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C.1. Trends in international trade and investment flows

- Globalisation is a dynamic, multidimensional process. National economies can integrate their activities and internationalise through various channels, *e.g.* trade in goods and services, capital and labour flows, transfer of production facilities and/or technology.
- Even though such economic linkages are not new, the intensity and multiplicity of transactions have accelerated over the past decade, making the concept of “globalisation” elusive and its economic implications harder to quantify.
- Several interdependent factors have contributed to the globalisation process of the 1990s, *e.g.* more advanced information and communication technology, lower transport costs, firms’ strategies regarding location and the need to exploit worldwide technological and organisational advantages, liberalisation of trade and financial flows, etc.
- As a result, the structure of international trade and financial transactions has been gradually evolving over the past decade. Financial transactions (direct investment, investment income, portfolio investment) constituted the fastest-growing segment of international transactions. The upsurge in direct investment and portfolio investment was especially significant in the second half of the 1990s.
- However, such investment flows have also proven to be highly volatile; periods of decline were followed by periods of high growth in investment flows, and *vice versa*. Portfolio investment, for instance, declined in the early 1990s, tripled between 1995 and 1999 and declined again from 1999, one year before the decline in foreign direct investment.
- The lowering of trade and non-trade tariff barriers has contributed to the steady rise in international trade. The share of trade in international transactions has remained persistently high, averaging 15% of OECD GDP in the 1990s.
- In terms of the composition of international trade, the share of trade in goods is four times the share of trade in services.

Main components of international trade and investment

Trade in goods and services. Data relating to trade in goods and services correspond to each country’s exports to, and imports from, the rest of the world. These data are collected to compile the balance of payments. Data relating to international trade in goods are also collected in customs surveys, but as a general rule they are not comparable to balance of payment data. Since data on trade in services are collected solely for use in compiling balances of payments, the latter have been chosen as source data to ensure that trade in goods and trade in services are comparable.

Foreign direct investment. Foreign direct investment is defined as an investment in which an investor resident in another economy owns 10% or more of the ordinary shares or voting power in the firm in which the investment is made (direct investment enterprise). This 10% limit means that the direct investor is able to influence and participate in the management or the control of a foreign investment enterprise. Direct investment comprises not only the initial transaction establishing the relationship between the investor and the enterprise but also all subsequent transactions between them and among affiliated enterprises, both incorporated and unincorporated.

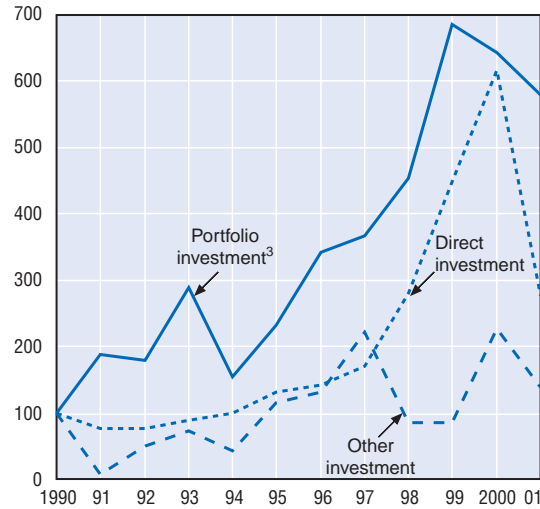
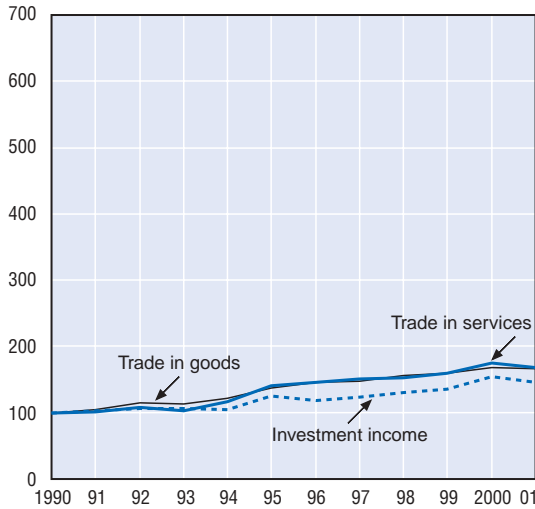
Portfolio investments. In cases where the foreign investor holds less than 10% of the capital (ordinary shares or voting power) of a firm, the investment is considered to be a “portfolio investment”. This type of investment usually corresponds to investment transactions in which the investor has no intention of influencing the management of a firm.

Investment income. This covers two types of transactions between residents and non-residents: *i*) those involving compensation of employees which is paid to non-resident workers; and *ii*) those involving investment income receipts and payments on external financial assets and liabilities. Included in the latter are receipts and payments on direct investment, portfolio investment, other investment and receipts on reserve assets.

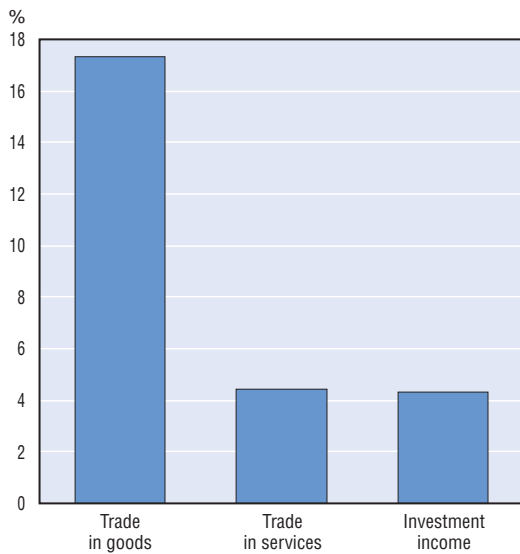
Other investment. This is a residual category that includes all financial transactions not covered in direct investment, portfolio investment or reserve assets. This type of investment comprises trade credits, loans, currency and deposits and other assets and liabilities.

C.1. Trends in international trade and investment flows

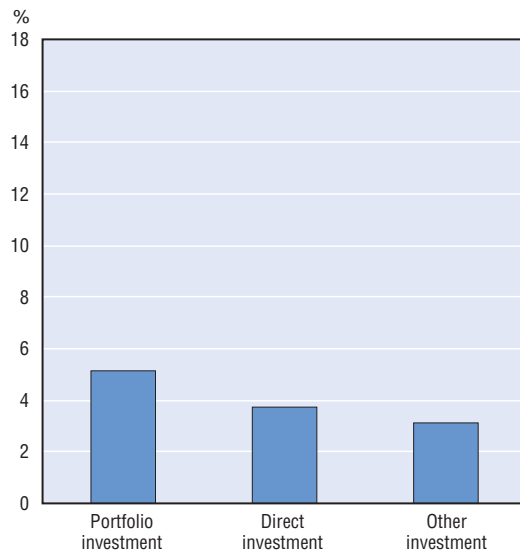
Trends in international trade and investment components,¹ 1990-2001
 OECD², 1990 = 100



Main components of the current account
 as a percentage of GDP,⁴ OECD⁵
 Gross basis, average 1999-2001



Main components of the financial account
 as a percentage of GDP,⁶ OECD⁵
 Net basis, average 1999-2001



1. Average imports + exports or average assets + liabilities.
 2. OECD excludes the Czech Republic, Hungary and the Slovak Republic, 1990-92; Greece, 1998; Iceland and the Slovak Republic, 2001.
 3. Excluding financial derivatives.
 4. Imports + exports divided by 2 and by GDP.
 5. OECD excludes Iceland and the Slovak Republic in 2001.
 6. Assets + liabilities (in absolute terms) divided by 2 and by GDP.
- Source: IMF, Balance of Payments Statistics; and OECD, Annual National Accounts database, January 2003.

C.2.1. International trade

- Traditionally, international trade in goods has been the principal channel of economic integration. In the 1990s, however, other forms of exchange became prevalent as firms increasingly implemented global strategies.
- In the 1990s, international trade in goods constituted on average about 15% of OECD GDP. The share of international trade in services was substantially lower, accounting for around 4% of GDP. In the second half of the decade, international trade in services as a share of GDP picked up slightly in the OECD area. This is partly the result of a gradual change in the nature of services, certain of which, *e.g.* software, financial services and accounting, have become more internationally tradable.
- Aggregate trade figures in goods and services hide significant cross-country differences in the OECD area. The international trade-to-GDP ratio is high (over 50%) for Luxembourg, Ireland, Belgium, the Netherlands and certain eastern European countries, *e.g.* the Slovak Republic, the Czech Republic and Hungary.
- In contrast, the trade-to-GDP ratio is only around 10% for the United States and Japan as well as the European Union when intra-EU trade flows are excluded. During the 1990s, the international trade-to-GDP ratio grew on average about 2 percentage points in the European Union and the United States, while it remained stable in Japan.
- As a share of GDP, trade in services rose faster than trade in goods in several OECD countries in the 1990s. Average annual growth in the trade-to-GDP ratio in services was over 6% for Hungary, Ireland, Turkey and Greece. It was negative for the Czech Republic, Mexico, the Slovak Republic, France and Norway. Trade in goods rose most rapidly in Hungary, Turkey and the Czech Republic over the 1990s.

The trade-to-GDP ratio

The most frequently used indicator of the importance of international transactions relative to domestic transactions is the trade-to-GDP ratio, which is the average share of exports and imports of goods and services in GDP.

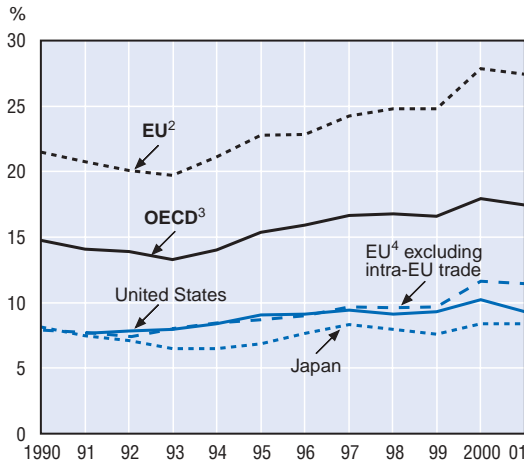
International trade tends to be more important for countries that are small (in terms of size or population) and surrounded by neighbouring countries with open trade regimes than for large, relatively self-sufficient countries or those that are geographically isolated and thus penalised by high transport costs. Other factors also play a role and help explain differences in trade-to-GDP ratios across countries, such as history, culture, (trade) policy, the structure of the economy (especially the weight of non-tradable services in GDP), re-exports and the presence of multinational firms (intra-firm trade).

The trade-to-GDP ratio is often called the trade openness ratio. However, the term “openness” to international competition may be somewhat misleading. In fact, a low ratio for a country does not necessarily imply high (tariff or non-tariff) obstacles to foreign trade, but may be due to the factors mentioned above, especially size and geographic remoteness from potential trading partners.

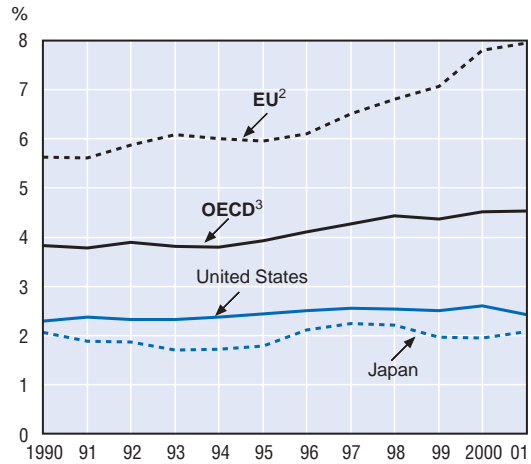
For more details, see Annex Table C.2.1.

