EU industrial structure

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Executive summary

EU Sectoral structure and specialization

- The industrial structure of the economy and the distribution of value added across sectors is the result of long-term trends, in particular productivity developments, the increase in the standard of living, changes in the structure of demand and in international trade. The sectoral trends in the EU are characterised by the dynamism of market services, which record growth rates higher than the economy as a whole. Services industries – market and non-market – account for 71% of total value added in EU-25, while the share of manufacturing amounts to less than one fifth (18.3%). The rest is divided among utilities and construction (all together 7.7%), mining (0.8%), and agriculture and fishing (2.2%).

- Some sectors, in particular in manufacturing and utilities, where economies of scale are important, are characterised by the dominance of large enterprises (more than 80% of value added). On the contrary, services are mostly characterised by the predominance of small and medium enterprises. In activities such as hotels and catering, renting of machinery, construction, and wood and wood products, smallest enterprises (with less than 10 employed persons) dominate.

- The cost structure of industries reflects their relative factor intensity, and the use of inputs like energy. The data on cost structures highlights the role of services as inputs into the production of manufactured goods, or into the production of other services As regards the sectors producing market services, the most significant intermediate inputs come from market services themselves.

- The analysis of specialization of EU countries shows a large diversity within the Union. In general, there is an inverse relationship between country size and sectoral specialization: small countries, in particular Malta, Luxembourg and Finland have more specialized production structures, while large countries – Germany, UK, Italy, and in particular France – show a more diversified and balanced sectoral distribution of economic activity.

- In terms of the specialization of countries into activities which involve different levels of labour skills, several groups of countries can be identified. Luxembourg, Belgium, France and Ireland are specialized in activities which require high labour skills. Germany, the Netherlands and the UK present rather balanced a profile, with no strong specialization pattern. Denmark, Sweden and Finland are specialized in high-intermediate and in low-intermediate labour skills. In Hungary, Italy, and Portugal, the specialization pattern is biased towards low-intermediate and low labour skills. The share of high-skill activities in the production structures of the Czech Republic, Estonia, Lithuania and Latvia is clearly below the EU average; their specialization is in low and low-intermediate labour skills and, to a lesser degree, in high-intermediate skills. Spain, Greece, Austria, Slovakia, Poland and Slovenia belong to a group which is characterized by a strong specialization in low and low-intermediate labour skills, and the higher labour skills are underrepresented in relative terms. For Malta, the strongest degree of specialization is in low labour skills sectors, but the country also exhibits a high degree of specialization in high-intermediate labour skills.

Sectoral developments in the Single Market

- At the face of increasing globalisation and the emergence of China as a major trade partner, the relative share of intra-EU trade in the total trade of the Member States has declined. Nevertheless, intra-EU trade still accounts for by far the largest part of the exports and imports of the Member States: in 2005, 59% of EU-15 manufacturing exports went to and 60% of imports came from other EU-15 Member States; this compares with 64% and 67% respectively in 1988. The decrease in the relative importance of intra-EU trade has taken place in a context of increasing external openness of the EU-15 Member States, in which the enlargement of the EU played an important role.

- Data at sector level show a decline in the relative importance of intra-EU-15 trade in most manufacturing sectors between 1988 and 2005. A particular case is textiles, clothing, leather and footwear, for which the importance of intra-EU-15 imports declined dramatically.

- The effects of further integration in the Single Market, including the introduction of the euro, on trade flows during the 1988-2005 period are blurred by other parallel events, in particular the trade agreements with the countries which in 2004 joined the EU. The share of the ten new EU Member States in total manufacturing trade of EU-15 rose from 1% to 5.5% between 1988 and 2005. However, in total manufacturing exports as well as imports of the EU-25, the share of intra EU trade declined over this period.

- China is playing an ever increasing role in EU trade, alongside the traditionally strong partners the US, Japan and Switzerland. China currently accounts for almost 7% of the manufacturing imports into EU-15, while in 1988 its share was less than 1%.

- Despite intensified import competition and expanding export markets, changes in trade specialization at sector level have been rather limited. At a more detailed product (or "niche") level, changes in specialization patterns are more visible as one could expect. The specialization patterns differ substantially across countries.

- The share of intra-industry trade, where a country is both an exporter and importer of (different variants of) the same product, increased both in intra-EU trade and in EU trade with non-EU countries between 1988 and 2005. However, the share of intra-industry trade remains higher in trade within the EU in comparison to extra-EU trade.

- Foreign Direct Investment (FDI) data demonstrate the importance of the economic links among the EU Member States: between 1995 and 2005, the share of intra-EU-15 FDI in total EU-15 outward FDI stocks in manufacturing continued to increase, rising from 46 to 52%, at the expense of investments to other industrialised (non-EU) countries. The share of the new Member States as a destination for EU-15 FDI increased.

Sectoral growth

- EU sectoral performance relative to other industrialized countries is measured using annual growth rates of value added in constant prices, employment and labour productivity per hour worked. The data show a mixed picture of the EU growth in manufacturing sectors, although, on average, the performance of the EU is better than that of the seven industrialised countries used as the area of reference. Most manufacturing sectors exhibit negative growth in employment. Substantial steady gains in productivity in manufacturing, in absolute terms as well as relative to services, explain the secular decrease in both the share and the absolute level of manufacturing employment. Relative to the world, growth in EU manufacturing sectors is, in most cases, lower. The presence of China and other emerging countries in the world aggregate explains this contrasting performance of the EU in manufacturing.

- Contrary to manufacturing, services industries in the EU grow, on average, at lower rates than in other industrialised countries. This is linked to weaker productivity performance. In both the EU and other industrialised countries, employment in market services has continued to increase.

- Developments in Unit Labour Costs are assessed to describe price competitiveness. In the EU, leather and footwear, tobacco, clothing, textiles, and oil refining, exhibit annual growth rates of unit labour costs greater than 2%. The high growth in unit labour costs in textiles and clothing has gone together with a weak performance in external trade. On the other extreme, unit labour costs declined in office machinery and radio and TV equipment, along with chemicals, electrical machinery, and motor vehicles.

- Growth performance of the individual Member States relative to the EU average is analysed by decomposing it into two components: *industry structure* (are high growth sectors more prominent than in the EU as a whole) and *competitiveness effect* (do individual sectors display growth rates above those in the rest of the EU). In Finland, Hungary, Ireland, Luxembourg, Sweden and the UK, both the industry structure and sector performance are more favourable than in the EU as a whole. In Italy and the Czech Republic, both the industry structure effect and competitiveness effect are negative. For Belgium, France and Germany, the competitiveness of their sectors exerts a negative influence on economic growth, while these countries benefit from a favourable industry composition. Finally, growth in Austria, Denmark, Spain, Greece, Netherlands, Poland, Portugal and Slovakia owes to the competitiveness of their sectors, while the contribution of the industry mix is negative.

Demand-side sectoral structure and developments

- Information about the demand destination of sectoral output allows classifying sectors in three main groups. *Intermediate demand* (products being used as inputs by other firms) is the destination of sectors which produce intermediate goods and services and play an important role in the competitiveness and performance of their main customers. The relationship between business services and manufacturing is but one example of the significance of these relationships, which also exist among

manufacturing sectors and services sectors themselves. A second group of sectors is clearly oriented towards *consumption demand*, and play a determinant role to meet basic needs of the consumers. The supply of high quality and low price goods and services is a key factor for raising the standard of living of consumers. A third group of sectors is clearly oriented towards *investment demand*.

- A second way of analysing the structure of demand is to look into the geographical origin of demand. The penetration rate of imported products is high in all the three segments of demand (intermediate, consumption and investment), with the highest rates in investment demand.

- The third method of assessing developments on the demand side is the analysis of changes over time in the composition of household expenditures. The most fundamental change is the gradual shift towards services, at the expense of goods, in the distribution of private consumption expenditure. Broadly speaking, the higher income-elasticity of the demand for services contributes to explaining this. Good and services have recorded differing developments in productivity, unit labour costs and relative prices. The superior productivity performance of manufacturing is reflected in the favourable developments of unit labour costs and relative prices.

- In the structure of private consumption, the relative share of food and beverages has decreased over the last three decades, as has the share of clothing and footwear, furniture and other household equipment. All the other categories, basically services, have increased their share in private consumption. The process of economic growth, the increase in income per capita, demographic transformations, and social and cultural changes are at the origin of the basic changes in the structure of private consumption demand.

Performance in external trade

- The analysis of external trade flows allows measuring the competitiveness of EU sectors relative to the rest of the world. The six most important manufacturing sectors in the EU-25 are pharmaceuticals, machinery and equipment n.e.c., aircraft and spacecraft, non-metallic mineral products, printing and publishing, and scientific instruments. Altogether, these account for 34 % of total manufacturing exports. At the bottom of the important ranking are radio and television receivers, electronic valves and tubes, office machinery, clothing, textiles, other instruments, railroad and other transport equipment and basic metals.

- In the US, aircraft and spacecraft, scientific instruments, and printing and publishing are the three sectors that exhibit the highest revealed comparative advantage. Japan is characterized by a high performance in capital equipment, motor vehicles, and other instruments. As regards China and India, the sectoral specialization profile is strongly oriented towards textiles, and clothing and leather, and China's performance is also strong in radio and TV receivers, office machinery and telecommunications equipment. In this group, the EU exhibits a specialization profile which is closest to the US.

- The highest share of EU exports (34%) is accounted for by sectors which are characterised by low labour skills (Food, drink and tobacco, Textiles, Clothing, Leather and footwear, Rubber & plastics, Non-metallic mineral products, Basic metals, Motor vehicles, Furniture, miscellaneous manufacturing; recycling), although exports of high labour skills products also account for a significant (27%) part of EU sales abroad. To a considerable extent, the EU's export structure mirrors the production structure of the EU manufacturing industry, although relative to the production structure, exports show a bias towards a greater content of labour skills. More than half of EU trade with low income countries is in products with low levels of labour skills. In EU trade with low-medium and upper-medium income countries, the share of products involving high labour–skills is higher. In trade with high income countries, the largest part of EU exports are products of high-labour skills, although low labour skills products also account for a high share, 30% of the total trade with these countries. Relative to several other countries, the EU-25 exhibits a balanced skills specialization profile. India exhibits high specialization in low skills and China shows a dual specialization, in both high and low labour skills. The US and Japan are strongly specialized in high-intermediate labour skills. During the last five years, the EU trade balance in trade with high labour skill products improved slightly.

- In terms of the technological content of the products traded, the distribution of EU-25 exports is balanced, with a higher revealed comparative advantage in medium-high technology products. Furthermore, a relative improvement in the EU performance in high technology products has take place over time. In cross-country comparison, the US exhibits the highest specialization in high and medium high technology products, while Japan's comparative advantage is particularly strong in medium-high technology. India's comparative advantage is particularly strong in low technology products, while China exhibits a dual structure, with a high comparative advantage in both high and low technology products. The EU exhibits a more balanced profile.

- The largest share in the total trade of EU-25 takes place with high-income countries and in similar goods (Intra-Industry trade). At the other end is trade with low income countries which is basically inter-industry; it consists of the exchange of goods of different industries in which the level of wages plays an important role. However, the volume of EU trade with low income countries is very low. Low-medium income countries rank in the second place as trade partners for the EU. Since trade with these countries is a mixture of intra-industry and inter-industry, there is a wide range of possibilities for both areas to gain from trade.

- Trade in goods is an important, but not the unique, way of internationalization of the economic activity in manufacturing industry. Foreign Direct Investment (FDI) complements and facilitates traditional forms of trade, helps breaking into new markets, and contributes to the competitiveness of sectors and companies. There is high variation in the FDI intensity of EU sectors. Financial intermediation, mining and quarrying and petroleum, chemical rubber and plastic products exhibit a high degree of FDI in non-EU countries. On average, 63% of the total FDI stock of the EU Member States is located in other EU countries. In electricity, gas and water supply; mining and quarrying; transport storage and communications; and in construction, the EU FDI stock abroad is substantially higher than the investments of the rest of the world in the EU. At the other end are textiles and wood, and real estate and business

activities, for which the FDI stock in the EU is greater than the stock of investments of the EU abroad.

I Introduction

The production of *EU industrial structure* is a response to the increasing interest in analysing the competitiveness of the EU economy from a sectoral perspective. This approach provides insight into the relative performance of each industry, and contributes to explaining the competitiveness of the EU economy at large. This publication follows the path laid by *EU Sectoral Competitiveness Indicators*[1] and shares with it the objective to elaborate and present information on sectoral competitiveness and performance.

The purpose of this publication is to track sectoral developments and to assess the competitiveness of EU industries by building a set of sectoral competitiveness indicators. *Three* aspects are worth mentioning here. First, the list of sectors covered varies across indicators depending upon availability of data in the original sources. The aim is to maximize the use of the information available and this publication does not intend to bring all indicators to the same common nomenclature, which would imply loosing valuable information for sectoral analysis. A table which shows the nomenclature used for each indicator and the relationship between them is presented in the annex. The presentation and discussion of the indicators is basically descriptive. In other words, the publication does not aim at explaining the performance of EU sectors, but at presenting tools for doing so. Relative to its predecessor, *EU Sectoral Competitiveness Indicators*, this publication incorporates new topics and indicators, and enlarges the country coverage in order to cover EU-25, wherever possible. Due to lack of data at the time of producing this publication, Bulgaria and Rumania were not included in the study.

The publication is organized over the following chapters: Chapter II presents information on the industrial structure of the EU. The main topic of the chapter is sectoral specialization in EU countries and its development over time. The rest of the chapter presents information on the cost structure of sectors and the distribution of value added by size classes. Chapter III deals with industrial growth from various angles. Growth in EU, vis-à-vis industrialized countries and the World is analyzed in terms of output, and employment. Furthermore, productivity and Unit labour Costs are used to assess developments of competitiveness across sectors. To gain insight into EU countries' growth, this is broken down into three components, two of which, namely *industry structure* and *competitiveness*, *explain* the growth differential of each country relative to the EU average. In order to provide a framework for the analysis of short and medium term developments, the cyclical profile of manufacturing sectors is also described in this chapter. The second main topic in Chapter III is the analysis of growth factors -Gross Fixed Capital Formation, human capital, and technology-, for which a set of indicators is presented and discussed. Chapter IV looks at sectoral structure and developments from the demand-side, with special attention to the product composition and developments of private consumption and capital formation. Furthermore, the demand orientation of sector and the geographical origin of goods in the various segments of demand are presented and discussed. Chapter V presents indicators pertaining to sectoral performance in international trade. Along with indicators of Revealed Comparative Advantage (RCA) and IIT, FDI at sectoral level, albeit highly aggregated, is presented as an indicator of international movement of factors. The RCA index is presented for EU, and Member States separately, US, Japan, China and India in terms of a standard sectoral classification, as well as in terms of technology and labour skills sectoral groups. Finally, to provide a comprehensive view of the sectoral desegregation used along the publication, the annex presents a comparative table of

[1] European Commission (2005), EU sectoral competitiveness indicators, OPOCE, Luxembourg.

the nomenclatures and lists of sectors used. Additional material (tables and graphs), which complements the content of the chapters of this publication, is presented in the companion web site of this publication

(http://europa_eu.staging.entr.cec.eu.int/enterprise/enterprise_policy/competitiveness/2_Indicators/Indicators%20of%20the%20competitiveness.htm)

II Industrial structure and specialization in the EU

II.1 Introduction

The present chapter describes basic characteristics of the EU sectoral structure, with emphasis on sectoral specialization in EU countries. The chapter is organized as follows. Section II.2 presents an overall picture. Section II.3 analyses EU countries' sectoral specialization. Section II.4 analyses the EU structure, and its changes, in the context of the Single Market. Section II.5 presents the distribution of sectoral economic activity by enterprise size classes. Finally, Section II.6 discusses the cost structure of sectors in the EU.

II.2 Industrial structure

The industrial structure of the economy and the distribution of value added across sectors is the result of long-term trends in sectoral growth, associated with the process of economic growth, in which productivity developments, the increase in the standard of living, the structure of demand - closely related to income per capita developments-, and international trade play an important role. Looking at developments of broad sectors, the sectoral trends in the EU are characterised by the dynamism of market services, with growth rates higher than the economy as a whole, while all the other sectors lag the total economy, or track it closely[2]. This uneven performance leads to a steady change of the sectoral distribution of value added among the main sectors of the economy, whereby services activities increase their share at the expense of all other sectors. More precisely, this change refers basically to market services, as non-market services also follow the path of the other sectors with below-average growth rates. It is important to note that this refers to sectoral growth rates *relative* to the total economy, but the below-average growth rates of, say, manufacturing, do not imply a decrease in the volume of manufacturing activity. On the contrary the volume of goods supplied by the EU manufacturing industry has continued to increase in the context of this deep change of the industrial structure. It is the increase in labour productivity which has made possible this steady growth in the supply of manufacturing goods, particularly in a context where jobs have gradually shifted towards services industries. These trends are consistent with Baumol's effect[3], according to which different productivity developments in *technologically progressive* and *non-progressive* sectors make services' relative prices higher. This, along with a higher income elasticity of demand for services, explains the fact that the share of services in total value added, in nominal terms, and in total employment increases over time. Similar trends are observed in all developed economies[4].

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2 See European Commission (2005), EU sectoral competitiveness indicators, OPOCE, Luxembourg, Section IV.2.

3 See William J. Baumol (1967), Macroeconomics of unbalanced growth: the anatomy or urban crisis, The American Economic Review, Vol. 57, No. 3, June 1967, pp. 415-426, and William J. Baumol, Sue Anne Batey Blackman and Edward N. Wolff (1985), Unbalanced growth revisited: asymptotic stagnancy and new evidence, The American Economic Review, Vol. 75, No. 4, September 1985, pp. 806-817.

4 Relative developments of output (both in current and constant prices), productivity, unit labour costs and prices, in highly aggregated sectors, among which, manufacturing and market and non-market services, are presented in European Commission (2003), EU sectoral competitiveness indicators, OPOCE, Luxembourg, Chapter IV. At a more detailed level of sectoral definition, services sectors exhibit a contrasting performance

The trends mentioned above refer to broadly defined sectors (from agriculture to non-market services). However, also within each category of activities there have been different sectoral trends, which have shaped the current profile of sectoral activities in the EU. The objective of this Section is to look into the EU industrial structure as reflected in the sectoral shares in the total value added of the economy[5]. The results are presented in Graph II.1[6]. This is a static picture, yet it

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in productivity developments, one example of which is communications: see O'Mahony and Van Ark (2003), EU productivity and competitiveness: an industry perspective, European Commission, 2003.

[5] Generally speaking, the structure of the statistical nomenclature used, the list of industries retained for a specific application, and the way data are collected determine, to a large extent, data availability. In this respect two situations can be considered in the present publication. First, for a series of economic activities data is not available in some of the sources used. One example is the *pharmaceutical industry*, which is a subdivision of "*manufacture of chemicals and chemical products*". Secondly, for a series of industries, the statistical nomenclatures of economic activities (NACE Rev.1 and ISIC Rev.3) do not allow going into further detail. One example is "*manufacture of office, accounting and computing machinery*", for which ISIC Rev.3 does not show "*manufacturing of office machinery*" and "*manufacturing of computers*" separately. This is not the case of NACE Rev.1, although usually data for the two sub-sectors using this nomenclature are not available. Other cases are economic activities which encompass *manufacturing* and *repairing* activities under the same heading. Examples of these are "*building and repairing of ships and boats*" and "*manufacturing of aircraft and spacecraft*". In the context of NACE Rev.1, as well as of ISIC Rev.3, these economic activities cannot be split into further detail. This implies that the aggregates may mask different trends and performance of sub-sectors, an example of which is "*building and repairing of ships and boats*» in the EU.

[6] Graph II.1 is based on a dataset created from various sources in order to obtain the maximum coverage of countries and sectors. The sectoral detail corresponds to list C (see Annex VI), that is basically NACE Rev.1 nomenclature's 2-digits, with further detail in a few sectors (ICT activities and chemicals). Eurostat's National Accounts, presented at subsection level of NACE Rev.1 nomenclature, provide the basic framework for the calculations. These data are available for all EU countries – with the exception of Cyprus – and for the EU-25, as well as for all sectors of the economy, from agriculture through non-market services. To reach the level of sectoral detail wanted, beyond NACE subsections, the data were broken down as follows. The main criterion was to use the internal structure of each subsection as reflected in Eurostat's Structural Business Statistics (SBS) data. This method was applied to both individual countries and EU-25 as a whole. Individual cases with missing data were treated by using the adjacent year's percentage or by interpolation, as appropriate. In the cases where, due to lack of data, this method did not work *ad-hoc* criteria were used. For Greece, which is not covered by Eurostat's SBS, National Accounts data were broken down using the detailed structure given by "Groningen Growth and Development Centre, 60-Industry Database, September 2006, http://www.ggdc.net"**.** Data from this database were also used to break down NACE subsection J "financial intermediation, for which detailed data are not available in SBS. Some other cases were also worked out using the 60-industry database. Examples are sub-Section I "transport services" in Ireland and NACE class 33 "manufacture of instruments, watches and clocks" in Netherlands; also, sectors 31, 32, 33 and 35 in Luxembourg. Obviously, the use of this database applied only to the nineteen EU countries covered by it. In some cases the above methods did not allow completing all sectors for EU-25. Wherever necessary, individual countries' ad-hoc aggregates were created and their structure was used to estimate the EU-25 missing items. Two examples of this procedure are NACE items 321, 322 and 323, which, for 2002 and 2003, were estimated from the structure of an aggregate of twenty EU countries, and items J65, J66 and J67, for which an aggregate of nineteen EU countries was used to decompose the EU "J" aggregate. Furthermore, some cases were worked out using information from UNIDO statistics. An example is Latvia, for which employment data were used in sector 313 "insulated wire, and Malta for sectors 27, 28.and 33. For Poland data is available only for 2003; the structure at sub-Section level of 2003 was applied to 2001 and 2002. However, to take into account the changes occurred in these years, this structure was adjusted using SBS data. The result is, with a few exceptions, a complete Table, which provides an overall picture of the sectoral activity in EU-25. The data that was not possible to complete are as follows: Cyprus: all sectors; Estonia: 322, 323, 65, 66 and 67; Greece: 244 and 24ex344; Ireland: 36 and 37; Lithuania: 65, 66 and 67; Luxembourg: 24 and 24ex244; Latvia: 65, 66 and 67; Malta: 353, 35ex351&353, 65, 66 and 67; Slovenia: 65, 66 and 67. Percentages for some years/sectors/countries cannot be calculated from the SBS database. In such cases, the percentages (or averages) of percentages for adjacent years were used. For EU-25 as a whole SBS percentages were used, and in the cases where these were not available the percentages for the aggregate of

shows the basic characteristics of the structure of the EU economy. Broadly speaking, services industries, both market and non-market, account for 71% of total value added in EU-25, while the share of manufacturing amounts to less than one fifth (18.3%). The rest is divided among utilities and construction (all together 7.7%), mining (0.8%), and agriculture and fishing (2.2%).

As regards manufacturing, sectoral shares are in all cases below 2% of total value added (with the exception of food, drinks and tobacco, which is slightly above this percentage). As a matter of fact, only six sectors have a percentage of total value added ranging between 1% and 2%. The share of all other manufacturing activities is below 1% and in some cases account for a negligible part of the economy as a whole. Examples are insulated wire, radio and TV receivers, other instruments, and other transport equipment, whose share in total value added is 0.1%.

As indicated above, the bulk of the economic activity in the EU, like in all developed economies, is in the services sectors, as is illustrated in Graph II.1. Among these, market activities (from sale and repair of motor vehicles through other business activities) account for nearly half (48.4%) of total value added of the economy, while the share of non-market activities (from public administration through other community and personal services) amounts to more than one fifth (22%). Furthermore, some sectors, individually, account for significant percentages of the economy: among market services, the share of legal, technical and advertising, wholesale and retail trade, real estate activities and computer related activities, is in all cases greater than 3%. Also in the case of services, the figures represented in the graph do not do justice to their fundamental role in the economy. Besides the importance of services oriented to final demand (e.g. services to people like transport, communications, education, and health) to improve living conditions of the population, business services are crucial to increase productivity and competitiveness of all producing activities.

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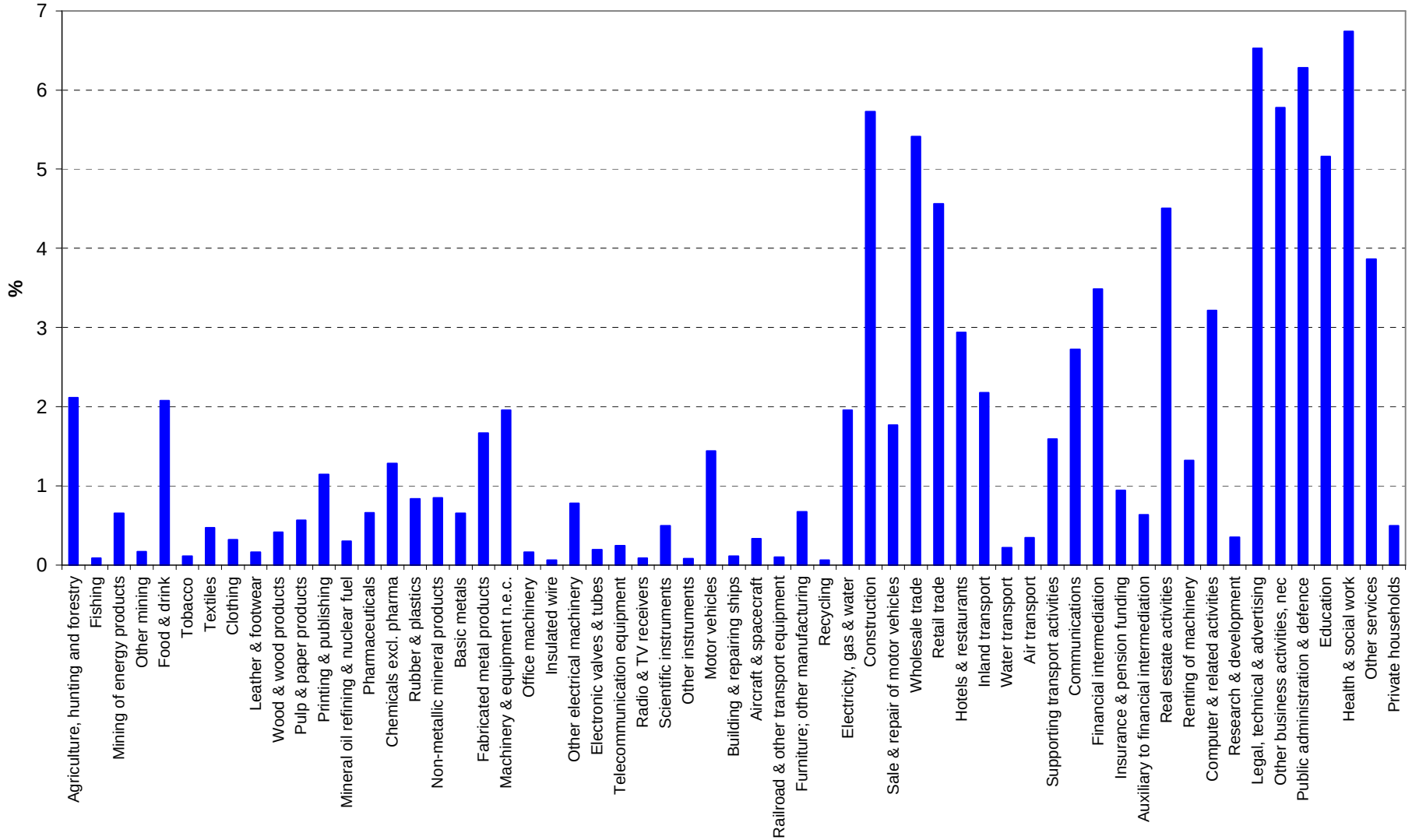
the individual countries available were used. This Table covers all sectors, among which it is worth mentioning: financial intermediation (not available from SBS); NACE M, N, and O Sections, not covered by SBS; all countries, including Baltic States, Malta, Cyprus and Slovenia, which are not available in 60-industry database ("Groningen Growth and Development Centre, 60-Industry Database, September 2006, http://www.ggdc.net"). It also covers Greece not available from Eurostat's SBS.

