opens up new opportunities for developing countries with strong skills and a technological base to enhance the development of their innovative capabilities. It has important implications for developed countries as well as for the world economy as a whole. It is still too early to assess the full impact of these developments, but some implications are clear.

FDI in R&D can bring several benefits to host countries. While the empirical evidence is limited, what exists suggests that such benefits – strengthening the NIS, promoting human resource development, creating knowledge spillovers, upgrading industrial competitiveness – can be very important for developing countries.

Host countries attract innovative R&D by TNCs particularly in areas in which they have established a competitive advantage. In Italy, TNCs are more likely to undertake innovative R&D in medium-tech or low-tech industries. In India, strong domestic capabilities in the pharmaceuticals industry are now attracting TNC R&D in drug development. In China, similarly, the telecom equipment industry hosts some of the most innovative domestic firms as well as significant R&D by TNCs.

At the same time, these benefits do not appear automatically. The most important factor for realizing them is the *absorptive capacity* of the host country. Technological capabilities in the domestic enterprise sector and technology institutions are necessary not only to attract R&D but also to benefit from its spillovers. There may be tensions between TNCs and host governments in that the former may seek to retain their proprietary knowledge while the latter seek to promote as many spillovers as possible.

Although the benefits to developing countries from R&D internationalization are likely to outweigh the costs, the process can give rise to unwanted effects. Concerns may relate, for example, to the risk of foreign affiliates attracting the best scientists and engineers from basic research, or to unfair compensation of local counterparts who collaborate with TNCs in R&D. These and other risks should be borne in mind by governments when designing and implementing policies.

The nature of benefits to a host country depends on the type of R&D conducted, and on whether the R&D is linked to production. Generalizations are difficult, but a host country is likely to benefit more when the results of R&D are used in the host country and when the R&D involves intense interaction between the TNC and local firms and institutions. R&D-related technology sourcing may give rise to some concern among developed host countries of technology leakage. In developing host countries the main potential costs are related to the risk of crowding out in the labour market, the closure of R&D units after acquisition, and insufficient compensation for contributions to innovation when collaborating with TNCs.

The implications for home countries also depend on the type of R&D. It appears that technology sourcing and innovative R&D can generate significant knowledge spillovers to the home economy, especially in developing countries. The establishment of an R&D presence in leading technological centres abroad offers a potentially important way to link up with TNC R&D systems. Adaptive R&D abroad aimed at supporting sales in foreign markets is also likely to benefit home countries by improving the competitiveness of their TNCs and increasing indirect exports.

At the same time the expansion of R&D to developing countries, motivated by weaknesses in the NIS of home countries or by lower R&D costs has given rise to concern in home countries, especially with regard to the risk of hollowing out and loss of jobs. Such offshoring is so new that its assessment has to be tentative. Protectionist measures to limit the offshoring of R&D by TNCs are unlikely to be effective in addressing the root causes. In fact, restricting the ability of firms to raise their R&D efficiency will have negative impacts on their competitiveness.

Instead, it will become more important to explore new ways of collaborating with the new R&D locations, such as through joint research programmes and outsourcing as well as through inward and outward R&D-related FDI. As developing countries increase their number of university graduates, the historical near-monopoly of developed countries on scientists and engineers and other highly educated workers is diminishing. Moreover, to the extent that a larger proportion of researchers and scientists from developing countries decide to stay in their own countries instead of migrating to Europe or the United States, the latter economies may have to rely more on developing their own domestic base of human resources.

This makes it increasingly important for developed countries to consider ways of making their NISs more competitive, for example, by removing bottlenecks and addressing "systemic inertia", and by identifying niches where they are particularly strong. Similar to the case of offshoring of services in the broadest sense (*WIR04*), R&D internationalization may require appropriate policy responses to assist those workers who are directly affected. Adjustment to any change in employment patterns calls for greater labour mobility and changes in the skills profile. In general, countries now face greater pressure to make the necessary adjustments in their institutional framework to enable their workers as well as their firms to move up the technology and skills ladder – also in the area of R&D.

For the world economy as a whole, the internationalization of R&D should help speed up the innovation process. By bringing more national systems of innovation closer together it should also facilitate more cross-border flows of knowledge and technology.

In the short to medium term, however, most developing countries are not in a position to benefit from R&D internationalization. Many lack the skills and institutions to attract foreign R&D. Given the growing importance of technological and innovative capabilities for competitiveness, this may be a cause for concern. Countries that do not connect with these networks risk falling further behind in terms of technological and innovative capabilities. There is no “quick fix” to this problem, but there are vital long-term policy issues that need to be addressed now. The next chapter deals with some of these.

Notes

1. For example, information may be exchanged between foreign affiliates and TNC headquarters in the form of tacit knowledge or understandings that are not described in a patent. Patent data may underestimate the true degree of technology and knowledge transfer that has been possible. Similarly, patenting is a relatively new activity in many developing countries. Some countries may have been innovative but may not have seen the importance of patenting their ideas.
2. For a discussion on the potential impacts of different types of R&D by foreign affiliates on a host-country NIS, see Pearce 2004.
3. See “A new transnational capitalist class? Capital flows, business networks and entrepreneurs in the Indian software industry”, *Economic and Political Weekly*, 27 November 2004.
4. TNCs tend to internalize their most valuable technologies rather than sell them to unrelated parties (*WIR99*).
5. Source: various news articles.
6. This centre has filed 240 patents in the United States and has already been granted 25 (see “Eastern rebirth

of the life sciences", *Financial Times*, 10 June 2005).

7 Tacit knowledge may include cognitive capacity, experience and skills, or knowledge of routine, organizational structure, practices and norms.

8 See, for example, "Research labs power China's next boom", *International Herald Tribune*, 13 September 2004.

9 See "From the third type of fortune to the birth of tycoons", *New Fortune*, 28 April 2005 (in Chinese), "Dexin lands successfully in NASDAQ, raising $142 million", www.tom.com, 7 May 2005 (in Chinese).

10 When a firm that is applying for a patent cites patents previously taken out by other firms, it indicates that there has been a path of learning and knowledge, from the first firm to those that followed its R&D trail.

11 Foreign affiliates made up the majority of the 445 firms in the sample.

12 Foreign affiliates account for 47% of business R&D in the Czech Republic (chapter IV).

13 This result was sustained even after controlling for other explanatory factors relating to firms' industry sector and location.

14 This accords with the upgrading process of enterprises in some East Asian economies that have made the transition from original equipment assembly (OEA) to original equipment manufacture (OEM), to own design manufacture (ODM) and own brand manufacture (OBM).

15 The impact of the innovative R&D on domestic innovative capability and possible spillover effects may, however, be at least as important as for adaptive R&D.

16 Developing countries may even experience "immiserizing growth" if they become locked into stagnant incomes as producers face intense competition and are engaged in a "race to the bottom" (Hubert 1995, Kaplinsky and Readman 2000, UNCTAD 2002a).

17 By early 2003 the Pudong New District had attracted 66 FDI projects in microelectronics with investments totalling $8 billion. See "Shanghai Pudong New District tries to establish a world-class industrial base in microelectronics", *China News Agency*, 15 March 2003.

18 Shanghai Economic Commission "Shanghai's IC industry is leading the country", 2 February 2005.

19 "Happiness and worries coexist in Pudong's microelectronics industry", *Shanghai Securities News Capital Weekly*, 12 December 2003 (www.stocknews.com.cn).

20 About 70% of all acquisitions are based on a market-driven rationale (Kutschker 1989, p. 12, Granstrand et al. 1993, p. 416, Håkanson and Nobel 1993b, p. 402).

21 "Technology transfer from TNCs to China: new trends and policy measures", article posted on the website of MOFCOM 17 January 2005 (www.chinafdi.org.cn).

22 The companies were located in Croatia, the Czech Republic, Hungary, Latvia, Poland and Slovenia.

23 In part this is attributed to the Canadian Government's support of its research activities from 1962 to 1983 (Rugman and D'Cruz 2003, p. 146.)

24 The experience of joint research with TNCs in the aerospace industry in the Russian Federation, for example, suggests that local experience with the patenting and marketing of innovative outputs, as well as the legal and regulatory environment, are both critical in this regard (Ivanova 2004).

25 While an element of crowding out may also apply to infrastructure, such physical capital can be expanded more easily than human resources (Pearce 2004).

26 "Yet another sector embraces outsourcing to Asia: life sciences", *International Herald Tribune*, 25 February 2005.

27 However, TNCs might be restrained from doing this because if the drugs being tested are for consumption in developed countries, clinical trials need to be carried out on patients that have similar health and nutritional standards as those of the developed countries.

28 "Innovative Asia: how spending on research and development is opening the way to a new sphere of influence", *Financial Times*, 9 June 2005.

29 PalmOne's designers provided the product specifications, chose the key components and set the performance needs of the product. HTC carried out much of the mechanical and electrical design (Engardio et al. 2005).

30 A study of Japanese TNCs' R&D activities in the United States reached similar findings. A positive impact on the parent company's R&D productivity in terms of patents was noted for "research activities" by the foreign affiliates, but no such effect was observed in the case of "development-oriented R&D" (Iwasa and Odagiri 2004).

31 Such concerns have been voiced, for example, in the area of software development (e.g. British Computer Society 2004).

32 "Innovative India", *The Economist*, 3 April 2004.

CHAPTER VII

THE ROLE OF NATIONAL POLICIES

A. Coherent policies and institutions make a difference

The new trend towards the internationalization of R&D outside the Triad implies new opportunities for developing countries to connect with the R&D networks of TNCs. However, to date most developing countries remain excluded from these networks. Thus the technological and innovative capability gap between this latter group of countries and other economies continues to widen. The challenge is to narrow this gap.

The experience of those developing countries that have tapped into the TNC knowledge networks shows that policies and institutions are very important in TNCs' decisions on where to locate their R&D. Investment in R&D is attracted more to "created assets" than "inherited endowments", which means that it is possible for governments to influence the outcome of this decision-making process. This chapter discusses how host countries can enhance their ability to benefit from R&D internationalization by TNCs. Chapter VIII considers the international framework for rule-making in this area.

The development of innovative capabilities lies at the heart of economic growth and development (chapter III). While the precise interrelationship between technology and economic growth is open to debate, few, if any, countries have succeeded in achieving and sustaining high growth levels without investing in and exploiting technology. The promotion of innovation, with R&D being an integral part of innovative activity, is consequently becoming a policy priority in countries at all levels of development.

The globalization process makes this even more important. A freer flow of goods, services, capital and labour adds competitive pressure on firms — be they large or small, local or transnational. Innovation is essential if firms are to use new technologies efficiently and stay competitive in such an environment.

The ability of companies to innovate is intrinsically linked to the environment in which they operate. A useful framework for assessing the role of policies in facilitating innovation is the national innovation system (NIS) (chapter VI). An understanding of the NIS helps policymakers identify ways to enhance innovative performance and assist in pinpointing mismatches within the system, both among institutions and in relation to government policies (OECD 1997b). Proper institutions – interpreted broadly to cover organizations and the rules and incentive structures governing innovation — are crucial to the effective functioning of an NIS (North 1990, Metcalfe 1995, Edquist 1997).

Key policy objectives include providing an institutional setting that encourages and rewards innovation and strengthens innovative capabilities in domestic enterprises and technology institutions. The ability to make commercial use of results generated by R&D — by firms, universities or government agencies — depends on factors that can be influenced by government action, such as the skills of the work force, incentives for entrepreneurship and risk-taking, the quality of public institutions, access to venture capital, trade and competition policies and governance structures (Andersson 2005). In addition, governments can take measures to foster interaction among the various actors in the NIS.

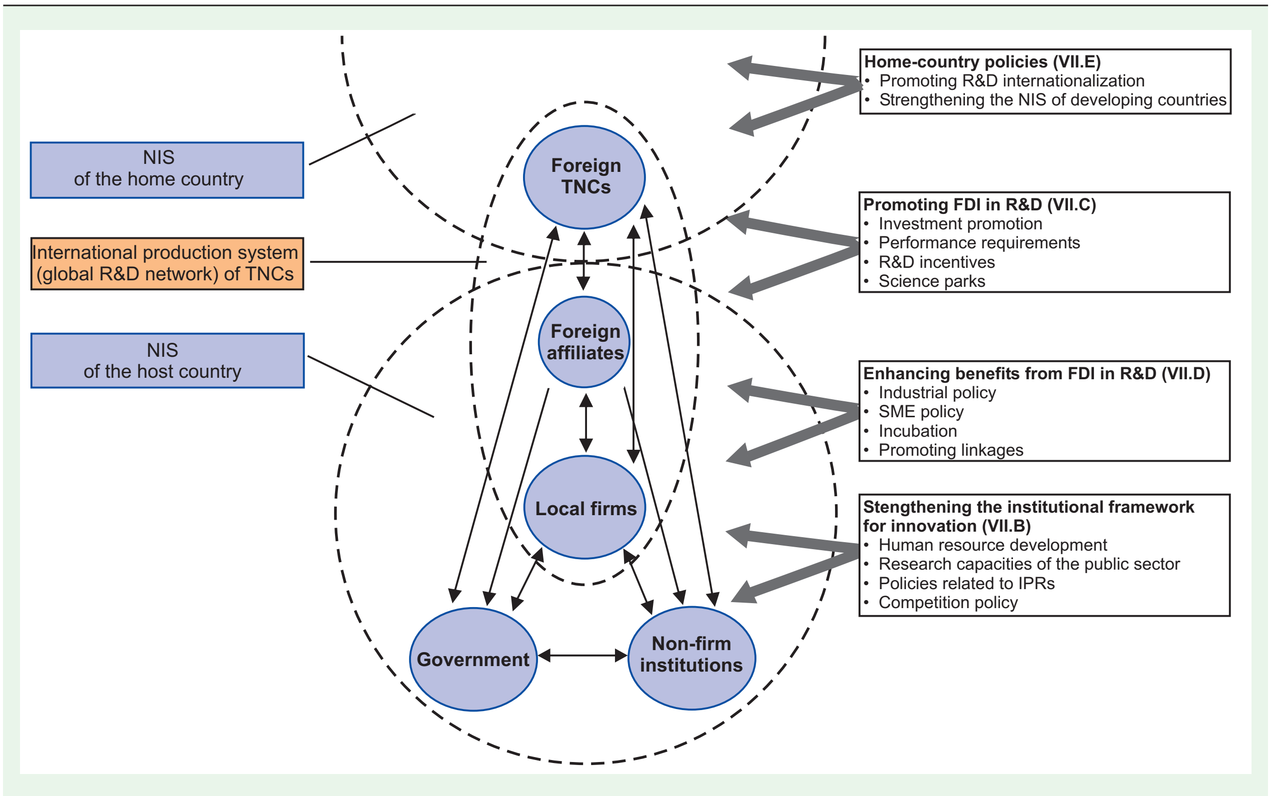
As depicted in figure VII.1, various policy and institutional areas need to be addressed to maximize the benefits that can be obtained from

R&D internationalization. The starting point is to build an institutional framework that fosters innovation. Particular policy attention is needed in four areas: the availability, cost and quality of human resources; the role of public research; intellectual property rights (IPRs); and competition policy. Efforts in these areas need to reflect the comparative advantage and technological specialization of each country as well as the development trajectory along which a country plans to move. FDI policy is also vital to promote desired forms and impacts from FDI. Selective policies in this area include targeted investment promotion, performance requirements and incentives, and science and technology parks. Finally, governments need to pay attention to boosting the capabilities of the domestic enterprise sector, notably through industry-specific policies and those relating to small and medium-sized enterprises (SMEs). It is of course also important to ensure political and macro-economic stability and the proper functioning of financial markets, but these aspects are beyond the scope of this analysis.

While the long-term goals are similar, countries at different levels of development and with different industrial structures have different policy priorities. Throughout, this analysis seeks to draw lessons from countries — notably in East and South-East Asia — that have successfully managed to develop their innovation capabilities, sometimes, but by no means always, involving TNCs in the process.

The chapter is structured as follows. Section B considers key policy areas that need to be addressed to strengthen the institutional framework for fostering innovation with the involvement of TNCs, taking into account the different comparative advantages and development strategies of countries. Section C addresses the role of FDI policies, and section D discusses industry-specific policies and SME policies for enhancing the benefits of R&D internationalization by TNCs. Section E considers the role of home countries in enhancing the ability of host countries to benefit from the internationalization of R&D by TNCs**.** Section F concludes.

Figure VII.1. National innovation systems and FDI in R&D: the policy dimension



Source: UNCTAD, adapted from Liang 2004, p. 171.

B. Strengthening the institutional framework for innovation

The policy agenda for promoting benefits from R&D internationalization is wide. This section discusses four areas that are critical for strengthening the institutional framework and the functioning of the NIS: human resources, public R&D, the protection of IPRs and competition policy.

1. Fostering human resources

The critical importance of human resources for development is widely accepted. For example, a common denominator of the economic success of the various economies of East Asia is a strong emphasis on human capital at all levels (e.g. World Bank 1993). This applies directly to policies concerning R&D internationalization. Company surveys show that access to skills is an overriding concern for most TNCs in deciding where to locate their R&D. As noted above (chapter V), the expansion of R&D in developing countries – although still limited – is heavily influenced by the availability of knowledge workers. The improved supply of highly skilled people is occurring as a result of deliberate and long-term policies to raise educational standards, particularly at the tertiary level, as well as from efforts to attract human resources from abroad. While education is important at all levels – from primary to tertiary – the discussion below focuses on higher education.

a. Development of skilled human resources

Not all innovation requires people with a university education. Many important inventions have been produced by people with limited formal education. However, for R&D in large private organizations such as TNCs, which seek a stream of incremental improvements in addition to new inventions, there is a clear need for technical and scientific skills developed through higher education (Baumol 2004). Moreover, the growing science base of many new industrial technologies makes it more difficult for the "gifted amateur" to innovate. To the extent that countries aspire to attract TNCs' R&D, the development of relevant domestic skills and capabilities is thus crucial. For countries that are currently in a weak position to attract such R&D, skills development is even more relevant to boost domestic capabilities.

In the past decade or so a few countries in developing Asia, but also some other economies, have emerged as large sources of workers with tertiary education, and this trend is set to continue (chapter V). This is particularly visible in technical skills like science, engineering, mathematics and computing. China, India and the Russian Federation together accounted for almost a third of all tertiary-level technical students in the world in 2000/01.

While the number of qualified engineers and scientists clearly plays an important role in attracting R&D by TNCs, their quality and specialization also matter. The skills required for applied research in pharmaceuticals and biotechnology are, for example, different from those required in automotive design. Similarly, the needs differ between different stages of economic development. Policy-makers have to ensure that the education system delivers the kind of skills that are the most in demand. Thus, efforts in the education area need to be closely coordinated with policies in other fields. For example, the development of technical capabilities in the enterprise sector is important to create local demand for university graduates. Without such demand, there is an increasing risk of people with higher education migrating to other countries in search of job opportunities.[1] In this context, foreign affiliates can help by providing new job opportunities (chapter VI).

One way to address this challenge is to use the State as a "skills coordinator" (Green et al. 1999). To accelerate skills formation in relevant areas, governments need an informed view of the skills that are in demand. Asia offers significant lessons. In Singapore, for example, the Ministry of Trade and Industry, the Economic Development Board and the Council for Professional and Technical Education work closely together to monitor future skills needs, drawing on inputs from foreign and local investors as well as from education and training institutions. This information is matched against national policy objectives and used to build targets for various components of universities, polytechnics, schools and the Institute for Technical Education (Green et al. 1999, p. 88).

In Latin America, the private sector has expressed concern that the skills generated by universities do not match its needs (Freeman

1995, de Ferranti et al. 2003, p. 228). Two out of three LAC researchers work in the public sector, mostly in universities, and only one in ten are employed in the business sector. Except for Costa Rica — where around 25% of researchers are working in the business sector — that figure does not exceed 12% in any LAC country. In terms of R&D spending, development work (as opposed to basic or applied research) accounts for less than 30% in LAC as compared with more than 60% in countries like the Republic of Korea or the United States (Velho 2004, p. 17). Thus there appears to be a misalignment between the policies taken to promote skills and the demand from the private sector, partly reflecting the current industrial specialization towards natural resources and assembly operations based on low labour costs:

> "Latin American and Caribbean production patterns on the one hand induce private sector and enterprises to express a meagre demand for knowledge and on the other hand lead domestic agents to mostly seek outward oriented linkages and coordination, basically privileging foreign companies and research laboratories that already have sound reputation and worldwide widely recognized experience in effective and efficient science and technology efforts. Thus a mismatch ensues between demand side needs and supply side offering, hampering policies' impact " (Cimoli et al. 2004, p. 11).

Education policies also need to evolve over time as the demands from industry change and countries develop. The case of the Republic of Korea is illustrative. In the 1960s, a system of technical training was set up as part of broader efforts to improve the infrastructure for science and technology. In the 1970s, the Government placed emphasis on technical and engineering education in the fields of heavy and chemical industries. In the 1980s focus shifted towards the technology-intensive industries and greater efforts were made to bring back Korean scientists working overseas. Since 1990 more attention has been given to promoting creativity, with the setting up of the Creative Research Initiative in 1997 to encourage a move from "imitation" to "innovation". More recently, special incentives have been offered for universities to become less teaching-oriented and more research-oriented.

It is important not just to educate people but also to ensure that their skills are updated continuously. This is especially true when there is a mismatch between the supply and demand of specialized skills. Policies involving all stakeholders can help mitigate such problems if all relevant actors recognize and accept the need for actual implementation of specific policy changes (Vertzberger 2005, pp. 24-25). Policy intervention may be needed to re-skill and re-train production workers, technicians and engineers, expand the numbers of graduates with skills in special demand in industry,[2] emphasize the training of experienced managers, encourage entrepreneurs to upgrade their strategic capabilities and align incentives for universities to interact with the private sector (e.g. through internships and sabbaticals).

Countries can involve foreign affiliates in this process, for example by encouraging them to participate in joint projects with universities and other training institutions. This can be done at different levels of education and training. Costa Rica, for example, attracted a major semiconductor investment from Intel in 1996. Close links between Intel and the Instituto Tecnológico de Costa Rica helped secure financial support from Intel to develop new programmes and increase enrolments of engineering students (Mytelka and Barclay 2004). The auto parts maker Delphi collaborates with the privately-run Tec de Monterrey in Mexico to ensure adequate skills for its development work in Ciudad Juarez.[3] In India, Motorola works with the Pune Institute of Advanced Technologies to offer a postgraduate degree in advanced telecommunications engineering with a software focus (Reddy 2000). In Singapore, the efforts of the Economic Development Board to involve TNCs and foreign governments in training programmes helped ensure that they were relevant and up to date (box VII.1). Without these efforts the Board's investment promotion activities and subsequent upgrading into more advanced activities would have been crippled (Low et al. 1993, chapter 7).[4]

b. Importing human resources

Few countries can create all the skills they need; they therefore make use of a number of expatriate skills. In the OECD as a whole, some 1.9 million students are enrolled in tertiary education outside their country of origin (OECD

Box VII.1. Engaging foreign affiliates in training: the Singapore case

In 1970 Singapore faced a serious and unexpected shortage of welders due to the rapid expansion of its ship-repair industry.[a] The Government addressed this problem partly by expanding specially designed courses for the training of welders, and also by launching policies to anticipate future needs for industrial skills (Low et al. 1993). A number of joint industrial training programmes by the Economic Development Board (EDB) and leading TNCs were established: the Tata-Government Training Centre (in 1972), the Rollei-Government Training Centre (1973)[b] and the Philips-Government Training Centre (1975).

The training programmes, with annual intakes of up to 100 people, were designed by the TNCs involved, which also managed the operations through seconded directors and experts. All the programmes required in-plant training in the TNC factories after completion of two years of in-centre training. Vocational institutes subsequently adopted many of the courses and curricula. The EDB offered incentives (e.g. land and buildings and cost sharing) to induce TNCs to participate. It also launched a scheme that required trainees to work in the TNC for a number of years after the training, thereby assuring the TNCs a secure supply of skilled craftsmen. While these institutes did not engage directly in innovation or R&D, they contributed to the development of innovative capabilities in Singapore.

The model of joint training institutions was subsequently refined, involving not only TNCs but also foreign governments or government agencies. Between 1979 and 1982 the Japan-Singapore Technical Institute, the German-Singapore Institute and the French-Singapore Institute were started. In the mid-1980s a "transnational" approach was adopted, in which resources and expertise were sourced from more than one country.[c] The contributions of the TNCs took various forms (Low et al. 1993):

- Transfer of technology and know-how through secondment of experts;
- Training of EDB instructors and technical staff at the participating firms' overseas locations;
- Assistance in curriculum and programme development;
- Donation and/or loan of equipment by the participating firms;
- Commitment by the participating firms to upgrade equipment and software; and
- Commitment to participate for a minimum duration of three years, subject to review and extension.

Source: UNCTAD.

[a] The shortage was a consequence of the closure of the Suez Canal, and the rapid growth of offshore oil exploration in South-East Asia. The demand for welders was further fuelled by the construction of new oil refineries and the expansion of existing refineries.

[b] In 1982 this became the Brown Boveri-Government Training Centre following the failure of Rollei Werke.

[c] For example, the German-Singapore Institute attracted the participation of several TNCs from the United States (e.g. Hewlett-Packard), Europe (e.g. Siemens, Bull, Asea, Zeiss) and Japan (e.g. Seiko, Matsushita). The Brown Boveri-Government Training Centre was transformed into the Precision Engineering Institute in 1988, which oversees a number of laboratories and manufacturing units (such as the Siemens-Nixdorf-EDB Centre for Advanced Tool and Die Making and the Japan-EDB Computer Numerical Control Laboratory).

2004c, chart 3.6). The United States has been the main recipient of global knowledge migration in recent decades. At the end of the 1990s over 50% of the post-doctoral students at MIT and Stanford were foreign citizens and more than 30% of computer professionals in Silicon Valley had been born abroad.[5] In Europe the growing importance of the knowledge society and an aging population has made the attraction and retention of talent a key priority within the Lisbon agenda (European Commission 2004, p. 20). Also at the national level, many European countries have taken steps to attract foreign skills. For example, the Government of France in 2004 launched a programme to attract the world's leading experts to growth sectors and to build teams around them (*WIR04*, p. 87); Belgium, Denmark, Finland, France, the Netherlands and Sweden have introduced special tax rules for foreign experts; and Germany and the United Kingdom have established special programmes to facilitate easier migration of foreign experts.[6]

Several developing countries are also seeking to attract foreign expertise. Singapore has a liberal immigration policy to attract highly skilled people to private firms and public research institutes. By 2003, almost a third of doctorate level research and engineering scientists in the tertiary and public research institutions in Singapore were non-citizens.[7] Such migration contributed to Singapore having the 7th highest ratio of researchers per million inhabitants in the world, just below that of the United States and ahead of countries such as France, Germany and the United Kingdom. Singapore is spending almost $2 billion to recruit leading foreign scientists to develop research in the areas of biotechnology, genomics and nanotechnology.[8]

Many cities in China are actively seeking to attract highly skilled people in the large diaspora. For example, Shanghai is one of the most R&D-intensive areas of China. In 2002 the Shanghai government announced a series of measures, such as a preferential residential policy and a number of financial incentives, to attract university graduates from elsewhere (Chen 2004, pp. 29-30). The Republic of Korea has not relied much on skills immigration although various efforts have been made to increase the return of Korean scientists working abroad (box VII.2).[9]

Box VII.2. Policies in the Republic of Korea to attract back scientists in the diaspora

In the 1960s the Republic of Korea initiated a project to recruit Korean scientists working abroad to meet the demand for human resources in science and technology. These efforts began with the establishment of the Korea Institute of Science and Technology in 1966, and in 1968 a specific project was launched to attract back qualified scientists in the diaspora. As inducement measures they were offered modern laboratories, competitive salaries and autonomy in their research. From 1968 to 1979, 238 scientists returned to stay permanently in the country and another 255 scientists returned temporarily. These people played an important role in the 1970s and 1980s and contributed to cultivating new human resources in R&D. In 1994 the work to attract qualified Korean scientists from abroad was absorbed into a new “Invitation Program for Foreign Scientists & Engineers”.

Source: UNCTAD, based on Cho 2002.

What are the implications of the increased mobility of highly skilled workers for the strength of the NIS of a country? On the one hand, it may accentuate the brain drain from some developing economies, aggravating an already limited supply of skilled human resources. Up to a third of R&D professionals from developing countries reside in the OECD area.[10] On the other hand the diaspora is a potential source of skills, entrepreneurship, knowledge and capital for the home countries. Bangalore in India has some 35,000 “returned non-resident Indians”, many with training and work experience in the United States.[11] While some of these returnees join foreign affiliates, others have set up new technology-intensive businesses in India (see also chapter VI). To the extent that countries can create conditions that are conducive to such return flows of human resources, the original brain drain can be turned into brain circulation with positive implications for the NIS.

2. The role of research capabilities in the public sector

The public sector assumes an important role in every NIS, but notably in the area of basic research. In many developing countries, public universities and research institutes even account for the bulk of R&D (chapter III), but such efforts are too often de-linked from the enterprise sector. For public R&D to provide spillovers and help kick-start innovation by enterprises it is essential that enterprise R&D links with public R&D efforts, and that the public research institutes promote the spin-off of new companies.

Public research institutes can perform three important functions within the NIS (Patel and Pavitt 1994): undertake basic research and engineering/development work and produce new knowledge, some of which may be patentable; provide technical services (e.g. testing, consultancy) for firms as part of the infrastructure for metrology, standards, testing and quality (MSTQ); and provide training to researchers. As countries develop, the nature of the work undertaken in public research institutes tends to become more sophisticated. In the most developed countries, universities and other public research institutes assume key roles especially in the area of basic research. In general, public R&D funding has played a more important role in East Asia than in developed countries in helping to develop innovative capabilities in key technological industries (Hu and Mathews 2003). The Industrial Technology Research Institute in Taiwan Province of China is a good illustration of the role that public research institutes can play (box VII.3).

However, linkages between universities, public research institutes and enterprise R&D are often weak (e.g. Ernst and Mowery 2004). This is a common situation in African countries. A study covering four African countries found hardly any interaction between universities and the private sector (Lall and Pietrobelli 2002). Moreover, the establishment of specialized R&D institutes in Africa with the aim of supporting firms in agriculture or manufacturing has produced meagre results (Adeboye 1997, Oyelaran-Oyeyinka 2004a). Public R&D activities tend to be insufficiently oriented towards serving the needs of private-sector clients, and industrial stakeholders are often unaware of the new technologies developed (Lewanika 2005). This failure has been explained by the lack of an institutional base for innovation, a shortage of appropriate human capital, and the inability to tailor the activities of the institutes to the local context (Oyelaran-Oyeyinka 2004a).

In LAC, many public research institutes have been in existence for many decades, mainly dealing with natural resources and health (Velho 2004). There are also many industrial technology institutes and some R&D institutes that focus specifically on oil, telecoms, electricity and space. However, in many instances their work has not benefited the private sector directly. While the performance of the institutes varies, a common problem is that their researchers have limited knowledge and understanding of the specific needs of the private sector. To some extent this reflects the weak incentives provided to their researchers to interact with the private sector (de Ferranti et al. 2003, p. 224; Cimoli et al. 2004). After the economic crisis in the 1980s, however, public research institutes in many LAC countries were required to increase their sourcing of funds from the private sector. As a consequence, where stronger links with the private sector emerged, institutes also began to conduct R&D that was more relevant to industry (Velho 2004).

It is possible to increase the relevance of public research institutes to the private sector. India has a network of 38 laboratories and 45 field/extension centres under the Council of Scientific and Industrial Research (CSIR), employing over 4,600 active scientists. In order to revamp a system that had till then produced little that was of technological benefit to industry, the Government in the late 1980s launched a major reform programme.[12] It decided to limit the level of public financing of the laboratories, and set a target for CSIR to earn 40% of its expenditures by selling research and other services to industry. The new annual budget of each laboratory was determined by its revenues earning capability. As a result, the institutes'

Box VII.3. Spurring innovation in Taiwan Province of China

A well-known public research institute that has had a strong impact on innovation capabilities is the Industrial Technology Research Institute (ITRI) in Taiwan Province of China. Established in 1973 as a non-profit R&D organization, ITRI was instrumental in establishing the integrated circuit industry in Taiwan Province of China in the 1970s by licensing fabrication technology from RCA and transferring it to local companies. Its subsidiary, the Electronics Research and Service Organisation, was also instrumental in 1984 in helping Acer develop what became the first 16-bit IBM-compatible personal computer from Taiwan Province of China (Amsden and Chu 2003).

According to ITRI's president in an interview in 1996, ITRI's unique role was to train professionals and then spin them off and encourage them to go into industry. Almost 10,000 people have been trained at ITRI over the past 20 years of which 73% joined industry. ITRI was able to replace them by recruiting new graduates from universities and expatriates from the United States. Personnel trained by ITRI made up the backbone of the R&D and engineering workforce in the Taiwanese IT industry on an ongoing basis, together with the overseas Chinese returning to Taiwan Province of China with technical and managerial experience from companies and universities in the United States (Kim and Tunzelmann 1998).

Source: UNCTAD.

earnings almost tripled between 1992 and 1997 to reach 2.1 billion rupees in 1996/97.[13] By 2005, CSIR accounted for around 25% of all patents filed in India by Indians and a significant share of all patents assigned by the USPTO to Indian institutions (chapter IV).[14]

Thus, while the building of innovative skills in the public sector initially may be costly, it can provide vital resources for technological development if enterprise R&D grows and establishes close links with public R&D. Institutes that have strong ties with the domestic private sector may also become partners with foreign affiliates. Foreign affiliates can interact with the institutes in three main ways: by subcontracting services to them; by undertaking joint research projects or programmes; and by employing skilled people from the institutes. Government-supported research institutes in the Republic of Korea play an important role in this regard, a role that has evolved over time (box VII.4). In light of the internationalization of R&D, there is a growing need to explore various international dimensions of university-industry linkages. Specifically, further analysis is warranted of the role of TNCs as collaborators with national universities in developing countries and of possible new avenues for the international exchange of scarce human resources (Ernst and Mowery 2004).

Box VII.4. Government-supported research institutes in the Republic of Korea

In the early stages of economic development, the Republic of Korea, lacking indigenous technological capability, had to rely on foreign sources for technologies required for industrialization. With a view to developing the absorptive capabilities of the country, in 1966 the Government established the Korea Institute of Science and Technology (KIST). KIST's R&D activities were initially directed towards finding solutions for simple and practical problems arising from the application of the imported technology.

In the 1970s the Government created specific R&D organizations in strategic fields such as electronics, telecommunications, machinery and metals, shipbuilding and chemicals to support industrial development. These institutes have been making important contributions to building an indigenous R&D base.

As private R&D expanded, changes were needed in the role, operational efficiency and research performance of the institutes. In response, the "Law for the Establishment, Operation and Development of GRIs", enacted in January 1999, paved the way for the creation of five research councils to oversee the operation of the research institutes.[a] The councils were placed directly under the Prime Minister's Office, and individual institutes were given more autonomy and responsibility. The changes were expected to improve research productivity, strengthen linkages between institutes, and increase the transfer and commercialization of research results. As of June 2005 there were 31 government-sponsored research institutes in the country.[b]

The institutes actively interact with foreign research institutes and with TNCs. For example:

- The Paris-based Pasteur Institute set up a branch in KIST in April 2004. A joint project costing 146 million will initially focus on malaria, tuberculosis and cancer research.
- Intel opened a research centre in Seoul in 2004 to develop the next platform for state-of-the-art wireless communications technology and multimedia compression technology. The centre will also collaborate with the Electronics and Telecommunications Research Institute.
- The Korea Advanced Institute of Science and Technology and the Cavendish Laboratory of Cambridge University opened a joint research centre in Daejeon City in November 2004. It will focus on nanoelectronics, fibre-optic electronics and biophysics.

Source: UNCTAD, based on Republic of Korea, Ministry of Science and Technology 2003a.

[a] These five research councils are: the Korea Research Council of Fundamental Science and Technology (S&T); the Korea Research Council of Industrial S&T; the Korea Research Council of Public S&T; the Korea Council of Economic and Social Research Institutes; and the Korea Council of Humanities and Social Research Institutes.

[b] In 2004, the three S&T-related councils were placed directly under the Deputy Prime Minister of Science and Technology.

3. Policies related to intellectual property

A well-defined, balanced and enforceable system of IPRs is an important part of the NIS, especially in countries which have fairly well developed innovative capabilities. By assigning ownership to knowledge assets it creates incentives for knowledge generation and facilitates commercial exchange. It can also assist in protecting the interests of a host country's firms and institutions in making sure that they are adequately rewarded in R&D collaborations with TNCs (chapter VI). All members of the WTO are now required to meet minimum standards of IPR protection as set out in the Agreement on Trade-related Aspects of Intellectual Property Rights (TRIPS) (chapter VIII; UNCTAD and ICTSD 2005). Thus the prime issue is how to implement an IPR regime that helps create an environment conducive to innovative activities and maximize the benefits of the country's knowledge assets, including in the context of the R&D internationalization by TNCs.

The main areas of intellectual property include copyright, geographical indications, patents, trademarks and undisclosed information (including trade secrets).[15] For R&D — and innovation in general — the most relevant types are patents and trade secrets.[16] Trade secrets may in fact be even more important than patents for a country to be able to attract FDI in R&D. To the extent that the R&D process involves sensitive information, TNCs will always seek to protect trade secrets against disclosure. A 1994 survey of 1,478 R&D labs in the United States manufacturing sector found that trade secrecy was effective for 51% of innovations, while the corresponding figure for patents was only 35% (Cohen et al. 2000).

As noted in chapter V, the importance of IPR protection for attracting R&D-related FDI is mixed and varies by industry (box V.3). Developing countries could increase their attractiveness as locations for conducting R&D by strengthening their protection of intellectual property, but it is not necessarily considered a prerequisite in the decision-making process of TNCs. Other factors, such as the availability of human resources, infrastructure and the domestic innovative capacity in general, appear to be more important. However, the development of domestic innovative capacity, which does affect TNCs' location decisions, is partly influenced by the IPR regime. Furthermore, to the extent that such a regime facilitates sharing of knowledge and learning, it can also help enhance the benefits of FDI in R&D.

At the same time, IPR protection — especially a system of patents — may also entail costs. It may, for example, place excessive burdens on consumers. IPR protection assigns the owner of intellectual property a degree of monopoly power. In order to balance the interests of producers and consumers, countries therefore need to complement the introduction of IPR regimes with adequate competition policies (section B.4).

If well implemented, an IPR regime can help address the risk of negative effects from R&D activities of TNCs (chapter VI). While collaboration in R&D between TNCs and local R&D institutions can be beneficial to the host economy by transferring tacit knowledge to the host country, there are also potential pitfalls. Typical university–industry collaboration takes the form of the outsourcing of a research project to a university by a TNC. The latter may provide funding in exchange for the legal ownership of the research outcome, including the right to patent it. If well designed and effectively implemented, an IPR system may help protect the local partners against unfair compensation for their contributions (chapter VI).

Another example of the misappropriation of knowledge assets in developing countries is related to traditional knowledge.[17] This broadly refers to the cumulative dynamic body of knowledge, much of which is related to the natural environment, held by an indigenous or local community that has been handed down through generations by oral transmission. There are two main issues of concern. First, indigenous communities that are holders of traditional knowledge should be able to maintain their way of life. Second, if commercialization based on their knowledge assets were to yield profits, the indigenous communities should be appropriately compensated. Governments or communities may take measures to safeguard against the possibility of others taking IPRs illegitimately.

One approach is to publish the details of the traditional knowledge before anyone tries to patent it. This can be useful for traditional knowledge that is clearly in the public domain and that entered the public domain with the free and informed consent of the owners of this knowledge (which is often not the case). This approach has some limitations, however, including the fact that it puts the burden of publication fully on generally poor local and indigenous communities. Moreover, as it increases public access to the knowledge, without proper safeguards the possibility of its unauthorized commercial use increases.

Furthermore, governments may consider establishing a legal framework that gives holders of traditional knowledge the right to take action against misuse or false claims in this area. Ascertaining whether the knowledge was accessed from the community with its free prior informed consent and in accordance with its customary laws could be one component.

Given that traditional knowledge has long been used by indigenous communities, it may be hard to claim that products based on traditional knowledge are "novel" or involve "inventive steps", which opens the way for legal challenges against such patents. In March 2005 the world's first legal challenge to a patent drawing on traditional knowledge was concluded in favour of the challenger. In 1994, a patent on the method for controlling fungi using extracts from the Neem tree — a tree indigenous to the Indian subcontinent — was granted to the United States Government and a United States-based TNC, W.R. Grace.[18] However, a legal opposition to this patent was subsequently filed, and after a process lasting ten years the European Patent Office eventually revoked the patent.[19] It is worth pointing out that actions to revoke inappropriate patents are costly, no financial compensation is provided to those opposing the patent to cover these costs.

Apart from establishing a legal framework for IPRs it is clear that many developing countries need to build the capacity for its implementation — including an efficient patent office and judicial system. In addition to knowledge of the legal system, a considerable degree of expertise in science and technology is required for examining patent applications and claims of infringement.[20] In designing the IPR policy governments need to take into account their countries' economic needs as well as their capacity for implementation.

In this area there is need for additional technical assistance and capacity building. Although several initiatives exist to assist developing countries in implementing the TRIPS Agreement (chapter VIII), a significant gap remains between the development of legal systems and their enforcement and management. Additional technical assistance may be required to help developing countries to:

- Manage and assess the value of their knowledge resources;
- Integrate IPR systems in their national development strategies;
- Assess the performance and adequacy of their IPR systems; and
- Develop and implement IPR systems to promote R&D collaboration with TNCs. This involves an improved understanding of licensing agreements and the interface between IPRs and competition law and policy.

Such assistance could also aim at strengthening the capacities of entrepreneurs and governments to negotiate contracts and other conditions or clauses for the transfer of technology and IPR protection, either as providers or as receivers (UNCTAD 1996a, p. 4).

4. Competition policy and innovation

Competition policy can play an important role in complementing the institutional framework for ensuring that a country's NIS is conducive to innovation, and that the benefits from TNCs' R&D are maximized while potential costs are minimized. Competition policy is not a proactive tool in encouraging FDI in R&D, but it can help boost innovation by maintaining and promoting a competitive environment. Competition provides a general incentive for firms — be they foreign or local — to innovate, for example, by encouraging them to invest in R&D and other innovatory activities (Nickell 1996, Boone 2001).[21] At the industry level, a key determinant of R&D intensity is the extent to which the local institutional context rewards innovation (Furman et al. 2002). This depends on many factors, including the IPR regime at the national level, as well as industry-specific factors such as government regulations, pressure from local rivals and openness to international competition (Sakakibara and Porter 2000).[22]

The relationship between competition and innovation is complex. Although the traditional literature on industrial organization predicts a positive correlation between market concentration and innovation,[23] empirical work has shown a positive correlation between the level of competition and innovative output (Geroski 1994, Blundell et al. 1999).[24] This is particularly evident in developing countries and transition economies, where firms that face greater pressure, especially from TNCs, are more innovative than firms that feel less pressure (Carlin et al. 2001, World Bank 2004). Recent work has shown that stricter competition laws and better enforcement of those laws have a positive impact on innovation in low- and middle-income countries (Clarke 2005).

It is now commonly accepted that competition policy needs to move beyond its traditional focus on static efficiency (Ordover and Baumol 1988).[25] It should *inter alia* seek to evaluate the effects of business practices on innovation and assess potential trade-offs between dynamic and static benefits. Firms do not innovate in isolation; close interaction with customers, competitors and suppliers is required for the innovation process to take off.[26] Finding the right combination of competition and interaction is therefore crucial (Wald and Feinstein 2004). Such considerations become even more important when FDI enters the picture.

For promoting greater benefits from R&D internationalization by TNCs, some applications of competition policy are particularly relevant such as the licensing of IPRs, collaboration through joint ventures and alliances in high-technology industries, standard setting and patent pools, merger control, and policies to address restrictive business practices. These areas of application all relate to business practices of international scope, and represent the interface between competition policy and R&D by TNCs.

One set of competition policy issues relates to such IPR-related business practices as conditional licences and unconditional refusals to license. Various jurisdictions, especially in developed countries, have introduced guidelines regarding the licensing of IPRs.[27] Specific guidelines have also been issued to tackle competition policy questions arising from various forms of cooperation such as joint ventures, standard-setting and patent pools.[28] In terms of international competition policy enforcement, these regulations may facilitate cross-border collaborative business activities, some of which are associated with R&D-related FDI.

Merger control is another relevant application area. Many firms have internationalized their R&D activities through acquisitions of firms that also conduct R&D. From a host country perspective this may raise concerns that existing R&D activities may be dismantled after the takeover or that strategic technology will be lost (chapter VI). From a wider perspective, mergers between two major players in an industry can have both positive and negative effects on R&D and other innovative activities. On the one hand the combination of two firms' sales and distribution networks may create better conditions for investing in R&D and innovation. On the other hand the merger of two competing firms may result in a stronger (or even dominant) market position for the merged firms, and therefore weaker incentives to innovate. Such concerns may be particularly important in high-technology industries, in which technology changes rapidly and the pressure for innovation is fierce. In the United States, for instance, many more merger challenges were based on innovation concerns during the 1995-1999 period than in the 1990-1994 period (Gilbert and Tom 2001). For developing countries it may be important to implement a more stringent competition policy for dealing with TNCs entering through mergers and acquisitions,[29] giving due consideration to the enhancement of national innovative capacities.

Finally, competition policies need to address possible restrictive business practices by TNCs and their foreign affiliates. A prominent role for foreign affiliates in an NIS implies that a competition authority may have to pay more attention to possible obstacles to market entry facing domestic firms. This is particularly important if foreign companies engage in certain forms of restrictive business practices such as strategic behaviour and vertical restrictions or influencing government policy-making.[30] The latter might lead to regulatory capture, whereby the public authorities involved lose sight of the public interest and protect the privileges of established firms (Stigler 1971, Peltzman 1976). Unrestricted entry of domestic firms is crucial for ensuring the existence of an active and innovative domestic enterprise sector, and thus for reaping benefits from spillovers from TNC R&D. In this regard, competition policy can complement other government efforts in countering TNC restrictions and influencing the formulation of relevant policies, and in safeguarding consumer interests (Liang 2004).

C. Promotion of R&D-related FDI

In the context of reaping benefits from the R&D internationalization by TNCs, FDI policies assume an important role. FDI policies should in principle be derivatives of industrial, regional and science and technology policies. Investment promotion agencies (IPAs) are important in this process, especially if they act in close partnership with other government actors in an NIS. Relevant FDI policies also include the use of performance requirements, incentives and science parks.

1. The role of investment promotion agencies

The appropriate role of an IPA in a country's overall strategy to benefit from R&D internationalization by TNCs depends on several factors, including the country's level of development, comparative advantage, institutional framework and development objectives. An IPA can potentially serve two prime functions. The first is to communicate and market existing investment opportunities, e.g. through targeted promotion. In the specific case of R&D-related FDI, such targeting would have to be based on a careful assessment of the location's strengths and weaknesses, and a good understanding of the locational determinants of potential R&D-related projects.

If a location is unlikely to be able to offer the conditions needed to attract R&D by TNCs, however, the main role of the IPA may not be to actively promote related FDI opportunities but rather to act in its policy advocacy role. IPAs may draw the attention of relevant government bodies to areas that are important for making a location more attractive for knowledge-intensive activities by TNCs. IPAs can potentially serve as a bridge between the private and public sector, helping to improve the understanding of what is required to benefit from R&D by TNCs.

For an IPA to play a constructive and effective role in this regard it needs to be well connected with key government ministries and to have a well-defined mandate to provide policy advice on relevant issues (see box VII.5 for the case of the Czech Republic).[31]In the Republic of Korea, the Government in 2003 set up an IPA, Invest Korea, to promote FDI, including in R&D. In addition, it also established in the same year the Korea Foundation for International Cooperation of Science and Technology (KICOS) to serve as a bridge between domestic and foreign non-profit R&D centres. KICOS focuses on promoting R&D centres involving prestigious foreign research institutions and educational organizations. The two agencies both provide assistance to investors in R&D, as part of the Government's effort to make the Republic of Korea the North-East Asian R&D Hub for the advancement of science and technology.[32]

Preceding chapters have shown that a significant presence of production activities can be an asset when countries seek to develop R&D activities in an industry. The experiences of some Asian countries in the case of electronics and semiconductors, and Brazil in automotive, are examples from developing countries. From the perspective of investment promotion, this makes the role of after-care services potentially important. Indeed, in many countries the greatest potential for R&D investment by TNCs is likely to be found among already existing foreign affiliates. The experiences of Singapore and Ireland (box VII.6), for example, suggest that close collaboration with existing investors can pay off, if supported by other policies to make the host-country environment more conducive to such investments.

The extent to which IPAs actively engage in the promotion of R&D-related FDI differs by region and country. In an UNCTAD survey conducted in February–April 2005, involving 84 national IPAs,[33] as many as 46 (or 55%) of these IPAs reported that they actively promote FDI in R&D (table VII.1).[34] A large number of IPAs in developed countries — including six of the new EU members — promote it (79%), as do 46% of the IPAs based in developing countries. By subregion, the highest percentage was noted for IPAs in Asia and Oceania. Conversely a minority of IPAs in Africa actively promote R&D-related FDI, and only 11% of the LAC IPAs that participated in the survey do so.

In terms of industry focus, computer and ICT services are the most commonly targeted industries by IPAs in both developed and developing countries that promote R&D-related FDI. In developed countries (excluding the new EU members), many IPAs also target such FDI in chemicals and chemical products (including pharmaceuticals) along with motor vehicles and other transport equipment; developing-country

Box VII.5. The IPA's role in the Czech NIS

IPAs frequently find themselves operating in significant policy vacuums, partly due to a lack of coherence between FDI and science and technology policies. Only recently have Government policies in the Czech Republic aimed at encouraging and fostering an innovation and technology culture, moved to centre stage.

Essentially, CzechInvest's expanded role in stimulating and securing R&D and innovative activities can be traced back to the year 2000, as a response to three main factors:

- Increased competitive pressure;
- A shift in the agencies strategy from labour-cost-sensitive manufacturing to business support services and technology centres; and
- Positive results from a location audit that benchmarked the Czech Republic against leading recipients of R&D-related FDI.

The results of the location audit also suggested a need for CzechInvest to help bridge the gaps between different policy fields. For example, the incentive regime was exclusively aimed at manufacturing, the supply of suitable property options was limited and the link between universities and enterprises was not sufficiently strong. CzechInvest had the expertise and strong support to initiate and oversee the administration of a new incentive regime aimed at enhancing factor conditions underpinning R&D and innovation activities.

The number of business support services and technology centre projects in the Czech Republic increased to 41 in 2004. This alone is insufficient to ensure the sustainable development of science and technology in the country. CzechInvest continues to fulfil a policy advocacy role, and designs and administers EU Structural Fund programmes aimed at enhancing innovation; it has also fostered a deep-rooted partnership with key constituents. It has joined with the Ministry of Industry and Trade to design and implement two programmes specifically aimed at supporting innovation.

Also involved are the office of the Deputy Prime Minister, Economic Affairs; the Department of Research, Development and Innovation; and the Council for Research and Development.[a]

The implementation of policies aimed at developing the skills and capacities to sustain the growth of R&D activities and innovative knowledge-based industries will take time. All the conditions needed to stimulate and sustain growth in knowledge-based industries cannot be provided by domestic means and resources alone. Consequently, CzechInvest will continue to target companies with mobile R&D and technologically advanced innovative projects while simultaneously fulfilling a policy advocacy role aimed at enhancing competitiveness. Such policy advocacy could manifest itself in the creation of a new technology agency modelled on best international practices operating as an integral unit of, or running in close association with, CzechInvest.

Source: CzechInvest.

[a] The Department of Research, Development and Innovation has established steering committees for each of three priority areas (life sciences, technical/engineering sciences and social sciences) while the Council for Research and Development facilitates decisions on the efficient use of Government funding for research, which was about 550 million euros for 2005.

IPAs pay relatively much attention to R&D by TNCs in agriculture. IPAs were also asked to specify what tools they use to promote FDI in R&D. Most agencies mentioned "general investment promotion" (such as missions, seminars and websites), followed by the setting up of science parks and the provision of tax incentives for R&D activities (table VII.2).[35] The use and effectiveness of performance requirements, incentives and science parks is discussed in more detail in subsequent sections of this chapter.

Table VII.1. Do IPAs actively target FDI in R&D?
(Number of responses)

Region	Yes	No
All economies	46	38
Developed countries (excl. new EU members)	9	3
New EU members	6	1
South-East Europe and CIS	5	4
Developing countries	26	30
Africa	9	13
Latin America and the Caribbean	2	16
Asia and Oceania	15	1

Source: UNCTAD survey of IPAs, February–April 2005.

Box VII.6. Enhancing the benefits from R&D-related FDI: the case of Ireland

In Ireland foreign affiliates account for about two-thirds of business expenditures on R&D; this is mainly in ICT (75%) and another 20% is in pharmaceuticals and medical devices. However, R&D expenditures per employee in foreign affiliates are still below levels prevailing in other European economies with a high-tech industrial structure such as Finland and Sweden. To boost innovation by both domestic and foreign companies, the development agencies — IDA Ireland, Enterprise Ireland and Forfás (the national policy and advisory board for enterprise, trade, science, technology and innovation) — in the 1990s jointly pushed for greater emphasis on science, technology and innovation.

The release in 1996 of the first-ever Irish Government White Paper on Science, Technology and Innovation emphasized the importance of these areas. As a result, under the National Development Plan 2000-2006, there was a five-fold increase in investment in these areas, from 0.5 billion in 1994 to 2.5 billion in 1999.[a] Moreover, in 1998 the Programme for Research in Third-Level Institutions was launched, which established 24 major research centres as well as major programmes in human genomics and computational physics. A Technology Foresight exercise in 1999 identified biotechnology and ICT as priority areas for R&D support by Science Foundation Ireland.[b] Finally, a 20% tax credit for incremental R&D was introduced in the Finance Act of 2004.

With a view partly to enhancing the interaction between enterprises and academia in Ireland, Science Foundation Ireland – in collaboration with industrial partners — has set up six Centres for Science, Engineering and Technology: three in the bio-medical field and three in ICT. The development agencies also conduct various activities to promote business-academia linkages, including the promotion of networks and clusters. In addition Enterprise Ireland, IDA Ireland and Science Foundation Ireland are considering the introduction of pilot schemes to fund academic researchers to spend periods working in industry and vice versa.

These policy efforts are expected to enhance the benefits from R&D activities undertaken by foreign companies in Ireland. The country has managed in recent years to attract several significant R&D projects by TNCs. During the period 2002-2004 more than 40 such projects were recorded (LOCOmonitor database). In several cases the foreign companies have collaborated with local academic institutes. Examples include:

- Bell Labs' R&D centre at Lucent Technologies' Dublin facility, linked with the establishment of a collaborative academic centre at one of the city's universities.
- Hewlett-Packard's technology development centre at its manufacturing facility outside Dublin, and the Digital Enterprise Research Institute in collaboration with University College Galway.
- Intel's innovation centre outside Dublin and the expansion of its R&D centre near Limerick. Intel has also partnered three Irish universities in the creation of an academic Centre for Research on Adaptive Nanostructures and Nanodevices.

Source: UNCTAD, based on Ireland, Department of Enterprise, Trade and Employment 2004 and Barry forthcoming.

[a] Despite this increase in State spending on research, R&D expenditures in higher education and the public sector remain below the EU average (Ireland, Department of Enterprise, Trade and Employment, 2004, p. 10).

[b] Science Foundation Ireland funds selected research programmes (153 by mid-2004, employing more than 750 researchers) and five joint partnerships between tertiary level research institutions and industry.

2. Performance requirements

Some countries have applied performance requirements to induce TNCs to undertake more R&D and other innovatory activities in their economies. In this context the most relevant instruments are R&D requirements, but technology transfer and joint-venture/equity-ownership requirements may also play a role.

Both developed and developing countries have applied specific *R&D requirements* to foreign investors. For example, some developed countries have imposed R&D requirements as a condition for entry to address the concern that most R&D activity of TNCs tends to remain in the home country (UNCTAD 2003c, chapter VI). In India, R&D requirements have been imposed on both foreign and local investors to encourage

Table VII.2. Policies and policy tools used by IPAs promoting FDI in R&D
(Number of times the tool has been mentioned; multiple answers possible)

Policies and policy tools	All economies	Developed countries (excl. new EU members)	New EU members	South-East Europe and CIS	Developing economies	Africa	LAC[a]	Asia and Oceania
General investment promotion	36	7	6	5	18	7	1	10
Setting up of science parks	26	5	5	2	14	4	-	10
Tax incentives for R&D	26	3	3	3	17	7	1	9
Promotion of linkages between foreign affiliates and universities	24	4	4	2	14	6	1	7
Strengthening of intellectual property rights	22	2	2	2	16	6	2	8
Grants for R&D activities	20	4	6	2	8	2	-	6
Reduced tariffs on imported R&D equipment	14	-	-	1	13	8	-	5
Special incentives to attract foreign researchers	9	3	-	2	4	2	-	2
R&D requirements as a condition for entry	7	-	1	2	4	-	1	3
Other policy tools	12	3	2	1	6	1	-	5

Source: UNCTAD survey of IPAs, February–April 2005.
[a] Latin America and the Caribbean.
Note: Based on responses from the 46 IPAs that stated that they target FDI in R&D.

them to set up in-house R&D facilities or to enter into long-term consultancy agreements with local R&D institutions. However, requirements have tended to be minimal and are seldom closely monitored (UNCTAD 2003c, chapter III).