C.2.1. International trade

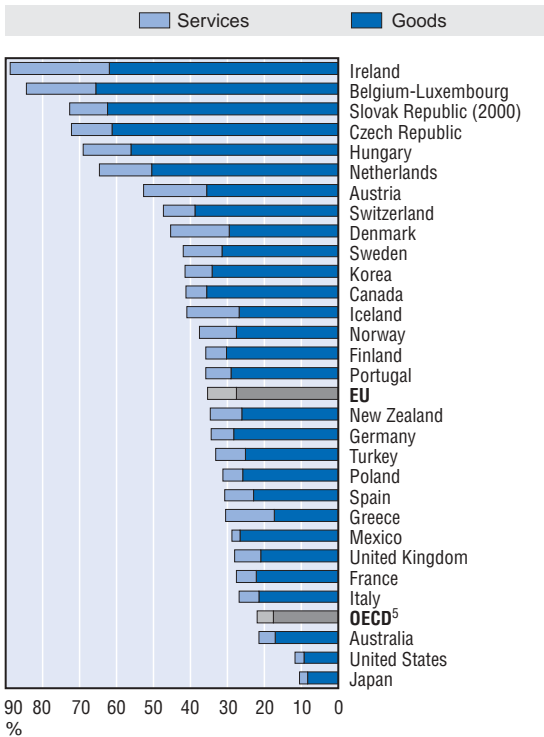
Trade in goods as a share of GDP¹



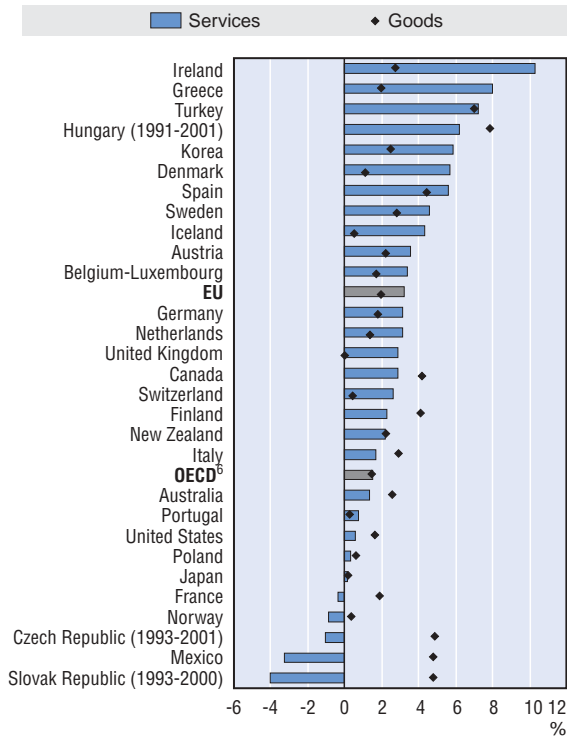
Trade in services as a share of GDP¹



Trade-to-GDP ratios, ¹ 2001



Average annual growth in trade-to-GDP ratios, ¹ 1990-2001



1. Average of imports and exports as a share of nominal GDP.
 2. Includes intra-EU trade.
 3. Excludes Hungary 1990, the Czech Republic and the Slovak Republic 1990-92, Iceland and the Slovak Republic 2001.
 4. Excludes intra-EU trade (calculation based on ITCS database).
 5. Excludes the Slovak Republic.
 6. Excludes the Czech Republic, Hungary and the Slovak Republic.

Source: IMF, Balance of Payments Statistics; and OECD, National Accounts database, June 2003.

C.2.2. Exposure to international trade competition by industry

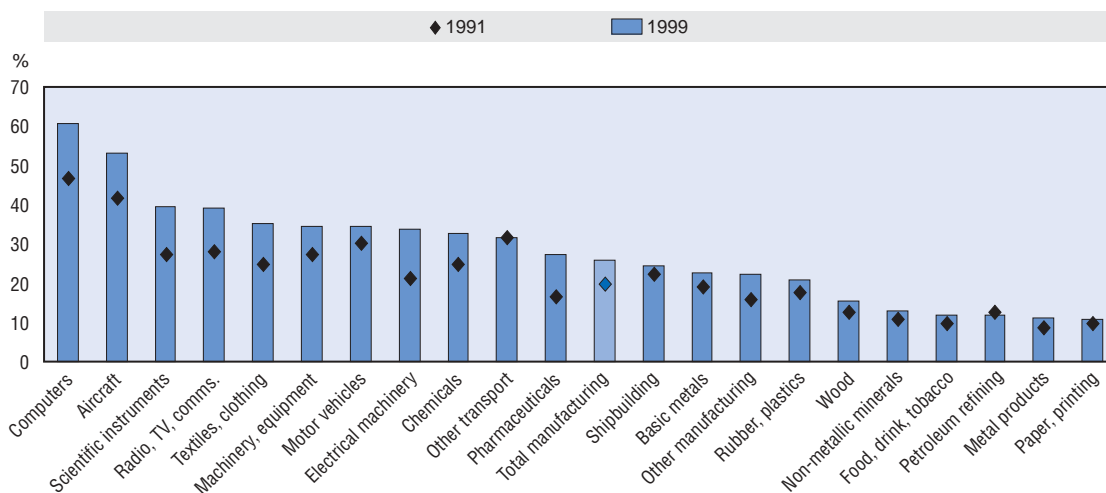
- The exposure of manufacturing industries to international trade has increased in OECD countries in the past decade. Over the 1990s, the average export ratio and import penetration rate rose for virtually all manufacturing industries.
- The export ratios and import penetration rates for the United States, Japan and the European Union (excluding intra-EU trade) show similar patterns of internationalisation across manufacturing industries. Computers, aircraft, scientific instruments and radio and television communication equipment have high exposure to international trade competition, whereas that of paper, printing, metal products and food, drink, tobacco is low.
- A strong difference between the export ratio and import penetration rate could indicate patterns of national specialisation. For instance, the United States has a strong export orientation in aircraft, while Japan and the European Union have a strong export orientation in shipbuilding, motor vehicles and machinery and equipment.
- For other industries, import penetration rates are high. This is the case, for example, for textiles, computers and motor vehicles in the United States; aircraft, scientific instruments, computers and textiles in Japan; and computers and aircraft in the European Union.
- Owing to international sourcing and intra-industry trade (see C.2.3), strongly export-oriented industries can also have a high import penetration rate. This is the case for computers and electrical machinery in the United States and for scientific instruments and aircraft in Japan and the European Union.

Export ratio and import penetration

The *export ratio* indicates the share of output Y which is exported X , i.e. X/Y , and the *import penetration rate* shows to what degree domestic demand D is satisfied by imports M , i.e. $M/D = M/(Y - X + M)$. As for the trade-to-GDP ratio (C.2.1), a low penetration rate does not necessarily imply the existence of high import barriers. In fact, it may reflect industry-specific characteristics unfavourable to international trade, such as high transport costs for goods with a low value per ton. A low penetration rate may also reflect the presence of highly competitive domestic firms capable of resisting foreign competition, especially if the export ratio is high at the same time. Conversely, a high import penetration rate may reflect weak competitiveness of domestic firms, especially if the export ratio is low. Both indicators are high for some industries, thereby reflecting their internationalisation, especially owing to sourcing of intermediate goods, intra-industry trade and intra-firm trade.

Exposure to international trade competition for manufacturing industries in selected OECD countries¹

Average of export ratio and import penetration



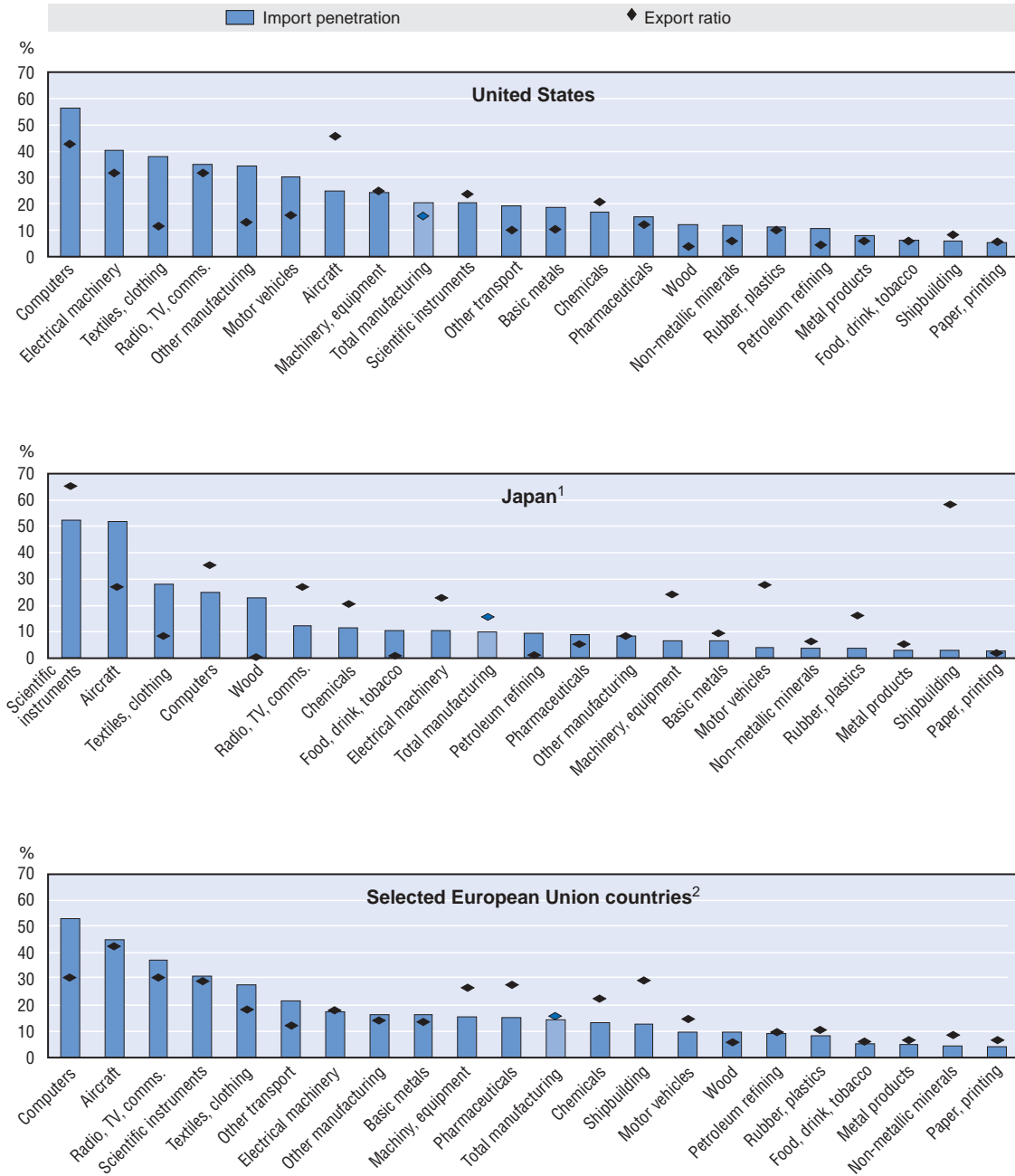
1. OECD includes Australia, Austria, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Norway, Portugal, Spain, Sweden, the United Kingdom, the United States.

Source: OECD, STAN database, June 2003.

For more details, see Annex Tables C.2.2.1. and C.2.2.2.

C.2.2. Exposure international trade competition by industry

Exposure of manufacturing industries, 1999



1. Motor vehicles (ISIC 34) includes Other transport (ISIC 352 + 359).

2. EU includes Austria, Denmark, Finland, France, Germany, Ireland, Italy, Portugal, Spain, Sweden, the United Kingdom. Intra-EU trade is excluded.

Source: OECD, STAN and Bilateral Trade database, June 2003.