Graph II.1: EU-25 sectoral share in total value added (2001-2003)



Source: own calculations with data from Eurostat, Unido and "Groningen Growth and Development Centre, 60-Industry Database, September 2006, http://www.ggdc.net".

II.3 Sectoral specialization

The present Section looks into the sectoral specialization of EU countries using an index, which compares the share of a given sector in one country with the share of the same sector in the EU as a whole[7]. A value of 1 for a sector indicates the same share for that sector in the country and the EU. Values above (below) 1 indicate specialization (lack of specialization) of the country, and the higher the value of the indicator, the higher the country's specialization compared to the EU average. The indicator was calculated from the data underlying Graph II.1 in the previous Section, and the results presented here correspond to the mean value of the last three years, 2001, 2002 and 2003.

The specialization of EU countries in each sector is shown in a set of graphs presented in the companion web site of this publication

(http://europa_eu.staging.entr.cec.eu.int/enterprise/enterprise_policy/competitiveness/2_Indicators/Indicators%20of%20the%20competitiveness.htm)[8]. To facilitate the interpretation, the circle of radius 1, which indicates the same sectoral structure in the country and the EU as a whole, is highlighted. Sectors located out (in) of this circle have a greater share in the country than in the EU and are the sectors in which the country is (not) specialized.

Before discussing the results in more detail, it is worth presenting a summary picture of the degree of specialization in EU countries. Graph II.2 shows a ranking of countries based on the standard deviation of the distribution of the sectoral indices of specialization. From Malta, Finland and Greece, in the first places, to France, Germany and United Kingdom at the bottom of the ranking, the graph shows high variation across EU countries. This indicator plotted against the population (Graph II.3) shows the inverse relationship between country size and sectoral specialization. Small countries exhibit a profile of high sectoral specialization, while the big countries have a sectoral structure closer to the one of the EU. This is, in part, due to the way the indicator is calculated[9], but also to other factors. The

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7 It is defined, for country "*i*" and industry "*j*", as follows:

$$S_{i,j} = \frac{\frac{VA_{i,j}}{\sum_j VA_{i,j}}}{\frac{VA_{EU,j}}{\sum_j VA_{EU,j}}}$$

where VA is value added and EU is EU-25; a value of 1 for a given industry indicates specialization equal to the EU average. The higher the value of the indicator, the higher the country's specialization compared to the EU average.

8 Results for Cyprus are not presented. The data for this country are incomplete, as they do not cover primary (agriculture and fishery) and public services sectors. The shares and the specialization indices would not be comparable to those calculated for all other countries.

9 Big countries determine to a large extent the sectoral profile of the EU, in which they are included. It is therefore less likely to find significant differences between big countries and the EU as a whole. For the same reason it is more likely to find a substantially different profile in small countries from the one of the EU. This *arithmetic* property of the indicator affects the value of the index but not the specialization profile of the country. As a matter of fact, the specialization indices were calculated also using a second approach: for each country the area of reference is, in this case, the aggregate of all ***other*** EU countries, rather than EU-25. The results are, even for the value of the index, very similar with the following

obvious limitations for small countries to undertake efficiently a large range of economic activities lead these countries to specialize according to, among others, their own comparative advantages, the degree of development, availability of specific resources, historical reasons, geographical and location advantages, and technical characteristics of the sectors (e.g. economies of scale). The opposite applies to big countries, which are in a more favourable position to undertake a larger number of activities with success. All in all, this makes small countries more fluctuating and vulnerable to sectoral shocks, both domestic and international.

Malta[10] and Luxembourg are evident examples of a high degree of specialization in small countries. Finland is another example of strong specialization profile. The specialization index of these countries display values greater than 4 in various sectors. At the other end, Germany, UK and Italy, and particularly France, show a more balanced sectoral distribution, which is closer to the one of the EU as a whole. It is worth mentioning some countries which appear as an exception to this rule, in that, despite their relatively small size, they exhibit a more balanced sectoral structure than other countries of similar size. Austria, Belgium, Czech Republic, Slovenia and Sweden show a relatively high degree of specialization in one or several sectors, although they are below the *average* specialization level represented by the red line in the graph.

A more compact picture can be obtained by grouping sectors according to labour skills categories and calculating subsequently the specialization index for these groups. The result is presented in Table II.1, where, broadly speaking, various groups of countries can be identified.

A first group is formed by Luxembourg, Belgium, France and Ireland, which have in common the fact of being specialized in high labour skills and that the specialization level decreases gradually along with the level of labour skills. This profile is patent in Luxembourg, which exhibits the highest index in high labour skills, and, to a lesser extent, in the other countries of the group. Furthermore, Luxembourg is unique, in that its specialization is, above all, in services industries: air transport, financial intermediation and auxiliary activities, research and development are the sectors predominant in this country, relative to the EU. In addition, two sectors (namely, rubber and plastics and basic metals) characterize also the manufacturing activity of the country. Ireland exhibits a profile of very high specialization in seven sectors, out of which six are manufacturing, namely, printing and publishing, chemicals, office machinery, electronic valves and tubes, scientific instruments, and other instruments. Air transport, among services activities, completes the list of sectors of high specialization in Ireland. Despite its relatively small size, Belgium presents a less marked specialization profile than similar countries, with the highest value of the index in radio and TV receivers, oil refining, basic metals and, in services, insurance and pension funding. France's sectoral profile is the most similar to the one of the EU, with all sectors presenting specialization indices close to the circle of radius 1. Two exceptions are aircraft and space craft, in manufacturing, and other business activities and renting of machinery among services.

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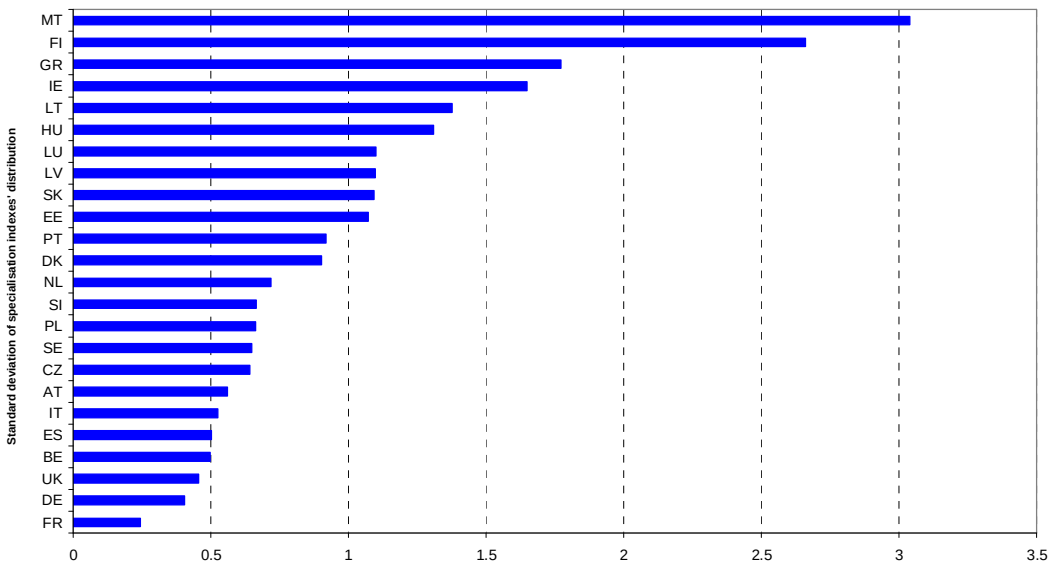
exceptions, for which the change in the value of the index is indicated between parentheses. Germany: machinery and equipment n.e.c. (from 1.7 to 2.1), other electrical machinery (from 1.9 to 2.6) and motor vehicles (from 2.2 to 3.3). Italy: textiles (from 2.5 to 3.2), clothing (2.7 to 3.6), leather and footwear (3.2 to 5). United Kingdom: mining (from 2,9 to 4,7), aircraft and spacecraft (from 2 to 2.6), air transport (from 2 to 2.6). Finland: telecommunications equipment (from 18 to 24).

[10] As indicated in Section II.2, Malta data for sectors 353, 35ex(351&353), 65, 66 and 67 are not available.

A second group of countries (Germany, Netherlands and UK) presents a quite balanced profile, with no clear specialization pattern. The values of the indices for the four categories of labour skills are not far from 1. Germany is oriented towards manufacturing, and more specifically towards the production of capital equipment. As regards the UK, its specialization is balanced among three services activities (insurance and pension funds, auxiliary to financial intermediation, and air transport) and three manufacturing sectors (aircraft and spacecraft, office machinery and printing and publishing). Netherlands' specialization is biased towards services (water transport, air transport, financial intermediation and auxiliary to financial intermediation, and research and development), although oil refining and shipbuilding, among manufacturing, exhibit also a higher share than in the EU.

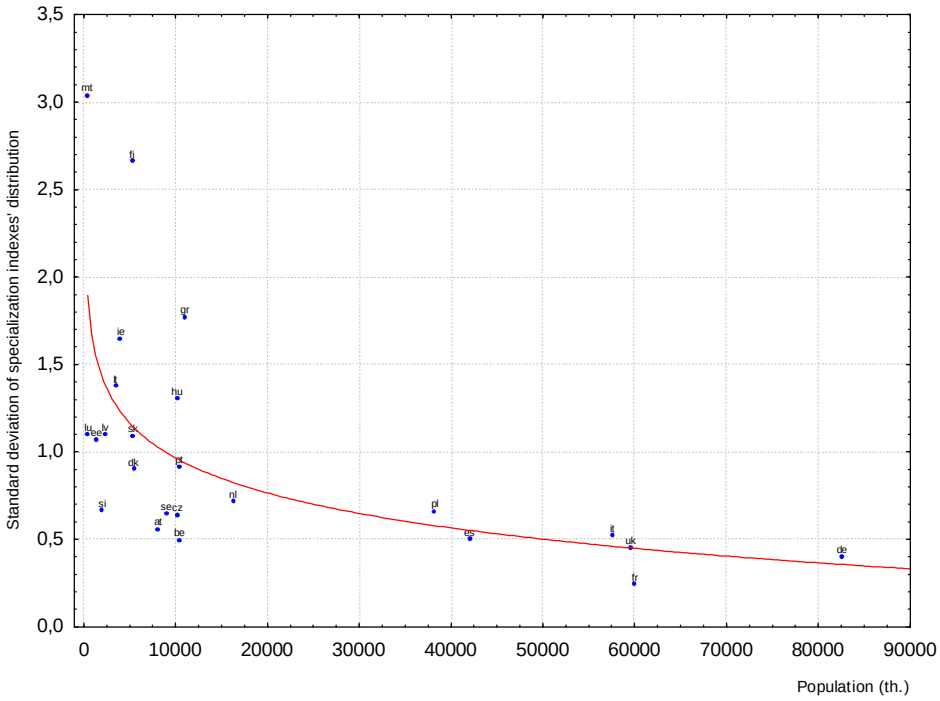
Denmark, Sweden and Finland are specialized in both high-intermediate and low-intermediate labour skills. The three countries have in common their specialization in water transport, with a particularly high index in Denmark. Sweden and Finland are both specialized in pulp, paper and paper products. Furthermore, Sweden is specialized in insulated wire, Denmark in radio and TV receivers, shipbuilding and scientific and other instruments, while Finland is particularly strong in telecommunications equipment and shipbuilding. It is worth mentioning that Finland, with a very high specialization index in telecommunications equipment, is above the average specialization profile of the countries of similar size (see Graph II.3).

Graph II.2: Sectoral specialization - Ranking of countries (2001-2003)



Source: calculated from Graph II.1 data.

Graph II.3: Sectoral specialization vs. country size



Source: calculated from Graph II.1 data and Eurostat population data.

Table II.1: Sectoral specialization index by labour skills categories				
Country	**High**	**High-intermediate**	**Low-intermediate**	**Low**
AT	0.87	0.89	1.22	1.07
BE	1.12	1.04	0.96	0.76
CZ	0.73	1.00	1.24	1.25
DE	1.03	0.99	0.99	0.95
DK	0.93	1.19	1.04	0.92
EE	0.81	1.12	1.13	1.13
ES	0.83	0.83	1.10	1.39
FI	0.90	1.13	1.22	0.80
FR	1.12	1.06	0.88	0.86
GR	0.86	0.79	1.06	1.41
HU	1.00	0.93	0.99	1.08
IE	1.13	0.92	0.96	0.85
IT	0.99	0.84	1.04	1.11
LT	0.68	1.13	1.21	1.27
LU	1.28	0.94	0.84	0.68
LV	0.80	1.13	1.26	0.94
MT	0.90	1.21	0.79	1.35
NL	1.02	1.05	1.00	0.91
PL	0.77	0.79	1.33	1.20
PT	0.90	1.01	1.03	1.16
SE	0.95	1.30	1.03	0.81
SI	0.91	0.84	1.15	1.12
SK	0.81	1.00	1.15	1.21
UK	1.02	1.07	0.94	0.97
Source: calculated from Graph II.1 data.				

In Hungary, Italy, and Portugal the specialization pattern shifts moderately towards low-intermediate and low labour skills. In Italy the highest index corresponds to leather and footwear, clothing and textiles, and, to a lesser extent, non-metallic mineral products, other instruments and other transport equipment. Portugal is strongly specialized in textile, clothing and leather and footwear, and also in non-metallic mineral products and radio and TV receivers. Finally, it is worth mentioning that, despite the general orientation of this group of countries, Hungary exhibits a high specialization index in some high labour skills activities, like oil refining, office machinery, and radio and TV receivers[11].

Czech Republic, Estonia, Lithuania and Latvia have much lower shares than the EU in high labour skills and their specialization is in low and low-intermediate labour skills, but also, and to a lesser degree, in high-intermediate skills. On the one hand, the Baltic States display high specialization in various transport activities, including water transport in Estonia and Lithuania, and inland transport and supporting transport activities in the three countries. Common sectors in these countries as regards manufacturing sectors are shipbuilding, wood and wood products, and textiles and clothing. Moreover, mineral oil refining, electronic

[11] The specialization index for each sector compares the share in the country with the share in the reference area, and it is, therefore, an indicator of ***relative*** size. In other words, a very high specialization level in a given sector may correspond to a very small sector.

valves and tubes, and radio and TV receivers are also sectors in which Lithuania is specialized. What distinguishes the Czech Republic in this group is that this country's profile is more balanced: the sectoral specialization is less intensive (the value of the index is in all cases below 2.5) and the distribution of the indices is closer to the one of the EU.

Spain, Greece, Austria, Slovakia, Poland and Slovenia belong to a group characterized by being strongly specialized in low and low-intermediate labour skills, along with low values of the index in the two categories of the highest labour skills. Within this group the specialization of Spain and Greece is stronger in low labour skills, while the one of Austria, Poland and Slovenia is more intensive in low-intermediate labour skills. Spain and Poland are both characterized by being specialized in manufacturing activities. The former is specialized in leather and footwear, oil refining, non-metallic mineral products, and shipbuilding. Among non-manufacturing, it is specialized in construction and, with the highest value of the index, in hotels and catering. Poland's strongest specialization is in two ICT sectors, namely, insulated wire and radio and TV receivers, and, among non-manufacturing it is worth mentioning two sectors, wholesale trade and electricity, gas and water supply.

As regards Malta, the strongest degree of specialization is in low labour skills sectors, but this country also exhibits a high degree of specialization in high-intermediate labour skills. Sectors to be underlined are clothing, electronic valves and tubes, shipbuilding, furniture and other manufacturing, hotels and catering, and air transport.

II.4 EU industry structure and the Single Market

II.4.1 Structural changes in the Single Market

II.4.1.1 Introduction

The purpose of the present section is to shed light on the functioning of the Single Market, which, by bringing in more competition and creating a larger market, has been one of the factors to shape the structure of EU industry. The chapter is based on an empirical analysis of EU-15 industrial structure, and changes in these structures as reflected in trade flows and sectoral specialization in the Member States over the period 1988-2005[12].

The section looks at a set of indicators, which could a priori be expected to reflect the changes triggered by the Single Market. Although the analysis carried out does not capture uniquely the effect of the Single Market (factors such as exchange rate changes, the adoption of euro as single currency, changes in the world trading system, or faster growth of markets outside the EU will also have an effect on trade flows), one could expect that the removal of barriers to trade within the EU would lead to an increase in intra-EU trade relative to total EU trade, and to changes in specialization patterns. The focus is on EU-15. However, the results show the important role of new Member States and the last part of the section is devoted to analyse specialization in EU-19, namely EU-15 plus Hungary, Poland, Czech Republic and Slovakia.

The process of economic integration and successive enlargement of the EU has increased competition in the EU domestic market and caused changes in trade flows among EU Member States and with third countries. Along this process, the intensification of trade

[12] The analysis in this Section is based on manufacturing sectors, whose output is, relative to services, more tradable.

triggers the reallocation of resources in EU countries in order to maximize the mutual benefits of external trade by fully exploiting the comparative advantages of each country. Changes may occur at the level of both industries and products. As a matter of fact, the process of economic integration since the creation of the EU has been characterized by the intensification of intra-industry trade; in other words, the increased specialization, and subsequent reallocation of resources, takes place to a large extent within industries (intra-industry), rather than across industries (inter-industry). The indicators used in this chapter pertain to these two levels, namely inter-industry and intra-industry.

To analyse such effects four indicators are calculated: (i) market shares[13]; (ii) the ratio of exports and imports relative to production and apparent consumption; (iii) sector and product specialization; and (iv) Grubel-Lloyd indices to measure the importance of intra-industry trade. In addition to these indicators, which are calculated from trade flows in goods, developments in foreign direct investment are also considered.

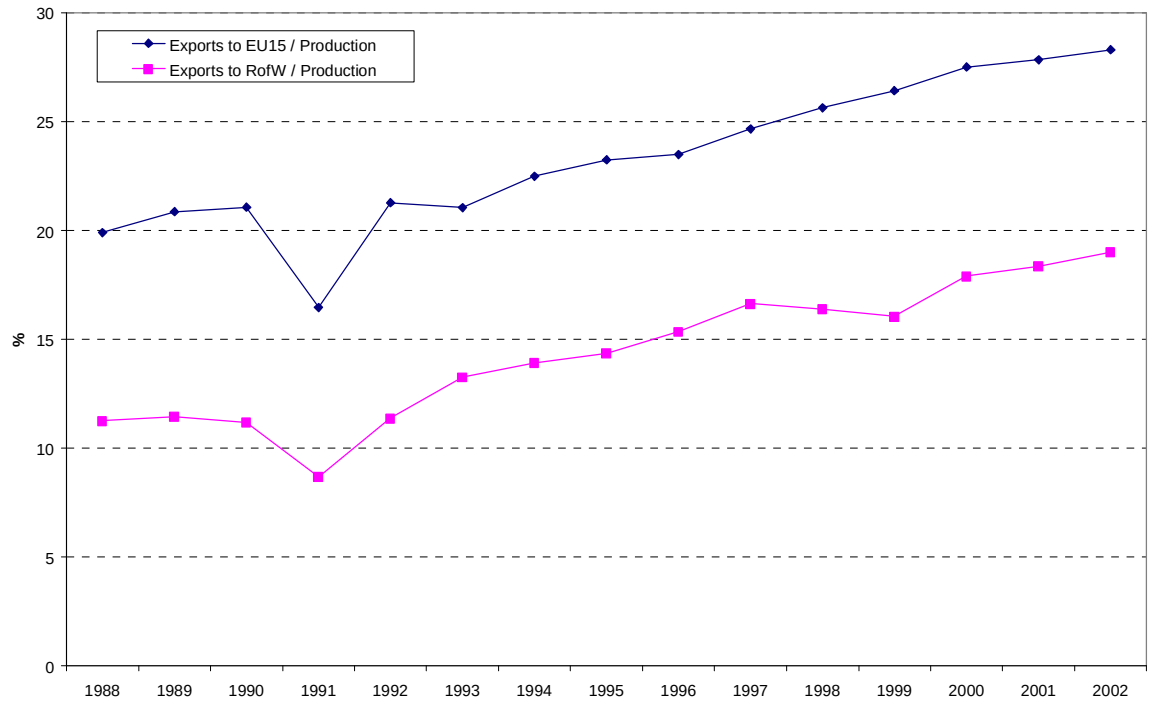
II.4.1.2 Openness of EU Member States and market shares

The elimination of barriers to trade and the process of harmonization of the conditions under which businesses operate enlarges the opportunities for firms to market their products in the internal market of the EU. This, along with geographical proximity, should result in an increasing openness of the EU Member States

Between 1988 and 2002, the manufacturing sector has gone through a steady process of increasing openness, both within the Union and towards non-EU countries. Trade exchanges among the EU countries have intensified. For manufacturing as a whole, the share of production exported to the rest of the Union has raised from 20% to over 28% (Graph II.4). Similarly, the share of imports in apparent consumption rose from 20% to 26% Graph II.5). Interestingly, this process has taken place in a context of globalization whose effects on the openness of EU countries are even stronger than the effect of the Single Market itself. In effect, openness of EU-15 towards the rest of the World has increased in relative terms more than openness the EU. EU-15 Member States currently export an increasing part of their manufacturing production, to the rest of the World (19%, up from 11% in 1988) and import an increasing part of their consumption from the rest of the World (the share of imports in consumption rose from 10% in 1988 to 17% in 2002). It is important to underline the role played by the enlargement of the EU to EU-25 in this process of openness, which is reflected in the shares in total exports and imports of the ten new member States.

[13] The sectoral classification used in this section, particularly in Tables II.2, II.3 and Graph II.16 corresponds to the manufacturing products of list C (see Annex VI).

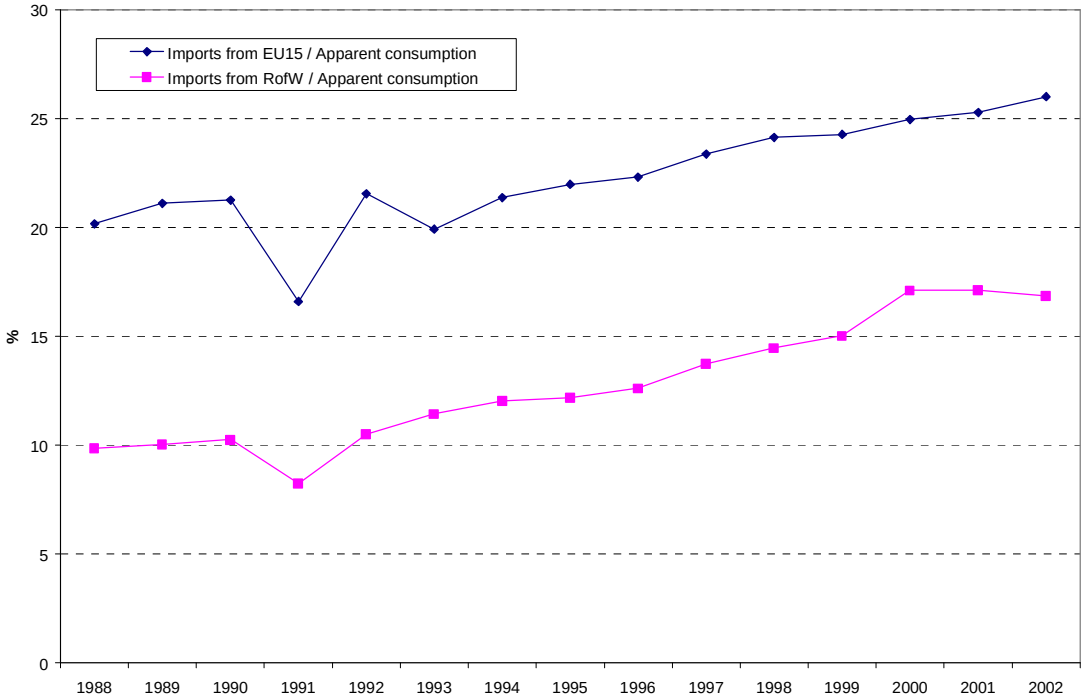
Graph II.4: EU-12 manufacturing exports to EU-15 and to rest of World relative to EU-12 manufacturing production



Note: Data are for the following 12 EU Member States: Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom. Intra-EU exports refer to exports to EU-15 (rather than EU-12).

Source: calculated from OECD STAN and bilateral trade databases.