In China, requirements to undertake R&D are imposed as a condition for entry in selected industries where the inflows of FDI may be considerable but where TNCs have not undertake R&D activities. A prominent example is the passenger car industry. In an effort to tackle the relatively slow enhancement of domestic innovation capability, the 2004 industrial policy required the establishment of an R&D centre with an investment of at least 500 million yuan (about $60 million) for any new automotive project to be approved.[36] Although the provision largely deters the entry of domestic players into that industry, it has contributed to changing the attitude of TNCs on R&D localization.[37]

The rationale for imposing a *technology-transfer requirement* may be to induce foreign affiliates to adopt technologies that are appropriate to the factor endowments of the specific host economy and to facilitate knowledge transfer. However, TNCs are unlikely to channel proprietary information and knowledge unless it is also in their interest. A review concluded that explicit requirements for transferring technology have not been used very often (UNCTAD 2003c).[38] In two studies of Japanese and United States FDI, no positive impact was found of related performance requirements on the extent to which technology was transferred to foreign affiliates (Urata and Kawai 2000, Blomström et al. 2000, pp. 216-217). The implementation of technology transfer requirements can be a challenge, mainly due to the difficulties involved in measuring the extent to which transfers occur and in determining what technology is desirable.

Joint-venture and equity-ownership requirements have also been used to promote diffusion of knowledge and technology from foreign affiliates to local counterparts, with mixed results. Some researchers have found that technology employed in foreign affiliates established in response to joint-venture requirements tends to be three to ten years behind the cutting edge for the industry concerned and that the amount of technical training provided to local managers and workers is often a fraction of that received in wholly-owned affiliates (Moran 2002).[39] Meanwhile, others argue that even if the content and quality of technology are superior in the case of wholly-owned ventures, the presence of a local partner may increase the opportunities for local learning and diffusion of whatever knowledge is created locally or transferred from abroad (Yun 2002).

There is always a risk that the use of performance requirements repels some FDI. In general, for countries in a stronger bargaining position vis-à-vis the foreign investors (e.g. owing to a large domestic market), this risk is lower. China and India have been able to attract considerable amounts of FDI in R&D while imposing various requirements as mandatory conditions for entry or as conditions for providing an incentive. The use of mandatory R&D or joint-venture requirements in smaller economies would increase the risk of losing FDI, unless the foreign investors are compensated (e.g. through various fiscal or financial incentives). Even for such "voluntary" R&D requirements, without other conditions in place – such as an adequate supply of local capabilities and technical skills — fiscal and financial incentives linked to R&D requirements are likely to have a limited impact. Conversely, if other factors are in place, the foreign investors may decide to locate R&D activities in the host country even without an extra inducement through incentives.

3. The use of R&D incentives is expanding

Most developed countries and a growing number of developing countries use some form of incentives to attract R&D activities. In many cases government support is offered to both domestic and foreign firms on equal terms. Evidence suggests that R&D incentives could have a *marginal* impact (i.e. they might tilt the balance in favour of a specific location) when countries with similar factor endowments are competing for an FDI project. In general, however, other locational factors are more important determinants. In considering the use of R&D incentives, governments should examine carefully what incentives are the most appropriate, taking into account budgetary and administrative implications.

The rationale for government support for R&D is a presumption that, if left to the market, private firms will underinvest in R&D due to the problems of appropriability and the high degree of uncertainty associated with R&D investment.[40] Incentives may aim to secure socially optimal levels of R&D.[41]

However, there are several pitfalls in providing R&D incentives. As is the case with other types of incentives, international competition among countries in offering incentives could result in the wasting of public funds as well as global economic distortions. Defining "R&D expenditures" is also problematic. A broad and simple definition is likely to result in an unnecessarily generous system, while a more targeted system involves more complex administration. Whatever the definition, firms may resort to "re-labelling" so that costs not related to R&D are counted as R&D expenditures in order to benefit from favourable tax treatment. Another problem is related to the evaluation of R&D support programmes. It is almost impossible to ascertain whether the benefits (spillover effects) justify the costs of subsidies or foregone tax revenues. Finally, there is a risk that a government might end up supporting R&D projects that firms would have undertaken even without its support.

Government support for R&D broadly takes the form of financial and fiscal incentives (box VII.7). UNCTAD's survey of IPAs (see above) indicates that more than half of the agencies that target FDI in R&D offer tax breaks for such activities and in 43% of the cases R&D grants were provided (table VII.2). While the picture is not uniform, the use of such R&D incentives is on the increase, especially in *developed countries*. EU countries are making the greatest efforts to promote R&D activities by way of incentives[42] and Austria, Denmark, Italy (for SMEs only), Portugal, Spain and the United Kingdom have some of the most generous R&D incentive systems (OECD 2003), while France, Ireland and the United Kingdom all made their tax treatments of R&D more favourable in 2004 (MacDougall 2004). Notable exceptions among the EU members are the Nordic countries. With regard to financial incentives, the European Commission in 2005 set out a seven-year plan to increase R&D spending in the EU by way of grants worth 70 billion.[43] The plan was a response to the slow progress towards EU members' pledge to increase R&D spending to 3% of GDP by 2010.[44] Outside Europe, the most generous fiscal incentive schemes are offered by Australia and Canada.[45] In the United States, tax credit for R&D is the most significant of the remaining domestic tax credits.[46]

Partly due to limited resources, *developing countries* are more likely to apply fiscal than financial incentive schemes. In the UNCTAD survey of IPAs, more than twice as many developing-country IPAs used tax incentives than those who used financial incentives (table VII.2). Many developing countries also charge lower tariffs on imported R&D equipment as a way of promoting technology transfer.

The two largest emerging-market destinations of FDI in R&D, China and India, have strengthened their systems of R&D support. In China, TNCs can set up R&D centres as independent entities (under the rules applying to Sino-foreign joint ventures), wholly foreign-owned enterprises or as independent departments or branches of existing companies. Equipment and parts imported by R&D centres meeting certain requirements are exempt from customs duties and import value-added tax, and the technologies they develop and use are exempt from business tax.[47] India offers *inter alia* a ten-year tax holiday for companies engaged exclusively in scientific R&D with commercial applications (EIU 2004n).

Most other Asian countries that have attracted significant FDI in R&D also provide extensive R&D support. In Malaysia, companies can offset 100% of capital expenditure incurred within ten years against 70% of their income.[48] Singapore allows a 100% deduction of R&D expenses (in certain cases 200%) and provides various grants and tax exemptions.[49] Thailand revamped its system of R&D incentives in 2004, after which firms can be entitled to a corporate income tax holiday for up to eight years (EIU 2004p).

In Latin America, the use of government support for R&D is less widespread. For example Argentina, Chile and Mexico[50] do not have significant fiscal measures to promote R&D. Brazil, on the other hand, allows locally owned IT firms[51] to deduct some R&D expense from their taxable income, and research financing is available for research projects in bioscience, physics, chemistry and environmental science (EIU 2004q). Colombia also offers investors in R&D centres certain fiscal tax exemptions (EIU 2004r). While there is little information on the use of incentives in Africa, South Africa allows accelerated depreciation of assets in certain targeted areas, including R&D investment. Both foreign and domestic firms are eligible for tax incentives. The Government also provides some direct financial support for R&D (EIU 2004s).

Despite the proliferation of financial incentives for R&D, few studies have assessed their effectiveness. An analysis of the Small Business Innovation Research Program in the United States found that firms awarded subsidies under this programme enjoyed greater sales and employment growth and increased their chances of receiving venture capital financing (Lerner 1999). Another study, conversely, concluded that the subsidies granted under this programme did not affect employment of R&D personnel. Furthermore, there is evidence that subsidies have crowded out firm-financed R&D spending (Wallstein 2000).[52]

There are more studies on the effectiveness of *fiscal incentives*. They typically measure how much additional R&D expenditures are generated by a 1% reduction in the costs of undertaking R&D. Various studies have noted that the long-term impact of R&D incentives may be more important than the short-term ones (e.g. van Pottelsberghe et al. 2003, Bloom et al. 2002). However, it should be noted that these studies did not address the problems of re-labelling and input price inflation.[53]

Box VII.7. Types of R&D incentives

Two main types of R&D incentives can be distinguished: financial and fiscal. *Financial incentives* refer to direct funding of R&D projects by the government through the granting of preferential loans or subsidies. *Fiscal incentives* are tax based and can be further divided into six types: accelerated depreciation, tax allowance, tax credit, tax holidays, income tax allowances and import tariff exemption.

- *Accelerated depreciation* refers to a practice whereby faster depreciation rates are applied for current and capital R&D expenditures.[a] In most countries, non-capital R&D expenditures are treated as current expense, thus allowing the whole amount to be deducted from the taxable income during that year.
- Firms that are given *tax allowances* can deduct R&D expenditures from taxable income at a rate higher than 100%, resulting in a further reduction of corporate income tax liability.
- *Tax credits* also reduce a firm's corporate income tax, but the deductible amount is calculated differently. In this case a certain percentage of eligible R&D expenditures can be deducted directly from corporate income tax.
- A *tax holiday* exempts firms investing in R&D from paying taxes, or lowers the rates for a given period of time.
- *Tax allowances for personal income tax* and *import tariff exemption* can be targeted at personnel and products linked to the R&D activities of the firms.

Source: UNCTAD.

[a] This is an advantage for firms since R&D investments would normally be treated as capital expenditures, in which case only the amount that corresponds to the depreciation of such assets could be deducted from taxable income each year.

Regarding the factors that most influence TNCs' decisions on where to locate their R&D, a recent survey found that incentives, while important, are not a major determinant (EIU 2004a). Infrastructure and a tradition of innovation have the greatest impact. Nevertheless, government support can tip the balance in favour of a certain location when other factors are equally attractive (Cantwell and Mudambi 2000, chapter V).

As incentives are only one of many factors that influence the location of R&D, countries that continue to compete by offering incentives to attract such FDI need to be aware of the risk that the costs involved may eventually outweigh the benefits. In designing an incentive policy, governments also need to decide whether a more targeted approach or a more universal approach is the most appropriate. A targeted approach is more complicated and is likely to involve higher administration costs. Complicated incentive schemes also tend to be less effective.[54] A more universal approach (primarily fiscal incentives) requires larger resources, some of which will inevitably be used to support R&D projects that do not require any support.

One way to enhance the potential benefits from incentives is to promote R&D collaboration among local firms and/or institutions. Such a measure may help build domestic R&D capabilities by providing local R&D entities more opportunities for learning and funding. In Brazil, for example, some R&D incentives are provided only on the condition that the R&D is done jointly with research institutes and schools of high academic standing (EIU 2004q). Among developed countries, in Denmark firms can receive extra tax deductions on research projects co-financed by enterprises and public research institutions; in the United Kingdom companies are able to claim credit for R&D work which they subcontract to certain institutions including universities, charities and scientific research organizations (United Kingdom, Inland Revenue 2002).

4. Using science parks as attractors

Science parks are used to create a more conducive environment for innovation and R&D in enterprises, often in close proximity to universities and other public technical institutes. In UNCTAD's survey of IPAs, the setting up of science parks was the second most commonly mentioned policy tool used by those that target FDI in R&D. While their precise goals differ, such parks offer various kinds of support and networking activities, help newly started ventures and enhance cooperation between existing companies in the park. Many of them provide the specialized infrastructure needed to undertake R&D work. As locations for R&D-related FDI, science parks may offer attractive features by facilitating clustering and networking, offering access to skilled people, providing the necessary infrastructure and administrative support and, last but not least, offering a pleasant living and working environment. According to the International Association of Science Parks there were about 600 science parks in 2004 worldwide, hosting some 65,000 companies.[55] Two-thirds of all parks are located in the United States and Europe, and East Asia accounts for the bulk of all science parks in developing economies (Andersson et al. 2004, p. 152).[56]

A well-known case in Asia is the Hsinchu Science Park set up in 1980 in Taiwan Province of China. While it was originally established with a view to serving local companies, non-Taiwanese companies have also been attracted. In 2004, 52 out of 384 companies in the park were non-Taiwanese.[57] In Singapore, the first science park was also established in 1980 and now hosts 300 local and foreign companies (Zhang 2004). The Zhongguancun Science Park (Beijing) is China's first and largest science park with more than 14,000 high-technology firms, including 1,600 foreign affiliates (see also box VI.2). The offshoring of software development to India has often benefited from the presence of dedicated technology parks for IT services (*WIR04*). As of 2003 there were 39 such parks, accounting for 80% of all India's software exports in 2002/03.

A few science and technology parks have been established in different parts of Africa, especially in North Africa. Algeria, Egypt, Morocco and Tunisia all have at least one such park in place.[58] Madagascar and Senegal similarly host technology parks;[59] and in UNCTAD's survey of IPAs Ghana, Kenya, Mali and Nigeria stated that they use science parks to attract FDI in R&D. In South Africa a new park — "The Innovation Hub" — will become the first African science park that is accredited internationally. Its main objective will be to attract a variety of enterprises active in, *inter* *alia*, ICT, electronics, life sciences and aerospace.[60]

There has been limited use of science and technology parks in Latin America (IADB 2001). The first attempt at promoting innovative clusters was Brazil's creation of 13 "technological innovation nuclei" in selected universities and research centres in 1982 (Quandt 1999). Mexico started to create business incubators in 1990 with the support of the National Council for Science and Technology and the Association of Incubators and Technological Parks.

There is little evidence concerning the effectiveness of science parks. There appears to be some consensus that they can contribute to commercializing university-based knowledge and technology and can act as an important node in innovative clusters and in the NIS more broadly. As such they can also be useful tools in attracting FDI and embedding foreign affiliates in an NIS. However, establishing a park does not guarantee success. One issue concerns the financing of the park and the role of government support. It has been argued that governments should ensure strong private sector interest in any project before extending financial support, and that government support should be reduced as the park develops (IADB 2001). Another issue concerns the assigning of IPRs, especially if a science park facilitates the commercialization of university-based knowledge. Thirdly, in developing countries it is important to find a balance between providing employment opportunities for university students and avoiding the risk of draining skills away from universities (Andersson et al. 2004, p. 154). Fourthly, as science parks can constitute a key tool for the regional development of innovative clusters, the role of sub-national and local governments is decisive.

D. Industry-specific policies to enhance the benefits of FDI in R&D

In addition to specific policies geared to attract R&D by TNCs, various "flanking policies" are important to enhance the benefits from such activities. In this context industry-specific policies deserve particular attention as they have played an important role in encouraging indigenous production and innovation capabilities in developing countries. Such capabilities are central to sustaining technological and economic development and to reaping the benefits from R&D by TNCs. Policy formulation needs to reflect the fact that the nature of different industries varies considerably.

Industry-specific policies need to be defined in light of a country's overall development strategy. Within such a strategy, an industry-based vision can form the basis for deciding what R&D by TNCs to target and how to benefit from it, highlighting the need for close interaction between industrial and FDI policies. For developing countries it is important to take account of their development level and comparative advantage so that policy objectives are realistically set. For many low-income countries it may be appropriate to give priority to the development of less technology-intensive industries and services rather than high-technology ones.

What policy tools should be used depends in part on the industries a country seeks to promote. Appropriate policy formulation and design therefore requires in-depth knowledge of an industry, its production and technological capabilities and the kind of R&D that is undertaken locally. In countries that lack the knowledge base necessary for new product development in an industry, the enhancement of manufacturing rather than R&D capacity is likely to be the first priority for industrial development. Before moving towards R&D-based activities, a country first has to develop basic production capabilities (chapter III). For developing countries that already have significant manufacturing capabilities in some technology-intensive industries, policymakers may first consider promoting experimental development (by foreign affiliates as well as by local enterprises) in these industries. For more advanced developing countries with strong manufacturing capabilities in some high-technology industries, going from development to (applied) research is the major challenge.[61] The ultimate test for most countries is to foster national innovative capabilities in technology-intensive industries.

As many policy measures target R&D in specific industries, the boundary between industrial policy and science and technology policy becomes blurred, requiring close coordination between the two. In some countries the policy focus is shifting from "industries" to "clusters", which reflects the growing emphasis on inter-organizational relationships and networks in R&D and production (Freeman and Barley 1989, Olk and Young 1997). By fostering knowledge-based cluster formation,[62] industrial policy can encourage joint R&D efforts and knowledge spillovers involving both domestic firms and foreign affiliates.[63]

To enhance benefits from R&D internationalization, industry-specific policies also need to support entrepreneurship and foster the emergence of technology start-up SMEs. There is growing recognition of the role of SMEs in an NIS.[64] Small-sized technology start-up firms are often responsible for important innovations. While the relatively high concentration of R&D in large firms is a natural consequence of their ability to manage fixed costs and risk, SMEs tend to be more flexible and can therefore drive technological change at a faster pace than large firms. Thus SMEs can be especially important in high-technology industries.

However, small firms face several difficulties that can prevent them from fully realizing their technological and commercial potential. By making resources accessible and affordable to them, active SME policies can contribute to the emergence of an innovative domestic enterprise sector in new areas.

In high-technology industries governments can foster technology enterprise development through business incubation systems for technology start-ups. Such systems can provide young start-ups with the necessary resources and services (e.g. access to financing, networking, technical assistance and business consulting), help reduce non-commercial risks, support entrepreneurship and, thereby, the commercialization of R&D by these firms.

As part of efforts to build domestic enterprise capabilities in an industry there can be a need to strengthen the environment for technology start-ups by upgrading existing financial intermediaries and by introducing such financial instruments as seed and venture capital funds. Venture capital has been perceived mainly as a private sector activity, and in most developing countries governments have played a limited role in this area. However, there can be a role for public venture capital funds to compensate for the lack of private sources of venture capital needed to encourage R&D investment (Andersson and Napier 2005).

When carefully designed, business incubator and venture capital programmes function as complementary approaches. While business incubators help prepare the ground for growing firms and may compensate for some of the market failures that hinder the growth of new firms, venture capital provides both financial capital and expertise. Despite the obvious benefits and synergies deriving from close collaboration between incubators and venture capitalists, in reality such collaboration is far from automatic. Active policies are often needed to catalyse it.

In many instances industry-specific policies and SME policies directed towards technology start-ups need to be implemented at the local rather than national level. This is particularly important in large countries where comparative advantages and resource endowments of various locations may differ considerably. In Shanghai, for example, policies at the central level were complemented by strong local government support to attract FDI in the semiconductor industry and to build up an internationally competitive industrial base (box VII.8).

E. The role of home countries

Developed countries can help secure benefits from the internationalization of R&D to developing countries in different ways, including through the promotion of R&D internationalization and measures aimed at strengthening the NISs of developing countries.

The limited information available on home-country policies related to R&D internationalization suggests, however, that relatively few countries have specific measures in this area. A recent review of home-country measures in developed countries concluded that few governments support firms financially that want to conduct R&D abroad (OECD and Belgian Science Society 2005). Some financial mechanisms encourage joint collaboration in R&D activities, such as the EU Framework Programmes. In a few countries indirect funding of R&D (e.g. tax credits) is also granted if R&D expenditure is incurred outside the country (e.g. purchase of R&D services from foreign research institutes). Most jurisdictions among developed

Box VII.8. The role of local governments in building domestic capabilities: the case of Shanghai

Following decisions taken by the Central Government in China in June 2000, the municipal Government of Shanghai took a series of steps to develop the local semiconductor industry.[a]

- For projects on integrated circuit (IC) manufacturing it granted exemptions and reductions of local taxes and fees, facilitated the import, export and international travel of company employees and provided a 1% interest deduction of commercial loans denominated in renminbi.
- For IC design, it provided preferential treatment to firms and set up specific funds for the establishment of a technical platform, including a semiconductor intellectual property bank.
- Various agencies of the municipal government worked together to accelerate the upgrading of the semiconductor industry. Specific funding programmes (e.g. the Product-Design-Chip Project) were introduced and existing ones (e.g. the Technology-oriented SME Innovation Fund) were leveraged to enhance local technological levels and innovative capabilities.
- In terms of manpower development, education and research centres in relevant areas at local universities were encouraged and specific policies were adopted to attract highly skilled human resources from within China and abroad. The municipal government also established a programme to attract Chinese returnees to form start-ups for conducting R&D in Shanghai.
- In 2003, a semiconductor intellectual property exchange centre was set up to serve as a platform for IPR protection and trading, and a specialized guarantee fund was launched to address the financing problem facing small IC design companies.
- To encourage linking together downstream and upstream firms in the value chain, the local government also introduced the Specialized Project to Encourage the Collaboration between Final Product Industry and IC Design Industry.

Source: UNCTAD.

[a] This took place right after the Central Government had introduced “Several Policies to Encourage the Development of the Industries of Software and Integrated Circuit” (File No. 18).

countries that grant R&D incentives do so irrespectively of whether the R&D supported is undertaken inside or outside the country. However, Belgium, France, Japan and Spain require (at least for some incentives) that the R&D is conducted in the respective country (IBFD 2004, pp. 222-230).

Some developed countries provide support to domestic public institutions to undertake R&D activities abroad, including in developing countries. For example the Australian Centre for International Agricultural Research promotes partnerships between Australian and developing-country institutions. It supported more than 50 R&D projects in Viet Nam between 1993 and 2003 (UNCTAD 2004, p. 10). The French Centre for International Cooperation on Agricultural Research for Development provides new and emerging technologies related to sustainable agricultural development and conservation of the environment in Africa, Asia and Oceania, Latin America and Europe. Its researchers, posted in 50 countries, work with national research organizations or provide technical support in development projects (ibid., p. 27).

A growing number of developing-country TNCs — mainly from Asia — also conduct R&D abroad to access technologies, skilled human resources, unique innovative networks and attractive innovation environments (chapter IV). Some Asian governments, such as those of China, India, Malaysia and Singapore, actively facilitate and encourage outward FDI,[65] but few specifically encourage FDI in R&D. The only known example in this regard is China. In the context of its “go global” strategy[66] the Government of China has promulgated a series of regulations and circulars in recent years to manage and encourage overseas investment by Chinese enterprises.[67] The country adopts a selective support strategy.

In October 2004 the National Development and Reform Commission (NDRC) and the Export-Import Bank of China (EIBC) jointly issued a circular encouraging overseas investment projects in four areas, including "overseas R&D centres that can utilize internationally advanced technologies, managerial skills and professionals" (see also chapter II). Preferential credit is granted for investments in these four areas and the NDRC and the EIBC have established a joint supportive mechanism to promote such outward FDI. The EIBC specifically arranges "special loans for overseas investments" within its export credit plan in order to support the identified investment projects. It accelerates the process of project screening, and the NDRC also facilitates contacts with other agencies to improve the risk-control mechanism for overseas investment. The encouragement of R&D abroad reflects the efforts of the Government to enhance China's innovative capability by leveraging foreign resources.

An indirect way for home countries to help developing countries derive greater benefits from R&D internationalization is to assist them in strengthening their NISs. However, bilateral aid organizations rarely focus on science and technology, and when they do the aid tends not to be effective:

> "A few bilateral development agencies have a strong focus on science and technology. But even where such programs exist, they lack strong links with domestic scientific institutions in donor countries…Aid programs need to reflect the view that the best way to address poverty is to stimulate economic growth. This will require a focus on science, technology, and innovation" (UN Millennium Project 2005, p. 165).

There is scope for more bilateral cooperation to foster policy formulation and stronger innovation systems in developing countries (UNCTAD 2005d). A key area in this regard is human resource development. The domestic educational systems in many poor countries, especially in Africa, are not sufficiently flexible or well-funded to achieve the needed increase in the number of tertiary students. The international community could play a more active role in this area, for example, by strengthening the local educational infrastructure and by making education opportunities to developing countries available in developed countries. Many developed countries already provide developing-country students with scholarships for higher education in their countries.[68] Some also provide developing countries' academic, research and professional institutions with research and equipment support (UNCTAD 2004, p. 11). It has been proposed that developed countries establish a second "Colombo Plan" for sub-Saharan Africa under which students from African countries could study abroad.[69] To address the risk of brain drain, special provisions would, however, have to be made to ensure that students return to their home countries upon completion of their studies (UN Millennium Project 2005).

Efforts by home countries to improve the institutional framework for innovation in developing countries could help establish technical standards and certification systems through access to and provision of testing equipment for standard setting and quality assessment (UNCTAD 2004, p. 15). Similar steps could be taken in the area of IPRs and through R&D collaboration between institutions in developed and developing countries. In the health sector some developed-country governments have funded R&D public and private institutions in developing countries to develop drugs and vaccines. Such support has mainly involved financing research, conducting trials and providing mechanisms for delivery of services to end-users (UNCTAD 2004, p. 9). Moreover, the EU has contributed to the NISs of developing countries by encouraging an exchange of scientists and closer interaction between universities in developing countries and EU member countries (UNCTAD 2005d, para 27).

F. Concluding remarks

Today, no country can rely entirely on knowledge created within its borders. The challenge facing countries is therefore to ensure that they connect in the most effective way with global R&D networks of TNCs and the innovation systems of other countries. Inward as well as outward R&D-related FDI can here play a role. In order to derive benefits from the current trend of R&D internationalization, this chapter has underlined the need for active government policies in a number of areas, and that such intervention is done in a coherent way. For the many developing countries that are currently not taking part in the process of R&D internationalization, important lessons could be drawn from the experience of other countries.

In all the developing economies that have been successful in improving their innovation capabilities and in attracting R&D by foreign companies, the government has played a key role.

In particular, while their strategies differ they have all sought to strengthen their innovation systems by enhancing their "created assets", notably their human resources, and their institutional frameworks affecting the incentives and conditions for firms to innovate. But in order to be effective, such policies demand political commitment and a clear, long-term vision. A country that simply opens up to trade and investment and passively waits for new knowledge and technology to flow in from abroad is likely to be at a competitive disadvantage vis-à-vis those that actively adapt and strengthen their policies and institutions.

The ability of a country to benefit from R&D internationalization depends first and foremost on the strength of its NIS. The stronger the NIS, the greater is the likelihood not only of attracting R&D by TNCs but also of spillover benefits arising from inward as well as outward FDI in R&D. Policies on human resource development, promotion of linkages between R&D activities in the public and enterprise sectors, strategic use of IPR systems and competition policies are key in this respect. Efforts in these areas need to be closely coordinated with investment policies. Indeed, a coherent approach is required to ensure that government interventions are effective in securing benefits from R&D internationalization. In essence, policies in the areas of innovation, education, competition, FDI as well as those targeting the needs of specific industries and SMEs need to be seen as part of a vision aimed at enhancing competitiveness and development.

Active and coherent policies are among the most striking features of those developing countries that are now emerging as nodes in the R&D networks of TNCs. The success of some Asian economies is no coincidence. In most of them the starting point has been a long-term vision of how to move the economy towards higher value-added and knowledge-based activities. In many instances, targeted government policies aimed at strengthening the NIS and facilitating knowledge inflows. Such policies have included:

- Active promotion of imports of technology, know-how, people and capital from abroad; some have relied on inward FDI while others have linked up with the TNCs through contractual arrangements.
- Strategic investment in human resources to support technological upgrading in the private sector - typically with a strong focus on science and engineering.
- Continuous improvement of educational systems.
- Promoting immigration or the return of skilled workers in the diaspora.
- Development of infrastructure (such as science parks, public R&D labs, incubators) that helps promoting innovation in the NIS by both foreign and local firms.
- Use of performance requirements and/or incentives as part of an overall strategy to attract FDI in targeted activities.
- Strategic implementation of IPR protection.

Effective implementation of policies in these areas requires collaboration between relevant government bodies and coordination at the highest level. There is also a need to delineate the responsibilities of individual ministries and agencies at both the national and sub-national levels. Because R&D activities have a strong tendency towards geographic clustering, government agencies at the local level can play an important role in attracting FDI in R&D to specific localities by establishing science parks, providing specific incentives and facilitating the mobility and availability of technically qualified people. Moreover, in designing and implementing their policies, governments need to understand what determines the location of R&D, how R&D by TNCs interacts with other actors within the NIS of a country and how to connect effectively with other systems of innovation.

For many developing countries at the lower ranks of the *UNCTAD Innovation Capability Index*, any expectation of a major influx of R&D by TNCs would be unrealistic in the short-term. That is not a reason for inaction, however. Rather, countries should consider how to begin a process through which economic and technological upgrading can be fostered. As argued by one expert (Lewanika 2005, p. 12):

> "An important starting point for developing countries is to increase the percentage of GNP devoted to education, science teaching as well as research and development. The notion that investing in science and technology is a time-consuming, wasteful and costly activity will condemn developing countries to perpetual economic illness. Initiatives to assist Third World countries to develop

must include science, technology and innovation as one of its main themes."

Successful efforts at the interface of investment, technology and industrial policies are essential in order for more countries to benefit from the current trend towards greater internationalization of R&D. Recent developments have shown that developing countries can play a role even in highly sophisticated R&D by TNCs. Currently the phenomenon is confined to relatively few developing and transition economies, but R&D internationalization is expected to deepen and potentially involve more countries. This process is still in its infancy. The fostering of innovative capabilities is a long-term task for governments. For latecomer countries, ensuring that a process aimed at strengthening the NIS gains momentum can be seen as a first necessary step.

For developed home countries, current trends accentuate the need for relying more on the creation, diffusion and exploitation of scientific and technological knowledge as a means of promoting growth and productivity. Rather than regarding R&D internationalization as a threat, these countries may seek to seize the opportunities it offers. Reverting to protectionism most likely would harm the ability of their firms to compete. Instead, it will be important to explore new ways of collaborating with the new R&D locations, such as through joint research programmes and outsourcing as well as through inward and outward R&D-related FDI. To facilitate such collaboration, and to help more countries build the necessary capabilities to participate in the process, developed countries may decide to offer additional support aimed at strengthening various aspects of the innovation systems of countries which currently have weak innovative capabilities. Such contributions could effectively help in the overall efforts to narrow the technology and innovative capability gap that may otherwise continue to widen.

Notes

1 In many parts of Africa, for example, academic education has often produced skills demanded in public administration rather than in industry. African institutions of higher education enrol 60% of students in the arts and humanities and only 40% in science and engineering (Oyelaran-Oyeyinka 2004a, p. 20).

2 In Malaysia, for example, such needs were identified for electrical and electronics engineering, information technology, communications technology and circuit design personnel who are able to combine hardware, software and application knowledge (Ernst 2004).

3 UNCTAD interviews.

4 See also *WIR01*, chapter V, for examples on how countries have involved foreign affiliates in training and technological upgrading of suppliers.

5 Among those working in science and engineering occupations in 2000, 17% with bachelors' degrees, 29% with masters' degrees and 38% with doctorates were foreign-born (Ernst 2005a). In 2001, 133,000 foreign citizens were enrolled at the graduate level in science and engineering in the United States. This corresponded to more than 30% of the total number of science and engineering graduates that year, an increase from 20% in 1983 (United States, NSF 2004, appendix table 2-12).

6 See ISA (2004) and "The brain drain: old myths, new realities", *OECD Observer*, May 2002.

7 Tertiary technical institutions in Singapore also attract a large number of foreign students. According to figures from the Singaporean Agency for Science, Technology and Research (A*STAR), 79% of full-time postgraduate research students in science and engineering were foreigners in 2003.

8 "Singapore aims to be a biotechnology hub", *Financial Times*, 10 June 2005.

9 In 2003 only 2.7% of all professors were non-Korean, foreign students at universities accounted for only 0.2% of all enrolled students and there were few foreign workers in the private and public sectors (Kwon 2003).

10 Some estimates suggest that around 300,000 professionals from the African continent live and work in Europe and North America (see "The brain drain: old myths, new realities", *OECD Observer*, May 2002). Many countries in Latin America have also been exporting human resources (ECLAC 2002, chapter 8). At the beginning of the 1990s, some 300,000 Latin American and Caribbean professionals and technicians were living outside their home country; over two-thirds of that total were concentrated in the United States (Villa and Martínez 2001).

11 "In a 'brain gain', India's Westernized émigrés return home", *International Herald Tribune*, 26 July 2004.

12 This programme coincided with a World Bank Industrial Technology Development project, one component of which was to upgrade the technology institutions and strengthen their linkages with industry. The project helped shape the direction of reform and provided technical assistance to help reorient the laboratories and train their managers and staff.

13 In 1996, outside earnings contributed to 16.4% of total expenditures, and some laboratories, such as the National Chemical Laboratory in Pune, were even more successful, earning over 50% from industry, the bulk of which came from foreign contracts.

14 Communication from CSIR, May 2005.

15 The TRIPS Agreement also covers industrial designs and layout designs of integrated circuits.

16 Not all pieces of knowledge can be patented. For example, information obtained in the process of an R&D project before its completion may be valuable, but it does not constitute an invention as such and therefore cannot be patented. Even when an invention can potentially be patented firms may prefer not to

disclose the details of their intellectual property through patenting. In these circumstances such information can be kept as a trade secret.

17 For more information, see UNCTAD (2004), and relevant papers at www.unctad.org/trade_env/TK2.htm.

18 While the legal process was taking place the patent was sold on to other firms although the Government of the United States remained the co-proprietor of the patent.

19 *ICTSD Bridges Weekly News Trade Digest*, 23 May 2005 (www.ictsd.org).

20 In countries where the IPR regime allows patenting in new areas such as software, business models and financial formulae, the required range of expertise is even wider.

21 See also Cimoli and Primi forthcoming and ECLAC 2004c.

22 According to the 1995 United States antitrust guideline there is a clear division of powers between IPR policy and competition policy in this area.

23 Schumpeter's economic analysis is a commonly used starting point. It argues that firms must make high levels of profits and enjoy some monopoly power in order to be able to invest in innovation.

24 Several attempts have been made to provide a theoretical explanation for this positive impact (e.g., Aghion and Howitt 1998, and Sutton 1998).

25 In the short run, competition is necessary to enhance the allocative efficiency of an economy and maximize consumer welfare. Beyond this *static* function, competition is a key driving force behind technological progress and long-term economic growth, thus influencing *dynamic* economic efficiency.

26 Innovations are strongly influenced by horizontal rivalry between competitors, but vertical relations are also important (Edquist 1997).

27 In the United States, "Guidelines for the Licensing of Intellectual Property" were issued in 1995 by the Department of Justice and the Foreign Trade Commission; the European Commission published its Regulation No 240/96 concerning Technology Transfer Agreements in 1996; and in Japan, "Guidelines for Patent and Know-How Licensing Agreements" were issued in July 1999.

28 In 2000, the "Antitrust Guidelines for Collaboration Among Competitors" were published in the United States, and the European Commission issued regulations regarding specialization agreements and R&D agreements. In 2001 the European Commission further introduced "Guidelines on the Applicability of Article 81 of the EC Treaty to Horizontal Co-operation Agreements".

29 For a discussion of cross-border M&As and their effects on competition, including limitations in this respect, see *WIR2000,* and Singh 2003.

30 Strategic behaviour aims to deter potential entrants rather than to destroy actual competitors. Vertical restrictions occur when a firm at one stage of the line of value-added activity imposes restraints on the terms of trading by firms at another stage. Vertical restraints include resale price maintenance, selective distribution systems, tying arrangements (tie-in sales), exclusive dealing and refusal to sell.

31 In Mauritius, for example, the Board of Investment is actively participating in the work of the National Productivity and Competitiveness Council to boost the country's innovation performance.

32 Republic of Korea, Ministry of Science and Technology 2003b; KICOS 2004.

33 The response rate was 55%.

34 This number is higher than that reported in the 2004 UNCTAD survey on FDI in services, in which only one-third of the IPAs responded that they promoted FDI in R&D activities (*WIR04)*. This may imply that an increasing number of IPAs are quickly responding to new opportunities created by the internationalization of R&D networks.

35 Frequent use of general promotion was also reported by IPAs that do *not* actively target R&D-related FDI.

36 This applies to both foreign and local companies.

37 For example, as part of the joint venture agreement between Nissan Motor and Dongfeng Motor Corporation, the building of an R&D centre began in December 2004. Meanwhile DaimlerChrysler, Honda Motor and Hyundai Motor, together with their respective local joint-venture partners, have announced plans to establish R&D centres in China. In addition Shanghai GM and Shanghai Volkswagen have both decided to expand their existing R&D centres. An estimated four billion yuan (about $0.5 billion) will be invested in R&D in the industry. See "Can four billion Yuan in R&D heal the pain of China's automotive technology?" *Jiefang Daily*, 26 January 2005. [In Chinese].

38 In South Africa for example, the Foreign Investment Grant, which was established in 2000, intended among other things to induce investors to bring in new machinery and equipment. As of 2003, the system had not been able to induce the level of technology transfer that the Government had hoped for (UNCTAD 2003c, pp. 196-197).

39 Similar findings were reported by Ernst 1999.

40 It is argued that Governments are better placed to take on risk than firms or financial institutions for two reasons. First, they may be able to spread risks over a larger number of projects. Secondly, they may assess the risks differently; even a commercially unsuccessful R&D project could be worth pursuing if it generates enough knowledge from which the society can benefit.

41 Although the estimates of the social return from R&D investment vary, empirical studies indicate that there are important spillover effects (Jones and Willams 1998).

42 For a recent comprehensive report on the tax treatment of the 25 EU member countries as well as the United States and Japan, see IBFD 2004. For more information on various schemes in use in developed countries, see Gregory and Botha, 2003. For country-specific information on R&D support programmes, see also EIU (2004b) for Australia, EIU (2001) for Austria, EIU (2004c) for Belgium, EIU (2004d) for Canada, EIU (2004e) for France, EIU (2004f) for Germany, EIU (2004g) for Greece, EIU (2004h) for Italy, EIU (2004i) for Japan, EIU (2004j) for Spain, EIU (2004k) for Switzerland, EIU (2004l) for the United Kingdom and EIU (2004m) for the United States.

43 "Brussels hopes research money will aid innovation", *Financial Times*, 3 April 2005.

44 A high-level group chaired by the former Prime Minister of the Netherlands, Wim Kok, had already

proposed that incentives be used to strengthen the science base and make the EU more competitive (European Commission 2004, p. 21).

45 See EIU (2004b) for Australia and www.irap-pari.nrc-cnrc.gc.ca for Canada.

46 Network World Fusion, www.nwfusion.com.

47 Circular of the Ministry of Foreign Trade and Economic Cooperation concerning the establishment of foreign-invested research and development centres, file No. 218, 18 April 2000

48 The rules differ somewhat between firms performing R&D on a contractual basis and those undertaking R&D in-house R&D (EIU 2004o).

49 Singaporean Economic Development Board, www.sedb.com.

50 In 2003 Mexico revoked its R&D credit, which was aimed at encouraging United States TNCs to shift more R&D activities to their Mexican affiliates, as the complexity of the system rendered it ineffective (EIU 2004t).

51 A company is regarded as "locally owned" if 51% of its voting shares are owned by Brazilian institutions or individuals.

52 In Israel an extra dollar of R&D subsides granted to the manufacturing sector was found to increase the long-run company-financed R&D expenditures by 41 cents on average, which was lower than expected given the dollar-for-dollar matching requirements upon which many subsidized projects are based (Lach 2000).

53 The problem of input price inflation refers to the difficulty of distinguishing the volume effect from the price effect. If incentives do stimulate extra R&D, they will result in an increased demand for input into R&D. If the supply of R&D inputs such as highly skilled professionals is limited, increased demand will result in raising the price of R&D inputs. Thus an increase in R&D expenditures as a result of public support may partly be accounted for by the inflated price of these inputs.

54 In Thailand, for example, few firms took advantage of an R&D tax break because of complicated regulations and the cost of the investment involved in the R&D schemes (EIU 2004p). The Government of Mexico in 2003 decided to revoke a 30% R&D tax credit that had provided incentives for United States companies to shift more R&D activities to their foreign affiliates in Mexico. The original measure had been ineffective due to too many exceptions and clauses (EIU 2004t).

55 See Sanz 2004. Other estimates suggest that there were over 1,000 science parks worldwide in 1990 (Andersson et al. 2004, p. 152).

56 In the Russian Federation, the State Duma approved the first draft legislation in June 2005 to set up research zones of up to 2 square kilometres and offered tax incentives. See "Duma bill aims for tech parks", *The Moscow Times*, 10 June 2005.

57 Communication from Hsinchu Science-Based Industrial Park, April 2005.

58 See, for example, UNIDO, *Technology Parks: Tunisia*, at: www.unido.org.

59 See e.g., United Nations Educational Scientific and Cultural Organization (UNESCO), www.unesco.org.

60 See e.g., www.theinnovationhub.com.

61 In Singapore for instance, the transition from manufacturing-related R&D to applied and even basic research began to take place as a consequence of proactive government policies targeted at TNCs involved in such manufactures as hard disk drives and telecom equipment in the 1990s (Amsden and Tschang 2003), and the biotechnology industry in recent years. In economies such as the Republic of Korea and Taiwan Province of China, the upgrading from manufacturing to development and then to research was mainly through domestic efforts rather than foreign TNCs.

62 See for instance, Porter 1997 and Dunning 1997.

63 See Roelandt and Den Hertog (1999) for cluster-based policy measures in various countries. In Thailand, for example, the Board of Investment (BOI) in 2004 initiated new investment packages for specific industrial clusters concerned with the manufacture of hard disk drives and semiconductors. Eligible firms in these clusters are not only final producers but also suppliers.

64 The relationship between firm size and innovative activity has been found to be ambiguous (e.g. Vossen 1996).

65 For instance the "Regionalisation Finance Scheme" in Singapore is a fixed-cost financing programme designed to assist Singapore-based enterprises set up operations abroad. It is part of the Government's effort to assist Singapore-based enterprises to internationalize their operations, sell in the global market place and leverage global resources in order to grow.

66 The "go global" strategy of the Government of China was formulated in the mid-1990s and formally announced in the *Suggestion from the Central Commission of the CCP on the Tenth Five-Year Plan on National Economy and Social Development* passed in October 2000 (www.people.com.cn).

67 These regulations include the 2004 *Interim Administrative Measures on the Approval of Overseas Investment Projects* (NDRC), the 2004 *Provisions on Issues Concerning the Approval of Overseas Investment and Establishment of Enterprises* (MOC), the 2004 *Circular on the Supportive Credit Policy on Key Overseas Investment Projects Encouraged by the State* (NDRC and EIBC) and various other regulations and circulars on foreign currency management, statistics, performance assessment and State-owned assets management (People's Republic of China, MOFCOM, www.fec.mofcom.gov.cn).

68 An example of mutually beneficial cooperation exists between France and universities in China. This cooperation has resulted in the training of highly qualified researchers who could find employment both in local institutes and firms, and in foreign affiliates of French TNCs (UNCTAD 2005d).

69 Under the Colombo Plan for Cooperative Economic Development in Asia and Oceania, donor countries have offered scholarships and fellowships to developing countries in the region since 1951. The Plan supported the development of scientific and technological expertise in a number of countries (UN Millennium Project 2005, p. 92).

CHAPTER VIII

THE INTERNATIONAL FRAMEWORK

As shown in Chapter VII, national policies are critical for strengthening the NIS, as well as for encouraging and facilitating foreign investment in R&D and maximizing the benefits from it. However, in an increasingly integrated global economic system, national policies cannot be pursued in isolation. Their reach and impact are often influenced by legal and regulatory arrangements at the international level. In fact, most of the recent international investment agreements (IIAs) contain specific provisions governing FDI in R&D.[1] Other international regulatory frameworks that have a direct bearing on FDI in R&D include those that address intellectual property right (IPR) regimes and the generation, transfer and diffusion of science, technology and innovation, agreements that encourage home-country measures and corporate social responsibility, and international cooperation agreements in science and technology.

This chapter examines these various agreements in turn, and identifies issues of special relevance to FDI in R&D, both in terms of facilitating national policies to encourage FDI in R&D or restricting the policy space available to countries to design and implement such policies. These issues include entry and establishment of investment in R&D, performance requirements, use of incentives to encourage FDI in R&D, free movement of key personnel, protection of investment in R&D, home-country measures and corporate social responsibility, protection of IPRs and international cooperation in R&D.

A. International investment agreements

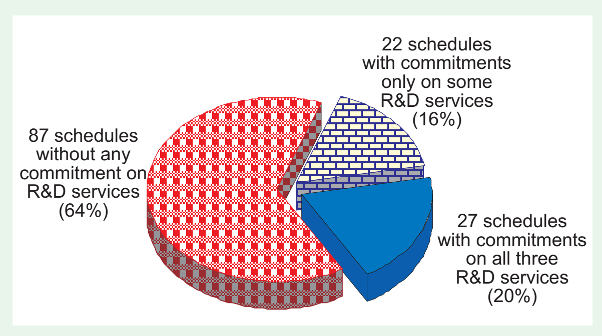
1. Entry and establishment

In general, IIAs do not impose restrictions on the entry and establishment of R&D-related investment, unless, for example, reasons of national security are involved.

Of special significance in relation to the entry and establishment of FDI in R&D is the WTO General Agreement on Trade in Services (GATS). The GATS addresses market access for R&D services through commercial presence (akin to FDI) if scheduled in a member country's list of commitments. It applies to any measure affecting trade in services (if supplied on a commercial basis), and R&D is defined and considered as one of the many services.[2] Under its positive list approach, countries indicate the industries they want to liberalize – with or without conditions. A number of countries have undertaken liberalization commitments in R&D services, some of them with partial limitations attached.

As of March 2005, 49 out of 136 members' schedules included commitments on R&D services (i.e. about 36% of WTO members have undertaken commitments in this area).[3] The majority of these (27 schedules) included commitments in all three categories of R&D: natural sciences, social sciences and humanities, and interdisciplinary R&D (figure VIII.1).

Figure VIII.1. Schedules with commitments on commercial presence in R&D services



Source: UNCTAD, based on GATS schedules of specific commitments (as of March 2005).

Twenty-six developing-country members, including two LDCs (Gambia, Nepal), 11 developed countries and 12 transition economies (including 6 new EU members) had undertaken commitments on FDI in R&D.[4]

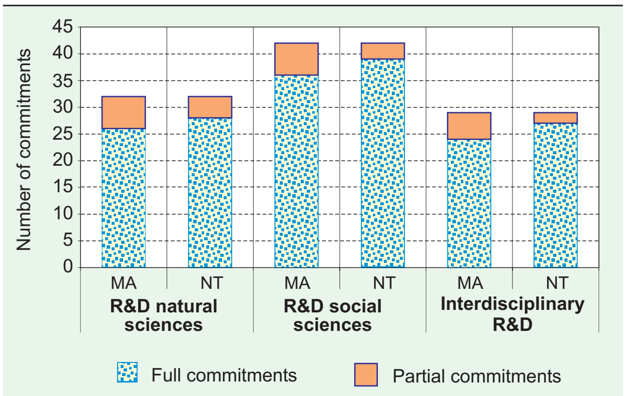
In terms of the number of commitments in different fields,[5] more countries undertook commitments on R&D in the social sciences and humanities than in the natural sciences and interdisciplinary R&D (figure VIII.2). A little more than half of the commitments made by developed countries were related to R&D in the social sciences and humanities; the rest were distributed equally between the natural sciences and interdisciplinary R&D. Commitments by developing countries, on the other hand, were evenly distributed across all three fields. Countries formerly classified as transition economies scheduled two-fifths of their commitments in relation to R&D in the social sciences and humanities, with the remainder being distributed equally between the natural sciences and interdisciplinary R&D.

Most commitments have no limitations attached. However, developing countries undertook more partial commitments with respect to market access, while developed countries undertook more partial commitments regarding national treatment. Countries formerly classified as transition economies made no partial commitments (figure VIII.3).

Partial limitations relate mainly to the ownership and control of enterprises involved in R&D services. Typical restrictions on FDI in R&D listed in the GATS schedules include requirements to have a local partner in joint ventures, a limit on the shares of foreign capital, nationality requirements for members of the board of directors and key personnel, and various licensing and registration requirements. Most limitations reflect the desire to maintain some degree of national control, while at the same time creating an enabling framework for the inflow of investments into R&D. This is the main effect of limitations on the participation of foreign capital, particularly in those cases in which the limit is set at 49% of the equity share or below. The combination of limits on foreign participation with the requirement to conduct R&D through a joint venture with local partners may be intended to ensure that spill-over of technological innovation to local partners takes place. A similar objective may also be sought by the requirements to employ nationals as key personnel and as members of the board of directors.

Some WTO members have included licensing and registration requirements as limitations in their schedules. In principle, prior licensing and registration requirements are not necessarily contrary to the GATS, and it is not mandatory to list them as limitations in the schedules of commitments, unless a country wishes to use them as instruments to discriminate against the establishment of a foreign commercial presence. This may be done to ensure that only such R&D that meets national policy

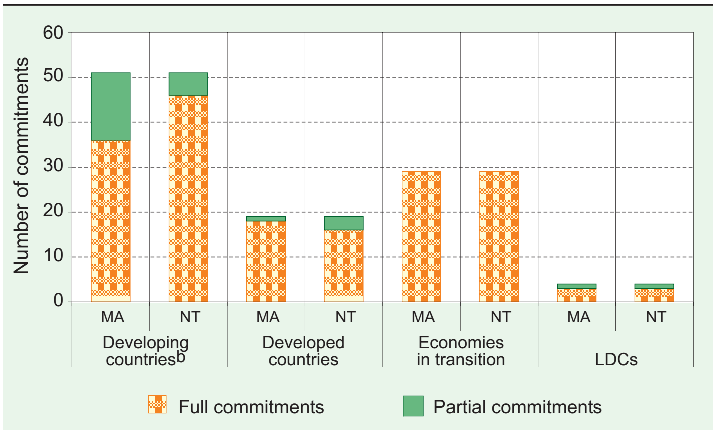
Figure VIII.2. Level of commitments under commercial presence for R&D activities



Source: UNCTAD based on GATS schedules of specific commitments (as of March 2005).

Note: MA = market access (Article XVI); NT = national treatment (Article XVII). Figures on "full commitments" relate to schedules' entries where WTO members have committed to apply no MA or NT limitations (i.e. "none" entries, in terms of GATS). "Partial limitations" count those services in which only particular listed restrictions apply, as listed in members' schedules of specific commitments.

Figure VIII.3. Level of commitments of R&D services, by group of countries[a]



Source: UNCTAD, based on the GATS schedules of specific commitments (as of March 2005).

[a] Based on former United Nations geographical classification; see footnote 4.

[b] Excluding LDCs.

Note: MA = market access (Article XVI); NT = national treatment (Article XVII). Total commitments of developing countries (excluding LDCs) amount to 51, those of developed countries to 19, those of countries formerly classified as transition economies to 29 and those of LDCs to 4. All of these cover both market access and national treatment.

requirements is permitted, and to protect national R&D development against external competition.

In sum, R&D is generally not a restricted activity in IIAs. Rather, international agreements confirm the predominance of policies seeking to encourage and facilitate FDI in R&D. However, as the experience of GATS suggests, countries may restrict liberalization in this area in order to increase the likelihood of reaping the full benefits from FDI in R&D.

2. Performance requirements

BITs generally do not address performance requirements with regard to the entry of FDI. As to the post-entry treatment of FDI, national treatment and other standards of treatment and protection apply across the board.

A small number of IIAs contain specific provisions prohibiting the use of performance requirements that mandate investment in R&D activities as a condition for entry and operation, unless they are attached to the receipt or continued receipt of an advantage. For example, the 1998 BIT between Bolivia and the United States (as well as 12 other BITs concluded by the United States) prohibits countries to "mandate and enforce, as a condition for the establishment, acquisition, expansion, management, conduct or operation of a covered investment, any requirement (including any commitment or undertaking in connection with the receipt of a governmental permission or authorization)" to "[...] (f) carry out a particular type, level or percentage of research and development in the Party's territory" (Article IV).[6] Similar prohibitions can be found in the 2002 BIT concluded between Japan and the Republic of Korea[7] and in the 2002 New Age Economic Partnership Agreement between Japan and Singapore.[8]

This approach limits the possibility for countries to devise policies to mandate R&D activities by foreign investors as a condition for their entry and operation, and therefore narrows their policy space, or at the least the mandatory character of such policies. They will have to be used only in connection with an encouragement to foreign investors (i.e. an incentive) but not as a self-standing obligation.

A different approach has been taken by NAFTA, where there is no prohibition of performance requirements attached to the entry and operation of FDI that mandate R&D activities in the territory of the host country (Article 1106(1)). Moreover, NAFTA explicitly allows their use as a condition for the receipt or continued receipt of an advantage (Article 1106(4)).[9] This approach implies that countries are free to attach conditions to the entry and operation of investments in the form of mandatory involvement in R&D activities, provided other core disciplines of the applicable agreements (such as national treatment, MFN, protection against expropriation) are adhered to. It also implies that countries are specifically allowed to apply such conditions by attaching them to an incentive.

Following the NAFTA approach, the 2004 version of the United States model BIT[10] and all investment chapters in subsequent FTAs concluded by the United States, the 2004 Canadian Foreign Investment Protection and Promotion Agreement model (hereinafter the Canada BIT model), the 2004 Japan-Mexico New-Age Economic Partnership Agreement, and the 2004 BIT between the United States and Uruguay do not prohibit the use of performance requirements relating to the establishment and operation of FDI in R&D.

3. Incentives

As stated above, R&D performance requirements relating to the entry and operation of FDI may be expressly and specifically allowed when they are a *quid pro quo* for investment incentives (i.e. when they are a condition for the receipt or continued receipt of an advantage). This further illustrates the importance countries accord to R&D policies and encouragements at the international level.

In a number of countries, R&D has traditionally been undertaken or encouraged and supported by the government. Of key importance here is the protection or denial of access by foreign investors to government-funded R&D programmes. This practice has been identified as a barrier to investment by the 2005 *United States National Trade Estimate Report on Foreign Trade Barriers*.[11] It is a sensitive issue for countries that grant substantial support to public and private research, but also for developing countries wishing to foster indigenous R&D capacity. Some countries have seen the need to safeguard flexibility for targeted encouragement and support policies at the international level by introducing reservations and exceptions to their core commitment on non-discrimination.

One approach for achieving this objective is to list a specific reservation relating to R&D subsidies. This approach has been favoured, for example, in the 2004 Agreement between Japan and the United Mexican States for the Strengthening of the Economic Partnership, in which the schedule of Japan under Annex 7 (Reservations for Future Measures) provides that "National Treatment may not be accorded to investors of Mexico and their investment with respect to subsidies for research and development".[12]

In other cases, countries do not single out R&D incentives, grants or government programmes, but have adopted general reservations and exceptions to national treatment, MFN, and provisions on entry of personnel relating to "subsidies or grants provided by a Party or a state enterprise, including government-supported loans, guarantees and insurance" (Canada BIT model, Article 9.5 (b)), with a view to denying foreign investors access to such subsidies. This approach also applies to any subsidies, grants or government programmes in the area of R&D. It may be added that a preferred avenue for dealing with incentives for an investment in R&D activities is the conclusion of individual investment or State contracts, whereby a government enters into an agreement with an investor that can also include provisions on subsidies for FDI in R&D (UNCTAD 2004d).[13] General standards of treatment still apply across the board, however, including to State contracts.

At the multilateral level, the WTO Agreement on Subsidies and Countervailing Measures (SCM) deals specifically with subsidies, including R&D subsidies. It aims at reducing and eventually eliminating subsidies that distort international trade in goods. Although it regulates subsidies related to trade in goods only, R&D subsidies could be challenged under the SCM Agreement if they are provided for services that are used in the production of exported goods, and hence can be considered a cross-subsidy on goods. This is also relevant in the case of subsidies for R&D services that form an input into traded goods.

The GATS is directly relevant to subsidies for FDI in R&D. Fifteen WTO members have lodged horizontal limitations (i.e. measures that affect all services listed in the schedule) to national treatment as far as access to R&D programmes is concerned,[14] thus ensuring against access of foreign investors to such subsidies. If such limitations are not scheduled, it may be that national treatment and MFN treatment apply to subsidies in industries that have been liberalized. On the other hand, unlike the General Agreement on Tariffs and Trade (GATT), which is supplemented by the SCM in the field of trade in goods, the GATS does not have specific disciplines on subsidies in relation to services. However, Article XV of the GATS envisages future negotiations to develop disciplines in this area.

Some WTO members have also introduced broader limitations to national treatment with regard to government subsidies through horizontal restrictions in their schedules, which apply across the board to all sectors and types of subsidies, including those in R&D. Specific horizontal limitations on subsidies may follow from national policies that reserve government assistance only to *national* research institutions and/or firms. Finally, a few limitations concerning subsidies may also be found in WTO members' schedules dealing with particular industries. In these, restrictions on subsidies may apply also to public assistance to R&D.

4. Key personnel

To ensure the effective operation of an investment, TNCs may wish to employ key foreign personnel with relevant technical skills, including R&D personnel, while host countries may wish to ensure that their nationals have the advantage of working in foreign affiliates so as to facilitate the transfer of knowledge and skills. To this end, a host country may impose restrictions on the employment of key foreign personnel. While a majority of IIAs have no specific provisions dealing with the movement of key personnel,[15] some treaties include provisions related to the admission of individuals or employees of an investor in connection with an investment so as to facilitate the employment of key personnel, including R&D personnel. These provisions apply to investors of the other contracting party, and, specifically, to personnel employed by an investor, for the purpose of establishing, administering or advising on the operation of an investment (see, for example, the United States-Romania BIT of 1992, Article II.3). The Canadian BIT model (Article 6) specifically seeks to facilitate the entry of foreign nationals employed in a capacity that requires specialized knowledge. The Australia-Thailand FTA, like many recent FTAs, has a separate chapter on the "Movement of natural persons" that covers natural persons employed by an investor in respect of an investment, with a separate entry for "specialists".[16] The same approach is taken by the GATS mode 4 ("Presence of natural persons") where countries have specifically scheduled commitments on market access concerning "intra-corporate transferees", including specialists.

Two approaches prevail in IIAs. One consists of an obligation by the host country to permit entry and sojourn subject to its laws and regulations on the entry of aliens (e.g. the 1992 BIT between the United States and Kazakhstan and the 2004 Canadian BIT model). Another approach provides for an obligation by the contracting parties to "give sympathetic consideration to applications" for the entry and sojourn of persons (e.g. the 2003 China-Germany BIT).