C.2.3. Intra-firm trade in total trade

- The share of intra-firm exports in the total exports of manufacturing affiliates under foreign control ranges between 35% and 60% in the OECD countries for which data are available.
- This proportion held steady at around 50% throughout the 1990s in the United States, Canada and the Netherlands, but it rose sharply in Sweden (from 35% to 80%) and declined in Japan (from 35% to 20%). In 1999, in other words, only 20% of the exports of affiliates under foreign control in Sweden were destined for non-affiliated firms, while the corresponding share for affiliates under foreign control in Japan was 80%.
- More detail is available for intra-firm exports and imports between US parent companies and their foreign affiliates in relation to aggregate US trade. Overall, these ratios amount to 25% for exports and 15% for imports.
- For exports, the ratio of intra-firm trade of US parent companies is highest with Singapore, Switzerland, Ireland, Canada, the Netherlands and Hong Kong (China). For imports it is highest with Singapore, Hong Kong (China), Ireland, Canada and Mexico.
- Over 80% of US parent company exports to their affiliates in Singapore involve computers and other electronics products; the imports from these affiliates are mainly computers. Exports to Ireland include computers and products related to chemicals and pharmaceuticals, while imports mainly consist of computers. Exports to Canada are largely cars, while imports are more varied and include cars, computers and distribution services.
- It should be borne in mind that ratios of intra-firm trade with partner countries, even if they attain substantial values, may account for only a small percentage of overall intra-firm trade. For example, intra-firm imports from Canada account for less than 30% of aggregate US imports, as opposed to more than 65% in the case of Singapore. However, in absolute value they account for nearly 39% of aggregate US intra-firm imports (*i.e.* double the share for Europe) but scarcely 7.5% in the case of Singapore.

Intra-firm trade

Intra-firm trade is trade between enterprises belonging to the same group, but located in different countries. The ratio of intra-firm trade to total trade in countries that publish the relevant data is quite high. Once foreign investments have been made, these transactions reflect centralised decisions made as part of a group's global strategy. A significant portion of intra-firm trade may reflect the fact that affiliates have a better understanding of local market demand. Parent corporations and other firms in the group often prefer to export to their own affiliates, which then sell the goods as received to local consumers. In fact, parent corporations could sell these products directly to local distributors, without involving their affiliates. It is difficult to determine whether such transactions would be less numerous if they did not go through their affiliates.

Two indicators are shown here, both for inward investment, although indicators can also be derived for outward investment. They refer to exports (X_F^{intra}) and imports (M_F^{intra}) by the foreign-controlled affiliates in compiling countries with parent companies and other affiliates located abroad to total exports (X) and imports (M) of the compiling countries:

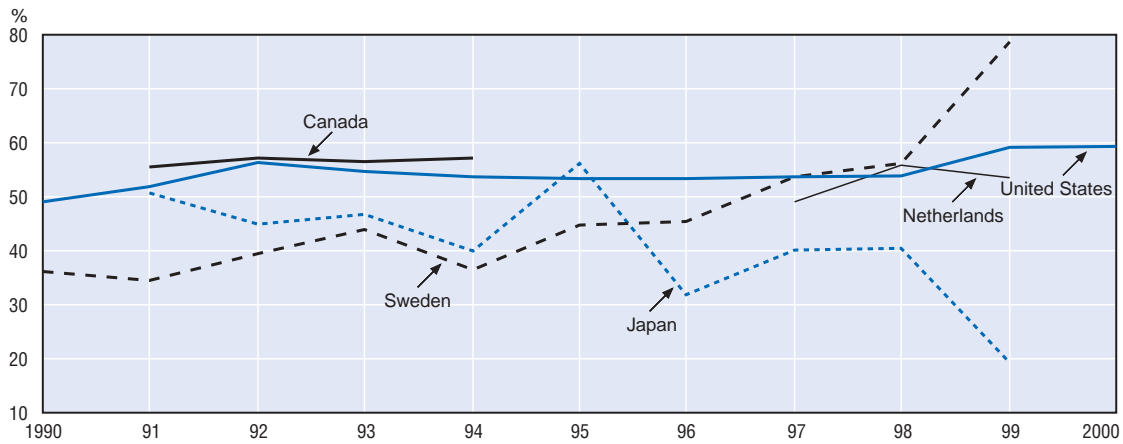
$$X_F^{intra}/X, M_F^{intra}/M$$

These indicators might also be calculated in terms of these firms' total exports and imports, and by industrial sector and by country of origin and destination.

In the case of imports by affiliates under foreign control in host countries and by parent companies controlled by compiling countries, it is also useful to distinguish between imports destined for use in their own production, those resold as same-state goods on the domestic market, and those re-exported, either as received or after further processing.

C.2.3. Intra-firm trade in total trade

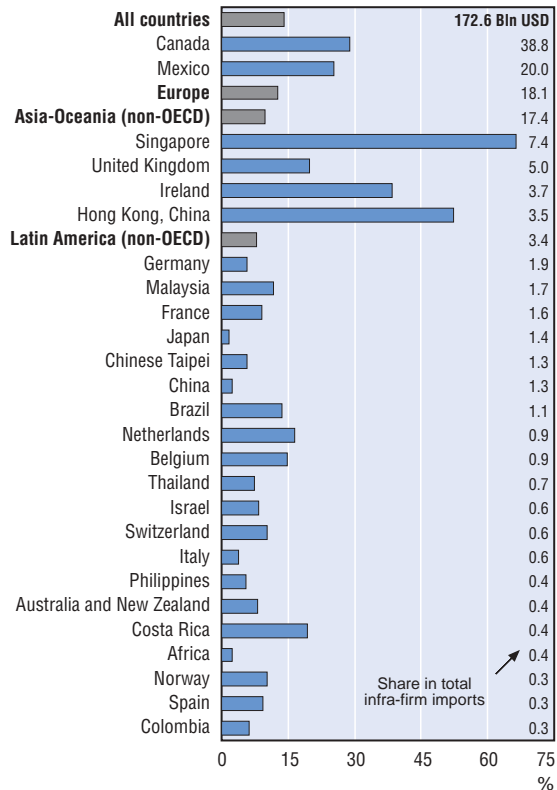
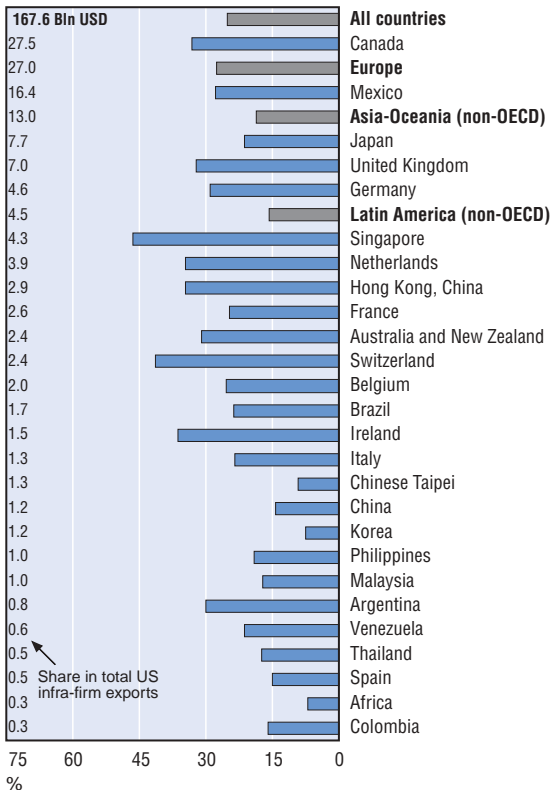
Share of intra-firm trade in total exports of affiliates under foreign control (inward investment)¹



United States intra-firm trade in goods from outward investment

Intra-firm exports of goods in total exports of goods to partner country, 2000

Intra-firm imports of goods in total imports of goods to partner country, 2000



1. The US data also include minority controlled affiliates. For the United States and the Netherlands (from 1998), trade in goods only.
Source: OECD, AFA and ITS databases, May 2003.

C.2.4. Import content of exports

- Importing in order to export is an essential characteristic of economic integration and the globalisation of production. Imports vital to the production of exported goods may come from affiliates controlled by the exporter or from non-affiliated firms.
- In the Netherlands, for example, the import content of exports exceeds 40%. In contrast, Japan and the United States are the least dependent on imports for exports.
- Between 1980 and 1997, dependency on imports for subsequent exports increased in Canada, Germany, Australia and the United States. It decreased in France, Japan, Denmark and the Netherlands. If the energy imports needed to manufacture goods for export are excluded, the above percentages are reduced by 2 to 3 points.

Import content of exports

The link between a country's exports and imports is an important but little known aspect of globalisation. It may be a complex one if a number of countries produce parts of the same final goods and services. One way of measuring the relationship is to use input-output tables. These tables make it possible to measure the relationships between the producers of goods and services (including imports) in an economy and the users of these goods and services (including exports). They can therefore be used to estimate the contribution made by imports to the production of any good (or service) for export. For example, if a motor car manufacturer imports certain components (*e.g.* the chassis), the direct import contribution will be the ratio of the value of the chassis to the total value of the car. If the car manufacturer purchases other components from domestic manufacturers, who in turn use imports in their production process, those imports must be included in the car's value. These indirect imports should be included in any statistic that attempts to measure the contribution of imports to the production of motor cars for export. The total direct and indirect imports are known as embodied imports. In an input-output framework, the relationship between producers and consumers can be described as follows:

$g = A * g + y$, where g is an $n * 1$ vector of the output of n industries within an economy; A is an $n * n$ matrix describing the relationships among industries [($I - A$) is known as the Leontief matrix], where a_{ij} is the ratio of inputs from domestic industry i used in the output of industry j and Y is an $n * 1$ vector of final demand for domestically produced goods and services, including exports.

Assuming that no other imports (re-exports) are recorded, total imports embodied in exports can be shown as $m * (I - A)^{-1} * e$ where m is a $1 * n$ vector with components m_j (the ratio of intermediate imports purchased to output produced, in industry j) and e is an $n * 1$ vector of exports by industry.

Estimates of imports of goods embodied in exports of goods can be calculated by including only imported goods in m and setting all exports of services in e to zero, assuming that goods industries produce goods only and services industries produce services only. By adapting the equation above to reflect supply-use table data sources, this assumption can be relaxed. In this case the equation above can be rewritten as $m * (I - DB)^{-1} * Dx$, where x is a $n * 1$ vector of exports by product, $DB = A$ and $Dx = e$, B is an $n * n$ matrix where b_{ij} is the ratio of inputs of domestically produced product i used in the output of industry j . This approach can be applied to the equation below by replacing each occurrence of A and e with DB and Dx .

Thus, the import content of exports (the share of imports used in production to make one unit of export) is equal to:

$$m * (I - A)^{-1} * e / E \text{ where } E = \sum_{i=1}^n e_i \text{ (total exports)}$$

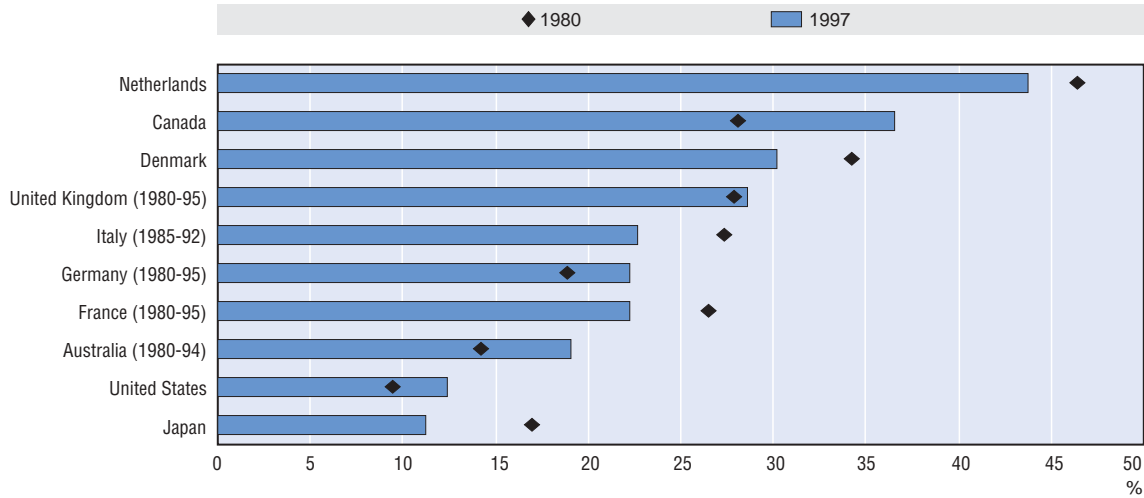
Similarly, the embodied imports in exports by industry j can be shown as $\sum m_i * L_{ij}$ where L_{ij} is the ij^{th} element of the Leontief inverse $(I - A)^{-1}$.