Graph II.5: EU-12 manufacturing imports from EU-15 and from rest of World relative to EU-12 manufacturing apparent consumption

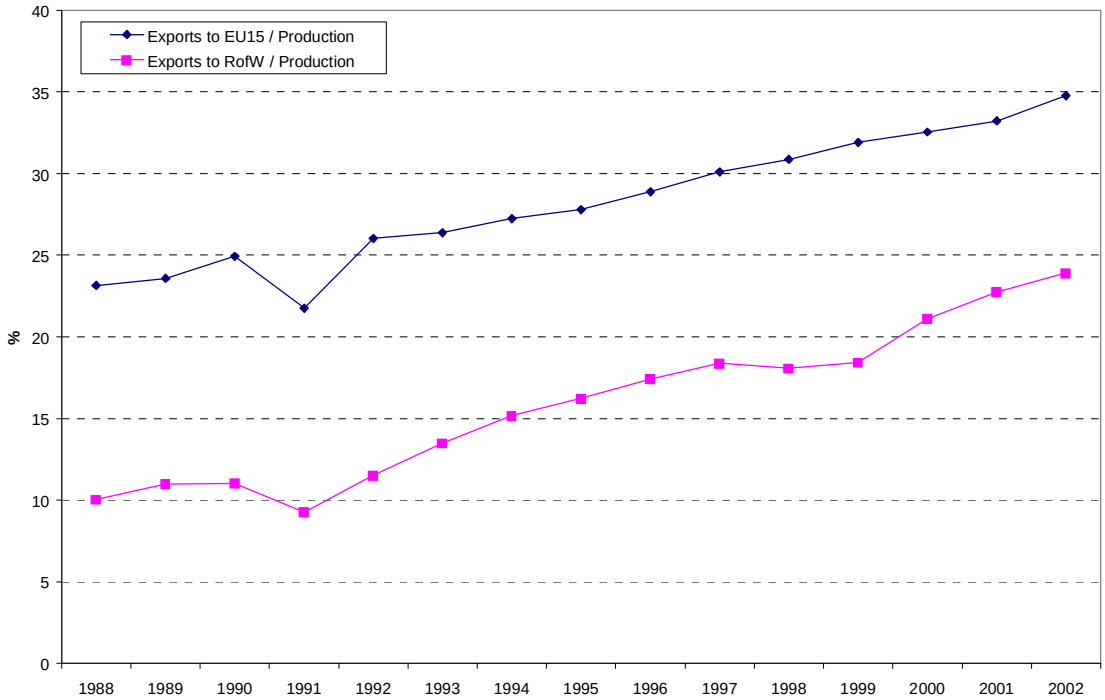


Note: Data are for the following 12 EU Member States: Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom. Intra-EU imports refer to imports into EU-15 (rather than EU-12).

Source: calculated from OECD STAN and bilateral trade databases.

In general, all manufacturing sectors exhibit similar trends as regards both intra-EU and extra-EU trade flows. However, particular mention must be made of the textiles sector as regards developments in imports (see Graph II.7). In this case imports from EU stagnate while those from the rest of the World increase from 15% to 35%. This is an example of how, although the integration process in the EU has intensified, the rest of the World is playing an increasingly important role in the openness of the EU.

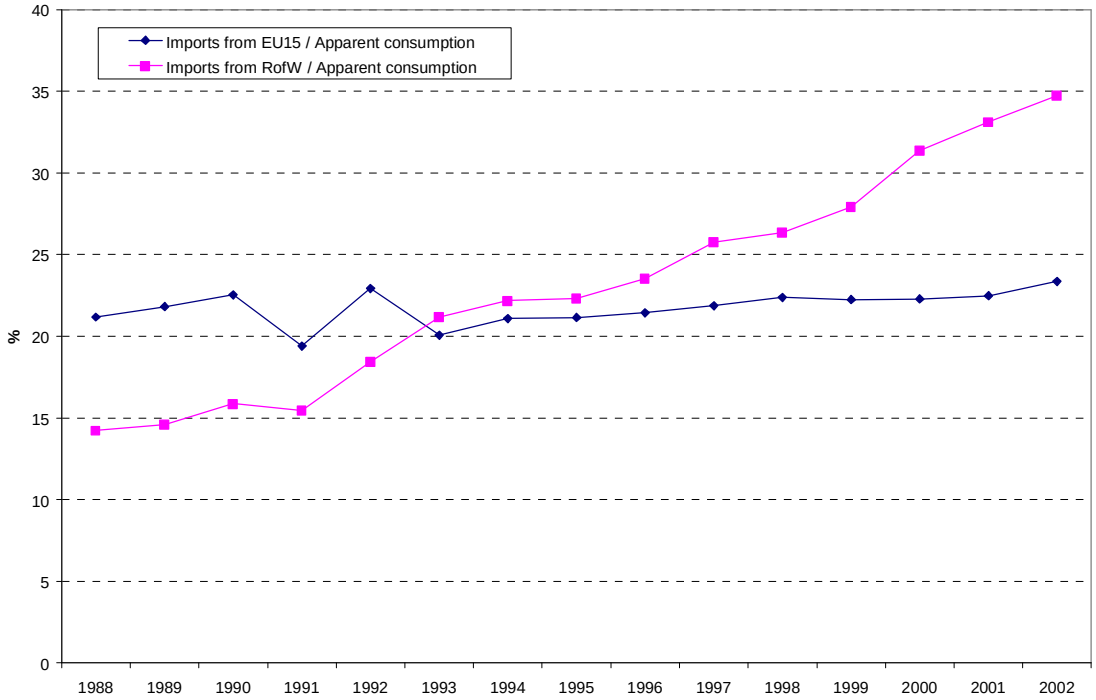
Graph II.6: EU-12 textiles exports to EU-15 and to rest of Wold relative to EU-12 textiles production



Note: Data are for the following 12 EU Member States: Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom. Intra-EU exports refer to exports to EU-15 (rather than EU-12).

Source: calculated from OECD STAN and bilateral trade databases.

Graph II.7: textiles - EU-12 intra-EU and extra-EU imports relative to EU-12 apparent consumption



Note: Data are for the following 12 EU Member States: Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom. Intra-EU imports refer to imports into EU-15 (rather than EU-12).

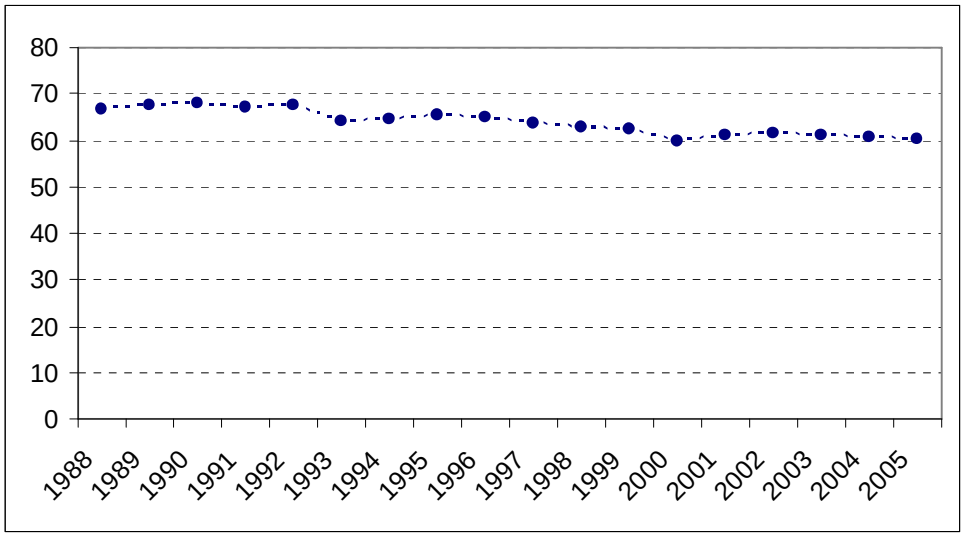
Source: calculated from OECD STAN and bilateral trade databases.

Despite the fact that the process of increasing openness of EU-15 countries has taken place vis-à-vis both the Single Market participants and the rest of the World (including the rest of the EU) the data show that at the face of increasing globalisation and the emergence of China as a major trade partner, the relative share of intra-EU trade in the total trade of the Member States has declined – while intra-EU trade still accounts for by far the largest part of the exports and imports of the Member States. In 2005, 59% of EU-15 manufacturing exports went to and 60% of imports came from other EU-15 Member States; this compares with 64% and 67% respectively in 1988.

Extra EU-15 trade grew faster than intra EU-15 trade over the period 1988-2005, with new partners, especially China, playing an ever increasing role alongside more traditional partners such as the US, Japan and Switzerland. China currently accounts for almost 7% of the manufacturing imports into EU-15, while in 1988 its share was less than 1%. Over the same period, the geographical scope of the original Single Market was extended to the countries that later became EU Member States, thus blurring the effect of the 1992 programme, but only to a certain extent: for total manufacturing trade, even on an EU-25 basis, the share of intra EU trade declined for exports and imports alike. The share of the ten new EU Member States in total manufacturing trade of EU-15 rose from 1% to 5½% between 1988 and 2005.

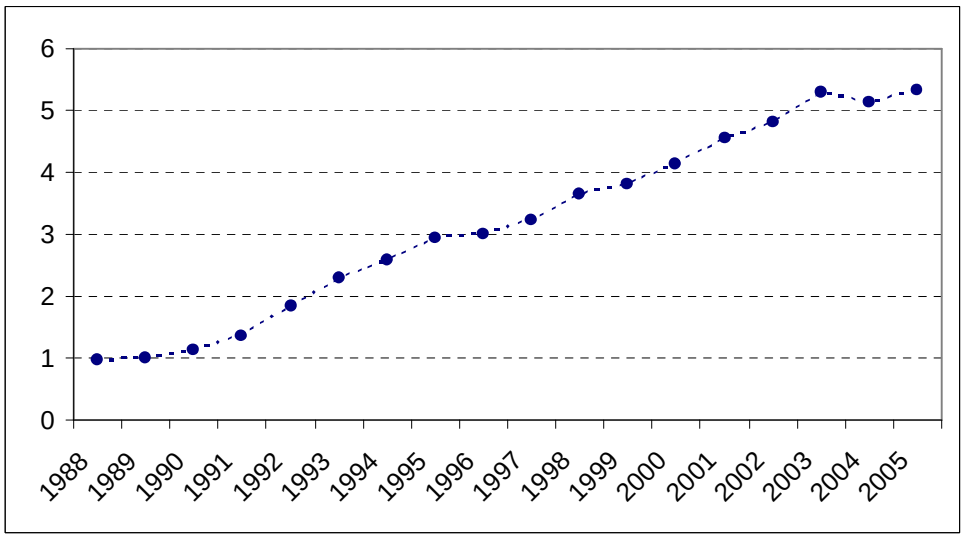
Export and imports trends for manufacturing to and from EU-15 and CC10 are shown in Graphs II.8 through II.11.

Graph II.8: Manufacturing - EU-15 imports from other EU-15 countries (% of total imports)



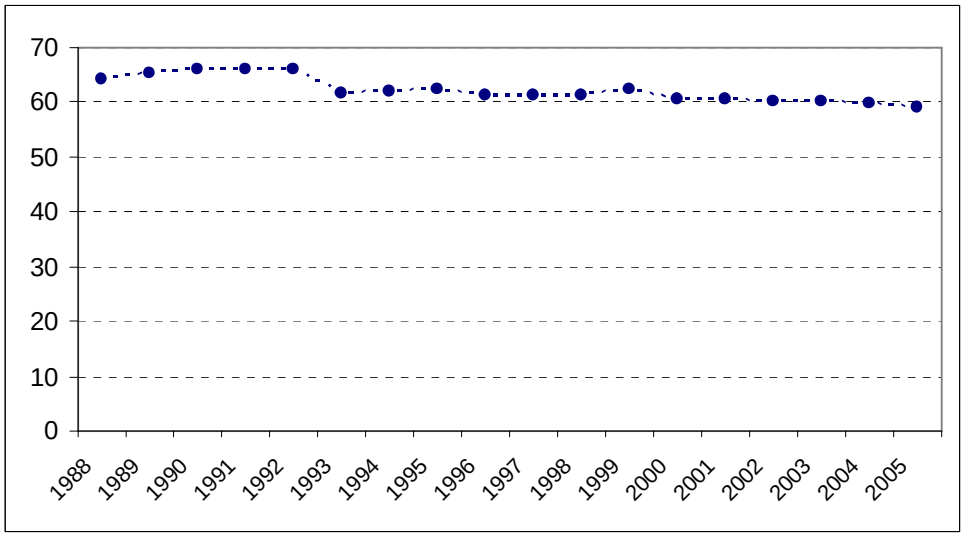
Source: calculated from COMTRADE database.

Graph II.9: Manufacturing - EU-15 imports from CC10 countries (% of total imports)



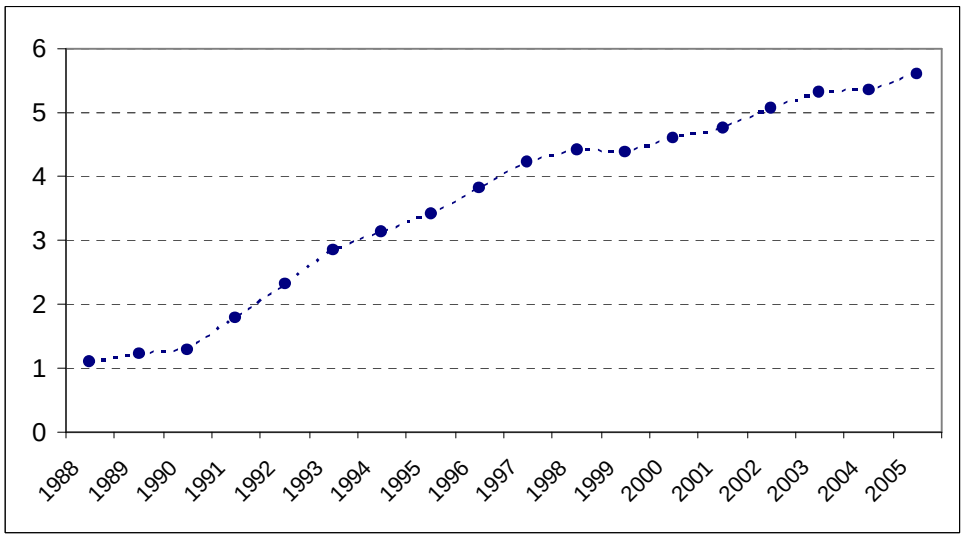
Source: calculated from COMTRADE database.

Graph II.10: Manufacturing - EU-15 exports to other EU-15 countries (% of total exports)



Source: calculated from COMTRADE database.

Graph II.11: Manufacturing - EU-15 exports to CC10 countries (% of total exports)



Source: calculated from COMTRADE database.

Data at sector level show a decline in the share of intra-EU-15 trade in most manufacturing sectors between 1988 and 2005. The manufacturing sectors in which intra-EU-15 trade is least important in terms of the share in total imports (Table II.2) are shipbuilding (where 25% of total EU-15 imports have there origin within the area), and radio and TV receivers (32%). Between 1988 and 2005, the importance of intra-EU-15 imports declined in a spectacular way i.e. in textiles, clothing, leather and footwear. These developments reflect the rise of China as an exporter to the EU in sectors such as clothing, leather and footwear, office machinery,

radio and TV receivers and, furniture and other manufacturing, sectors where China took a share of 20 to 25% of the EU-15 market.

Nevertheless, in several manufacturing sectors, intra-EU-15 trade represents more than three quarters of total imports. The importance of EU-15 imports is highest for motor vehicles, for which 77% of the EU-15 imports have their origin within the EU-15 area. For pulp, paper and paper products as well as for printing and publishing, intra-EU-15 imports represent 76% of the total. Also for food and drinks, chemicals and pharmaceuticals, the share of intra-EU-15 trade in total imports is more than 70%. Of these sectors, the share of intra-EU-15 trade increased significantly between 1988 and 2005 in pulp, paper and paper products and in pharmaceuticals.

Table II.2: EU-15 imports from EU-15 as % of total EU-15 imports by sector

Sector	1988	1993	1995	2000	2005	2005 minus 1988
Food, drink & tobacco	72.2	74.8	76.0	73.3	73.6	+
Textiles	67.8	60.8	61.4	51.9	45.7	-
Clothing	48.3	36.1	35.5	30.0	29.5	-
Leather and footwear	59.6	50.6	50.2	43.2	39.3	-
Wood & products of wood	48.9	54.6	55.4	50.5	53.4	+
Pulp, paper & paper products	70.3	79.5	77.2	75.4	76.2	+
Printing & publishing	76.3	69.7	71.0	73.5	76.2	-
Mineral oil refining & nuclear fuel	52.4	59.3	60.3	62.8	46.8	-
Chemicals	74.9	72.7	73.2	70.8	72.5	-
Pharmaceuticals	68.5	66.9	68.3	68.6	72.4	+
Other chemical	76.0	73.7	73.7	71.5	72.4	-
Rubber & plastics	80.7	76.4	75.7	70.2	69.0	-
Non-metallic mineral products	83.8	77.6	76.8	69.5	67.5	-
Basic metals	66.8	65.9	65.7	61.0	61.1	-
Fabricated metal products	76.6	70.8	69.9	64.1	62.7	-
Machinery & equipment n.e.c.	72.9	69.0	69.3	62.8	63.1	-
Office machinery	47.4	44.3	45.8	46.0	41.7	-
Insulated wire	71.5	68.1	64.6	53.7	52.8	-
Other electrical machinery nec	67.9	61.6	58.2	50.2	52.0	-
Electronic valves and tubes	50.5	41.0	41.2	34.9	37.1	-
Telecommunication equipment	38.4	43.5	49.8	52.5	41.8	+
Radio and television receivers	40.7	43.6	49.7	36.7	32.4	-
Scientific instruments	55.1	50.3	51.3	44.8	49.1	-
Other instruments	36.1	29.5	30.8	31.4	36.2	+
Motor vehicles	81.9	81.8	84.1	79.3	76.9	-
Building and repairing of ships	28.2	34.2	32.8	33.0	25.8	-
Railroad and transport equipment nec	52.2	48.3	50.1	40.5	53.4	+
Aircraft and spacecraft	43.2	41.4	40.0	38.8	44.1	+
Furniture; manufacturing nec	56.7	47.2	49.8	41.7	41.6	-

Source: calculated from COMTRADE database.

Table II.3: EU-15 exports to EU-15 as % of total EU-15 exports by sector

Sector	1988	1993	1995	2000	2005	2005 minus 1988
Food, drink & tobacco	71.3	70.1	69.8	69.7	70.8	-
Textiles	71.0	67.1	64.7	60.7	58.9	-
Clothing	71.5	70.1	66.8	64.9	65.3	-
Leather and footwear	62.8	59.4	55.4	54.8	56.4	-
Wood & products of wood	77.8	77.7	76.2	68.6	66.3	-
Pulp, paper & paper products	74.4	73.4	73.5	70.8	68.9	-
Printing & publishing	64.1	63.1	63.7	64.6	67.0	+
Mineral oil refining & nuclear fuel	64.8	58.5	58.4	60.8	53.5	-
Chemicals	62.3	60.7	62.3	58.4	59.8	-
Pharmaceuticals	52.1	51.2	52.2	52.7	58.1	+
Other chemical	64.1	62.5	64.1	60.6	60.8	-
Rubber & plastics	73.9	74.2	73.7	68.5	66.4	-
Non-metallic mineral products	64.4	64.7	62.4	58.5	58.7	-
Basic metals	66.0	64.7	71.1	68.5	64.1	-
Fabricated metal products	64.3	64.2	64.3	62.6	59.8	-
Machinery & equipment n.e.c.	54.9	48.5	49.4	51.0	47.1	-
Office machinery	75.2	72.6	73.4	71.4	67.8	-
Insulated wire	63.0	59.3	60.2	58.9	55.8	-
Other electrical machinery nec	60.0	58.2	60.0	55.7	52.7	-
Electronic valves and tubes	65.8	54.9	54.2	46.8	46.6	-
Telecommunication equipment	48.5	44.9	45.6	59.3	50.7	+
Radio and television receivers	82.0	81.3	79.4	72.9	77.4	-
Scientific instruments	51.0	50.4	51.3	48.6	47.4	-
Other instruments	52.5	46.9	47.8	43.5	41.8	-
Motor vehicles	70.5	69.8	70.1	69.2	65.2	-
Building and repairing of ships	16.7	25.3	26.5	26.2	35.7	+
Railroad and transport equipment nec	53.8	66.4	64.0	66.3	71.5	+
Aircraft and spacecraft	41.4	35.9	33.0	42.7	41.4	-
Furniture; manufacturing nec	54.3	54.2	54.1	52.3	54.4	+

Source: calculated from COMTRADE database.

The place of non-EU main partners in EU-15 exports and imports is summarized in Tables II.4 and II.5. These give a broader picture in which the role of non-EU countries can be assessed. Among these China is an outstanding case, particularly as regards the origin of EU imports, from 0.7% of total EU-15 imports in 1988 (including intra-EU imports) to 6.7% in 2005. As market of destination for EU manufactured goods China has also increased its importance, but to a much lesser extent than in the case of imports.

Table II.4: EU-15 manufacturing exports by area of destination – Share in total EU-15 exports (%)

			Destination																						
	Area	Year	EU15	CC10	CA	US	BR	MX	IL	JP	IR	SA	AE	TR	CN	HK	KR	IN	MY	TH	AU	SG	NO	CH	RofW	World
Origin	EU15	1988	64.1	1.1	1.1	7.9	0.3	0.3	0.4	1.9	0.3	0.7	0.2	0.5	0.6	0.6	0.5	0.4	0.2	0.2	0.8	0.5	1.3	3.9	12.1	100
	EU15	1993	61.6	2.8	0.7	7.3	0.5	0.5	0.5	2.0	0.5	0.8	0.4	1.0	1.0	1.0	0.7	0.3	0.3	0.5	0.7	0.7	1.1	3.4	11.6	100
	EU15	1995	62.3	3.4	0.7	6.7	0.8	0.3	0.5	2.2	0.2	0.5	0.4	0.8	1.0	1.0	0.8	0.5	0.5	0.5	0.7	0.7	1.2	3.3	10.9	100
	EU15	2000	60.6	4.6	0.8	9.5	0.7	0.6	0.5	1.9	0.2	0.5	0.5	1.3	1.0	0.9	0.7	0.3	0.4	0.3	0.7	0.6	1.1	2.8	9.7	100
	EU15	2005	58.9	5.6	0.8	8.5	0.6	0.6	0.4	1.6	0.4	0.5	0.9	1.4	1.7	0.7	0.7	0.5	0.3	0.3	0.8	0.6	1.1	2.7	10.5	100

Country codes: CA: Canada; US: United States; BR: Brazil; MX: Mexico; IL: Israel; JP: Japan; IR: Iran; SA: Saudi Arabia; AE: United Arab Emirates ; TR: Turkey; CN: China; HK: Hong-Kong; KR: South Korea; IN: India; MY: Malaysia; TH: Thailand; AU: Australia; SG: Singapore; NO: Norway; CH: Switzerland.

Source: calculated from COMTRADE database.

Table II.5: EU-15 manufacturing imports by area of origin – Share in total EU-15 imports (%)

			Origin																						
	Area	Year	EU15	CC10	CA	US	BR	MX	IL	JP	IR	SA	AE	TR	CN	HK	KR	IN	MY	TH	AU	SG	NO	CH	RofW	World
Destin.	EU15	1988	66.8	1.0	0.8	7.0	0.7	0.1	0.3	5.7	0.1	0.1	0.0	0.4	0.7	0.9	1.0	0.3	0.3	0.3	0.2	0.4	1.0	3.1	8.8	100
	EU15	1993	63.9	2.3	0.7	8.0	0.6	0.1	0.3	5.6	0.1	0.1	0.1	0.6	1.8	0.9	0.8	0.5	0.6	0.5	0.2	0.8	0.9	3.2	7.4	100
	EU15	1995	65.2	2.9	0.7	7.5	0.6	0.2	0.3	4.7	0.1	0.1	0.0	0.6	1.8	0.8	0.9	0.6	0.6	0.5	0.2	0.8	0.9	3.0	7.2	100
	EU15	2000	59.6	4.1	0.7	9.2	0.6	0.2	0.4	4.7	0.0	0.1	0.1	0.8	3.4	0.6	1.3	0.6	0.8	0.6	0.2	0.8	0.8	2.4	8.0	100
	EU15	2005	60.1	5.3	0.5	6.5	0.6	0.3	0.3	3.5	0.0	0.1	0.1	1.2	6.7	0.5	1.4	0.7	0.7	0.6	0.2	0.8	0.7	2.3	6.9	100

Country codes: see Table II.4.

Source: calculated from COMTRADE database.

II.4.1.3 Product specialization and nature of trade

Stronger competition within the Single Market countries and from other countries is expected to lead to a reallocation of resources for countries to benefit from their comparative advantage. This should be reflected in changes in the specialization pattern of different EU countries. Two questions are examined here: first, if specialization has changed significantly over time; second, the nature of trade and more particularly the role of Intra-Industry trade.

The coefficient of sectoral specialization calculated from exports figures shows to what extent countries have adapted to stronger international competition conditions, triggered by the process of openness and economic integration. With the exception of the UK, correlation between 1988 and 2005 specialization coefficients is positive and statistically significant (see Table II.6). This implies that, despite intensified import competition and expanding export markets, changes in trade specialization have been rather limited at sector level. The table also shows the correlation coefficient for specialization indices calculated from value added data. In this case, the data shows stronger persistence in the specialization patterns, with the exception of Denmark and Finland, and to a lesser extent Sweden. The standard deviations of the distribution of specialization indices from both value added and trade data show mixed results. In any case, the degree of specialization has remained at similar levels (in terms of value added data), or even decreased in a number of countries (in terms of trade data). The most outstanding case in Finland with a marked increase in specialization in value added. However, at a more detailed product (or "niche") level, changes in specialization patterns are more visible, with a turnover of some 40% between 1993 and 2005 in the list of the top products in terms of export specialization (detailed tables on specialization at product level are presented in the companion web site:

http://europa_eu.staging.entr.cec.eu.int/enterprise/enterprise_policy/competitiveness/2_Indicators/Indicators%20of%20the%20competitiveness.htm).