5. General protection of FDI in R&D

In terms of protection, most IIAs do not address the issue of FDI in R&D specifically, but refer to the protection of investment in general. Three issues are particularly relevant to the protection of FDI in R&D: the protection of IPRs by including them in the definition of investment; provisions on the free transfer of returns arising from R&D activities; and the application of the national treatment/MFN standard to foreign investors investing in R&D activities.

By using a broad definition of the term "investment", IIAs provide protection to both tangible property (e.g. research and test laboratories) and intangible assets such as IPRs that form part of the assets of an investor (e.g. patents or test data on R&D results). The inclusion of IPRs in the definition of assets takes into account their economic value. This has come to be of critical importance and central to investment protection (UNCTAD 1998, p. 35). The vast majority of IIAs define IPRs broadly. For example, the 1999 BIT between Croatia and Finland states in Article 1 that:

> ''The term 'investment' means every kind of asset established or acquired by investors of one Contracting Party in the territory of the other Contracting Party in accordance with its laws and regulations and shall include in particular, though not exclusively:
>
> …
>
> d) intellectual property rights including, but not limited to, copyrights and neighbouring rights, industrial property rights, trademarks, patents, industrial designs and technical processes, rights in plants [*sic*] varieties, know-how, trade secrets, trade names and goodwill;''

This emphasis on IPRs forming part of the protected assets signifies that their economic value will be taken into account in case of compensation. This may provide additional comfort for investment in R&D where IPRs are crucial – both the ones that form part of the assets contributed by the investor when making the investment, and the ones that derive from the operation of the investment (i.e. the carrying out of R&D activities by TNCs in a host country).

Furthermore, by including IPRs in the definition of protected investment, the protection against direct and indirect expropriation offered by an agreement could potentially also encompass protection against compulsory licensing, where it can be shown that this has an expropriatory purpose and that it is carried out in breach of the protective standards of treatment contained in the applicable IIA and in disregard of the relevant provisions of IPR agreements (UNCTAD 2001).

To avoid such a far-reaching interpretation of the expropriation provision, several agreements, such as the recent United States and Canada model BITs, explicitly carve out from the scope of expropriation "the issuance of compulsory licenses granted in relation to IPRs in accordance with the TRIPS Agreement" (United States model BIT, Article 6.5; see also the Canada model BIT, Article 13.5).

When it comes to the free transfer of funds – licence fees, "royalties, technical assistance and technical fees … accruing from any investment of the investors" (Article 6 of the 1997 Malaysia-Ghana BIT) – relevant provisions in IIAs also apply to FDI in R&D, as the proceeds of such investment generally take the form of licence fees and other royalties.

As indicated above, countries have to be careful when designing and implementing their national policies if they want to reserve some special treatment to local R&D companies, and if they do not want to give to foreign investors access to all their available incentives or support packages.

Finally, investors can also benefit from the general protection provided by national treatment and MFN standards. A direct implication for investment projects in R&D is that (unless exceptions apply) any subsidies, grants and government funds are available to foreign investors on the same conditions as they are for national companies performing R&D. But, as indicated earlier, several treaties seek to "carve out" access to such programmes from the scope of the provision on national treatment. A more general carve-out, as far as taxation issues are concerned (e.g. as in the Canada model BIT of 2004), may also provide for the possibility to give special treatment to domestic firms when government policy takes the form of tax incentives.

6. Home-country measures and corporate social responsibility

Some international agreements encourage the use of home-country measures in the area of R&D. For example, Article 66 (2) of the WTO Agreement on Trade-related Aspects of Intellectual Property Rights (TRIPS) states that "[d]eveloped country Members shall provide incentives to enterprises and institutions in their territories for the purpose of promoting and encouraging technology transfer to least developed country Members in order to enable them to create a sound and viable technological base".

In addition, home countries of TNCs can also encourage their firms to participate actively in international cooperation on R&D by investing in R&D activities and establishing linkages with local and regional firms. Such encouragement is also sought by international agreements (box VIII.1).

Even when provisions are hortatory (i.e. non-binding), some of these instruments provide an enabling framework within which TNCs are encouraged to operate and invest in R&D-related activities in developing countries.

Box VIII.1. The OECD Guidelines for Multinational Enterprises

Chapter VIII ("Science and Technology") of the 2000 OECD Guidelines for Multinational Enterprises provides that corporations should:

"1. Endeavour to ensure that their activities are compatible with the science and technology (S&T) policies and plans of the countries in which they operate and as appropriate contribute to the development of local and national innovative capacity.

2. Adopt, where practicable in the course of their business activities, practices that permit the transfer and rapid diffusion of technologies and know-how, with due regard to the protection of intellectual property rights.

3. When appropriate, perform science and technology development work in host countries to address local market needs, as well as employ host country personnel in an S&T capacity and encourage their training, taking into account commercial needs.

4. When granting licenses for the use of intellectual property rights or when otherwise transferring technology, do so on reasonable terms and conditions and in a manner that contributes to the long term development prospects of the host country.

5. Where relevant to commercial objectives, develop ties with local universities, public research institutions, and participate in co-operative research projects with local industry or industry associations."

Source: OECD.

B. International rules relating to IPRs

International rules on IPR protection are increasingly setting parameters for national policies in the area of the generation, transfer and diffusion of technology.[17] Such rules may provide incentives for TNCs to undertake FDI in R&D,[18] but at the same time they may also restrict a country's freedom to implement national policies concerning IPRs and R&D development.

Most relevant here is the TRIPS Agreement. That Agreement recognizes in its preamble "the underlying public policy objectives of national systems of intellectual property, including developmental and technological objectives". Furthermore, in Article 7 (entitled "*Objectives*"), it states as objectives of IPR protection and enforcement to "contribute to the promotion of technological innovation and to the transfer and dissemination of technology, [...] in a manner conducive to social and economic welfare, and to a balance of rights and obligations". It also recognizes the authorization of WTO members to control the abuse of IPRs.[19] The TRIPS Agreement establishes international minimum standards of protection and enforcement for R&D-relevant IPRs such as patents and undisclosed information (trade secrets).[20] These standards may contribute to making host countries safer destinations for FDI in R&D by obliging the provision of effective protection of IPRs (box VIII.2; see also chapters V and VII). A number of recent IIAs have extended the TRIPS minimum standards, thus setting further disciplines on the national regulation of IPRs ("TRIPS-plus") (box VIII.3),[21]

Box VIII.2. TRIPS minimum IPR standards of relevance to FDI in R&D and TRIPS flexibilities of relevance to host-country R&D

Minimum standards

- The TRIPS Agreement contains provisions on national treatment and MFN. Both apply to natural and juridical persons with regard to the protection of intellectual property. These provisions remove any discrimination between domestic and foreign firms in the protection of intellectual property.
- The Agreement extends protection to both product patents and process patents in all fields of technology, including, with certain qualifications, pharmaceutical and biotechnological products.[a]
- It also obliges members to make patents available, without discrimination as to the place of invention, the field of technology or whether the products are imported or produced locally.[b] The latter may be interpreted as prohibiting the imposition on foreign investors of "local working" requirements for patents (providing compulsory licensing or revocation of the patent if the protected product is not produced locally but imported).[c] The protection of foreign investors' R&D assets is thereby made less dependent on a particular performance.

Flexibilities

- The TRIPS Agreement leaves members the freedom to define criteria of patentability, namely novelty, inventive step and industrial applicability (Article 27.1).
- It appears not to contain obligations to make patents available for new uses of known products ("second uses") (although there is no WTO practice on this matter).
- It contains no obligation to provide patents on "plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes" (Article 27.3(b)).
- The TRIPS Agreement gives WTO members the discretion to include in their patent laws the obligation for a patent applicant to indicate the best mode for carrying out the invention known to the inventor at the filing date or, where priority is claimed, at the priority date of the application (Article 29). This complements members' obligations under the same provision to require a patent applicant to disclose his/her invention in return for obtaining a patent. This information is usually published 18 months after the filing of the application. The repository of patent information is perhaps the single largest existing source of technological information available for developing countries.
- The Agreement also allows limited exceptions to exclusive patent rights "provided that such exceptions do not unreasonably conflict with a normal exploitation of the patent and do not unreasonably prejudice the legitimate interests

/...

Box VIII.2. TRIPS minimum IPR standards of relevance to FDI in R&D and TRIPS flexibilities of relevance to host-country R&D (concluded)

of the patent owner, taking account of the legitimate interests of third parties" (Article 30). This provision has been used in most jurisdictions to establish exceptions to patent rights for some forms of experimental or research uses. The scope of such exceptions varies by country.

- The Agreement leaves members the freedom to issue compulsory licences to third parties, provided a number of conditions are met (Article 31), as confirmed in the Doha Declaration on TRIPS and Public Health. In order to facilitate the use of compulsory licensing by members lacking sufficient domestic pharmaceutical manufacturing capacities, the General Council Decision of 30 August 2003 (WT/L/540) on "Implementation of Paragraph 6 of the Doha Declaration on the TRIPS Agreement and Public Health" waived certain requirements under Article 31 on a temporary basis. Members of the WTO have so far failed to replace this transitional waiver with a permanent amendment to the Agreement.
- The TRIPS Agreement also gives members discretion to choose their own regime of exhaustion of IPRs (Article 6), equally confirmed in the Doha Declaration on TRIPS and Public Health.
- The Agreement authorizes the control of IPR abuses through competition laws and policies, in particular in licensing agreements (e.g. between local researchers and TNCs) (Article 8.2 and Article 40).
- LDC members have been allowed extendable transition periods for the implementation of the TRIPS minimum standards (1 January 2006 in general;[d] 1 January 2016 for the application of patent rights and rules on the protection of undisclosed information to pharmaceutical products).[e]

Source: UNCTAD, based on UNCTAD-ICTSD 2005.

a Article 27.3(b), TRIPS Agreement, contains optional exemptions from patentability in the area of biotechnology products. Article 65.4, TRIPS Agreement, authorized for developing countries a transition period until 1 January 2005 for products not protectable under national patent law on 1 January 2000. This applies mainly to pharmaceutical products.

b Article 27.1, TRIPS Agreement.

c According to some views in the literature, the non-discrimination obligation under Article 27 TRIPS does not apply to *bona fide* distinctions between local and foreign production, in particular in the area of public health and the promotion of affordable access to essential medicines. For details, see UNCTAD-ICTSD 2005, chapter 25 ("Patents: Non-voluntary Uses (Compulsory Licenses)").

d Except for some basic obligations such as national treatment and MFN, see Article 66.1. The TRIPS Agreement also provides that this transition period has to be extended by the WTO Council for TRIPS upon duly motivated request by an LDC. The Maldives is the first LDC to have been granted such an extension (Decision of the TRIPS Council on 15 June 2005, IP/C/35).

e See paragraph 7 of the Doha Declaration on the TRIPS Agreement and Public Health, WT/MIN(01)/DEC/W/2, and the Decision of the Council for TRIPS of 22 June 2002, IP/C/25.

assuming that this may provide an additional incentive for FDI in R&D.

At the same time, these international obligations restrict national policy space within which IPRs and R&D development policies can be implemented. One example is the TRIPS provision that denies WTO members the right to exempt certain fields of technology from patent protection or to limit the latter to processes only (which would leave all new products in the public domain).[22] Also, the potential prohibition of local working requirements (box VIII.2) could reduce a host country's possibilities of promoting access by local researchers to foreign technologies. Moreover, TRIPS-plus agreements make it more difficult for local R&D actors to access first-generation inventions (due to some TRIPS-plus obligations to extend the patent term for unknown uses of already patented products). As a result, some countries have resisted the inclusion of the full range of provisions noted in box VIII.3.

The effects that limitations of national policy space may have on technological development often depend on a country's level of domestic technological capacity (chapter VII). In the past, some countries have used lax IPR protection to encourage development in some industries, and strengthened their IPR protection policies once these industries had prospered. The Indian pharmaceutical industry and its interaction with patent regimes is one example. This industry has attained its high level of development partly because the Indian Patent Act of 1971 denied patent protection to pharmaceutical products. This gave the domestic industry an opportunity to build up capabilities in imitative product innovation. Some Indian companies developed their own expertise and technological capacity, reflected in sharply increased R&D expenditures in the 1990s, from $36.5 million in 1990/91 to $73.6 million in 1999/00 (UNCTAD 2003d, p. 109). The introduction of patent protection from 1 January 2005, in fulfilment of India's TRIPS obligations, corresponds with calls from Indian pharmaceutical companies for enhanced protection of their new assets. Existing firms can now enjoy patent protection for their earlier technological innovations.

For these and other reasons, it is essential for countries, in particular developing countries and LDCs, to understand and make use of the flexibilities contained in the TRIPS Agreement (box VIII.2). There is also a need for additional technical assistance and capacity building, as provided for in Article 67 of the TRIPS Agreement, with a view to facilitating the development-oriented implementation of IPRs for the promotion of local R&D capacities.

C. International cooperation in R&D

Several international agreements also aim to encourage international cooperation in the area of R&D. They do so by establishing cooperation among the State parties to the agreements, thereby providing an enabling framework for private-sector R&D projects and FDI in R&D. Such cooperation can either take place in a broader context, for example at the regional level, or be encouraged through specific science and technology cooperation agreements. Given the will of the parties to do so, both approaches can help build domestic innovatory capacity and provide a framework in which national policies aimed at encouraging FDI in R&D can be developed to benefit from the greater impact and/or stronger support of the international community.

As far as the broader cooperation context is concerned, some IIAs, particularly some recent FTAs, contain provisions promoting R&D collaboration in scientific and industrial endeavours. This may involve joint research projects in fields of common interest, the exchange of scientists and researchers and the fostering of relations between research centres.[23] Several agreements extend this to the promotion of FDI in R&D (box VIII.4). International cooperation in the area of R&D is particularly pertinent at the regional level within the context of regional economic integration. Here, it could

Box VIII.3. TRIPS-plus provisions of potential relevance to FDI in R&D and local R&D

A number of recent IIAs require their parties to:

- Extend the patent term in cases of delays in the granting of the patent caused by the regulatory approval process (mainly in the field of medicines).
- Provide patents for new uses of known products ("second uses"), as opposed to the TRIPS Agreement.
- Extend patent protection to plants and animals.
- Provide for exclusive rights in pharmaceutical test data (Article 39.3 of the TRIPS Agreement may be interpreted as leaving Members the freedom to protect such data through non-exclusive rights only).[a]

These provisions make R&D activities more expensive and complicated than before for competitors. For example, a system of data exclusivity prevents regulatory authorities responsible for granting marketing approval from relying on test data first submitted by the data originator. In order to receive marketing approval, the competitor has to carry out the same tests as already undertaken by the data originator. The competitors are thus obliged to focus their R&D activities on the reproduction of expensive testing, instead of concentrating efforts on follow-on R&D that could improve the existing products or adapt them to particular local needs.

Source: UNCTAD.

[a] There is no WTO jurisprudence or authoritative interpretation on this matter.

Box VIII.4. The promotion of R&D investment in regional agreements

Several regional IIAs address investment in R&D. For example, Article 46 of the Association Agreement between the European Community and Egypt (which came into effect in 2004) – entitled "Investments and promotion of investments" – states that: "Cooperation shall aim at increasing the flow of capital, expertise and technology to Egypt through, inter alia: appropriate means of identifying investment opportunities and information channels on investment regulations. [...] Cooperation may extend to the planning and implementation of projects demonstrating the effective acquisition and use of basic technologies". In addition, the agreement includes specific clauses on cooperation in science and technology (Article 43) and industrial cooperation, including in R&D (Article 45). In this case, the agreement seeks to promote R&D and facilitate FDI and technology transfer to the developing partner, thereby strengthening its R&D capacity.[a]

Some regional groupings of developing countries place emphasis on cooperation among their members in the area of science and technology, identifying R&D as a specific area for cooperation. This approach has been taken in Protocol III on Industrial Policy Amending the Treaty Establishing the Caribbean Community: "Mindful of the imperatives of research and development and technology transfer and adaptation for the competitiveness of Community enterprises on a sustainable basis" (Preamble), the contracting parties seek to adopt measures to promote market-led research, technological development, encourage public/private sector cooperation in research and technological development activities and facilitate cooperation between private sector enterprises to integrate the results of research and technological development (Article VIII, replacing Article 44 with Article 43.1 and 2(a) and (c)).

Within the broader ASEAN cooperation framework, the Agreement on ASEAN Energy Cooperation of 1986 (as amended in 1995) specifically identifies private sector participation in the cooperation among ASEAN member countries in the area of technological research, development and demonstration (Article 1.2(iii)).

Similarly, the Treaty establishing the Common Market for Eastern and Southern Africa (COMESA) includes specific clauses that seek to promote industrial R&D, the transfer, adaptation and development of technology, and linkages through the provision of investment incentives to industries (Treaty Establishing COMESA, Article 100d).

Source: UNCTAD.

[a] Similar provisions can be found in other agreements entered into by the European Community; see for example the Association Agreements with Algeria (art. 51), Chile (art. 36), Jordan (art. 64, 73), and the Palestinian Liberation Organization (art. 38, 49), the Cooperation Agreements with Armenia (art. 51, 56), Brazil (art. 10, 16), the Lao People's Democratic Republic (art. 10), Sri Lanka (art.4, 9), and South Africa (art. 55); and the Partnership Agreements with Georgia (art.53) and the Russian Federation (art. 62, 77).

lead to the development of competitive industries, in which members can pool their resources, share the costs and risks and enhance opportunities for regional or local enterprises.[24] However, where this approach ignores foreign investors from outside the region, it may risk excluding a significant source of technology and cooperation (UNCTAD 2001).

Science and technology cooperation agreements are another avenue of international R&D cooperation that has a direct bearing on FDI in R&D. These agreements focus specifically on international R&D cooperation, and offer a framework within which countries can develop policies encouraging local and foreign investors to participate in specific R&D projects. Frameworks established by such agreements can facilitate the flow of information, the formation of alliances, the pooling of financial resources, the joining of technological expertise and endowments, the financing of technology matchmaking and the creation of public-private sector partnerships. These global approaches are important for promoting FDI in R&D and, more broadly, the internationalization of R&D.

* * *

Within a globalized world economy, national policies aimed at the development of R&D capabilities are increasingly being complemented by rule-making at the international level. As this overview of international agreements has shown, R&D activities are given special attention in a number of international treaties, ranging from IIAs to international IPR regimes to international cooperation agreements in the field of science and technology. This multifaceted framework imposes legal and regulatory measures and standards that affect the ability of countries to devise their own policies in this regard and to develop their innovative capabilities, including through the internationalization of R&D. The implications for R&D development vary by the level of development of countries and by the types of international agreements involved.

Notes

1 Unless referenced, all IIAs (for a definition, see chapter I, footnote 45) referred to in this chapter can be found in UNCTAD 2005e, 2004c, 2002b, 2000 and 1996b and at www.unctad.org/iia.

2 According to the Provisional Common Product Classification (CPC), used by most WTO members in the GATS context, the definition of R&D covers services relating to scientific progress achieved in the various fields of the natural sciences (CPC 851), social sciences and humanities (CPC 852) and interdisciplinary R&D (CPC 853) in three areas: basic research, applied research and experimental development. FDI in any of these fields is then covered by the concept of commercial presence.

3 Compared to commitments in other sectors and areas of activity, this number is quite modest.

4 One schedule represents one WTO member country, except for the case of the European Communities and its 12 members (at the time of the signature of the GATS), which are counted as one single WTO member. All other current EU members are counted separately, as they all have presented individual lists of commitments to the GATS. From that perspective, the total number of WTO members is therefore considered to be 136, instead of the official number of 148. The 12 transition economies include six countries of South-East Europe and the CIS (Bulgaria, Croatia, The former Yugoslav Republic of Macedonia, Georgia, Kyrgyzstan, the Republic of Moldova) and six new EU members (the Czech Republic, Estonia, Hungary, Latvia, Slovakia, Slovenia).

5 WTO members were mostly free to choose the scheduling technique of their preference; not all countries followed the CPC structure, or they modified it in certain aspects. Therefore, an interpretative effort was required in some cases to make the content of different schedules compatible. As a result, these data should be considered indicative in nature and may vary from those in other studies in this area.

6 The 12 other BITs concluded by the United States that include similar provisions are with: Georgia (1994), Trinidad and Tobago (1994), Uzbekistan (1994), Albania (1995), Honduras (1995), Nicaragua (1995), Croatia (1996), Azerbaijan (1997), Jordan (1997), Mozambique (1998), Bahrain (1999), El Salvador (1999). The texts of these BITs can be found at (www.unctad.org/iia).

7 See Article 9.1.h, expressly prohibiting the use of requirements to "(h) achieve a given level or value of research and development in its territory as a condition for investment and business activities in its territory".

8 See Article 75, stating similarly in connection with "the establishment, acquisition, expansion, management, operation, maintenance, use or possession of investments".

9 Some countries have chosen to go beyond this permissive approach by making specific reservations in this regard. For example, Canada has listed a reservation in Annex 1 of NAFTA stating that prohibiting the use of performance requirements (Article 1106(1)) does not apply to any requirement, commitment or undertaking imposed or enforced in connection with a review under the Investment Canada Act, to "carry out research and development".

10 The 1994 model BIT of the United States prohibited the use of R&D performance requirements (Article VI(f)), not including conditions for the receipt or continued receipt of an advantage

11 See www.ustr.gov.

12 See also Article 10, paragraph 8, of the Energy Charter Treaty, available at: www.unctad.org/iia.

13 Individual State contracts can provide more favourable conditions for the investor than a treaty. This is usually confirmed in BITs through a provision undertaking to respect all commitments made in specific agreements, including State contracts.

14 A typical horizontal measure concerning subsidies on R&D reads: "3) Unbound for subsidies for research and development". Australia, Brazil, Cambodia, Canada, Croatia, the EU (12), Finland, Iceland, Japan, the Republic of Korea, Mexico, Norway and Slovenia have recorded such a restriction. Kuwait and Qatar have similar horizontal measures listed in their limitations on market access.

15 BITs, for example, typically submit this issue to national laws and regulations.

16 Article 1002 of the FTA between Australia and Thailand states that: "… i. **"**specialist**"** means a natural person within an organisation who possesses knowledge at an advanced level of technical expertise, and who possesses proprietary knowledge of the organisation's service, research equipment, techniques, or management; or a natural person with high-level technical or professional qualifications and skills and experience.''

17 International IPR standards (as contained, for example, in the Paris Convention for the Protection of Industrial Property) lay out the main principles for the interaction of national IPR laws with foreign investors: national treatment, right of priority and the independence of patents obtained for the same invention in different countries. Another core principle of the international intellectual property architecture, the MFN treatment obligation, was only introduced with the WTO-TRIPS Agreement.

18 IPR protection may also help to build domestic R&D capacity and encourage domestic innovation – a matter not further explored here.

19 See Article 8.2: "Appropriate measures, provided that they are consistent with the provisions of this Agreement, may be needed to prevent the abuse of intellectual property rights by right holders or the resort to practices which unreasonably restrain trade or adversely affect the international transfer of technology." Note that this provision does not allow members to deviate from their obligations, requiring that national measures be "consistent with the provisions of this agreement". Unlike other WTO Agreements such as the GATT, the TRIPS Agreement does not contain a general exception clause.

20 Other categories of IPRs covered under the TRIPS Agreement are copyright and related rights, trademarks, geographical indications, industrial designs, and layout designs of integrated circuits.

21 For an overview, see Fink and Reichenmiller 2005.

22 Article 27.1, TRIPS Agreement; see also box VIII.1.

23 For example, the Australia-Thailand Free Trade Agreement of 2004. In chapter 8 on “Trade in Services”, “Part III: Cooperation”, it spells out several areas of cooperation. Article 808 states that “1. The Parties shall strengthen and enhance existing cooperation efforts in service sectors and develop cooperation in sectors that are not covered by existing cooperation arrangements, through *inter alia*: (a) research and development...”

24 R&D cooperation within the European Union illustrates the benefits of this regional approach (see Article 163 of the Treaty Establishing the European Community). Such cooperation among European countries in areas that are very sensitive to security and economic competitiveness was facilitated at an early stage by the Treaty Establishing the European Community.

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ANNEXES

Annex table A.I.1. Cross-border M&A deals with values of over $1 billion completed in 2004

Rank	Value ($ billion)	Acquired company	Host economy	Industry of the acquired company	Acquiring company	Home economy	Industry of the acquiring company
1	15.8	Abbey National Plc	United Kingdom	Banks	Santander Central Hispano SA	Spain	Banks
2	11.1	John Hancock Financial	United States	Life insurance	Manulife Financial Corp	Canada	Life insurance
3	10.5	Charter One Finl	United States	Savings institutions, federally chartered	Citizens Financial Group	United States	National commercial banks
4	9.6	Amersham Plc	United Kingdom	Biological products, except diagnostic substances	General Electric	United States	Power, distribution, and specialty transformers
5	7.8	John Labatt Ltd	Canada	Malt beverages	Ambev	Brazil	Malt beverages
6	4.5	GAGFAH-Housing Portfolio	Germany	Dwelling operators, except apartments	Fortress Deutschland GmbH	Germany	Investors, nec
7	4.0	Braco SA	Brazil	Malt beverages	Interbrew SA	Belgium	Malt beverages
8	3.9	Edison Mission Energy Co.	Australia	Cogeneration, alternative energy sources	Investor Group	United Kingdom	Investors, nec
9	3.9	Grupo Financiero BBVA Bancomer	Mexico	Banks	BBVA	Spain	Banks
10	3.7	TXU Australia Ltd	Australia	Electric services	Singapore Power Pte Ltd	Singapore	Electric services
11	3.4	SICOR Inc	United States	Pharmaceutical preparations	Teva Pharma Inds Ltd	Israel	Pharmaceutical preparations
12	3.4	Messer Griesheim-Ind Gas Ops	Germany	Industrial gases	Air Liquide SA	France	Industrial gases
13	3.1	Canary Wharf Group Plc	United Kingdom	Land subdividers and developers, excl. cemeteries	Songbird Acquisition Ltd	United States	Investors, nec
14	2.9	Dial Corp	United States	Soap & other detergents, except specialty cleaners	Henkel KGaA	Germany	Perfumes, cosmetics, and other toilet preparations
15	2.8	Moore Wallace Inc	Canada	Manifold business forms	RR Donnelley & Sons Co	United States	Commercial printing, lithographic
16	2.7	Celltech Group Plc	United Kingdom	Commercial physical and biological research	UCB SA	Belgium	Medicinal chemicals and botanical products
17	2.7	Dynamit Nobel AG	Germany	Explosives	Rockwood Specialties Group	United States	Chemicals and chemical preparations, nec
18	2.6	Hidrocantabrico	Spain	Electric services	EDP	Portugal	Electric services
19	2.6	VNU World Directories	Netherlands	Miscellaneous publishing	Investor Group	United Kingdom	Investors, nec
20	2.4	JC Penney-Eckerd Stores	United States	Drug stores and proprietary stores	Jean Coutu Group(PJC)Inc	Canada	Drug stores and proprietary stores
21	2.4	LeasePlan Corp NV	Netherlands	Passenger car leasing	Investor Group	Germany	Investors, nec
22	2.4	GSW	Germany	Single-family housing construction	Investor Group	United States	Investors, nec
23	2.3	Tom Brown Inc	United States	Crude petroleum and natural gas	EnCana Corp	Canada	Crude petroleum & natural gas
24	2.2	Celanese AG	Germany	Industrial organic chemicals, nec	Blackstone Group LP	United States	Investors, nec
25	2.1	EnCana(UK)Holdings Ltd	United Kingdom	Crude petroleum and natural gas	Nexen Inc	Canada	Crude petroleum & natural gas
26	2.0	DDI Pocket Inc	Japan	Radiotelephone communications	Investor Group	United States	Investors, nec
27	2.0	Procter & Gamble-Hutchison Ltd	China	Soap & other detergents, except specialty cleaners	Procter & Gamble Co	United States	Soap & other detergents, except specialty cleaners
28	1.9	Fondo Immobili Pubblici	Italy	Real estate investment trusts	Investor Group	United Kingdom	Investors, nec
29	1.9	Aquila Sterling Ltd	United Kingdom	Electric services	PowerGen PLc	United Kingdom	Electric services
30	1.9	STMicroelectronics NV	Switzerland	Semiconductors and related devices	Cassa Depositi e Prestiti SpA	Italy	Personal credit institutions
31	1.9	US Premium Office Properties	United States	Operators of non-residential buildings	Investor Group	Singapore	Investors, nec
32	1.8	WCM-Residential Ppty	Germany	Real estate agents and managers	Blackstone Group LP	United States	Investors, nec
33	1.8	ATU Auto-Teile-Unger GmbH	Germany	Auto and home supply stores	Kohlberg Kravis Roberts & Co	United States	Investors, nec
34	1.7	BoCOMM	China	Banks	HSBC Holdings Plc	United Kingdom	Banks
35	1.7	If Skadeforsakring Holding AB	Sweden	Life insurance	Sampo Oyj	Finland	Investment advice
36	1.7	Vodafone KK	Japan	Radiotelephone communications	Vodafone Intl Holdings	Netherlands	Radiotelephone communications
37	1.7	Securicor Plc	United Kingdom	Security systems services	Group 4 Falck A/S	Denmark	Investors, nec
38	1.7	New Real SpA	Italy	Real estate investment trusts	Excelsia Otto	Germany	Special purpose finance
39	1.7	Brenntag AG	Germany	Chemicals and allied products, nec	Bain Capital Inc	United States	Investors, nec

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Annex table A.I.1. Cross-border M&A deals with values of over $1 billion completed in 2004 (concluded)

Rank	Value ($ billion)	Acquired company	Host economy	Industry of the acquired company	Acquiring company	Home economy	Industry of the acquiring company
40	1.7	Gas Transmission NW Corp	United States	Natural gas transmission	TransCanada Corp	Canada	Electric services
41	1.7	Koninklijke Vendex KBB NV	Netherlands	Department stores	VDXK Acquisition BV	United States	Special purpose finance
42	1.7	Picard Surgeles SA	France	Grocery stores	BC Partners Ltd	United Kingdom	Investors, nec
43	1.6	Koram Bank	Korea, Republic of	Banks	Citigroup Inc	United States	National commercial banks
44	1.6	Sophia SA	France	Lessors of real property, nec	GE Capital Real Estate	United States	Lessors of real property, nec
45	1.5	Verizon-Canadian Directory Bus	Canada	Miscellaneous publishing	Bain Capital Inc	United States	Investors, nec
46	1.5	Ashanti Goldfields Co Ltd	Ghana	Gold ores	Anglogold Ltd	South Africa	Gold ores
47	1.5	Contact Energy Ltd	New Zealand	Electric services	Origin Energy Ltd	Australia	Electric services
48	1.5	MONY Group Inc	United States	Life insurance	AXA Financial Inc	United States	Life insurance
49	1.5	BSN Glasspack SA	France	Glass containers	Owens-Illinois Inc	United States	Glass containers
50	1.5	ChipPAC Inc	United States	Semiconductors and related devices	ST Assembly Test Services Ltd	Singapore	Instruments to measure electricity
51	1.5	MobilTel AG	Bulgaria	Radiotelephone communications	BidCo AD	Austria	Special purpose finance
52	1.4	Vimpelcom OJSC	Russian Federation	Radiotelephone communications	Alfa Telecom Ltd	British Virgin Islands	Telephone communications, except radiotelephone
53	1.4	Four Seasons Health Care Ltd	United Kingdom	Nursing&personal care facils	Investor Group	Germany	Investors, nec
54	1.4	Vodafone Holdings KK	Japan	Telephone communications, except radiotelephone	Vodafone Intl Holdings	Netherlands	Radiotelephone communications
55	1.4	La Rinascente SpA	Italy	Department stores	Auchan SA	France	Grocery stores
56	1.4	Savoy Group Ltd	United Kingdom	Hotels and motels	Investor Group	Ireland	Investors, nec
57	1.4	NK Slavneft	Russian Federation	Oil and gas field exploration services	British Petroleum Plc	United Kingdom	Soap & other detergents, except specialty cleaners
58	1.4	Burns Philp-Herbs & Spice Div	United States	Food preparations, nec	Associated British Foods Plc	United Kingdom	Bread and other bakery products, except cookies
59	1.3	Telefonica Movil Chile SA	Chile	Radiotelephone communications	Telefonica Moviles SA	Spain	Radiotelephone communications
60	1.2	IGEN International Inc	United States	Pharmaceutical preparations	Roche Holding AG	Switzerland	Pharmaceutical preparations
61	1.2	Community First Bankshares	United States	State banks,member fed reserve	BancWest Corp,Honolulu,HI	United States	State banks
62	1.2	Gold Fields Ltd	South Africa	Gold ores	Norimet Ltd	United Kingdom	Metals service centres and offices
63	1.2	Bank of Bermuda Ltd	Bermuda	Banks	HSBC Holdings Plc	United Kingdom	Banks
64	1.2	Telcel Celular SA	Venezuela	Radiotelephone communications	Telefonica Moviles SA	Spain	Radiotelephone communications
65	1.1	FIH Erhvervsbank A/S	Denmark	Banks	Kaupthing Bunadarbanki hf	Iceland	Banks
66	1.1	Vodafone Holdings KK	Japan	Telephone communications, except radiotelephone	Vodafone Intl Holdings	Netherlands	Radiotelephone communications
67	1.1	Loral Space-Satellites(6)	United States	Communications services, nec	Intelsat Ltd	Bermuda	Communications services, nec
68	1.1	Weetabix Ltd	United Kingdom	Cereal breakfast foods	Latimer Acquisitions Ltd	United Kingdom	Special purpose finance company
69	1.1	Bellsouth-Colombian Operations	Colombia	Radiotelephone communications	Telefonica Moviles SA	Spain	Radiotelephone communications
70	1.0	First Active Plc	Ireland	Mortgage bankers and loan correspondents	Royal Bank of Scotland Group	United Kingdom	Banks
71	1.0	ICA AB	Sweden	Grocery stores	Koninklijke Ahold NV	Netherlands	Grocery stores
72	1.0	Dollarama	Canada	Department stores	Bain Capital Inc	United States	Investors, nec
73	1.0	CalWest LLC-Indl Ppty Portfoli	United States	Operators of nonresidential buildings	Investor Group	Australia	Investors, nec
74	1.0	Friedrich Grohe AG & Co KG	Germany	Plumbing & heating equipment & supplies(hydronics)	Investor Group	United States	Investors, nec
75	1.0	Petrom SA	Romania	Crude petroleum and natural gas	OMV AG	Austria	Crude petroleum & natural gas

Source: UNCTAD, cross-border M&A database.

Note: Where the ultimate parent company is different, M&A deals within the same economy are still considered cross-border M&As.

Annex table A.I.2. Number of greenfield FDI projects, by destination, 2002-2004

Destination economy/region	Total 2002	Total 2003	Total 2004
World	5 656	9 303	9 796
Developed countries	2 721	3 843	4 070
Europe	1 814	2 651	2 941
European Union	1 770	2 565	2 851
Austria	13	80	96
Belgium	62	62	99
Cyprus	9	8	6
Czech Republic	94	141	136
Denmark	25	73	86
Estonia	32	29	40
Finland	17	31	30
France	126	155	201
Germany	130	264	247
Greece	26	42	56
Hungary	210	213	211
Ireland	93	137	128
Italy	72	110	123
Latvia	38	42	27
Lithuania	36	43	22
Luxembourg	4	12	12
Malta	4	3	3
Netherlands	42	100	82
Poland	91	154	230
Portugal	42	58	69
Slovakia	44	63	85
Slovenia	13	23	16
Spain	153	215	241
Sweden	68	93	123
United Kingdom	326	414	482
Other developed Europe	44	86	90
Iceland	1	4	1
Liechtenstein	2	-	-
Norway	7	26	23
Switzerland	34	56	66
North America	632	829	801
Canada	218	241	223
United States	414	588	578
Other developed countries	275	363	328
Australia	137	180	139
Greenland	1	2	1
Israel	7	16	16
Japan	106	132	152
New Zealand	24	33	20
Developing countries and territories	2 355	4 446	4 758
Africa	169	306	262
North Africa	74	125	104
Algeria	15	21	19
Egypt	23	40	32
Libyan Arab Jamahiriya	2	4	7
Morocco	23	35	32
Sudan	3	10	5
Tunisia	8	15	9
Other Africa	95	181	158
West Africa	27	53	30
Benin	-	1	-
Burkina Faso	-	1	1
Cape Verde	1	-	-
Côte d'Ivoire	-	1	-
Ghana	2	13	4
Guinea	4	2	3
Guinea-Bissau	-	1	-
Mauritania	1	2	1
Niger	-	1	-
Nigeria	17	25	18
Senegal	2	2	3
Sierra Leone	-	4	-
Central Africa	11	21	19
Angola	6	14	16
Cameroon	2	1	1
Chad	1	-	-
Congo	-	1	1
Congo, Dem. Rep. of	1	3	1
Equatorial Guinea	1	2	-
East Africa	22	44	50
Burundi	1	-	-
Eritrea	-	1	1
Ethiopia	-	2	1
Kenya	4	12	15
Madagascar	-	3	3
Mauritius	6	3	7
Mozambique	2	5	4
Seychelles	1	-	2
Somalia	-	-	1
Tanzania, United Rep. of	2	6	6
Uganda	2	5	5
Zambia	4	4	4
Zimbabwe	-	3	1
Southern Africa	35	63	59
Botswana	3	4	5
Lesotho	-	1	-
Namibia	1	3	3
South Africa	31	55	49
Swaziland	-	-	2
Latin America and the Caribbean	562	794	794
South and Central America	525	742	743
South America	367	530	556
Argentina	44	64	73
Bolivia	10	9	14
Brazil	175	287	258
Chile	38	61	55
Colombia	26	43	47
Ecuador	11	9	21
Guyana	-	-	1
Paraguay	1	3	2

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Annex table A.I.2. Number of greenfield FDI projects, by destination, 2002-2004 (concluded)

Destination economy/region	Total 2002	2003	2004
Peru	26	30	32
Suriname	1	2	-
Uruguay	12	4	10
Venezuela	23	18	43
Central America	158	212	187
Costa Rica	7	13	7
El Salvador	6	4	7
Guatemala	3	5	3
Honduras	4	7	5
Mexico	129	168	154
Nicaragua	3	8	1
Panama	6	7	10
Caribbean and other America	37	52	51
Antigua and Barbuda	1	-	-
Aruba	-	1	-
Bahamas	2	3	1
Barbados	2	-	1
Bermuda	1	1	-
Cuba	4	6	5
Dominican Rep.	7	11	9
Guadeloupe	-	1	-
Haiti	1	-	-
Jamaica	3	5	4
Martinique	-	1	-
Puerto Rico	12	19	29
Saint Lucia	-	1	-
Trinidad and Tobago	4	3	2
Asia and Oceania	1 624	3 346	3 702
Asia	1 621	3 340	3 696
West Asia	233	421	403
Bahrain	24	24	15
Iran, Islamic Rep. of	10	29	23
Iraq	-	32	5
Jordan	4	15	11
Kuwait	4	7	19
Lebanon	8	20	23
Oman	10	11	14
Qatar	14	22	26
Saudi Arabia	21	32	37
Syrian Arab Rep.	2	8	6
Turkey	46	69	64
United Arab Emirates	88	146	156
Yemen	2	6	4
South, East and South-East Asia	1 388	2 919	3 293
East Asia	743	1 621	1 842
China	581	1 299	1 529
Hong Kong, China	57	90	122
Korea, Dem. People's Rep. of	-	1	-
Korea, Republic of	60	109	100
Macao, China	2	3	6
Mongolia	2	6	2
Taiwan Province of China	41	113	83
South Asia	284	514	725
Afghanistan	2	6	4
Bangladesh	9	17	7
India	250	457	685
Maldives	1	-	-
Nepal	1	1	1
Pakistan	13	23	17
Sri Lanka	8	10	11
South-East Asia	361	784	726
Brunei Darussalam	1	2	2
Cambodia	1	5	7
Indonesia	31	60	59
Lao People's Dem. Rep.	-	5	3
Malaysia	79	183	125
Myanmar	-	5	1
Philippines	28	74	74
Singapore	107	156	173
Thailand	59	161	121
Timor-Leste	-	1	-
Viet Nam	55	132	161
Oceania	3	6	6
Fiji	-	2	-
New Caledonia	2	-	2
Papua New Guinea	1	4	4
Transition economies	580	1 014	968
South-East Europe	299	352	398
Albania	12	10	7
Bosnia and Herzegovina	15	28	18
Bulgaria	77	96	109
Croatia	33	45	39
Macedonia, TFYR	8	10	7
Romania	112	116	168
Serbia and Montenegro	42	47	50
CIS	281	662	570
Armenia	2	16	6
Azerbaijan	9	25	25
Belarus	1	15	10
Georgia	4	3	6
Kazakhstan	6	36	30
Kyrgyzstan	-	6	1
Moldova, Republic of	5	8	14
Russian Federation	202	432	377
Tajikistan	-	6	4
Turkmenistan	5	13	3
Ukraine	28	72	79
Uzbekistan	19	30	15

Source: UNCTAD, based on information from OCO Consulting, LOCOmonitor website (www.locomonitor.com).

Note: Includes new (greenfield) and expansion FDI projects, both announced and realized.

Annex table A.I.3. Number of greenfield FDI projects, by industry, 2002-2004

Sector/industry	World			Developed countries			Africa			Latin America and the Caribbean		
	2002	2003	2004	2002	2003	2004	2002	2003	2004	2002	2003	2004
Total	5 656	9 303	9 796	2 721	3 843	4 070	169	306	262	562	794	794
Primary	217	473	281	31	83	45	31	76	45	78	128	83
Extraction	217	473	281	31	83	45	31	76	45	78	128	83
Manufacturing	1 929	3 176	3 108	809	1 134	1 119	66	103	88	218	318	304
Services	3 510	5 654	6 407	1 881	2 626	2 906	72	127	129	266	348	407
Electricity	26	76	58	12	33	24	4	2	2	5	17	8
Construction	263	403	369	113	130	140	14	12	15	34	47	62
Retail	741	1 217	1 463	420	632	774	16	16	21	73	87	95
Internet or ICT infrastructure	72	148	137	45	59	55	4	3	2	8	12	31
Business services	592	1 034	940	254	446	388	14	45	22	41	61	40
Research and development	331	516	642	168	188	194	1	8	3	3	17	21
Sales, marketing and support	581	1 041	1 462	336	525	682	8	18	31	42	53	76
Headquarters	292	319	358	195	185	210	1	3	5	6	6	10
Testing	58	47	39	31	18	11	-	-	1	3	4	2
Customer support centre	125	176	146	77	104	65	2	3	6	12	11	11
Logistics and distribution	275	425	507	157	203	269	6	8	11	29	26	39
Maintenance/service	41	107	74	16	43	26	-	5	4	3	2	3
Shared services centre	42	73	77	18	34	25	-	1	2	2	2	1
Technical support centre	18	17	62	13	7	26	-	-	3	-	1	2
Training	53	55	73	26	19	17	2	3	1	5	2	6

Sector/industry	Asia and Oceania			*of which:* West Asia			*of which:* South, East and South-East Asia			South-East Europe and CIS		
	2002	2003	2004	2002	2003	2004	2002	2003	2004	2002	2003	2004
Total	1 624	3 346	3 702	233	421	403	1 388	2 919	3 293	580	1 014	968
Primary	56	122	66	15	31	21	39	90	44	21	64	42
Extraction	56	122	66	15	31	21	39	90	44	21	64	42
Manufacturing	580	1 246	1 241	47	85	81	533	1 158	1 158	256	375	356
Services	988	1 978	2 395	171	305	301	816	1 671	2 091	303	575	570
Electricity	3	17	15	1	4	-	2	13	15	2	7	9
Construction	62	155	101	19	48	23	43	107	78	40	59	51
Retail	130	299	404	40	58	74	90	241	329	102	183	169
Internet or ICT infrastructure	10	51	33	1	7	2	9	44	31	5	23	16
Business services	198	377	376	42	74	66	156	301	309	85	105	114
Research and development	155	291	405	-	1	5	155	290	400	4	12	19
Sales, marketing and support	159	341	564	25	52	80	134	289	483	36	104	109
Headquarters	86	116	127	18	21	19	68	95	108	4	9	6
Testing	19	24	23	3	1	1	15	23	22	5	1	2
Customer support centre	34	57	61	2	5	2	32	52	59	-	1	3
Logistics and distribution	69	137	137	14	14	19	55	123	118	14	51	51
Maintenance/service	19	43	30	2	12	5	17	31	25	3	14	11
Shared services centre	21	35	49	1	-	-	20	35	49	1	1	-
Technical support centre	5	8	27	1	-	-	4	8	27	-	1	4
Training	18	27	43	2	8	5	16	19	38	2	4	6

Source: UNCTAD, based on information from OCO Consulting, LOCOmonitor website (www.locomonitor.com).
Note: The items under the main sectors refer to the key business function or the primary activity of each project.

Annex table A.I.4. Estimated world inward FDI stock, by sector and industry, 1990, 2003
(Millions of dollars)

Sector/industry	1990 Developed countries	1990 Developing economies	1990 World	2003 Developed countries	2003 Developing economies	2003 South-East Europe and CIS	2003 World
Primary	145 404	24 727	170 131	428 831	143 993	21 498	594 321
Agriculture, hunting, forestry and fishing	3 326	4 253	7 579	6 854	22 579	205	29 637
Mining, quarrying and petroleum	142 078	18 337	160 415	417 878	121 414	21 294	560 585
Unspecified primary	-	2 137	2 137	4 099	-	-	4 099
Manufacturing	595 142	150 410	745 552	2 081 645	779 112	15 345	2 876 102
Food, beverages and tobacco	66 744	10 010	76 754	211 181	25 983	6 278	243 442
Textiles, clothing and leather	22 277	5 224	27 501	49 055	8 545	41	57 641
Wood and wood products	19 280	4 563	23 843	78 160	15 990	1 114	95 264
Publishing, printing and reproduction of recorded media	14 444	568	15 013	59 310	4	51	59 365
Coke, petroleum products and nuclear fuel	51 526	3 147	54 672	59 309	17 702	450	77 460
Chemicals and chemical products	115 342	45 481	160 823	437 022	76 201	2 475	515 699
Rubber and plastic products	12 225	1 838	14 064	36 427	2 440	37	38 904
Non-metallic mineral products	16 079	2 835	18 914	59 928	5 526	832	66 286
Metals and metal products	47 540	15 104	62 643	153 850	23 415	1 463	178 728
Machinery and equipment	44 776	10 015	54 792	130 369	28 990	1 765	161 124
Electrical and electronic equipment	68 291	17 311	85 603	222 348	57 125	347	279 821
Precision instruments	11 312	478	11 789	32 062	1 811	92	33 964
Motor vehicles and other transport equipment	45 085	8 124	53 208	277 764	13 123	52	290 940
Other manufacturing	17 896	3 173	21 069	91 257	15 348	35	106 640
Unspecified secondary	42 324	22 539	64 863	183 604	486 910	313	670 827
Services	717 147	157 950	875 097	4 015 555	1 110 757	27 514	5 153 826
Electricity, gas and water	6 804	2 784	9 588	143 734	41 016	1 130	185 880
Construction	15 919	5 267	21 185	56 441	38 216	776	95 433
Trade	191 244	24 399	215 644	762 879	152 371	5 548	920 798
Hotels and restaurants	20 269	4 004	24 274	66 177	24 029	378	90 585
Transport, storage and communications	15 367	11 988	27 355	343 859	90 296	10 843	444 998
Finance	264 677	88 920	353 597	1 299 225	251 082	4 832	1 555 138
Business activities	107 279	14 341	121 620	831 063	448 307 [a]	3 700	1 283 070 [a]
Public administration and defence	-	57	57	1 831	383	65	2 279
Education	90	-	90	490	2	18	510
Health and social services	952	-	952	9 382	4 378	1	13 761
Community, social and personal service activities	12 795	20	12 815	68 089	5 186	192	73 468
Other services	68 585	4 517	73 102	369 438	36 711	2	406 152
Unspecified tertiary	13 165	1 654	14 819	62 947	18 778	28	81 753
Private buying and selling of property	..	..	..	1 000	-	-	1 000
Unspecified	8 822	4 229	13 051	57 055	74 859	3 245	135 159

Source: UNCTAD.

[a] A considerable share of investment in this industry is in Hong Kong (China), which accounted for 60% of developing economies stock and 21% of the world total stock. Hong Kong (China) data include investment holding companies.

Note: Data should be interpreted with caution. The world total was extrapolated on the basis of data covering 50 countries in 1990 and 63 countries in 2003, or latest year available. They accounted for over four-fifths of world inward FDI stock in 1990 and 2003. Only countries for which data for the three main sectors were available, were included. The distribution share of each industry of these countries was applied to estimate the world total in each sector and industry. As a result, the sum of the sectors for each economic group is different from the totals shown in annex table B.2. Approval data were used for Mongolia in 1992. However in the case of Cambodia, China, Indonesia, the Lao People’s Democratic Republic, Mongolia (2002), Myanmar, Nepal, Sri Lanka, Taiwan Province of China and Viet Nam, the actual data were estimated by applying the implementation ratio of realized FDI to approved FDI to the latter (33% in 1994 for Cambodia, 54% in 2002 for China, 30% in 1997 for Indonesia, 10% in 1990 and 7% in 1999 for Lao People's Democratic Republic, 44% in 2002 for Mongolia, 39% in 1990 and 45% in 2002 for Myanmar, 41% in 1990 and 47% in 1999 for Nepal, 62% in 1995 for Sri Lanka, 74% in 1990 and 63% in 2002 for Taiwan Province of China and 15% in 1990 for Viet Nam). The world total in 1990 includes South-East Europe and the CIS, although data by sector and industry are not available for that region.

Annex table A.I.5. Estimated world outward FDI stock, by sector and industry, 1990, 2003
(Millions of dollars)

Sector/industry	1990 Developed countries	1990 Developing economies	1990 World	2003 Developed countries	2003 Developing economies	2003 South-East Europe and CIS	2003 World
Primary	158 187	867	159 054	400 733	3 178	554	404 465
Agriculture, hunting, forestry and fishing	5 135	285	5 420	3 470	697	1	4 168
Mining, quarrying and petroleum	153 052	582	153 634	394 607	2 481	553	397 641
Unspecified primary	..	..	..	2 657	-	-	2 657
Manufacturing	773 322	6 109	779 432	2 117 367	103 414	392	2 221 174
Food, beverages and tobacco	74 023	420	74 443	233 185	2 060	59	235 304
Textiles, clothing and leather	19 142	187	19 329	108 596	2 712	7	111 315
Wood and wood products	21 041	80	21 121	53 803	1 462	-	55 265
Publishing, printing and reproduction of recorded media	2 218	-	2 218	11 799	-	-	11 800
Coke, petroleum products and nuclear fuel	38 500	-	38 500	28 069	274	6	28 349
Chemicals and chemical products	147 763	762	148 525	436 793	4 351	230	441 373
Rubber and plastic products	14 240	101	14 341	27 166	969	-	28 135
Non-metallic mineral products	12 845	183	13 028	19 830	864	6	20 701
Metals and metal products	64 963	85	65 048	219 894	2 618	-	222 512
Machinery and equipment	41 162	22	41 183	81 679	406	-	82 085
Electrical and electronic equipment	95 467	1 018	96 485	169 149	15 854	-	185 002
Precision instruments	13 246	-	13 246	31 040	405	-	31 445
Motor vehicles and other transport equipment	58 996	10	59 006	351 904	1 512	52	353 468
Other manufacturing	34 096	10	34 106	53 994	186	33	54 213
Unspecified secondary	135 621	3 231	138 852	290 466	69 742	-	360 209
Services	815 717	11 350	827 067	5 058 640	562 409	795	5 621 844
Electricity, gas and water	9 417	-	9 417	108 142	27	-	108 169
Construction	17 861	178	18 038	37 526	6 805	6	44 337
Trade	136 983	1 836	138 819	498 761	65 342	43	564 146
Hotels and restaurants	6 978	-	6 978	82 072	8 486	-	90 558
Transport, storage and communications	38 930	501	39 431	457 599	41 093	112	498 804
Finance	389 831	7 027	396 858	1 731 335	153 304	74	1 884 714
Business activities	53 959	1 283	55 242	1 700 643	271 469	526	1 972 639
Public administration and defence	..	..	..	5 677	-	-	5 676
Education	422	-	422	877	1	-	878
Health and social services	838	-	838	839	-	-	839
Community, social and personal service activities	3 354	-	3 354	16 133	202	-	16 336
Other services	108 148	526	108 674	371 099	13 258	34	384 391
Unspecified tertiary	48 995	-	48 995	47 936	2 421	-	50 358
Private buying and selling of property	..	..	..	1 155	-	-	1 155
Unspecified	3 413	240	3 653	143 616	51 870	21	195 507

Source: UNCTAD.

Notes: Data should be interpreted with caution. The world total was extrapolated on the basis of data covering 24 countries in 1990 and 37 countries in 2003, or latest year available. They accounted for around four-fifths of world outward FDI stock in 1990 and 2003. The distribution share of each industry of these countries was applied to estimate the world total in each sector and industry. As a result, the sum of the sectors for each economic group is different from the totals shown in annex table B.2. Approval data were used for Taiwan Province of China. For 1990, the world total includes South-East Europe and the CIS although data by sector and industry were not available for that region. Moreover, as major home developing economies were not covered due to lack of data, the respective shares for developing economies were underestimated for that year.

Annex table A.I.6. Estimated world inward FDI flows, by sector and industry, 1989-1991 and 2001-2003

(Millions of dollars)

Sector/industry	1989-1991 Developed countries	1989-1991 Developing economies	1989-1991 World	2001-2003 Developed countries	2001-2003 Developing economies	2001-2003 South-East Europe and CIS	2001-2003 World
Primary	9 552	3 725	13 276	34 260	14 597	2 780	51 637
Agriculture, hunting, forestry and fishing	- 11	610	599	81	1 699	44	1 823
Mining, quarrying and petroleum	9 523	3 115	12 638	34 215	12 899	2 736	49 850
Unspecified primary	39	-	39	- 36	-	-	- 36
Manufacturing	50 915	16 880	67 795	96 424	68 997	1 760	167 181
Food, beverages and tobacco	5 100	2 581	7 681	11 249	3 110	731	15 089
Textiles, clothing and leather	2 148	263	2 411	2 580	1 114	2	3 697
Wood and wood products	2 032	254	2 286	1 871	260	155	2 286
Publishing, printing and reproduction of recorded media	915	-	915	1 537	124	-	1 661
Coke, petroleum products and nuclear fuel	- 1 013	325	- 688	7 032	178	68	7 278
Chemicals and chemical products	11 270	2 265	13 535	13 789	5 363	103	19 255
Rubber and plastic products	954	32	987	1 260	231	2	1 493
Non-metallic mineral products	1 372	233	1 604	2 112	243	16	2 371
Metasl and metal products	4 115	1 343	5 457	8 571	1 355	48	9 973
Machinery and equipment	5 158	3 077	8 235	7 536	5 268	320	13 124
Electrical and electronic equipment	3 877	1 011	4 888	6 639	5 206	9	11 854
Precision instruments	880	-	880	18	83	22	123
Motor vehicles and other transport equipment	3 728	317	4 045	9 952	1 939	1	11 891
Other manufacturing	2 410	1 032	3 442	10 067	1 573	6	11 646
Unspecified secondary	7 970	4 148	12 118	12 211	42 952	277	55 440
Services	82 694	12 027	94 721	353 428	103 402	4 198	461 028
Electricity, gas and water	872	1 247	2 118	18 621	5 543	94	24 258
Construction	527	700	1 227	3 047	2 028	118	5 192
Trade	16 426	2 599	19 025	32 914	14 787	1 287	48 988
Hotels and restaurants	3 782	945	4 727	1 433	1 251	18	2 703
Transport, storage and communications	1 702	1 290	2 993	60 339	14 090	1 384	75 813
Finance	33 841	2 553	36 393	92 600	20 923	583	114 105
Business activities	11 591	1 565	13 155	98 293	34 072 [a]	673	133 038 [a]
Public administration and defence	2 435	-	2 436	2 590	-	5	2 595
Education	7	5	12	- 4	38	7	41
Health and social services	71	24	94	- 241	149	- 1	- 93
Community, social and personal service activities	2 391	9	2 400	5 113	3 549	23	8 685
Other services	8 191	672	8 863	32 697	3 919	2	36 618
Unspecified tertiary	859	419	1 277	6 026	3 054	6	9 085
Private buying and selling of property	120	-	120	552	-	-	552
Unspecified	7 614	4 018	11 632	11 583	6 024	664	18 272

Source: UNCTAD.

[a] A considerable share of investment in this industry is in Hong Kong (China), which accounted for 67% of inward flows to developing economies and 17% of total inward flows. Hong Kong (China) data include investment holding companies.

Note: Data should be interpreted with caution. The world total was extrapolated on the basis of data covering 67 countries in 1989-1991 and 84 countries in 2001-2003, or the latest three-year period average available. They accounted for 89 and 78 per cent of of world inward FDI flows respectively in the periods 1989-1991 and 2001-2003. Only countries for which data for the three main sectors were available were included. The distribution share of each industry of these countries was applied to estimate the world total in each sector and industry. As a result, the sum of the sectors for each economic group is different from the totals shown in annex table B.1. Approval data was used for Israel (1994 instead of 1989-1991), Mongolia (1991-1993 instead of 1989-1991) and Sri Lanka (2000-2002 instead of 2001-2003). In the case of Cambodia, China, Indonesia, Japan, Kenya, the Lao People's Democratic Repbulic, Mongolia, Myanmar, Nepal, Papua New Guinea, Solomon Islands, Sri Lanka, Taiwan Province of China, Turkey and Zimbabwe, the actual data was estimated by applying the implementation ratio of realized FDI to approved FDI to the latter: Cambodia (9% in 1994-1995 and 92% in 2000-2002), China (47% in 1989-1991), Indonesia (15% in 1989-1991), Japan (21% in 1989-1991 and 41% in 2001-2003), Kenya (7% in 1992-1994), the Lao People's Democratic Republic (1% in 1989-1991), Mongolia (45% in 2000-2002), Myanmar (21% in 1992-1994), Nepal (30% in 1989-199153% in 1996-1998), Papua New Guinea (20% in 1993-1995 and 36% in 1996-1998), Solomon Islands (1% in 1994-1995), Sri Lanka (47% in 1995), Taiwan Province of China (65% in 1989-1991 and in 2000-2002), Turkey (40% in 1989-1991) and Zimbabwe (23% in 1993-1995). The world total for 1989-1991 includes South-East Europe and the CIS, although data by sector and industry are not available for that region.