In addition, the share of imports used in the production process to produce exports is equal to $m * (I - A)^{-1} * e / M$, where $M = m * g$ (total imports).

In the same way, one can estimate the total indirect and direct contribution of exports to value added by replacing the import vector m above with an equivalent vector that shows the ratio of value-added to output (v). Thus, the contribution of exports to value added is equal to $v * (I - A)^{-1} * e$; the value-added content of exports = $v * (I - A)^{-1} * e / E$; and the share of value added embodied in exports = $v * (I - A)^{-1} * e / V$, where V = total value added.

C.2.4. Import content of exports

Import content of exports of goods (including energy), 1980 and 1997



Source: OECD, Input-Output database, February 2003.

C.3.1. Foreign direct investment flows

- Since the second half of the 1980s, foreign direct investment (FDI) has played a fundamental role in furthering international integration. The bulk of this investment has gone for acquisition or capacity enlargement of existing firms, *i.e.* changes of ownership rather than creation of a new enterprise.
- All flows of direct investment dropped sharply as of 2000. The United States is the main foreign investor and the leading host country for foreign investment. The United Kingdom is the second outward investor, and in 2000 it ranked ahead of the United States. In 2001, however, its outward investment dropped sharply, declining more than that of other large countries.
- In 2000, France, which invests more abroad than it receives at home, became the third outward investor, after the United States and the United Kingdom. In contrast, Japan, despite the size of its economy, invested less abroad over 1994-2001 than the Netherlands or Germany.
- Between 1994 and 2001, Belgium-Luxembourg held second place in absolute value as a host country for FDI. This may be due to the presence of financial holding companies, which make their own investments, often in other countries.

Foreign direct investment flows

Main definitions

A foreign investment is classified as a direct investment if the foreign investor holds at least 10% of the ordinary shares or voting power in an enterprise and exerts some influence over its management. Any investment amounting to less than 10% of ordinary shares is posted as portfolio investment.

Direct investment is measured in terms of flows and stocks. Direct investment flows, whether inward or outward, comprise investors' net capital contributions, net loans and undistributed (reinvested) profits.

Main limitations of the data

Only one OECD country has not yet adopted the threshold of 10% of assets or voting rights held in a company as the rule for distinguishing between direct and portfolio investment. However, inward direct investment statistics in Belgium, Korea, Mexico, Netherlands, Norway and Portugal include transactions between a resident enterprise and its direct investor when the foreign investor has an effective voice in management, even though the investor owns less than 10% of the enterprise's assets.

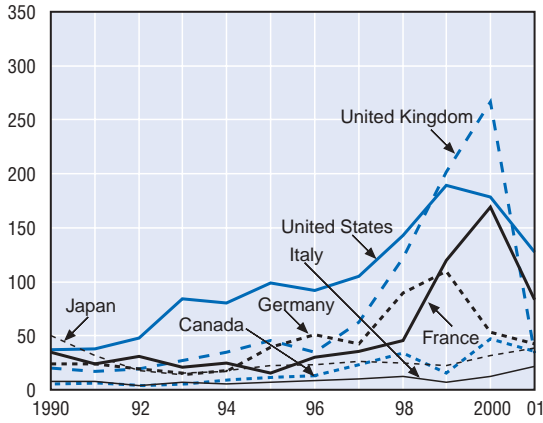
A number of foreign investors may hold a majority stake in some companies, although each may own less than 10% of ordinary shares. These should not be counted as direct investments, and the companies should not be considered as direct investment enterprises.

Direct investment flows do not include investments made through the host country's capital market or via other financial sources which do not pass through the investor country or via other investor enterprises, although such investments may represent a significant part of the actual total investment. In the balance of payments approach to flows of foreign direct investment, it the immediate investor is more relevant, the investor's country of origin needs to be taken into account. If the ultimate beneficiary is more relevant, the investor and the country of origin may be different.

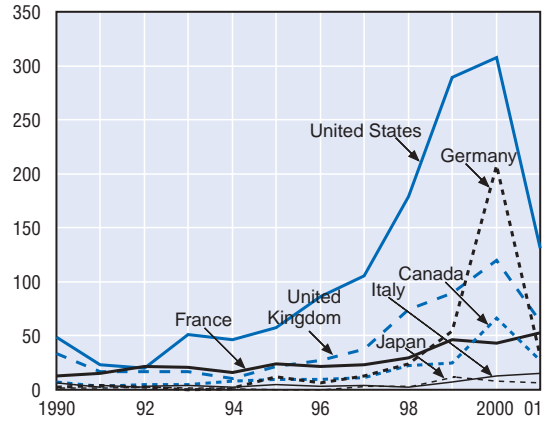
For example, data on the activity of foreign affiliates in the services sector in Denmark by country of origin show that the most important immediate investors are the Netherlands (27%), Sweden (18.1%) and the United Kingdom (11.7%), while the United States represents only 8.1%. If the ultimate beneficial owner (UBO) is taken into account, the United States becomes the first investor country with 20%. This is because significant US holding companies, which fund most American investments in Europe, are located in the Netherlands. In the balance of payments approach, the FDI flows from the Netherlands to Denmark are considered as European investments while in the UBO approach, these investments are not European but American.

C.3.1. Foreign direct investment flows

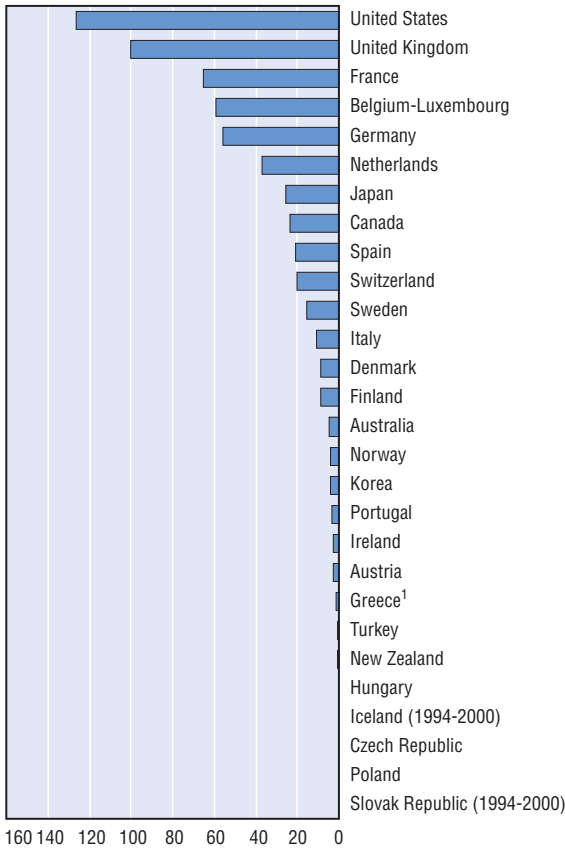
Outward 1990-2001, G7 countries
Billion USD



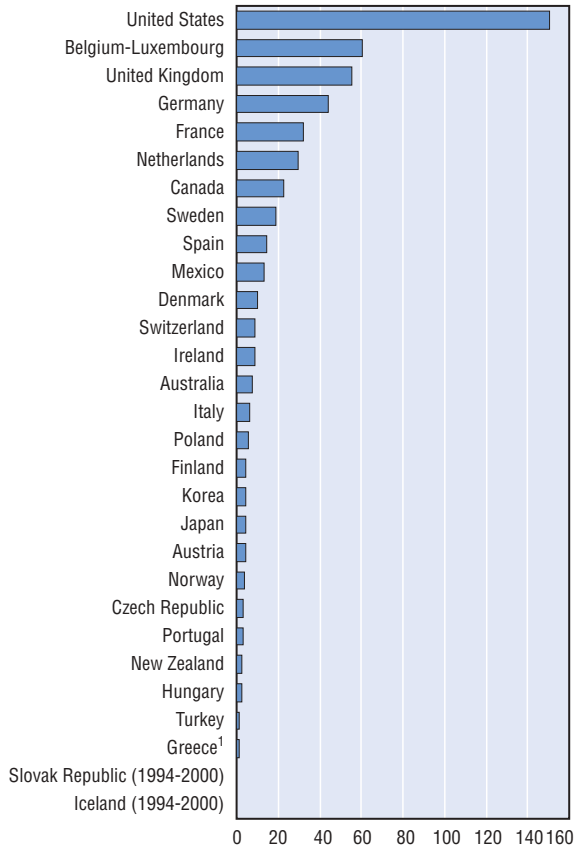
Inward 1990-2001, G7 countries
Billion USD



Outward, average 1994-2001
Billion USD



Inward, average 1994-2001
Billion USD



1. Excluding 1998.

Source: IMF, Balance of Payments Statistics, January 2003.

C.3.2. Cross-border mergers and acquisitions

- Mergers and acquisitions are the most common form of foreign direct investment (FDI). Firms engage in cross-border mergers and acquisitions for several reasons: to strengthen their market position, to expand their businesses, to exploit other firms' complementary assets, *e.g.* technology, expertise, brand names, or to realise efficiency gains by restructuring their businesses on a global basis.
- During the 1990s, cross-border mergers and acquisitions increased more than five-fold worldwide on a value basis. The upsurge in deal value and number of deals was especially strong between 1995 and 1999.
- The United States was the main target country for mergers and acquisitions during 1995-2001, attracting on average 25% to 30% of the OECD total and 50% more in terms of value than the United Kingdom, the second target country. Germany, Canada and France were the other important countries for inward mergers and acquisitions.
- Over the same period, the United Kingdom was the principal acquirer, with deals valued at close to USD 120 billion on average, followed by the United States, France and Germany.
- Large-scale transactions account for the bulk of the increase in the value of cross-border mergers and acquisitions. In the telecommunications sector, for example, the deal between Mannesmann (Germany) and Vodafone AirTouch (United Kingdom) in 2000 was valued at USD 202.8 billion.
- Cross-border mergers and acquisitions take place in manufacturing and in services and are changing the shape of industry worldwide in sectors such as motor vehicles, chemicals and pharmaceuticals, telecommunications and financial industries. During the 1990s, the most active sectors in terms of mergers and acquisitions at global level were oil, motor vehicles, banking, finance and telecommunications.

Cross-border mergers and acquisitions

A merger is an operation in which two or more companies decide to pool their assets to form a single company. In the process, one or more companies disappear completely. An acquisition does not constitute a merger if the acquired company does not disappear. Mergers are less frequent than acquisitions.

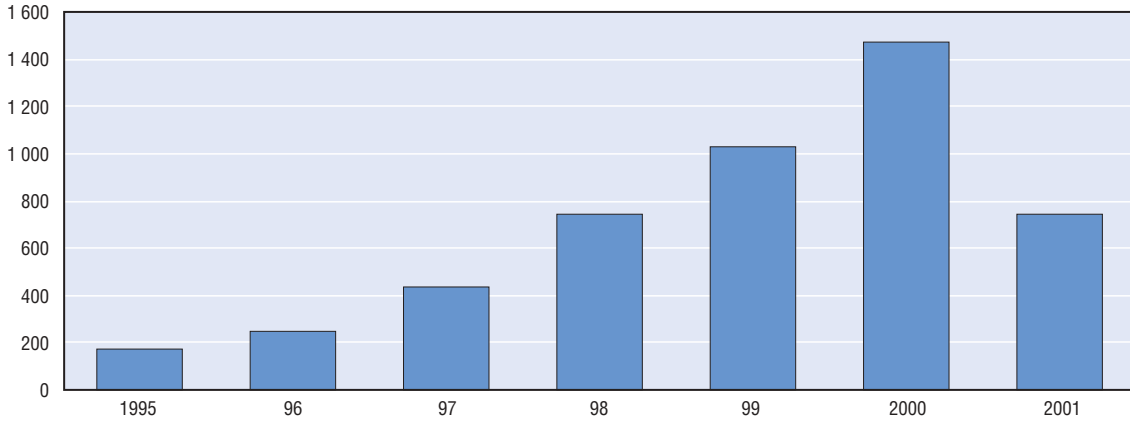
Cross-border mergers and acquisitions can be either inward or outward. Inward cross-border mergers and acquisitions imply an inward capital movement through the sale of domestic firms to foreign investors, while outward cross-border mergers and acquisitions imply an outward capital movement through the purchase of all or parts of foreign firms.