Table II.6: correlation between specialization coefficients in 1988 and 2005 and standard deviation of the distribution of specialization indices

	Correlation among specialisation indexes		Standard Deviation			
			Trade		Value added	
Country	Value added	Trade	1988	2005	1988	2003
AT	0.96	0.74	0.86	0.84	0.74	0.70
BE	0.83				0.53	0.50
BELU		0.78	0.53	0.45		
DE	0.87	0.67	0.31	0.26	0.33	0.39
DK	0.53	0.83	0.79	0.69	0.58	0.72
ES	0.74	0.43	0.53	0.73	0.50	0.45
FI	0.36	0.79	2.29	1.71	1.12	3.02
FR	0.81	0.51	0.31	0.40	0.26	0.29
GR	0.79	0.82	2.30	1.53	1.40	1.45
IE	0.83	0.77	1.28	1.02	1.41	1.62
IT	0.96	0.88	0.81	0.87	0.38	0.49
LU	0.91				1.62	1.21
NL	0.96	0.41	0.64	0.76	1.11	1.20
PT	0.80	0.82	1.97	1.40	0.94	0.98
SE	0.69	0.92	1.39	0.94	0.88	0.72
UK	0.71	0.38	0.68	0.45	0.46	0.52

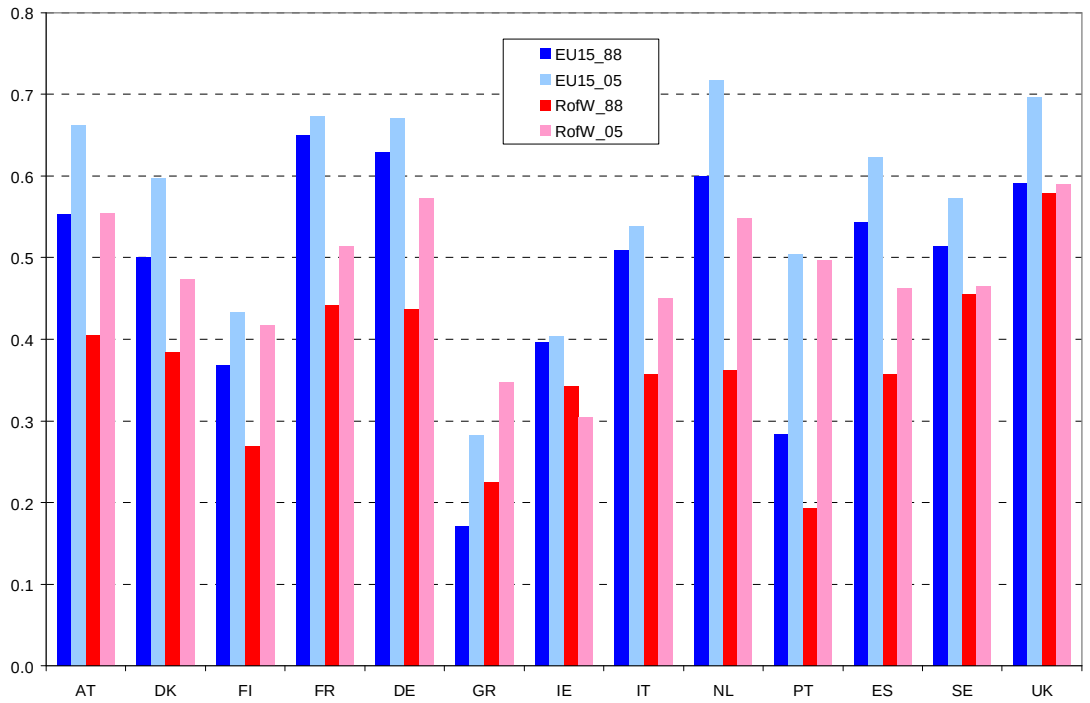
Source: Calculated with data from COMTRADE and "Groningen Growth and Development Centre, 60-Industry Database, September 2006, http://www.ggdc.net".

Besides the changes in specialization at product level, trade within the Single Market is characterised by Intra-Industry trade (IIT). As a matter of fact, the share of IIT, whereby a country is both an exporter and importer of (different variants of) the same product, increased both in intra-EU trade and in EU trade with non-EU countries between 1988 and 2005. However, the share of intra-industry trade remains higher in trade within the EU in comparison to extra-EU trade.

Intra-industry trade has become more important for all the Member States (Graph II.12). For Greece and Portugal, the share of intra-industry trade in total trade is lower than for the others; however, the share has increased faster than in the other Member States. Intra-industry trade is particularly important for France, Germany, the Netherlands, and the UK.

The data do not split IIT into *horizontal* (exchange of products of the same quality) and *vertical* (exchange of products of different quality), which would add further evidence on the nature of trade and the impact of the Single Market. From a policy point of view the implications of increased IIT are less traumatic than for inter-industry trade, as the adjustments in production and reallocation of resources take place within the same industry.

Graph II.12: Intra-Industry trade index (Grubel-Lloyd) – Intra-EU-15 trade and trade with the rest of the World (1988 and 2005)



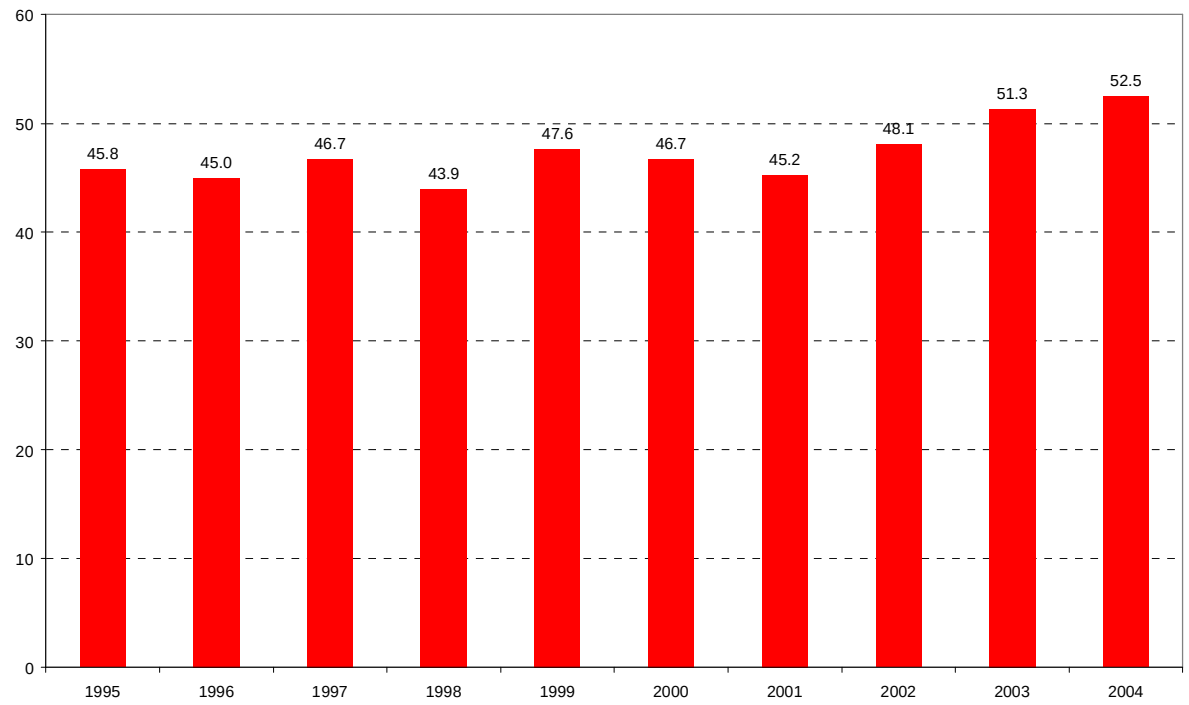
Source: calculated from COMTRADE database.

II.4.1.4 Foreign Direct Investment

The findings presented above are based on trade data. They give a partial view of economic integration, as the latter take many other forms, notably foreign direct investment (FDI). FDI data demonstrate that the EU is a powerful engine for integration: between 1995 and 2005, intra EU-15 outward FDI stocks in manufacturing continued to increase, going from 46 to 52% of total outward stocks, at the expense of investments to other industrialised (non-EU) countries (Graph II.13). The share of the new Member States as a destination for EU-15 FDI increased.

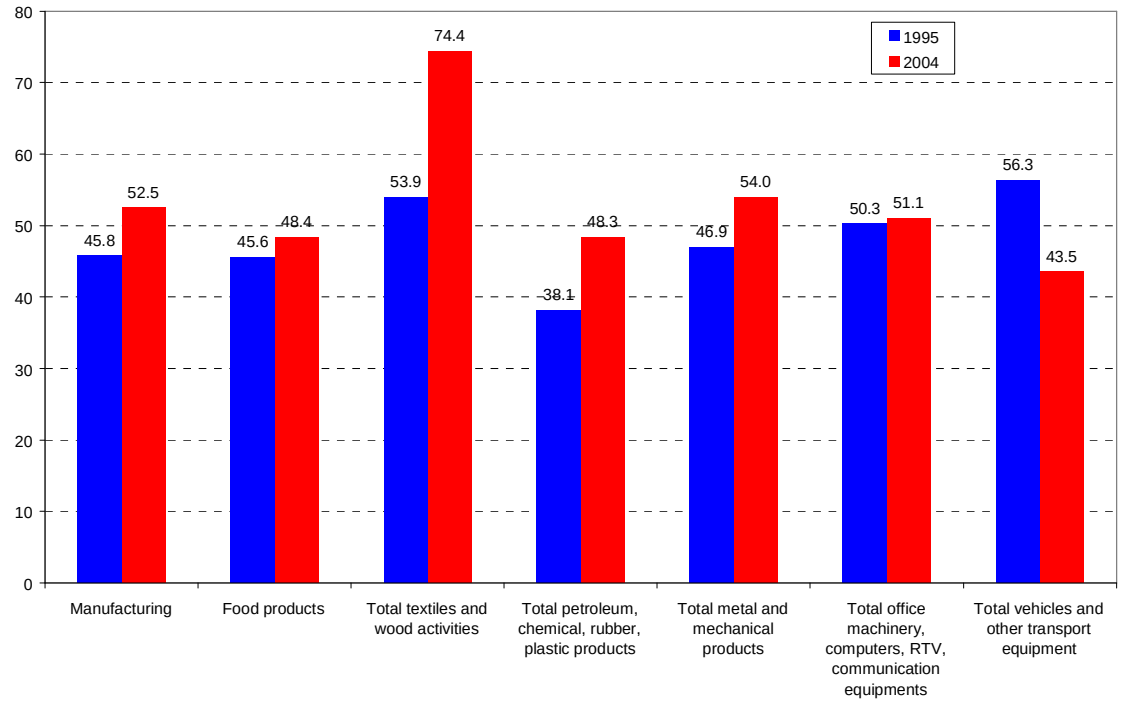
An increased share of EU-15 outward FDI remained within the EU-15 area, also when the FDI stocks are assessed at the level of individual manufacturing sectors (Graph II.14). The exception was vehicles and other transport equipment, for which the EU-15 share decreased.

Graph II.13: Share of intra-EU-15 FDI in total EU-15 FDI outward stock (%)



Source: calculated from Eurostat data.

Graph II.14: Share of intra-EU-15 FDI in total EU-15 outward FDI stock (%) by sector



Source: calculated from Eurostat data.

The data presented in this section may be interpreted as suggesting suggest that most of the effects of the Single Market materialised 15 years ago, and today's trade and production patterns are primarily determined by other factors, such as the emergence of China in the world trading system. However, recent trends also reveal continuous changes in the Single Market in terms of a closer integration of the new Member States, increased openness vis-à-vis other EU Member States but also to non-EU countries, increased intra-industry trade, increased concentration of foreign direct investments outflows within the EU, and changes in the specialization patterns of the Member States. Further analysis is needed to explore the causes and consequences of these trends, and the role of EU policy makers in fostering the competitiveness of EU industry at the face of globalisation and strong international competition.

II.4.2 Inter-industry specialization in EU-19

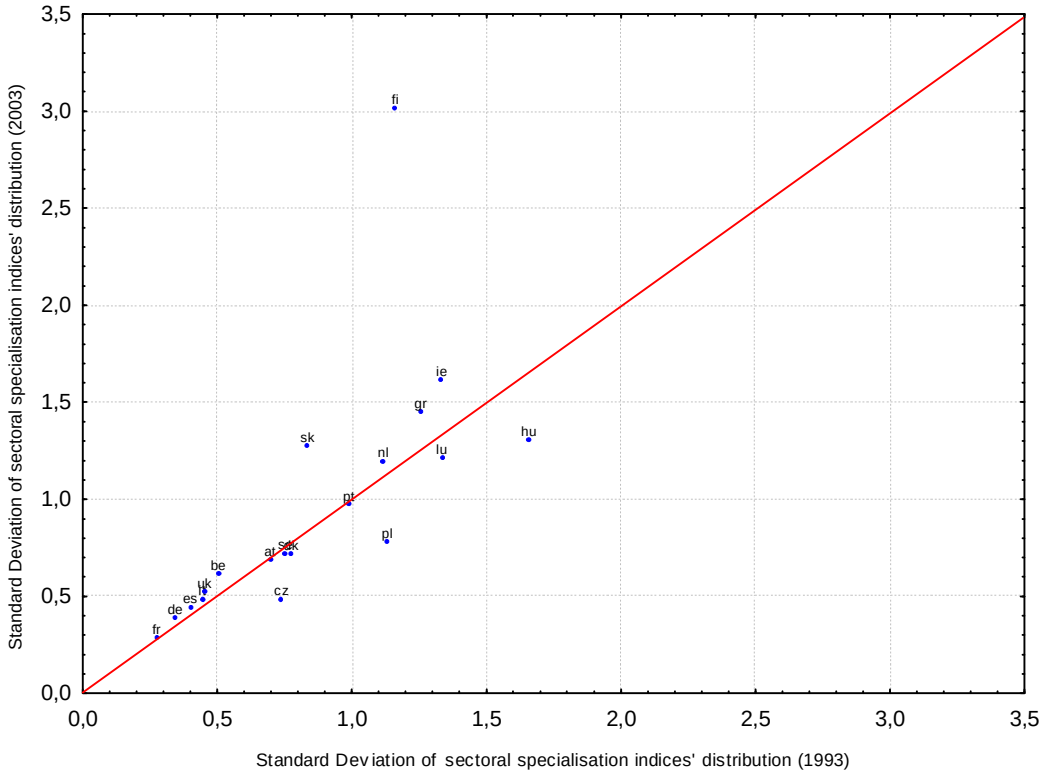
In analysing trade in the Single Market the role of new Member States has been underlined. To gain insight into this role the rest of the section is devoted to analyse specialization of EU countries in a broader context, namely EU-19 (EU-15 plus Hungary, Poland, Czech Republic and Slovakia).

Two issues are discussed here. First, the *degree* of sectoral specialization in EU countries and its evolution over time. Secondly, changes in the specialization of countries at the level of specific sectors.

Generally speaking the degree of specialization[14] of EU-19 countries has increased, or remained without significant change. The scatter plot in Graph II.15 shows the standard deviation of the distribution of sectoral specialization indices for each country in 1993 and 2003. Most of the countries are on, or very close to, the main diagonal of the graph, which is the locus of the countries whose degree of specialization has not changed during the 10 years covered by the sample. Two exceptions are worth mentioning. Hungary, Poland, and Czech Republic, in which the degree of specialization has diminished, and Finland and Slovakia, with a substantial increase in the degree of sectoral specialization, particularly in the case of the former. Ireland and Greece have also intensified their specialization, but in this case to a lesser extent. Therefore, with the exception of Hungary, Poland and Czech Republic, and to a lesser extent Luxembourg, there has been a slight increase in the degree of specialization of the countries, although the high level of sectoral aggregation may mask the more substantial changes that might have taken place at a more detailed definition of the sectors. Two qualifications are in order here. On one hand, the indicator used measures the spread of the distribution of sectoral specialization indices, and Graph II.15 tells if the sectoral composition of countries has become, between 1993 and 2003, closer to, or farther from, the EU average. However, it does not inform about changes in a country's specialization degree in the various sectors. On the other, Graph II.15 is based on (the distribution of) specialization indices of manufacturing sectors, which are assumed to be more sensitive to changing conditions in the internal market and to international competition. However, although less exposed to international trade, the different growth rates of the various services sectors across countries can also induce a change in the specialization profile of a country. A graph with the same layout as II.15, but based on the specialization indices of all sectors, is presented in the annex (Graph II.19). Interestingly, this graph confirms and reinforces the conclusions discussed above. For most countries the specialization degree has not changed significantly, although there is a substantial increase for Finland, Greece, Luxembourg and Ireland, which have increased substantially their degree of specialization, and a significant decrease in only one country, Poland.

[14] Measured by the standard deviation of the distribution of the sectoral specialization indices.

Graph II.15: Sectoral specialization index – 2003 vs. 1993 (manufacturing sectors)



Source: calculated from "60-industry database. (Groningen Growth and Development Centre-September 2006)".

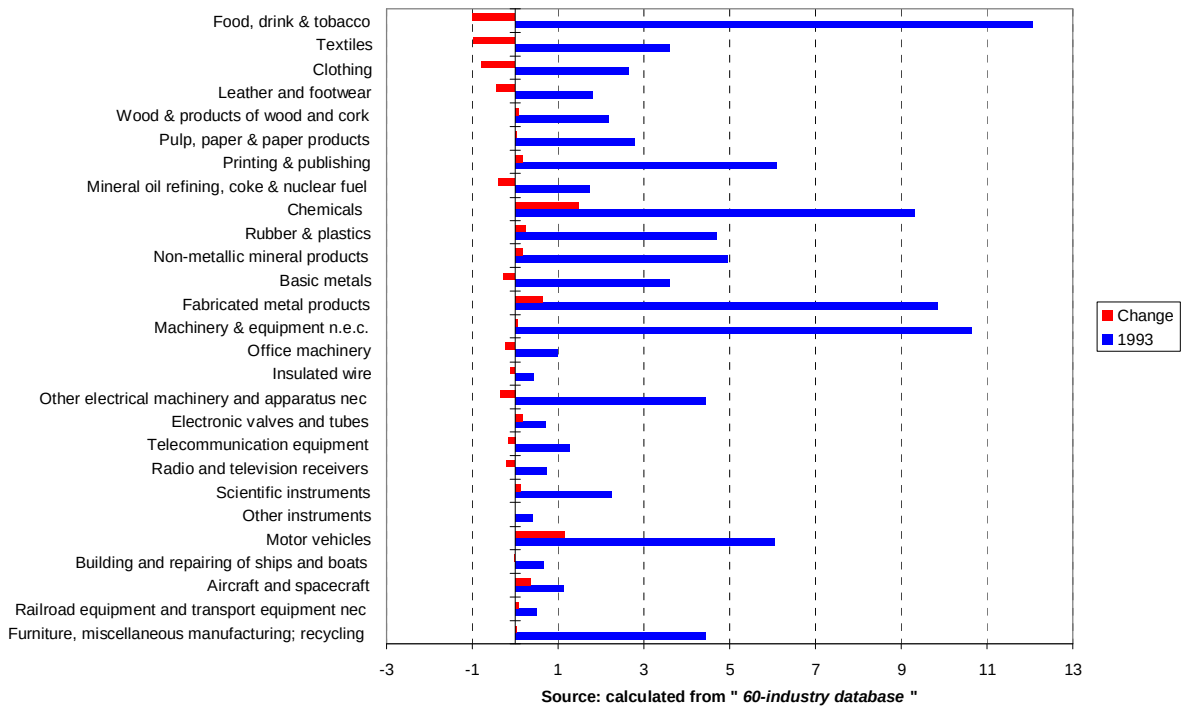
It is also worth underlining that the reallocation of resources that may have taken place as the internal market developed needs not necessarily imply a change in the degree of specialization of the countries. Broadly speaking the sets of specialization indices in 1993 and 2003 are highly and significantly correlated, indicating no substantial change over time in the overall specialization profile. Poland is an exception, as the correlation, though positive, is not significant[15]. Actually, the high correlation reflects the fact that a fundamental change in the specialization profile of a country cannot be expected in a relatively short period of time. Nevertheless, this does not exclude possible changes affecting individual sectors as a reaction of the countries to both the development of the internal market and to the increasing international competition in terms of changes in specific sectors. These changes are shown in Table II.7, which shows the sectors that have moved, significantly, between 1993 and 2003, from specialization to lack of specialization ("-") and vice versa ("+"). In 18, out of the 19 countries considered in this Section, there have been significant changes in one or various sectors. Interestingly, the number of sectors that have changed in various countries simultaneously is small. For example, insulated wire appears in six countries, electrical machinery and electronic valves and tubes in five countries, and five more sectors can be added to the previous list if the number of countries is reduced to four: motor cars, other instruments, printing and publishing, radio and TV receivers, and railroad and other transport equipment. In other words, the development of the internal market, the transition process in the four new EU countries, and the increasing competition in international markets, from, but

[15] The value of the correlation coefficients is as follows. AT: 0.91;BE: 0.88;DK: 0.57;ES: 0.80;FI: 0.47;FR: 0.78;DE: 0.89;GR: 0.85;IE: 0.85;IT: 0.85;LU: 0.98;NL: 0.98;PT: 0.92;SE: 0.75;UK: 0.82;CZ: 0.56; HU : 0.55; PL: 0.13; SK: 0.59.

no only, newly industrialized countries, have triggered a process of adaptation in EU economies, which has materialized in changes particularly intensive in the eight sectors mentioned above.

Several qualifications are in order here. First, the sectors considered are only manufacturing activities, as they are more exposed to international trade, and consequently they reflect better the challenges of the internal market and international competition. Thus the changes mentioned take place within the manufacturing sector, although they occur simultaneously with the more general process of steady shift of the economy towards services industries. Secondly, the changes refer to sectoral specialization, and therefore capture changes relative to the EU average. Therefore, changes that may affect a sector in *all* countries in the same direction do not imply changes in the specialization of individual countries and are not reflected here, although they might be reflected in the specialization of the EU, and EU countries, relative to a larger area of reference. Thirdly, the sectors presented in Table II.7 are only those that have changed essentially their status, although other changes have actually taken place, but these are not shown in the table.

Graph II.16: EU-19 sectoral shares (%) in total manufacturing (1993) and change (1993-2003)



Source: calculated from "60-industry database. (Groningen Growth and Development Centre-September 2006)".

As regards the change of specialization patterns over time for ICT and labour skills categories, the results are presented in Table II.8, which shows the value of the specialization index in 2003 for both the seven ICT categories and the four labour skills groups and the absolute change in the index between 1993 and 2003. Focusing on labour skills categories, the change over this period is in many cases minor, relative to what can be observed at sector level, which can be explained by the fact that each category averages the change of several sectors. Nevertheless, important changes can be observed in a few countries and sector categories; the most significant changes are as follows: Ireland, Luxembourg and Poland are examples of a shift from low to high labour skills. Indeed, these three countries have

diminished considerably their specialization in low labour skills, along with a reinforcement of high labour skills sectors. The strongest transformation from low to high labour skills has taken place in Luxembourg, where the specialization in low and low-intermediate labour skills has occurred along with a substantial increase in the specialization in high labour skills. Similar trends, but to a lesser extent, characterize Finland and Hungary, at least as regards the process of de-specialization in low labour skills.

Table II.7: Change in specialization between 1993 and 2003

Country	Sector
Austria	- Insulated wire (-) - Food (-) - Radio and TV receivers (-) - Mineral oil refining (+) - Metal products (+)
Belgium	- Motor cars (-) - Insulated wire (-)
Czech Republic	- Mineral oil refining (-) - Radio and TV receivers (+) - Motor cars (+) - Electrical machinery (+) - Electronic valves and tubes (+)
Denmark	- Other instruments (+) - Electrical machinery (+) - Chemicals (+)
Finland	- Telecom equipment (+)
France	- Clothing (-) - Printing and publishing (-) - Shipbuilding (+) - Metal products (+)
Germany	- Electronic valves and tubes (+)
Greece	- Printing and publishing (+)
Hungary	- Scientific instruments (-) - Other instruments (-) - Leather and footwear (-) - Wood and wood products (-) - Radio and TV receivers (+) - Electrical machinery (+) - Railroad and other transport equipment (+) - Office machinery (+) - Electronic valves and tubes (+) - Motor cars (+)
Ireland	- Railroad and other transport equipment (-)
Italy	- Oil refining (-) - Telecom equipment (-) - Insulated wire (-) - Other instruments (+) - Shipbuilding (+)
Luxembourg	- Printing and publishing (+) - Scientific instruments (+)

Poland	- Oil refining (-) - Radio and TV receivers (+) - Pulp and paper (+) - Printing and publishing (+) - Rubber and plastic (+) - Furniture and other manufacturing (+)
Portugal	- Electronic valves and tubes (-) - Railroad and other transport equipment (+) - Office machinery (+) - Electrical machinery (+)
Slovakia	- Insulated wire (+) - Motor cars (+) - Electrical machinery (+)
Spain	- Office machinery (-) - Insulated wire (+) - Textiles (+) - Rubber and plastic (+)
Sweden	- Telecom equipment (-) - Aircraft and spacecraft (-)
UK	- Insulated wire (-) - Metal products (-) - Electronic valves and tubes (-) - Other instruments (-) - Railroad and other transport equipment (+)
(-) from specialization to lack of specialization **(+)** from lack of specialization to specialization	
Source: calculated from "60-industry database. (Groningen Growth and Development Centre-September 2006)"..	