Annex table A.I.7. Estimated world outward FDI flows, by sector and industry, 1989-1991 and 2001-2003

(Millions of dollars)

Sector/industry	1989-1991 Developed countries	1989-1991 Developing economies	1989-1991 World	2001-2003 Developed countries	2001-2003 Developing economies	2001-2003 South-East Europe and CIS	2001-2003 World
Primary	10 821	79	10 900	35 174	117	120	35 411
Agriculture, hunting, forestry and fishing	530	42	572	268	4	-	272
Mining, quarrying and petroleum	10 140	37	10 177	35 021	113	120	35 254
Unspecified primary	151	-	151	- 116	-	-	- 116
Manufacturing	82 351	1 498	83 849	102 851	4 444	3	107 298
Food, beverages and tobacco	13 326	136	13 461	15 598	39	4	15 641
Textiles, clothing and leather	2 044	61	2 104	- 1 488	46	-	- 1 442
Wood and wood products	5 343	40	5 383	6 576	5	-	6 581
Publishing, printing and reproduction of recorded media	156	-	156	789	-	-	789
Coke, petroleum products and nuclear fuel	122	-	122	3 055	-	-	3 056
Chemicals and chemical products	13 150	212	13 362	16 389	108	-	16 498
Rubber and plastic products	587	35	621	1 653	14	-	1 667
Non-metallic mineral products	1 195	70	1 265	725	5	-	730
Metals and metal products	6 328	168	6 495	12 330	21	-	12 351
Machinery and equipment	7 475	7	7 483	3 337	8	-	3 345
Electrical and electronic equipment	10 419	305	10 725	8 078	765	-	8 843
Precision instruments	655	-	655	2 430	20	-	2 449
Motor vehicles and other transport equipment	5 712	-	5 712	12 617	65	- 1	12 681
Other manufacturing	8 602	5	8 607	1 478	14	-	1 492
Unspecified secondary	7 236	460	7 696	19 283	3 334	-	22 618
Services	117 209	1 020	118 229	463 975	26 778	14	490 767
Electricity, gas and water	1 015	-	1 015	14 388	51	-	14 439
Construction	2 445	31	2 476	2 096	169	-	2 265
Trade	15 594	270	15 864	48 681	3 660	2	52 343
Hotels and restaurants	416	4	420	4 636	- 322	-	4 315
Transport, storage and communications	7 689	33	7 722	83 378	632	2	84 011
Finance	49 567	446	50 013	151 620	2 893	4	154 517
Business activities	26 642	19	26 661	143 497	18 128	6	161 630
Public administration and defence	-	-	-	475	-	-	475
Education	20	-	20	142	-	-	142
Health and social services	- 124	-	- 124	74	-	-	74
Community, social and personal service activities	568	-	568	1 510	1	-	1 511
Other services	8 873	217	9 090	8 722	1 354	-	10 077
Unspecified tertiary	4 505	-	4 505	4 756	212	-	4 968
Private buying and selling of property	576	-	576	2 067	-	-	2 067
Unspecified	9 673	90	9 763	27 916	2 338	2	30 256

Source: UNCTAD.

Note: Data should be interpreted with caution. The world total was extrapolated on the basis of data covering 27 countries in 1989-1991 and 38 countries in 2001-2003, or the latest three-year period average available. They accounted for 94 and 79 per cent of of world outward FDI flows respectively in the periods 1989-1991 and 2001-2003. Only countries for which data for the three main sectors were available were included. The distribution share of each industry of these countries was applied to estimate the world total in each sector and industry. As a result, the sum of the sectors for each economic group is different from the totals shown in annex table B.1. Approval data was used for Taiwan Province of China. In the case of India and Japan, the actual data was estimated by applying the implementation ratio of realized FDI to approved FDI to the latter: India (57% in 2001-2003) and Japan (75% in 1989-1991 and 95% in 2001-2003). The world total in 1989-1991 includes South-East Europe and the CIS, although data by sector and industry are not available for that region.

Annex table A.I.8. Number of parent corporations and foreign affiliates, by region and economy, latest available year
(Number)

Region/economy	Year	Parent corporations based in economy[a]	Foreign affiliates located in economy[a]
Developed economies		**50 520[b]**	**247 241[b]**
Europe		**41 461[b]**	**209 788[b]**
European Union		**36 003[b]**	**199 303[b]**
Austria	2003	969	2 679[c]
Belgium	2003	991[d]	2 341[d]
Cyprus	2004	4 500	2 000
Czech Republic	1999	660[e]	71 385[f]
Denmark	1998	9 356	2 305[g]
Estonia	2003	351	2 858
Finland	2001	900[h]	2 030[c, g]
France	2002	1 267	10 713
Germany	2003	6 010	9 314
Greece	2003	170	750
Hungary	2003	..	26 793[i]
Ireland	2001	39[j]	1 225[k]
Italy	1999	1 017[l]	1 843[l]
Luxembourg	2002	41[m]	773[m]
Latvia	2004	7	450
Lithuania	2003	150	2 652
Malta	2004	23	132
Netherlands	2004	1 608[n]	13 365
Poland	2001	58[j]	14 469[o]
Portugal	2002	600[p]	3 000
Slovakia	2004	..	2 128
Slovenia	2000	..	1 617[q]
Spain	2004	857[r]	6 340
Sweden	2002	4 260[s]	4 656[c]
United Kingdom	2004	2 169	13 485
Other developed Europe		**5 458[b]**	**10 485[b]**
Gibraltar	2004	34	98
Iceland	2000	18	55
Norway	1998	900	5 105[t]
Switzerland	2004	4 506[u]	5 227
North America		**3 857[b]**	**28 332[b]**
Canada	1999	1 439	3 725[c]
United States	2002	2 418	24 607
Other developed countries		**5 202[b]**	**9 121[b]**
Australia	2001	682	2 352
Israel	2004	154	37
Japan	2003	4 149[v]	4 710[w]
New Zealand	2004	217[e]	2 022
Developing economies		**18 029[b]**	**335 338[b]**
Africa		**324[b]**	**5 846[b]**
North Africa		**157[b]**	**3 286[b]**
Algeria	2004	..	54
Egypt	2004	10	271
Morocco	2004	3	295
Sudan	2004	2[p]	7
Tunisia	2004	142[h]	2 659
Other Africa		**167[b]**	**2 560[b]**
West Africa		**15[b]**	**575[b]**
Benin	2004	..	19
Burkina Faso	2004	..	..
Côte d'Ivoire	2004	..	174
Gambia	2004	..	13
Ghana	2004	1	78
Guinea	2004	..	31
Guinea-Bissau	2004	..	5
Liberia	2004	..	18
Mali	2004	1	21
Mauritania	2004	2[p]	4
Niger	2004	1[p]	4
Nigeria	2004	..	124
Senegal	2004	6[p]	63
Sierra Leone	2004	1[p]	7
Togo	2004	3[p]	14
Central Africa		**4[b]**	**274[b]**
Angola	2004	..	68
Cameroon	2004	..	92
Central African Republic	2004	..	1
Chad	2004	..	9
Congo	2004	..	45
Congo, Democratic Republic of	2004	4[p]	1
Equatorial Guinea	2004	..	7
Gabon	2004	..	51
East and Southern Africa		**148[b]**	**1 711[b]**
East Africa		**51[b]**	**792[b]**
Burundi	2004	..	..
Comoros	2004	..	1
Djibouti	2004	1[p]	4
Ethiopia	2004	4[p]	21
Kenya	2004	8	170
Madagascar	2004	..	49
Malawi	2004	..	16
Mauritius	2004	4	71
Mozambique	2004	5[p]	68
Rwanda	2004	2	13
Seychelles	2004	..	24
Somalia	2001	1	..
Uganda	2003	..	255
United Republic of Tanzania	2004	15[p]	61
Zambia	2004	11	13
Zimbabwe	2004	..	26
Southern Africa		**97[b]**	**919[b]**
Botswana	2004	..	6
Lesotho	2004	..	1
Namibia	2004	..	6
South Africa	2004	85	845
Swaziland	2002	12	61
Latin America and the Caribbean		**2 914[b]**	**35 617[b]**
South and Central America		**2 301[b]**	**33 811[b]**
South America		**2 077[b]**	**6 654[b]**
Argentina	2004	42	1 383
Bolivia	2003	..	364
Brazil	2004	1 225	2 820
Chile	2004	478[x]	575
Colombia	2004	302[u]	427
Ecuador	2004	2	218
Guyana	2002	4[h]	56
Paraguay	2004	..	38
Peru	2004	10[e,y]	329
Suriname	2004	1	11
Uruguay	2002	..	164[z]
Venezuela	2004	13	545
Central America		**224[b]**	**26 881[b]**

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Annex table A.I.8. Number of parent corporations and foreign affiliates, by region and economy, latest available year (continued)

(Number)

Region/economy	Year	Parent corporations based in economy[a]	Foreign affiliates located in economy[a]
Belize	2004	4	13
Costa Rica	2004	8	173
El Salvador	2003	..	304
Guatemala	2004	..	151
Honduras	2004	1	69
Mexico	2002	..	25 708
Nicaragua	2004	..	51
Panama	2003	211	412
The Caribbean and other America		**613 [b]**	**1 806 [b]**
Antigua and Barbuda	2004	..	13
Aruba	2004	..	32
Bahamas	2004	44	158
Barbados	2004	11	146
Bermuda	2004	362	348
British Virgin Islands	2002	..	129
Cayman Islands	2004	85	470
Dominica	2004	..	2
Dominican Republic	2004	2	147
Grenada	2004	..	13
Haiti	2004	1	13
Jamaica	2004	..	74
Netherlands Antilles	2004	101	159
Saint Kitts and Nevis	2004	5	10
Saint Lucia	2004	1	20
Saint Vincent and the Grenadines	2004	1	11
Trinidad and Tobago	2004	..	61
Asia and Oceania		**14 791 [b]**	**293 875 [b]**
Asia		**14 769 [b]**	**293 427 [b]**
West Asia		**1 642 [b]**	**10 988 [b]**
Bahrain	2004	13	79
Iran, Islamic Republic of	2004	13	42
Jordan	2004	2	26
Kuwait	2004	15	35
Lebanon	2004	9	64
Oman	2004	92 [aa]	49
Qatar	2003	5	30
Saudi Arabia	2004	..	167
Syrian Arab Republic	2004	..	11
Turkey	2004	1 474	9 616
United Arab Emirates	2004	13	865
Yemen	2002	6 [p]	4
South, East and South-East Asia		**13 127 [b]**	**282 439 [b]**
East Asia		**11 049 [b]**	**245 310 [b]**
China	2003	2 000 [ab]	215 000 [ac]
Hong Kong, China	2003	948 [ad]	9 072
Korea, Republic of	2004	7 460 [ae]	16 181
Macao, China	2003	35	723
Mongolia	1998	..	1 400
Taiwan Province of China	2004	606 [af]	2 934
South Asia		**1 764 [b]**	**3 237 [b]**
Afghanistan	2004	1	2
Bangladesh	2004	2	28
Bhutan	1997	..	2
India	2004	1 700 [ag]	1 181
Maldives	2004	1	3
Nepal	2004	1 [p]	9
Pakistan	2001	59 [ah]	582
Sri Lanka	2004	..	1 430
South-East Asia		**314 [b]**	**33 892 [b]**
Brunei Darussalam	2004	1	34
Cambodia	2002	..	23 [ai]
Indonesia	2004	313 [aj]	721
Lao People's Democratic Republic	2004	..	161 [ak]
Malaysia	1999	..	15 567 [al]
Myanmar	2004	..	15
Philippines	2004	..	411
Singapore	2002	..	14 052 [am]
Thailand	1998	..	2 721
Viet Nam	2004	..	187
Oceania		**22 [b]**	**448 [b]**
Fiji	2002	2	151 [e]
Kiribati	2004	..	1
New Caledonia	2004	..	3
Papua New Guinea	2004	..	208
Samoa	2004	7 [p]	43
Solomon Islands	2004	7 [p]	18
Tonga	2004	..	5
Vanuatu	2002	6	19 [an]
South-East Europe and the CIS		**1 178 [b]**	**107 812 [b]**
South-East Europe		**124 [b]**	**97 407 [b]**
Albania	2004	..	14
Bosnia and Herzegovina	2004	1	51
Bulgaria	2000	26 [j]	7 153 [ao]
Croatia	2004	70 [e]	191
Macedonia, TFYR	2002	..	6
Romania	2002	20 [j]	89 911 [ap]
Serbia and Montenegro	2004	7	81
CIS		**1 054 [b]**	**10 405 [b]**
Armenia	2004	..	347
Azerbaijan	2004	1	30
Belarus	2004	..	25
Georgia	1998	..	190 [aq]
Kazakhstan	2004	101	1 575
Kyrgyzstan	1998	..	4 004 [ar]
Moldova, Republic of	2002	951	2 670
Russian Federation	2004	..	1 176
Ukraine	2004	1	367
Uzbekistan	2004	..	21
World		**69 727**	**690 391**

Source: UNCTAD, based on national sources.

[a] The number of parent companies/foreign affiliates in the economy shown, as defined by that economy. Deviations from the definition adopted in the *World Investment Report* (see section on "definitions and sources" in annex B) are noted below. The data for Afghanistan, Albania, Algeria, Angola, Antigua and Barbuda, Argentina, Aruba, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belize, Benin, Bermuda, Bosnia and Herzegovina, Botswana, Brazil, British Virgin Islands, Brunei Darussalam, Burkina Faso, Burundi, Cameroon, Cayman Islands, Central African Republic, Chad, Chile, Colombia, Congo, Costa Rica, Côte d'Ivoire, Democratic Republic of the Congo, Djibouti, Dominica, Dominican Republic, Ecuador, Equatorial Guinea, Ethiopia, Gabon, Gambia, Ghana, Gibraltar, Grenada, Guatemala, Guinea-Bissau, Haiti, Honduras, India, Islamic Republic

of Iran, Israel, Jamaica, Jordan, Kenya, Kiribati, Kuwait, Latvia, Lebanon, Lesotho, Liberia, Madagascar, Malawi, Maldives, Mali, Malta, Mauritania, Mauritius, Morocco, Mozambique, Myanmar, Namibia, Nepal, the Netherlands, Netherlands Antilles, New Caledonia, New Zealand, Nicaragua, Niger, Nigeria, Panama, Qatar, Paraguay, the Philippines, Saint Lucia, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Samoa, Saudi Arabia, Serbia and Montenegro, Senegal, Seychelles, Sierra Leone, Slovakia, Solomon Islands, Somalia, South Africa, Spain, Sudan, Suriname, Switzerland, Syrian Arab Republic, Togo, Tonga, Uganda, United Arab Emirates, United Republic of Tanzania, Uzbekistan, Vanuatu, Viet Nam, Western Samoa and Zimbabwe are from *Who Owns Whom 2004* (London, Dun & Bradstreet). For Argentina, Bermuda, Israel and South Africa, the number of parent corporations based in the economy refers to only those that have affiliates abroad and affiliates in the home economy. Therefore, the number of parent corporations is underestimated in those four countries.

[b] Includes data only for the countries shown below.
[c] Majority-owned foreign affiliates.
[d] Provisional figures by Banque Nationale de Belgique (2003).
[e] As of 1997.
[f] Of this number, 53,775 are fully-owned foreign affiliates; includes joint ventures.
[g] Directly and indirectly owned foreign affiliates (subsidiaries and associates), excluding branches.
[h] As of 1999.
[i] *Source*: Hungary Statistics Office.
[j] As of 1994.
[k] Refers to the number of foreign-owned affiliates in Ireland in manufacturing and services activities that receive assistance from the Investment and Development Authority (IDA).
[l] Relates to parent companies' and foreign affiliates' industrial activities (based on Consiglio Nazionale dell'Economia e del Lavoro, "*Italia Multinazionale, 2000, inward and outward FDI in Italian industry in 1998 and 1999*" April 2002.
[m] Excludes special purpose entities (SPEs), i.e. holding companies.
[n] Data refers to October 1993.
[o] Cumulative number of companies with a foreign capital share that participated in the statistical survey.
[p] As of 2001.
[q] *Source:* Bank of Slovenia.
[r] Data refer to 1998: includes those Spanish parent enterprises which are controlled, at the same time, by a direct investor.
[s] Data provided by Sveriges Riksbank; includes those Swedish parent companies that are controlled, at the same time, by a direct investor.
[t] Data refers to Norwegian non-financial joint-stock companies with foreign shareholders owning more than 10 per cent of the total shares in 1998.
[u] As of 1995.
[v] Data refer to Japanese companies that had overseas affiliates as of fiscal year ending in March 2004, except for financial, insurance and real estates industries (source: Ministry of Economy, Trade and Industry, *Survey of Overseas Business Activities*) where Japanese firms had at least two foreign affiliates with a more than 20% equity share as of November 2003 (source*: Toyokeizai, Kaigai Shinshutsu Kigyo Soran 2004*, Tokyo: Toyokeizai Shimposha, 2004).
[w] Data refer to the number of foreign affiliates in which foreign investors hold more than one-third of the stocks or shares, except for financial, insurance and real estate industries as at the end of March 2003 (source: Ministry of Economy, Trade and Industry, *Survey of Trends in Business Activities of Foreign Affiliates*) and the number of foreign affiliates in financial, insurance and real estate industries as of December 2002 (source*: Toyokeizai, Gaishikei Kigyo Soran 2003,* Tokyo: Toyokeizai Shimposha, 2003).
[x] Estimated by Comité de Inversiones Extranjeras 1998.
[y] Less than 10.
[z] Number of enterprises included in the Central Bank survey (all sectors).
[aa] As of May 1995.
[ab] Estimated by UNCTAD.
[ac] Currently existing registered foreign-invested enterprises, which include: (i) equity joint ventures (foreign equity>25%), (ii) contractual joint ventures (no equity arrangements), and (iii) wholly foreign-owned enterprises (100% foreign ownership).
[ad] Number of regional headquarters as at 1 June 2002.
[ae] As of 1999. Data refer to the number of investment projects abroad.
[af] Number of approved new investment projects abroad in 1998.
[ag] Data refer to the number of approved FDI projects as of 2003.
[ah] As of 1998.
[ai] Data refer to the number of approved foreign investment projects, including joint-venture projects with local investors. Wholly owned Cambodian projects are excluded.
[aj] As of 1996.
[ak] Number of projects licensed since 1988 up to end 2004.
[al] May 1999. Refers to companies with foreign equity stakes of 51 per cent and above. Of this, 3,787 are fully owned foreign affiliates.
[am] Number of wholly owned foreign companies.
[an] Data refer to the number of projects implemented.
[ao] The number refers to registered investment projects between 1992 and 2000, data from Bulgarian Foreign Investment Agency.
[ap] Data refer to the cumulative number of companies with FDI as at end December 2002.
[aq] Number of cases of approved investments of more than 100,000 dollars registered during the period January 1996 up to March 1998.
[ar] Joint-venture companies established in the economy.

Note: The data can vary significantly from preceding years, as data become available for countries that were not been covered before, as definitions change, or as older data are updated.

Annex table A.I.9. The world's top 100 non-financial TNCs, ranked by foreign assets, 2003[a]

(Millions of dollars and number of employees)

Ranking by: Foreign assets	TNI[b]	II[c]	Corporation	Home economy	Industry[d]	Assets: Foreign	Assets: Total	Sales: Foreign[e]	Sales: Total	Employment: Foreign	Employment: Total	TNI[b] (Per cent)	No. of affiliates: Foreign	No. of affiliates: Total	II[c]
1	77	37	General Electric	United States	Electrical & electronic equipment	258 900	647 483	54 086	134 187	150 000	305 000	43.2	1 068	1 398	76.39
2	7	95	Vodafone Group Plc	United Kingdom	Telecommunications	243 839 [f]	262 581	50 070	59 893	47 473	60 109	85.1	71	201	35.32
3	72	12	Ford Motor Company	United States	Motor vehicles	173 882 [f]	304 594	60 761	164 196	138 663 [g]	327 531	45.5	524	623	84.11
4	90	65	General Motors	United States	Motor vehicles	15 4466 [f]	448 507	51 627	185 524	104 000	294 000	32.5	177	297	59.60
5	10	78	British Petroleum Company Plc	United Kingdom	Petroleum expl./ref./distr.	141 551	177 572	192 875	232 571	86 650	103 700	82.1	60	117	51.28
6	31	41	ExxonMobil Corporation	United States	Petroleum expl./ref./distr.	116 853 [f]	174 278	166 926	237 054	53 748 [g]	88 300	66.1	218	294	74.15
7	22	80	Royal Dutch/Shell Group	United Kingdom/ Netherlands	Petroleum expl./ref./distr.	112 587 [h]	168 091	129 864	201 728	100 000 [g]	119 000	71.8	454	929	48.87
8	68	94	Toyota Motor Corporation	Japan	Motor vehicles	94 164 [f]	189 503	87 353	149 179	89 314	264 410	47.3	124	330	37.58
9	16	48	Total	France	Petroleum expl./ref./distr.	87 840 [f]	100 989	94 710	118 117	60 931	110 783	74.1	419	602	69.60
10	62	69	France Telecom	France	Telecommunications	81 370 [f]	126 083	21 574	52 202	88 626	218 523	48.8	118	211	55.92
11	14	58	Suez	France	Electricity, gas and water	74 147 [f]	88 343	33 715	44 720	111 445	172 291	74.7	605	947	63.89
12	89	34	Electricite De France	France	Electricity, gas and water	67 069	185 527	16 062	50 699	51 847 [i]	167 309	32.9	204	264	77.27
13	80	63	E.On	Germany	Electricity, gas and water	64 033 [f]	141 260	18 659	52 330	29 651	69 383	41.2	478	790	60.51
14	85	74	Deutsche Telekom AG	Germany	Telecommunications	62 624	146 601	23 868	63 023	75 241 [g]	248 519	37.0	97	178	54.49
15	59	67	RWE Group	Germany	Electricity, gas and water	60 345	98 592	23 729	49 061	53 554 [g]	127 028	50.6	377	650	58.00
16	23	23	Hutchison Whampoa Limited	Hong Kong, China	Diversified	59 141	80 340	10 800	18 699	104 529	126 250	71.4	1 900	2 350	80.85
17	32	40	Siemens AG	Germany	Electrical & electronic equipment	58 463 [f]	98 011	64 484	83 784	247 000	417 000	65.3	753	1011	74.48
18	53	46	Volkswagen Group	Germany	Motor vehicles	57 853 [f]	150 462	71 190	98 367	160 299	334 873	52.9	203	283	71.73
19	21	35	Honda Motor Co Ltd	Japan	Motor vehicles	53 113 [f]	77 766	54 199	70 408	93 006 [g]	131 600	72.0	102	133	76.69
20	34	89	Vivendi Universal	France	Diversified	52 421 [f]	69 360	15 764	28 761	32 348 [j]	49 617	65.2	106	238	44.54
21	42	83	ChevronTexaco Corp.	United States	Petroleum expl./ref./distr.	50 806	81 470	72 227	120 032	33 843	61 533	59.2	93	201	46.27
22	3	30	News Corporation	Australia	Media	50 803	55 317	17 772	19 086	35 604 [j]	38 500	92.5	213	269	79.18
23	65	29	Pfizer Inc	United States	Pharmaceuticals	48 960 [f]	116 775	18 344	45 188	73 200 [g]	122 000	47.5	73	92	79.35
24	93	85	Telecom Italia Spa	Italy	Telecommunications	46 047	101 172	6 816	34 819	14 910	93 187	27.0	33	73	45.21
25	50	18	BMW AG	Germany	Motor vehicles	44 948	71 958	35 014	47 000	26 086	104 342	54.0	129	157	82.17
26	60	53	Eni Group	Italy	Petroleum expl./ref./distr.	43 967 [f]	85 042	29 341	58 112	36 658	76 521	50.0	154	226	68.14
27	4	9	Roche Group (Umoe AS)	Switzerland	Pharmaceuticals	42 926	48 089	22 790	23 183	57 317 [g]	65 357	91.8	139	159	87.42
28	95	79	DaimlerChrysler AG	Germany/ United States	Motor vehicles	41 696 [f]	225 143	55 195	153 992	76 993	362 063	25.2	281	558	50.36
29	44	32	Fiat Spa	Italy	Motor vehicles	41 552	79 160	36 078	53 353	88 684	162 237	58.3	339	436	77.75
30	15	3	Nestlé SA	Switzerland	Food & beverages	41 078 [f]	72 402	44 308	65 329	247 506	253 000	74.1	471	501	94.01
31	55	5	IBM	United States	Electrical & electronic equipment	40 987 [f]	10 4457	55 369	89 131	180 515 [g]	319 273	52.6	315	342	92.11
32	83	47	ConocoPhillips	United States	Petroleum expl./ref./distr.	36 510 [f]	82 402	29 428	90 491	14 982 [j]	39 000	38.4	103	147	70.07
33	46	31	Sony Corporation	Japan	Electrical & electronic equipment	35 257 [f]	84 880	44 366	64 661	96 400	162 000	56.6	236	299	78.93
34	58	71	Carrefour SA	France	Retail	34 323 [f]	49 335	39 368	79 780	138 283	419 040	50.6	128	231	55.41
35	96	24	Wal-Mart Stores	United States	Retail	34 018	104 912	47 572	256 329	361 765	1500 000	25.0	67	83	80.72
36	69	54	Telefonica SA	Spain	Telecommunications	33 466 [k]	66 825	10 508	32 054	85 765 [g]	148 288	46.9	133	199	66.83
37	36	70	Veolia Environnement SA	France	Water Supply	33 399 [f]	49 154	17 578	32 283	205 694	309 563	62.9	424	760	55.79
38	43	21	Procter & Gamble	United States	Diversified	33 361	57 048	27 719	51 407	68 694 [g]	110 000	58.3	174	215	80.939

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Annex table A.I.9. The world's top 100 non-financial TNCs, ranked by foreign assets, 2003[a] (continued)

(Millions of dollars and number of employees)

Ranking by: Foreign assets	TNI[b]	II[c]	Corporation	Home economy	Industry[d]	Assets: Foreign	Assets: Total	Sales: Foreign[e]	Sales: Total	Employment: Foreign	Employment: Total	TNI[b] (Per cent)	No. of affiliates: Foreign	No. of affiliates: Total	II[c]
39	41	10	Sanofi-Aventis	France	Pharmaceuticals	33 024 [f]	44 484	12 291	22 247	36 576	75 567	59.3	335	385	87.01
40	57	16	Hewlett-Packard	United States	Electrical & electronic equipment	32 144 [f]	74 708	43 843	73 061	73 158 [j]	142 000	51.5	179	215	83.26
41	92	77	Mitsubishi Corporation	Japan	Wholesale trade	31 258 [f]	78 342	20 054	130 912	14 765 [j]	49 219	28.4	170	314	54.14
42	87	13	Deutsche Post AG	Germany	Transport and storage	29 524	195 748	19 714	45 166	175 775	383 173	34.9	341	406	83.9
43	35	62	Unilever	United Kingdom/ Netherlands	Diversified	28 654 [h]	47 952	27 635	48 186	179 000	234 000	64.5	316	522	60.54
44	6	49	Philips Electronics	Netherlands	Electrical & electronic equipment	28 524	36 626	31 594	32 773	136 750	164 438	85.8	263	378	69.58
45	63	91	Nissan Motor Co Ltd	Japan	Motor vehicles	28 517	73 388	42 002	64 082	50 836 [l]	123 748	48.5	58	146	39.73
46	11	27	Lafarge SA	France	Non-metallic products	28 127	31 365	13 117	15 415	50 524	75 338	80.6	389	489	79.55
47	66	56	Repsol YPF SA	Spain	Petroleum expl./ref./distr.	27 933	48 034	14 515	40 710	14 924	30 644	47.5	81	124	65.32
48	48	28	BASF AG	Germany	Chemicals	27 099	42 437	21 999	37 653	37 054	87 159	54.9	206	259	79.54
49	25	33	Compagnie De Saint-Gobain SA	France	Non-metallic mineral products	27 056	38 008	23 834	33 967	122 696	172 811	70.8	612	791	77.37
50	45	6	Novartis	Switzerland	Pharmaceuticals	26 748 [f]	49 317	16 076	24 864	41 031	78 541	57.0	232	256	90.63
51	84	75	Mitsui & Co Ltd	Japan	Wholesale trade	26 262 [f]	62 709	47 508	105 936	10 826 [j]	39 735	38.0	198	364	54.40
52	86	14	Altria Group Inc	United States	Tobacco	25 711 [f]	96 175	34 371	60 704	40 557 [m]	165 000	36.0	196	234	83.76
53	78	81	Endesa	Spain	Electric services	25 488	58 155	6 228	18 328	12 939	26 777	42.0	85	177	48.02
54	8	4	Alcan Inc.	Canada	Metal and metal products	25 275 [f]	31 957	13 172	13 640	38 000	49 000	84.4	306	328	93.29
55	26	90	BHP Billiton Group	Australia	Mining & quarrying	24 254	36 675	17 673	24 943	25 294	35 070	69.7	42	98	42.86
56	28	50	Glaxosmithkline Plc	United Kingdom	Pharmaceuticals	23 893	42 813	32 296	35 006	56 360 [h]	100 919	68.0	158	229	69.00
57	82	55	Renault SA	France	Motor vehicles	22 342 [f]	71 283	27 330	42 353	34 921 [g]	130 740	40.9	136	207	65.70
58	37	93	Anglo American	United Kingdom	Mining & quarrying	21 623	43 105	10 872	18 562	151 000	193 000	62.3	197	524	37.60
59	19	87	Koninklijke Ahold	Netherlands	Retail	20 884	29 552	47 744	63 282	189 945 [h]	257 140	73.3	74	164	45.12
60	20	64	AES Corporation	United States	Electricity, gas and water	20 871 [f]	29 904	6 257	8 415	216 22 [j]	30 000	72.1	56	93	60.22
61	54	22	Dow Chemical Company	United States	Chemicals	20 039	41 891	19 810	32 623	22 964 [g]	46 400	52.7	216	267	80.90
62	18	43	Volvo AB	Sweden	Motor vehicles	19 451	31 787	23 160	24 023	47 603	75 740	73.5	233	319	73.04
63	47	57	Pinault-Printemps Redoute SA	France	Wholesale trade	19 254 [f]	30 649	16 828	30 767	51 847	100 779	56.3	287	449	63.92
64	74	42	Bayer AG	Germany	Pharmaceuticals/chemicals	18 892	47 020	17 033	32 334	48 700	115 400	45.0	236	320	73.75
65	1	1	Thomson Corporation	Canada	Media	18 418	18 732	7 943	8 159	38 350	39 000	98.0	300	310	96.77
66	33	36	Singtel Ltd.	Singapore	Telecommunications	17 911	21 668	4 672	6 884	8 642 [j]	19 081	65.3	23	30	76.67
67	30	52	British American Tobacco Plc	United Kingdom	Tobacco	17 871 [h]	33 891	27 972 [n]	41 832	68 702	86 941	66.2	248	363	68.32
68	81	99	National Grid Transco	United Kingdom	Energy	17 563	41 780	7 673	15 848	9 029	27 308	41.2	42	244	17.21
69	24	2	Nokia	Finland	Telecommunications	17 050 [f]	29 273	36 763	37 202	28 979	51 359	71.2	98	103	95.15
70	99	84	Hitachi Ltd	Japan	Electrical & electronic equipment	16 296	89 545	21 177	80 602	80 226	326 344	23.0	309	670	46.12
71	49	20	United Technologies Corporation	United States	Transport equipment	16 212	34 648	14 257	31 034	143 000	203 300	54.4	345	422	81.75
72	94	68	Petronas - Petroliam Nasional Bhd	Malaysia	Petroleum expl./ref./distr.	16 114 [i]	53 457	8 981	25 661	3 625	30 634	25.7	234	411	56.93
73	38	92	McDonald's Corporation	United States	Retail	15 913	25 525	11 101	17 140	240 142	418 000	61.5	26	67	38.81
74	27	25	Stora Enso OYJ	Finland	Paper	15 910	22 646	10 382	15 373	29 156	42 814	68.6	229	285	80.35
75	61	44	Du Pont (E.I.) de Nemours	United States	Chemicals	15 840 [f]	37 039	14 888 [o]	26 996	39 657 [j]	81 000	49.0	115	158	72.78
76	12	82	Rio Tinto Plc	United Kingdom	Mining & quarrying	15 419	24 015	9 773	10 009	26 000	36 016	78.0	68	145	46.90
77	98	86	Duke Energy Corporation	United States	Electricity, gas and water	15 414 [f]	56 203	5 537	22 529	4 652 [j]	23 800	23.8	33	73	45.21

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Annex table A.I.9. The world's top 100 non-financial TNCs, ranked by foreign assets, 2003[a] (concluded)

(Millions of dollars and number of employees)

Ranking by: Foreign assets	TNI[b]	II[c]	Corporation	Home economy	Industry[d]	Assets: Foreign	Assets: Total	Sales: Foreign[e]	Sales: Total	Employment: Foreign	Employment: Total	TNI[b] (Per cent)	No. of affiliates: Foreign	No. of affiliates: Total	II[c]
78	40	38	Lvmh Moët-Hennessy Louis Vuitton SA	France	Textiles and leather	15 386 [p]	24 356	8 285	15 063	35 360	56 241	60.4	296	390	75.90
79	73	66	Thyssenkrupp AG	Germany	Metals and metal products	15 237 [f]	36 641	20 074	45 641	92 179 [j]	184 358	45.2	389	668	58.23
80	67	15	Abbott Laboratories	United States	Pharmaceuticals	15 214	26 715	7 703	19 681	33 166 [j]	72 181	47.3	103	123	83.74
81	70	76	Matsushita Electric Industrial Co., Ltd.	Japan	Electrical & electronic equipment	14 739 [f]	69 449	42 025	69 839	170 965	290 493	46.8	274	504	54.37
82	100	100	Verizon Communications	United States	Telecommunications	13 831 [f]	165 968	2 449	67 752	17 269 [j]	203 100	6.8	13	219	5.94
83	76	88	Metro AG	Germany	Retail	13 600 [f]	33 571	32 104	67 690	107 210	242 010	44.1	245	549	44.63
84	29	39	Norsk Hydro Asa	Norway	Diversified	13 429	32 729	23 158	25 716	30 866	44 602	66.8	254	335	75.82
85	52	97	Christian Dior SA	France	Textiles	13 388	31 895	8 461	15 745	36 391	56 815	53.3	10	35	28.57
86	2	8	CRH Plc	Ireland	Lumber & other building material dealers	13 184 [f]	13 976	13 070	13 608	51 694	54 239	95.2	421	476	88.45
87	64	61	Scottish Power	United Kingdom	Electric utilities	12 991	24 665	4 753	10 352	6 663	14 339	48.4	71	115	61.74
88	71	72	Alcoa	United States	Metals and metal products	12 931 [f]	31 711	8 319	21 504	70 700	120 000	46.1	104	188	55.32
89	9	11	Publicis Groupe SA	France	Business services	12 919 [f]	13 400	4 367	4 879	21 451	35 166	82.3	295	342	86.26
90	97	73	Marubeni Corporation	Japan	Wholesale trade	12 814 [f]	39 722	25 175	73 815	1 723 [j]	24 417	24.5	161	293	54.95
91	13	60	Holcim AG	Switzerland	Non-metallic mineral products	12 808 [h]	20 091	6 596	10 187	46 946	48 200	75.3	105	170	61.76
92	5	17	Cadbury Schweppes Plc	United Kingdom	Food & beverages	12 804	14 209	8 862	10 525	48 390	55 799	87.0	94	113	83.19
93	79	26	Wyeth	United States	Pharmaceuticals	12 776	29 727	6 269	15 851	21 617 [j]	52 385	41.3	67	84	79.76
94	88	96	Statoil Asa	Norway	Petroleum expl./ref./distr.	12 721	33 174	9 684	37 239	7 491	19 326	34.4	35	112	31.25
95	17	98	BAE Systems Plc	United Kingdom	Transport equipment	12 695	16 802	17 530	22 450	48 900	72 300	73.8	57	248	22.98
96	56	19	Robert Bosch GmbH	Germany	Machinery and equipment	12 683 [q]	40 410	32 761 [q]	45 919	123 000	232 000	51.9	210	256	82.03
97	51	45	Motorola Inc	United States	Telecommunications	12 618	32 098	17 983	27 058	48 400 [j]	88 000	53.6	79	109	72.48
98	39	51	Bertelsmann	Germany	Media	12 498 [f]	25 466	14 694	21 219	46 157	73 221	60.5	320	468	68.38
99	75	7	Samsung Electronics Co Ltd	Republic of Korea	Electrical & electronic equipment	12 387 [p]	56 524	41 362	54 349	19 026 [j]	55 397	44.1	80	89	89.89
100	91	59	International Paper Company	United States	Paper	12 088	35 525	6 992	25 179	28 980	82 800	32.3	93	148	62.84

Source: UNCTAD/Erasmus University database.

[a] All data are based on the companies' annual reports unless otherwise stated.
[b] TNI, the Transnationlity Index, is calculated as the average of the following three ratios: foreign assets to total assets, foreign sales to total sales and foreign employment to total employment.
[c] II, the"Internaionlaization Index", is calculated as the number of foreign affiliates divided the number of all affiliates (note: affiliates counted in this table refer to only majority-owned affiliates).
[d] Industry classification for companies follows the United States Standard Industrial Classification as used by the United States Securities and Exchange Commission (SEC).
[e] Foreign sales are based on the origin of the sales, unless otherwise stated.
[f] In a number of cases, companies reported only partial foreign assets. In these cases, the ratio of the partial foreign assets to the partial (total) assets was applied to total assets to calculate the total foreign assets. In all cases, the resulting figures were sent for confirmation to the companies.
[g] Foreign employment data are calculated by applying the share of foreign employment in total employment of the previous year to total employment of 2003.
[h] Data for outside Europe.
[i] Data were obtained from the company in response to an UNCTAD survey.
[j] Foreign employment data are calculated by applying the share of both foreign assets in total assets and foreign sales in total sales to total employment.
[k] Foreign assets data are calculated by applying the share of foreign assets in total assets of the previous year to total assets of 2003.
[l] Foreign employment data are calculated by applying the average of the shares of foreign employment in total employment of all companies in the same industry (omitting the extremes) to total employment.
[m] Foreign employment data are calculated by applying the share of foreign employment in total employment of Philip Morris in the previous year to total employment of Altria Group this year.
[n] In a number of cases companies reported only partial region-specified sales. In these cases, the ratio of the partial foreign sales to the partial (total) sales was applied to total sales to calculate the total foreign sales. In all cases, the resulting figures have been sent for confirmation to the companies.
[o] Foreign sales are based on customer location.
[p] Foreign assets data are calculated by applying the share of both foreign sales in total sales and foreign employment in total employment to total assets.
[q] Data for outside Western Europe.

Note: The list covers non-financial TNCs only. In some companies, foreign investors may hold a minority share of more than 10 per cent.

Annex table A.I.10. The top 50 non-financial TNCs from developing economies, ranked by foreign assets, 2003[a]

(Millions of dollars, number of employees)

Ranking by: Foreign assets	TNI[b]	II[c]	Corporation	Home economy	Industry[d]	Assets: Foreign	Assets: Total	Sales: Foreign[e]	Sales: Total	Employment: Foreign	Employment: Total	TNI[b] (Per cent)	No. of affiliates: Foreign	No. of affiliates: Total	II[c]
1	7	41	Hutchison Whampoa Limited	Hong Kong, China	Diversified	59 141	80 340	10 800	18 699	104 529	126 250	71.4	1900	2350	80.85
2	27	39	Singtel Ltd.	Singapore	Telecommunications	17 911 [f]	21 668	4 672	68 848	8 642 [g]	21 716	43.1	23	30	76.67
3	42	35	Petronas - Petroliam Nasional Bhd [h]	Malaysia	Petroleum expl./ref./distr.	16 114	53 457	8 981	25 661	3 625	30 634	25.7	167	234	71.37
4	26	48	Samsung Electronics Co., Ltd.	Republic of Korea	Electrical & electronic equipment	12 387	56 524	41 362	54 349	19 026 [g]	55 397	44.1	80	89	89.89
5	12	36	Cemex S.A.	Mexico	Construction Materials	11 054	16 021	5 189	7 167	17 051 [g]	25 965	69.0	35	48	72.92
6	23	37	América Móvil	Mexico	Telecommunications	8 676	13 348	3 107	7 649	8 403 [g]	18 471	50.4	12	16	75.00
7	31	24	China Ocean Shipping (Group) Company	China	Transport and storage	8 457 [f]	18 007	6 076 [i]	9 163	4 600	64 586	40.1	22	56	39.29
8	46	7	Petroleo Brasileiro S.A. - Petrobras	Brazil	Petroleum expl./ref./distr.	7 827	53 612	8 665	42 690	5 810	48 798	15.6	13	79	16.46
9	25	47	LG Electronics Inc.	Republic of Korea	Electrical & electronic equipment	7 118 [j]	20 173	14 443 [i]	29 846	36 268	63 951	46.8	134	151	88.74
10	16	34	Jardine Matheson Holdings Ltd	Hong Kong, China	Diversified	6 159 [k]	8 949	5 540 [k]	8 477	57 895 [g]	110 000	62.3	16	23	69.57
11	10	14	Sappi Limited	South Africa	Paper	4 887 [f]	6 203	3 287	4 299	9 454 [g]	16 939	70.4	115	456	25.22
12	33	45	Sasol Limited	South Africa	Industrial chemicals	4 226	10 536	5 033	9 722	5 643	31 150	36.7	21	25	84.00
13	50	30	China National Petroleum Corporation	China	Petroleum expl./ref./distr.	4 060 [f]	97 653	5 218	57 423	22 000	1 167 129	5.0	119	204	58.33
14	22	2	Capitaland Limited	Singapore	Real estate	3 936	10 316	1 449	2 252	5 033 [g]	10 175	50.7	2	61	3.28
15	8	43	City Developments Limited	Singapore	Hotels	3 879 [l]	7 329	703 [l]	930	11 549	13 703	70.9	228	275	82.91
16	4	49	Shangri-La Asia Limited	Hong Kong, China	Hotels and motels	3 672	4 743	436	542	12 619 [m]	16 300	78.4	29	31	93.55
17	15	33	Citic Pacific Ltd.	Hong Kong, China	Diversified	3 574 [f]	7 167	2 409	3 372	8 045	12 174	62.5	2	3	66.67
18	45	16	CLP Holdings	Hong Kong, China	Electricity, gas and water	3 564	9 780	298	3 639	488	4 705	18.3	3	11	27.27
19	41	21	China State Construction Engineering Corp.	China	Construction	3 417	9 677	2 716	9 134	17 051	121 549	26.4	28	75	37.33
20	24	22	MTN Group Limited	South Africa	Telecommunications	3 374	4 819	1 308	3 595	2 601	6 063	49.8	6	16	37.50
21	2	26	Asia Food & Properties	Singapore	Food & beverages	3 331	3 537	1 232	1 273	32 295 [n]	41 800	89.4	2	4	50.00
22	11	46	Flextronics International Ltd.	Singapore	Electrical & electronic equipment	3 206 [l]	5 634	4 674	8 340	80 091 [g]	82 000	70.2	92	106	86.79
23	30	17	Companhia Vale do Rio Doce	Brazil	Mining & quarrying	3 155 [f]	11 434	6 513	7 001	224	29 632	40.5	16	55	29.09
24	29	10	YTL Corp. Berhad	Malaysia	Utilities	2 878	6 248	489	1 060	1 518 [g]	4 895	41.1	24	115	20.87
25	20	38	Hon Hai Precision Industries	Taiwan Province of China	Electrical & electronic equipment	2 597	6 032	4 038	10 793	78 575 [n]	93 109	54.9	25	33	75.76
26	9	11	China Resources Enterprises [h]	Hong Kong, China	Petroleum expl./ref./distr.	2 364	4 034	2 542	4 450	76364 [g]	80 000	70.4	4	19	21.05
27	49	1	Oil & Natural Gas Corp.	India	Petroleum expl./ref./distr.	2 328	15 249	648	9 370	4 515 [n]	38 033	11.4	1	40	2.50
28	5	31	Neptune Orient Lines Ltd.	Singapore	Transport and storage	2 266	4 064	4 705	5 523	10 367 [g]	11 322	77.5	6	10	60.00
29	37	4	United Microelectronics Corporation	Taiwan Province of China	Electrical & electronic equipment	2 251	10 302	1 891	2 781	1 045 [g]	10 576	33.2	7	75	9.33
30	44	20	Singapore Airlines Limited	Singapore	Transport and storage	2 118	11 278	2 932	6 182	2 465 [g]	29 734	24.8	4	11	36.36
31	32	19	Metalurgica Gerdau S.A. [h]	Brazil	Metal and metal products	2 056 [f]	4 770	2 096	4 531	5 334	19 597	38.9	19	53	35.85
32	21	27	Barloworld Ltd	South Africa	Diversified	1 967	3 482	2 380	4 574	10 514	22 749	51.6	2	4	50.00
33	40	50	Quanta Computer Inc	Taiwan Province of China	Computer and related activities	1 934	4 593	737	8 657	5 772 [n]	17 318	28.0	4	4	100.00
34	1	42	First Pacific Company Limited [h]	Hong Kong, China	Electrical & electronic equipment	1 910	2 074	2 162	2 162	46 926	46 951	97.3	28	34	82.35
35	43	40	Hyundai Motor Company	Republic of Korea	Motor vehicles	1 780 [o]	20 334	12 008	20 935	4 825	51 837	25.1	8	10	80.00
36	36	18	Taiwan Semiconductor Manufacturing Co Ltd	Taiwan Province of China	Computers and related activities	1 539 [f]	11 957	3 787	6 067	4 442	16 997	33.8	4	12	33.33

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Annex table A.I.10. The top 50 non-financial TNCs from developing economies, ranked by foreign assets, 2003[a] (concluded)
(Millions of dollars, number of employees)

Ranking by: Foreign assets	TNI[b]	II[c]	Corporation	Home economy	Industry[d]	Assets Foreign	Assets Total	Sales Foreign[e]	Sales Total	Employment Foreign	Employment Total	TNI[b] (Per cent)	No. of affiliates Foreign	No. of affiliates Total	II[c]
37	17	3	Benq Corp.	Taiwan Province of China	Computers and related activities	1 497	2 778	1 838	3 774	11 100	14 911	59.0	1	14	7.14
38	48	23	China National Offshore Oil Corp.[h]	China	Petroleum and natural gas	1 467	14 479	1 877	6 507	1 000	24 000	14.4	41	105	39.05
39	19	28	Fraser & Neave Limited	Singapore	Food & beverages	1 395	4 536	1 232	2 140	9 951 [g]	12 878	55.2	80	148	54.05
40	39	25	Swire Pacific Limited [h]	Hong Kong, China	Business services	1 387 [f]	12 060	1 042	2 263	18 791	56 700	30.2	231	470	49.15
41	35	9	Keppel Corporation Limited	Singapore	Diversified	1 361	5 928	898	3 496	11 364	20 402	34.8	10	53	18.87
42	3	29	Yue Yuen Industrial Holdings Limited [h]	Hong Kong, China	Textiles and leather	1 317	2 569	2 470	2 520	241 800	242 000	83.1	18	33	54.55
43	13	32	Acer Inc.	Taiwan Province of China	Electrical & electronic equipment	1 244	3 451	3 637	4 640	5 374 [n]	6 368	66.3	9	14	64.29
44	28	8	Delta Electronics Inc.	Taiwan Province of China	Electronics	1 219	1 861	266	1 458	1 356 [l]	3 238	41.9	13	78	16.67
45	38	12	Grupo Bimbo SA De Cv	Mexico	Food	1 156	2 716	1 417	4 153	15 525	70 644	32.9	50	232	21.55
46	14	5	China Minmetals Corporation [h]	China	Metals mining and processing	1 150	5 352	1 933	1 168	973	33 000	63.3	22	162	13.58
47	6	44	The MUI Group	Malaysia	Hotels	1 135	1 840	499	621	9 022 [n]	11 000	74.7	166	199	83.42
48	18	13	Gruma S.A. De C.V.	Mexico	Food & beverages	1 086	2 081	1 396	2 051	8 519	15 104	58.9	12	52	23.08
49	47	6	Hongkong Electric Holdings Limited	Hong Kong, China	Electricity, gas and water	1 074	7 305	258	1 449	295 [m]	2 092	15.5	1	7	14.29
50	34	15	Nan Ya Plastics Corporation	Taiwan Province of China	Rubber and plastics	1 030	8 576	936	5 052	16 478 [n]	22 027	35.1	3	11	27.27

Source: UNCTAD/ Erasmus University database.

a All data are based on the companies' annual reports unless otherwise stated.
b TNI is calculated as the average of the following three ratios: foreign assets to total assets, foreign sales to total sales and foreign employment to total employment.
c II is calculated as the number of foreign affiliates divided by number of all affiliates (note: affiliates counted in this table refer to only majority-owned affiliates).
d Industry classification for companies follows the United States Standard Industrial Classification as used by the United States Securities and Exchange Commission (SEC).
e Foreign sales are based on the origin of the sales. In a number of cases companies reported sales only by destination.
f In a number of cases, companies reported only partial foreign assets. In these cases, the ratio of the partial foreign assets to the partial (total) assets was applied to total assets to calculate the total foreign assets.
g Foreign employment data are calculated by applying the share of foreign employment in total employment of the previous year to total employment of 2003.
h Data were obtained from the company in response to an UNCTAD survey.
i Foreign sales data are calculated by applying the share of foreign sales in total sales of the previous year to total sales of 2003.
j Foreign assets data are calculated by applying the share of foreign assets in total assets of the previous year to total assets of 2003.
k Data for outside Hong Kong (China) and mainland China.
l Data for outside Asia.
m Foreign employment data are calculated by applying the share of foreign assets in total asets to total employment.
n Foreign employment data are calculated by applying the average of the shares of foreign employment in total employment of all companies in the same industry (omitting the extremes) to total employment.
o Foreign assets are calculated by applying the share of foreign employment in total employment to the balance of total assets.

Annex table A.I.11. The top 10 non-financial TNCs from South-East Europe and the CIS,[a] ranked by foreign assets, 2003

(Millions of dollars and number of employees)

Ranking by Foreign assets	Ranking by TNI[b]	Corporation	Home country	Industry	Assets Foreign	Assets Total	Sales Foreign	Sales Total	Employment Foreign	Employment Total	TNI[b] (Per cent)
1	4	Lukoil JSC	Russian Federation	Petroleum and natural gas	7 247	26 574	16 260	22 118	13 929 [c]	150 000	36.7
2	10	Norilsk Nickel, OJSC MMC	Russian Federation	Mining	1 518	5 916	1 518	11 253	1 569	96 520	13.6
3	3	Novoship Co.	Russian Federation	Transportation	1 107	1 213	317	395	65	4 782	57.6
4	2	Pliva d.d.	Croatia	Pharmaceuticals	925	1 629	908	1 078	3 500	6 780	64.2
5	5	Rusal	Russian Federation	Metal mining services	691	6 085	3 660	4 509	5 490	63 458	33.7
6	1	Primorsk Shipping Corporation	Russian Federation	Transportation	382 [d]	442	104 [e]	134	1 305 [f]	2 611 [f]	71.3
7	7	Mechel	Russian Federation	Metals and metal products	121	1 835	1 048	2 050	12 578	84 982	24.2
8	6	Podravka Group	Croatia	Food and beverages/ pharmaceuticals	104	571	210	480	1 241	7 376	26.3
9	8	Far Eastern Shipping Co.	Russian Federation	Transport	52 [d]	160	57 [e]	180	166 [g]	4 000	22.8
10	9	Alrosa	Russian Federation	Nonmetallic Mineral Mining	46	4 630	886	1 955	8 [g]	46 998	15.4

Source: UNCTAD.

[a] Based on survey responses and annual reports.
[b] The TNI is calculated as the average of the following three ratios: foreign assets to total assets, foreign sales to total sales and foreign employment to total employment.
[c] Foreign employment data are calculated by applying the share of foreign employment in total employment of 2001 to total employment of 2003.
[d] Foreign assets data are calculated by applying the share of foreign assets in total assets of the previous year to total assets of 2003.
[e] Foreign sales data are calculated by applying the share of foreign sales in total sales of the previous year to total sales of 2003.
[f] 2002 data.
[g] Foreign employment data are calculated by applying the share of foreign employment in total employment of the previous year to total employment of 2003.

Annex table A.I.12. The world's top 50 financial TNCs ranked by total assets, 2003
(Millions of dollars, number of employees)

Ranking by Assets	Corporation	Home economy	Assets (Total)	Employment (Total)	No. of affiliates: Foreign	No. of affiliates: Total	II[a]	Number of host countries
1	Citigroup	United States	1 264 032	275 000	320	601	53.2	77
2	UBS	Switzerland	1 221 066	65 929	344	410	83.9	48
3	Allianz Group	Germany	1 179 298	173 750	606	852	71.1	48
4	Mizuho Financial Group	Japan	1 115 081 [b]	27 900	41	87	47.1	15
5	Crédit Agricole SA	France	1 102 800	63 140	196	447	43.8	41
6	HSBC Bank plc	United Kingdom	1 034 216	218 000	573	971	59.0	48
7	Deutsche Bank	Germany	1 012 554	67 682	469	679	69.1	40
8	Mitsubishi Tokyo Financial Group	Japan	995 403 [b]	37 000	49	82	59.8	37
9	BNP Paribas SA	France	986 675	89 071	351	641	54.8	48
10	ING Group	Netherlands	981 740	114 344	429	1 098	39.1	34
11	Sumitomo Mitsui Financial Group	Japan	967 978 [b]	22 431	27	59	45.8	14
12	The Royal Bank of Scotland Group	United Kingdom	813 030	120 900	166	968	17.1	26
13	Barclays Bank PLc	United Kingdom	791 754	74 800	117	507	23.1	37
14	UFJ Holdings	Japan	782 330 [b]	17 565	25	63	39.7	11
15	Credit Suisse	Switzerland	777 525	60 837	296	356	83.1	37
16	JP Morgan Chase Group	United States	770 912	93 453	209	411	50.8	27
17	Bank of America NA	United States	764 132	133 549	40	273	14.6	14
18	HBOS	United Kingdom	729 344	66 200	215	560	38.4	10
19	ABN AMRO	Netherlands	706 150	97 000	441	1 031	42.8	48
20	Société Générale	France	679 630	87 920	338	525	64.3	47
21	AIG Group	United States	678 350	86 000	141	349	40.4	38
22	Fortis Group	Belgium/Netherlands	659 295	64 454	83	598	13.9	15
23	Industrial & Commercial Bank of China	China	637 823	389 000	71	22 000	..	12
24	HVB Group	Germany	626 850	60 214	572	935	61.2	30
25	Morgan Stanley	United States	602 843	51 196	102	174	58.6	16
26	Axa Group	France	567 250	117 113	340	432	78.7	28
27	GE Capital Services	United States	554 526	87 000	1 068	1 398	76.4	50
28	Rabobank Nederland	Netherlands	508 164	57 055	146	459	31.8	22
29	Merrill Lynch	United States	496 316	48 100	140	181	77.3	21
30	Commerzbank AG	Germany	480 797	32 377	102	217	47.0	20
31	Caisse des Dépôts et Consignations	France	478 178	4 620	58	354	16.4	18
32	Lloyds TSB Bank plc	United Kingdom	450 043	71 600	122	607	20.1	21
33	Groupe Crédit Mutuel	France	447 306	55 690	22	159	13.8	6
34	Bank of China	China	442 598	188 716	543	12 090	4.5	26
35	Dexia	Belgium	440 850	23 865	9	54	16.7	5
36	Nissay (Nippon Life)	Japan	424 700	70 073	3	11	27.3	3
37	Grupo Santander	Spain	421 608	103 038	310	436	71.1	27
38	DZ Bank Group	Germany	417 970	25 313	48	232	20.7	15
39	China Construction Bank	China	409 438	410 000	9	21 000	..	8
40	LB-BW	Germany	406 722	12 648	16	274	5.8	10
41	Goldman Sachs	United States	403 799	19 476	37	86	43.0	12
42	Wachovia Bank	United States	401 032	86 670	6	165	3.6	4
43	Bayern LB	Germany	394 923	9 061	28	141	19.8	10
44	Wells Fargo Bank	United States	387 798	140 000	13	358	3.6	5
45	Resona Holdings	Japan	377 342 [b]	16 090	12	1 533	0.8	5
46	Aviva	United Kingdom	375 623	60 740	235	424	55.4	19
47	Grupo BBVA	Spain	361 809	86 197	78	149	52.3	22
48	Nordea Bank	Sweden	330 360	8 165	64	119	53.8	12
49	Banca Intesa	Italy	327 870	60 040	51	103	49.5	14
50	Gruppo Assicurazioni Generali	Italy	327 360	60 638	311	359	86.6	38

Source: UNCTAD.