The data are taken from the Mergers and Acquisitions Global database (Dealogic). The limitations on data collection methods create a credibility problem, as data collected by different private sources show significant differences in overall merger and acquisition activity across countries.

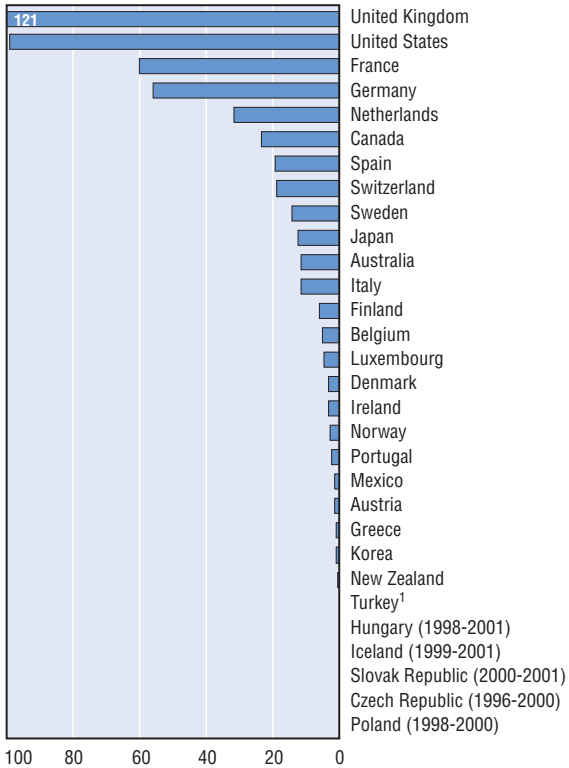
A detailed analysis of mergers and acquisitions can be found in OECD (2001), *New Patterns of Industrial Globalisation: Cross-border M&As and Alliances*, OECD, Paris; and in Nam-Hoon Kang and Sara Johansson, "Cross-border Mergers and Acquisitions: Their Role in Industrial Globalisation", *STI Working Papers 2000/1*, as well as in *International Investment Perspectives*, No. 1, OECD, 2002.

C.3.2. Cross-border mergers and acquisitions

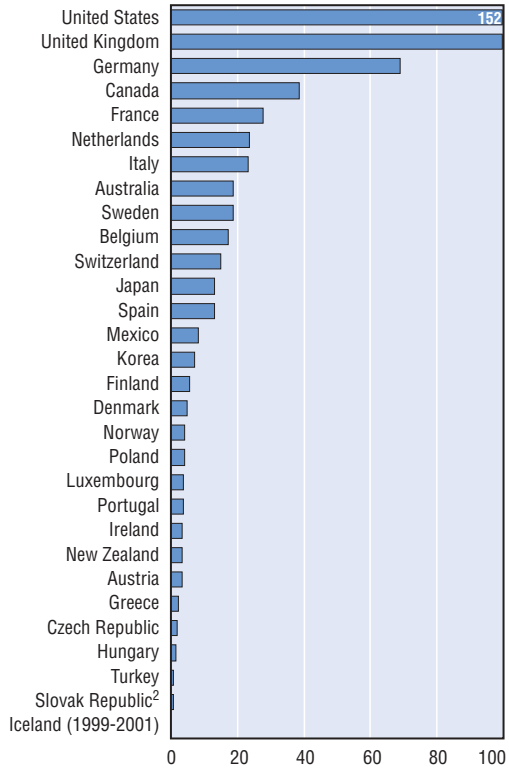
Trends in cross-border mergers and acquisitions, world total
Billions USD



Outward mergers and acquisitions in OECD countries, average 1995-2001
Billions USD



Inward mergers and acquisitions in OECD countries, average 1995-2001
Billions USD



1. 1995 and 1997 not available.

2. 1996-97 not available.

Source: Dealogic, M&A Global database, March 2003.

C.4.1. Activity of affiliates under foreign control in manufacturing

- Firms increasingly adopt global strategies and establish overseas sales, marketing, production and research units to cope with new competitive pressures and innovation methods. Foreign direct investment (FDI) data do not capture this phenomenon. While they indicate the magnitude of financial flows between firms related through foreign investment, they are typically not classified by type of investment activity. Indicators on the activity of foreign affiliates are thus an important complement to information on FDI when analysing the weight and economic contribution of such firms in host countries.
- Available data on the share of foreign affiliates in manufacturing turnover and employment show considerable variation across OECD countries. The share of turnover under foreign control in the manufacturing sector ranges from over 70% in Hungary and Ireland to under 3% in Japan. For 1995-2000, however, the shares of foreign affiliates in manufacturing turnover rose in nearly all countries for which data are available. The shares of foreign affiliates in manufacturing employment range from around 50% in Ireland, Luxembourg and Hungary to 4% in Germany.
- The available data also indicate that the export and import ratios of foreign affiliates in manufacturing are high. This tends to confirm the view that foreign affiliates have a better knowledge of international markets and distribution networks and engage heavily in intra-firm trade (see C.2.3).
- Comparisons of domestic firms and foreign affiliates should be made with caution. The latter usually do not have the same profile as domestic firms, they are generally larger and concentrated in relatively more productive and capital-intensive industries, and they typically require a higher level of skills than the average national firm.
- In the second half of the 1990s, manufacturing employment in firms controlled by the compiling countries declined except in Norway, Sweden and Ireland. On the other hand, employment numbers in foreign affiliates rose in all countries except Germany and Netherlands.
- The generally rapid growth in employment and production for foreign affiliates as compared with national firms does not necessarily point to the creation of new foreign affiliates. In most cases, it reflects changes of ownership owing to acquisitions.

Activity of foreign affiliates

The criterion of possession of 10% of a company's voting shares or voting power is deemed to indicate the existence of a direct investment relationship and of influence over the management of the firm in question.

In contrast, control implies the ability to shape a company's activities. This entails ownership of a majority of ordinary shares (more than 50%) or voting power on the board of directors. Variables such as turnover, number of employees or exports are attributed in full to the investor that controls the company.

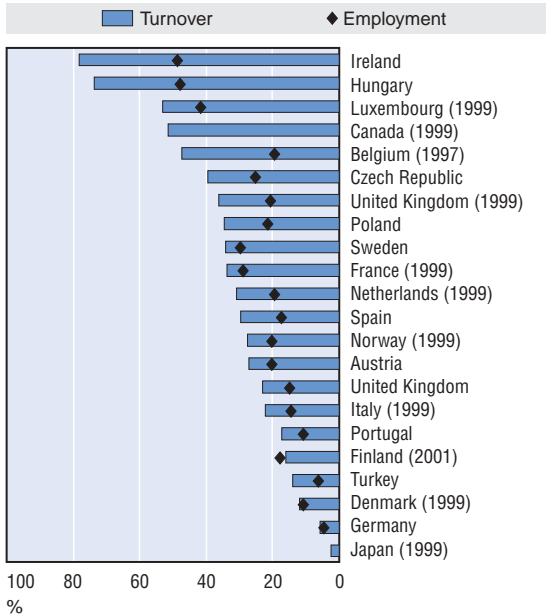
The term "foreign affiliate" is restricted to foreign affiliates that are majority-owned. Accordingly, the geographical origin of a foreign affiliate is defined as the country of the parent company if it holds, directly or indirectly, more than 50% of the affiliate's voting shares.

However, the majority holding criterion is not used for the United States and Hungary, since minority foreign-owned firms are also included in their statistics.

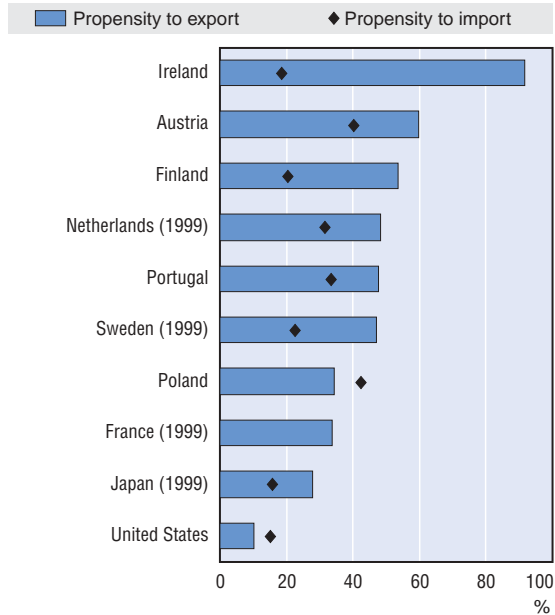
For more details, see Annex Table C.4.1.

C.4.1. Activity of affiliates under foreign control in manufacturing

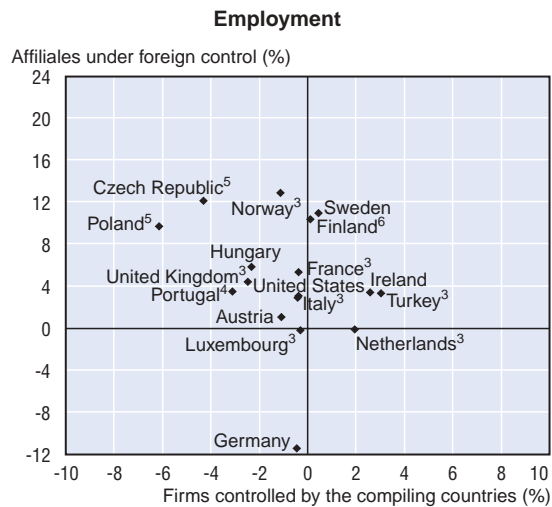
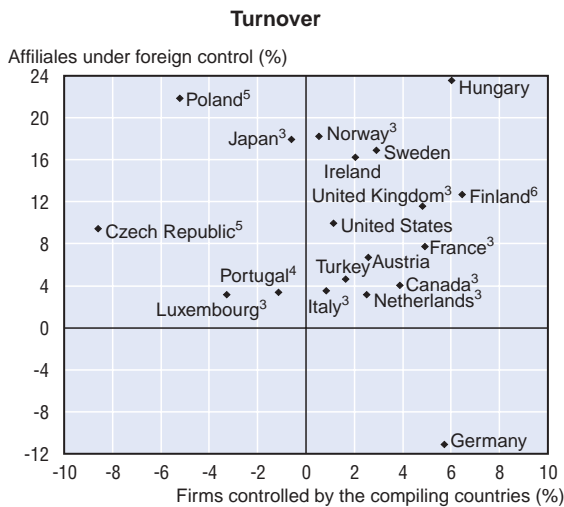
Share of affiliates under foreign control in manufacturing turnover¹ and employment 2000 or latest available year



Export and import propensity² of foreign affiliates in manufacturing 2000 or latest available year



Employment and turnover¹ of foreign affiliates and firms controlled by the compiling countries in manufacturing Average annual growth rate 1995-2000



1. Production instead of turnover for Canada and Ireland.
 2. Exports or imports as a share of turnover (except Ireland for which production is used).
 3. 1995-1999.
 4. 1996-2000.
 5. 1997-2000.
 6. 1996-2001.