Table II.8: Specialization index (2003) and change ("2003" minus "1993") – ICT and Labour skills categories

	AT		BE		DK		ES		FI		FR		DE		GR		IE		IT	
Sector	**2003**	**Change**	**2003**	**Change**	**2003**	**Change**	**2003**	**Change**	**2003**	**Change**	**2003**	**Change**	**2003**	**Change**	**2003**	**Change**	**2003**	**Change**	**2003**	**Change**
ICTPM	1.29	0.11	0.70	-0.06	1.00	0.24	0.39	-0.23	4.21	3.19	0.97	0.04	1.39	0.12	0.25	0.03	4.10	1.74	0.76	-0.12
ICTPS	0.84	0.00	1.30	0.13	0.82	-0.07	0.90	0.13	1.20	0.33	0.99	-0.16	0.80	-0.13	0.69	-0.02	1.76	0.63	0.88	-0.05
ICTUM	1.15	0.23	0.65	0.00	1.00	0.01	0.77	0.05	1.17	0.09	0.72	-0.02	1.34	0.05	0.67	-0.13	1.12	0.19	1.15	0.06
ICTUS	1.07	-0.02	1.39	-0.12	0.94	-0.10	0.86	-0.06	0.74	-0.03	0.96	-0.05	1.07	-0.03	0.86	-0.02	1.00	-0.08	1.13	0.01
NICTM	1.08	0.16	1.16	0.02	0.79	0.04	1.02	0.00	1.03	-0.09	0.80	-0.03	1.19	0.10	0.67	-0.04	1.83	0.39	1.04	-0.01
NICTS	0.90	-0.06	0.86	0.04	1.07	-0.02	1.01	0.00	0.98	-0.06	1.12	0.04	0.96	0.05	1.08	0.03	0.60	-0.10	0.94	0.00
NICTO	1.16	0.00	0.78	-0.04	1.10	0.19	1.42	0.10	1.03	-0.02	0.93	-0.05	0.70	-0.20	1.64	0.03	1.17	-0.19	0.95	-0.01
HS	0.82	0.01	1.04	0.00	0.89	-0.02	0.83	-0.03	0.86	0.04	1.07	0.02	0.97	0.01	0.80	-0.03	1.06	0.17	0.92	0.01
HIS	0.86	-0.16	1.10	0.08	1.24	-0.01	0.90	-0.04	1.24	-0.01	1.07	-0.03	1.08	0.07	0.83	0.01	1.01	-0.02	0.93	0.08
LIS	1.26	0.08	0.99	-0.01	1.04	0.02	1.13	0.13	1.17	0.06	0.89	-0.04	0.99	-0.08	1.08	0.14	0.93	0.13	1.06	-0.06
LS	1.18	0.05	0.81	-0.08	1.02	0.04	1.34	-0.02	0.87	-0.17	0.92	0.01	1.04	0.05	1.57	-0.07	0.95	-0.58	1.19	0.03

	LU		NL		PT		SE		UK		CZ		HU		PL		SK	
Sector	**2003**	**Change**	**2003**	**Change**	**2003**	**Change**	**2003**	**Change**	**2003**	**Change**	**2003**	**Change**	**2003**	**Change**	**2003**	**Change**	**2003**	**Change**
ICTPM	0.27	0.03	0.84	-0.35	0.58	0.05	0.93	-0.31	1.03	-0.29	1.28	0.72	1.81	0.73	0.96	0.21	0.95	0.34
ICTPS	1.03	-0.17	1.02	0.23	0.84	0.11	1.15	0.17	1.26	0.16	1.85	0.45	0.98	0.17	0.97	0.29	1.32	0.74
ICTUM	0.31	-0.07	0.76	-0.04	0.71	-0.03	1.06	0.20	0.88	-0.12	1.30	0.43	1.07	0.23	0.96	-0.10	0.92	0.18
ICTUS	2.11	0.66	1.20	0.08	0.98	-0.18	0.87	-0.04	1.14	0.11	1.01	0.03	0.97	-0.06	1.23	0.16	1.10	-0.02
NICTM	0.63	-0.37	0.83	-0.02	1.03	-0.09	1.15	0.22	0.74	-0.24	1.55	0.25	1.28	0.04	1.08	-0.28	1.30	0.11
NICTS	0.76	-0.18	0.94	-0.05	1.00	0.10	1.03	-0.06	0.99	0.01	0.65	-0.06	0.90	0.02	0.79	0.11	0.77	0.04
NICTO	0.71	-0.13	1.17	0.02	1.24	0.01	0.86	-0.09	0.99	0.02	1.36	-0.42	1.08	-0.21	1.42	-0.38	1.38	-0.51
HS	1.31	0.23	0.95	0.01	0.85	-0.01	0.89	-0.06	0.99	0.04	0.70	0.00	0.94	0.06	0.70	0.16	0.79	0.09
HIS	0.82	-0.06	1.15	0.10	1.08	0.12	1.34	0.00	1.07	-0.06	1.13	0.01	0.94	-0.08	0.88	-0.05	1.11	-0.05
LIS	0.80	-0.14	0.97	-0.05	1.01	0.00	1.04	0.04	0.95	0.00	1.20	0.04	1.02	0.08	1.39	0.14	1.14	-0.09
LS	0.65	-0.34	1.05	-0.03	1.33	-0.02	0.91	0.08	1.06	-0.04	1.36	0.01	1.18	-0.16	1.29	-0.46	1.23	0.01

ICTPM: ICT producing manufacturing; ICTPS: ICT producing services; ICTUM: ICT using manufacturing; ICTUS: ICT using services; NICTM: non-ICT manufacturing

NICTS: non-IT services; NICTO: non-ICT other;

HS: high labour skills; HIS: high-intermediate labour skills; LIS: low-intermediate labour skills; LS: low labour skills.

Source: own calculations.

II.5 Value added by enterprise size category

The present Section presents an indicator to describe the structure of sectors in the EU, which is of interest to understand sectoral performance, to analyze competitiveness, and for policy analysis. The distribution of economic activity, namely value added, by enterprise-size category reflects certain characteristics of sectors and, simultaneously, determines performance and competitiveness. Sectoral technology (e.g. economies of scale) and market size are, among others, explanatory factors of the enterprise-size structure of the sector, which, in turn, determines market power and sectoral performance and competitiveness. Furthermore, policy measures are often designed to target specific groups of enterprises, particularly small and medium enterprises. It is clear that the strength and vulnerability of sectors and enterprises to certain market shocks is affected by the size of enterprises, and also that the latter plays a crucial role in the development of new activities, innovation, and development of new products. For these reasons, among others, it is important to bear in mind the size of enterprises in sectoral analysis, and to incorporate it into the formulation of industrial policy.

The distribution of sectoral value added by enterprise size is shown in Graph II.17[16]. To facilitate the interpretation of the information, sectors in the graph are ordered according to the distribution of value added by size classes, in the following manner: sectors on the left of the graph are those with highest share of large enterprises in total value added of the sector. As we move from left to right the weight of large enterprises becomes smaller, and the share of small and medium-size enterprises increases progressively. The distribution of value added in manufacturing as a whole is presented on the right side of the graph.

The graph shows the high variation in the shape of the distribution across sectors. Nine sectors, from aircraft and spacecraft through telecommunications equipment, exhibit a high degree of concentration, with at least 80% of value added generated by large enterprises. SMEs play a negligible role in these sectors, which are characterized, among other by sizeable economies of scale. All these sectors, with the exception of communications and air transport, are manufacturing, extractive industries and utilities. As a matter of fact, all sectors with dominance of large enterprises (with a share of 45%) with the exception of the already mentioned communications and air transport are manufacturing, extractive or utilities.

The sectors located on the right half of the graph exhibit a different pattern, which is based on the predominance of the various categories of small and medium enterprises. All services

[16] From 2002 on data availability in this field has changed in two respects. The size categories are now restricted to five, and all enterprises above 250 persons employed are grouped in one single category. As regards country coverage, data are not available for EU-25, or for EU-15, and data availability varies largely across sectors. The approach taken to construct Graph II.17 is to use data for 2003 wherever data coverage is considered sufficient. In some cases this was not the case and data for EU-25 and 2001 are used. The detail of data availability and the countries included in the calculation of the distribution of value added for each sector is presented in http://europa_eu.staging.entr.cec.eu.int/enterprise/enterprise_policy/competitiveness/2_Indicators/Indicators%20of%20the%20competitiveness.htm. Broadly speaking the distribution for 2001 (EU-15) and 2003 (countries available) are very similar. It was presented, for EU-15 and 2001 in European Commission (2005), EU sectoral competitiveness indicators, OPOCE. Although this indicator is relatively stable, and substantial changes cannot be expected, at least at this relatively high level of sectoral aggregation, it is worth calculating and presenting the indicator using the new data set. The sectoral breakdown in Graph II.17 corresponds to list C (see Annex VI).

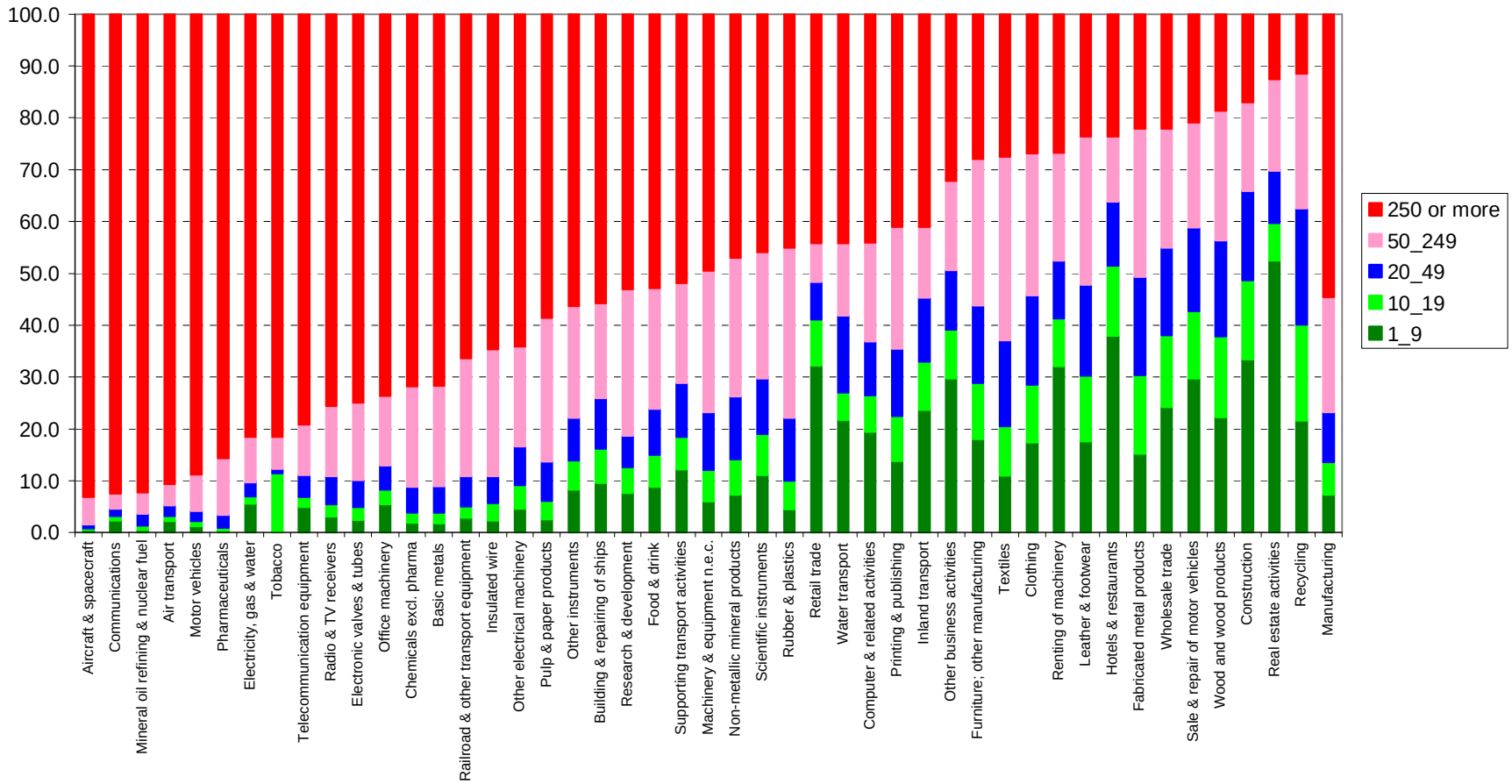
activities[17], with the exception of the two mentioned above are in this area of the graph, along with a series of manufacturing sectors. In some cases, like hotels and catering, renting of machinery, construction, and woods and wood products, the largest share corresponds to the smallest enterprises (less than 10 persons employed). The manufacturing sectors with the highest share of small and medium enterprises are wood and wood products, metal products, leather and footwear, clothing, furniture and other manufacturing, and textiles.

Beyond the split of sectors between those dominated by large enterprises and by small enterprises respectively, there are different categories of sectors, with a mixture of various size classes and a more uniform distribution of value added. Two cases are worth mentioning. First, sectors for which the distribution of value added across the five size categories is relatively uniform: clothing, leather and footwear, wood and wood products, and other manufacturing and recycling are the sectors in this group. A second group is formed by sectors which combine significant shares of the largest and smallest enterprises: retail trade, inland transport and water transport, and some business services (renting of machinery, computer and related activities, and other business activities).

Although a detailed analysis of these issues is beyond the scope of this publication, it is worth mentioning that enterprises in different size categories (particularly those in large and small categories) may mask economic activities of substantially different nature. These enterprises may serve different markets (local, regional, national and international), use different technology (capital or labour intensive), produce products of different nature (large scale production vs. costumer-tailored products), and have different forms of organization, management, and financial structure. This emphasizes the interest of looking at enterprises in various size categories as substantially distinct entities that require particular attention in terms of analysis, diagnosis, and policy design.

[17] Due to lack of data, financial services are not included in the graph.

Graph II.17: Distribution of value added by enterprise size (%) (2001/2003)



Source: calculated from Eurostat's SBS data.

II.6 Cost structure of EU sectors

This Section looks into the cost structure of EU industry. More precisely the objective is to measure the share of the various intermediate inputs (raw materials, intermediate products, and various categories of services), along with the cost of labour in the total value of the production of each sector.

The main results are presented in Table II.9, in which the total cost is broken down into 7 items, from primary products to public services and labour[18]. A more detailed version of this Table is presented in the web site

(http://europa_eu.staging.entr.cec.eu.int/enterprise/enterprise_policy/competitiveness/2_Indicators/Indicators%20of%20the%20competitiveness.htm), where each category of inputs is broken down into a more detailed classification of products. However, some stylised facts regarding the cost structure of sectors are captured in Table II.9.

The Table shows the value of the inputs coming from the various sectors (columns) of the economy used in the production process of each of the industries (rows). According to their sectoral origin inputs are divided into six main categories:

a) primary, which includes agriculture, forestry and fishing, and mining;

b) manufacturing, including all goods produced by manufacturing sectors;

c) utilities, which encompasses electricity, gas and water. Secondary raw materials are also included in this group;

d) construction

e) market services, that is, services produced by a large set of sectors, from trade through other market services; and

f) public services.

A complete list of the goods and services included under each category of inputs is in the detailed Tables presented in the annex. In addition to the intermediate inputs mentioned, the column "labour" covers the cost of labour used in the production process. "Other" is presented as a residual, which basically refers to gross operating margin, or the *rest* to reach the total value of production.

Therefore the columns of the Table correspond to the *cost* items into which the value of production is broken down. However, they can also be looked at as the contribution of the other sectors to the production process of a given industry. This perspective emphasizes the role of, say, services, as a factor which contributes to the production of manufacturing goods, or of other services, and the same applies to manufacturing goods, which are necessary for the production of, for example, the various categories of services. Obviously, the Table also presents the contribution of labour. In all cases the Table measures *current* expenditure. The

[18] The Table refers to an aggregate of 18 EU countries: Austria, Slovenia, Slovak Republic, Malta, Hungary, United Kingdom, Netherlands, Portugal, Spain, Sweden, Finland, France, Ireland, Belgium, Denmark, Germany, Estonia, and Greece.

value of investment carried out by the sectors is not included, although depreciation is a component of *other*.

The transforming and *assembling* nature of manufacturing sectors is evident from the high share of inputs from other manufacturing sectors, which reaches the maximum value in the case or motor vehicles, a sector in which 65.6% of the total value of production corresponds to inputs coming from other manufacturing sectors. Similar high percentages can be found in other sectors producing capital equipment, such as office machinery and computers, other transport equipment, machinery, radio, TV and communications equipment. Needles to say, the role of the primary sectors as supplier of inputs is reflected in the case of industries like food and beverages, tobacco, refined petroleum, and non-metallic mineral products. Some energy intensive sectors see this characteristic reflected in the relatively higher share of inputs included in the group utilities: examples are basic metals, pulp and paper, and non-metallic mineral products, although in the case of the former secondary raw materials (included in utilities) is also significant.

Table II.9: Cost structure of EU sectors (% of production value) (2001)

Sector	Inputs								
	Primary	Manuf.	Utilities	Constructions	Market services	Public services	Labour	Other	Total
Food products and beverages	27,1	30,2	1,5	0,3	13,2	0,8	15,5	11,5	100
Tobacco products	15,0	19,7	0,5	0,2	19,2	2,0	14,5	29,0	100
Textiles	3,3	48,2	2,5	0,3	10,5	0,8	23,8	10,5	100
Wearing apparel	0,4	55,7	1,0	0,2	9,5	0,6	23,6	9,0	100
Leather	0,8	57,4	0,9	0,2	7,4	0,6	23,1	9,7	100
Wood and wood products	12,6	40,8	1,6	0,4	10,5	0,9	20,8	12,4	100
pulp, paper and paper products	5,0	43,6	3,9	0,4	11,8	1,3	18,5	15,5	100
Publishing, printing	0,0	36,3	0,8	0,2	16,7	4,2	26,5	15,1	100
Refined petroleum and nuclear fuels	57,9	15,2	1,1	1,0	7,5	0,5	5,2	11,5	100
Chemicals and chemical products	2,0	43,5	2,5	0,5	17,6	1,4	18,0	14,7	100
Rubber and plastic products	1,0	45,5	2,0	0,3	12,9	0,8	26,6	10,9	100
Non-metallic mineral products	10,2	28,7	3,8	0,8	14,8	1,0	25,0	15,6	100
Basic metals	7,0	49,7	4,2	0,7	9,4	1,0	17,4	10,6	100
Fabricated metal products	0,3	45,8	1,6	0,4	10,0	1,1	29,8	11,1	100
Machinery and equipment n.e.c.	0,1	46,7	0,9	0,3	13,7	0,9	28,3	9,2	100
Office machinery and computers	0,0	64,4	0,4	0,2	14,5	0,7	13,2	6,6	100
Electrical machinery and apparatus n.e.c.	0,2	50,7	0,9	0,3	13,4	0,7	26,4	7,6	100
Radio, TV and communication equipment	0,0	54,5	0,7	0,3	19,1	1,0	19,3	5,1	100
Scientific and other instruments	0,1	39,1	0,7	0,3	15,4	0,9	30,7	12,8	100
Motor vehicles	0,1	65,6	0,7	0,2	9,9	0,5	16,6	6,4	100
Other transport	0,1	58,0	0,8	0,4	10,8	1,1	21,8	7,1	100

equipment									
Furniture; manufacturing n.e.c.	1,2	45,8	1,0	0,3	12,4	0,8	27,6	10,9	100
Recycling	0,2	42,7	1,6	0,6	13,6	1,5	13,5	26,5	100
Electricity, gas	16,6	10,2	19,0	2,2	9,0	2,0	15,2	25,9	100
Water	0,3	9,7	6,7	4,5	14,8	2,4	22,9	38,8	100
Construction	1,7	29,4	0,2	15,2	12,7	0,5	24,2	16,0	100
Sale, and repair of motor vehicles	0,1	19,1	0,9	0,5	19,9	0,9	36,6	22,0	100
Wholesale trade	0,4	9,9	0,8	0,8	32,9	1,5	33,6	19,9	100
Retail trade	0,5	7,6	1,4	0,9	23,7	1,6	36,5	27,7	100
Hotels and restaurants	2,4	28,9	1,7	0,7	11,8	1,8	28,2	24,5	100
Land transport	0,8	16,5	1,3	0,7	25,7	1,4	35,3	18,3	100
Water transport	0,3	12,9	0,2	0,2	54,9	0,7	12,8	18,0	100
Air transport	0,0	21,1	0,3	0,2	38,8	2,0	21,0	16,6	100
Auxiliary transport activities	0,2	5,8	0,6	1,7	49,5	1,6	24,2	16,3	100
Post and telecommunications	0,0	10,9	0,6	1,3	29,6	1,2	27,1	29,2	100
Financial intermediation	0,0	3,7	0,5	1,0	39,1	1,4	33,4	20,9	100
Insurance and pension funding	0,1	3,7	0,4	1,9	61,8	1,6	22,7	7,8	100
Auxiliary to financial intermediation	0,0	4,3	0,6	0,4	43,4	0,7	25,4	25,2	100
Real estate activities	0,1	1,4	0,5	7,1	9,7	1,2	5,0	74,8	100
Renting of machinery	0,0	5,0	0,4	0,2	29,2	0,9	14,2	50,1	100
Computer and related activities	0,0	6,2	0,4	0,2	32,4	1,6	37,6	21,6	100
Research and development	0,1	16,0	0,9	1,6	23,2	4,0	45,3	9,0	100
(*) Inputs into the production process of the sectors in the first column.									
Source: calculated from Eurostat's Input-Output Tables.									

Market services also play an important role in the production process of manufacturing sectors. For example, the share of market services in the total value of production of the chemical industry amounts to 17.6%, and in the case of printing and publishing the share of market services is 16.7%. Among market services the most important input to manufacturing activities is other business services, which includes a variety of services to enterprises. Besides other business services, other service activities play also an important role. Some random examples are as follows: computer and related services for manufacture of office machinery and computers; research and developments services for manufacture of radio, TV and telecommunications equipment and chemical industry; transport for manufacture of other non-metallic mineral products; and post and telecommunications services for the printing and publishing sector.

As regards the sectors producing market services, the most significant intermediate inputs come from market services themselves. The high percentage of manufacturing inputs for manufacturing sectors and of market services for market services is explained in many cases by intra-branch consumption, which is in most cases particularly high. However, this is less the case in market services, for which inputs from, for example, other business services are, in some cases, higher than the intra-branch consumption. For example the high percentage of

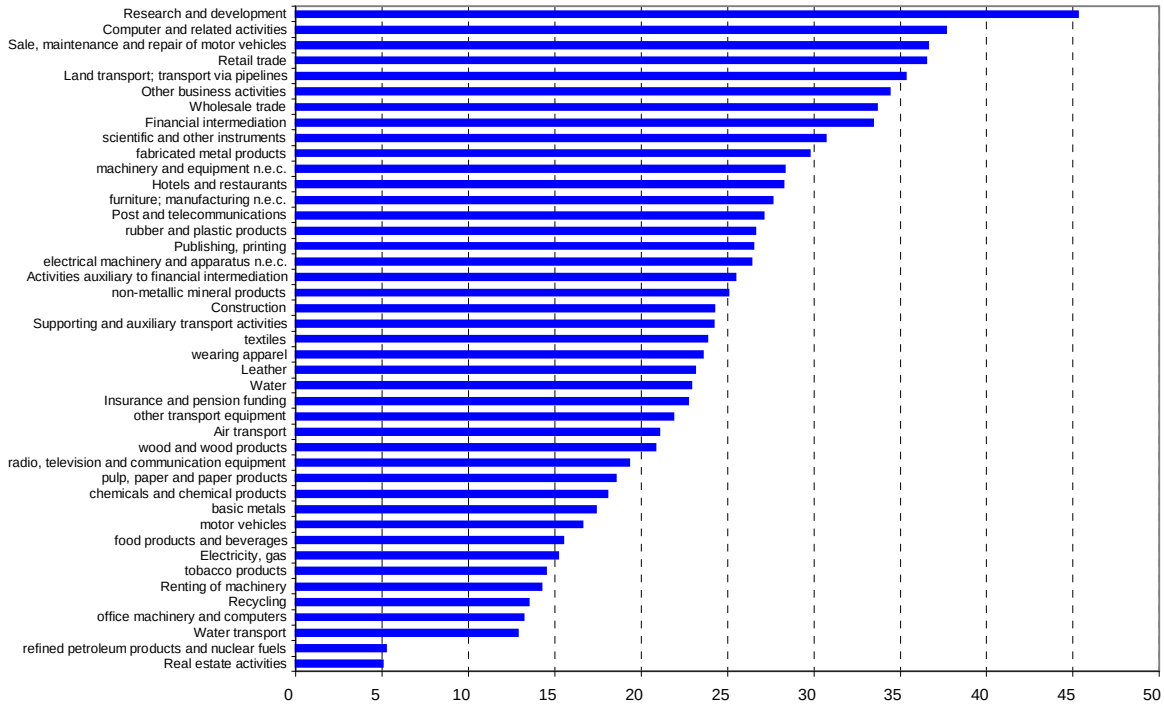
market services as input to insurance and pension funding is explained basically by the intensive use in this sector of other business services. All in all, it is important to underline the role of market services to ensure the transformation, productivity improvement, and competitiveness of, not only manufacturing sectors, but also of the services activities themselves.

So far we have referred to intermediate inputs, that is, inputs coming from other sectors of the economy. The share of labour in the value of production also varies significantly across sectors. With a few exceptions the percentage accounted for by labour compensation is higher in services than in manufacturing. As a matter of fact, this share reflects, partially, the labour intensity (encompassing both labour inputs and human capital, reflected in the relative level of wages and salaries) in the various activities, relative to other factors of production, including intermediate inputs[19]. Graph II.18 presents the ranking of sectors according to the share of labour compensation in total production. The first eight sectors are services activities, with a share of labour greater than 30%. A number of capital intensive sectors can be found at the bottom of the graph: for example, real estate activities, water transport, refined petroleum, motor vehicles, and electricity and gas. It is worth noting that the labour intensity as reflected here is not relative to capital, as intermediate inputs are also included in the calculation. This contributes to explain the presence of sectors like office machinery among the sectors at the bottom of the graph. Indeed, this sector is characterized, as was indicated above, by an important share of intermediate inputs, with a correspondingly lower share of labour in total production[20].

[19] To the extent that the remuneration of capital is included in *other*, which is calculated as a rest, no definitive conclusions regarding factor intensity can be drawn from this table. Indeed, the data refer to a single year, and the benefits of sectors could be affected by the particular year for which the calculation is made.

[20] An indicator of capital intensity based on investment per person is presented in European Commission (2005), EU sectoral competitiveness indicators, OPOCE, Section II.4.

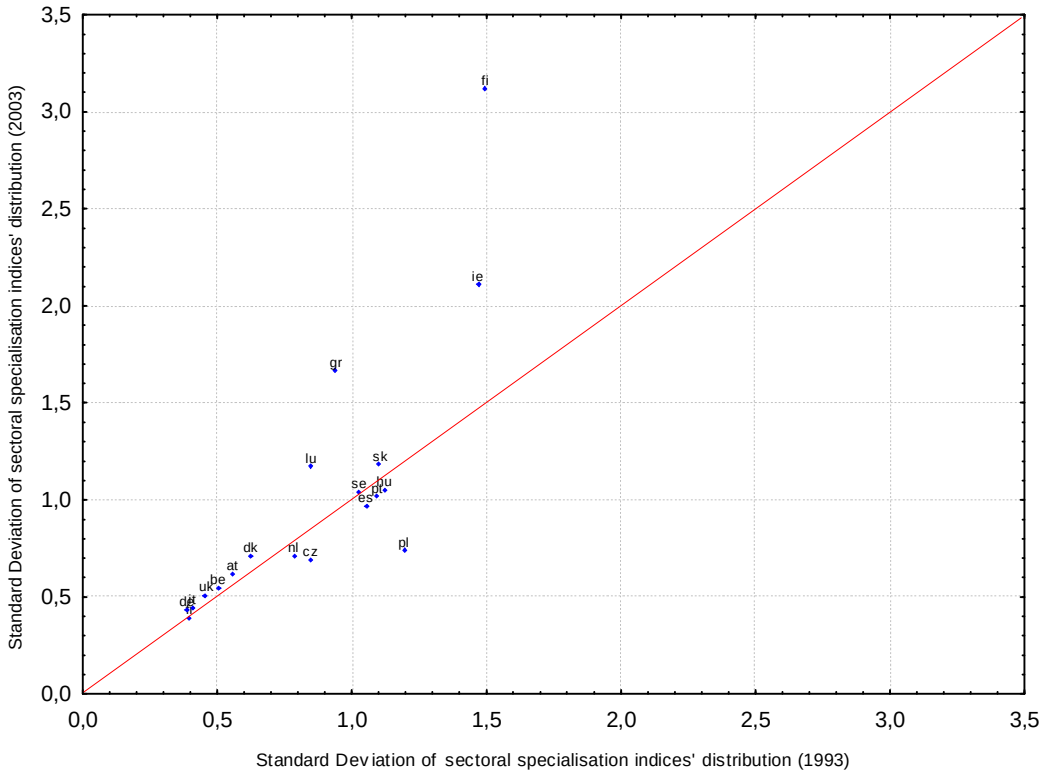
Graph II.18 Share of labour in total production (2001)



Source: calculated from Eurostat's Input-Output Tables.