Notes: Two large mortgage companies in the United States, Fannie Mae and Freddie Mac, are excluded from this list since they only operate in their home country. Similarly, the largest cooperative financial group in Japan, Zenkyoren, is excluded from the list.

[a] The Internationalization Index (II) is calculated as the number of foreign affiliates divided by the number of all affiliates (note: affiliates counted in this table refer to only majority-owned affiliates).

[b] Data refer to March 2004.

Annex table A.I.13. Inward FDI Performance and Potential Index rankings, 1990-2004[a]

	Inward FDI Performance Index							Inward FDI Potential Index						
Economy	1990	1995	2000	2001	2002	2003	2004	1990	1995	2000	2001	2002	2003	2004
Albania	..	30	85	67	55	50	42	..	116	101	95	78	80	..
Algeria	102	130	110	103	96	92	95	48	97	82	77	74	71	..
Angola	105	10	3	2	4	4	4	73	102	100	97	81	76	,,
Argentina	39	58	42	48	82	98	82	59	48	46	53	71	66	..
Armenia	..	65	17	31	30	31	22	..	112	112	102	89	78	..
Australia	15	46	92	91	72	84	40	12	12	20	23	21	19	..
Austria	77	87	77	75	79	83	89	18	18	24	24	24	24	..
Azerbaijan	..	3	10	35	13	3	1	..	104	124	107	100	82	..
Bahamas	66	52	48	56	52	62	52	28	41	48	46	48	48	..
Bahrain	24	45	43	55	75	56	27	23	29	33	30	28	29	..
Bangladesh	103	128	125	127	127	132	122	102	118	107	117	113	115	..
Belarus	..	121	89	90	104	102	99	..	64	65	62	57	52	..
Belgium and Luxembourg	8	23	1	1	1	1	2	10	11	9	7	8	9	..
Benin	16	107	95	87	97	101	97	113	136	134	133	133	134	..
Bolivia	29	27	12	12	16	22	43	87	89	75	80	82	83	..
Botswana	23	138	103	115	66	34	41	32	47	68	67	62	65	..
Brazil	78	103	46	37	38	52	62	52	71	66	71	72	70	..
Brunei Darussalam	90	19	7	7	5	2	3	29	32	37	42	44	45	..
Bulgaria	..	96	29	26	24	16	12	..	40	67	65	63	61	..
Burkina Faso	93	104	121	124	122	121	115	85	122	127	128	129	129	..
Cameroon	114	131	134	133	136	137	137	80	132	116	114	111	110	..
Canada	38	70	33	33	34	71	94	2	2	5	5	5	4	..
Chile	10	25	20	18	31	30	21	45	38	45	45	47	50	..
China	46	14	52	57	50	42	45	41	61	44	44	41	38	..
Colombia	42	66	81	82	73	69	69	58	82	86	96	99	103	..
Congo	83	12	14	16	45	29	10	72	110	98	98	96	99	..
Congo, Dem. Rep. of	110	133	119	117	100	75	20	105	139	139	139	140	140	..
Costa Rica	18	36	65	73	68	53	51	51	62	63	64	66	69	..
Côte d'Ivoire	80	56	78	85	87	89	87	91	115	109	110	124	122	..
Croatia	..	91	32	22	26	21	33	..	84	56	49	49	49	..
Cyprus	27	40	22	15	12	10	14	34	36	38	40	42	42	..
Czech Republic	..	34	18	14	14	19	28	..	39	40	39	40	39	..
Denmark	56	41	11	10	9	46	139	16	15	16	18	17	18	..
Dominican Republic	26	49	50	44	56	51	58	57	59	53	63	58	63	..
Ecuador	32	35	54	38	35	27	34	66	96	104	101	104	109	..
Egypt	14	57	106	112	116	124	108	70	83	70	72	73	75	..
El Salvador	88	117	55	96	84	82	73	97	49	80	83	90	96	..
Estonia	..	7	19	21	20	13	16	..	58	36	38	36	32	..
Ethiopia	99	118	79	74	49	26	24	112	128	114	120	123	121	..
Finland	65	77	24	43	32	48	55	9	14	10	10	12	13	..
France	45	68	71	64	62	59	80	7	8	13	16	15	12	..
Gabon	35	140	137	139	138	109	57	55	79	85	84	91	92	..
Gambia	9	29	15	11	10	9	6	60	106	102	100	105	106	..
Georgia	..	113	39	61	44	25	13	..	130	136	130	114	104	..
Germany	86	115	49	40	37	90	118	4	6	8	9	10	8	..
Ghana	89	38	83	77	90	94	91	81	100	113	108	110	100	..
Greece	37	80	123	114	119	122	129	33	37	34	34	33	33	..
Guatemala	22	95	94	100	102	108	120	103	109	92	94	98	101	..
Guinea	61	126	112	116	124	104	85	84	124	119	119	119	124	..
Guyana	60	1	21	19	19	28	31	107	66	71	73	86	94	..
Haiti	82	137	122	125	128	134	133	117	134	135	134	136	137	..
Honduras	33	63	60	53	63	58	53	88	99	99	99	106	118	..
Hong Kong, China	3	15	2	3	3	8	7	20	16	12	12	13	15	..
Hungary	49	4	26	25	28	39	46	50	60	43	41	39	40	..
Iceland	84	132	99	97	94	76	76	14	19	17	15	14	14	..
India	98	110	120	121	121	118	112	76	92	91	88	84	85	..
Indonesia	57	59	138	138	139	139	136	44	67	77	82	87	91	..
Iran, Islamic Rep. of	111	125	133	132	132	131	130	49	46	57	59	59	57	..
Ireland	52	48	4	5	2	5	5	27	22	15	11	9	10	..
Israel	76	81	70	66	70	67	83	31	26	22	21	23	23	..
Italy	64	111	116	109	103	99	98	17	24	25	26	26	26	..
Jamaica	25	37	30	24	23	15	17	64	68	76	75	76	84	..
Japan	104	129	128	129	133	136	134	13	7	11	14	16	16	..
Jordan	75	134	37	50	57	79	48	61	57	60	60	61	60	..
Kazakhstan	..	8	23	13	11	7	11	..	72	84	74	64	59	..
Kenya	74	122	118	119	117	125	127	86	101	115	125	126	123	..
Korea, Republic of	81	119	93	98	109	116	109	21	17	19	19	19	20	..
Kuwait	101	127	129	134	137	138	138	47	30	31	31	38	41	..
Kyrgyzstan	..	22	66	108	134	105	77	..	135	117	118	120	111	..
Latvia	..	20	34	52	65	70	47	..	86	58	52	46	44	..
Lebanon	94	116	101	99	98	91	90	74	65	49	57	60	64	..
Libyan Arab Jamahiriya	68	135	135	135	131	133	116	46	50	42	36	37	34	..

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Annex table A.I.13. Inward FDI Performance and Potential Index rankings, 1990-2004[a] (concluded)

	Inward FDI Performance Index							Inward FDI Potential Index						
Economy	1990	1995	2000	2001	2002	2003	2004	1990	1995	2000	2001	2002	2003	2004
Lithuania	..	79	35	59	43	61	59	..	91	59	56	51	47	..
Macedonia, TFYR	..	102	68	29	25	32	72	..	111	108	112	117	120	..
Madagascar	72	112	102	89	101	115	123	100	131	126	123	131	132	..
Malawi	43	85	96	88	113	120	119	93	121	122	126	130	133	..
Malaysia	5	9	51	71	74	77	56	38	33	30	32	32	35	..
Mali	85	47	105	80	33	33	37	108	108	111	122	116	112	..
Malta	21	21	5	6	48	107	84	37	34	35	37	34	37	..
Mexico	34	42	72	65	67	63	79	43	54	50	48	50	51	..
Moldova, Rep. of	..	33	31	20	15	20	26	..	76	129	113	107	102	..
Mongolia	..	86	63	45	29	17	9	42	81	88	93	94	90	..
Morocco	63	62	100	54	59	35	65	68	88	95	92	92	87	..
Mozambique	87	53	27	23	21	12	23	111	127	120	111	101	98	..
Myanmar	28	84	107	123	125	127	117	118	120	96	89	80	79	..
Namibia	79	31	75	34	18	23	32	96	73	78	81	83	86	..
Nepal	97	123	131	130	135	135	135	109	133	131	132	132	135	..
Netherlands	13	39	9	8	7	18	68	8	10	7	8	11	11	..
New Zealand	7	13	61	63	71	81	74	25	25	27	28	29	30	..
Nicaragua	96	54	25	28	36	38	30	114	125	118	106	112	113	..
Niger	58	124	130	122	123	123	128	104	129	123	129	128	130	..
Nigeria	4	28	82	72	60	41	44	62	94	90	90	97	97	..
Norway	51	61	59	69	92	103	103	5	4	4	2	2	2	..
Oman	36	99	126	113	115	93	110	35	52	55	51	52	53	..
Pakistan	71	89	117	120	118	113	102	92	113	130	131	127	125	..
Panama	116	26	16	32	51	40	29	65	44	47	50	54	56	..
Papua New Guinea	2	11	45	42	89	86	92	89	56	97	109	122	128	..
Paraguay	59	71	84	105	112	119	107	69	80	93	103	108	105	..
Peru	91	17	76	83	80	68	64	79	95	79	78	79	89	..
Philippines	30	44	87	95	95	96	100	83	69	61	58	56	58	..
Poland	100	43	47	46	61	72	75	53	55	41	43	43	43	..
Portugal	12	72	67	49	42	44	81	39	35	32	35	35	36	..
Qatar	109	69	97	101	86	66	63	19	20	18	13	6	7	..
Romania	..	83	64	76	76	57	35	..	87	94	86	77	81	..
Russian Federation	..	101	104	106	111	97	88	..	31	39	33	30	27	..
Rwanda	62	120	127	128	126	128	124	115	140	138	138	137	131	..
Saudi Arabia	113	108	132	131	130	130	121	30	28	28	29	31	31	..
Senegal	67	93	90	93	105	110	101	94	123	105	104	103	107	..
Sierra Leone	48	136	91	86	88	126	131	101	137	140	140	139	139	..
Singapore	1	2	6	4	6	6	8	15	3	2	4	4	5	..
Slovakia	..	64	41	27	8	14	25	..	51	51	47	45	46	..
Slovenia	..	88	113	110	58	49	60	..	43	29	27	27	28	..
South Africa	107	109	114	84	81	78	126	54	63	74	70	75	73	..
Spain	19	55	53	39	27	37	49	24	27	26	25	25	25	..
Sri Lanka	73	74	108	107	108	100	96	99	107	106	116	109	114	..
Sudan	108	114	62	58	41	24	18	116	138	125	121	118	116	..
Suriname	117	139	140	140	140	140	140	75	93	89	91	95	88	..
Sweden	53	24	8	9	22	54	93	6	9	6	6	7	6	..
Switzerland	31	97	36	36	39	45	61	11	13	14	17	18	17	..
Syrian Arab Republic	54	16	57	51	47	43	39	77	77	83	85	93	95	..
Taiwan Province of China	50	100	111	102	106	117	125	22	21	21	20	20	21	..
Tajikistan	..	60	88	94	85	87	19	..	98	137	137	134	127	..
Thailand	17	75	44	60	83	88	106	40	42	52	55	53	55	..
Togo	44	76	86	68	53	55	66	95	126	110	115	115	119	..
Trinidad and Tobago	20	6	13	17	17	11	15	67	78	64	61	55	54	..
Tunisia	55	32	69	78	64	64	67	71	75	69	68	68	67	..
Turkey	69	105	124	111	110	106	111	63	74	73	79	70	72	..
Uganda	106	50	80	79	69	60	54	106	117	103	105	102	108	..
Ukraine	..	98	98	92	91	74	71	..	53	81	76	69	62	..
United Arab Emirates	92	92	136	136	107	95	104	26	23	23	22	22	22	..
United Kingdom	11	67	28	30	40	85	78	3	5	3	3	3	3	..
United Rep. of Tanzania	95	51	58	41	46	36	36	90	114	128	127	125	126	..
United States	41	94	74	81	93	111	114	1	1	1	1	1	1	..
Uruguay	70	90	109	104	99	80	70	56	70	62	66	88	93	..
Uzbekistan	..	106	115	118	120	114	105	..	90	121	124	121	117	..
Venezuela	40	78	56	70	77	73	86	36	45	54	54	65	74	..
Viet Nam	47	5	38	47	54	47	50	78	85	72	69	67	68	..
Yemen	115	73	139	137	114	112	132	110	103	87	87	85	77	..
Zambia	6	18	40	62	78	65	38	98	119	132	135	135	136	..
Zimbabwe	112	82	73	126	129	129	113	82	105	133	136	138	138	..

Source: UNCTAD.

Note: Covering 140 economies. The potential index is based on 12 economic and policy variables.

a Three-year moving averages, using data for the three previous years, including the year in question.

Annex table A.I.14. Outward FDI Performance Index rankings, 1990-2004[a]

Economy	1990	1995	2000	2001	2002	2003	2004
Albania	..	39	68	73	87	106	103
Algeria	75	88	98	89	81	83	64
Angola	79	117	59	60	60	60	60
Argentina	65	42	47	53	84	85	70
Armenia	..	104	102	99	56	53	53
Australia	20	31	48	31	23	21	18
Austria	22	38	21	24	20	22	17
Azerbaijan	..	107	18	21	24	6	4
Bahamas	111	100	105	108	107	63	67
Bahrain	23	17	26	26	27	11	6
Bangladesh	81	99	113	97	100	100	102
Belarus	..	82	110	107	131	129	127
Belgium and Luxembourg	9	9	1	1	1	1	1
Benin	99	78	78	74	77	88	96
Bolivia	61	83	100	93	93	95	92
Botswana	49	40	91	19	18	17	19
Brazil	43	60	53	75	68	94	37
Brunei Darussalam	85	25	70	54	49	54	65
Bulgaria	..	125	90	71	71	67	125
Burkina Faso	78	61	83	98	92	89	87
Cameroon	38	69	97	68	82	76	95
Canada	21	13	14	14	14	16	13
Chile	59	19	17	15	19	25	27
China	36	41	62	57	53	59	72
Colombia	51	52	50	64	48	41	38
Congo	55	120	127	69	66	69	78
Congo, Dem. Rep. of	94	95	126	121	121	119	116
Costa Rica	53	79	99	88	75	70	56
Côte d'Ivoire	42	29	67	95	118	96	88
Croatia	..	72	56	51	33	34	32
Cyprus	56	58	28	22	17	14	12
Czech Republic	..	54	66	66	61	57	48
Denmark	17	11	8	6	7	15	129
Dominican Republic	92	67	80	90	86	123	121
Ecuador	101	68	72	110	108	108	106
Egypt	58	73	96	92	94	99	74
El Salvador	87	122	71	76	126	121	104
Estonia	..	59	36	23	21	23	20
Ethiopia	93	112	32	130	119	114	112
Finland	11	10	4	8	5	20	36
France	13	16	9	10	10	12	16
Gabon	31	49	63	56	122	130	128
Gambia	32	15	31	33	32	26	30
Georgia	..	108	103	104	90	81	68
Germany	18	21	16	18	26	39	81
Ghana	90	113	45	40	41	45	61
Greece	77	91	42	37	36	50	52
Guatemala	104	124	77	72	74	87	93
Guinea	67	90	93	78	72	74	79
Guyana	82	62	117	100	76	101	101
Haiti	109	94	119	119	102	104	99
Honduras	106	126	87	84	98	118	118
Hong Kong, China	5	1	2	2	2	5	3
Hungary	70	66	39	39	38	33	35
Iceland	50	47	20	17	15	13	5
India	80	87	94	67	63	62	54
Indonesia	73	24	88	81	78	84	84
Iran, Islamic Rep. of	102	123	81	85	103	125	122
Ireland	12	28	13	13	13	10	26
Israel	33	27	27	30	30	36	22
Italy	26	37	35	32	29	29	34
Jamaica	34	18	33	34	35	32	31
Japan	16	45	46	41	37	40	40
Jordan	110	130	95	83	70	72	73
Kazakhstan	..	101	101	122	42	47	130
Kenya	74	71	89	55	46	44	45
Korea, Republic of	30	36	30	38	39	43	41
Kuwait	14	132	132	80	124	132	132
Kyrgyzstan	..	105	40	48	59	73	131
Latvia	..	131	51	61	69	61	44
Lebanon	105	30	60	62	54	56	49
Libyan Arab Jamahiriya	35	129	43	45	67	68	117
Lithuania	..	93	92	86	80	71	42
Macedonia, TFYR	..	109	122	103	105	105	98
Madagascar	108	65	109	115	113	112	110
Malawi	83	106	76	113	112	111	109
Malaysia	27	8	23	28	28	30	23
Mali	96	102	52	58	57	64	91
Malta	84	70	34	36	50	55	69
Mexico	54	75	57	49	51	46	51
Moldova, Rep. of	..	35	125	101	101	102	80
Morocco	57	74	79	65	65	75	82
Mozambique	72	97	114	109	116	107	105
Namibia	68	119	111	127	130	127	126
Netherlands	3	3	3	3	3	4	11
New Zealand	10	12	22	42	62	128	43
Nicaragua	98	96	58	59	58	51	66
Niger	45	51	65	125	127	124	119
Nigeria	15	34	54	52	52	49	47
Norway	19	14	19	20	22	37	29
Oman	62	77	124	105	117	117	115
Pakistan	52	116	108	96	91	91	86
Panama	1	5	10	16	9	2	2
Papua New Guinea	37	128	131	43	44	42	89
Paraguay	103	53	86	82	83	82	76
Peru	46	118	74	70	88	79	83
Philippines	60	43	104	128	125	90	50
Poland	63	85	84	118	95	86	62
Portugal	40	44	15	12	16	19	15
Qatar	107	55	75	79	97	120	120
Romania	..	92	123	120	120	97	77
Russian Federation	..	50	38	35	34	27	24
Rwanda	66	121	115	114	111	110	108
Saudi Arabia	24	63	85	124	123	122	85
Senegal	48	64	64	91	64	66	58
Sierra Leone	97	81	121	111	109	109	107
Singapore	8	2	12	4	4	3	7
Slovakia	..	57	130	132	79	78	124
Slovenia	..	127	61	47	45	35	28
South Africa	47	23	37	131	132	131	46
Spain	28	32	11	11	12	9	10
Sri Lanka	64	76	82	87	96	80	75
Sweden	2	7	7	9	8	7	8
Switzerland	4	4	6	5	6	8	9
Syrian Arab Republic	95	115	120	117	115	116	114
Taiwan Province of China	6	22	25	25	25	24	21
Tajikistan	..	103	116	112	110	52	55
Thailand	44	46	73	63	73	58	57
Togo	41	48	44	126	128	126	123
Trinidad and Tobago	88	111	29	29	40	28	33
Tunisia	71	86	106	102	104	103	97
Turkey	100	80	55	50	55	65	59
Uganda	89	26	129	129	129	113	111
Ukraine	..	89	112	94	99	98	100
United Arab Emirates	69	84	49	44	43	48	63
United Kingdom	7	6	5	7	11	18	14
United Rep. of Tanzania	86	110	118	116	114	115	113
United States	25	20	24	27	31	31	25
Uruguay	76	114	107	106	89	77	71
Venezuela	29	33	41	46	47	38	39
Yemen	91	98	128	123	106	92	90
Zimbabwe	39	56	69	77	85	93	94

Source: UNCTAD.

Note: Covering 132 economies.

[a] Three-year moving averages, using data for the three previous years, including the year in question.

A.I.15. International investment agreements (other than BITs and DTTs) concluded, 2004-2005

Agreement	Year	Geographical scope
Framework Agreement on the BIMSTEC Free Trade Area	2004	Regional (1group)
Free Trade Agreement between the EFTA States and the Republic of Tunisia	2004	Interregional (1 group + 1 country)
Free Trade Agreement between the Government of the United Mexican States and the Republic of Uruguay	2004	Regional (bilateral)
Framework Agreement on the South Asia Free Trade Area (SAARC)	2004	Regional (1group)
Free Trade Agreement between the Kingdom of Morocco and the United Sates of America	2004	Interregional (bilateral)
Free Trade Agreement between Australia and Thailand	2004	Regional (bilateral)
Free Trade Agreement between Australia and the United States of America	2004	Interregional (bilateral)
Agreement Concerning the Development of Trade and Investment Relations between the Government of the United States of America and the Government of the State of Qatar	2004	Interregional (bilateral)
Agreement Concerning the Development of Trade and Investment Relations between the Government of the United States of America and the Government of the United Arab Emirates	2004	Interregional (bilateral)
Agreement Concerning the Development of Trade and Investment Relations between Mongolia and the United Sates of America	2004	Interregional (bilateral)
Agreement Concerning the Development of Trade and Investment Relations between the Government of the United States of America and the Government of the State of Kuwait	2004	Interregional (bilateral)
Agreement Concerning the Development of Trade and Investment Relations between Malaysia and the United States of America	2004	Interregional (bilateral)
Agreement Concerning the Development of Trade and Investment Relations between the Government of the United States of America and Government of the Republic of Yemen	2004	Interregional (bilateral)
Free Trade Agreement between the Kingdom of Bahrain and the United States of America	2004	Interregional (bilateral)
Free Trade Agreement between the Republic of Albania and the Republic of Romania	2004	Regional (bilateral)
Free Trade Agreement between the Republic of Albania and the Republic of Serbia and Montenegro	2004	Regional (bilateral)
Free Trade Agreement between the Hashemite Kingdom Jordan and the Republic of Singapore	2004	Interregional (bilateral)
Cooperation Agreement between the European Community and Pakistan	2004	Interregional (1 group + 1 country)
Free Trade Agreement between the EFTA States and Lebanon	2004	Interregional (1 group + 1 country)
Free Trade Agreement between the Republic of Bosnia Herzegovina and the Republic of Moldova	2004	Regional (bilateral)
Free Trade Agreement between the Republic of Bosnia Herzegovina and the Republic of Romania	2004	Regional (bilateral)
Free Trade Agreement between Central America, the Dominican Republic and the United States of America (CAFTA)	2004	Regional (1 group + 2 country)
Partial Reach Agreement for Economic, Trade and Investment Promotion between the Republic of Argentina and the Republic of Bolivia	2004	Regional (bilateral)
Economic Complementation General Agreement on Integration, Economic and Social Cooperation for the Establishment of a Common Market between the Republic of Bolivia and the Republic of Peru	2004	Regional (bilateral)
Framework Agreement Between the Government of the United States of America, the Government of the Republic of Kazakhstan, The Government of the Kyrgyz Republic, the Government of the Republic of Tajikistan, the Government of Turkmenistan, and the Government of the Republic of Uzbekistan Concerning the Development of Trade and Investment Relations	2004	Interregional (1 group + 1 country)
Free Trade Agreement between the Caribbean Community (CARICOM) and Costa Rica	2004	Regional (1 group + 1 country)
Interim Free Trade Agreement between the Republic of Turkey and the Palestinian Authority	2004	Regional (bilateral)
Framework Agreement between MERCOSUR and the Arab Republic of Egypt	2004	Interregional (1 group + 1 country)
Agreement for the Establishment of a Free Trade Area between the Gulf Cooperation Council and Lebanon	2004	Regional (1 group + 1 country)
Framework Agreement on Economic Cooperation Agreement between the Gulf Cooperation Council (GCC) and India	2004	Interregional (1 group + 1 country)
Comprehensive Economic Cooperation Agreement between the Republic of India and the Republic of Chile	2005	Interregional (bilateral)
Agreement between Japan and the United Mexican States for the Strengthening of Economic Partnership	2005	Interregional (bilateral)
Agreement on Closer Economic Partnership between New Zealand and Thailand	2005	Interregional (bilateral)
Comprehensive Economic Cooperation Agreement between India and Singapore	2005	Regional (bilateral)

Source: UNCTAD.

A.I.16. International investment agreements (other than BITs and DTTs) under negotiation or consultation, as of end 2004

Agreement	Geographical scope
Agreement Establishing an Association between the European Communities and Their Member States, of the One Part, and Syria, of the Other Part[a]	Interregional (1 group + 1 country)
Closer Economic Partnership Agreement between Hong Kong (China) and New Zealand	Regional (bilateral)
Comprehensive Economic Cooperation Agreement between China and the Republic of India	Interregional (bilateral)
Comprehensive Economic Cooperation Agreement between India and Singapore	Regional (bilateral)
Comprehensive Economic Cooperation Agreement between the Republic of India and the Republic of Mauritius	Interregional (bilateral)
Economic Framework Agreement between Canada and Japan	Interregional (bilateral)
Economic Partnership Agreement between CARICOM and the European Union	Interregional (2 groups)
Economic Partnership Agreement between India and Sri Lanka Comprehensive	Regional (bilateral)
Economic Partnership Agreement between Japan and the Kingdom of Thailand	Regional (bilateral)
Economic Partnership Agreement between Japan and the Philippines	Regional (bilateral)
Economic Partnership Agreement between the European Union and CEMAC	Inter-regional (2 groups)
Economic Partnership Agreement between the European Union and Eastern and Southern Africa (ESA)	Interregional (2 groups)
Economic Partnership Agreement between the European Union and ECOWAS	Interregional (2 groups)
Economic Partnership Agreement between the European Union and SADC	Interregional (2 groups)
Free Trade Agreement between ASEAN, Australia, New Zealand	Regional (1 group + 2 country)
Free Trade Agreement between Australia and China	Regional (bilateral)
Free Trade Agreement between Canada and Central America	Interregional (1 group + 1 country)
Free Trade Agreement between Canada and the Republic of Korea	Interregional (bilateral)
Free Trade Agreement between Canada and the Republic of Singapore	Interregional (bilateral)
Free Trade Agreement between Canada the Dominican Republic	Interregional (bilateral)
Free Trade Agreement between CARICOM and Canada	Interregional (1 group + 1 country)
Free Trade Agreement between CARICOM and the United States of America	Interregional (1 group + 1 country)
Free Trade Agreement between China and New Zealand	Regional (bilateral)
Free Trade Agreement between China and the Republic of Chile	Interregional (bilateral)
Free Trade Agreement between EFTA and Canada	Interregional (1 group + 1 country)
Free Trade Agreement between EFTA and CARICOM	Interregional (2 groups)
Free Trade Agreement between EFTA and SACU	Interregional (2 groups)
Free Trade Agreement between EFTA and the Kingdom of Thailand	Interregional (1 group + 1 country)
Free Trade Agreement between EFTA and the Republic of Korea	Interregional (1 group + 1 country)
Free Trade Agreement between Japan and the Republic of Korea	Regional (bilateral)
Free Trade Agreement between Japan and the Republic of Malaysia	Regional (bilateral)
Free Trade Agreement between SACU and the United States of America	Interregional (1 group + 1 country)
Free Trade Agreement between the Andean Community and Canada	Interregional (1 group + 1 country)
Free Trade Agreement between the Andean Community and the United States of America	Interregional (1 group + 1 country)
Free Trade Agreement between the Arab Republic of Egypt and the Republic of Singapore	Interregional (bilateral)
Free Trade Agreement between the Gulf Cooperation Council (GCC) and China	Regional (1 group + 1 country)
Free Trade Agreement between the Kingdom of Bahrain and the Republic of Singapore	Regional (bilateral)
Free Trade Agreement between the Kingdom of Kuwait and the Republic of Singapore	Regional (bilateral)
Free Trade Agreement between the Republic of Chile and Japan	Regional (bilateral)
Free Trade Agreement between the Republic of Chile and the Republic of Ecuador	Regional (bilateral)
Free Trade Agreement between the Republic of Chile and the Republic of Peru	Regional (bilateral)
Free Trade Agreement between the Republic of Costa Rica and the Republic of Panama	Regional (bilateral)
Free Trade Agreement between the Republic of Guatemala and Taiwan (Province of China)	Inter-regional (bilateral)
Free Trade Agreement between the Republic of Korea and the Republic of Singapore	Regional (bilateral)
Free Trade Agreement between the Republic of Korea and the United States of America	Interregional (bilateral)
Free Trade Agreement between the Republic of Nicaragua and Taiwan (Province of China)	Interregional (bilateral)
Free Trade Agreement between the Republic of Panama and the Republic of Singapore	Interregional (bilateral)
Free Trade Agreement between the Republic of Peru and the Kingdom of Thailand	Interregional (bilateral)
Free Trade Agreement between the Republic of Singapore and Qatar	Regional (bilateral)
Free Trade Agreement between the Republic of Sri Lanka and the Republic of Singapore	Regional (bilateral)
Free Trade Agreement between the Republic of Thailand and the United States of America	Interregional (bilateral)
Free Trade Agreement between the United Mexican States and the Republic of Singapore	Interregional (bilateral)
Free Trade Agreement between the United States of America and Colombia	Regional (bilateral)
Free Trade Agreement between the United States of America and Ecuador	Regional (bilateral)
Free Trade Agreement between the United States of America and Oman	Interregional (bilateral)
Free Trade Agreement between the United States of America and Panama	Regional (bilateral)
Free Trade Agreement between the United States of America and Peru	Regional (bilateral)
Free Trade Agreement between the United States of America and the United Arab Emirates	Interregional (bilateral)
Free Trade Agreement between the United States of America and Uruguay	Interregional (bilateral)
Free Trade Area between ASEAN and the Republic of Korea	Regional (1 group + 1 country)
Free Trade Area of the Americas (FTAA)	Regional (1 group)
Inter-Regional Association Agreement between the European Union and MERCOSUR	Interregional (2 groups)
Pacific Three Free Trade Agreement between Chile, New Zealand and Singapore	Regional (3 countries)
Partial Scope Trade Agreement between Belize and the Republic of Guatemala	Regional (bilateral)
SAARC Agreement for the Promotion and Protection of Investment	Regional (1 group)
Trade and Investment Enhancement Agreement between Canada and the European Union	Interregional (1 group + 1 country)
Trans-Regional EU-ASEAN Trade Initiative	Interregional (2 groups)

Source: UNCTAD.

[a] Negotiations on the EC-Syria association agreement are formally completed.

Annex table A.II.1. Cross-border M&A deals with values of over $100 million concluded in developing and transition economies, 2004

Rank	Value ($ million)	Acquired company	Host economy	Industry of the acquired company	Acquiring company	Home economy	Industry of the acquiring company
			Africa				
1	1 504	Ashanti Goldfields Co Ltd	Ghana	Gold ores	Anglogold Ltd	South Africa	Gold ores
2	1 205	Gold Fields Ltd	South Africa	Gold ores	Norimet Ltd	United Kingdom	Metals service centers and offices
3	500	Energy Africa Ltd	South Africa	Crude petroleum and natural gas	Tullow Oil Plc	United Kingdom	Crude petroleum and natural gas
4	250	KenCell Communications Ltd	Kenya	Radiotelephone communications	Celtel Uganda	Uganda	Telephone communications, except radiotelephone
5	235	Rosetta Concession Offshore	Egypt	Crude petroleum and natural gas	BG Group Plc	United Kingdom	Crude petroleum and natural gas
6	137	Mauritania Holdings BV	Mauritania	Crude petroleum and natural gas	BG Group Plc	United Kingdom	Crude petroleum and natural gas
7	102	Block 5A	Sudan	Crude petroleum and natural gas	ONGC Videsh Ltd	India	Crude petroleum and natural gas
			Latin America and the Caribbean				
1	3 974	Braco SA	Brazil	Malt beverages	Interbrew SA	Belgium	Malt beverages
2	3 888	Grupo Financiero BBVA Bancomer	Mexico	Banks	BBVA	Spain	Banks
3	1 304	Telefonica Movil Chile SA	Chile	Radiotelephone communications	Telefonica Moviles SA	Spain	Radiotelephone communications
4	1 199	Bank of Bermuda Ltd	Bermuda	Banks	HSBC Holdings PLC{HSBC}	United Kingdom	Banks
5	1 195	Telcel Celular SA	Venezuela	Radiotelephone communications	Telefonica Moviles SA	Spain	Radiotelephone communications
6	1 050	Bellsouth-Colombian Operations	Colombia	Radiotelephone communications	Telefonica Moviles SA	Spain	Radiotelephone communications
7	833	Bellsouth-Ecuador Operations	Ecuador	Telephone communications, except radiotelephone	Telefonica Moviles SA	Spain	Radiotelephone communications
8	715	El Paso Corp-Aruba Refinery	Aruba	Petroleum refining	Valero Energy Corp	United States	Petroleum refining
9	657	BellSouth de Panama	Panama	Telephone communications, except radiotelephone	Telefonica Moviles SA	Spain	Radiotelephone communications
10	591	Holcim Apasco SA de CV	Mexico	Cement, hydraulic	Holcim Ltd	Switzerland	Cement, hydraulic
11	525	Grupo Imsa-Mexican Battery Ops	Mexico	Electrical industrial apparatus, nec	Johnson Controls Inc	United States	Process control instruments
12	442	Mova Pharmaceuticals Corp	Puerto Rico	Pharmaceutical preparations	Patheon Inc	Canada	Pharmaceutical preparations
13	400	Embratel Participacoes SA	Brazil	Telephone communications, except radiotelephone	Telefonos de Mexico SA de CV	Mexico	Telephone communications, except radiotelephone
14	375	Hipotecaria Nacional SA de CV	Mexico	Personal credit institutions	Grupo Financiero BBVA Bancomer	Mexico	Banks
15	364	Avianca SA	Colombia	Air transportation, scheduled	Sinergy	Brazil	Investors, nec
16	340	Caribbean Restaurants Inc	Puerto Rico	Eating places	Castle Harlan Inc	United States	Security brokers, dealers, and flotation companies
17	324	Alpart Jamaica	Jamaica	Miscellaneous metal ores, nec	Hydro Aluminium AS	Norway	Primary production of aluminum
18	309	Plaza Carolina,San Juan,Puerto	Puerto Rico	Operators of non-residential buildings	Simon Property Group Inc	United States	Real estate investment trusts
19	305	Tele Centro Oeste Celular Part	Brazil	Telephone communications, except radiotelephone	Telesp Celular Participacoes	Brazil	Telephone communications, except radiotelephone
20	300	Bompreco SA Supermercados	Brazil	Grocery stores	Wal-Mart Stores Inc	United States	Variety stores
21	295	Cia de Telecomunicaciones	El Salvador	Telephone communications, except radiotelephone	America Movil SA de CV	Mexico	Radiotelephone communications
22	275	Accion-Buildings Portfolio	Mexico	Operators of non-residential buildings	Investor Group	United States	Investors, nec
23	266	Bunge Brasil SA	Brazil	Investors, nec	Bunge Ltd	United States	Flour and other grain mill products
24	260	Rio Paracatu Mineracao (RPM)	Brazil	Miscellaneous metal ores, nec	Kinross Gold Corp	Canada	Gold ores
25	235	Copamex-Tissue Business	Mexico	Sanitary paper products	Svenska Cellulosa AB	Sweden	Sanitary paper products
26	210	Bellsouth Peru SA	Peru	Radiotelephone communications	Telefonica Moviles SA	Spain	Radiotelephone communications
27	210	Refineria de Cajamarquilla SA	Peru	Lead and zinc ores	Votorantim Metais	Brazil	Rolling, drawing, & extruding of nonferrous metals
28	207	AT&T Latin-South American Unit	Brazil	Telephone communications, except radiotelephone	Telefonos de Mexico SA de CV	Mexico	Telephone communications, except radiotelephone
29	200	PlusPetrol Norte	Peru	Crude petroleum and natural gas	CNPC	China	Crude petroleum and natural gas
30	195	FLAG Telecom Group Ltd	Bermuda	Telephone communications, except radiotelephone	Reliance Gateway Net Pvt Ltd	India	Telephone communications, except radiotelephone
31	180	Scottish RE Group Ltd	Bermuda	Life insurance	Cypress Group LLC	United States	Investors, nec
32	175	Bellsouth Guatemala	Guatemala	Telephone communications, except radiotelephone	Telefonica Moviles SA	Spain	Radiotelephone communications
33	155	Centennial Puerto Rico Cable	Puerto Rico	Cable and other pay television services	Hicks Muse Tate & Furst Inc	United States	Investors, nec
34	150	Bellsouth-Nicaraguan Cellular	Nicaragua	Radiotelephone communications	Telefonica Moviles SA	Spain	Radiotelephone communications
35	124	Indusval-Consumer Finance Ops	Brazil	Banks	HSBC Bank Brasil SA	Brazil	Banks

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Annex table A.II.1. Cross-border M&A deals with values of over $100 million concluded in developing and transition economies, 2004 (continued)

Rank	Value ($ million)	Acquired company	Host economy	Industry of the acquired company	Acquiring company	Home economy	Industry of the acquiring company
36	120	PosVen CA	Venezuela	Primary metal products, nec	MASISA	Venezuela	Gray and ductile iron foundries
37	119	Celular CRT Participacoes SA	Brazil	Telephone communications, except radiotelephone	Brasilcel NV	Brazil	Investors, nec
38	114	Techtel Telecomunicaciones	Argentina	Telephone communications, except radiotelephone	Telefonos de Mexico SA de CV	Mexico	Telephone communications, except radiotelephone
39	110	Unilever-Mexican Oil Brands	Mexico	Edible fats and oils, nec	ACH Food Companies Inc	United States	Bread and other bakery products, except cookies
40	110	Corporacion Digitel(Telecom)	Venezuela	Communications services, nec	TIM International	Italy	Investors, nec
41	100	Supergasbras Inds e Comercio	Brazil	Gas production and/or distribution	SHV Holdings NV	Netherlands	Grocery stores
		Asia and Oceania					
1	2 000	Procter & Gamble-Hutchison Ltd	China	Soap & other detergents, except specialty cleaners	Procter & Gamble Co	United States	Soap & other detergents, except specialty cleaners
2	1 749	BoCOMM	China	Banks	HSBC Holdings PLC{HSBC}	United Kingdom	Banks
3	1 637	Koram Bank	Korea, Republic of	Banks	Citigroup Inc	United States	National commercial banks
4	984	Koram Bank	Korea, Republic of	Banks	Citigroup Inc	United States	National commercial banks
5	824	Hynix-Non Memory Chip Op	Korea, Republic of	Semiconductors and related devices	Citigroup Venture Capital	United States	Investors, nec
6	562	NAPOCOR-Masinloc Power Plant	Philippines	Electric services	YNN Pacific Consortium Inc	Australia	Investors, nec
7	543	Bank of Asia PCL	Thailand	Banks	UOB	Singapore	Banks
8	529	Guoco Group Ltd	Hong Kong, China	Investment advice	Guoline Overseas Ltd	Hong Kong, China	Investors, nec
9	460	Harbin Brewery Grp Ltd	Hong Kong, China	Malt beverages	Anheuser-Busch Cos Inc	United States	Malt beverages
10	415	International Bank of Asia	Hong Kong, China	Banks	Fubon Financial Holding Co Ltd	Taiwan Province of China	Investors, nec
11	391	Habib Bank Ltd	Pakistan	Banks	Aga Khan Fund for Economic	Sweden	Investment offices, nec
12	375	Hyundai Capital Co Ltd	Korea, Republic of	Personal credit institutions	GE Consumer Finance	United States	Investment advice
13	362	Tingyi-Breweries Op(13)	Hong Kong, China	Bottled & canned soft drinks & carbonated waters	A-I China Breweries Ltd	Japan	Bottled & canned soft drinks & carbonated waters
14	326	Internet Auction Co Ltd	Korea, Republic of	Business services, nec	eBay Inc	United States	Catalog and mail-order houses
15	317	GlobalSantaFe-Land Drill Asts	Kuwait	Crude petroleum and natural gas	Precision Drilling Corp	Canada	Drilling oil and gas wells
16	309	Digital GlobalSoft Ltd	India	Prepackaged Software	Hewlett Packard Leiden BV	Netherlands	Investors, nec
17	305	Bank Permata Tbk PT	Indonesia	Banks	Investor Group	United Kingdom	Investors, nec
18	305	Hyundai Investment Trust & Sec	Korea, Republic of	Investment advice	Prudential Financial Inc	United States	Investment advice
19	304	Fortis Bank Asia HK	Hong Kong, China	Banks	ICBC(Asia)	Hong Kong, China	Banks
20	267	Successful Road Corp	Hong Kong, China	Investors, nec	China Merchant Hldg(Pac)Ltd	Singapore	Hotels and motels
21	260	Hymall Commercial Retail Group	China	Grocery stores	Tesco PLC	United Kingdom	Grocery stores
22	227	Hughes Software Systems Ltd	India	Computer related services,nec	Flextronics International Ltd	Singapore	Printed circuit boards
23	209	Industrial Bank Co Ltd	China	Banks	Hang Seng Bank Ltd	Hong Kong, China	Banks
24	203	Scotts Shopping Centre,Ascott	Singapore	Operators of nonresidential buildings	Marco Polo Developments Ltd	Singapore	Hotels and motels
25	195	Siam Nissan Automobile Co Ltd	Thailand	Motor vehicles and passenger car bodies	Nissan Motor Co Ltd	Japan	Motor vehicles and passenger car bodies
26	190	Idea Cellular Ltd	India	Radiotelephone communications	Investor Group	Singapore	Investors, nec
27	188	China Huarong Asset Mgmt-Asset	China	Investment advice	Investor Group	United States	Investors, nec
28	170	Daksh eServices Pvt Ltd	India	Information retrieval services	IBM Corp	United States	Computer programming services
29	159	Internet Auction Co Ltd	Korea, Republic of	Business services, nec	eBay Inc	United States	Catalogue and mail-order houses
30	149	Shenzhen Dvlp Bank Co Ltd	China	Banks	Newbridge Asia AIV III LP	United States	Management investment offices, open-end
31	144	Bank Lippo Tbk PT	Indonesia	Banks	Investor Group	Switzerland	Investors, nec
32	139	Jawa Power PT	Indonesia	Electric services	YTL Power International Bhd	Malaysia	Electric services
33	139	Global Conduit Holdings Ltd	Hong Kong, China	Investors, nec	Anheuser-Busch Cos Inc	United States	Malt beverages
34	134	PTP Group	China	Reconstituted wood products	Carter Holt Harvey Ltd	New Zealand	Logging
35	132	China Lion Brewing Group	China	Malt beverages	Interbrew SA	Belgium	Malt beverages

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Annex table A.II.1. Cross-border M&A deals with values of over $100 million concluded in developing and transition economies, 2004 (concluded)

Rank	Value ($ million)	Acquired company	Host economy	Industry of the acquired company	Acquiring company	Home economy	Industry of the acquiring company
36	132	China Lion Brewing Group	China	Malt beverages	Interbrew SA	Belgium	Malt beverages
37	131	Jaya Holdings Ltd	Singapore	Deep sea foreign transportation of freight	Sime Darby Eastern Ltd	Singapore	Insurance agents, brokers, and service
38	129	e-Serve International Ltd	India	Information retrieval services	Citibank Overseas Invest Corp	United States	Investors, nec
39	126	Advantage Ltd	Hong Kong, China	Investors, nec	Standard Chartered Links(HK)	Hong Kong, China	Investors, nec
40	122	Parkson Venture Pte Ltd	Singapore	Investors, nec	Lion Diversified Holdings Bhd	Malaysia	Investors, nec
41	121	C&M Communications Co Ltd	Korea, Republic of	Cable and other pay television services	GS Capital Partners 2000 LP	United States	Investment advice
42	120	UMCi Pte Ltd	Singapore	Semiconductors and related devices	UMC	Taiwan Province of China	Semiconductors and related devices
43	120	3721 Network Software Co Ltd	Hong Kong, China	Information retrieval services	Yahoo! Holdings(Hong Kong)Ltd	Hong Kong, China	Investors, nec
44	120	Starway Management Ltd	Hong Kong, China	Electric equipment, nec	Rim Holdings Inc	United States	Computer maintenance and repair
45	115	PT Bank Buana Indonesia	Indonesia	Banks	UOB	Singapore	Banks
46	110	Ctrip.com International Ltd	China	Business services, nec	Rakuten Inc	Japan	Information retrieval services
47	107	Baekyang Tunnel Ltd	Korea, Republic of	Bridge, tunnel, and elevated highway construction	Korean Road Infrastructure	Korea, Republic of	Investment advice
48	107	Brizay Property Pte Ltd	Singapore	Land subdividers and developers, except cemeteries	TC Services @ Wilby Pte Ltd	Singapore	Investors, nec
49	105	Muturi PSC,West Papua	Indonesia	Crude petroleum and natural gas	CNOOC Muturi Ltd	Indonesia	Investors, nec
50	103	China Cinda-Non-Performing	China	Investment advice	Silver Grant Intl Asts Mngt Co	Hong Kong, China	Investors, nec
51	102	Thai Amarit-Thailand Assets	Thailand	Malt beverages	San Miguel Corp	Philippines	Malt
52	101	Daewoo Commercial Vehicle Co	Korea, Republic of	Motor vehicles and passenger car bodies	Tata Motors Ltd	India	Motor vehicles and passenger car bodies
53	101	Adira Dinamika Multifinance	Indonesia	Personal credit institutions	Bank Danamon Tbk PT	Indonesia	Banks
54	101	Bank of Asia PCL	Thailand	Banks	UOB	Singapore	Banks
55	100	Glovis Co Ltd	Korea, Republic of	Trucking, except local	Wilhelm Wilhelmsen ASA	Norway	Deep sea foreign transportation of freight
		South-East Europe and CIS					
1	1 454	MobilTel AG	Bulgaria	Radiotelephone communications	BidCo AD	Austria	Special purpose finance company
2	1 430	Vimpelcom OJSC	Russian Federation	Radiotelephone communications	Alfa Telecom Ltd	British Virgin Islands	Telephone communications, except radiotelephone
3	1 350	NK Slavneft	Russian Federation	Oil and gas field exploration services	BP PLC	United Kingdom	Crude petroleum and natural gas
4	1 004	Petrom SA	Romania	Crude petroleum and natural gas	OMV AG	Austria	Crude petroleum and natural gas
5	809	Petrom SA	Romania	Crude petroleum and natural gas	OMV AG	Austria	Crude petroleum and natural gas
6	625	Svyazinvest JSC	Russian Federation	Telephone communications, except radiotelephone	Access Industries Inc	United States	Elevators and moving stairways
7	425	Kar-Tel Ltd	Kazakhstan	Radiotelephone communications	Vimpelcom OJSC	Russian Federation	Radiotelephone communications
8	349	Bulgarian Telecommunications	Bulgaria	Radiotelephone communications	Viva Ventures Holding GmbH	Austria	Investors, nec
9	345	Capital Electricity Co	Bulgaria	Electric services	CEZ as	Czech Republic	Electric services
10	326	Plovdiv EAD	Bulgaria	Electric services	EVN AG	Austria	Electric services
11	279	MobiFon SA	Romania	Radiotelephone communications	Telesystem Int Wireless Inc	Canada	Radiotelephone communications
12	205	Balkan Star JSC	Russian Federation	Cigars	Altadis SA	Spain	Cigarettes
13	179	Gorna Oyahovitza EAD	Bulgaria	Electric services	E ON Energie AG	Germany	Electric services
14	150	DeltaBank CJSC	Russian Federation	Banks	GE Consumer Finance	United States	Investment advice
15	126	Albanian Savings Bank	Albania	Banks	Raiffeisen Zentralbank AG	Austria	Banks
16	121	Uzdunrobita	Uzbekistan	Telephone communications, except radiotelephone	OAO Mobile Telesystems	Russian Federation	Radiotelephone communications
17	103	Welor Kerama	Russian Federation	Ceramic wall and floor tiles	Marazzi Gruppo Ceramiche SpA	Italy	Ceramic wall and floor tiles

Source: UNCTAD, cross-border M&A database.

Note: M&A deals within the same economy, but where the ultimate parent company is different, are still considered cross-border M&As.

Annex table A.II.2. West Asia: selected FDI-related liberalization, 2004

Country	Content
Iraq	The maximum marginal tax rate on corporate income is limited to 15%.
	Revised regulations by the Iraqi Central Bank oblige the prospective foreign bank to present feasibility studies of their planned activities in Iraq on how they could enhance the economy, especially in the area of investment through loans, respecting laws that forbid money laundering and dealing in international terrorism money; and stipulate that the number of Iraqi employees in those banks should not be less than 80% of total staff, and that each bank should open at least three branches.
	Order 64 amending Company Law No. (21) of 1997 states that in order to implement foreign investment using freely convertible currencies and Iraqi legal tender, foreign investors may establish a wholly foreign-owned company or economic establishment, including a branch or an office in Iraq, in all industries except oil and mineral extraction. The Company Law now allows the incorporation of Iraqi companies by foreign individuals and corporate entities.
Kuwait	An amendment to the banking law has opened the banking sector to foreign participation.
	A new taxation law on corporate taxation has reduced the maximum rate from 55% to 25%.
Oman	A Royal Decree has increased the permitted level of foreign ownership in privatization projects to 100%. Privatization includes the conversion of a State-owned or mixed enterprise into a private sector firm and the establishment of any new firm providing a commercial service that had previously been provided by the State (e.g. electricity).
	A Ministerial Decision allows foreign nationals to own real estate in tourist complexes in Oman.
Qatar	Law No. 31/2004 allows foreign investment in the banking and insurance industries.
	Law No. 17/2004 allows foreigners to own residential property in selected projects of the Pearl of the Gulf Real Estate Development Project.
Saudi Arabia	A new income tax law has reduced the previous graduated corporate tax rate to a flat 20%. Investments in certain strategic resources are still taxed at higher rates: 30% for gas and 85% for oil and hydrocarbons. The new executive bylaw to the new income tax has lowered the rate of taxation on foreign investors from 45% to 20%. The law was imposed on foreign companies and individuals doing business in the Kingdom.
	A new law for investment in the mining sector has simplified and streamlined the procedures for obtaining exploration and licences for mining and makes them more transparent.
Turkey	Law No. 5035 amends some laws to accord tax incentives to the Technology Development Zones Management Company and the firms active in the zone.
	Law 5084 revises the free zones law to effectively eliminate certain income and corporate tax immunities for the zones.
	Law 5177 abolishes the pre-licence period in the mining industry to reduce red tape. The amount of taxation has been reduced by 50% on mining production that comes from domestic investors using their own facilities and creating added value. The permission procedures in the mining industry shall be concluded within three months.
	Law 5189 removes the limit on foreign ownership of Türk Telekom. The privatization plan foresees a block sale of 55% of company's shares.
	Law No. 5228 amends Decree-law No.178 and some tax laws by expanding the scope of corporate tax exceptions.
United Arab Emirates	The Dubai International Financial Centre (DIFC) has created a self-regulating financial free zone granting 100% foreign ownership, zero tax rate and permission to repatriate capital and profits without restrictions.

Source: UNCTAD, based on national sources.

Annex table A.II.3. New projects announced by TNCs in the non-oil mining and oil and gas industries in Latin America, January 2004 - May 2005

Company	Home country	Description of the project	Host country	Projected amount ($ million)
		Non-oil mining projects		
Minmetals	China	Financing-based partnership with Codelco.	Chile	2 000
Barrick	Canada	Pascua-Lama copper and gold project, scheduled to start production by 2009.	Argentina/Chile	1 450
Xstrata	Switzerland	Exploration and possible exploitation of Las Bambas copper deposit.[a]	Peru	1 163
BHP Billiton	Australia	Development of Spencer copper mine.	Chile	1 000
Rio Tinto	Australia	Expansion of its existing iron ore operations and improvement of rail and water infrastructure.	Brazil	1 000
Minera Escondida[b]	Australia	Building of a copper cathode plant.	Chile	870
Phelps Dodge	United States	Expansion of Cerro Verde copper mine.	Peru	850
Northern Orion	Canada	Agua Rica Copper-gold-molybdenum project.	Argentina	600
CVRD	Brazil	Identification and evaluation of deposits of potash in the province of Neuquen.	Argentina	..
		Oil and gas projects		
Repsol-YPF	Spain	Investment plans for 2005-2009.	Argentina	6 500
Chevron Corp./Repsol-YPF	United States	Heavy oil in Orinoco Belt region.	Venezuela	5 000
Exxon Mobil	United States	Preliminary agreement for partnership with PDVSA to construct ethylene plant by the end of the decade.	Venezuela	2 500
Camisea Consortium[c]	Argentina	Export of LNG to Mexico and the United States.	Peru	2 000[d]
Repsol-YPF	Spain	Investment plans for 2005-2009.	Bolivia and Brazil	2 000
Petrobras	Brazil	Investment plans for 2004-2007.	Argentina	1 600
Repsol-YPF	Spain	Investment plans for 2005-2009.	Trinidad & Tobago	1 250
Repsol-YPF	Spain	Investment plans for 2005-2009.	Venezuela	1 050
Conoco Philips	United States	Duplication of production in Corocoro oil field by 2009.	Venezuela	850
Chevron Corp.	United States	LNG liquefaction terminal.[e]	Venezuela	..
Total	France	Construction of a second Sincor synthetic crude oil project by 2010.[f]	Venezuela	..
Chevron Corp.	United States	Natural gas import terminal.	Mexico	..

Source: UNCTAD, based on press accounts.

[a] Xstrata won a concession to develop the Las Bambas copper deposit with a $121 million bid. Bidding rules require a minimum investment in exploration of $42 million over four years and $1 billion in the construction phase if reserves are found.

[b] Minera Escondida is controlled by the Australian BHP Billiton (57.5%) in partnership with the Australian Rio Tinto (30%), Japan's Mitsubishi (10%) and the World Bank's International Financial Corp (2.5%).

[c] Camisea Consortium, led by Pluspetrol (Argentina), includes Tecpetrol (Argentina), Hunt Oil (United States), SK (Republic of Korea) and Sonatrach (Algeria).

[d] This amount includes investments to be made in Mexico and the United States.

[e] Chevron Corp. declared that this project will be launched if sufficient commercial gas is found in its two blocks in Plataforma Deltana. At the end of 2004, the company announced that significant amounts of natural gas had been found in block 2 in Plataforma Deltana (www.chevrontexaco.com/news/press/2004/).

[f] Pending government approval. Total already operates the Sincor plant which has extra-heavy crude oil.

Annex table A.II.4. New projects announced by TNCs in the automobile industry in Argentina, Brazil and Mexico, January 2004 - May 2005

Company	Home country	Projected amount ($ million)	Description of project
			Argentina
Volkswagen	Germany	200	Raise cars and parts production and produce new model, 95% destined for export.
PSA Peugeot-Citroen	France	60	Begin assembling locally its 307 model currently imported from France, 60% will be exported.
Daimler Chrysler	Germany	38	New assembly line for the production of NCV3 (12,000 units per year by 2007) — 100% destined for extraregional exports
Ford Motor	United States	25	Launch a Mondeo model and expand dealership network.
General Motors	United States	20.5	Increase capacity.
Daimler Chrysler	Germany	12	Development of auto parts.
Toyota	Japan	..	Introduce a new Hilux pickup truck (production started on February 2005), and plans underway to produce an SUV model from the second half of 2005; 70% of two models are destined for export.
			Brazil
Fiat	Italy	490	Develop technologies, processes and new products.
Bridgestone Firestone	Japan	300	Build tyre plant near a Ford Motor plant.
Continental	Germany	270	Build tyre plant near a Ford Motor plant.
General Motors	United States	240	Expand car capacity for export.
Hyundai	Rep. of Korea	205	Set up new plant.
Pirelli	Italy	100	Increase production.
Michellin	France	98	Build a new earthmover tyre plant adjacent to its already existing heavy truck site in Campo Grande.
Deere	United States	80	Raise production of tractors.
Mitsubishi Motors	Japan	44	..
Kia	Rep. of Korea	..	Build a factory to assemble light commercial vehicles.
			Mexico
Volkswagen	Germany	2 000	Investment plans 2003-2008.
Ford Motor	United States	1 200	Expand Hermosillo plant in 2004-2005; the new facility will open during the second half of 2005.
Bridgestone Firestone	Japan	220	Build a plant in Nuevo Leon that makes high-performance radial tyres for cars and vans.
Toyota	Japan	140	Build a plant in Baja California that makes trucks and truck beds. It has been fired up in February 2005.
Nissan	Japan	..	Expand Aguascalientes plant.

Source: UNCTAD, based on press accounts.