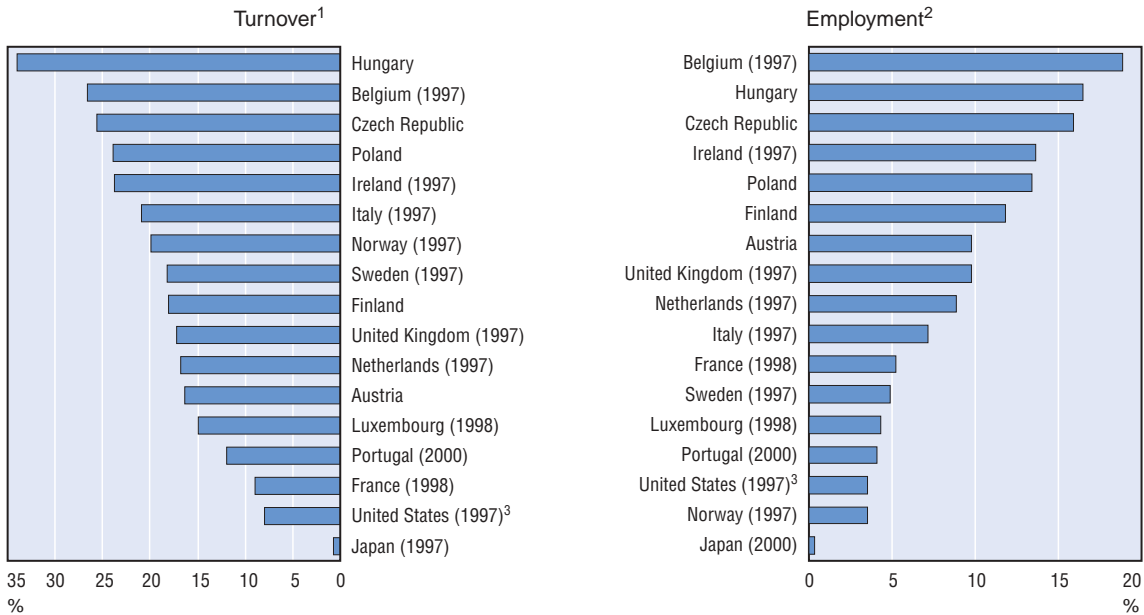
Source: OECD, AFA and FATS databases, May 2003.

C.4.2. Activity of affiliates under foreign control in services

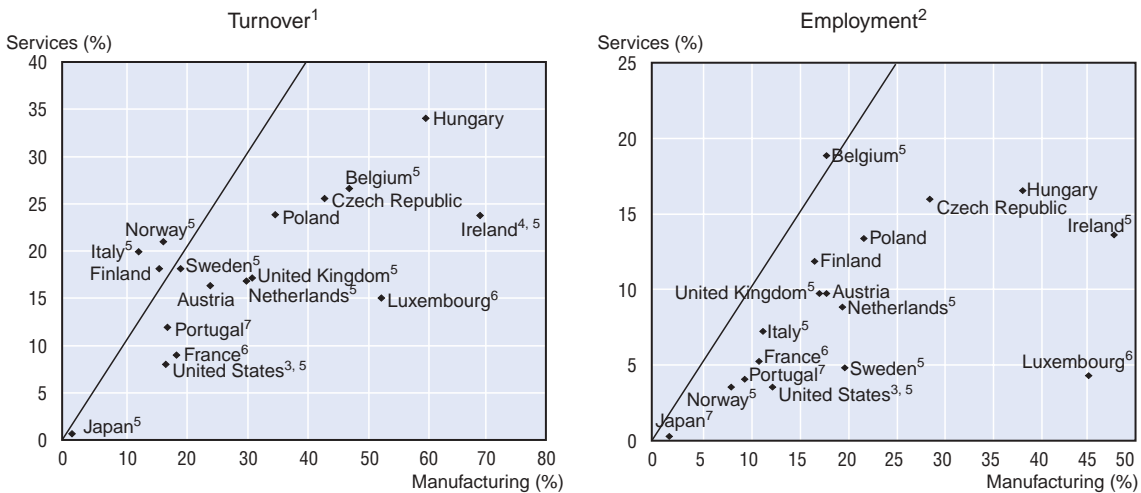
- Collection of data on the activity of foreign affiliates in services did not start until the second half of the 1990s, and data are not yet available for all OECD countries. However, the growing availability of data confirms the increasing importance of foreign affiliates in the services sector.
- The share of turnover under foreign control in the services sector is relatively high, at over 20%, for Hungary, Belgium, Ireland, the Czech Republic, Poland and Italy. In terms of employment, the share of foreign affiliates ranges from 19% in Belgium and around 15% in Hungary, Poland, the Czech Republic and Ireland to less than 1% in Japan.
- In all countries except Finland, the share of turnover of foreign affiliates is greater for manufacturing than for services (see C.4.1).
- In terms of employment, penetration of foreign affiliates seems evenly distributed between services and manufacturing in Belgium, Finland, Portugal and the Czech Republic. The largest differences are in Hungary, Ireland and Luxembourg.
- In Japan, the penetration of foreign affiliates is similar in services and manufacturing with respect to employment and turnover, but the shares are quite low compared with those of other OECD countries.

C.4.2. Activity of affiliates under foreign control in services

Share of affiliates under foreign control in services, 2001 or latest year available



Comparative share in national turnover and employment for services and manufacturing, 2001



- Financial intermediation (ISIC 65 to 67) is excluded from turnover for all countries except France, Hungary, Norway and Poland. Insurance (ISIC 66) is also included for Austria, Luxembourg and the United States. Community, social and personal services (ISIC 75 to 99) are excluded for Austria, Belgium, Ireland, Italy, Japan, Netherlands (except ISIC 90 and 93) and the United Kingdom.
- Financial intermediation (ISIC 65 to 67) is excluded from employment for all countries except Austria, Finland, France, Hungary, Luxembourg, Norway and Poland. Insurance (ISIC 66) is also included for the United States. Community, social and personal services (ISIC 75 to 99) are excluded for Austria, Belgium, Ireland, Italy, Japan, Netherlands (except ISIC 90 and 93) and the United Kingdom.
- The data used here for affiliates under foreign control are broken down by industry of sales to be compatible with national total data.
- Production instead of turnover for manufacturing.
- 1997 instead of 2001.
- 1998 instead of 2001.
- 2000 instead of 2001.

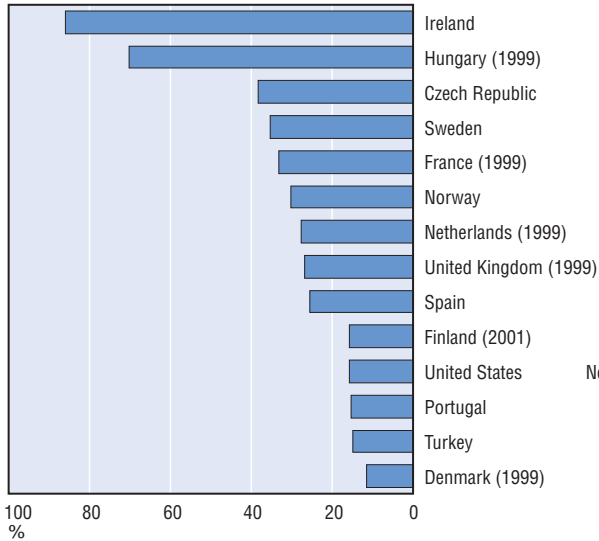
Source: OECD, FATS database, December 2002.

C.4.3. The contribution of multinationals to value added and labour productivity

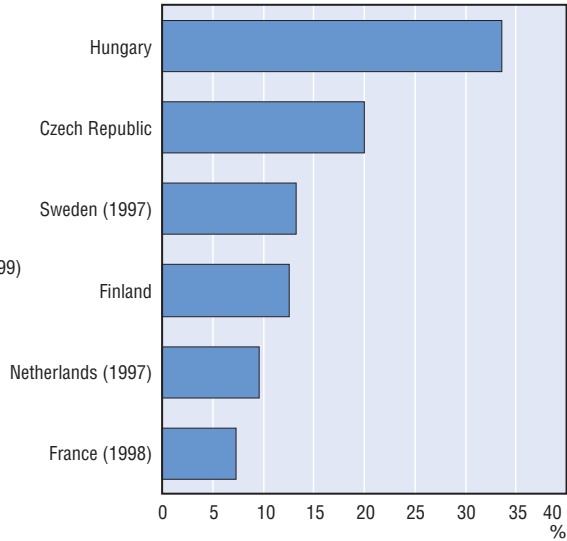
- In Ireland, over 85% of value added in the manufacturing sector in 2000 was generated by firms under foreign control. In Hungary, their contribution was over 70%. In Sweden, France, the Netherlands, Norway, the United Kingdom and Spain, their contribution was between 25% and 35%. In other countries, it was below 20%.
- The value added shares show that Ireland is the only country in which the value added of affiliates under foreign control is substantially higher than the share of those same affiliates' turnover in total manufacturing turnover (see C.4.1). For most other countries, the contribution of these affiliates' value added to that of manufacturing as a whole is lower or roughly the same as their contribution to turnover.
- In the United States and the United Kingdom, the share of foreign affiliates in value added is lower than their shares in turnover, possibly because affiliates under foreign control import more intermediate products from their parent companies abroad or because they outsource a significant portion of their production. Ireland's situation may be just the opposite.
- Hungary is the only country where the share in total value added of affiliates in services under foreign control is slightly higher than those same affiliates' share in turnover (see C.4.2). In other countries, foreign affiliates in services have a slightly lower share in value added than in turnover.
- The comparison of employment and labour productivity trends of firms under foreign control between 1995 and 2000 reveals some striking differences as well as some groupings with common characteristics.
- Germany, the Czech Republic and Poland differ widely. Germany saw a drop in employment and stagnant labour productivity. The Czech Republic experienced a sharp rise in employment, largely due to acquisitions, accompanied by a slight upturn in productivity. Poland's significant growth in employment occurred along with a sharp rise in labour productivity, the sharpest recorded in any of the OECD countries.
- In Ireland, Hungary, the United States, the United Kingdom and Austria, productivity improved more than employment. In Italy, Portugal and Turkey, employment inched up slightly but productivity was low or declined. In Sweden, Finland, Japan, Norway, employment far outpaced labour productivity.

C.4.3. The contribution of multinationals to value added and labour productivity

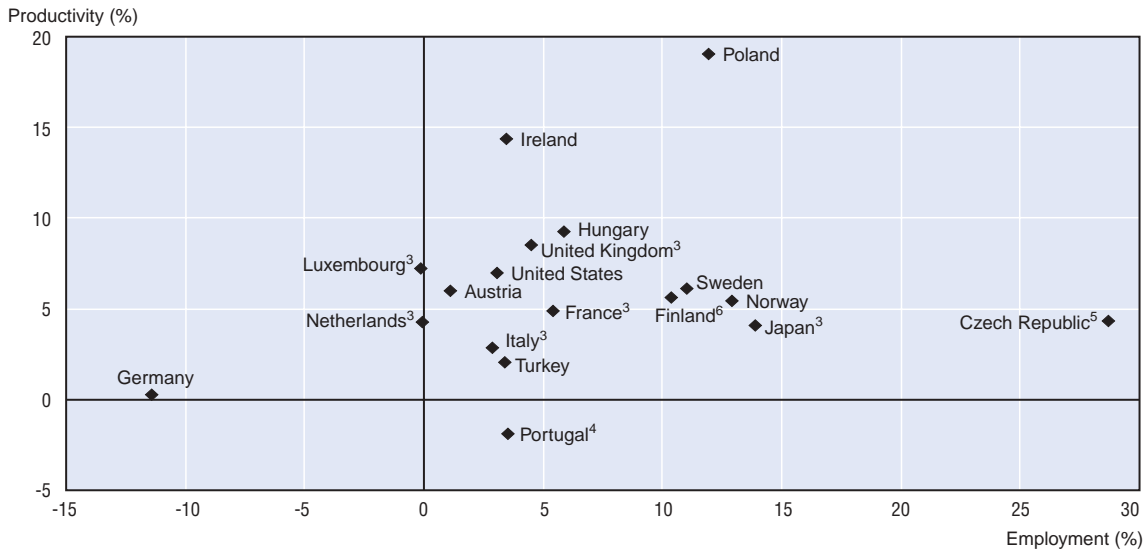
Share of affiliates under foreign control in manufacturing value added
2000 or latest available year



Share of affiliates under foreign control in services¹ value added
2000 or latest available year



Trends in manufacturing employment and labour productivity² of affiliates under foreign control
Average annual growth rate 1995-2000



1. Excluding financial intermediation (ISIC Rev. 3, 65 to 67).
2. Turnover to employment.
3. 1995-99.
4. 1996-2000.
5. 1997-2000.
6. 1996-2001.

Source: OECD, AFA and FATS databases, May 2003.