II.7 Annexes

Graph II.19: Sectoral specialization index (2003 vs. 1993) (all sectors included)



Source: calculated from "60-industry database. (Groningen Growth and Development Centre-September 2006)".

III Sectoral growth

III.1 Introduction

The present chapter presents indicators to measure sectoral growth in the EU. The chapter is organized as follows. Section III.2 presents EU manufacturing growth rates relative to the World. Section III.3 extends the analysis, first, by looking at both manufacturing and services and at more indicators -value added, employment and labour productivity-. Secondly, Section III.3 provides data on growth (output and employment) and competitiveness indicators (productivity and unit labour cost). Thirdly, growth in each EU Member State is decomposed into three components: the influence of growth in the EU as a whole, of the industry-mix in the country, and of the competitiveness of individual sectors in the country in comparison to the EU average. Finally, Section III.3 looks at the cyclical patterns in manufacturing sectors, which provides a framework for the analysis of sectoral growth and short-term developments. Section III.4 discusses the role for growth of gross fixed capital formation, human capital, and two indicators of technology: R&D expenditure and the number of patents. Information and indicators on the industrial structure and growth in China, as well as graphs and tables which complement the information of the chapter are presented in the web site: http://europa_eu.staging.entr.cec.eu.int/enterprise/enterprise_policy/competitiveness/2_Indicators/Indicators%20of%20the%20competitiveness.htm.

III.2 EU and world sectoral trends

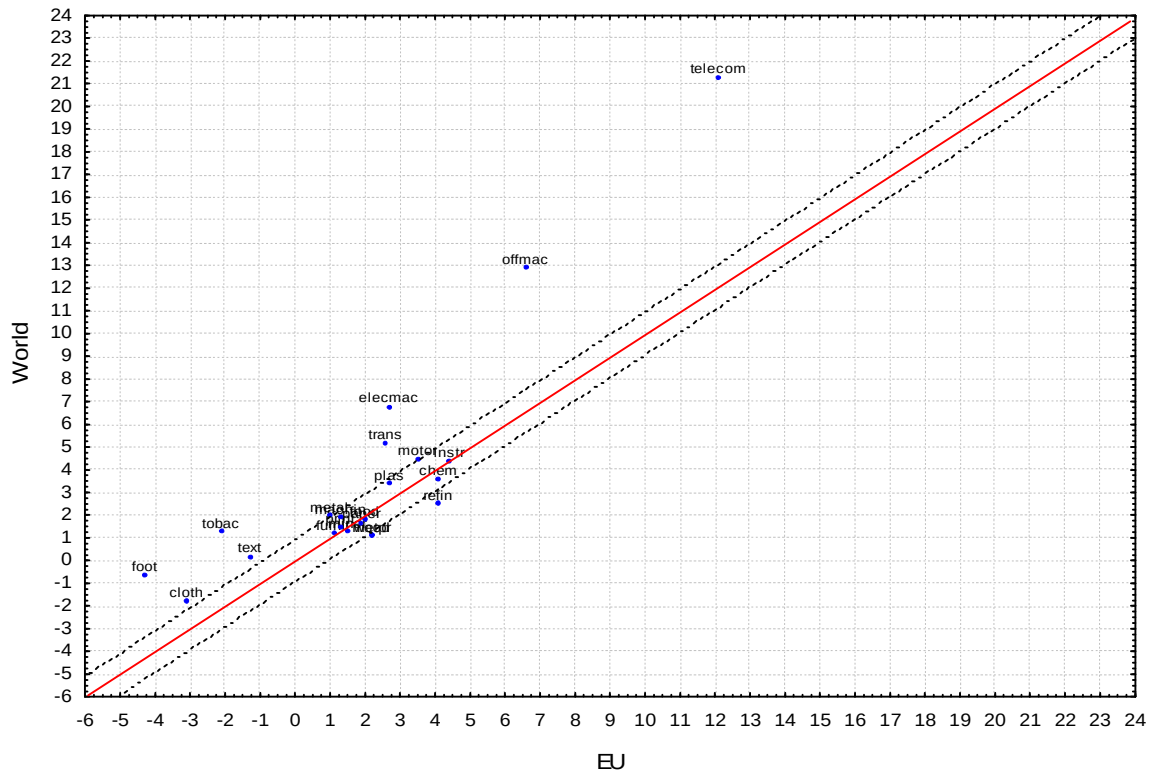
The objective of this section is to present an overview of the World sectoral growth in manufacturing sectors and the relative position of the EU in the international context. This is done by presenting the average annual growth rates of valued added in constant prices over 1995-2005 in the EU and the World, calculated from UNIDO statistical data[21].

In general, growth rates in manufacturing in the EU and in the world are highly correlated (Graph III.1)[22]. However, growth rates in EU manufacturing tend to be below the world average. The gap is the largest in the two ICT sectors which is both areas displayed the highest growth rates: radio and TV equipment, and office machinery, and in electrical machinery and other transport equipment. The sectors in which the EU exhibited higher growth rates are chemicals, mineral oil refining and nuclear fuel, food and drinks, pulp and paper products, non-metallic mineral products, wood and wood products, and fabricated metal products; however, in most of these sectors the EU lead is relatively small. Three manufacturing sectors exhibited negative growth rates in the EU: leather and footwear, clothing, and textiles. Although growth in these sectors was stagnating or negative also in the world as a whole, growth rates in the EU are significantly lower.

[21] The list of countries included in the World aggregate is presented in http://europa_eu.staging.entr.cec.eu.int/enterprise/enterprise_policy/competitiveness/2_Indicators/Indicators%20of%20the%20competitiveness.htm

[22] The correlation coefficient between the growth rates series in EU and World is 0.87; however, part of this is explained by the fact the EU is included also in the World aggregate.

Graph III.1: EU and World average annual growth rates by manufacturing sector (%) (1995-2005)

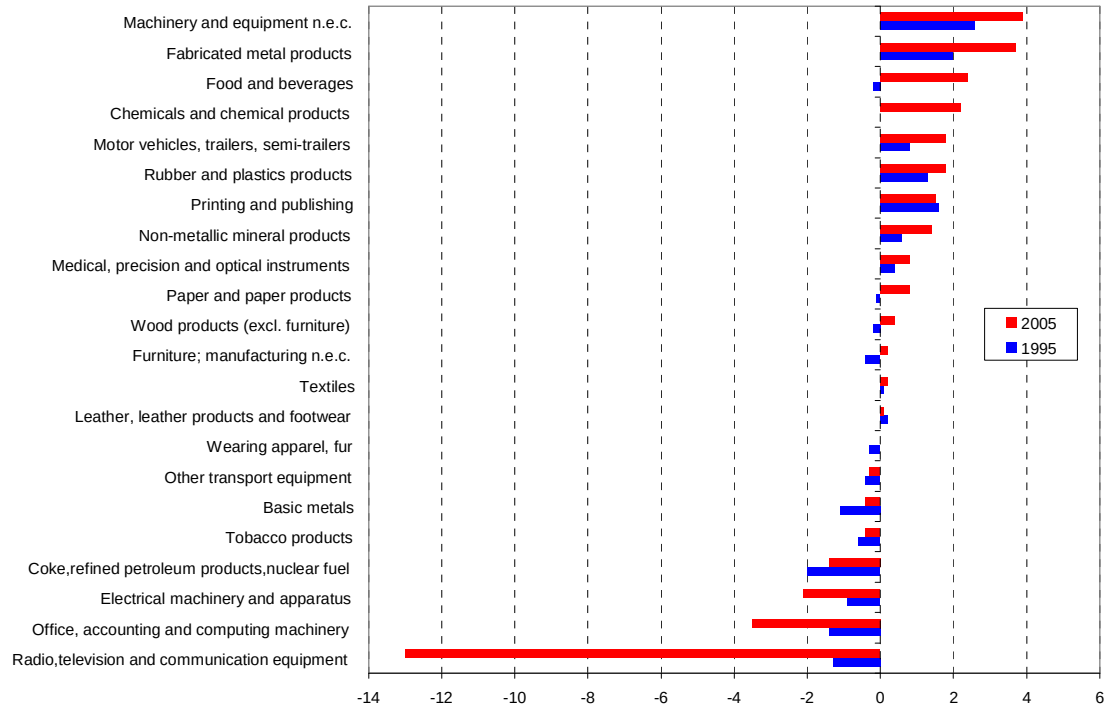


Note: average annual growth rates of valued added in constant prices.

Source: UNIDO and own calculations for EU weighted average.

Graph III.2 compares the sectoral specialization of the EU relative to the world average, in 1995 and 2005. The EU is highly specialized in machinery and equipment, fabricated metal products, food and beverages and chemicals. The share of these sectors in manufacturing is substantially higher than in the World as a whole. The EU exhibits significantly lower shares in the manufacturing of radio and TV equipment, office machinery and computers and electrical machinery. Between 1995 and 2005, the general trend has been towards a further specialization in the EU relative to the World: the sectors with higher (lower) weight in the EU in 1995 have increased (decreased) their share relative to the World.

Graph III.2: EU manufacturing specialisation: sector shares (%) in manufacturing value added, EU minus World



Source: calculated with data from UNIDO and AMECO database.

Table III.1 compares growth rates in EU manufacturing relative to the world by grouping the sectors by technology level[23]. In both areas, sectoral growth rates tend to increase with the level of technology. The slower growth performance of the EU is particularly evident in the high and medium-high technology sectors, with the exception of chemicals where EU growth exceeded the world average.

Table III.1: Average annual growth rates (%) in manufacturing value added in the World and the EU, by technology group (1992-2005)

Technology group	Sector	World	EU
High & Medium-High	**Chemicals and chemical products**	3.6	4.1
	Machinery and equipment n.e.c.	1.9	1.3
	Office, accounting and computing machinery	12.9	6.6
	Electrical machinery and apparatus	6.8	2.7
	Radio, television and communication equipment	21.3	12.1
	Medical, precision and optical instruments	4.4	4.4
	Motor vehicles, trailers, semi-trailers	4.5	3.5

23 These categories correspond to the OECD classification of sectors. However, the upper (high and medium-high) categories have been merged, since the available data are not detailed enough to present these two categories separately.

	Other transport equipment	5.2	2.6
Medium-Low	Coke, refined petroleum products, nuclear fuel	2.5	4.1
	Rubber and plastics products	3.4	2.7
	Non-metallic mineral products	1.3	1.5
	Basic metals	2.0	1.0
	Fabricated metal products	1.1	2.2
Low	**Food and beverages**	1.8	2.0
	Tobacco products	1.3	-2.1
	Textiles	0.2	-1.3
	Wearing apparel, fur	-1.8	-3.1
	Leather, leather products and footwear	-0.6	-4.3
	Wood products (excl. furniture)	1.1	2.2
	Paper and paper products	1.7	1.9
	Printing and publishing	1.5	1.3
	Furniture; manufacturing n.e.c.	1.2	1.1
Source: UNIDO; for the EU average: own calculations.			
Note: EU-25 growth has been calculated as the weighted average of the growth rates in the Member States, using fixed weights for 2000.			

The sectors in which the EU is specialized are highlighted in Table III.1. EU's specialization profile is mixed: it is specialized in the medium-low and in the higher technology categories. Data on export specialisation in Chapter V which split the upper technology category into high and medium-high technology categories, show that the EU is specialized in medium-high technology sectors, and not specialized in high technology sectors. In terms of growth performance, the EU is specialized in sectors with medium-high (e.g. motor vehicle, chemicals and rubber and plastics) and medium-low growth rates (fabricated metal products, non-metallic mineral products and printing and publishing) in world demand. In contrast, the share in the EU of the most dynamic sectors (office, accounting and computing equipment and radio, television and communication equipment) is below the world average. Low technology sectors are the least dynamic in the EU as well as the world; in this category, several EU sectors exhibit negative growth rates.

III.3 Sectoral growth in the EU

III.3.1 EU performance in manufacturing and services against seven industrialised countries

The preceding Section III.2 covered manufacturing only. The present Section looks at both manufacturing and market services, and provides information on growth rates of value added, employment and labour productivity for two areas: the EU and a group of seven other

industrialized countries (from now on "World-7"[24]). Due to the absence of important producers of manufactured goods like China, the data should be seen as a comparison of EU performance relative to other industrialised competitors.

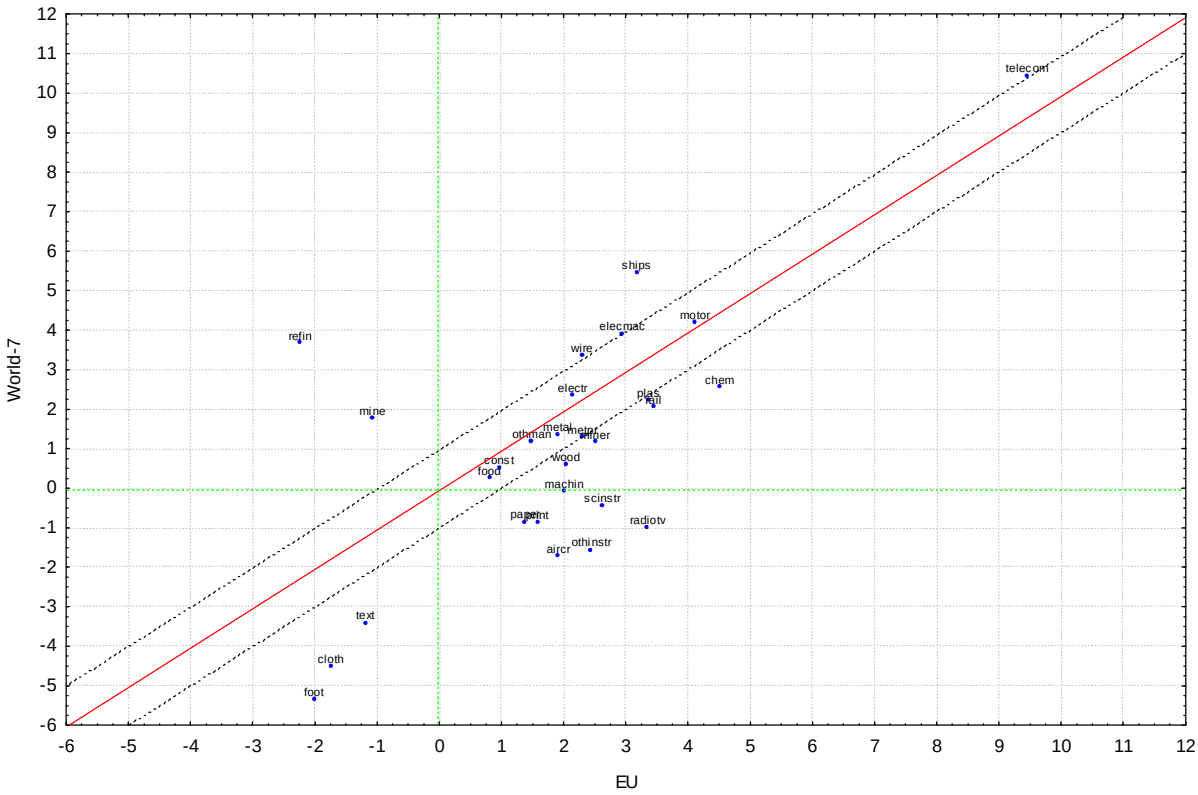
The evidence is presented in the form of scatter plots, in which the performance of the EU is compared to World-7. The diagonal is the locus of equal annual growth rates, over 1993-2003, in EU and World-7. Points on the right (left) of the diagonal represent sectors with higher (lower) growth rate in the EU than in World-7[25].

The preceding section showed that growth in EU manufacturing has in general remained below the growth rates in the rest of the world. The comparison in the present Section with other industrialised countries gives a different picture of EU's relative performance: growth in most EU manufacturing sectors has been higher than in the group of seven non-EU industrialised countries (Graph III.3). Among other possible factors, like the different period of time covered, the presence of China and other emerging countries in the World aggregate used in Section III.2 would explain the different performance of the EU relative to the World and to other industrialized countries. The most significant exceptions are mining and oil refining where the seven industrialised countries registered positive growth rates, while growth was negative in the EU.

[24] The data source is "Groningen Growth and Development Centre, 60-Industry Database, October 2005, http://www.ggdc.net". Data for World-7 are for 1993-2002. The acronym of sectors in the scatterplot can be found in Table VI.1 in Chapter VI "Annex: statistical nomenclatures". The sectors considered in this section correspond to those in list C of the Annex. The EU" refers to EU-19. Missing countries are the three Baltic States, Slovenia, Malta and Cyprus. As regards the rest of the World, this is a group of 7 industrialized countries, namely, Australia, Canada, USA, Japan, Korea, Taiwan, and Norway. EU-19 and World-7 aggregated growth rates are calculated as a chained weighted average of the respective countries' growth rates. To calculate country weights for each sector the EU-19 and World-7 aggregate was calculated at international prices, using 1995 fixed PPS for GDP. Furthermore, for the EU, "activities auxiliary to financial intermediation" does not include Czech Republic and Research and Developments does not include Poland. Shipbuilding does not include the Czech Republic and Slovakia. Aircraft excludes Slovakia. Water transport excludes Poland.

[25] Two ICT sectors are outliers in the manufacturing graphs. To make the graphs readable these two sectors are not represented; see the relative position of these two sectors in http://europa_eu.staging.entr.cec.eu.int/enterprise/enterprise_policy/competitiveness/2_Indicators/Indicators%20of%20the%20competitiveness.htm.

Graph III.3: Manufacturing value added, annual growth rate (%) (1993-2003)



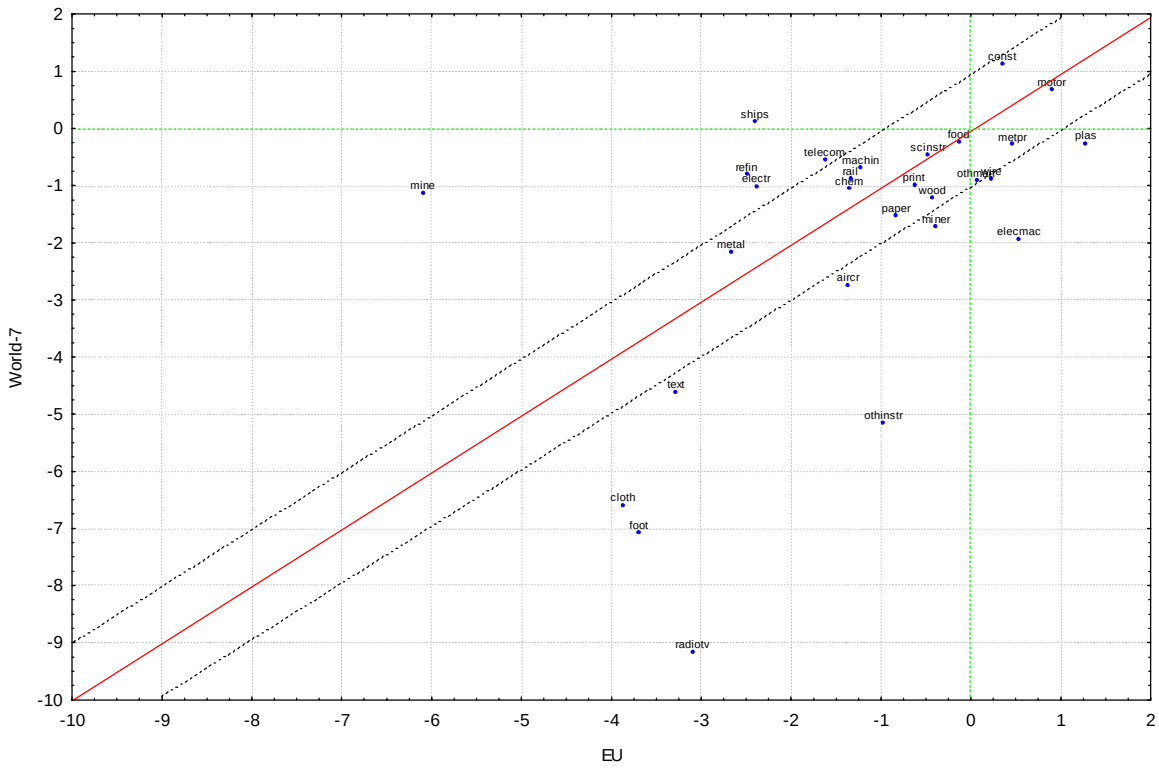
Source: calculated from "Groningen Growth and Development Centre, 60-Industry Database, October 2005, http://www.ggdc.net".

Note: average annual growth rates in value added in constant prices. See also footnotes 24 and 25.

As regards employment, most manufacturing sectors exhibited negative growth rates over the period 1993-2003 in the EU as well as the other seven industrialised countries (Graph III.4). Exceptions are construction and motor vehicles where employment increased in the two areas. In the EU, employment increased also in the manufacturing of rubber and plastics, metal products, insulated wire, electrical machinery, and other manufacturing (including furniture).

In general, the decline in employment in manufacturing takes place in a context of substantial productivity gains and does not involve a decrease in value added. Labour productivity in manufacturing has increased at average annual rates which in most cases range between 2% and 6% in the EU (nearly 8% in shipbuilding and more than 10% in telecommunications equipment, see Graph III.5).

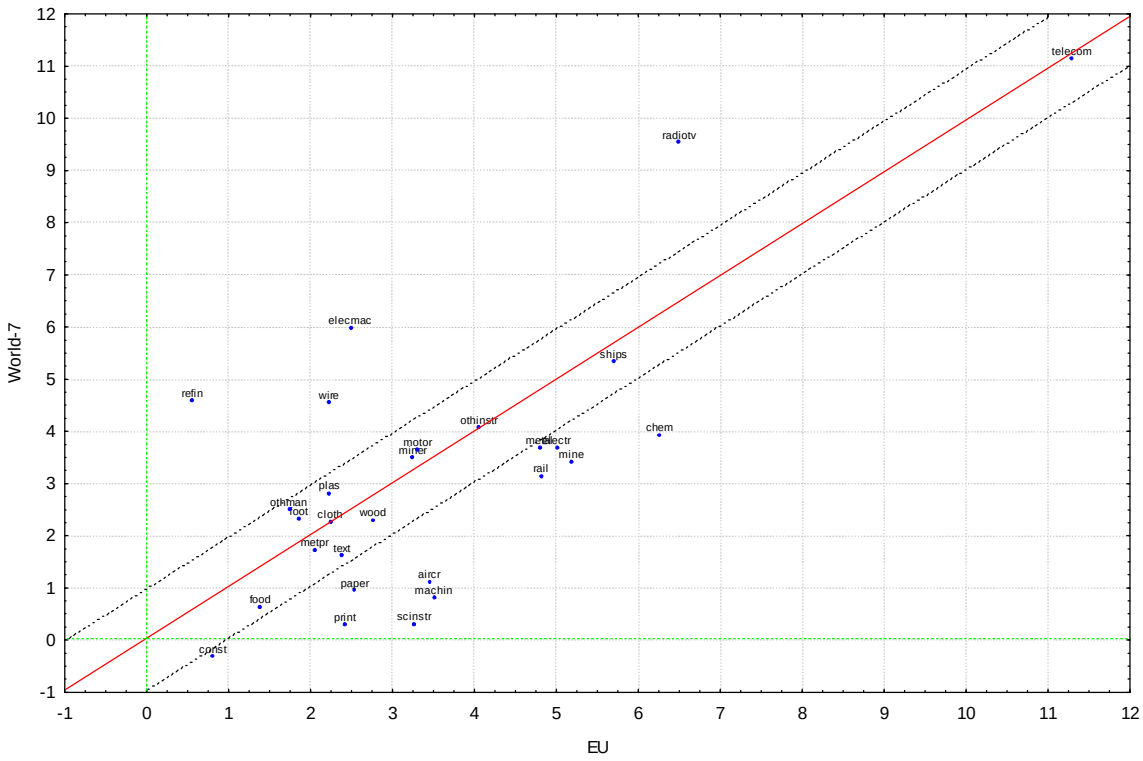
Graph III.4: Manufacturing employment, annual growth rate (%) (1993-2003)



Source: calculated from "Groningen Growth and Development Centre, 60-Industry Database, October 2005, http://www.ggdc.net".

Note: average annual growth rates in employment. See also footnotes 24 and 25.