Annex table A.II.5. Industry composition of FDI inflows in selected South-East European countries and CIS, 2003, 2004
(Millions of dollars)

	South-East Europe								CIS					
	Bulgaria		Croatia[a]		TFYR Macedonia		Romania[b]		Kazakhstan[c]		Russian Federation[d]		Ukraine[e]	
Sector/Industry	**2003**	**2004**	**2003**	**2004**	**2003**	**2004**	**2003**	**2004**	**2003**	**2004**	**2003**	**2004**	**2003**	**2004**
Primary	**24**	**27**	**19**	**34**	**2**	**12**	**32**	**19**	**2 190**	**5 430**	**1 768**	**2 717**	**88**	**7**
Agriculture, hunting, forestry and fishing	3	1	..	..	2	6	32	19	2	-2	..	..	94	21
Mining, quarrying and petroleum	21	26	19	34	-	6	..	..	2 189	5 432	1 768	2 717 [f]	-6	-13
Manufacturing	**591**	**392**	**565**	**..**	**16**	**54**	**849**	**2 006**	**1 000**	**516**	**2 342**	**3 830**	**621**	**426**
Food, beverages and tobacco	88	68	53	..	4	2	..	..	43	37	341	322	146	108
Textiles, clothing and leather	84	43	..	..	3	1	..	..	2	1	..	..	20	20
Wood, publishing, pulp and paper	78	-12	..	..	4	1	..	..	10	10	200	330	69	45
Coke, petroleum products and nuclear fuel	170	-3 [g]	512	..		21	..	..	197	20	..	.. [f]	-11	28
Chemicals and chemical products	..	.. [g]	..	..	1	6	..	..	6	25	..	..	57	151
Rubber and plastic products	..	.. [g]	..	..	1	0.2	..	..	6	9	..	..	..	..
Non-metallic mineral products	77	98	..	..	..	..	..	..	35	9	669	1 067	31	25
Metals and metal products	67	54	..	..	1	19	..	..	624	322	496	1 008	161	-32
Machinery and equipment	1	14	..	..	..	-	..	..	3	8	256	527 [h]	132	67
Electrical and electronic equipment	30	-1	..	..	0.1	-	..	..	70	71	..	..	..	..
Motor vehicles and other transport equipment	2	-1	..	..	0.2	..	..	..	2	1	..	.. [h]	..	..
Unspecified manufacturing	-5	132	..	..	1	4	..	..	1	2	380	575	16	13
Services	**1 419**	**2 195**	**206**	**195**	**82**	**97**	**568**	**1 125**	**1 418**	**2 478**	**2 665**	**2 810**	**629**	**1 064**
Electricity, gas and water	9	871	..	..	1	3	..	..	68	11	..	..	-35	-14
Construction	6	62	..	..	0.1	0.1	7	-4	51	154	85	138	26	48
Trade	497	390	71	93	5	8	282	356	164	268	1052	1299	196	423
Hotels and restaurants	28	17	..	17	7	7	61	-18	7	13	..	..	26	69
Transport, storage and communications	174	439	..	15	32	63	28	176	76	82	181	335	137	93
Finance	488	236	40	61	31	9	..	..	53	68	213	279	85	179
Real estate and business activities	191	175	95	10	5	7	..	..	995	1 792	1 134	405	154	193
Public administration and defence	..	..	..	..	..	..	..	..	..	..	-	354	-0.1	-
Education, health and social services	28	4	..	..	..	..	..	..	4	91	..	..	17	18
Unspecified services	..	..	..	..	1	0.2	190	615	..	..	..	..	25	55
Unspecified	**55**	**11**	**97**	**90**	**-**	**0.3**	**-22**	**58**	**..**	**..**	**6**	**64**	**-**	**-**
Total	**2 089**	**2 625**	**888**	**319**	**99**	**163**	**1 427**	**3 208**	**4 608**	**8 424**	**6 781**	**9 420**	**1 337**	**1 497**

Source: UNCTAD, based on national sources.

[a] Equity investment only.
[b] Calculations based on the data of the National Trade Register Office of Romania; the totals do not necessarily correspond to FDI flows reported in the balance of payments.
[c] Gross FDI inflows.
[d] Calculation based on the Russian Federation, State Statistical Service, *Current Statistical Survey: Quarterly Magazine*, No. 1 (52), 2005. Note that as of 2001 the State Statistical Service stopped providing industry breakdowns of direct and portfolio investment – the estimates for FDI are projected from total foreign investment.
[e] Calculated from Hunya 2005.
[f] Russian statistics show the extraction of petroleum and the petroleum products industries together under the heading of “fuel industry”.
[g] Coke and petroleum, chemicals and rubber and plastic products are taken together.
[h] Machinery and equipment includes motor vehicles and other transport equipment.

Annex table A.III.1. Illustrative matrix of technological and organizational capabilities within firms

Nature of capability building strategy and effort		Investment		Production management & engineering			Technological linkages		Marketing	
		Pre-investment	Project execution	Process engineering	Product engineering	Industrial engineering and human resouce development	Domestic	Foreign	Domestic	Foreign
Basic	Simple, routine: based mainly on internal effort and experience	Pre-feasibility and feasibility studies, site selection, scheduling, arranging financing	Routine engineering of civil works; ancillary services; erection and commissioning	Debugging plant; routine process coordination; quality management; routine maintenance; process quality certification	Assimilation of basic product design; product quality management and certification; minor adaptations to meet market needs	Workflow scheduling; time/ motion studies; innovative management and optimization; skills upgrading and training	Local procurement systems and procedures, drawing on available knowledge from institutions	Foreign sourcing; information from suppliers; industry networking; accessing public information	Market research; distribution and servicing systems; some advertising	Export market analysis; links with buyers and other export channels; design/ packaging capability
Intermediate	Adaptive, duplicative: based on search, experimentation and inter-firm and other cooperation	Search for sources of technology, equipment; contract negotiation	Equipment procurement; detailed engineering; staff recruitment; training and capacity building	Capacity stretching; adapt & improve technology; use new production techniques (Just in Time, Total Quality Management, etc.); routine process engineering; preventive maintenance	Product quality/ design improvement; licensing new technology; reverse engineering; continuous monitoring of global technologies	Continuous and systematic productivity analysis and benchmarking; skill audit and formalized training; supply-chain/ logistics management; advanced inventory control	Technology transfer to and from local suppliers/buyers; coordination in design and manufacture; linking with technology and other institutions; devloping capacity to take collective action	Vertical technology transfer; systematic coordination of international knowledge sources; links with technology institutions overseas	Dedicated marketing department; systematic monitoring, feedback analysis; branding and differentiation	Systematic market-building and analysis of foreign markets; alliances and networks abroad; brand introduction; OEM arrangements
Advanced	Innovative, risky: based on purposive effort, R&D and advanced forms of collaboration	Own project outline and design capability; building of world class project management capabilities	Basic process engineering, equipment design and start up; turnkey capability	Continuous process improvement; process innovation; basic research; use of new process design methods; enhancing organizational capacity for generating, codifying, socializing knowledge	Mastery of product design methods; product innovation; basic research; strategic alliances; enhancement of organizational capacity for innovation and risk taking	World-class industrial engineering and supply-chain capabilities, training systems, inventory management	Continuous links with R&D institutions and universities; licensing own technology to others; deepening of innovative links with other firms; specialization in context of networks and clusters	Cooperative R&D; strategic alliances; advanced leveraging strategies for new technologies; foreign acquisitions; direct investment	Advanced brand creation; coordination with retailers/ buyers; advanced distribution systems	Brand deepening; original design management and organizational behaviour management arrangements; own marketing and design channels and affiliates abroad

Source: UNCTAD, based on Lall (1992) and Figueiredo (2001).

Note: This is only an illustrative list of capabilities within a manufacturing firm. It does not include several types of capability, such as financial management, labour relations and logistics.

Annex table A.III.2. Gross domestic expenditure on R&D (GERD) and business enterprise R&D (BERD), 1991-2003

(Millions of dollars)

	GERD					BERD				
Region/economy	1991	1996	2001	2002 [a]	2003	1991	1996	2001	2002 [a]	2003
World	**438 092**	**575 612**	**661 473**	**676 514**	**..**	**291 485**	**376 343**	**437 459**	**449 818**	**..**
Developed countries	***426 958***	***531 128***	***604 914***	***619 403***	***..***	***289 450***	***355 914***	***416 107***	***417 881***	***..***
Western Europe	**147 761**	**174 709**	**169 200**	**184 421**	**..**	**94 987**	**109 988**	**107 910**	**116 657**	**..**
European Union	**139 274**	**163 920**	**159 926**	**174 651**	**..**	**89 379**	**102 812**	**101 476**	**110 005**	**..**
EU-15	*138 157*	*161 427*	*156 877*	*171 279*	*..*	*88 691*	*101 658*	*100 098*	*108 651*	*121 875*
Austria	2 608	3 664	3 931	4 506	5 532	1 508 [c]	2 422 [e]	..	..	..
Belgium	3 442	4 743	4 935	5 471	7 038	2 289	3 395	3 635	4 012	5 212
Denmark	2 204	3 390	3 823	4 346	..	1 290	2 065	2 627	3 010	..
Finland	2 120	3 179	4 133	4 546	5 665	1 208	2 104	2 939	3 176	3 982
France	30 810	35 344	29 429	32 495	..	18 942	21 752	18 597	20 553	23 988
Germany	46 899	52 274	46 534	50 222	61 296	32 522	34 551	32 511	34 775	42 786
Greece	216	558 [d]	762	..	..	56	136	249	270	351
Ireland	435	969	1 150	1 351	..	277	685	806	930	1 214
Italy	11 300	12 562	12 145	13 740	..	6 306	6 720	5 960	6 641	8 082
Luxembourg	..	..	335 [f]	..	..	..	..	310 [f]	..	..
Netherlands	6 250	8 056	7 239	..	..	3 104	4 244	4 217	4 276	..
Portugal	..	654 [d]	929	1 132	..	113 [b]	147 [d]	296	390	..
Spain	3 570	4 892	5 572	6 770	9 269	1 999	2 365	2 918	3 695	5 015
Sweden	6 905	8 776 [d]	9 371	..	12 010	4 729	6 569 [d]	7 274	..	8 899
United Kingdom	21 396	22 367	26 588	29 328	..	14 347	14 505	17 758	19 649	22 347
New EU members	*1 117*	*2 493*	*3 049*	*3 372*	*3 450*	*688*	*1 154*	*1 379*	*1 354*	*1 452*
Cyprus	..	21 [e]	25	32	43	..	..	..	..	..
Czech Republic	516	599	745	903	1 143	358	359	448	551	697
Estonia	..	25	44	52	76	..	6 [e]	15	16	26
Hungary	358	294	491	665	784	148	127	197	236	288
Latvia	..	24	34	39	42	..	..	12	16	15
Lithuania	..	41	82	94	..	..	1	24	16	..
Malta	..	..	3 [f]	..	..	..	..	..	..	..
Poland	..	1 024	1 187	1 108	1 172	..	419	425	225	321
Slovakia	244	193	134	140	191	182	108	90	90	105
Slovenia	..	272	306	339	..	..	133	167	203	..
Other Western Europe	**8 486**	**10 790**	**9 273**	**9 770**	**..**	**5 608**	**7 175**	**6 433**	**6 652**	**..**
Iceland	78	136 [e]	234	263	..	17	..	138	150	..
Norway	1 944	2 571 [d]	2 718	3 186	..	1 061	1 463 [d]	1 624	1 830	..
Switzerland	6 464 [b]	8 082	6 321 [f]	..	..	4 530 [b]	5 712	4 672 [f]	..	..
North America	**170 291**	**207 421**	**287 845**	**290 015**	**300 608**	**119 349**	**148 235**	**207 446**	**202 320**	**204 922**
Canada	9 400	10 133	14 280	13 830	16 024	4 674	5 864	8 941	7 890	8 810
United States	160 891	197 288	273 565	276 185	284 584	114 675	142 371	198 505	194 430	196 112
Other developed countries	**108 906**	**148 998**	**147 869**	**144 966**	**..**	**75 115**	**97 691**	**100 752**	**98 904**	**..**
Australia	4 761	6 881	5 997 [f]	..	..	1 842	3 314	2 868	..	..
Israel	1 499	2 883	5 376	..	..	835	1 745	3 512	..	..
Japan	102 233	138 623	136 000	132 988	144 947	72 328	92 466	94 225	92 328	101 429
New Zealand	412	611	496 [f]	605	822	111	165	147 [f]	196	304
Developing economies	***10 893***	***39 519***	***51 877***	***51 616***	***..***	***2 035***	***17 561***	***18 656***	***28 760***	***..***
Africa	**..**	**1 001**	**1 217**	**1 083**	**..**	**..**	**..**	**..**	**..**	**..**
Burkina Faso	..	4	..	..	..	..	..	..	..	..
Cape Verde	..	- [d]	-	-	..	..	..	..	..	..
Egypt	..	144	189 [f]	..	..	..	..	..	..	..
Madagascar	..	8 [d]	5 [f]	..	..	..	..	..	..	..
Mauritius	..	13 [d]	..	..	..	..	..	..	..	..
Seychelles	..	..	..	1	..	..	..	..	..	..
South Africa	..	742 [e]	871	710	..	..	..	..	..	..
Tunisia	..	60	106	132	..	..	..	..	..	..
Uganda	..	30	46	..	..	..	..	..	..	..
Zambia	..	-	..	..	..	..	..	..	..	..
Latin America and the Caribbean	**1 265**	**9 383**	**10 942**	**9 114**	**..**	**205**	**3 464**	**3 564**	**2 960**	**..**
South America	**244**	**8 181**	**8 186**	**6 079**	**..**	**58**	**3 218**	**2 785**	**2 182**	**..**
Argentina	..	1 137	1 141	397	532	..	294	260	103	154
Bolivia	21 [b]	24	24	22	..	..	6	6	5	..
Brazil	..	6 004	5 855 [f]	..	4 647	..	2 733	2 389 [f]	..	1 876
Chile	208	400	366	473	..	58	89	99	165	..
Colombia	..	291	136	81	..	..	87	25	..	..

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Annex table A.III.2. Gross domestic expenditure on R&D (GERD) and business enterprise R&D (BERD), 1991-2003 (concluded)
(Millions of dollars)

	GERD					BERD				
Region/economy	1991	1996	2001	2002 [a]	2003	1991	1996	2001	2002 [a]	2003
Ecuador	..	19	..	..	..	..	1	..	..	..
Paraguay	..	..	6	5	..	..	..	..	..	..
Peru	..	49 [d]	58	58	..	..	7 [d]	6	6	..
Uruguay	15	54	48 [f]	32	..	1	-	- [f]	..	..
Venezuela	..	204	553	362	..	..	..	..	..	..
Other Latin America and the Caribbean	**1 021**	**1 201**	**2 756**	**3 035**	**..**	**147**	**246**	**779**	**779**	**..**
Costa Rica	..	35	62 [f]	..	..	..	8	14 [f]	..	..
Cuba	111	87	179	190	..	..	..	..	..	..
El Salvador	..	10 [e]	..	..	..	..	- [e]	..	..	..
Honduras	..	..	3 [f]	..	..	..	..	..	..	..
Jamaica	..	..	5	6	..	..	..	..	..	..
Mexico	887 [c]	1 030	2 453	2 719	..	147 [c]	236	763	..	..
Nicaragua	..	3 [d]	..	2	..	..	..	..	..	..
Panama	22	31	45	44	44	..	1	..	..	..
Saint Vincent and the Grenadines	..	..	-	1	..	..	..	..	..	..
Trinidad and Tobago	..	6	9	..	..	..	1	1	..	..
Asia and Oceania	**9 628**	**29 135**	**39 717**	**41 419**	**..**	**1 829**	**14 097**	**15 092**	**25 799**	**..**
West Asia	**837**	**903**	**1 286**	**1 378**	**..**	**176**	**229**	**385**	**381**	**..**
Kuwait	39	57	232	155	158	7 [b]	17	29	30	..
Syrian Arab Republic	..	27 [d]	..	..	..	..	..	..	..	..
Turkey	798	819	1 054	1 223	..	168	213	356	351	..
South, East and South-East Asia	**8 791**	**28 232**	**38 432**	**40 041**	**41 600**	**1 654**	**13 868**	**14 707**	**25 418**	**23 920**
China	..	4 865	12 595	15 556	18 601	..	..	..	9 520	11 601
Hong Kong, China	..	723 [e]	909	967	..	..	206	267	321	..
India	..	2 112	3 743	..	..	..	..	..	..	..
Korea, Republic of	5 670	13 522	12 479	13 848	16 002	..	9 899	9 507	10 371	12 177
Malaysia	..	218	440 [f]	658	..	..	..	..	..	..
Mongolia	..	2 [d]	3	3	..	..	..	..	..	..
Nepal	..	..	..	36	..	..	..	..	..	..
Pakistan	..	92 [d]	113	164	..	..	..	..	..	..
Philippines	72	158	..	107	..	19	52	..	71	..
Singapore	..	1 271	1 804	1 901	..	..	804	1 141	1 168	..
Sri Lanka	..	26	..	..	..	..	..	..	..	..
Taiwan Province of China	3 049	5 024	6 064	6 491	6 997	1 635	2 906	3 792	3 966	..
Thailand	..	218	282	309	..	..	..	..	..	143
South-East Europe and CIS	***241***	***4 965***	***4 683***	***5 496***	***6 000***	***..***	***2 868***	***2 696***	***3 177***	***..***
South-East Europe	**241**	**404**	**446**	**515**	**340**	**..**	**215**	**111**	**119**	**154**
Bulgaria	..	51	63	76	100	..	30	13	14	20
Croatia	..	89	213	255	..	..	..	..	..	..
Macedonia, TFYR	..	14 [d]	11	10	10	..	2 [d]	1	-	-
Romania	241 [c]	249	158	174	230	..	183	97	105	134
Serbia and Montenegro	..	- [d]	-	..	..	..	..	..	..	..
CIS	**..**	**4 561**	**4 237**	**4 981**	**5 660**		**2 652**	**2 585**	**3 058**	**..**
Armenia	..	1	3	6	6	..	..	..	..	..
Azerbaijan	..	7	19	19	..	..	..	..	..	..
Belarus	..	103 [d]	88	91	109	..	54 [d]	46	46	49
Georgia	..	10	8	10	..	..	..	..	..	..
Kazakhstan	..	73	49	..	..	..	..	..	..	..
Kyrgyzstan	..	3 [d]	3	3	4	..	..	1	2	3
Moldova, Republic of	..	12	6	7	6	..	2	1	1	4
Russian Federation	..	3 753	3 609	4 307	5 534	..	2 597	2 536	3 009	..
Ukraine	..	598 [d]	453	490	..	..	..	..	..	..

Source: UNCTAD, based on national sources, OECD, *Main Science and Technology Indicators*, various issues, World Bank, *World Development Indicators*, 2004, data from the Iberoamerican Web of Science and Technology Indicators (RICYT), and data from the UNESCO Institute of Statistics.

[a] Regional totals for 2002 have been complemented by data from 2001 or 2000 (and 2003 for Brazil) for countries that did not report R&D spending in 2002.
[b] 1992.
[c] 1993.
[d] 1997.
[e] 1998.
[f] 2000.

Annex table A.III.3. Patent applications from developing countries and South-East Europe and CIS in the United States, by residence of inventor, 1991-2003

(Period averages)

Region/economy	Average 1991-1993	Share of foreign (%)	Average 2001-2003	Share of foreign (%)	Change between periods (%)
Developing economies	***5 121***	***6.63***	***25 322***	***16.78***	***394.5***
Africa	**221**	**0.29**	**257**	**0.17**	**16.1**
Egypt	6	0.01	13	0.01	..
Kenya	2	-	12	0.01	..
South Africa	213	0.28	232	0.15	8.9
Latin America and the Caribbean	**347**	**0.45**	**670**	**0.44**	**93.2**
Argentina	58	0.08	119	0.08	105.2
Brazil	114	0.15	240	0.16	111.4
Chile	12	0.02	31	0.02	168.6
Colombia	7	0.01	22	0.01	..
Costa Rica	4	-	7	-	..
Ecuador	3	-	8	0.01	..
Mexico	98	0.13	179	0.12	83.6
Panama	2	-	7	-	..
Peru	3	-	8	0.01	..
Uruguay	4	0.01	9	0.01	..
Venezuela	43	0.06	39	0.03	-7.8
Asia and Oceania	**4 553**	**5.89**	**24 395**	**16.17**	**435.8**
West Asia	**18**	**0.02**	**69**	**0.05**	**294.3**
Saudi Arabia	13	0.02	32	0.02	137.5
Turkey	3	-	31	0.02	..
United Arab Emirates	2	-	7	-	..
South, East and South-East Asia	**4 536**	**5.87**	**24 326**	**16.12**	**436.3**
China	130	0.17	849	0.56	553.3
Hong Kong, China	146	0.19	679	0.45	365.9
India	56	0.07	909	0.60	1513.0
Indonesia	10	0.01	13	0.01	37.9
Korea, Republic of	1 472	1.91	8 356	5.54	467.6
Malaysia	19	0.03	165	0.11	753.4
Philippines	10	0.01	50	0.03	420.7
Singapore	85	0.11	788	0.52	823.4
Sri Lanka	10	0.01	64	0.04	536.7
Taiwan Province of China	2 598	3.36	12 453	8.25	379.4
South-East Europe and CIS	**157**	**0.20**	**480**	**0.32**	**205.5**
Belarus	4	0.01	8	0.01	..
Bulgaria	7	0.01	10	0.01	..
Croatia	2	-	20	0.01	..
Romania	3	-	11	0.01	..
Russian Federation	112	0.14	384	0.25	242.6
Serbia and Montenegro	23	0.03	7	-	-70.6
Ukraine	7	0.01	40	0.03	..
***Memorandum*:**					
New EU members [a]	*114*	*0.15*	*273*	*0.18*	*139.9*
Czech Republic	-	-	65	0.04	..
Hungary	83	0.11	116	0.08	40.7
Lithuania	-	-	5	-	..
Poland	21	0.03	48	0.03	125.0
Slovakia	-	-	6	-	..
Slovenia	9	0.01	31	0.02	..
Developed countries [a]	***71 805***	***92.94***	***124 905***	***82.77***	***73.9***
All foreign applications	**77 263**	**100.00**	**150 899**	**100.00**	**95.3**
Domestic applications	**93 445**	**..**	**183 566**	**..**	**96.4**
All applications	**170 708**	**..**	**334 465**	**..**	**95.9**

Source: United States Patent and Trademark Office, Information Products Division, Technology Assessment and Forecast Branch, special tabulations, Washington, DC, February 2005.

[a] In the new United Nations classification, the total for developed countries includes the new EU members under EU (box I.2).

Annex table A.III.4. Technological Activity Index

	Rank	1995		2001	
High innovation	1	Sweden	0.981	Sweden	0.976
	2	United States	0.963	Finland	0.973
	3	Japan	0.949	Switzerland	0.955
	4	Switzerland	0.947	United States	0.948
	5	Finland	0.932	Japan	0.935
	6	Denmark	0.931	Denmark	0.917
	7	Canada	0.930	Taiwan Province of China	0.902
	8	Norway	0.905	Canada	0.900
	9	Australia	0.900	Iceland	0.895
	10	Taiwan Province of China	0.890	Germany	0.891
	11	Germany	0.887	Norway	0.890
	12	United Kingdom	0.877	Singapore	0.875
	13	Netherlands	0.875	Netherlands	0.872
	14	France	0.867	Australia	0.870
	15	Israel	0.858	Belgium	0.863
	16	Belgium	0.848	United Kingdom	0.861
	17	Iceland	0.843	France	0.849
	18	Singapore	0.803	Israel	0.846
	19	Austria	0.798	Austria	0.830
	20	New Zealand	0.793	Korea, Rep. of	0.812
	21	Russian Federation	0.792	New Zealand	0.802
	22	Ireland	0.783	Ireland	0.781
	23	Slovenia	0.766	Slovenia	0.764
	24	Korea, Rep of.	0.762	Russian Federation	0.759
	25	Italy	0.753	Spain	0.744
	26	Estonia	0.734	Estonia	0.730
	27	Spain	0.728	Italy	0.703
	28	Belarus	0.721	Hungary	0.692
	29	Hungary	0.696	Greece	0.681
	30	Greece	0.660	Czech Rep.	0.680
Medium-high innovation	31	Ukraine	0.653	Portugal	0.678
	32	Georgia	0.643	Lithuania	0.674
	33	Poland	0.635	Hong Kong (China)	0.632
	34	Lithuania	0.629	South Africa	0.621
	35	Portugal	0.621	Belarus	0.618
	36	Bulgaria	0.619	Jordan	0.606
	37	Hong Kong (China)	0.613	Argentina	0.603
	38	Armenia	0.611	Bulgaria	0.602
	39	Argentina	0.609	Ukraine	0.600
	40	Saudi Arabia	0.601	Poland	0.598
	41	Czech Rep.	0.597	Slovakia	0.588
	42	Cyprus	0.597	Georgia	0.567
	43	South Africa	0.588	Kuwait	0.564
	44	Kuwait	0.576	Latvia	0.563
	45	Chile	0.560	Cyprus	0.555
	46	Uruguay	0.558	Chile	0.544
	47	Costa Rica	0.551	Armenia	0.543
	48	Romania	0.539	Saudi Arabia	0.538
	49	Slovakia	0.504	Costa Rica	0.526
	50	Venezuela	0.499	Romania	0.522
	51	Uzbekistan	0.493	Lebanon	0.507
	52	Lebanon	0.483	Brazil	0.478
	53	Mexico	0.474	Uzbekistan	0.472
	54	Brazil	0.459	Mexico	0.461
	55	Mauritius	0.457	Malaysia	0.446
	56	Egypt	0.430	Venezuela	0.438
	57	Jamaica	0.419	Turkey	0.425
	58	Turkey	0.415	China	0.417
	59	Latvia	0.412	Kazakhstan	0.404
Medium innovation	60	Zimbabwe	0.405	Egypt	0.387
	61	Malaysia	0.401	Thailand	0.361
	62	Morocco	0.396	Kenya	0.358
	63	China	0.390	Iran, Islamic Rep. of	0.336
	64	Qatar	0.362	Morocco	0.332
	65	Moldova, Rep. of	0.342	Zimbabwe	0.327
	66	Bahrain	0.340	India	0.323
	67	Thailand	0.340	Kyrgyzstan	0.323
	68	Peru	0.332	Jamaica	0.315
	69	India	0.328	Bahrain	0.311
	70	Kazakhstan	0.320	Colombia	0.311
	71	Sri Lanka	0.304	Uruguay	0.298
	72	Honduras	0.296	Sri Lanka	0.298
	73	United Arab Emirates	0.294	United Arab Emirates	0.290
	74	Tajikistan	0.288	Peru	0.289
	75	Colombia	0.288	Tunisia	0.285
	76	Philippines	0.264	Syrian Arab Rep.	0.281
	77	Dominican Rep.	0.255	Algeria	0.278
	78	Jordan	0.253	Qatar	0.277
	79	Iran, Islamic Rep. of	0.242	Moldova, Rep. of	0.275
	80	Mongolia	0.238	Philippines	0.265
	81	Kyrgyzstan	0.237	Botswana	0.261
	82	Botswana	0.231	Mauritius	0.257
	83	Tunisia	0.225	Ecuador	0.235
	84	Kenya	0.210	Tajikistan	0.231
	85	Indonesia	0.203	Viet Nam	0.231
	86	Pakistan	0.199	Tanzania, United Rep. of	0.227
	87	Namibia	0.185	Mongolia	0.221
	88	El Salvador	0.181	El Salvador	0.204
Low innovation	89	Oman	0.178	Madagascar	0.195
	90	Viet Nam	0.162	Uganda	0.185
	91	Benin	0.159	Namibia	0.185
	92	Algeria	0.155	Oman	0.176
	93	Malawi	0.151	Indonesia	0.175
	94	Zambia	0.143	Pakistan	0.169
	95	Paraguay	0.127	Nigeria	0.161
	96	Senegal	0.126	Bolivia	0.155
	97	Ghana	0.126	Ghana	0.139
	98	Bolivia	0.122	Malawi	0.130
	99	Ecuador	0.116	Benin	0.122
	100	Cameroon	0.113	Senegal	0.120
	101	Nicaragua	0.111	Cameroon	0.102
	102	Syrian Arab Rep.	0.111	Zambia	0.101
	103	Guatemala	0.105	Côte d'Ivoire	0.097
	104	Tanzania, United Rep. of	0.105	Nicaragua	0.081
	105	Nigeria	0.104	Honduras	0.076
	106	Côte d'Ivoire	0.092	Paraguay	0.075
	107	Uganda	0.079	Bangladesh	0.063
	108	Djibouti	0.071	Ethiopia	0.059
	109	Bangladesh	0.069	Guatemala	0.055
	110	Ethiopia	0.063	Mozambique	0.042
	111	Mauritania	0.038	Mauritania	0.038
	112	Madagascar	0.033	Dominican Rep.	0.029
	113	Mozambique	0.021	Yemen	0.021
	114	Eritrea	0.017	Eritrea	0.017
	115	Yemen	0.013	Angola	0.013
	116	Haiti	0.008	Haiti	0.008
	117	Angola	0.000	Djibouti	0.000

Sources: UNCTAD.

Note: Each component of the Index has equal weights, the Index value being the simple average of the normalized value of the three variables: R&D manpower, patents in the United States and scientific journal articles.

Annex table A.III.5. The Human Capital Index

	High					Medium					Low			
	1995		2001			1995		2001			1995		2001	
1	Australia	0.989	Finland	0.982	41	Argentina	0.670	Uzbekistan	0.655	81	Indonesia	0.349	Iran, Islamic Rep. of	0.355
2	Belgium	0.975	Sweden	0.982	42	Slovakia	0.657	Kazakhstan	0.646	82	Syrian Arab Rep.	0.340	El Salvador	0.354
3	Canada	0.964	Australia	0.971	43	Moldova, Rep. of	0.653	Bahrain	0.622	83	Paraguay	0.339	Paraguay	0.351
4	Finland	0.963	Norway	0.957	44	Philippines	0.641	Singapore	0.621	84	Namibia	0.337	Indonesia	0.347
5	New Zealand	0.956	New Zealand	0.955	45	Singapore	0.635	Georgia	0.619	85	Mauritius	0.324	Algeria	0.347
6	Norway	0.954	United Kingdom	0.951	46	Bahrain	0.629	Thailand	0.615	86	China	0.318	Sri Lanka	0.337
7	United Kingdom	0.951	Denmark	0.934	47	Tajikistan	0.620	Chile	0.609	87	Nicaragua	0.313	China	0.298
8	Netherlands	0.949	Belgium	0.924	48	Chile	0.601	Lebanon	0.602	88	Albania	0.308	Oman	0.288
9	Denmark	0.938	Canada	0.914	49	Lebanon	0.593	Romania	0.586	89	Zimbabwe	0.298	Nicaragua	0.277
10	France	0.936	United States	0.905	50	Qatar	0.580	Jordan	0.584	90	Botswana	0.297	Honduras	0.272
11	Sweden	0.933	Netherlands	0.904	51	Hong Kong (China)	0.573	Philippines	0.581	91	Oman	0.290	Namibia	0.251
12	United States	0.929	Spain	0.895	52	Romania	0.569	Brazil	0.579	92	Viet Nam	0.275	India	0.247
13	Austria	0.907	France	0.877	53	South Africa	0.569	Bolivia	0.578	93	Honduras	0.262	Yemen	0.239
14	Spain	0.900	Austria	0.875	54	Cyprus	0.564	Cyprus	0.577	94	Morocco	0.251	Zimbabwe	0.229
15	Germany	0.892	Poland	0.867	55	Peru	0.563	Egypt	0.562	95	India	0.247	Morocco	0.222
16	Korea, Rep of.	0.879	Korea, Rep. of	0.866	56	Costa Rica	0.558	Mongolia	0.562	96	Guatemala	0.224	Guatemala	0.215
17	Ireland	0.875	Iceland	0.857	57	Armenia	0.538	Peru	0.561	97	Nepal	0.173	Syrian Arab Rep.	0.212
18	Japan	0.863	Ireland	0.848	58	Venezuela	0.509	Moldova, Rep. of	0.550	98	Nigeria	0.169	Bangladesh	0.180
19	Iceland	0.826	Latvia	0.846	59	Kyrgyzstan	0.504	Qatar	0.528	99	Côte d'Ivoire	0.166	Nepal	0.170
20	Belarus	0.819	Slovenia	0.838	60	Thailand	0.485	Hong Kong (China)	0.514	100	Zambia	0.157	Cameroon	0.167
21	Estonia	0.815	Japan	0.835	61	Egypt	0.469	Armenia	0.509	101	Cameroon	0.152	Kenya	0.161
22	Taiwan Province of China	0.813	Taiwan Province of China	0.829	62	Dominican Rep.	0.459	Tajikistan	0.493	102	Bangladesh	0.148	Côte d'Ivoire	0.157
23	Italy	0.809	Estonia	0.820	63	Iran, Islamic Rep. of	0.456	Malaysia	0.488	103	Yemen	0.146	Nigeria	0.153
24	Greece	0.806	Russian Federation	0.817	64	Kuwait	0.454	Venezuela	0.482	104	Kenya	0.137	Ghana	0.148
25	Ukraine	0.804	Portugal	0.814	65	Colombia	0.447	Mexico	0.477	105	Ghana	0.136	Zambia	0.130
26	Russian Federation	0.802	Lithuania	0.811	66	Turkey	0.446	Colombia	0.476	106	Pakistan	0.122	Pakistan	0.104
27	Poland	0.800	Ukraine	0.810	67	Bolivia	0.443	Jamaica	0.475	107	Mauritania	0.103	Mauritania	0.098
28	Switzerland	0.794	Germany	0.810	68	Ecuador	0.442	South Africa	0.475	108	Haiti	0.102	Uganda	0.095
29	Portugal	0.787	Switzerland	0.799	69	Mexico	0.433	Tunisia	0.445	109	Madagascar	0.097	Eritrea	0.092
30	Slovenia	0.760	Greece	0.794	70	Jordan	0.426	Albania	0.435	110	Senegal	0.083	Benin	0.090
31	Israel	0.758	Italy	0.789	71	Mongolia	0.405	Costa Rica	0.419	111	Uganda	0.083	Haiti	0.083
32	Bulgaria	0.723	Belarus	0.776	72	United Arab Emirates	0.399	Saudi Arabia	0.140	112	Benin	0.077	Senegal	0.081
33	Georgia	0.722	Argentina	0.767	73	Saudi Arabia	0.391	Dominican Rep.	0.413	113	Eritrea	0.077	Malawi	0.080
34	Kazakhstan	0.722	Israel	0.762	74	Malaysia	0.385	Ecuador	0.404	114	Malawi	0.066	Madagascar	0.071
35	Uzbekistan	0.717	Hungary	0.758	75	Brazil	0.383	Mauritius	0.389	115	Tanzania, United Rep. of	0.056	Tanzania, United Rep. of	0.063
36	Hungary	0.713	Bulgaria	0.729	76	Tunisia	0.379	Kuwait	0.383	116	Angola	0.044	Djibouti	0.055
37	Lithuania	0.701	Uruguay	0.715	77	El Salvador	0.371	Botswana	0.370	117	Djibouti	0.043	Ethiopia	0.044
38	Czech Rep.	0.700	Czech Rep.	0.701	78	Jamaica	0.369	United Arab Emirates	0.363	118	Ethiopia	0.028	Angola	0.025
39	Latvia	0.697	Kyrgyzstan	0.676	79	Sri Lanka	0.368	Viet Nam	0.358	119	Mozambique	0.015	Mozambique	0.019
40	Uruguay	0.675	Slovakia	0.664	80	Algeria	0.359	Turkey	0.355					

Source: UNCTAD.

Note: The Human Capital Index is calculated from the literacy rate (weight of 1), secondary enrolments (weight of 2) and tertiary enrolments in all subjects (weight of 3).

Annex table A.IV.1. R&D expenditure by foreign affiliates in selected economies, 1993-2003
(Millions of dollars and per cent of business R&D)

Economy	Category	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Argentina	Expenditure	..	21	22	42	43	56	26	38	43	24	..
	Share (%)	..	..	..	14.3	12.0	15.1	7.1	11.8	16.5	23.2	..
Australia	Expenditure	..	..	978	..	..	..	1 090	..	..	..	..
	Share (%)	..	..	30.3	..	..	..	41.1	..	..	..	..
Brazil	Expenditure	..	..	..	..	..	..	..	1 145	..	..	898
	Share (%)	..	..	..	..	..	..	..	48.0	..	..	47.9
Canada	Expenditure	1 582	1 646	1 732	1 866	2 187	2 168	2 241	2 439	2 650	2 658	3 070
	Share (%)	..	..	29.8	31.8	34.6	33.2	32.0	29.3	29.6	33.7	34.8
Chile	Expenditure	..	2	15	6	7	6	4	11	8	6	..
	Share (%)	..	2.3	14.1	6.7	10.7	9.3	6.2	10.8	8.1	3.6	..
China	Expenditure	..	..	..	..	..	..	..	..	..	2 098	2 748
	Share (%)	..	..	..	..	..	*18.0*	*19.2*	*21.6*	*21.7*	22.0	23.7
Czech Republic	Expenditure	..	..	71	65	85	141	118	152	203	239	325
	Share (%)	..	..	20.9	18.0	22.1	30.7	27.4	36.9	45.3	43.4	46.6
Finland	Expenditure	..	..	250	..	305	358	449	388	427	476	..
	Share (%)	..	..	13.9	..	14.0	14.2	15.9	13.4	14.5	15.0	..
France	Expenditure	..	2 793	3 721	3 633	..	3 238	..	..	4 006	3 986	..
	Share (%)	..	14.2	17.1	16.7	..	16.4	..	..	21.5	19.4	..
Germany	Expenditure	4 065	..	4 554	..	4 744	..	5 501	..	7 170	..	..
	Share (%)	13.4	..	13.0	..	14.5	..	15.4	..	22.1	..	..
Greece	Expenditure	6	..	6	..	5	..	10	..	..	..	..
	Share (%)	6.4	..	3.7	..	3.8	..	4.5	..	..	..	..
Hungary	Expenditure	15	29	31	56	90	65	71	113	141	155	180
	Share (%)	12.4	22.6	21.8	44.4	65.3	52.7	53.2	68.4	71.4	65.5	62.5
India	Expenditure	..	..	..	48	59	84	103	..	..	..	..
	Share (%)	..	..	*1.7*	2.3	2.4	3.2	3.4	..	..	..	..
Ireland	Expenditure	266	320	407	452	454	504	532	498	521	639	875
	Share (%)	67.1	66.8	66.7	65.9	65.4	64.4	63.7	64.2	64.6	68.7	72.1
Israel	Expenditure	..	96	97	169	208	141	389	630	726	889	..
	Share (%)	..	7.9	6.7	9.7	10.0	6.1	14.3	17.5	20.7	..	..
Italy	Expenditure	..	..	..	..	..	..	..	..	1'964	..	..
	Share (%)	..	..	..	..	..	..	..	..	33.0	..	..
Japan	Expenditure	702	1 319	1 365	862	1 140	1 386	3 666	3 636	3 197	..	..
	Share (%)	0.9	1.5	1.4	0.9	1.3	1.7	3.9	3.6	3.4	..	..
Korea, Rep.	Expenditure	..	17	29	34	41	29	101	143	157	167	..
	Share (%)	..	*0.2*	0.3	0.3	0.4	0.5	1.4	1.6	1.7	1.6	..

/...

Annex table A.IV.1. R&D expenditure by foreign affiliates in selected economies, 1993-2003 (concluded)
(Millions of dollars and per cent of business R&D)

Economy	Category	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Mexico	Expenditure	..	183	58	121	126	191	238	303	248	284	..
	Share (%)	..	52.7	29.3	51.3	46.9	38.6	39.9	45.9	32.5	..	..
The Netherlands	Expenditure	..	..	..	..	857	885	983	1 071	1 042	..	..
	Share (%)	..	..	..	..	20.4	21.2	21.7	26.1	24.7	..	..
Poland	Expenditure	..	..	..	..	42	61	97	52	62	43	61
	Share (%)	..	..	..	..	10.3	12.7	20.2	13.1	14.6	19.2	19.1
Portugal	Expenditure	..	..	..	..	..	..	35	..	91	..	..
	Share (%)	..	..	..	..	..	..	17.9	..	30.9	..	..
Singapore	Expenditure	..	..	..	..	..	..	..	..	658	618	715
	Share (%)	..	..	..	..	..	..	..	..	57.6	52.9	59.8
Slovakia	Expenditure	..	3	4	5	4	3	3	13	16	19	20
	Share (%)	..	4.1	3.9	4.4	2.3	2.9	3.2	15.2	18.1	20.7	19.0
Spain	Expenditure	742	..	673	..	798	..	934	..	981	1 223	1 371
	Share (%)	39.6	..	30.0	..	35.7	..	33.8	..	33.6	33.1	27.3
Sweden	Expenditure	582	..	1 193	..	1 225	..	2 508	..	2 957	..	4 032
	Share (%)	13.3	..	19.3	..	18.7	..	36.4	..	40.7	..	45.3
Thailand	Expenditure	..	..	..	..	..	..	..	..	..	..	40
	Share (%)	..	..	..	..	..	..	..	..	..	..	28.1
Turkey	Expenditure	..	..	..	..	45	26	32	45	..	..	..
	Share (%)	..	..	..	..	14.8	8.4	7.3	10.6	..	..	..
United Kingdom	Expenditure	..	3 939	4 258	4 226	5 131	5 104	5 700	5 457	7 205	7 468	10 049
	Share (%)	..	29.1	29.6	29.1	32.8	30.4	31.2	31.3	40.6	38.0	45.0
United States	Expenditure	14 199	15 566	17 542	17 984	19 428	25 373	24 027	26 180	26 463	27 508	..
	Share (%)	12.3	13.3	13.5	12.6	12.5	15.2	13.3	13.2	13.3	14.1	..
Memorandum items:												
Developed countries [a]	Expenditure	28 973	32 303	36 778	37 704	40 116	47 055	51 304	56 349	59 400	62 342	..
	Share (%)	10.6	11.2	11.4	11.3	11.9	13.6	13.6	13.8	14.9	15.7	..
Developing countries	Expenditure	223	223	172	295	321	392	1 649	2 446	4 402	4 135	..
	Share (%)	2.3	2.3	1.5	2.3	2.5	4.1	11.8	14.3	18.3	17.7	..
Economies in transition [b]	Expenditure	18	104	106	167	220	269	288	331	422	455	..
	Share (%)	9.3	19.0	18.3	16.8	20.0	22.9	25.6	31.1	36.4	41.3	..
Estimated total	Expenditure	29 214	32 630	37 075	38 166	40 657	47 716	53 241	59 125	64 223	66 933	..
	Share (%)	10.3	11.0	11.1	11.0	11.6	13.3	13.5	13.9	15.2	15.9	..

Source: UNCTAD, based on national sources and data provided from the OECD AFA database.

[a] Excluding new EU members.
[b] Proxied by data for four new EU members: the Czech Republic, Hungary, Poland and Slovakia.

Note: The annual totals have been estimated using the data available for the given year; where no data were available, the data of the preceding, or subsequent year, in that order of preference, have been used.

Annex table A.IV.2. R&D performed by foreign affiliates of United States TNCs by country and NAICS industry, 2002

(Millions of dollars)

Region/economy	All industries	Total Manufacturing	Food	Chemicals	Primary and fabricated metals	Machinery	Computers and electronic products	Electrical equipment, appliances, and components	Transportation equipment	IT	Professional, scientific and technical services
All countries	**21 151**	**18 696**	**338**	**4 819**	**181**	**642**	**5 278**	**418**	**5 898**	**507**	**1 237**
Developed economies	**b**	**15 528**	**213**	**4 406**	**146**	**546**	**3 505**	**b**	**5 471**	**b**	**b**
Canada	2 345	2 272	27	438	14	25	510	13	1 170	29	16
EU-15	b	11 453	180	3 234	127	462	2 122	249	4 276	258	601
Japan	1 433	1 283	4	732	5	50	375	b	25	b	b
Israel	889	520	2	2	-	9	498	-	-	56	b
Developing economies	**2 703**	**2 613**	**85**	**274**	**..**	**65**	**1 699**	**..**	**..**	**..**	**..**
Asia and Oceania	*2 113*	*1 955*	*9*	*90*	..	*30*	*1 628*	..	..	..	..
China	646	609	1	33	-	2	b	b	1	b	b
Hong Kong (China)	b	b	-	3	1	-	b	1	-	b	b
India	80	19	-	8	-	3	5	a	3	b	b
Indonesia	3	3	a	2	-	-	a	-	a	-	-
Korea, Republic of	167	149	2	10	a	11	90	2	27	8	6
Malaysia	b	b	-	1	-	1	b	-	-	-	-
Philippines	50	48	2	4	-	a	41	-	a	-	-
Singapore	589	578	-	11	-	a	550	5	b	1	5
Taiwan Province of China	70	b	1	16	b	9	25	-	b	b	1
Thailand	22	21	2	2	a	4	3	-	6	-	-
Latin America and the Caribbean	*b*	*633*	*75*	*172*	*b*	*33*	*71*	*b*	*189*	b	b
Brazil	306	298	36	68	b	28	30	b	b	b	3
Mexico	284	185	33	49	-	5	2	1	b	-	b
Sub-Saharan Africa	*b*	*25*	*1*	*12*	-	*2*	-	-	*b*	*a*	*a*
South Africa	b	19	1	9	-	a	-	-	b	a	a
Unspecified	**b**	**555**	**40**	**139**	**34**	**31**	**74**	**147**	**201**	**413**	**637**

Source: UNCTAD, based on United States Bureau of Economic Analysis, *Survey of U.S. Direct Investment Abroad*, annual series, www.bea.gov/bea.

[a] Less than half a million.
[b] Withheld to avoid disclosing operations of individual companies.

Annex table A.IV.3. Selected cases of R&D by foreign TNCs in Singapore, March 2005

TNC	Home country	Year established	R&D activities in Singapore
ABB	Switzerland	2002	Industrial IT R&D centre ($15 million invested).
Agilent Technologies	United States	..	R&D centre on photonics (150 design & R&D engineers employed; half of them expatriates) .
DaimlerChrysler	Germany	..	Environmental testing for fuel cell cars .
Delphi	United States	1989	Singapore Design and Engineering Centre (SDEC) designs advanced electronic components (140 designers from Singapore and the region).
Eli Lilly	United States	2001	Centre for Systems Biology (LSB) develops computational tools for drug discovery ($140 million to be invested in 2005-2009).
Emerson Process Management	United States	..	R&D on advanced process control instruments, in collaboration with the parent engineering centre ($1 million invested).
Ericsson	Sweden	..	Ericsson Cyberlab develops, for example, Chinese Language SMS and messaging (15 employees).
Essilor	France	..	Optometry R&D centre in Singapore is an integral node in Essilor's global R&D network (with France, the United States and Japan) (8 . employees, to grow to 25 by 2007).
Fujitsu	Japan	..	R&D Centre in Singapore, set up in 1989, handles research in telecommunication software, regional telecommunications support as in creation of switch configuration database, corporate network system for voice, data and videoconferencing. It employs about 130 people, of which 80 are engineers.
Gemplus	France	2002	R&D centre concentrates on security technologies and the adoption of smart card applications in Asia ($100 million invested; 100 R&D staff)
GlaxoSmithKline	United Kingdom	2004	Neurodegenerative disease R&D centre (first Asian pre-clinical research facility; $62 million planned investment).
Hewlett-Packard	United States	1991	Global printer and inkjet product development (48 patents registered in the United States; 180 engineers employed, two-thids from Singapore).
IBM	United States	2004	Two radio frequency identification centres, in collaboration with Nanyang Polytechnic ($12-million project).
Isis Pharmaceuticals	United States	..	Biotechnology research .
Miltenyi Biotec	Germany	..	Applications in stem cell research, human genome studies and cellular therapy.
Motorola	United States	..	Three R&D centres in Singapore: Singapore Design Centre (150 engineers), Global Software Centre, Integrated Circuits Design Centre.
Nestlé	Switzerland	..	One of the 25 development centres spread over 10 countries; focuses on product specifications, manufacturing processes and environment-friendly pest management (owns over 100 patents; 90 staff).
Novartis	Switzerland	2001	Novartis Institute of Tropical Diseases develops novel drugs for tuberculosis and dengue fever.
Optimer Pharmaceuticals	United States	..	R&D laboratory in Singapore develops therapeutics based on carbohydrate chemistry.
Philips	Netherlands	..	Philips Innovation Campus is the firm's largest R&D centre outside Europe (more than $130 million invested; more than 1,000 engineers from more than 20 countries).
Rhodia	France	2000	Nine labs at Science Park 2; R&D for application in baking, sauces, soups, dressing and beverages, chemicals.
Rolls Royce	United Kingdom	2004	Advanced technology centre on materials for aircraft engines, solid oxide fuel cells.
Siemens	Germany	..	R&D on information and communications technology (300 jobs will be created).
Sony Semiconductor	Japan	1982	Three R&D facilities in Singapore: components R&D Division (1996), Design Centre Asia (1993), Semiconductor Engineering Centre (1994) (150 R&D employees).
Sun Microsystems	United States	..	R&D centres run by Sun Microsystems include the Java Wireless Competency Centre at TeleTech Park, Science Park II, and the Sun Microsystems Asia Pacific Science and Technology Center.
Waseda-Olympus Bioscience	Japan	..	Research Institute focuses on higher brain functions such as intellect and awareness .
Wyeth Pharmaceuticals	United States	..	R&D centre taps into local pharmaceutical technologies.

Source: UNCTAD, based on Toh 2005.

Annex table A.V.1. Number of students enrolled at the tertiary level in all subjects and technical subjects (science, engineering, mathematics, computing), 2000-2001

(Thousands)

	Total tertiary		Tertiary technical	
1	United States	13 595.6	China	2 580.4
2	China	12 143.7	Russian Federation	2 388.0
3	India	9 834.0	India	1 913.0
4	Russian Federation	7 224.0	United States	1 718.5
5	Japan	3 972.5	Korea, Rep. of	1 000.4
6	Indonesia	3 017.9	Japan	817.1
7	Korea, Rep. of	3 003.5	Ukraine	643.8
8	Brazil	2 781.3	Germany	636.6
9	Egypt	2 447.1	Indonesia	585.6
10	Philippines	2 432.0	Mexico	576.8
11	Germany	2 159.7	United Kingdom	496.2
12	Thailand	2 095.7	Brazil	467.8
13	United Kingdom	2 067.3	Spain	460.7
14	Mexico	2 047.9	Iran, Islamic Rep.	455.6
15	France	2 031.7	Taiwan Prov. of China	368.9
16	Ukraine	1 950.8	Italy	368.2
17	Spain	1 833.5	Poland	360.4
18	Italy	1 812.3	Philippines	348.1
19	Poland	1 775.0	France	346.1
20	Argentina	1 766.9	Egypt	289.4
21	Turkey	1 607.4	Turkey	272.4
22	Iran, Islamic Rep.	1 569.8	Argentina	268.1
23	Canada	1 212.2	Colombia	265.5
24	Taiwan Prov. of China	1 008.2	Australia	227.5
25	Colombia	934.1	Thailand	186.0
26	Bangladesh	878.5	Venezuela	184.8

	Total tertiary		Tertiary technical	
27	Australia	845.1	Romania	176.3
28	Peru	824.0	Algeria	176.2
29	Viet Nam	749.9	Belarus	144.5
30	Venezuela	660.0	Kazakhstan	133.7
31	South Africa	644.8	Canada	131.0
32	Malaysia	549.2	Chile	127.0
33	Romania	533.2	Greece	121.0
34	Netherlands	504.0	Bangladesh	118.8
35	Greece	478.2	Peru	106.1
36	Algeria	456.4	Portugal	94.4
37	Chile	452.2	Sweden	93.4
38	Kazakhstan	445.7	Finland	92.7
39	Belarus	438.0	Netherlands	82.1
40	Saudi Arabia	432.3	South Africa	75.3
41	Portugal	387.7	Malaysia	74.9
42	Belgium	359.3	Morocco	71.7
43	Sweden	358.0	Pakistan	71.3
44	Pakistan	340.0	Morocco	70.6
45	Nigeria	336.0	Czech Rep.	69.2
46	Hungary	330.5	Bolivia	64.7
47	Morocco	310.3	Nigeria	63.6
48	Finland	279.6	Kyrgyzstan	57.2
49	Bolivia	278.8	Bulgaria	56.0
50	Israel	271.0	Austria	51.0
51	Austria	264.7	Israel	50.8
52	Austria	264.7	Slovakia	50.0

	Total tertiary		Tertiary technical	
53	Czech Rep.	260.0	Belgium	48.6
54	Bulgaria	247.0	Georgia	46.4
55	Tunisia	207.4	Ireland	43.9
56	Denmark	191.6	Switzerland	42.7
57	Kyrgyzstan	190.5	Saudi Arabia	41.6
58	Norway	189.9	Tunisia	39.6
59	Yemen	173.1	Hong Kong (China)	39.5
60	New Zealand	172.0	Jordan	36.8
61	Ireland	166.6	Denmark	35.4
62	Switzerland	163.4	Hungary	35.3
63	Jordan	162.7	Norway	31.9
64	Slovakia	143.9	Latvia	30.8
65	Georgia	140.6	Moldova, Rep. of	30.8
66	Lithuania	135.9	New Zealand	25.4
67	Lebanon	134.0	Tajikistan	22.0
68	Hong Kong (China)	128.1	Estonia	20.2
69	El Salvador	114.7	Lebanon	19.5
70	Nepal	103.3	Honduras	18.9
71	Latvia	102.8	Ethiopia	17.4
72	Moldova, Rep. of	102.8	Cameroon	17.3
73	Uruguay	97.5	Slovenia	17.3
74	Kenya	95.1	Paraguay	16.9
75	Slovenia	91.5	Nepal	16.3
76	Honduras	90.6	Singapore	15.9
77	Ethiopia	87.4	Sri Lanka	15.5
78	Singapore	85.0	El Salvador	15.0

	Total tertiary		Tertiary technical	
79	Paraguay	83.1	Armenia	14.9
80	Tajikistan	78.5	Ghana	14.0
81	Armenia	68.7	Kenya	14.0
82	Cameroon	68.5	Uruguay	13.2
83	Sri Lanka	65.0	Yemen	10.4
84	Ghana	64.1	Zimbabwe	10.4
85	Uganda	62.6	Nicaragua	9.1
86	Costa Rica	61.7	Costa Rica	8.2
87	Estonia	57.8	Jamaica	7.5
88	Zimbabwe	48.9	Madagascar	6.8
89	Jamaica	42.5	Tanzania, United Rep.of	6.2
90	Albania	40.9	Uganda	5.9
91	Nicaragua	36.0	Zambia	5.4
92	Madagascar	31.4	Senegal	5.4
93	Senegal	29.5	Albania	5.1
94	Zambia	24.6	Cyprus	3.0
95	Tanzania, United Rep. of	22.0	Oman	2.4
96	Oman	19.3	Botswana	1.7
97	Mauritius	12.5	Mauritius	1.1
98	Cyprus	11.9	Eritrea	1.1
99	Mozambique	9.3	Qatar	0.9
100	Mauritania	9.0	Mauritania	0.7
101	Qatar	7.8	Malawi	0.4
102	Botswana	7.7	Mozambique	0.3
103	Eritrea	5.5	Djibouti	-
104	Malawi	3.2		
105	Djibouti	0.5		

Sources: UNCTAD, based on UNESCO and Taiwan Province of China statistics.

Note: Data on tertiary enrolments by subject are not available after 1997. It is assumed here that the share of technical subjects in total tertiary enrolments was the same in 2000/01 as in 1997. For a number of economies in South-East Europe and the CIS, data are not available at all. In these cases, it is assumed that the shares of technical to total tertiary students were the same as in the economies in South-East Europe and the CIS for which data are available.

DEFINITIONS AND SOURCES

A. General definitions

1. Transnational corporations

Transnational corporations (TNCs) are incorporated or unincorporated enterprises comprising parent enterprises and their foreign affiliates. A parent enterprise is defined as an enterprise that controls assets of other entities in countries other than its home country, usually by owning a certain equity capital stake. An equity capital stake of 10 per cent or more of the ordinary shares or voting power for an incorporated enterprise, or its equivalent for an unincorporated enterprise, is normally considered as the threshold for the control of assets.[1] A foreign affiliate is an incorporated or unincorporated enterprise in which an investor, who is a resident in another economy, owns a stake that permits a lasting interest in the management of that enterprise (an equity stake of 10 per cent for an incorporated enterprise, or its equivalent for an unincorporated enterprise). In *WIR*, subsidiary enterprises, associate enterprises and branches – defined below – are all referred to as foreign affiliates or affiliates.

- A subsidiary is an incorporated enterprise in the host country in which another entity directly owns more than a half of the shareholder's voting power, and has the right to appoint or remove a majority of the members of the administrative, management or supervisory body.
- An associate is an incorporated enterprise in the host country in which an investor owns a total of at least 10 per cent, but not more than half, of the shareholders' voting power.
- A branch is a wholly or jointly owned unincorporated enterprise in the host country which is one of the following: (i) a permanent establishment or office of the foreign investor; (ii) an unincorporated partnership or joint venture between the foreign direct investor and one or more third parties; (iii) land, structures (except structures owned by government entities), and /or immovable equipment and objects directly owned by a foreign resident; or (iv) mobile equipment (such as ships, aircraft, gas- or oil-drilling rigs) operating within a country, other than that of the foreign investor, for at least one year.

2. Foreign direct investment

Foreign direct investment (FDI) is defined as an investment involving a long-term relationship and reflecting a lasting interest and control by a resident entity in one economy (foreign direct investor or parent enterprise) in an enterprise resident in an economy other than that of the foreign direct investor (FDI enterprise or affiliate enterprise or foreign affiliate).[2] FDI implies that the investor exerts a significant degree of influence on the management of the enterprise resident in the other economy. Such investment involves both the initial transaction between the two entities and all subsequent transactions between them and among foreign affiliates, both incorporated and unincorporated. FDI may be undertaken by individuals as well as business entities.

Flows of FDI comprise capital provided (either directly or through other related enterprises) by a foreign direct investor to an FDI enterprise, or capital received from an FDI enterprise by a foreign direct investor. FDI has three components: equity capital, reinvested earnings and intra-company loans.

- Equity capital is the foreign direct investor's purchase of shares of an enterprise in a country other than its own.
- Reinvested earnings comprise the direct investor's share (in proportion to direct equity participation) of earnings not distributed as dividends by affiliates, or earnings not remitted to the direct investor. Such retained profits by affiliates are reinvested.
- Intra-company loans or intra-company debt transactions refer to short- or long-term borrowing and lending of funds between direct investors (parent enterprises) and affiliate enterprises.

FDI stock is the value of the share of their capital and reserves (including retained profits) attributable to the parent enterprise, plus the net indebtedness of affiliates to the parent enterprise. FDI flow and stock data used in *WIR* are not always defined as above, because these definitions are often not applicable to disaggregated FDI data. For example, in analysing geographical and industrial trends and patterns of FDI, data based on approvals of FDI may also be used because they allow a disaggregation at the country or industry level. Such cases are denoted accordingly.