C.5.1. Internationalisation of manufacturing R&D

- In many OECD countries, R&D activities are less internationalised than production. This is changing as more multinationals set up offshore R&D laboratories.
- Evaluating the net effect of R&D performed by foreign affiliates is a complex process. Ideally, the presence of research-performing foreign affiliates enables the host country to benefit from their technological and organisational capabilities. However, the available data indicate that R&D activities abroad consist primarily of design and development to help the parent company establish a market presence in the host country.
- The share of foreign affiliates in industrial R&D varies widely across countries, ranging from less than 5% in Japan to over 70% in Hungary and Ireland. At over 30%, the share of R&D conducted by foreign affiliates is also high in Spain, Sweden, Canada, the Netherlands, the United Kingdom and Portugal.
- These differences primarily reflect the contribution of foreign affiliates to industrial activity (see C.4.1). For instance, the share of foreign affiliates in manufacturing production or turnover is high in Ireland and low in Japan.
- The share of foreign affiliates in R&D also reflects the size of their R&D effort relative to that of domestic firms. In Hungary and Ireland, for example, foreign affiliates carry out relatively more R&D than national firms. In most other OECD countries, and particularly in Japan, the opposite is true.
- Other factors, such as the quality of scientific personnel and research centres and the scale of technology transfers from parent companies to affiliates abroad in relation to the independent R&D activity of those affiliates, may also play a part.

Internationalisation of manufacturing R&D

The marked growth in R&D expenditures in OECD countries from the first half of the 1980s was accompanied by two major trends:

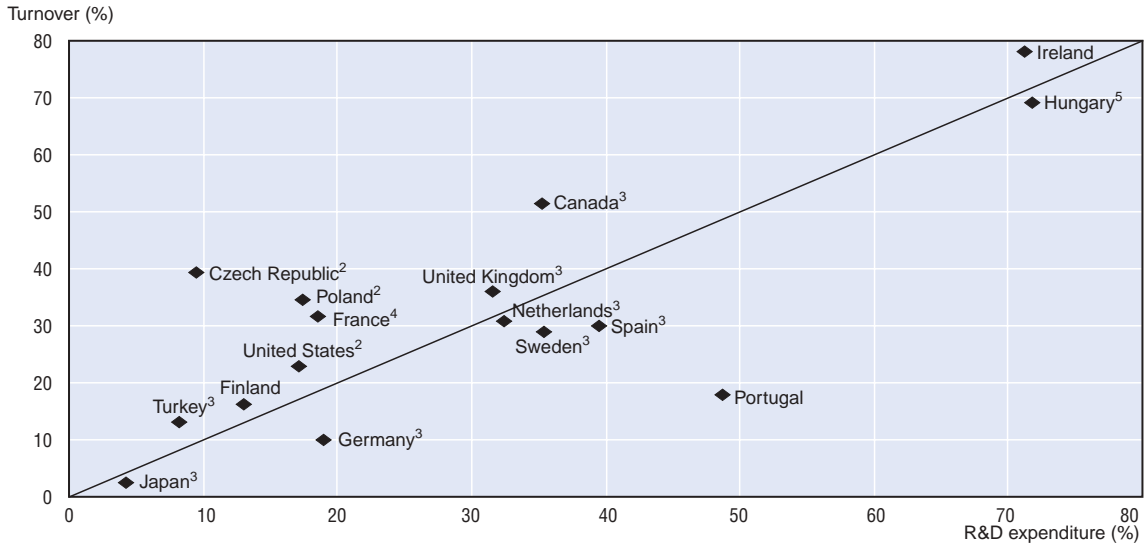
- First, the growing internationalisation of R&D activities of multinational firms as the result of an increase in the number of R&D laboratories located abroad.
- Second, the emergence and development of international networks of co-operation agreements or alliances either between firms or between firms and government or university R&D bodies.

While the first of these trends is restricted to multinationals, the second characterises all categories of firms. The decentralisation of their R&D activities by multinational firms, *i.e.* the establishment of laboratories outside the home country of the parent company, is by no means a new phenomenon. Decentralised R&D facilities have been used for some time to serve and support overseas production units. Until recently, owing to the absence of data on the R&D activities of multinational firms, it was thought that internationalisation of R&D was marginal to the general process of economic globalisation. The OECD's surveys, which cover more fully the activities of foreign affiliates in OECD countries and of national firms abroad (AFA database), show that R&D performed abroad and by foreign affiliates represents on average well over 12% of total expenditure on industrial R&D in the OECD area. In most OECD countries, the share of foreign affiliates in manufacturing R&D is increasing. In Sweden, Spain, Portugal, Hungary and Ireland, it exceeds 35%.

For further information see OECD (1998), *Internationalisation of Industrial R&D: Patterns and Trends*, OECD, Paris.

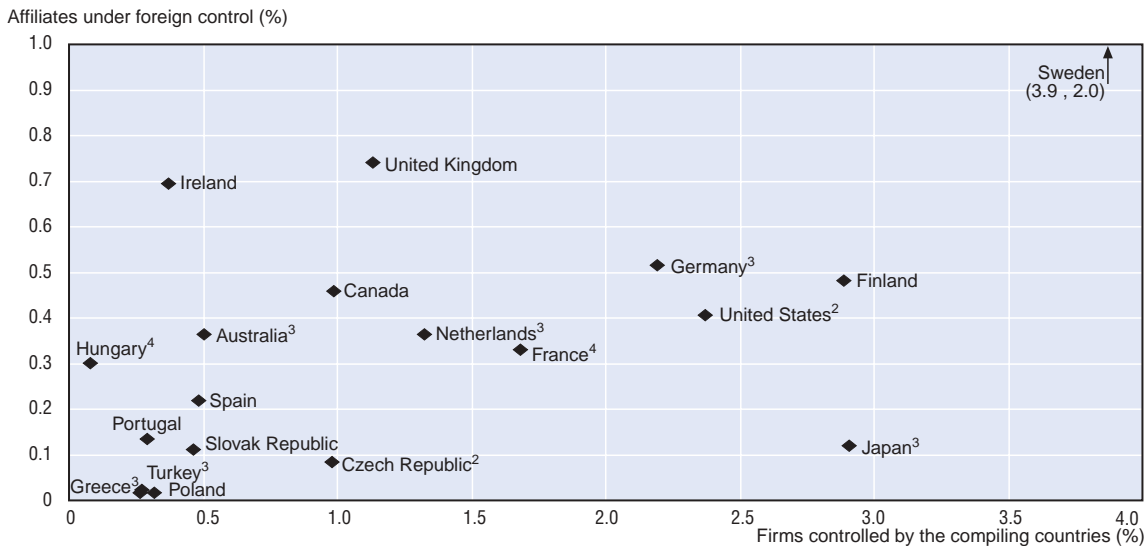
C.5.1. Internationalisation of manufacturing R&D

Share of R&D and turnover of affiliates under foreign control in total manufacturing R&D and turnover
2001 or latest available year



R&D intensities¹ of foreign affiliates and firms controlled by the compiling countries

Manufacturing sector, 2001 or latest available year



1. R&D expenditure as a share of value added in industry.
2. 2000.
3. 1999.
4. 1998.
5. 1997.

Source: OECD, AFA database, May 2003.

C.5.2. Cross-border ownership of inventions

- As firms progressively relocate their production and research facilities abroad as part of their internationalisation strategies (see C.5.1), an increasing share of technology is owned by firms of a country that is not the inventor's country of residence.
- In the late 1990s as in the mid-1990s, an average of 14% of all inventions in any OECD country were owned or co-owned by a foreign resident. Likewise, OECD countries owned around 14% of inventions made abroad.
- Foreign ownership of domestic inventions is high in Iceland, Luxembourg, Belgium, Portugal and Mexico, as well as in Poland, the Czech Republic and Hungary. It is also high in Canada and the United Kingdom, where a large share of inventions is owned by US companies and is related to the inventive activity of their foreign affiliates.
- Domestic ownership of inventions made abroad is also high in small open countries. For example, more than 80% of all inventions owned by residents of Luxembourg were made abroad. This share is also high in Switzerland (44%), Ireland (38%), Portugal (37%) and the Netherlands (31%). Although the United States, because of its size, is one of the largest owners of patents covering foreign inventions, the share of foreign inventions in its patent portfolio is only 16%. This figure has increased since the mid-1990s, when it was 13%.
- Japan and Korea, on the other hand, are much less internationalised in terms of cross-border ownership of inventions. Linguistic barriers, low penetration of foreign affiliates and geographical distance from Europe and the United States may help explain this.

Cross-border ownership of inventions

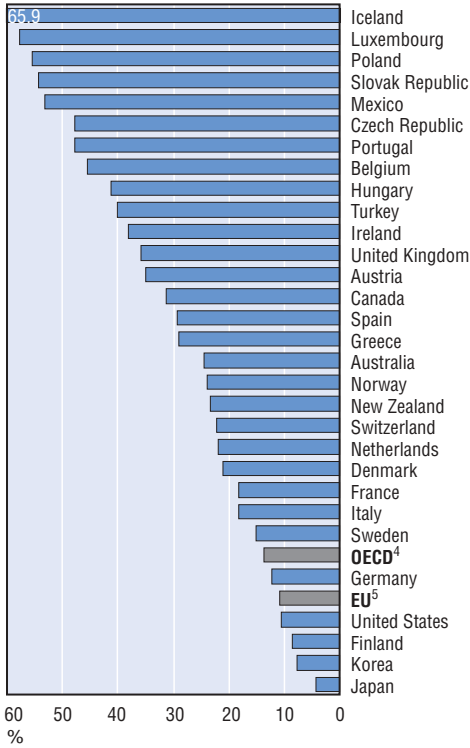
Patents are increasingly recognised as a rich source of information about technological performance. Patent files show the inventor and the applicant (the owner of the patent at the time of application), their addresses and hence their country of residence. For most patents, the applicant is an institution (generally a firm, university or public laboratory), and sometimes an individual, but inventors are always individuals. An increasing share of European Patent Office (EPO) patent applications is controlled by applicants whose country of residence is different from the country of residence of the inventor(s). Cross-border ownership practices are mainly the result of activities of multinationals; the applicant is a conglomerate and the inventors are employees of a foreign subsidiary. It is therefore possible to trace the international circulation of knowledge from "inventor" countries to "applicant" countries. Such information can be used to compute two main types of indicators:

- The first evaluates the extent to which foreign firms control domestic inventions by dividing the number of domestic inventions controlled by a foreign resident by the total number of domestic inventions.
- The second provides a mirror image: it evaluates the extent to which domestic firms control inventions made by residents of other countries. The number of foreign inventions controlled by resident applicants is divided by the total number of domestic applications. For example, a multinational from country A has research facilities in both country A and country B. This indicator provides the share of patents from its facilities in country B in the total number of patents.

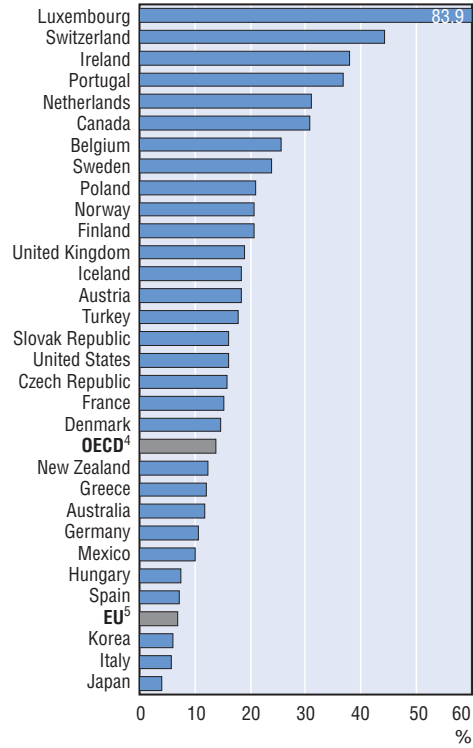
The analysis is based on the database of patent applications to the EPO. Patents granted by the United States Patent and Trademark Office (USPTO) and the EPO show similar internationalisation trends.

C.5.2. Cross-border ownership of inventions

Foreign ownership of domestic inventions¹
1997-99³



Domestic ownership of inventions made abroad²
1997-99³



1. Share of patent applications to the European Patent Office (EPO) owned by foreign residents in total patents invented domestically.
 2. Share of patent applications to the EPO invented abroad in total patents owned by country residents.
 3. Priority years.
 4. Patents of OECD residents' that involve international co-operation.
 5. The EU is treated as one country; intra-EU co-operation has been netted out.
- Source: OECD, Patent database, May 2003.