Graph III.5: Manufacturing labour productivity, annual growth rate (%) (1993-2003)



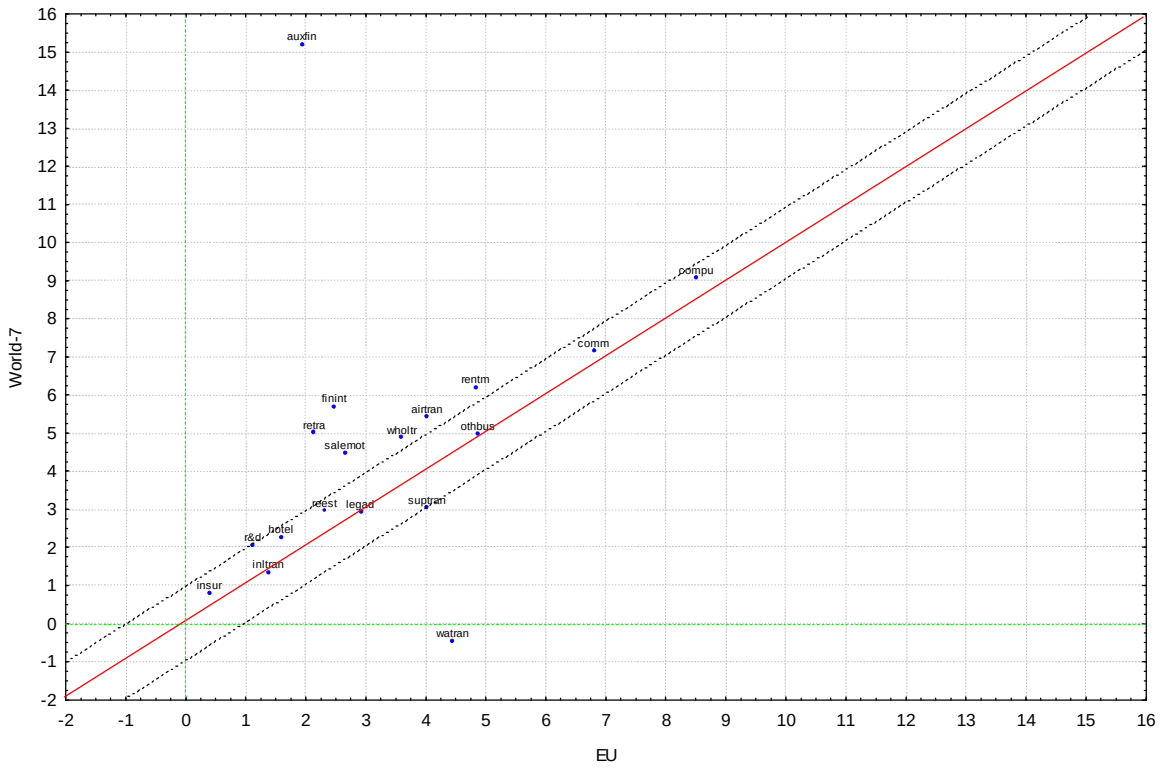
Note: average annual growth rates in productivity per hour worked. See also footnotes 24 and 25.

Source: calculated from "Groningen Growth and Development Centre, 60-Industry Database, October 2005, http://www.ggdc.net".

The previous graphs on manufacturing gave a reasonably positive view of EU competitiveness in comparison to other industrialised countries: in the majority of manufacturing sectors, EU growth rates are similar to, or higher, than in other industrialised countries. A large number of manufacturing sectors – however with important exceptions – recorded higher productivity growth rates. In the following, EU performance in market services will be looked at, and the data will give a much less positive view of EU competitiveness, with in general lower growth rates, linked with weaker productivity performance. .Nearly all market services industries in the EU grow, on average, at lower rates than in the other seven industrialised countries, with the only noticeable exception of water transport, and to a lesser extent transport supporting activities (Graph III.6).

Two particularly dynamic sectors in both the EU and the other industrialised countries are computer and related activities, and communications, with growth rates of 7% and over 8% respectively in both areas. Also other business services exhibit high growth, averaging 4.5% annually in both areas. This underlines the importance of services which support the development of enterprises in all sectors: software development and other computer related activities, communications (which, among a large range of activities includes Internet services), and business services in general.

Graph III.6: Market services value added, annual growth rate (%) (1993-2003)

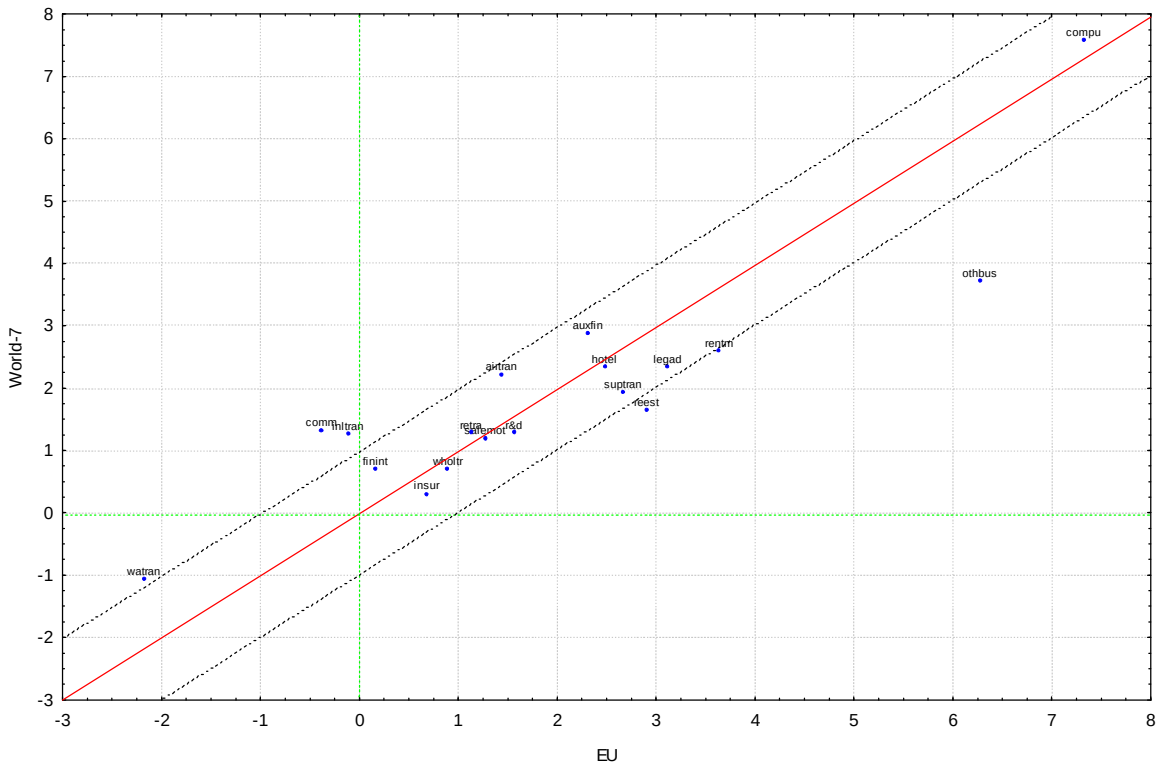


Source: calculated "Groningen Growth and Development Centre, 60-Industry Database, October 2005, http://www.ggdc.net".

Note: average annual growth rates in value added in constant prices. See also footnote 24.

Employment growth in market services has been strong in both the EU and the other industrialised countries (Graph III.7). Employment in computer and related activities, and in other business services, two sectors mentioned among those with the highest growth rates in value added, are also the two with the highest growth in employment. Communications has gone through a process of re-organization and increase in labour productivity, at least in the EU, which resulted in declining employment, in contrast to the other industrialised countries. As regards the relative performance of the two areas, the picture is mixed. Other business services are particularly dynamic in creating jobs in the EU, with an employment growth rate of about 6% (less than 4% in World-7).I Inland transport recorded negative growth in the EU and positive in World-7.

Graph III.7: Market services employment, annual growth rate (%) (1993-2003)

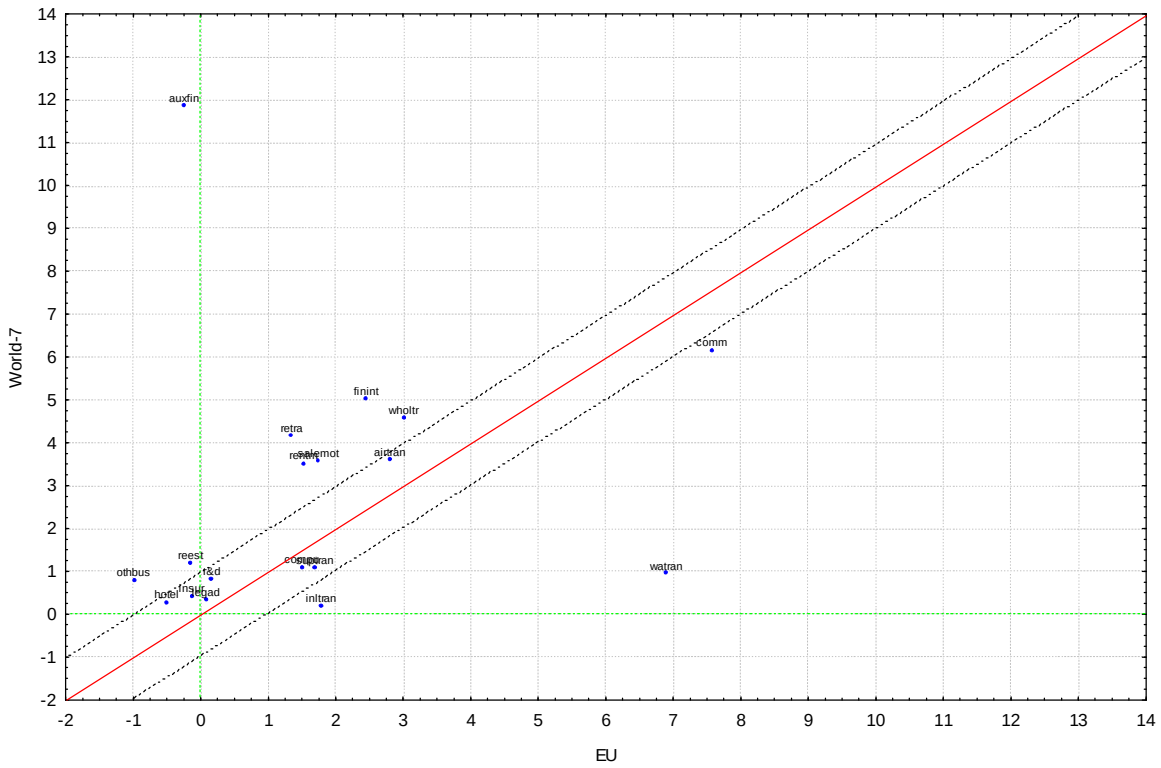


Source: calculated from "Groningen Growth and Development Centre, 60-Industry Database, October 2005, http://www.ggdc.net".

Note: average annual growth rates in employment. See also footnote 24.

While the employment performance of market services has been comparable in the EU and the other several industrialised countries, the higher growth rates in value added outside the EU are linked to the superior growth of labour productivity in the other industrialised countries (see Graph III.8). With the exception of communications, water transport and inland transport, in all other services industries, the productivity performance of the EU is similar to or weaker than that in the other industrialised countries. Given the importance of efficient market services for the development of services themselves and of other sectors of the economy, this gap highlights the importance of – and scope for – improving the competitiveness of services in the EU.

Graph III.8: Market services labour productivity, annual growth rate (%) (1993-2003)



Source: calculated from "Groningen Growth and Development Centre, 60-Industry Database, October 2005, http://www.ggdc.net".

Note: average annual growth rates in productivity per hour worked. See also footnote 24.

III.3.2 Recent sectoral developments in the EU

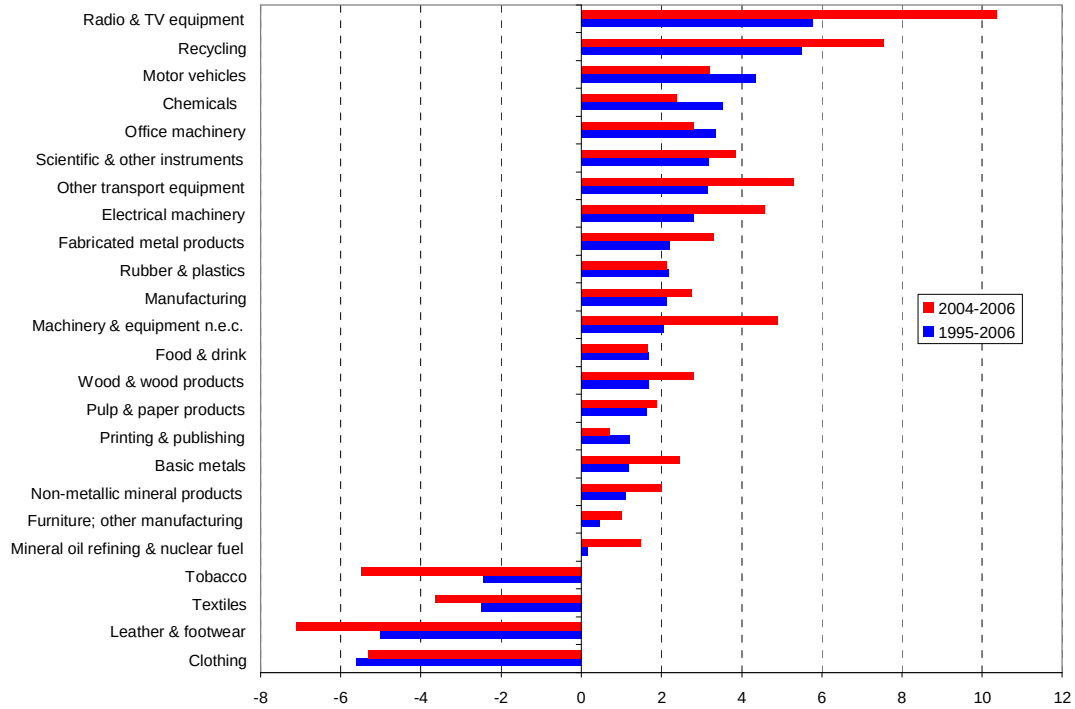
The present Section complements the previous two Sections by looking at data up to 2006 for EU manufacturing production, employment, labour productivity and Unit Labour Costs.

Growth rates are presented in Graph III.9, which ranks the sectors by the average annual growth rate of the production index over 1995-2006[26]. The graph also shows the average annual growth rate in the last three years, 2004-2006, which were not covered in the previous Section. The most recent developments coincide with the growth over the longer period 1995-2006. In this respect, the conclusions of the two preceding Sections would not be substantially affected by an extension of the data up to 2006. In most cases the trend of 1995-2006 accentuated in the last three years, with high growth sectors (ICT sectors, like radio and TV equipment, recycling, other transport equipment, electrical machinery, machinery and

26 Sectoral growth is measured using the production index, while in the previous section the variable used was value added in constant prices. Despite the difference in the indicators and sources used, the profile of sectoral growth is to a large extent comparable, with a few exceptions. The coefficient of correlation between the average annual growth rates over 1995-2003 calculated from the two series (production index and value added in constant prices) is 0.67. In the calculation of the correlation coefficient, the growth of value added in ISIC sectors 30 (office machinery and equipment) and 321 (electronic components and valves) is measured using national deflators (see O'Mahony and Van Ark (2003), EU productivity and competitiveness: an industry perspective, European Commission. List B of products (see Table VI.1 in the Annex) is used in this Section.

equipment n.e.c., and mineral oil refining) growing faster still and declining sectors –tobacco, textiles and leather and footwear- recording a steeper decline.

Graph III.9: Average annual growth (%) in EU manufacturing production by sector (1995-2006)

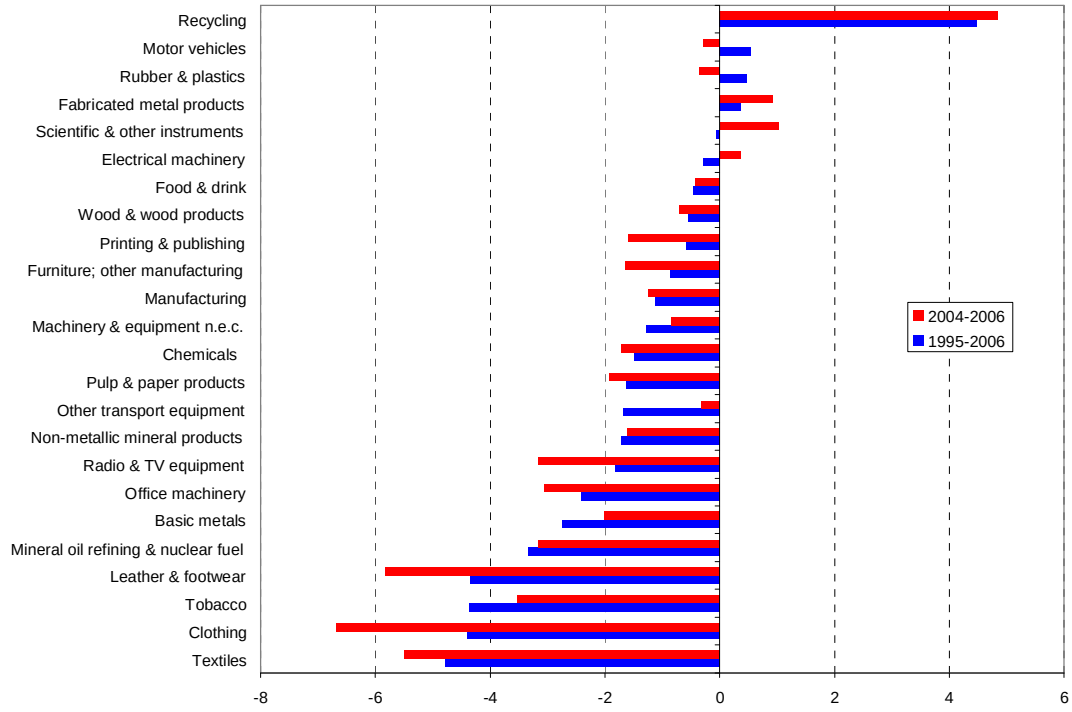


Source: calculated from Eurostat data.

Growth rates of labour inputs (persons employed and number of hours worked) and of derived indicators of competitiveness, like labour productivity and ULC, are presented, in the form of rankings, in Graphs III.10 through III.12. All in all, employment in manufacturing industries decreased over the last 10 years. This trend applies to most individual sectors, with the following exceptions: recycling, motor vehicles, rubber and plastic and metal products. The performance of these sectors over 2004-2006 is in some cases contrasting: for example, for motor vehicles and rubber and plastic the positive development over the whole period is broken in 2004-2006.

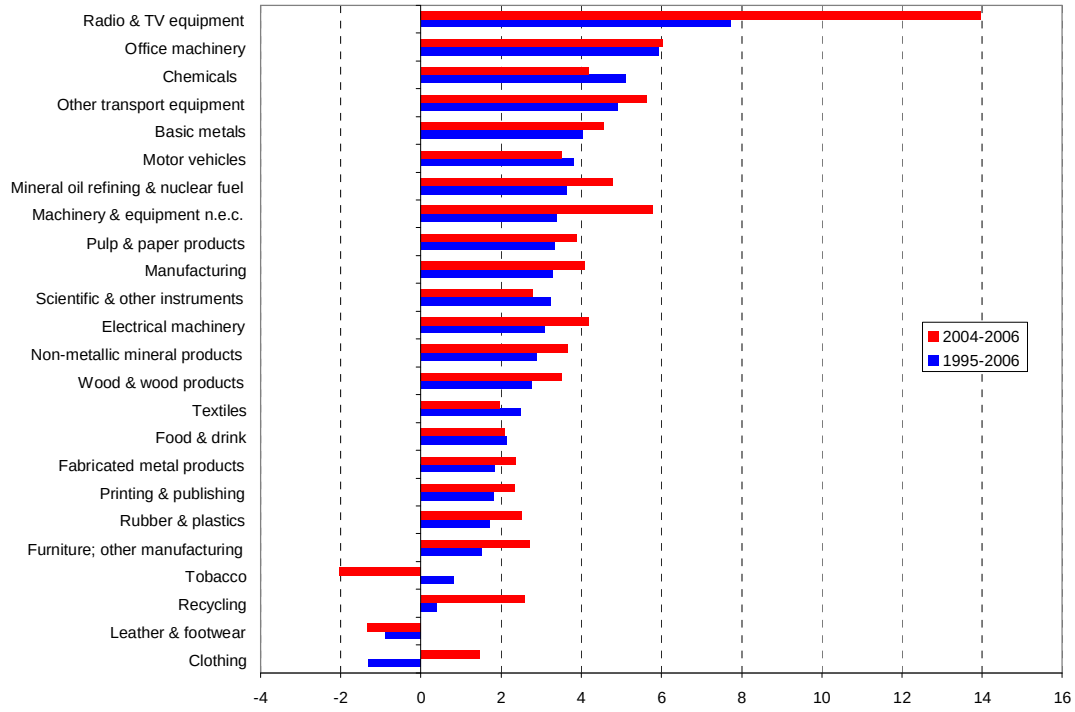
Graph III.12 ranks sectors in terms of annual growth rates in unit labour costs (ULC) to measure price competitiveness. Sectors with high growth in ULC and, consequently, by unfavourable developments in price competitiveness, include leather and footwear, tobacco, clothing, textiles, and oil refining, which exhibit annual growth rates in unit labour costs greater than 2%. On the other extreme, unit labour costs declined in office machinery and radio and TV equipment, along with chemicals, electrical machinery, and motor vehicles. The high growth in ULC in textiles and clothing exerts pressure on prices or profits, or both, which in turn lowers expectations on returns on investment return and causes negative developments in capital formation and production. This is reflected in poor revealed comparative advantage and performance in external trade.

Graph III.10: Average annual employment growth (%) in EU manufacturing by sector (1995-2006)



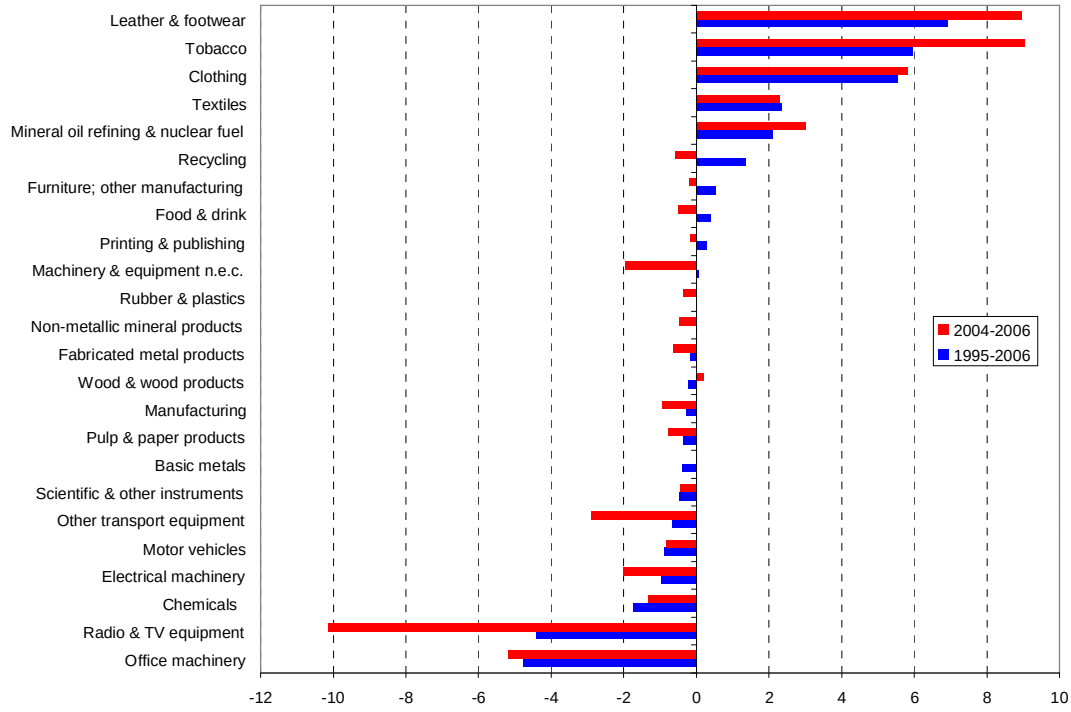
Source: calculated from Eurostat data.

Graph III.11: Average annual growth (%) in labour productivity in EU manufacturing by sector (1995-2006)



Source: calculated from Eurostat data.

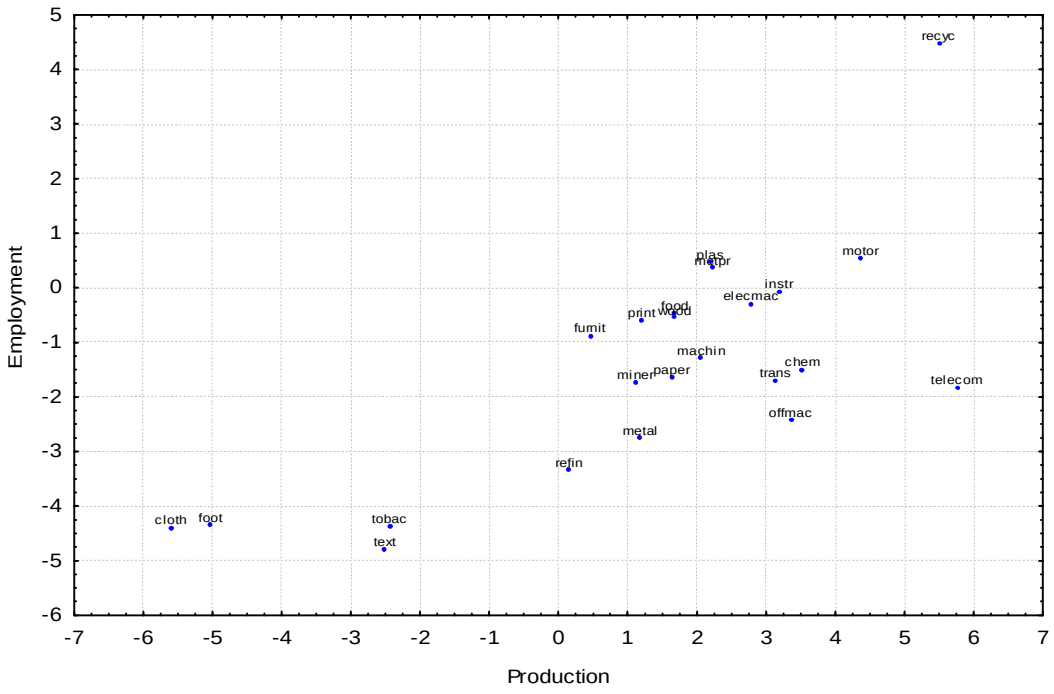
Graph III.12: Average annual growth (%) in unit labour costs in EU manufacturing by sector (1995-2006)



Source calculated from Eurostat data.