3. Non-equity forms of investment

Foreign direct investors may also obtain an effective voice in the management of another business entity through means other than acquiring an equity stake. These are non-equity forms of investment, and they include, inter alia, subcontracting, management contracts, turnkey arrangements, franchising, licensing and product-sharing. Data on these forms of transnational corporate activity are usually not separately identified in the balance-of-payments statistics. These statistics, however, usually present data on royalties and licensing fees, defined as "receipts and payments of residents and non-residents for: (i) the authorized use of intangible non-produced, non-financial assets and proprietary rights such as trademarks, copyrights, patents, processes, techniques, designs, manufacturing rights, franchises, etc., and (ii) the use, through licensing agreements, of produced originals or prototypes, such as manuscripts, films, etc."[3]

B. Availability, limitations and estimates of FDI data presented in *WIR*

FDI data have a number of limitations. This sections therefore spells out how UNCTAD collects and reports such data. These limitations need to be kept in mind also when dealing with the size of TNC activities and their impact.

1 . FDI flows

Data on FDI flows in annex table B.1, as well as in most of the tables in the text, are on a net basis (capital transactions' credits less debits between direct investors and their foreign affiliates). Net decreases in assets (outward FDI) or net increases in liabilities (inward FDI) are recorded as credits (recorded with a positive sign in the balance of payments), while net increases in assets or net decreases in liabilities are recorded as debits (recorded with a negative sign in the balance of payments). In the annex tables, as well as in the tables in the text, the negative signs are reversed for practical purposes in the case of FDI *outflows*. Hence, FDI flows with a negative sign in *WIR* indicate that at least one of the three components of FDI (equity capital, reinvested earnings or intra-company loans) is negative and is not offset by positive amounts of the other components. These are instances of reverse investment or disinvestment.

UNCTAD regularly collects published and unpublished national official FDI flows data directly from central banks, statistical offices or national authorities on an aggregated and disaggregated basis for its FDI/TNC database(www.unctad.org/fdistatistics). These data constitute the main source for reported data on FDI flows. These data are further complemented by data obtained from: (i) other international organizations such as the International Monetary Fund (IMF), the World Bank and the Organisation for Economic Co-operation and Development (OECD); (ii) regional organizations such as the ASEAN Secretariat and the European Bank for Reconstruction and Development (EBRD); (iii) Banque Centrale de l'Afrique de l'Ouest; (iv) Banque Centrale des Etats de l'Afrique Centrale and (vi) UNCTAD's own estimates.

For those economies for which data were not available from national official sources, or for those for which data were not available for the entire period covered in the *World Investment Report 2005 (WIR05)*, data from the IMF were obtained using the IMF's CD-ROM on International Financial Statistics and Balance of Payments, June 2005. If the data were not available from the above IMF data source, data from the IMF's *Country Report*, under Article IV of the IMF's Articles of Agreements, were used.

For those economies for which data were not available from national official sources and the IMF, or for those for which data were not available for the entire period, data from the World Bank's *World Development Indicators Online* were used. This report covers data up to 2003 and reports data on net FDI flows (FDI inflows less FDI outflows) and inward FDI flows only. Consequently, data on FDI outflows, which are reported as World Bank data, are estimated by subtracting inward FDI flows from net FDI flows.

Data from the EBRD were utilized for those economies in the Commonwealth of Independent States for which data were not available from one of the above-mentioned sources.

Furthermore, data on the FDI outflows of the OECD, as presented in its publication, *Geographical Distribution of Financial Flows to Developing Countries*, and as obtained from its online databank, were used as a proxy for FDI inflows. As these OECD data are based on FDI outflows to developing economies from the member countries of the Development Assistance Committee (DAC) of OECD,[4] inflows of FDI to developing economies may be underestimated. In some economies, FDI data from large recipients and investors are also used as proxies.

Finally, in those economies for which data were not available from either of the above-mentioned sources, or only partial data (quarterly or monthly) were available, estimates were made by: annualizing the data, if they are only partially available (monthly or quarterly) from either the IMF or national official sources; and using data on cross-border mergers and acquisitions (M&As) and their growth rates.

2. FDI stocks

Annex table B.2, as well as some tables in the text, present data on FDI stocks at book value or historical cost, reflecting prices at the time when the investment was made except for countries that report stock at market value (e.g. Australia, Hong Kong (China)).

UNCTAD regularly collects published and unpublished national official FDI stock data directly from central banks, statistical offices and/or national authorities on an aggregated and disaggregated basis for its FDI/TNC database. These data constitute the main source for the reported data on FDI stocks. They are further complemented by the data obtained from the IMF.

As for economies for which data were not available from national official sources, or for those for which data were not available for the entire period, data on international investment position assets and liabilities from the IMF's CD-ROMs on *International Financial Statistics* and *Balance of Payments*, June 2005, were used instead.

For a large number of economies, FDI stocks were estimated by either adding up FDI flows over a period of time, or adding or subtracting flows to an FDI stock that had been obtained for a particular year from national official sources, or the IMF data series on assets and liabilities of direct investment, or by using the mirror data of FDI stock of major economies as proxy.

Details of how data on FDI flows and stocks were obtained for each economy used in the Report, are given in the *WIR* website (www.unctad.org/wir).

3. Special notes on recent changes in the methodology

a. FDI inflows

- Bahrain. FDI data cover only the financial sector.
- Belgium and Luxembourg Economic Union. Up to 2001, the Belgium National Bank reported FDI data for the Belgium and Luxembourg Economic Union. As of 2002, this economic union is no longer in effect. Consequently, FDI data are reported separately by the respective national authorities. Therefore, data for 2002 onwards are not comparable to the combined flows as reported in previous years because of different methodologies.
- China. Data from the Ministry of Commerce (MOFCOM) were used for FDI inflows in that country. These data are reported on a gross basis (or do not take into account debits of FDI inward transactions). FDI outflows data were obtained from State Administration of Foreign Exchange (SAFE).
- Egypt. FDI inflows started to include investment in the petroleum sector in the third quarter of 2004.
- Republic of Korea. Data from the Ministry of Commerce, Industry and Energy (MOCIE) were used for FDI inflows in that country for the entire period 1980-2004, instead of those from the Bank of Korea. The MOCIE's data series include equity, long-term loans, investment in kind (i.e. provision of technology and capital goods) and conversion of convertible bonds.
- Lesotho. The Lesotho Highland Water Project, is excluded from its FDI *statistics* as it is not considered as foreign investment.

- Luxembourg. FDI flows data exclude investment by and from SPEs (holding companies and other financial vehicles). However, data include transactions made by these SPEs.
- Macao (China). The data covers only eight main industries, namely: Industrial production; construction; wholesale and retail; hotels and restaurants; transport, storage and communications; financial services; cultural, recreational, gambling and other services.
- Malta. The direct reporting system was installed by the National Statistics Office and the Central bank of Malta in 2003 for all sectors of its economy. This methodology is applied to data from 1995 onwards. Consequently, FDI statistics record a break in the series since 1995.
- Netherlands. The new direct reporting system was introduced in April 2003 to improve the method to record intra-company transactions in such a way that the Dutch National Bank (DNB) was able to clearly differentiate between loans taken by or lent abroad by TNCs (including the parent, subsidiary, sister etc.).
- Oman, Saudi Arabia and Syrian Arab Republic. For the first time in 2004, after technical cooperation was given by the Economic and Social Commission for Western Asia (ESCWA) and UNCTAD, a survey on inward FDI was undertaken. Flow data from this survey were used.
- Philippines. The 5th edition of the Balance of Payments Manual (BPM5) was adopted in 2000 covering data starting 1999. There is a difference in coverage of data on direct investment flows from 1999 onwards compared to those of prior years. In particular, the change in coverage pertains to inter-company loans. From 1999 onwards, direct investment flows include intra-company loans under the “other capital” component of direct investment, as spelled out in the BPM5 manual. Previously, intra-company loans were not part of direct investment but classified under the medium-and long-term loan accounts.
- United States. Data on FDI used in this Report do not include current cost adjustments, in other words, they are on a historical-cost basis.

b. FDI stocks

- Belgium. Stock data are estimated by subtracting the reported stock of Luxembourg in 2001 from the stock reported for Belgium and Luxembourg Economic Union for the same year. Flows are added to this estimated stock thereafter.
- The data on Chinese FDI stock during the period 1994-2004 are revised as reported by the Ministry of Commerce. The previous data in the past *WIRs* were also reported by the same Ministry, but they were the accumulation of FDI inflows. The revision was made on the basis of the China's own FDI statistical methodology and accounting rules, as well as the following assumptions: FDI inflows to China were mainly greenfield investment that accounted for 95% of total flows, 95% of which were transferred into fixed assets.
- Hong Kong (China). Data are in accordance with international standards and practices and are based on market value. Thus, the inward FDI stock for 1997 onward are not directly comparable to that of previous years.
- Republic of Korea. Data were obtained from the Ministry of Commerce, Industry and Energy. Inward stock refers to implemented FDI inflows less withdrawals accumulated since 1962, whereas outward stock refers to actual investment outflows less withdrawals, accumulated since 1968.
- Luxembourg. Stock data have been derived from the annual survey on FDI since 1995. The banking and insurance sectors are covered fully, while only the larger companies are included in the other sectors so as to ensure a high level of significance of the statistics. Stock data on Luxembourg excludes assets and liabilities of SPEs (holding companies and other financial vehicles). The population of companies surveyed has been progressively extended over time.
- Oman and Saudi Arabia. For the first time in 2004, after technical cooperation was given by the Economic and Social Commission for Western Asia (ESCWA) and UNCTAD, a survey on inward FDI was undertaken. Stock data from this survey were used.
- Philippines. Stock data of FDI started only in 2002 when the Bangko Sentral ng Pilipinas (BSP) compiled the international investment position statistics in compliance with the Special Data Dissemination Standard (SDDS) requirement of the IMF.
- Singapore. In the case of FDI stock, data are collected through the FDI survey, in line with the recommendations of the BPM5, conducted twice a year since 2001 for the purpose of IIP publication. The survey is based on purposive sampling method and covers all economic sectors. The total respondent

is around 900, comprising companies/enterprises, banks and non-bank financial institutions - on average the response rate of the survey is around 50%.

- United States. Data on FDI used in this Report do not include current cost adjustments, in other words, they are on a historical-cost basis. The Bureau of Economic Analysis prepares estimates of the positions that are valued on three bases—historical cost, current cost, and market value. Unlike the positions on a current-cost and market-value basis, the historical-cost position is not ordinarily adjusted to account for changes in the replacement cost of the tangible assets of affiliates or in the market value of foreign parent companies' equity in United States' affiliates.

C. Data revisions and updates

All FDI data and estimates in *WIR* are continuously revised. Because of ongoing revisions, FDI data reported in *WIR* may differ from those reported in earlier Reports or other publications of UNCTAD. In particular, recent FDI data are being revised in many economies according to the fifth edition of the *Balance-of-Payments Manual of the IMF*. Because of this, the data reported in last year's Report may be completely or partly changed in this Report.

D. Data verification

In compiling data for this year's Report, requests were made to national official sources of all economies for verification and confirmation of the latest data revisions and accuracy. In addition, websites of national official sources were consulted. This verification process continued until 15 June 2005. Any revisions made after this process are not reflected in the Report.

E. Definitions and sources of the data in annex table B.3

This annex table shows the ratios of inward and outward FDI flows to gross fixed capital formation and inward and outward FDI stock to GDP. All of these data are in current prices.

The data on GDP were obtained from the UNCTAD Secretariat, the IMF's CD-ROM on International Financial Statistics, June 2005 and the IMF's *World Economic Outlook*, April 2005. For some economies, such as Taiwan Province of China, data are complemented by official sources.

The data on gross fixed capital formation were obtained from the IMF's CD-ROM on *International Financial Statistics*, June 2005. For some economies, for which data are not available, or part of it, data are complemented by data on gross capital formation. These data are further complemented by data obtained from: (i) national official sources; and (ii) World Bank data on gross fixed capital formation or gross capital formation, obtained from *World Development Indicators Online*.

Figures exceeding 100 per cent may result from the fact that, for some economies, the reported data on gross fixed capital formation do not necessarily reflect the value of capital formation accurately, and FDI flows do not necessarily translate into capital formation.

Data on FDI are from annex tables B.1-B.2.

F. Definitions and sources of the data on cross-border M&As in annex tables B.4-B.5

FDI is a balance-of-payments concept involving the cross-border transfer of funds. Cross-border M&A statistics shown in the Report are based on information reported by Thomson Financial. In some cases, these include M&As between foreign affiliates and firms located in the same host economy. Such M&As conform to the FDI definition as far as the equity share is concerned. However, the data also include purchases via domestic and international capital markets, which should not be considered as FDI flows. Although it is possible to distinguish types of financing used for M&As (e.g. syndicated loans, corporate bonds, venture capital), it is not possible to trace the origin or country-sources of the funds used. Therefore, the data used in the Report include the funds not categorized as FDI.

FDI flows are recorded on a net basis (capital account credits less debits between direct investors and their foreign affiliates) in a particular year. On the other hand, M&A data are expressed as the total transaction amount of particular deals, and not as differences between gross acquisitions and divestment abroad by firms from a particular country. Transaction amounts recorded in the UNCTAD M&A statistics are those at the time of closure of the deals, and not at the time of announcement. The M&A values are not necessarily paid out in a single year.

Cross-border M&As are recorded in both directions of transactions. That is, when a cross-border M&A takes place, it registers as both a sale in the country of the target firm, and as a purchase in the home country of the acquiring firm. Data showing cross-border M&A activities on an industry basis are also recorded as sales and purchases. Thus, if a food company acquires a chemical company, this transaction is recorded in the chemical industry in the table on M&As by industry of seller, it is also recorded in the food industry in the table on M&As by industry of purchaser.

Notes

1 In some countries, an equity stake of other than 10% is still used. In the United Kingdom, for example, a stake of 20% or more was the threshold used until 1997.

2 This general definition of FDI is based on OECD, *Detailed Benchmark Definition of Foreign Direct Investment*, third edition (OECD 1996) and International Monetary Fund, *Balance of Payments Manual*, fifth edition (IMF 1993).

3 International Monetary Fund, op. cit., p. 40.

4 Includes Australia, Austria, Belgium, Canada, Denmark, European Commission, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom and United States.

Annex table B.1. FDI flows, by region and economy, 2002-2004

(Millions of dollars)

Region/economy	FDI inflows 2002	FDI inflows 2003	FDI inflows 2004	FDI outflows 2002	FDI outflows 2003	FDI outflows 2004
World	**716 128**	**632 599**	**648 146**	**652 181**	**616 923**	**730 257**
Developed economies	**547 778**	**442 157**	**380 022**	**599 895**	**577 323**	**637 360**
Europe	**427 560**	**359 369**	**223 400**	**396 868**	**390 021**	**309 498**
European Union	**420 433**	**338 678**	**216 440**	**384 549**	**372 400**	**279 830**
Austria	356	7 352	4 865	5 807	6 776	7 164
Belgium and Luxembourg	..	..	..	..	..	..
Belgium	15 626	32 098	34 366	12 693	36 900	26 125
Cyprus	1 057	1 011	1 146	461	524	630
Czech Republic	8 483	2 101	4 463	207	206	546
Denmark	6 630	2 595	- 10 722	5 686	1 126	- 10 363
Estonia	284	891	926	132	148	257
Finland	7 919	3 296	4 648	7 622	- 2 590	- 1 028
France	49 035	42 498	24 318	50 441	53 147	47 802
Germany	50 516	27 265	- 38 557	15 171	- 3 570	- 7 267
Greece	50	661	1 351	655	47	607
Hungary	2 994	2 162	4 167	278	1 647	538
Ireland	28 981	26 888	9 120	10 332	3 543	- 7 400
Italy	14 545	16 415	16 815	17 123	9 071	19 262
Luxembourg	117 218	91 055	57 000	126 098	101 044	59 008
Latvia	254	300	647	4	36	109
Lithuania	732	179	773	18	37	263
Malta	- 426	294	421	- 9	19	9
Netherlands	25 038	19 331	- 4 605	33 901	37 778	1 458
Poland	4 131	4 123	6 159	230	196	806
Portugal	1 767	6 558	1 112	155	7 326	6 178
Slovakia	4 094	669	1 122	5	22	- 155
Slovenia	1 686	337	516	153	466	498
Spain	43 696	29 013	18 361	36 454	30 807	54 246
Sweden	11 738	1 288	- 371	10 633	21 238	15 147
United Kingdom	24 029	20 298	78 399	50 300	66 457	65 391
Other developed Europe	**7 127**	**20 691**	**6 961**	**12 319**	**17 621**	**29 668**
Gibraltar	83 [a]	7 [a]	15 [a]	..	..	..
Iceland	91	318	308	323	370	2 594
Norway	677	3 801	2 159	4 138	2 139	1 866
Switzerland	6 276	16 564	4 478	7 859	15 112	25 207
North America	**92 838**	**63 183**	**102 152**	**161 704**	**140 859**	**276 747**
Canada	21 507	6 349	6 293	26 758	21 453	47 453
United States	71 331	56 834	95 859	134 946	119 406	229 294
Other developed countries	**27 379**	**19 604**	**54 469**	**41 323**	**46 443**	**51 115**
Australia	15 632	6 955	42 594	7 876	15 277	16 288
Israel	1 770	3 880	1 619	982	2 067	3 037
Japan	9 239	6 324	7 816	32 281	28 800	30 951
New Zealand	738	2 445	2 441	185	299	839
Developing economies	**155 528**	**166 337**	**233 227**	**47 775**	**29 016**	**83 190**
Africa	**12 994**	**18 005**	**18 090**	**427**	**1 215**	**2 824**
North Africa	**3 872**	**5 262**	**5 270**	**22**	**115**	**514**
Algeria	1 065	634	882	100	14	258
Egypt	647	237	1 253	28	21	159
Libyan Arab Jamahiriya	145	143	131	- 136	63	62
Morocco	481	2 314	853	28	12	31
Sudan	713	1 349	1 511	..	..	..
Tunisia	821	584	639	2	5	4
Other Africa	**9 122**	**12 743**	**12 821**	**404**	**1 100**	**2 310**
West Africa	**2 928**	**3 117**	**3 562**	**649**	**274**	**325**
Benin	14	45	60 [a]	1	-	..
Burkina Faso	15	29	35 [a]	2	2	1 [a]
Cape Verde	12	14	20	-	..	..
Côte d'Ivoire	213	165	360 [a]	- 4 [a]	21 [a]	..

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Annex table B.1. FDI flows, by region and economy, 2002-2004 (continued)
(Millions of dollars)

Region/economy	FDI inflows			FDI outflows		
	2002	2003	2004	2002	2003	2004
Gambia	43	25 [a]	60 [a]	5	7 [a]	1 [a]
Ghana	59	137	139	44 [a]	..	..
Guinea	30	79	100 [a]	7 [a]	..	..
Guinea-Bissau	4	4	5 [a]	1	1	1 [a]
Liberia	3	1 [a]	20 [a]	386 [a]	80 [a]	60 [a]
Mali	244	132	180 [a]	2	1	1 [a]
Mauritania	118	214	300 [a]	..	- 1 [a]	..
Niger	2	11	20 [a]	- 2	-	..
Nigeria	2 040	2 171	2 127	172	167	261
Saint Helena	..	..	..	..	..	..
Senegal	78	52	70 [a]	34	3	4 [a]
Sierra Leone	2	3	5	..	..	..
Togo	53	34	60 [a]	2	- 6	- 3 [a]
Central Africa	**3 212**	**6 346**	**6 122**	**9**	**- 32**	**35**
Angola	1 672	3 505	2 048	29	24	30 [a]
Cameroon	-	-	-	7 [a]	..	..
Central African Republic	6	3	- 13	1	-	..
Chad	924	713	478	-	-	..
Congo	137	323	668	6	2	..
Congo, Dem. Rep. of	117	158	900 [a]	- 2 [a]	..	..
Equatorial Guinea	323	1 431	1 664	-	-	..
Gabon	30	206	323	- 32	- 57	5 [a]
São Tomé and Principe	3	7 [a]	54 [a]			
East Africa	**1 521**	**2 013**	**2 098**	**108**	**74**	**87**
Burundi	-	-	3 [a]	-	-	..
Comoros	-	1	2 [a]	..	..	..
Djibouti	4	11	33	..	..	..
Eritrea	20	22	30 [a]	..	..	..
Ethiopia	255	465	545	..	..	..
Kenya	52	81	46	86	24	49
Madagascar	8	13	45 [a]	..	..	..
Malawi	6	10 [a]	16 [a]	..	..	..
Mauritius	33	70	65	9	41	33
Mayotte	..	..	..	..	..	..
Mozambique	348	337	132	- [a]	-	-
Reunion	- [a]	..	..	..	..	..
Rwanda	7	5	11	..	..	..
Seychelles	48	58	60 [a]	9	8	5 [a]
Somalia	- [a]	- [a]	9 [a]	..	..	..
Uganda	203	211	237	..	..	..
United Rep. of Tanzania	430	527	470	..	..	..
Zambia	82	172	334	..	..	..
Zimbabwe	26	30 [a]	60 [a]	3	..	..
Southern Africa	**1 460**	**1 267**	**1 038**	**- 362**	**783**	**1 863**
Botswana	405	418	47	43	206	274
Lesotho	27	42	52	-	-	-
Namibia	181	149	286	- 5	- 10	- 21
South Africa	757	720	585	- 399	577	1 606
Swaziland	90	- 61	69	- 1	10	4
Latin America and the Caribbean	**50 492**	**46 908**	**67 526**	**11 351**	**10 562**	**10 943**
South and Central America	**45 359**	**37 906**	**57 437**	**7 040**	**9 887**	**14 381**
South America	**28 463**	**24 357**	**37 872**	**4 099**	**5 246**	**10 587**
Argentina	2 149	1 887	4 254	- 627	774	319
Bolivia	677	197	117	3	3	3
Brazil	16 590	10 144	18 166	2 482	249	9 471
Chile	2 550	4 385	7 603	343	1 884	943
Colombia	2 115	1 793	2 739	857	938	142
Ecuador	1 275	1 555	1 241	-	- [a]	..

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Annex table B.1. FDI flows, by region and economy, 2002-2004 (continued)

(Millions of dollars)

Region/economy	FDI inflows 2002	FDI inflows 2003	FDI inflows 2004	FDI outflows 2002	FDI outflows 2003	FDI outflows 2004
Falkland Islands (Malvinas)	..	..	..	..	..	..
French Guiana	..	..	..	..	..	..
Guyana	44	26	48 [a]	- [a]	..	..
Paraguay	6	36	119	2	6	6
Peru	2 156	1 335	1 816	-	60	40 [a]
Suriname	- 74	- 76	- 60 [a]	..	..	..
Uruguay	194	416	311	14	15	11
Venezuela	782	2 659	1 518	1 026	1 318	- 348
Central America	**16 896**	**13 548**	**19 565**	**2 940**	**4 641**	**3 794**
Belize	50	58	170 [a]	-	-	- [a]
Costa Rica	658	574	618	34	27	62
El Salvador	470	173	466	- 26	19	7
Guatemala	111	131	155	15 [a]	2 [a]	..
Honduras	176	247	293	2 [a]	- 6 [a]	..
Mexico	15 129	11 373	16 602	930	1 784	2 240
Nicaragua	204	201	250	12 [a]	10 [a]	..
Panama	99	792	1 012	1 974 [a]	2 804 [a]	1 485 [a]
Caribbean and other America	**5 133**	**9 002**	**10 089**	**4 311**	**675**	**- 3 438**
Anguilla	38	33	104	..	..	..
Antigua and Barbuda	80	179	106	15 [a]	..	..
Aruba	306	188	131	3	18	- 1
Bahamas	153	147	206 [a]	-	28 [a]	- 6 [a]
Barbados	17	58	50 [a]	-	1	..
Bermuda	2 155 [a]	1 908 [a]	3 800 [a]	1 754 [a]	- 3 808 [a]	- 1 006 [a]
British Virgin Islands	178 [a]	12 [a]	100 [a]	8 501 [a]	2 362 [a]	- 2 364 [a]
Cayman Islands	- 242 [a]	4 084 [a]	3 000 [a]	- 6 157 [a]	1 773 [a]	- 205 [a]
Cuba	3 [a]	- 9 [a]	2 [a]	- [a]	..	..
Dominica	12	20	19	..	..	..
Dominican Republic	917	613	645	12 [a]	- 38 [a]	..
Grenada	61	85	42	..	..	..
Guadeloupe	..	..	..	..	..	..
Haiti	6	8	7 [a]	1 [a]	..	..
Jamaica	481	721	650 [a]	74	116	90 [a]
Martinique	..	..	..	..	..	..
Montserrat	2	2	2	..	..	..
Netherlands Antilles	8	- 81	- 30	1	- 2	25
Puerto Rico	- 5 [a]	- [a]	24 [a]	..	..	..
Saint Kitts and Nevis	81	67	62	..	..	..
Saint Lucia	55	102	111	..	..	..
Saint Vincent and the Grenadines	37	55	56	..	..	..
Trinidad and Tobago	791	808	1 001	106	225	29
Turks and Caicos Islands	- [a]	1 [a]	..	..	..	..
Asia and Oceania	**92 042**	**101 424**	**147 611**	**35 998**	**17 239**	**69 423**
Asia	**92 009**	**101 278**	**147 545**	**35 994**	**17 231**	**69 422**
West Asia	**5 691**	**6 522**	**9 840**	**910**	**- 3 954**	**- 6**
Bahrain	217	517	865	190	741	1 036
Iran, Islamic Rep. of	548	482	500 [a]	39 [a]	- 356 [a]	- 114 [a]
Iraq	- 2 [a]	5 [a]	300 [a]	..	..	..
Jordan	64	424	620	25	3	-
Kuwait	7	- 67	- 20	- 155	- 4 982	- 1 873
Lebanon	257	358	288 [a]	96 [a]	17 [a]	45 [a]
Oman	26	528	- 18	- [a]	- 1 [a]	- [a]
Palestinian Territory	- 5 [a]	..	..	..	..	..
Qatar	624 [a]	625 [a]	679 [a]	- 21 [a]	- 2 [a]	- 2 [a]
Saudi Arabia	453	778	1 867	143 [a]	83 [a]	73 [a]
Syrian Arab Republic	1 030	1 084	1 206	..	..	..
Turkey	1 063	1 753	2 733	175	499	859
United Arab Emirates	1 307 [a]	30 [a]	840 [a]	407 [a]	43 [a]	- 30 [a]

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Annex table B.1. FDI flows, by region and economy, 2002-2004 (continued)
(Millions of dollars)

Region/economy	FDI inflows 2002	FDI inflows 2003	FDI inflows 2004	FDI outflows 2002	FDI outflows 2003	FDI outflows 2004
Yemen	102	6	- 21	11 [a]	..	..
South, East and South-East Asia	**86 318**	**94 755**	**137 705**	**35 083**	**21 186**	**69 429**
East Asia	**67 282**	**72 060**	**105 037**	**27 555**	**14 442**	**53 521**
China	52 743	53 505	60 630	2 518	- 152	1 805
Hong Kong, China	9 682	13 624	34 035	17 463	5 492	39 753
Korea, Dem. People's Rep. of	- 15 [a]	158 [a]	40 [a]	- [a]	1 [a]	..
Korea, Rep. of	2 975	3 785	7 687	2 617	3 426	4 792
Macao, China	375	403	600 [a]	71	- 5	25 [a]
Mongolia	78	132	147 [a]	..	..	..
Taiwan Province of China	1 445	453	1 898	4 886	5 682	7 145
South Asia	**4 528**	**5 331**	**7 005**	**1 149**	**962**	**2 288**
Afghanistan	1 [a]	2 [a]	1 [a]	..	..	..
Bangladesh	52	268	460 [a]	3	3	4 [a]
Bhutan	- [a]	1 [a]	1 [a]	..	..	..
India	3 449	4 269	5 335	1 107	913	2 222
Maldives	12	14	13 [a]	..	..	..
Nepal	- 6	15	10 [a]	..	..	..
Pakistan	823	534	952	28	19	56
Sri Lanka	197	229	233	11	27	6
South-East Asia	**14 507**	**17 364**	**25 662**	**6 379**	**5 781**	**13 620**
Brunei Darussalam	1 035	2 009	103	27 [a]	- 1 [a]	..
Cambodia	145	84	131	6	10	10
Indonesia	145	- 597	1 023	182 [a]	15 [a]	107 [a]
Lao People's Dem. Rep.	25	19	17	..	- [a]	..
Malaysia	3 203	2 473	4 624	1 905	1 369	2 061
Myanmar	191 [e]	291 [e]	556 [a]	..	..	..
Philippines	1 792	347	469	59	197	412
Singapore	5 822	9 331	16 060	4 095	3 705	10 667
Thailand	947	1 952	1 064	106	486	362
Timor-Leste	1 [a]	5 [a]	4 [a]	..	..	..
Viet Nam	1 200	1 450	1 610	..	..	..
Oceania	**33**	**146**	**67**	**5**	**8**	**1**
Cook Islands	- [a]	..	..	2 [a]	..	..
Fiji	18	23	- 9 [a]	2	4	- [a]
French Polynesia	- 2 [a]	- 11 [a]	..	..	..	..
Kiribati	..	..	..	..	..	..
Marshall Islands	- 47 [a]	5 [a]	10 [a]	..	..	..
Micronesia, Federated States of	..	..	..	..	..	..
Nauru	1 [a]	1 [a]	..	..	..	..
New Caledonia	2 [a]	- 2 [a]	5 [a]	..	..	..
Niue	9 [a]	..	..	..	..	..
Northern Mariana Islands	..	..	..	..	..	..
Palau	1 [a]	3 [a]	5 [a]	..	..	..
Papua New Guinea	18	101	25	1	3	-
Samoa	- [a]	1 [a]	1 [a]	..	..	..
Solomon Islands	- 1	- 2	- 5 [a]	..	..	..
Tokelau	- [a]	- [a]	..	..	..	..
Tonga	1 [a]	12 [a]	4 [a]	..	..	..
Tuvalu	25 [a]	- [a]	9 [a]	..	..	..
Vanuatu	9	15	22 [a]	1	1	1 [a]
Wallis and Futuna Islands	..	..	..	..	..	..
South-East Europe and the CIS	**12 821**	**24 106**	**34 897**	**4 511**	**10 584**	**9 707**
South-East Europe	**3 790**	**8 365**	**10 778**	**589**	**140**	**158**
Albania	135	178	426 [a]	1 [a]	..	..
Bosnia and Herzegovina	265	381	497	..	..	1 [a]
Bulgaria	905	2 097	2 488	28	27	- 228
Croatia	1 126	2 042	1 076	539	108	314
Macedonia, TFYR	78	95	151	-	-	1

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Annex table B.1. FDI flows, by region and economy, 2002-2004 (concluded)
(Millions of dollars)

Region/economy	FDI inflows 2002	FDI inflows 2003	FDI inflows 2004	FDI outflows 2002	FDI outflows 2003	FDI outflows 2004
Romania	1 144	2 213	5 174	16	41	70
Serbia and Montenegro	137	1 360	966	5	- 35 [a]	..
CIS	**9 032**	**15 741**	**24 119**	**3 921**	**10 443**	**9 549**
Armenia	144	157	235	19 [a]	-	2
Azerbaijan	1 392	3 285	4 769 [a]	326	933	1 383 [a]
Belarus	247	172	169	- 206	2	- 1
Georgia	165	338	499	4	4	10
Kazakhstan	2 590	2 088	4 269	426	- 121	- 1 279
Kyrgyzstan	5	46	77 [a]	-	-	- 173 [a]
Moldova, Rep. of	132	71	151	-	-	3
Russian Federation	3 461	7 958	11 672	3 533	9 727	9 601
Tajikistan	36	32	272	..	12 [a]	..
Turkmenistan	100	100	150 [a]	- 176 [a]	- 126 [a]	..
Ukraine	693	1 424	1 715	- 5	13	4
Uzbekistan	65	70	140 [a]	..	..	..
Memorandum						
Least developed countries[b]	6 327	10 351	10 702	488	123	110
Major petroleum exporters[c]	12 162	15 767	15 994	2 095	- 2 705	- 482
All developing economies, excluding China	102 785	112 832	172 597	45 257	29 168	81 385
EU-15	397 145	326 611	196 099	383 072	369 099	276 330

Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics).

[a] Estimates. For details, see "Methodological notes: definitions and sources" (www.unctad.org/wir).

[b] Least developed countries include: Afghanistan, Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Cape Verde, Central African Republic, Chad, Comoros, Democratic Republic of Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Kiribati, Lao People's Democratic Republic, Lesotho, Liberia, Madagascar, Malawi, Maldives, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Samoa, Sao Tome and Principe, Senegal, Sierra Leone, Solomon Islands, Somalia, Sudan, Timor-Leste, Togo, Tuvalu, Uganda, United Republic of Tanzania, Vanuatu, Yemen and Zambia.

[c] Major pertoleum exporters include: Algeria, Angola, Bahrain, Brunei Darussalam, Congo, Gabon, Indonesia, Islamic Republic of Iran, Iraq, Kuwait, Libyan Arab Jamahiriya, Nigeria, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Trinidad and Tobago, United Arab Emirates, Venezuela and Yemen.

Note: Data on FDI inflows in China as reported by China's State Administration of Foreign Exchange are the following: $49,308 million for 2002, $47,077 for 2003 and $54,936 for 2004.

Annex table B.2. FDI stock, by region and economy, 1990, 2000, 2004[a]
(Millions of dollars)

Region/economy	FDI inward stock 1990	FDI inward stock 2000	FDI inward stock 2004	FDI outward stock 1990	FDI outward stock 2000	FDI outward stock 2004
World	**1 768 589**	**5 780 846**	**8 895 279**	**1 785 264**	**6 148 284**	**9 732 233**
Developed economies	**1 404 411**	**3 976 356**	**6 469 832**	**1 637 760**	**5 257 261**	**8 610 146**
Europe	**800 751**	**2 292 922**	**4 258 547**	**882 899**	**3 324 128**	**5 658 814**
European Union	**753 707**	**2 174 834**	**4 023 935**	**805 851**	**3 046 301**	**5 189 738**
Austria	10 972	30 431	62 657	4 747	24 821	67 424
Belgium and Luxembourg	58 388	195 219	..	40 636	179 773	..
Belgium	..	..	258 875 [b]	..	..	248 367 [b]
Cyprus	.. [a,c]	2 910 [a]	8 132 [a]	8 [a]	560 [a]	2 684 [a]
Czech Republic	1 363 [a]	21 644	56 415	..	738	3 061
Denmark	9 192	73 574	98 172	7 342	73 106	99 570
Estonia	..	2 645	9 530	..	259	1 398
Finland	5 132	24 272	55 946	11 227	52 109	80 936
France	86 845	259 796	535 201 [a]	110 126	445 059	769 353 [a]
Germany	111 231	271 611	347 957 [a]	151 581	541 861	833 651 [a]
Greece	5 681 [a]	14 113	27 213	2 882 [a]	6 094	13 056
Hungary	569	22 870	60 328	197	1 280	4 472
Ireland	42 058 [a]	127 088	229 241	12 779 [a]	27 925	95 955
Italy	59 998	121 170	220 720	60 184	180 275	280 481
Luxembourg	..	23 492 [d]	182 894 [a]	..	7 927 [d]	176 499 [a]
Latvia	..	2 084	4 493	..	241	226
Lithuania	..	2 334	6 389	..	29	423
Malta	465 [a]	2 385	3 557 [a]	..	203	361 [a]
Netherlands	68 731	243 733	428 803 [a]	106 899	305 462	545 808 [a]
Poland	109	34 227	61 427 [a]	408 [a]	1 018	2 661 [a]
Portugal	10 571	28 696	65 213	900	17 256	45 555
Slovakia	81	3 733	14 501	..	325	618
Slovenia	665 [a]	2 894	4 962 [a]	258	768	2 450 [a]
Spain	65 916	154 806	346 676	15 652	166 064	332 655
Sweden	12 636	93 970	162 973	50 720	123 230	203 943
United Kingdom	203 905	438 631	771 658	229 307	897 845	1 378 130
Other developed Europe	**47 045**	**118 088**	**234 612**	**77 047**	**277 827**	**469 076**
Gibraltar	263 [a]	529 [a]	646 [a]	..	..	..
Iceland	146	490	1 807	76	664	3 948
Norway	12 391	30 265	51 126 [a]	10 884	43 793	72 109 [a]
Switzerland	34 245	86 804	181 033	66 087	233 370	393 019
North America	**507 754**	**1 469 583**	**1 777 678**	**515 328**	**1 553 886**	**2 387 982**
Canada	112 843	212 716	303 818	84 807	237 639	369 777
United States	394 911	1 256 867	1 473 860 [a]	430 521	1 316 247	2 018 205 [a]
Other developed countries	**95 906**	**213 852**	**433 608**	**239 533**	**379 247**	**563 350**
Australia	73 641	111 141	253 620	30 506	85 387	167 541
Israel	4 476	24 319	33 081	1 188	9 353	16 010
Japan	9 850	50 322	96 984	201 441	278 442	370 544
New Zealand	7 938	28 070	49 922	6 398 [a]	6 065	9 256
Developing economies	**364 057**	**1 734 543**	**2 225 994**	**147 313**	**868 920**	**1 035 676**
Africa	**59 445**	**151 246**	**219 277**	**19 919**	**45 406**	**45 600**
North Africa	**24 542**	**44 264**	**70 213**	**1 836**	**3 380**	**4 346**
Algeria	1 561 [a]	3 647 [a]	7 423 [a]	183 [a]	346 [a]	727 [a]
Egypt	11 043 [a]	18 254 [a]	20 902 [a]	163 [a]	655 [a]	875 [a]
Libyan Arab Jamahiriya	678 [a]	472 [a]	758 [a]	1 321 [a]	1 943 [a]	2 107 [a]
Morocco	3 591 [a]	8 825 [a]	17 959 [a]	155 [a]	403 [a]	591 [a]
Sudan	55 [a]	1 398 [a]	5 545 [a]	..	..	..
Tunisia	7 615	11 668	17 626	15	33	46
Other Africa	**34 903**	**106 982**	**149 064**	**18 082**	**42 025**	**41 254**
West Africa	**13 822**	**33 528**	**45 587**	**1 862**	**7 094**	**8 164**
Benin	159 [a]	213	291 [a]	2 [a]	36 [a]	40 [a]
Burkina Faso	39 [a]	28	87 [a]	4 [a]	20 [a]	25 [a]
Cape Verde	4 [a]	173 [a]	228 [a]	1 [a]	7 [a]	7 [a]
Côte d' Ivoire	975 [a]	2 483	3 932 [a]	38 [a]	641 [a]	652 [a]

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Gambia	157	216	349 [a]	22	44	54 [a]
Ghana	319 [a]	1 493 [a]	1 917 [a]	..	271 [a]	355 [a]
Guinea	69 [a]	263 [a]	474 [a]	..	7 [a]	19 [a]
Guinea-Bissau	8 [a]	38 [a]	51 [a]	..	..	1 [a]
Liberia	2 454 [a]	2 968 [a]	3 001 [a]	453 [a]	1 524 [a]	1 737 [a]
Mali	229 [a]	132	863 [a]	22 [a]	63 [a]	84 [a]
Mauritania	59 [a]	140 [a]	864 [a]	3 [a]	5 [a]	4 [a]
Niger	286 [a]	295	367 [a]	54 [a]	144 [a]	139 [a]
Nigeria	8 539 [a]	23 786 [a]	31 402 [a]	1 207 [a]	4 132 [a]	4 826 [a]
Senegal	258 [a]	832 [a]	1 065 [a]	49 [a]	121 [a]	154 [a]
Sierra Leone	.. [a,c]	40 [a]	59 [a]	..	..	..
Togo	268 [a]	427 [a]	637 [a]	8 [a]	79 [a]	65 [a]
Central Africa	**4 769**	**13 133**	**32 443**	**373**	**701**	**758**
Angola	1 025 [a]	7 977 [a]	17 347 [a]	1 [a]	49 [a]	146 [a]
Cameroon	1 044 [a]	1 053 [a]	1 054 [a]	150 [a]	260 [a]	294 [a]
Central African Republic	95 [a]	104 [a]	106 [a]	18 [a]	43 [a]	45 [a]
Chad	250 [a]	577 [a]	3 152 [a]	37 [a]	70 [a]	70 [a]
Congo	575 [a]	1 893 [a]	3 098 [a]	..	..	..
Congo, Dem. Rep. of	546 [a]	617 [a]	1 874 [a]	..	..	..
Equatorial Guinea	25 [a]	1 128 [a]	5 491 [a]	- [a]	.. [a,c]	3 [a]
Gabon	1 208 [a]	.. [a,c]	242 [a]	167 [a]	280 [a]	200 [a]
São Tomé and Principe	- [a]	11 [a]	79 [a]	..	..	..
East Africa	**3 315**	**12 941**	**20 437**	**255**	**1 239**	**1 600**
Burundi	30 [a]	48 [a]	51 [a]	- [a]	2 [a]	2 [a]
Comoros	17 [a]	21 [a]	25 [a]	1 [a]	1 [a]	1 [a]
Djibouti	6 [a]	34 [a]	85 [a]	..	..	..
Eritrea	..	337 [a]	422 [a]	..	..	..
Ethiopia	124 [a]	933 [a]	2 547 [a]	..	435 [a]	435 [a]
Kenya	668 [a]	984 [a]	1 223 [a]	99 [a]	134 [a]	370 [a]
Madagascar	107 [a]	354 [a]	513 [a]	1 [a]	11 [a]	11 [a]
Malawi	198 [a]	328 [a]	379 [a]	..	8 [a]	8 [a]
Mauritius	169 [a]	687 [a]	887 [a]	1 [a]	132 [a]	219 [a]
Mozambique	42 [a]	1 094 [a]	2 166 [a]	1 [a]	2 [a]	2 [a]
Rwanda	213 [a]	252 [a]	279 [a]	2 [a]	4 [a]	4 [a]
Seychelles	204 [a]	577 [a]	808 [a]	61 [a]	136 [a]	167 [a]
Somalia	.. [a,c]	4 [a]	13 [a]	..	..	..
Uganda	6 [a]	807	1 613	..	133 [a]	133 [a]
United Rep. of Tanzania	388 [a]	3 038	5 203	..	..	..
Zambia	1 022 [a]	2 360 [a]	3 019 [a]	..	..	..
Zimbabwe	124 [a]	1 085 [a]	1 204 [a]	88 [a]	241 [a]	249 [a]
Southern Africa	**12 996**	**47 379**	**50 596**	**15 593**	**32 992**	**30 732**
Botswana	1 309 [a]	1 821 [a]	1 382 [a]	447	517	1 814
Lesotho	83 [a]	330 [a]	479 [a]	- [a]	2 [a]	2 [a]
Namibia	2 047	1 230	1 527 [a]	80	45	10 [a]
South Africa	9 221	43 462	46 283 [a]	15 027	32 333	28 790 [a]
Swaziland	336	537	926	38	95	116
Latin America and the Caribbean	**118 133**	**514 634**	**723 752**	**58 950**	**210 921**	**271 690**
South and Central America	**96 491**	**399 746**	**563 947**	**54 667**	**107 775**	**143 311**
South America	**68 017**	**284 498**	**353 969**	**49 295**	**95 934**	**115 456**
Argentina	8 778 [a]	67 601	53 697 [a]	6 057 [a]	21 141	21 819 [a]
Bolivia	1 026	5	10	7 [a]	29	40
Brazil	37 243	103 015	150 965 [a]	41 044 [a]	51 946 [a]	64 363 [a]
Chile	10 067	45 753	54 464	154 [a]	11 154	14 447
Colombia	3 500	10 992	22 278	402	2 989	4 284
Ecuador	1 626	7 081	12 482	16 [a]	152 [a]	152 [a]
Falkland Islands (Malvinas)	- [a]	58 [a]	76 [a]	..	..	..
Guyana	42 [a]	759 [a]	933 [a]	..	1 [a]	1 [a]

Annex table B.2. FDI stock, by region and economy, 1990, 2000, 2004[a] (continued)

(Millions of dollars)

	FDI inward stock			FDI outward stock		
Region/economy	**1990**	**2000**	**2004**	**1990**	**2000**	**2004**
Peru	1 330	11 062	13 310	112	505	874
Suriname	.. [a,c]	.. [a,c]	.. [a,c]	..	..	..
Uruguay	671 [a]	2 088	2 110 [a]	186 [a]	126 [a]	123 [a]
Venezuela	3 865	35 480	43 575	1 221	7 676	9 204
Central America	**28 474**	**115 248**	**209 978**	**5 372**	**11 841**	**27 855**
Belize	89 [a]	296 [a]	693 [a]	20 [a]	43 [a]	44 [a]
Costa Rica	1 309 [a]	2 709	4 815 [a]	44 [a]	90	219 [a]
El Salvador	212	2 001	3 686 [a]	56 [a]	74	154 [a]
Guatemala	1 734	3 420	4 441 [a]	..	71 [a]	106 [a]
Honduras	383 [a]	1 482 [a]	2 390 [a]	..	..	..
Mexico	22 424	97 170	182 536 [a]	1 064 [a]	7 540 [a]	15 885 [a]
Nicaragua	126 [a]	1 395 [a]	2 201 [a]	..	19 [a]	57 [a]
Panama	2 198 [a]	6 775	9 217	4 188 [a]	4 004 [a]	11 391 [a]
Caribbean and other America	**21 642**	**114 888**	**159 806**	**4 284**	**103 146**	**128 379**
Anguilla	11 [a]	230 [a]	441 [a]	..	..	..
Antigua and Barbuda	290 [a]	644 [a]	1 121 [a]	..	..	..
Aruba	145 [a]	934 [a]	1 294 [a]	490 [a]	694 [a]	728 [a]
Bahamas	586 [a]	1 587 [a]	2 195 [a]	614 [a]	1 385 [a]	1 407 [a]
Barbados	171	308	451 [a]	23	41	43 [a]
Bermuda	13 849 [a]	56 393 [a]	77 602 [a]	1 550 [a]	14 942 [a]	8 533 [a]
British Virgin Islands	126 [a]	11 363 [a]	11 876 [a]	875 [a]	64 531 [a]	97 041 [a]
Cayman Islands	1 749 [a]	24 973 [a]	36 172 [a]	648 [a]	20 423 [a]	18 737 [a]
Cuba	2 [a]	74 [a]	74 [a]	..	..	..
Dominica	66 [a]	275 [a]	341 [a]	..	..	..
Dominican Republic	572	5 214 [a]	8 468 [a]	..	113 [a]	59 [a]
Grenada	70 [a]	364 [a]	613 [a]	..	- [a]	- [a]
Haiti	149 [a]	215 [a]	240 [a]	..	3 [a]	4 [a]
Jamaica	790 [a]	3 317 [a]	5 783 [a]	42 [a]	709 [a]	1 079 [a]
Montserrat	40 [a]	77 [a]	85 [a]	..	..	..
Netherlands Antilles	408 [a]	78 [a]	.. [a,c]	21 [a]	11 [a]	36 [a]
Saint Kitts and Nevis	160 [a]	505 [a]	805 [a]	..	- [a]	- [a]
Saint Lucia	316 [a]	825 [a]	1 157 [a]	..	- [a]	- [a]
Saint Vincent and the Grenadines	48 [a]	500 [a]	669 [a]	- [a]	- [a]	- [a]
Trinidad and Tobago	2 093	7 008 [a]	10 443 [a]	21 [a]	293 [a]	711 [a]
Turks and Caicos Islands	2 [a]	4 [a]	5 [a]	..	..	..
Asia and Oceania	**186 479**	**1 068 663**	**1 282 964**	**68 444**	**612 594**	**718 387**
Asia	**183 849**	**1 064 078**	**1 278 608**	**68 178**	**612 305**	**717 997**
West Asia	**32 010**	**64 391**	**100 141**	**7 585**	**10 717**	**14 604**
Bahrain	552	5 906	7 585 [a]	719	1 752	3 935 [a]
Iran, Islamic Rep. of	2 039 [a]	2 474 [a]	4 065 [a]	..	411 [a]	.. [a,c]
Iraq	.. [a,c]	.. [a,c]	273 [a]	..	..	..
Jordan	615 [a]	2 272 [a]	3 501 [a]	16 [a]	.. [a,c]	.. [a,c]
Kuwait	37 [a]	608 [a]	381 [a]	3 662	1 427	.. [a,c]
Lebanon	53 [a]	1 116 [a]	2 269 [a]	43 [a]	430 [a]	611 [a]
Oman	1 706 [a]	2 506 [a]	3 432 [a]	10 [a]	33 [a]	32 [a]
Palestinian Territory	..	932 [a]	947 [a]	..	..	..
Qatar	71 [a]	1 920 [a]	4 144 [a]	..	74 [a]	67 [a]
Saudi Arabia	14 467 [a]	16 851 [a]	20 454	1 873 [a]	2 204 [a]	1 892 [a]
Syrian Arab Republic	374 [a]	8 224 [a]	12 491 [a]	..	..	..
Turkey	11 194	19 209	35 188 [a]	1 157 [a]	3 668	6 997 [a]
United Arab Emirates	751 [a]	1 061 [a]	4 422 [a]	99 [a]	819 [a]	1 440 [a]
Yemen	180	1 336	990 [a]	5 [a]	.. [a,c]	9 [a]
South, East and South-East Asia	**151 839**	**999 687**	**1 178 467**	**60 593**	**601 588**	**703 394**
East Asia	**84 065**	**707 616**	**802 657**	**49 032**	**509 636**	**575 468**
China	20 691 [a]	193 348	245 467	4 455 [a]	27 768 [a]	38 825 [a]
Hong Kong, China	45 073 [a]	455 469	456 833	11 920 [a]	388 380	405 589
Korea, Dem. People's Rep. of	572 [a]	1 046 [a]	1 225 [a]	..	..	..
Korea, Rep. of	5 186	37 189	55 327	2 301	26 833	39 319 [a]

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Annex table B.2. FDI stock, by region and economy, 1990, 2000, 2004[a] (continued)

(Millions of dollars)

Region/economy	FDI inward stock 1990	FDI inward stock 2000	FDI inward stock 2004	FDI outward stock 1990	FDI outward stock 2000	FDI outward stock 2004
Macao, China	2 809 [a]	2 801 [a]	4 195 [a]	..	..	497 [a]
Mongolia	- [a]	182 [a]	581 [a]	..	..	..
Taiwan Province of China	9 735 [a]	17 581	39 029 [a]	30 356 [a]	66 655	91 237 [a]
South Asia	**4 602**	**28 706**	**52 221**	**422**	**2 501**	**7 556**
Afghanistan	12 [a]	17 [a]	22 [a]	..	..	..
Bangladesh	324 [a]	2 429	3 433 [a]	45 [a]	68	100 [a]
Bhutan	2 [a]	12 [a]	15 [a]	..	..	..
India	1 657 [a]	17 517	38 676	124 [a]	1 859	6 592
Maldives	25 [a]	119 [a]	169 [a]	..	..	..
Nepal	12 [a]	97 [a]	135 [a]	..	..	..
Pakistan	1 892	6 919	7 596 [a]	245	489	733 [a]
Sri Lanka	679 [a]	1 596	2 175 [a]	8 [a]	86 [a]	131 [a]
South-East Asia	**63 171**	**263 365**	**323 588**	**11 138**	**89 450**	**120 369**
Brunei Darussalam	39 [a]	3 874 [a]	7 548 [a]	..	447 [a]	481 [a]
Cambodia	38 [a]	1 580	2 090	..	193	256
Indonesia	8 855 [a]	24 780 [a]	11 352 [a]	86 [a]	6 940 [a]	.. [a,c]
Lao People's Dem. Rep.	13 [a]	556 [a]	641 [a]	..	28 [a]	28 [a]
Malaysia	10 318	52 747 [a]	46 291 [a]	2 671	21 276	13 796 [a]
Myanmar	281	3 865	4 679	..	..	..
Philippines	3 268	12 810	12 685 [a]	155	1 597	1 606 [a]
Singapore	30 468	112 571	160 422 [a]	7 808	56 766	100 910 [a]
Thailand	8 242	29 915	48 598 [a]	418	2 203	3 393 [a]
Timor-Leste	- [a]	72 [a]	166 [a]	..	..	..
Viet Nam	1 650 [a]	20 596	29 115 [a]	..	..	..
Oceania	**2 630**	**4 585**	**4 356**	**267**	**288**	**390**
Cook Islands	14 [a]	34 [a]	35 [a]	..	..	..
Fiji	394 [a]	805 [a]	269 [a]	241 [a]	25 [a]	55 [a]
French Polynesia	69 [a]	139 [a]	106 [a]	..	..	..
Kiribati	- [a]	1 [a]	1 [a]	..	- [a]	- [a]
New Caledonia	76 [a]	146 [a]	150 [a]	..	..	..
Niue	..	- [a]	8 [a]	..	..	..
Northern Mariana Islands	304 [a]	767 [a]	767 [a]	..	..	..
Palau	..	97 [a]	117 [a]	..	..	..
Papua New Guinea	1 582	2 007 [a]	2 214 [a]	26 [a]	263 [a]	322 [a]
Samoa	9 [a]	53 [a]	56 [a]	..	..	..
Solomon Islands	70 [a]	150 [a]	130 [a]	..	..	..
Tokelau	..	- [a]	1 [a]	..	..	..
Tonga	1 [a]	21 [a]	39 [a]	..	..	..
Tuvalu	..	.. [a,c]	34 [a]	..	..	..
Vanuatu	110	366	430	..	..	13 [a]
South-East Europe and the CIS	**121**	**69 947**	**199 453**	**191**	**22 103**	**86 410**
South-East Europe	**112**	**15 000**	**46 863**	**191**	**1 220**	**2 773**
Albania	..	568 [a]	1 514 [a]	..	82 [a]	83 [a]
Bosnia and Herzegovina	..	398 [a]	1 660 [a]	..	40 [a]	41 [a]
Bulgaria	112 [a]	2 257	7 569 [a]	124 [a]	87	.. [a,c]
Croatia	..	3 568	12 989	..	875	2 426
Macedonia, TFYR	..	410 [a]	1 175 [a]	..	- [a]	2 [a]
Romania	-	6 480	18 009	66	136	301
Serbia and Montenegro	..	1 319 [a]	3 947 [a]	..	..	..
CIS	**9**	**54 947**	**152 590**	**..**	**20 883**	**83 637**
Armenia	9 [a]	632	1 004	..	3 [a]	25 [a]
Azerbaijan	..	3 735	13 408 [a]	..	474 [a]	2 642 [a]
Belarus	..	1 305	2 057	..	24	8
Georgia	..	423 [a]	1 536 [a]	..	..	..
Kazakhstan	..	10 078	22 399	..	16	.. [c]
Kyrgyzstan	..	447	568 [a]	..	33	.. [a,c]
Moldova, Rep. of	..	459	940 [a]	..	23	26 [a]
Russian Federation	..	32 204	98 444 [a]	..	20 141	81 874 [a]

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Annex table B.2. FDI stock, by region and economy, 1990, 2000, 2004[a] (concluded)

(Millions of dollars)

	FDI inward stock			FDI outward stock		
Region/economy	1990	2000	2004	1990	2000	2004
Tajikistan	..	146 [a]	495 [a]	..	..	..
Turkmenistan	..	944 [a]	1 464 [a]	..	..	..
Ukraine	..	3 875	9 217 [a]	..	170	168 [a]
Uzbekistan	..	699 [a]	1 057 [a]	..	..	..
Memorandum						
Least developed countries[e]	9 444	38 384	71 953	729	3 099	3 601
Major pertoleum exporters[f]	48 992	149 630	191 397	10 596	28 836	25 396
All developing economies, excluding China	343 366	1 541 195	1 980 527	142 858	841 152	996 851
EU-15	751 256	2 077 108	3 794 201	804 981	3 040 879	5 171 384

Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics).

a Estimates. For details, see “Methodological notes: definitions and sources” (www.unctad.org/wir).

b Estimated by UNCTAD. The stock data for Luxembourg, as reported by the official national source, are subtracted from the stock data of the Belgium and Luxembourg Monetary Union for 2001, the last year for which the data of the latter are available. Flows are added thereafter to arrive at the stock data for each year.

c Negative stock value. However, this value is included in the regional and global totals.

d This value is not included in the regional and global totals to avoid double counting as Luxembourg was covered under the Belgium and Luxembourg Monetary Union whose data were reported until 2001.

e Least developed countries include: Afghanistan, Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Cape Verde, Central African Republic, Chad, Comoros, Democratic Republic of Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Kiribati, Lao People’s Democratic Republic, Lesotho, Liberia, Madagascar, Malawi, Maldives, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Samoa, Sao Tome and Principe, Senegal, Sierra Leone, Solomon Islands, Somalia, Sudan, Timor-Leste, Togo, Tuvalu, Uganda, United Republic of Tanzania, Vanuatu, Yemen and Zambia.

f Major petroleum exporters include: Algeria, Angola, Bahrain, Brunei Darussalam, Congo, Gabon, Indonesia, Islamic Republic of Iran, Iraq, Kuwait, Libyan Arab Jamahiriya, Nigeria, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Trinidad and Tobago, United Arab Emirates, Venezuela and Yemen.