C.5.3. International co-operation in science and technology

- The production of scientific research and technological know-how increasingly depends on research conducted in other countries. Indicators of cross-border co-authorship of scientific articles and co-invention of patents seek to shed light on this trend.
- Scientific collaboration with large OECD countries is generally much more widespread than with smaller ones. Researchers in 160 countries co-authored at least 1% of their internationally co-authored papers with US researchers. The United Kingdom, France and Germany also play a leading role in international scientific collaboration.
- By the late 1990s, about 6% of patents of OECD residents were the result of international collaborative research. Several factors may affect the degree of a country's internationalisation in science and technology:
 - size, technological endowment, geographical proximity to regions with high research activity, language, industrial specialisation, existence of foreign affiliates, etc.
- Internationalisation tends to be higher in smaller European countries. For example, 56% of Luxembourg's patents have foreign co-inventors and 30% of Iceland's and Belgium's. International co-operation in science and technology is also relatively high in Poland, the Czech Republic and the Slovak Republic.
- When intra-EU co-operation is factored out, international collaboration in patenting is lower in the European Union than in the United States. In Japan, international co-operation in science and technology is rather limited.

International co-operation in science and technology

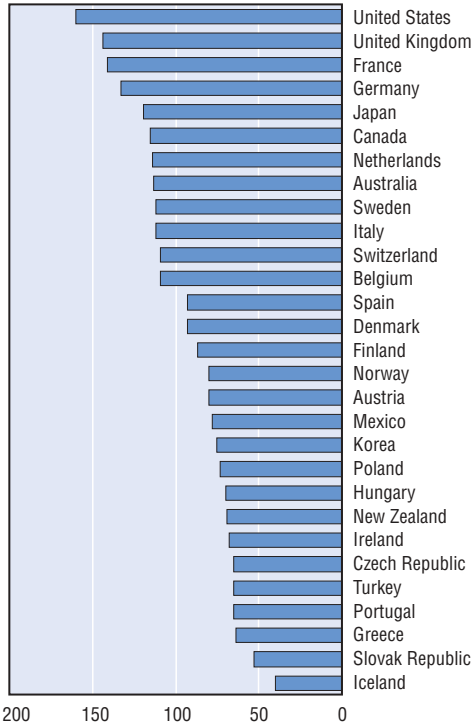
Patent data include the name and address of all inventors (individuals). An increasing share of European Patent Office (EPO) patent applications involves inventors with different countries of residence. International collaboration by researchers can take place either within a multinational corporation (research facilities in several countries) or through a research joint venture among several firms.

The propensity to collaborate internationally can be derived from the address of the inventors listed in the patent file. Here, it is approximated as the ratio of the number of inventions involving a country's residents and at least one inventor with foreign residence to the total number of inventions involving a country's residents. An increasing share of patents involves inventors with residences in more than two countries.

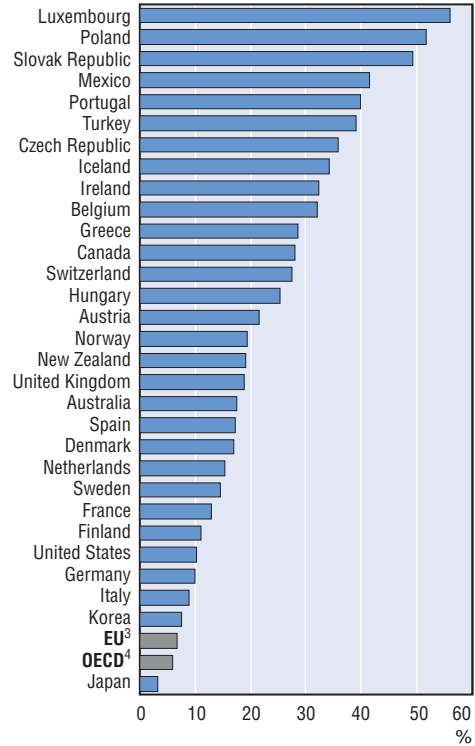
The indicator of scientific collaboration is based on data from the US National Science Foundation. It describes the number of countries that have jointly authored papers (based on institutional address) with the countries indicated. The information is based on data from the Institute for Scientific Information, Science Citation and Social Science Citation Indexes; from CHI Research, Inc., Science Indicators database; and from the National Science Foundation, Division of Science Resources Statistics (NSF/SRS).

C.5.3. International co-operation in science and technology

Breadth of international scientific collaboration by country, 1999



Percentage of patents¹ with foreign co-inventors 1997-99²



Note: The figure shows the number of countries that shared at least 1% of their internationally co-authored papers with the country.

Source: OECD, based on data from the National Science Foundation, *Science and Engineering Indicators* – 2002.

1. Patents applications to the European Patent Office.
 2. Priority years.
 3. The EU is treated as one country; intra-EU co-operation has been netted out.
 4. Patents of OECD residents that involve international co-operation.
- Source: OECD, Patent database, May 2003.

C.5.4. Technology balance of payments

- The technology balance of payments measures international technology transfers: licences, patents, know-how, research and technical assistance. These payments are for commercial technologies and are therefore different from R&D expenditure.
- In most OECD countries, technological receipts and payments increased sharply during the 1990s. Overall, the OECD area maintained its position as a net exporter of technology as compared to the rest of the world.
- The European Union, however, continued to run a deficit on its technology balance of payments. This does not necessarily indicate low competitiveness. It may be the result of increased imports of foreign technology into the European Union.
- The main technology exporters as a percentage of GDP are the United Kingdom, Switzerland, Belgium, Denmark, the United States, the Czech Republic, Japan and Canada. Ireland, Korea, Hungary and Portugal imported more technology than they exported.
- The magnitude of the deficit in Ireland's technology payments is due to the strong presence of foreign affiliates (mainly US and UK firms), which import technology from their home countries.

Technology balance of payments

Technology receipts and payments constitute the main form of disembodied technology diffusion. Trade in technology comprises four main categories:

- Transfer of techniques (through patents and licences, and disclosure of know-how).
- Transfer (sale, licensing, franchising) of designs, trademarks and patterns.
- Services with a technical content, including technical and engineering studies, as well as technical assistance.
- Industrial R&D.

Although the balance reflects a country's ability to sell its technology abroad and its use of foreign technologies, a deficit does not necessarily indicate low competitiveness. In some cases, it results from increased imports of foreign technology; in others, it is due to declining receipts.

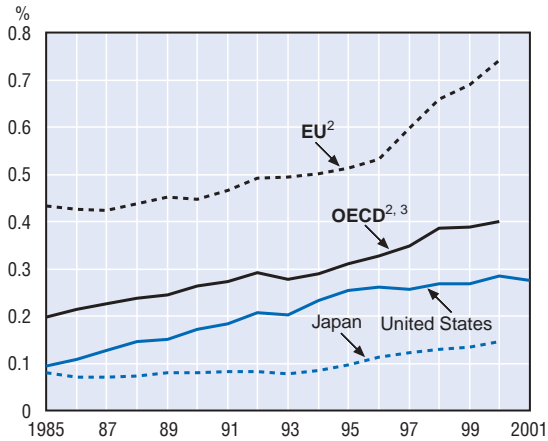
Likewise, if the balance is in surplus, this may be the result of a high degree of technological autonomy, a low level of technology imports or a lack of capacity to assimilate foreign technologies. Most transactions also correspond to operations between parent companies and affiliates, which may create distortions in the valuation of the technology transfer. Thus, additional qualitative and quantitative information is needed to analyse correctly a country's deficit or surplus position in a given year.

There is also the difficulty of dissociating the technological from the non-technological content of trade in services, which falls under the heading of pure industrial property. Thus, trade in services may be underestimated when a significant portion does not give rise to any financial payments or when payments are not in the form of technology payments.

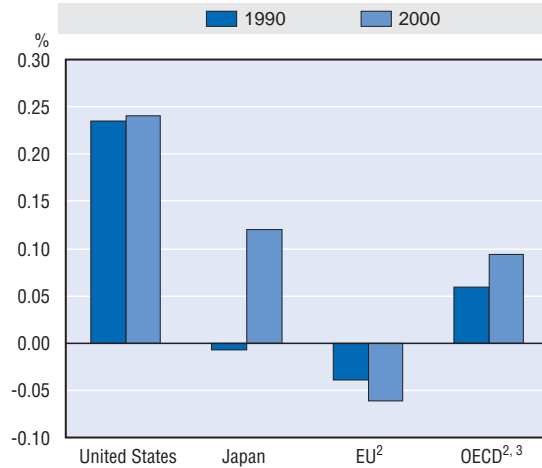
For more details, see Annex Table C.5.4.

C.5.4. Technology balance of payments

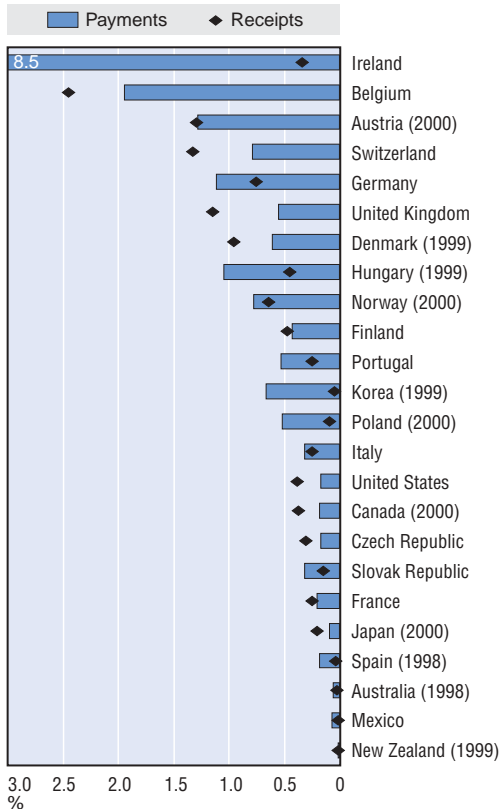
Trends in technology flows¹
as a percentage of GDP by geographical area



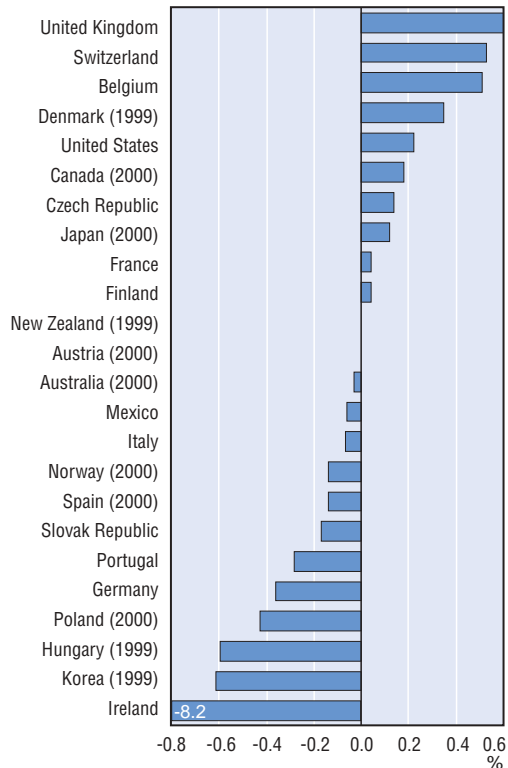
Change in the balance of payments
as a percentage of GDP, 1990 and 2000



Flows¹ as a percentage of GDP
2001 or latest available year



Technology balance of payments
as a percentage of GDP
2001 or latest available year

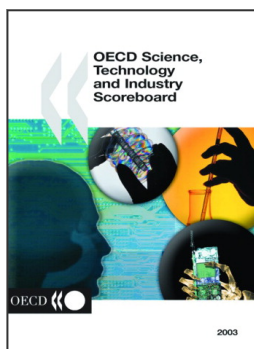


1. Average of technological payments and receipts.
2. Includes intra-area flows. Excludes Denmark and Greece. Data partially estimated.
3. Excludes the Czech Republic, Hungary, Iceland, Poland, the Slovak Republic and Turkey.
Source: OECD, Technology Balance of Payments (TBP) database, May 2003.

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