Annex table B.3. FDI flows as a percentage of gross fixed capital formation (GFCF), 2002-2004 and FDI stocks as a percentage of gross domestic product (GDP), 1990, 2000, 2004, by region and economy

(Per cent)

Region/economy	FDI flows as a percentage of GFCF			FDI stocks as a percentage of GDP		
	2002	2003	2004	1990	2000	2004
World						
inward	**10.6**	**8.3**	**7.5**	**8.4**	**18.3**	**21.7**
outward	***9.7***	***8.2***	***8.7***	***8.7***	***19.7***	***24.0***
Developed economies						
inward	**10.9**	**7.9**	**6.1**	**8.2**	**16.3**	**20.5**
outward	***12.0***	***10.3***	***10.3***	***9.6***	***21.5***	***27.3***
Europe						
inward	**22.9**	**16.1**	**8.6**	**10.8**	**26.5**	**32.0**
outward	***21.2***	***17.5***	***12.0***	***12.0***	***38.4***	***42.5***
European Union						
inward	**23.7**	**16.0**	**8.8**	**10.7**	**26.4**	**31.7**
outward	***21.7***	***17.6***	***11.4***	***11.5***	***37.0***	***40.9***
Austria						
inward	0.8	12.8	7.7	6.8	16.0	21.6
outward	*12.8*	*11.8*	*11.3*	*2.9*	*13.0*	*23.3*
Belgium and Luxembourg						
inward	..	..	..	27.8	78.8	..
outward	..	..	..	*19.4*	*72.5*	..
Belgium						
inward	32.6	55.7	52.8	..	..	73.5 [a]
outward	*26.5*	*64.0*	*40.1*	..	..	*70.6* [a]
Cyprus						
inward	55.6	44.2	40.2	.. [b]	33.0	52.7
outward	*24.2*	*22.9*	*22.1*	*0.2*	*6.4*	*17.4*
Czech Republic						
inward	43.2	8.7	15.4	3.9	38.9	52.7
outward	*1.1*	*0.9*	*1.9*	..	*1.3*	*2.9*
Denmark						
inward	18.6	6.2	- 22.3	6.9	46.4	40.5
outward	*16.0*	*2.7*	*- 21.6*	*5.5*	*46.1*	*41.1*
Estonia						
inward	14.1	34.5	29.6	..	51.4	85.1
outward	*6.5*	*5.7*	*8.2*	..	*5.0*	*12.5*
Finland						
inward	31.7	11.3	13.4	3.8	20.2	30.1
outward	*30.5*	*- 8.9*	*- 3.0*	*8.2*	*43.5*	*43.5*
France						
inward	17.6	12.6	6.2	7.1	19.9	26.5
outward	*18.1*	*15.7*	*12.1*	*9.1*	*34.0*	*38.1*
Germany						
inward	13.7	6.4	- 8.3	6.6	14.5	12.9
outward	*4.1*	*- 0.8*	*- 1.6*	*9.0*	*29.0*	*30.8*
Greece						
inward	0.2	1.5	2.6	6.8	12.4	13.2
outward	*2.1*	*0.1*	*1.2*	*3.4*	*5.4*	*6.4*
Hungary						
inward	19.7	11.7	18.6	1.7	49.0	60.7
outward	*1.8*	*8.9*	*2.4*	*0.6*	*2.7*	*4.5*
Ireland						
inward	106.2	74.9	20.1	88.9	134.1	126.3
outward	*37.9*	*9.9*	*- 16.3*	*27.0*	*29.5*	*52.9*
Italy						
inward	6.2	5.8	5.2	5.4	11.3	13.1
outward	*7.3*	*3.2*	*5.9*	*5.5*	*16.8*	*16.7*
Luxembourg						
inward	2 580.3	1 594.6	918.3	..	..	575.4
outward	*2 775.8*	*1 769.5*	*950.7*	..	..	*555.3*
Latvia						
inward	11.4	11.2	16.7	..	29.1	32.9
outward	*0.2*	*1.4*	*2.8*	..	*3.4*	*1.7*

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Annex table B.3. FDI flows as a percentage of gross fixed capital formation (GFCF), 2002-2004 and FDI stocks as a percentage of gross domestic product (GDP), 1990, 2000, 2004, by region and economy (continued)

(Per cent)

	FDI flows as a percentage of GFCF			FDI stocks as a percentage of GDP		
Region/economy	**2002**	**2003**	**2004**	**1990**	**2000**	**2004**
Lithuania						
inward	25.5	4.6	15.8	..	20.9	28.8
outward	*0.6*	*0.9*	*5.4*	*..*	*0.3*	*1.9*
Malta						
inward	- 68.0	30.6	37.0	20.1	67.1	66.0
outward	*- 1.5*	*2.0*	*0.8*	*..*	*5.7*	*6.7*
Netherlands						
inward	28.7	18.7	- 3.9	23.3	65.8	74.2
outward	*38.9*	*36.5*	*1.2*	*36.3*	*82.4*	*94.4*
Poland						
inward	11.4	10.8	14.5	0.2	20.9	25.4
outward	*0.6*	*0.5*	*1.9*	*0.7*	*0.6*	*1.1*
Portugal						
inward	5.6	19.5	2.8	14.8	27.0	39.0
outward	*0.5*	*21.8*	*15.7*	*1.3*	*16.2*	*27.2*
Slovakia						
inward	61.1	8.0	11.1	0.5	18.4	35.3
outward	*0.1*	*0.3*	*- 1.5*	*..*	*1.6*	*1.5*
Slovenia						
inward	32.7	5.1	6.5	3.8	15.3	15.1
outward	*3.0*	*7.0*	*6.3*	*1.5*	*4.0*	*7.5*
Spain						
inward	26.5	13.5	7.0	12.8	27.6	34.9
outward	*22.1*	*14.4*	*20.6*	*3.0*	*29.6*	*33.5*
Sweden						
inward	29.2	2.7	- 0.7	5.3	39.2	47.0
outward	*26.4*	*44.7*	*27.5*	*21.3*	*51.4*	*58.9*
United Kingdom						
inward	9.3	6.9	21.9	20.6	30.5	36.3
outward	*19.5*	*22.7*	*18.2*	*23.2*	*62.4*	*64.8*
Other developed Europe						
inward	**7.4**	**19.2**	**5.6**	**13.4**	**28.0**	**37.4**
outward	***12.9***	***16.3***	***24.1***	***22.0***	***66.3***	***74.9***
Iceland						
inward	6.2	15.2	11.5	2.3	5.8	14.1
outward	*21.8*	*17.7*	*96.5*	*1.2*	*7.9*	*30.9*
Norway						
inward	2.0	9.9	4.8	10.7	18.1	20.4
outward	*12.0*	*5.6*	*4.1*	*9.4*	*26.2*	*28.8*
Switzerland						
inward	10.5	24.5	5.9	15.0	36.1	50.6
outward	*13.2*	*22.4*	*33.4*	*28.9*	*97.1*	*109.8*
North America						
inward	**4.5**	**2.9**	**4.4**	**8.0**	**14.0**	**14.0**
outward	***7.8***	***6.4***	***12.0***	***8.1***	***14.8***	***18.8***
Canada						
inward	14.9	3.8	12.5	19.6	29.8	30.5
outward	*18.5*	*12.7*	*94.4*	*14.7*	*33.3*	*37.1*
United States						
inward	3.7	2.8	4.2	6.9	12.9	12.6
outward	*7.0*	*5.9*	*10.1*	*7.5*	*13.5*	*17.2*
Other developed countries						
inward	**2.5**	**1.6**	**4.2**	**2.8**	**4.0**	**7.9**
outward	***3.8***	***3.9***	***3.9***	***6.9***	***7.1***	***10.2***
Australia						
inward	16.5	5.6	28.2	23.7	28.6	41.1
outward	*8.3*	*12.3*	*10.8*	*9.8*	*22.0*	*27.1*
Israel						
inward	9.2	20.0	8.1	8.5	20.2	28.4
outward	*5.1*	*10.6*	*15.2*	*2.3*	*7.8*	*13.8*

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Annex table B.3. FDI flows as a percentage of gross fixed capital formation (GFCF), 2002-2004 and FDI stocks as a percentage of gross domestic product (GDP), 1990, 2000, 2004, by region and economy (continued)

(Per cent)

	FDI flows as a percentage of GFCF			FDI stocks as a percentage of GDP		
Region/economy	2002	2003	2004	1990	2000	2004
Japan						
inward	1.0	0.6	0.7	0.3	1.1	2.1
outward	*3.4*	*2.8*	*2.8*	*6.6*	*5.8*	*7.9*
New Zealand						
inward	6.0	14.0	11.1	18.2	54.3	51.5
outward	*1.5*	*1.7*	*3.8*	*14.7*	*11.7*	*9.5*
Developing economies						
inward	**9.5**	**8.8**	**10.5**	**9.8**	**26.2**	**26.4**
outward	***2.8***	***1.6***	***4.2***	***4.3***	***13.6***	***12.7***
Africa						
inward	**13.0**	**15.0**	**12.5**	**12.7**	**26.5**	**27.8**
outward	**-**	***1.1***	***2.4***	***4.8***	***8.5***	***6.2***
North Africa						
inward	**8.0**	**10.5**	**9.2**	13.3	17.3	24.4
outward	**-**	***0.2***	***1.0***	*1.1*	*1.4*	*1.6*
Algeria						
inward	7.7	4.0	4.5	2.5	6.7	9.1
outward	*0.7*	*0.1*	*1.3*	*0.3*	*0.6*	*0.9*
Egypt						
inward	4.3	2.0	9.9	25.6	17.7	27.1
outward	*0.2*	*0.2*	*1.3*	*0.4*	*0.6*	*1.1*
Libyan Arab Jamahiriya						
inward	5.5	4.8	3.9	2.4	1.4	2.6
outward	*- 5.1*	*2.1*	*1.9*	*4.6*	*5.7*	*7.3*
Morocco						
inward	5.8	22.5	7.5	13.9	26.5	36.1
outward	*0.3*	*0.1*	*0.3*	*0.6*	*1.2*	*1.2*
Sudan						
inward	23.8	37.0	41.4	0.4	12.1	26.1
outward	..	..	..	..	..	..
Tunisia						
inward	15.3	10.0	9.9	62.0	60.0	61.7
outward	-	*0.1*	*0.1*	*0.1*	*0.2*	*0.2*
Other Africa						
inward	**17.7**	**18.2**	**14.7**	**12.3**	**34.0**	**29.7**
outward	**-**	***1.8***	***3.5***	***7.6***	***14.5***	***8.8***
West Africa						
inward	**26.8**	**20.3**	**17.4**	**20.1**	**42.6**	**34.7**
outward	***2.5***	***1.5***	***1.8***	***3.2***	***9.1***	***6.3***
Benin						
inward	2.6	6.2	7.3	8.6	9.5	7.1
outward	*0.3*	-	..	*0.1*	*1.6*	*1.0*
Burkina Faso						
inward	2.3	3.8	3.1	1.4	1.3	1.7
outward	*0.3*	*0.2*	*0.1*	*0.1*	*0.9*	*0.5*
Cape Verde						
inward	9.4	6.5	8.4	1.1	31.9	23.1
outward	-	..	..	*0.4*	*1.2*	*0.7*
Côte d' Ivoire						
inward	18.3	12.8	24.7	9.0	23.2	24.7
outward	*- 0.4*	*1.6*	..	*0.4*	*6.0*	*4.1*
Gambia						
inward	54.6	32.9	69.9	49.4	51.3	85.9
outward	*6.1*	*8.9*	*1.2*	*6.9*	*10.4*	*13.3*
Ghana						
inward	5.1	8.2	7.0	5.4	30.0	21.7
outward	*3.8*	..	..	..	*5.5*	*4.0*
Guinea						
inward	7.3	22.1	27.1	2.4	8.6	12.6
outward	*1.7*	..	..	..	*0.2*	*0.5*

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Annex table B.3. FDI flows as a percentage of gross fixed capital formation (GFCF), 2002-2004 and FDI stocks as a percentage of gross domestic product (GDP), 1990, 2000, 2004, by region and economy (continued)

(Per cent)

	FDI flows as a percentage of GFCF			FDI stocks as a percentage of GDP		
Region/economy	**2002**	**2003**	**2004**	**1990**	**2000**	**2004**
Guinea-Bissau						
inward	17.4	12.9	9.7	3.3	16.9	18.1
outward	*4.9*	*1.7*	*1.0*	..	..	*0.4*
Liberia						
inward	..	..	..	194.9	548.7	483.8
outward	..	..	..	*36.0*	*281.7*	*280.1*
Mali						
inward	38.7	17.2	20.7	9.5	5.4	17.5
outward	*0.2*	*0.2*	*0.1*	*0.9*	*2.6*	*1.7*
Mauritania						
inward	35.9	43.7	62.6	5.8	15.6	64.2
outward	..	*- 0.2*	..	*0.2*	*0.6*	*0.3*
Niger						
inward	1.0	4.0	6.1	11.5	16.4	11.7
outward	*- 0.7*	-	..	*2.2*	*8.0*	*4.4*
Nigeria						
inward	49.2	32.4	20.4	30.0	56.3	44.0
outward	*4.1*	*2.5*	*2.5*	*4.2*	*9.8*	*6.8*
Senegal						
inward	6.7	3.6	4.4	4.5	19.0	14.0
outward	*2.9*	*0.2*	*0.3*	*0.9*	*2.8*	*2.0*
Sierra Leone						
inward	2.9	2.3	3.3	.. [b]	6.2	5.5
outward	..	..	..	..	..	..
Togo						
inward	23.5	9.9	15.5	16.5	32.1	31.4
outward	*1.0*	*- 1.9*	*- 0.8*	*0.5*	*5.9*	*3.2*
Central Africa						
inward	**32.0**	**54.1**	**46.5**	**11.1**	**37.4**	**51.8**
outward	***0.1***	***- 0.4***	***0.5***	***1.2***	***2.6***	***1.5***
Angola						
inward	46.1	82.6	42.7	10.0	87.4	88.8
outward	*0.8*	*0.6*	*0.6*	-	*0.5*	*0.7*
Cameroon						
inward	-	-	-	9.4	11.4	7.3
outward	*0.4*	..	..	*1.3*	*2.8*	*2.0*
Central African Republic						
inward	3.9	2.0	- 6.8	6.4	11.5	7.9
outward	*0.9*	-	..	*1.2*	*4.8*	*3.3*
Chad						
inward	73.6	49.7	45.2	14.4	44.3	72.9
outward	-	-	..	*2.1*	*5.4*	*1.6*
Congo						
inward	15.9	33.8	54.3	20.6	58.8	66.7
outward	*0.7*	*0.2*	..	..	..	..
Congo, Dem. Rep. of						
inward	29.0	20.4	75.8	5.8	12.4	28.7
outward	*- 0.5*	..	..	..	..	..
Equatorial Guinea						
inward	62.6	247.7	254.8	19.2	90.0	123.7
outward	-	-	..	*0.2*	.. [b]	*0.1*
Gabon						
inward	2.1	14.2	20.1	20.3	.. [b]	3.3
outward	*- 2.3*	*- 3.9*	*0.3*	*2.8*	*5.6*	*2.7*
São Tomé and Principe						
inward	17.3	38.7	..	0.7	24.9	123.4
outward	..	..	..	..	..	..
East Africa						
inward	**13.0**	**15.2**	**14.0**	**6.4**	**20.8**	**26.6**
outward	***2.1***	***1.8***	***2.0***	***0.9***	***2.7***	***2.8***

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Annex table B.3. FDI flows as a percentage of gross fixed capital formation (GFCF), 2002-2004 and FDI stocks as a percentage of gross domestic product (GDP), 1990, 2000, 2004, by region and economy (continued)

(Per cent)

Region/economy	FDI flows as a percentage of GFCF			FDI stocks as a percentage of GDP		
	2002	2003	2004	1990	2000	2004
Burundi						
inward	-	-	3.2	2.7	6.7	7.5
outward	*-*	*-*	*..*	*-*	*0.3*	*0.4*
Comoros						
inward	1.6	2.9	5.0	6.8	11.2	6.9
outward	*..*	*..*	*..*	*0.4*	*0.6*	*0.3*
Djibouti						
inward	4.8	14.1	36.0	1.5	6.1	12.8
outward	*..*	*..*	*..*	*..*	*..*	*..*
Eritrea						
inward	11.9	13.1	14.9	..	44.7	67.7
outward	*..*	*..*	*..*	*..*	*..*	*..*
Ethiopia						
inward	20.5	34.2	32.7	1.8	15.5	31.0
outward	*..*	*..*	*..*	*..*	*7.2*	*5.3*
Kenya						
inward	3.3	4.5	2.3	7.8	9.4	7.8
outward	*5.5*	*1.4*	*2.4*	*1.2*	*1.3*	*2.4*
Madagascar						
inward	1.4	1.3	4.5	3.5	9.1	11.8
outward	*..*	*..*	*..*	*-*	*0.3*	*0.2*
Malawi						
inward	3.3	6.0	8.4	10.5	18.8	20.4
outward	*..*	*..*	*..*	*..*	*0.5*	*0.5*
Mauritius						
inward	3.1	5.5	4.6	6.4	15.1	15.0
outward	*0.9*	*3.2*	*2.3*	*-*	*2.9*	*3.7*
Mozambique						
inward	47.5	44.9	15.5	1.7	29.7	39.0
outward	*-*	*-*	*-*	*-*	*-*	*-*
Rwanda						
inward	2.4	1.5	3.0	8.2	14.6	15.1
outward	*..*	*..*	*..*	*0.1*	*0.2*	*0.2*
Seychelles						
inward	22.5	41.8	43.2	55.4	96.3	114.7
outward	*4.2*	*5.8*	*3.6*	*16.6*	*22.7*	*23.8*
Somalia						
inward	..	..	..	.. [b]	0.2	0.8
outward	*..*	*..*	*..*	*..*	*..*	*..*
Uganda						
inward	16.7	15.1	16.3	0.1	14.1	23.6
outward	*..*	*..*	*..*	*..*	*2.3*	*1.9*
United Rep. of Tanzania						
inward	23.2	27.7	21.9	9.1	33.4	48.0
outward	*..*	*..*	*..*	*..*	*..*	*..*
Zambia						
inward	10.3	16.0	27.7	31.1	72.9	55.8
outward	*..*	*..*	*..*	*..*	*..*	*..*
Zimbabwe						
inward	1.6	1.7	3.0	1.4	15.1	20.7
outward	*0.2*	*..*	*..*	*1.0*	*3.3*	*4.3*
Southern Africa						
inward	**7.7**	**4.2**	**2.7**	**10.9**	**34.2**	**21.9**
outward	***- 1.9***	***2.6***	***4.8***	***13.0***	***23.8***	***13.3***
Botswana						
inward	33.1	23.7	2.3	34.8	36.6	15.1
outward	*3.5*	*11.7*	*13.5*	*11.9*	*10.4*	*19.9*
Lesotho						
inward	8.8	9.6	14.6	13.5	38.2	31.6
outward	*-*	*-*	*-*	*-*	*0.2*	*0.1*

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Annex table B.3. FDI flows as a percentage of gross fixed capital formation (GFCF), 2002-2004 and FDI stocks as a percentage of gross domestic product (GDP), 1990, 2000, 2004, by region and economy (continued)

(Per cent)

	FDI flows as a percentage of GFCF			FDI stocks as a percentage of GDP		
Region/economy	2002	2003	2004	1990	2000	2004
Namibia						
inward	32.4	15.8	38.6	80.9	35.6	32.6
outward	*- 0.9*	*- 1.0*	*- 2.8*	*3.1*	*1.3*	*0.2*
South Africa						
inward	4.5	2.7	1.7	8.2	33.9	21.7
outward	*- 2.4*	*2.2*	*4.6*	*13.4*	*25.3*	*13.5*
Swaziland						
inward	42.7	- 25.7	24.9	39.9	38.6	39.2
outward	*- 0.3*	*4.1*	*1.3*	*4.5*	*6.8*	*4.9*
Latin America and the Caribbean						
inward	**15.4**	**12.9**	**15.5**	**10.5**	**24.7**	**34.1**
outward	***2.3***	***3.2***	***3.9***	***5.5***	***10.3***	***13.1***
South and Central America						
inward	**15.0**	**12.4**	**15.2**	**9.0**	**20.8**	**29.1**
outward	***2.3***	***3.2***	***4.0***	***5.2***	***5.6***	***7.4***
South America						
inward	**17.4**	**14.3**	**17.0**	**8.7**	**22.3**	**30.1**
outward	***2.5***	***3.1***	***4.9***	***6.3***	***7.5***	***9.8***
Argentina						
inward	17.6	9.6	14.5	6.2	23.8	35.3
outward	*- 5.1*	*3.9*	*1.1*	*4.3*	*7.4*	*14.4*
Bolivia						
inward	54.4	19.0	10.5	21.1	0.1	0.1
outward	*0.2*	*0.2*	*0.3*	*0.1*	*0.4*	*0.4*
Brazil						
inward	19.6	11.3	15.3	8.0	17.1	25.2
outward	*2.9*	*0.3*	*8.0*	*8.8*	*8.6*	*10.7*
Chile						
inward	17.8	28.2	39.2	33.2	61.1	58.2
outward	*2.4*	*12.1*	*4.9*	*0.5*	*14.9*	*15.4*
Colombia						
inward	17.6	16.1	20.8	8.7	13.1	23.4
outward	*7.1*	*8.4*	*1.1*	*1.0*	*3.6*	*4.5*
Ecuador						
inward	23.0	25.1	18.9	15.2	44.4	41.8
outward	-	-	..	*0.2*	*1.0*	*0.5*
Guyana						
inward	30.2	16.2	26.5	10.6	106.5	120.9
outward	*0.1*	..	..	..	*0.1*	*0.2*
Paraguay						
inward	0.6	3.2	9.8	7.6	17.2	14.6
outward	*0.2*	*0.5*	*0.5*	*1.8*	*2.8*	*2.1*
Peru						
inward	21.6	12.3	14.7	5.1	20.8	19.6
outward	-	*0.6*	*0.3*	*0.4*	*1.0*	*1.3*
Suriname						
inward	- 12.0	- 11.1	- 7.8	.. [b]	.. [b]	.. [b]
outward	..	..	..	..	..	..
Uruguay						
inward	15.6	39.4	20.6	7.2	10.4	17.5
outward	*1.1*	*1.4*	*0.7*	*2.0*	*0.6*	*1.0*
Venezuela						
inward	3.8	20.4	7.9	8.0	29.3	40.5
outward	*5.0*	*10.1*	*- 1.8*	*2.5*	*6.3*	*8.6*
Central America						
inward	**12.2**	**10.0**	**12.7**	**9.8**	**17.7**	**27.5**
outward	***2.1***	***3.4***	***2.6***	***1.9***	***1.8***	***3.7***
Belize						
inward	23.9	31.3	81.7	22.1	39.1	66.2
outward	-	*0.2*	-	*5.0*	*5.7*	*4.2*

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Annex table B.3. FDI flows as a percentage of gross fixed capital formation (GFCF), 2002-2004 and FDI stocks as a percentage of gross domestic product (GDP), 1990, 2000, 2004, by region and economy (continued)

(Per cent)

	FDI flows as a percentage of GFCF			FDI stocks as a percentage of GDP		
Region/economy	2002	2003	2004	1990	2000	2004
Costa Rica						
inward	20.7	17.2	16.0	22.9	17.0	26.0
outward	*1.1*	*0.8*	*1.6*	*0.8*	*0.6*	*1.2*
El Salvador						
inward	20.0	6.9	18.9	4.4	15.2	23.3
outward	*- 1.1*	*0.7*	*0.3*	*1.2*	*0.6*	*1.0*
Guatemala						
inward	3.1	3.6	3.8	22.7	18.1	17.0
outward	*0.4*	*0.1*	..	..	*0.4*	*0.4*
Honduras						
inward	12.0	15.2	16.0	12.6	25.1	32.2
outward	*0.1*	*- 0.4*	..	..	..	..
Mexico						
inward	12.1	9.4	12.2	8.5	16.7	27.0
outward	*0.7*	*1.5*	*1.6*	*0.4*	*1.3*	*2.3*
Nicaragua						
inward	20.4	19.8	21.1	12.4	35.3	49.7
outward	*1.2*	*1.0*	..	..	*0.5*	*1.3*
Panama						
inward	5.9	35.9	28.8	41.4	67.6	66.8
outward	*118.6*	*127.0*	*42.3*	*78.8*	*40.0*	*82.6*
Caribbean and other America						
inward	**22.9**	**23.9**	**21.8**	**41.8**	**71.9**	**87.7**
outward	***1.7***	***3.2***	***1.5***	***20.7***	***78.6***	***86.1***
Anguilla						
inward	121.1	93.9	264.5	19.9	215.2	369.1
outward	..	..	..	..	..	..
Antigua and Barbuda						
inward	21.8	45.9	24.1	74.0	108.3	139.6
outward	*4.1*	..	..	..	..	..
Aruba						
inward	71.6	39.2	24.1	16.8	50.3	63.4
outward	*0.6*	*3.8*	*- 0.1*	*56.6*	*37.3*	*35.7*
Bahamas						
inward	9.9	8.5	10.5	18.9	36.8	39.9
outward	-	*1.6*	*- 0.3*	*19.8*	*32.1*	*25.6*
Barbados						
inward	4.2	12.7	9.7	10.0	11.9	15.9
outward	*0.1*	*0.1*	..	*1.4*	*1.6*	*1.5*
Bermuda						
inward	..	..	..	869.7	1 660.1	1 793.5
outward	..	..	..	*97.3*	*439.9*	*197.2*
British Virgin Islands						
inward	..	..	..	8.0	1 644.4	1 195.4
outward	..	..	..	*55.9*	*9 338.8*	*9 767.7*
Cayman Islands						
inward	..	..	..	353.3	1 840.3	2 195.8
outward	..	..	..	*131.0*	*1 505.0*	*1 137.5*
Cuba						
inward	..	..	..	-	0.3	0.2
outward	..	..	..	..	..	..
Dominica						
inward	22.8	30.9	24.9	39.7	101.4	130.7
outward	..	..	..	..	..	..
Dominican Republic						
inward	18.9	16.3	15.1	8.1	20.8	43.5
outward	*0.2*	*- 1.0*	..	..	*0.5*	*0.3*
Grenada						
inward	45.2	45.2	20.0	31.8	104.4	141.2
outward	..	..	..	..	-	-

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Annex table B.3. FDI flows as a percentage of gross fixed capital formation (GFCF), 2002-2004 and FDI stocks as a percentage of gross domestic product (GDP), 1990, 2000, 2004, by region and economy (continued)

(Per cent)

	FDI flows as a percentage of GFCF			FDI stocks as a percentage of GDP		
Region/economy	2002	2003	2004	1990	2000	2004
Haiti						
inward	0.7	0.9	0.7	5.0	6.1	6.7
outward	*0.1*	..	..	..	*0.1*	*0.1*
Jamaica						
inward	18.0	29.6	24.0	18.6	43.0	66.4
outward	*2.8*	*4.8*	*3.3*	*1.0*	*9.2*	*12.4*
Montserrat						
inward	10.1	10.5	9.3	55.7	220.6	225.8
outward	..	..	..	..	..	..
Netherlands Antilles						
inward	..	..	..	22.4	2.8	.. [b]
outward	..	..	..	*1.2*	*0.4*	*1.2*
Saint Kitts and Nevis						
inward	47.9	38.7	31.4	100.6	153.5	202.9
outward	..	..	..	..	-	-
Saint Lucia						
inward	35.8	67.5	65.1	79.5	122.0	162.9
outward	..	..	..	..	-	-
Saint Vincent and the Grenadines						
inward	34.4	43.2	38.7	24.3	148.8	169.8
outward	..	..	..	-	-	-
Trinidad and Tobago						
inward	52.5	39.7	43.0	41.3	85.8	83.3
outward	*7.1*	*11.0*	*1.2*	*0.4*	*3.6*	*5.7*
Turks and Caicos Islands						
inward	..	..	..	..	2.1	2.3
outward	..	..	..	..	..	..
Asia and Oceania						
inward	**7.7**	**7.3**	**9.1**	**8.7**	**26.9**	**23.2**
outward	***3.1***	***1.3***	***4.4***	***3.6***	***16.0***	***13.4***
Asia						
inward	**7.7**	**7.3**	**9.1**	**8.7**	**26.9**	**23.2**
outward	***3.1***	***1.3***	***4.4***	***3.6***	***16.1***	***13.4***
West Asia						
inward	**3.7**	**4.2**	**4.9**	**6.5**	**9.1**	**9.9**
outward	***0.7***	***- 2.7***	**-**	***2.3***	***1.6***	***1.5***
Bahrain						
inward	14.9	27.8	41.1	13.0	74.1	70.5
outward	*13.0*	*39.8*	*49.2*	*17.0*	*22.0*	*36.6*
Iran, Islamic Rep. of						
inward	1.4	1.2	1.0	2.2	2.4	2.4
outward	*0.1*	*- 0.9*	*- 0.2*	..	*0.4*	-
Iraq						
inward	..	..	..	.. [b]	.. [b]	1.8
outward	..	..	..	..	..	..
Jordan						
inward	3.5	20.1	27.6	15.3	26.8	31.9
outward	*1.4*	*0.1*	-	*0.4*	.. [b]	.. [b]
Kuwait						
inward	0.2	- 1.9	- 0.5	0.2	1.7	0.7
outward	*- 4.8*	*- 138.0*	*- 45.9*	*19.9*	*4.0*	.. [b]
Lebanon						
inward	8.3	11.3	8.9	1.9	6.8	11.6
outward	*3.1*	*0.5*	*1.4*	*1.5*	*2.6*	*3.1*
Oman						
inward	1.0	15.5	- 0.5	16.2	12.6	14.0
outward	-	-	-	*0.1*	*0.2*	*0.1*
Palestinian Territory						
inward	- 4.1	..	..	..	20.1	26.9
outward	..	..	..	..	..	..

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Annex table B.3. FDI flows as a percentage of gross fixed capital formation (GFCF), 2002-2004 and FDI stocks as a percentage of gross domestic product (GDP), 1990, 2000, 2004, by region and economy (continued)

(Per cent)

	FDI flows as a percentage of GFCF			FDI stocks as a percentage of GDP		
Region/economy	**2002**	**2003**	**2004**	**1990**	**2000**	**2004**
Qatar						
inward	15.5	13.9	13.4	1.0	10.8	14.6
outward	*- 0.5*	-	-	..	*0.4*	*0.2*
Saudi Arabia						
inward	1.3	2.0	4.3	13.8	8.9	8.2
outward	*0.4*	*0.2*	*0.2*	*1.8*	*1.2*	*0.8*
Syrian Arab Republic						
inward	5.8	21.3	22.7	3.0	33.3	52.6
outward	..	..	..	..	..	..
Turkey						
inward	3.5	4.7	5.1	7.4	9.6	11.7
outward	*0.6*	*1.3*	*1.6*	*0.8*	*1.8*	*2.3*
United Arab Emirates						
inward	9.0	0.2	4.6	2.2	2.0	4.6
outward	*2.8*	*0.3*	*- 0.2*	*0.3*	*1.5*	*1.5*
Yemen						
inward	6.4	0.3	- 1.0	3.7	15.7	7.7
outward	*0.7*	..	..	*0.1*	-	*0.1*
South, East and South-East Asia						
inward	**8.2**	**7.7**	**9.7**	**9.3**	**30.7**	**26.2**
outward	***3.4***	***1.8***	***5.0***	***3.9***	***19.1***	***16.1***
East Asia						
inward	**8.9**	**8.1**	**10.1**	**9.7**	**34.8**	**28.4**
outward	***3.7***	***1.6***	***5.1***	***5.8***	***25.3***	***20.5***
China						
inward	10.4	8.6	8.2	5.8	17.9	14.9
outward	*0.5*	-	*0.2*	*1.3*	*2.6*	*2.4*
Hong Kong, China						
inward	26.4	39.4	92.1	60.3	275.4	277.6
outward	*47.6*	*15.9*	*107.6*	*15.9*	*234.9*	*246.5*
Korea, Dem. People's Rep. of						
inward	..	..	..	3.4	9.9	10.7
outward	..	..	..	..	..	..
Korea, Rep. of						
inward	1.9	2.1	3.8	2.1	8.1	8.1
outward	*1.6*	*1.9*	*2.4*	*0.9*	*5.8*	*5.8*
Macao, China						
inward	51.9	36.0	35.9	86.4	45.2	52.1
outward	*9.8*	*- 0.5*	*1.5*	..	..	*6.2*
Mongolia						
inward	23.9	30.2	30.0	-	19.2	45.1
outward	..	..	..	..	..	..
Taiwan Province of China						
inward	2.9	0.9	3.1	6.1	5.7	12.8
outward	*9.8*	*11.4*	*11.6*	*19.0*	*21.5*	*29.9*
South Asia						
inward	**3.2**	**3.2**	**3.7**	**1.1**	**4.7**	**6.3**
outward	***0.8***	***0.6***	***1.2***	***0.1***	***0.4***	***0.9***
Afghanistan						
inward	0.1	0.3	0.1	0.1	0.8	0.5
outward	..	..	..	..	..	..
Bangladesh						
inward	0.5	2.2	3.5	1.1	5.0	6.1
outward	-	-	-	*0.1*	*0.1*	*0.2*
Bhutan						
inward	0.1	0.3	0.2	0.7	2.5	2.1
outward	..	..	..	..	..	..
India						
inward	3.0	3.2	3.4	0.5	3.7	5.9
outward	*1.0*	*0.7*	*1.4*	-	*0.4*	*1.0*

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Annex table B.3. FDI flows as a percentage of gross fixed capital formation (GFCF), 2002-2004 and FDI stocks as a percentage of gross domestic product (GDP), 1990, 2000, 2004, by region and economy (continued)

(Per cent)

	FDI flows as a percentage of GFCF			FDI stocks as a percentage of GDP		
Region/economy	2002	2003	2004	1990	2000	2004
Maldives						
inward	7.6	5.8	5.0	12.6	19.0	22.5
outward	..	..	..	..	..	..
Nepal						
inward	- 0.6	1.3	0.8	0.3	1.8	2.1
outward	..	..	..	..	..	..
Pakistan						
inward	7.2	4.3	6.2	4.7	10.9	9.2
outward	*0.2*	*0.2*	*0.4*	*0.6*	*0.8*	*0.9*
Sri Lanka						
inward	5.6	5.6	5.1	8.5	9.8	10.8
outward	*0.3*	*0.7*	*0.1*	*0.1*	*0.5*	*0.6*
South-East Asia						
inward	**9.7**	**9.9**	**14.2**	**18.7**	**43.0**	**38.2**
outward	***5.1***	***4.2***	***8.4***	***3.4***	***16.6***	***16.2***
Brunei Darussalam						
inward	..	..	..	1.1	89.8	135.9
outward	..	..	..	..	*10.3*	*8.7*
Cambodia						
inward	16.0	9.4	12.6	3.4	46.9	47.2
outward	*0.7*	*1.1*	*1.0*	..	*5.7*	*5.8*
Indonesia						
inward	0.4	- 1.3	1.9	7.7	16.5	4.4
outward	*0.5*	-	*0.2*	*0.1*	*4.6*	-
Lao People's Dem. Rep.						
inward	7.2	4.5	3.5	1.5	32.1	26.6
outward	..	-	..	..	*1.6*	*1.2*
Malaysia						
inward	14.5	10.8	19.1	23.4	58.6	39.3
outward	*8.6*	*6.0*	*8.5*	*6.1*	*23.6*	*11.7*
Myanmar						
inward	..	..	..	..	9.3	7.9
outward	..	..	..	..	..	..
Philippines						
inward	13.3	2.6	3.3	7.4	16.9	14.9
outward	*0.4*	*1.5*	*2.9*	*0.3*	*2.1*	*1.9*
Singapore						
inward	25.6	41.7	62.7	83.1	123.1	150.2
outward	*18.0*	*16.5*	*41.6*	*21.3*	*62.1*	*94.5*
Thailand						
inward	3.3	5.7	2.5	9.7	24.4	29.7
outward	*0.4*	*1.4*	*0.9*	*0.5*	*1.8*	*2.1*
Timor-Leste						
inward	..	..	..	..	22.3	50.6
outward	..	..	..	..	..	..
Viet Nam						
inward	11.0	11.6	11.3	25.5	65.7	66.3
outward	..	..	..	..	..	..
Oceania						
inward	**0.6**	**16.5**	**5.2**	**28.9**	**30.3**	**21.2**
outward	***0.5***	***0.9***	***0.1***	***5.8***	***3.2***	***3.2***
Cook Islands						
inward	..	..	..	..	42.5	25.4
outward	..	..	..	..	..	..
Fiji						
inward	7.6	8.7	- 3.1	28.5	48.7	10.1
outward	*0.7*	*1.4*	-	*17.4*	*1.5*	*2.0*
French Polynesia						
inward	..	..	..	..	4.2	2.4
outward	..	..	..	..	..	..

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Annex table B.3. FDI flows as a percentage of gross fixed capital formation (GFCF), 2002-2004 and FDI stocks as a percentage of gross domestic product (GDP), 1990, 2000, 2004, by region and economy (continued)

(Per cent)

	FDI flows as a percentage of GFCF			FDI stocks as a percentage of GDP		
Region/economy	**2002**	**2003**	**2004**	**1990**	**2000**	**2004**
Kiribati						
inward	..	..	..	1.2	1.9	1.3
outward	..	..	..	..	*0.1*	-
New Caledonia						
inward	..	..	..	3.0	5.4	3.8
outward	..	..	..	..	..	..
Palau						
inward	..	..	..	..	82.2	90.6
outward	..	..	..	..	..	..
Papua New Guinea						
inward	2.9	21.2	4.7	49.1	58.7	56.0
outward	*0.1*	*0.6*	-	*0.8*	*7.7*	*8.2*
Samoa						
inward	..	..	..	8.1	22.6	17.6
outward	..	..	..	..	..	..
Solomon Islands						
inward	- 2.6	- 3.4	- 7.4	33.0	44.5	50.3
outward	..	..	..	..	..	..
Tonga						
inward	2.0	36.4	12.2	0.8	14.8	18.7
outward	..	..	..	..	..	..
Tuvalu						
inward	..	..	..	..	.. [b]	137.0
outward	..	..	..	..	..	..
Vanuatu						
inward	16.6	25.9	32.6	71.8	165.4	136.0
outward	*1.1*	*1.1*	*1.2*	..	..	*4.0*
South-East Europe and the CIS						
inward	**11.6**	**17.1**	**19.1**	**0.2**	**15.8**	**21.5**
outward	***4.2***	***7.8***	***5.6***	***0.3***	***5.4***	***9.9***
South-East Europe						
inward	**16.0**	**26.8**	**27.6**	**0.2**	**16.5**	**27.1**
outward	***2.6***	***0.5***	***0.5***	***0.3***	***1.5***	***1.9***
Albania						
inward	10.9	13.0	26.0	..	14.8	20.2
outward	*0.1*	..	..	..	*2.1*	*1.1*
Bosnia and Herzegovina						
inward	24.1	27.5	29.7	..	9.0	20.1
outward	..	..	*0.1*	..	*0.9*	*0.5*
Bulgaria						
inward	31.8	54.3	49.2	0.5	17.9	31.7
outward	*1.0*	*0.7*	*- 4.5*	*0.6*	*0.7*	.. [b]
Croatia						
inward	20.1	25.7	11.4	..	19.4	39.1
outward	*9.6*	*1.4*	*3.3*	..	*4.7*	*7.3*
Macedonia, TFYR						
inward	12.4	11.9	16.2	..	11.4	24.8
outward	-	-	*0.1*	..	-	-
Romania						
inward	11.7	17.4	31.7	-	17.5	25.2
outward	*0.2*	*0.3*	*0.4*	*0.2*	*0.4*	*0.4*
Serbia and Montenegro						
inward	5.5	43.4	24.6	..	12.0	16.4
outward	*0.2*	*- 1.1*	..	..	..	..
CIS						
inward	**10.4**	**14.3**	**16.8**	**..**	**15.6**	**20.2**
outward	***4.6***	***9.7***	***6.9***	**..**	***6.3***	***11.5***
Armenia						
inward	28.8	23.2	29.9	..	33.0	28.3
outward	*3.8*	*0.1*	*0.3*	..	*0.1*	*0.7*

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Annex table B.3. FDI flows as a percentage of gross fixed capital formation (GFCF), 2002-2004 and FDI stocks as a percentage of gross domestic product (GDP), 1990, 2000, 2004, by region and economy (concluded)

(Per cent)

	FDI flows as a percentage of GFCF			FDI stocks as a percentage of GDP		
Region/economy	2002	2003	2004	1990	2000	2004
Azerbaijan						
inward	65.5	90.6	105.5	..	70.8	157.0
outward	*15.3*	*25.7*	*30.6*	..	*9.0*	*30.9*
Belarus						
inward	7.7	3.8	2.8	..	12.5	9.0
outward	*- 6.4*	-	-	..	*0.2*	-
Georgia						
inward	23.1	36.3	47.3	..	13.9	34.5
outward	*0.6*	*0.4*	*0.9*	..	..	..
Kazakhstan						
inward	43.8	29.4	46.6	..	55.1	55.0
outward	*7.2*	*- 1.7*	*- 14.0*	..	*0.1*	.. [b]
Kyrgyzstan						
inward	1.8	15.8	28.0	..	32.6	26.2
outward	-	-	*- 63.1*	..	*2.4*	.. [b]
Moldova, Rep. of						
inward	48.8	21.2	42.6	..	35.6	36.4
outward	*0.2*	-	*0.9*	..	*1.8*	*1.0*
Russian Federation						
inward	5.6	10.1	11.2	..	12.4	16.9
outward	*5.7*	*12.4*	*9.2*	..	*7.8*	*14.0*
Tajikistan						
inward	27.2	18.8	173.7	..	16.8	23.9
outward	..	*6.9*	..	..	..	..
Turkmenistan						
inward	8.1	6.3	8.4	..	19.1	12.0
outward	*- 14.3*	*- 8.0*	..	..	..	..
Ukraine						
inward	8.2	14.5	13.3	..	12.4	14.2
outward	*- 0.1*	*0.1*	-	..	*0.5*	*0.3*
Uzbekistan						
inward	3.1	3.2	6.0	..	5.1	10.9
outward	..	..	..	..	..	..
Memorandum						
Least developed countries[c]						
inward	16.2	23.0	20.8	5.8	18.5	24.4
outward	*0.4*	*0.2*	*0.2*	*0.9*	*2.5*	*2.1*
Major pertoleum exporters[d]						
inward	5.5	6.7	6.2	7.5	16.4	14.9
outward	*1.1*	*- 1.4*	*- 0.2*	*2.2*	*3.3*	*2.1*
All developing economies, excluding China						
inward	9.1	8.8	11.8	10.2	27.8	29.1
outward	*3.9*	*2.5*	*6.4*	*4.7*	*15.8*	*15.3*
EU-15						
inward	23.6	16.3	8.4	10.9	26.3	31.3
outward	*22.8*	*18.4*	*11.8*	*11.7*	*38.5*	*42.7*

Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics).

[a] Based on UNCTAD estimates for FDI stock.

[b] Negative stock value. However, this value is included in the regional and global totals.

[c] Least developed countries include: Afghanistan, Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Cape Verde, Central African Republic, Chad, Comoros, Democratic Republic of Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Kiribati, Lao People's Democratic Republic, Lesotho, Liberia, Madagascar, Malawi, Maldives, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Samoa, Sao Tome and Principe, Senegal, Sierra Leone, Solomon Islands, Somalia, Sudan, Timor-Leste, Togo, Tuvalu, Uganda, United Republic of Tanzania, Vanuatu, Yemen and Zambia.

[d] Major pertoleum exporters include: Algeria, Angola, Bahrain, Brunei Darussalam, Congo, Gabon, Indonesia, Islamic Republic of Iran, Iraq, Kuwait, Libyan Arab Jamahiriya, Nigeria, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Trinidad and Tobago, United Arab Emirates, Venezuela and Yemen.

Annex table B.4. Cross-border M&As, by region/economy of seller/purchaser, 2002-2004

(Millions of dollars)

Region/economy	Sales 2002	Sales 2003	Sales 2004	Purchases 2002	Purchases 2003	Purchases 2004
World	**369 789**	**296 988**	**380 598**	**369 789**	**296 988**	**380 598**
Developed economies	322 502	244 426	315 851	341 548	256 935	339 799
Europe	215 453	142 152	185 809	231 284	129 371	176 095
European Union	208 785	126 018	178 772	214 293	121 208	164 677
Austria	38	2 115	1 787	1 848	1 744	5 810
Belgium	5 449	3 182	2 345	5 474	3 166	9 309
Cyprus	..	19	-	36	5	-
Czech Republic	5 204	1 756	558	30	141	360
Denmark	2 014	1 384	5 893	2 012	2 724	4 703
Estonia	15	14	18	-	11	-
Finland	8 206	3 557	3 232	5 304	600	2 712
France	30 122	17 495	20 132	33 865	8 777	14 994
Germany	46 605	25 158	35 868	45 110	19 669	18 613
Greece	65	943	1 455	139	371	74
Hungary	1 278	1 109	453	242	949	317
Ireland	5 241	185	2 878	4 027	1 702	3 554
Italy	11 608	15 259	10 953	8 242	4 662	5 167
Luxembourg	2 952	958	72	3 683	613	558
Latvia	4	12	-	..	-	-
Lithuania	225	135	102	-	-	5
Malta	134	34	431	-	-	52
Netherlands	11 037	9 180	13 321	14 947	8 506	9 130
Poland	3 131	802	1 275	58	529	216
Portugal	1 132	1 732	1 233	1 481	107	3 105
Slovakia	3 350	160	432	4	-	232
Slovenia	1 502	1	168	63	15	59
Spain	8 903	5 110	7 143	6 276	5 538	32 492
Sweden	7 614	4 321	10 916	12 231	4 428	5 906
United Kingdom	52 958	31 397	58 107	69 220	56 953	47 307
Other developed Europe	6 668	16 134	7 038	16 992	8 163	11 418
Andorra	-	-	-	-	-	38
Gibraltar	-	-	92	-	-	-
Guernsey	136	17	-	-	339	775
Iceland	229	142	365	358	289	1 952
Isle of Man	52	-	4	..	3	3
Jersey	225	43	-	236	-	5
Liechtenstein	-	-	-	-	159	-
Monaco	8	382	198	..	77	-
Norway	2 162	5 579	1 603	6 823	303	3 080
Switzerland	3 856	9 970	4 776	9 575	6 993	5 564
North America	89 549	74 827	101 574	91 419	98 436	144 068
Canada	16 317	5 157	19 635	12 990	16 041	34 047
United States	73 233	69 670	81 939	78 429	82 395	110 022
Other developed countries	17 499	27 448	28 467	18 845	29 128	19 636
Australia	10 653	9 713	15 128	8 799	14 549	10 492
Israel	466	808	171	544	1 357	4 003
Japan	5 689	10 948	8 875	8 661	8 442	3 787
New Zealand	692	5 979	4 292	840	4 780	1 354
Developing economies	44 410	40 166	54 700	27 549	31 060	39 809
Africa	4 684	6 427	4 595	1 999	1 067	2 718
North Africa	598	4 594	443	5	433	111
Algeria	-	3	25	-	-	-
Egypt	335	2 200	254	-	3	61
Libyan Arab Jamahiriya	-	-	-	-	430	50
Morocco	47	1 624	25	-	-	-
Sudan	25	768	136	-	-	-
Tunisia	191	-	3	5	-	-
Other Africa	4 086	1 832	4 153	1 994	634	2 607
West Africa	52	56	1 685	-	37	-
Burkina Faso	-	-	4	-	-	-
Ghana	50	55	1 509	-	-	-
Guinea	-	1	-	-	-	-
Liberia	-	-	-	-	37	-
Mali	2	-	13	-	-	-
Mauritania	-	-	147	-	-	-

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Annex table B.4. Cross-border M&As, by region/economy of seller/purchaser, 2002-2004 (concluded)
(Millions of dollars)

Region/economy	Sales 2002	Sales 2003	Sales 2004	Purchases 2002	Purchases 2003	Purchases 2004
Nigeria	-	-	10	-	-	-
Sierra Leone	-	-	2	-	-	-
Central Africa	993	-	65	-	-	-
Equatorial Guinea	993	-	-	-	-	-
Gabon	-	-	65	-	-	-
East Africa	30	127	350	47	9	272
Kenya	-	-	265	..	2	-
Madagascar	-	5	-	-	-	-
Malawi	6	-	-	-	-	-
Mauritius	-	32	19	40	-	22
Mayotte	-	-	1	-	-	-
Mozambique	-	88	-	-	-	-
Rwanda	-	-	9	-	-	-
Seychelles	-	-	-	-	7	-
Uganda	20	-	-	-	-	250
United Rep. of Tanzania	1	2	-	-	-	-
Zambia	-	-	48	-	-	-
Zimbabwe	4	-	7	7	-	-
Southern Africa	3 011	1 650	2 053	1 947	588	2 334
Botswana	78	20	70	..	20	-
Namibia	-	67	16	-	-	14
South Africa	2 933	1 563	1 935	1 947	568	2 320
Swaziland	-	-	33	-	-	-
Latin America and the Caribbean	22 433	12 085	25 284	11 701	11 460	16 487
South and Central America	20 313	10 162	21 067	8 557	9 293	11 551
South America	12 395	8 566	13 148	3 643	3 879	9 488
Argentina	1 207	2 467	285	4	679	103
Bolivia	80	-	-	4	-	-
Brazil	5 897	5 271	6 639	1 302	3 065	9 124
Chile	3 783	95	1 720	1 744	39	95
Colombia	830	37	1 421	530	2	28
Ecuador	70	273	848	-	-	-
Peru	461	247	710	59	91	18
Uruguay	56	12	60	..	3	-
Venezuela	10	164	1 465	-	-	120
Central America	7 918	1 595	7 919	4 914	5 414	2 063
Belize	-	-	57	-	-	5
Costa Rica	229	23	20	-	13	81
El Salvador	..	417	295	-	-	-
Guatemala	-	-	175	..	-	-
Mexico	7 137	1 155	6 403	4 664	5 282	1 973
Nicaragua	53	-	206	-	-	-
Panama	499	-	763	249	120	4
Caribbean and other America	2 120	1 924	4 218	3 145	2 166	4 936
Antigua and Barbuda	-	47	40	-	-	-
Aruba	-	-	715	-	-	-
Bahamas	28	55	4	44	825	810
Barbados	814	44	33	671	-	-
Bermuda	241	1 414	1 580	1 750	428	1 883
British Virgin Islands	230	150	237	464	127	1 527
Cayman Islands	-	126	9	83	156	13
Jamaica	214	-	324	-	-	-
Netherlands Antilles	301	-	-	-	624	332
Puerto Rico	250	-	1 251	133	7	370
Saint Lucia	-	-	6	-	-	-
Trinidad and Tobago	40	87	18	-	-	-
United States Virgin Islands	1	-	-	..	-	-
Asia and Oceania	17 293	21 654	24 820	13 849	18 533	20 604
Asia	17 265	21 572	24 768	13 816	18 533	20 598
West Asia	458	1 404	575	3 038	1 555	1 280
Bahrain	-	9	-	646	432	-
Iran, Islamic Rep. of	18	-	77	..	-	9
Iraq	-	-	9	-	-	-
Jordan	-	990	-	-	-	-
Kuwait	-	-	317	114	441	845

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Annex table B.4. Cross-border M&As, by region/economy of seller/purchaser, 2002-2004 (continued)
(Millions of dollars)

Region/economy	Sales 2002	Sales 2003	Sales 2004	Purchases 2002	Purchases 2003	Purchases 2004
Lebanon	-	98	-	..	-	7
Oman	4	-	20	9	125	-
Qatar	..	-	-	-	15	192
Saudi Arabia	..	-	-	2 020	473	78
Syrian Arab Republic	..	-	7	-	-	-
Turkey	427	282	132	38	7	108
United Arab Emirates	9	26	14	10	62	40
Abu Dhabi	-	-	-	201	-	-
South, East and South-east Asia	16 807	20 167	24 193	10 778	16 978	19 319
South Asia	1 923	1 461	2 218	336	1 362	877
Bangladesh	-	437	60	-	-	-
India	1 698	949	1 760	270	1 362	863
Pakistan	222	-	398	63	-	14
Sri Lanka	3	76	-	3	-	-
East Asia	9 991	14 105	16 743	6 280	6 730	5 207
China	2 072	3 820	6 768	1 047	1 647	1 125
Hong Kong, China	1 865	6 098	3 936	5 062	4 168	2 963
Korea, Dem. People's Rep. of	90	-	-	-	-	-
Korea, Rep. of	5 375	3 757	5 638	98	662	409
Macao, China	109	-	-	-	-	-
Mongolia	0	7	3	-	-	-
Taiwan Province of China	480	422	398	74	253	710
South-East Asia	4 893	4 601	5 232	4 163	8 886	13 235
Brunei Darussalam	-	-	5	-	-	-
Cambodia	-	-	1	-	-	-
Indonesia	2 790	2 031	1 269	197	2	491
Lao People's Dem. Rep.	266	-	85	-	-	-
Malaysia	485	84	638	930	3 685	816
Myanmar	..	417	-	-	-	-
Philippines	544	230	733	2	1	105
Singapore	556	1 766	1 190	2 946	5 018	11 638
Thailand	247	55	1 236	87	176	185
Viet Nam	6	18	74	..	4	-
Oceania	28	83	53	33	-	5
Fiji	-	1	-	-	-	4
Marshall Islands	-	-	6	-	-	-
New Caledonia	-	-	1	-	-	-
Northern Mariana Islands	-	-	33	-	-	-
Papua New Guinea	28	82	13	28	-	2
Samoa	-	-	-	5	-	-
South-East Europe and CIS	2 877	12 395	10 047	691	8 992	991
South-East Europe	1 429	2 355	5 294	85	56	36
Albania	-	2	126	-	-	-
Bosnia and Herzegovina	19	-	110	-	-	-
Bulgaria	138	383	2 685	8	-	30
Croatia	875	613	51	42	32	6
Macedonia, TFYR	5	-	4	16	-	-
Romania	124	493	2 200	19	1	-
Serbia and Montenegro	-	-	38	-	-	-
Yugoslavia (former)	268	863	80	-	23	-
CIS	1 447	10 040	4 753	606	8 936	954
Armenia	52	25	-	-	-	-
Azerbaijan	52	1 387	-	-	-	-
Belarus	-	2	5	-	-	-
Georgia	-	1	-	-	-	-
Kazakhstan	1	507	428	-	170	5
Kyrgyzstan	1	5	3	-	-	-
Moldova, Rep. of	-	19	16	-	-	-
Russian Federation	1 252	7 880	4 062	606	8 763	949
Tajikistan	4	-	-	-	-	-
Ukraine	74	194	41	-	3	-
Uzbekistan	11	21	199	-	-	-

Source: UNCTAD, cross-border M&A database (www.unctad.org/fdistatistics).

Note: The data cover the deals involving the acquisition of an equity stake of more than 10 per cent.

Annex table B.5. Cross-border M&As, by sector/industry, 2002-2004
(Millions of dollars)

	Sales			Purchases		
Sector/industry	**2002**	**2003**	**2004**	**2002**	**2003**	**2004**
Total	369 789	296 988	380 598	369 789	296 988	380 598
Primary	12 751	7 714	6 978	9 309	4 227	4 766
Agriculture, hunting, forestry, and fishing	265	1 350	1 245	37	228	648
Mining, quarrying and petroleum	12 486	6 363	5 733	9 272	4 000	4 119
Manufacturing	137 414	129 713	134 975	115 460	112 758	119 674
Food, beverages and tobacco	32 072	29 597	23 870	20 996	23 307	22 735
Textiles, clothing and leather	915	676	1 585	549	681	256
Wood and wood products	7 325	2 765	3 769	5 258	2 671	3 916
Publishing, and printing	2 986	11 886	8 965	5 731	11 370	4 578
Coke, petroleum and nuclear fuel	33 018	24 267	15 108	28 201	20 260	13 138
Chemicals and chemical products	20 370	22 927	41 788	20 958	16 927	31 290
Rubber and plastic products	2 257	1 582	570	819	893	747
Non-metallic mineral products	3 183	2 688	5 178	2 186	1 867	6 032
Metals and metal products	10 034	8 083	4 579	9 015	11 390	4 541
Machinery and equipment	2 564	4 332	6 688	3 432	1 932	4 722
Electrical and electronic equipment	8 556	5 409	12 998	8 678	7 817	18 216
Precision instruments	5 064	8 046	5 871	2 689	7 072	4 799
Motor vehicles and other transport equipment	8 590	5 760	3 639	6 516	6 322	4 010
Other manufacturing	479	1 694	367	432	250	696
Services	219 623	159 561	238 645	243 771	180 002	256 156
Electricity, gas and water	61 572	15 909	24 799	57 866	13 440	17 596
Construction	1 465	1 089	3 324	1 041	1 048	610
Trade	16 710	13 183	26 445	22 886	10 761	13 087
Hotels and restaurants	3 860	4 142	4 618	1 433	5 496	1 268
Transport, storage and communications	30 824	34 724	36 214	37 115	21 598	24 634
Finance	41 903	54 790	81 809	90 787	114 150	174 096
Business services	47 248	23 565	55 261	29 805	9 090	22 387
Public administration and defence	76	55	18	318	604	-
Education	7	77	79	..	41	88
Health and social services	781	1 115	2 726	710	541	321
Community, social and personal service activities	15 169	10 911	3 349	1 809	3 231	2 068
Other services	7	2	3	..	2	-
Unknown[a]	-	-	-	1 248	-	2

Source: UNCTAD, cross-border M&A database (www.unctad.org/fdistatistics).
[a] Including non-classified establishments.

Selected UNCTAD Publications on TNCs and FDI

I. WORLD INVESTMENT REPORT PAST ISSUES

UNCTAD, ***World Investment Report 2004. The Shift Towards Services*** (New York and Geneva, 2004). 468 pages. Document symbol: UNCTAD/WIR/2004. Sales No. E.04.II.D.36. $75.

UNCTAD, ***World Investment Report 2004. The Shift Towards Services. Overview***. 54 pages (A, C, E, F, R, S). Document symbol: UNCTAD/WIR/2004 (Overview). Available free of charge.

UNCTAD, ***World Investment Report 2003. FDI Policies for Development: National and International Perspectives*** (New York and Geneva, 2003). 303 pages. Sales No. E.03.II.D.8.

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UNCTAD, ***World Investment Report 2002: Transnational Corporations and Export Competitiveness*** (New York and Geneva, 2002). 350 pages. Sales No. E.02.II.D.4.

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Khalil Hamdani
Officer-in-Charge
Division on Investment, Technology and Enterprise Development
United Nations Conference on Trade and Development
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