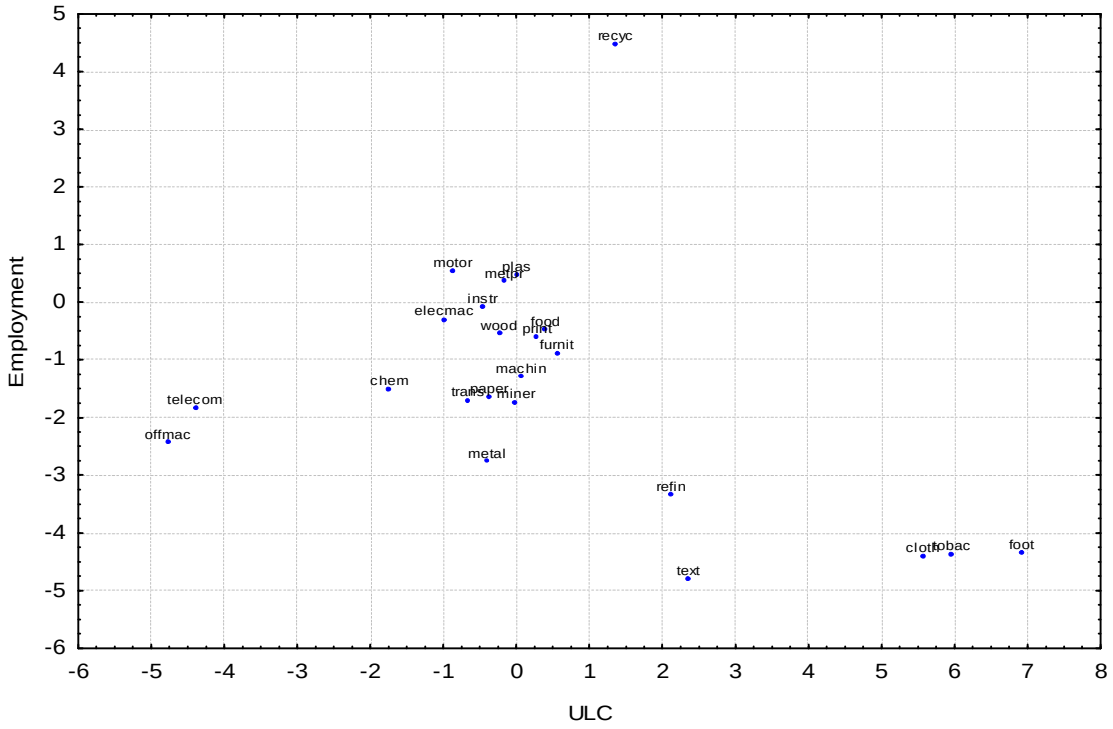
Graph III.13 illustrates the existence of a positive link between sectoral growth and employment. Graph III.14 compares developments in unit labour costs with employment growth by sector. For textiles and clothing as well as leather and footwear, the high growth in unit labour costs is associated with strong decreases in employment. Sectors with more competitive growth rates in unit labour costs in general record better performance also in terms of employment. Graph III.16 shows the positive relationship between labour productivity on the one hand, and wages and salaries per person on the other.

Graph III.13: Average annual growth (%) in EU manufacturing production and employment by sector (1995-2006)



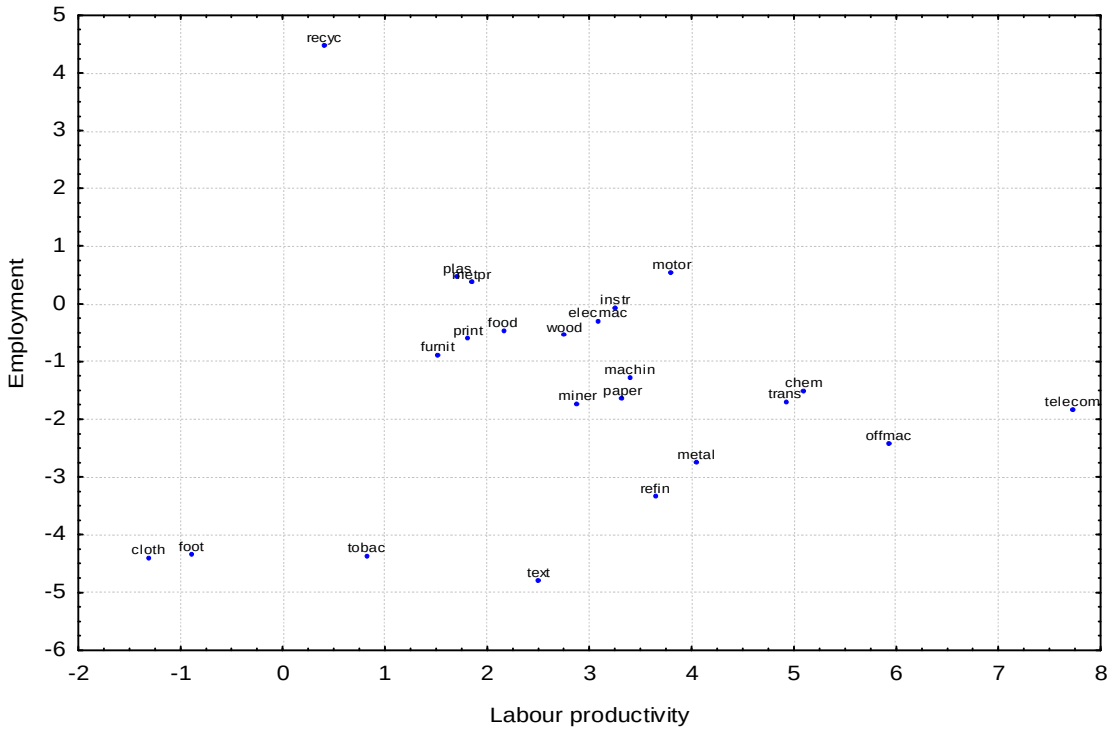
Source: calculated from Eurostat data.

Graph III.14: Average annual growth (%) in EU manufacturing employment and unit labour costs by sector (1995-2006)



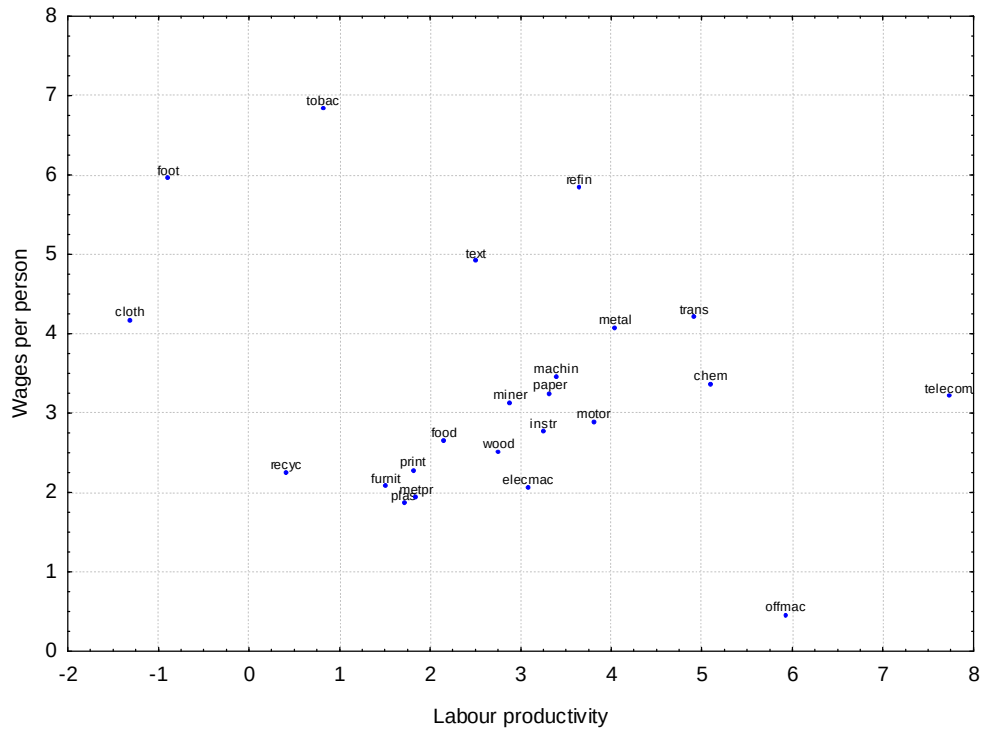
Source: calculated from Eurostat data.

Graph III.15: Average annual growth (%) in EU manufacturing labour productivity and employment by sector (1995-2006)



Source: calculated from Eurostat data.

Graph III.16: Average annual growth (%) in EU manufacturing labour productivity and wages per person, by sector (1995-2006)



Source: calculated from Eurostat data.

III.3.3 Growth, industry mix and competitiveness in EU Member States

Section II.3 showed the diversity in the industrial structures and specialization across the EU Member States, and Section III.3.1 showed that growth rates vary substantially across sectors in the EU. Beyond the dynamism of sectors in the global economy or at the EU level, country-specific conditions (e.g. business environment, policy measures and competitiveness of the industry) have an influence on sectoral growth in each country, and, ultimately, on the growth of the country as a whole. A better understanding of the role of sectors in EU countries' economic growth can be obtained by measuring the magnitude of the effects of the three above-mentioned components[27].

In the following, the country growth rates are decomposed into three components, related respectively to: a) what the country shares with the EU as a whole in terms of sectoral growth; b) the sectoral composition, or industry-mix of the country: are higher-growth sectors more (less) prominent than in the EU as a whole; and c) the country-specific competitiveness

27 The decomposition is carried out using standard dynamic shift-share analysis techniques. Total value added in country "c" at the end of the period is calculated as follows:

$$\sum_i VA_i^c g^{eu} + \sum_i VA_i^c (g_i^{eu} - g^{eu}) + \sum_i VA_i^c (g_i^c - g_i^{eu})$$

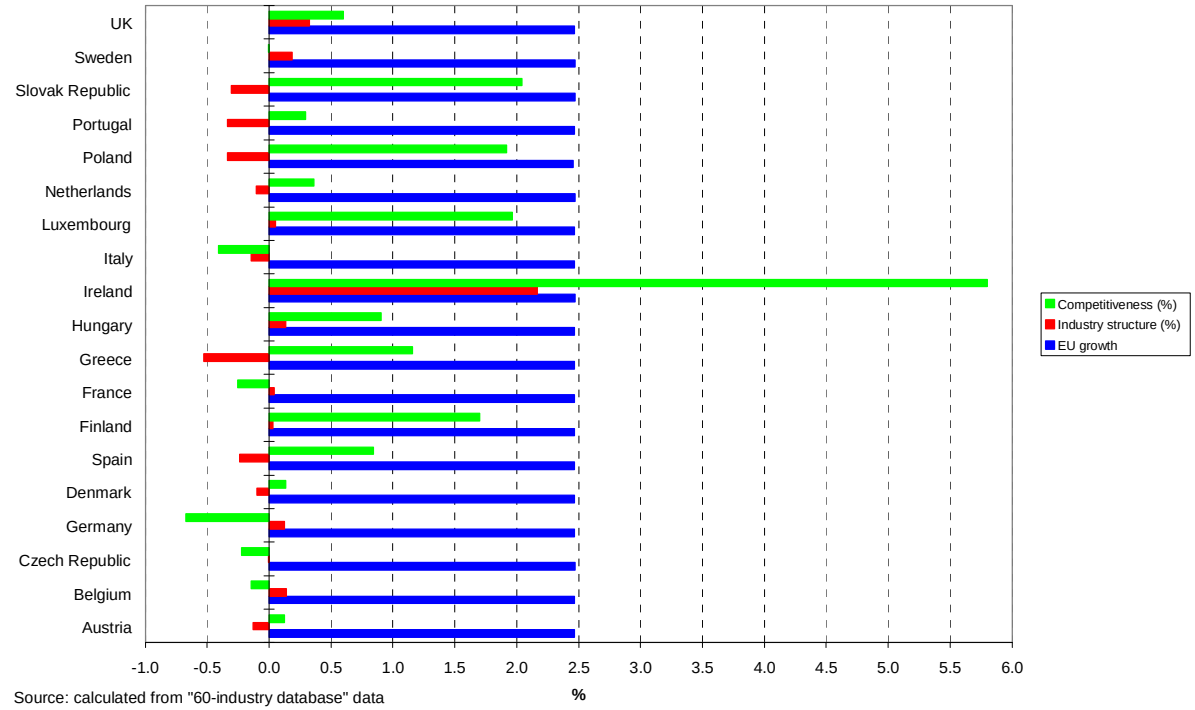
where: VA_i^c = value added of sector "i" in country "c"; g^c = GDP growth in country "c"; g^{eu} = growth of GDP in EU; g_i^c = growth of sector "i" in country "c"; g_i^{eu} = growth of sector "i" in EU. The decomposition is applied to growth over 1993-2003. To avoid the problems posed by static shift-share analysis the decomposition was applied to every year and the effects were averaged to obtain the effect for the whole period. See Richard A. Barff and Prentice L. Knight III (1988), Dynamic shift-share analysis, Growth and Change, vol. 19, No. 2, Spring.

situation: are individual sectors growing faster (more slowly) than in the EU as a whole. The first component, *EU growth*, captures the fact that sectors in a country are likely to share the sectoral growth dynamics in the EU. The second component, *industry structure*, implies that a sectoral structure biased towards fast (low) growth industries will benefit (harm) the growth of the country as a whole. Finally, the third component, *competitiveness effect*, encompasses a large range of, favourable or unfavourable, factors, which can boost, or deteriorate, the growth of the country relative to the EU.

The results are presented in Graph III.17, in which the three components of the total growth rate (growth of GDP) are shown. The *EU growth* is the growth of the EU as a whole, and the difference between a specific country and the EU average growth rates explained by the *industry structure* and *competitiveness* effects. In other words, the graph shows the sectoral forces that lead a country to grow **more** or **less** than the EU average. More precisely, it shows whether sectoral competitiveness and sectoral composition in a country are favourable to growth.

An example of negative impact of sectoral competitiveness on growth is France, Germany and Italy. In the case of Italy the sectoral composition also contributes to a growth rate lower than the average. The Czech Republic and Belgium are also affected by negative contributions of the competitiveness effect. In a number of cases (Austria, Belgium, Denmark and Portugal) the two effects exhibit opposite signs and the net effect is negligible. In any case, for Austria, Belgium and Denmark the absolute value of each of these two components is low. In some countries no negative effects are visible, and growth is boosted by sectoral competitiveness or sectoral composition, or by the two effects together. Ireland is a special case, where the sectoral competitiveness effect is greater than the EU share, and the industry-mix is nearly of the same magnitude as the latter. The UK benefits from positive sectoral competitiveness and an industrial structure that contributes also positively to the growth of the country. In all the other cases (small and medium countries, with the exception of Poland and Spain) competitiveness contributes substantially to growth rates higher than the in the EU.

Graph III.17: Components of country growth (%)

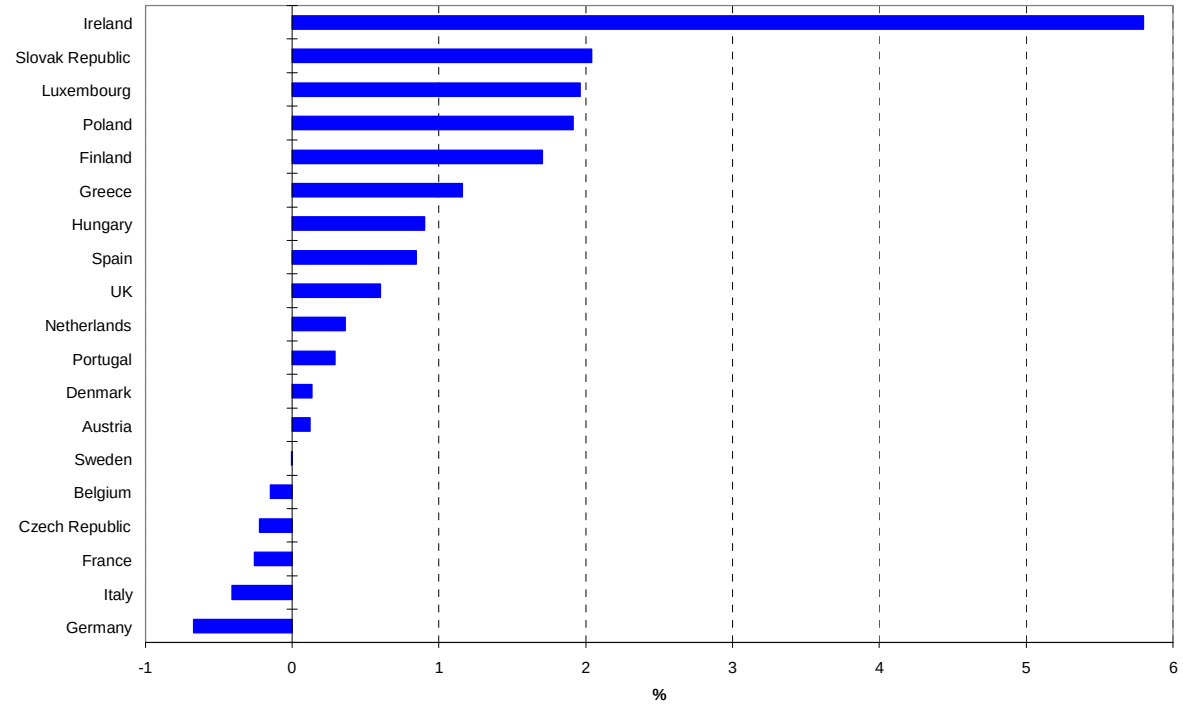


Source: calculated from "Groningen Growth and Development Centre, 60-Industry Database, September 2006, http://www.ggdc.net"..

Graphs III.18 and III.19 show the ranking of countries according to the size of the industry structure and competitiveness effects respectively. Ireland, Luxembourg, Greece and Spain, along with the new EU Member States with the exception of Czech Republic, are in the first ranks in terms of the contribution of sectoral competitiveness to growth, while economic growth in three large countries (Germany, Italy, and France) is negatively affected by this effect. Ireland, and to a lesser extent UK, Sweden, Belgium, Hungary and Germany, benefit from a favourable industry mix, while Greece, followed by Portugal, Poland, Slovak Republic, Spain, Italy, Austria, Netherlands and Denmark, are in the opposite position with unfavourable industrial structures.

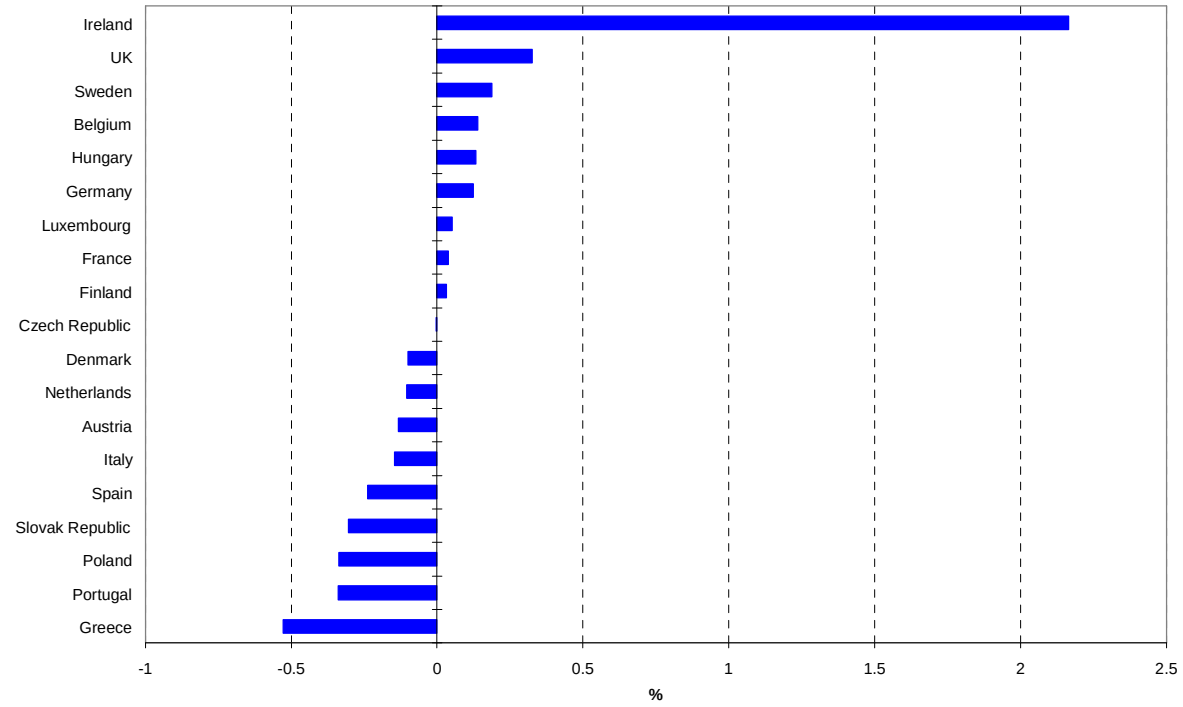
Finally, countries can be classified in four groups according to their position as regards the sign of the two effects. Countries in the North-West side of Table III.2 are in an optimal situation, as they benefit from both a favourable industry structure and above -average performance in sectoral growth. In contrast, in the two countries in the South-East zone, Italy and Czech Republic, the contributions of the industry structure and the competitiveness of their sectors are negative (in the case of the Czech Republic, the industry mix effect is negligible). The rest of the countries are in a mixed position. For Belgium, France and Germany, the competitiveness of their sectors exerts a negative influence on economic growth, while these countries benefit from a favourable industrial composition. The case of Belgium is nevertheless different within this group, in that the two effects are of nearly the same magnitude.

Graph III.18: Competitiveness effect - Contribution to country growth



Source: calculated from "Groningen Growth and Development Centre, 60-Industry Database, September 2006, http://www.ggdc.net".

Graph III.19: Industry structure - Contribution to country growth



Source: calculated from "Groningen Growth and Development Centre, 60-Industry Database, September 2006, http://www.ggdc.net".

Table III.2: EU countries grouped by the sign of the industry structure and competitiveness effects

		Industry mix	
		(+)	**(-)**
Competitiveness	**(+)**	Finland Hungary Ireland Luxembourg Sweden United Kingdom	Austria Denmark Spain Greece Netherlands Poland Portugal Slovakia
	(-)	Belgium Germany France	Czech Republic Italy

Source: Graph III.16.

III.3.4 Cyclical profile of EU manufacturing sectors

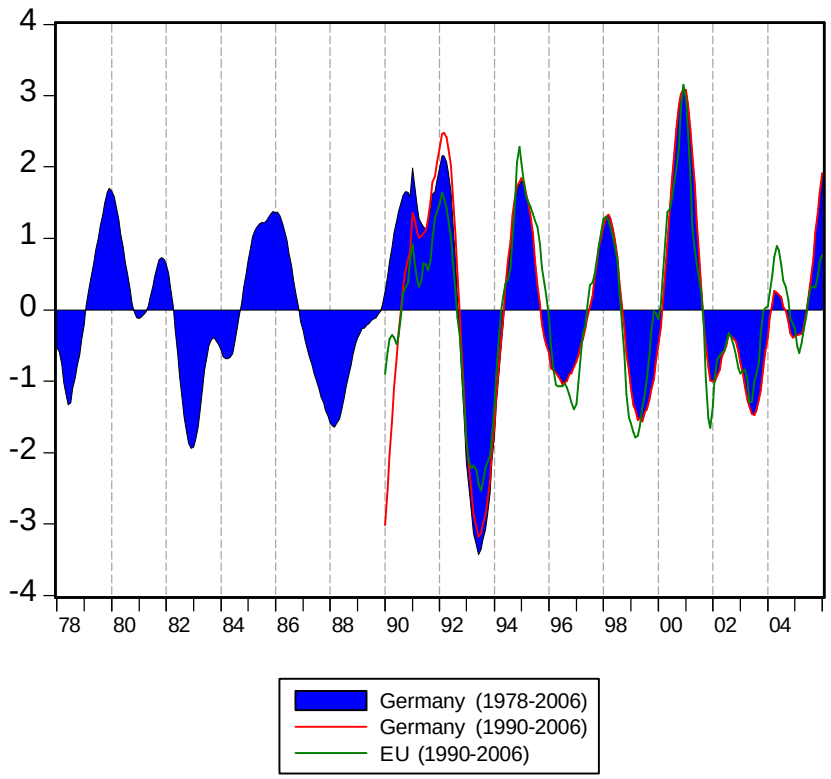
In this Section the index of production is used to determine the cyclical profile of each manufacturing sector, which is valuable information for the analysis of sectoral developments, particularly in the medium and short run.

The cyclical characteristics of manufacturing sectors are assessed here using the industrial production index for individual sectors and for manufacturing industry at large. The information used is the production index for Germany[28] and the EU. The results are presented in the form of graphs, which show the sectoral profile of each sector relative to total manufacturing, and a table with basic descriptive statistics. It is important to note that the objective of this Section is merely to show the cyclical profile of manufacturing sectors and to draw the attention to the importance of taking this into consideration when describing and analysing sectoral performance. The objective of this exercise is not to date the cycle phases (peaks and troughs), nor to analyze synchrony across sectors and countries, but to compare the contrasting cyclical patterns of different industries, as well as to visually inspect the phase of the cycle one given industry goes through in a particular point in time. The approach used is standard and the description of the cycle and comparisons across sectors are based on descriptive statistics. A more detailed analysis would go beyond the scope of this publication.

[28] The main objective of this section is to show the cyclical pattern of manufacturing sectors in the EU, which requires the use of long time series of data. However, the time series available for EU cover only the period 1990-2006. In this context the interest of using data for Germany is twofold: first, the data cover nearly three decades; secondly, Germany accounts for a significant share of EU's manufacturing production and is expected to mirror the EU cyclical profile. The production time series have been filtered with the Hodrick-Prescott method. The sample for Germany is January 1978-January 2006, with a total of 337 monthly observations. The industrial production series for Germany has been adjusted to avoid the break in January 1991. The cycle has been extracted for Germany and for the EU using data for 1990-2006. The results have been compared to the cycle for Germany extracted from the long time series (1980-2006). The results from Germany's long time series have been retained for presentation.

The cyclical component of total manufacturing in Germany is presented in Graph III.20, along with the cyclical component extracted from 1990-2006 data for EU and Germany[29]. To summarize the results obtained for all manufacturing sectors[30], the standard deviation of the cyclical component and the cross-correlogram of each sector's cyclical component with the one for manufacturing at large, as an indicator of synchrony of the cycle, have been calculated. For presentation purposes, sectors have been grouped in six homogeneous clusters according to the values of the standard deviation and the cross-correlation of each sector with manufacturing. The results for individual sectors are presented, by group, in Table III.3, which shows the maximum and minimum values, the standard deviation, and the cross-correlation with the general business cycle[31].

Graph III.20: Germany and EU manufacturing production - cyclical component



Source: own calculations from Eurostat short-term indicators data.

29 The use of the three series is to show visually that the cycle in Germany, calculated from both the 1978-2006 and the 1990-2006 series, reflects closely the cycle in the EU. It is on this basis that the data for Germany are used to identify the cyclical profiles of sectors in the EU.

30 The sectors analyzed are at 2-digit level of NACE Rev.1, with the exception of NACE items 31, 33, and 35, which are presented at 3-digit level (list D in Table VI.1).

31 "Industrial process control equipment" is an outlier in group 4, in that the cross-correlation with manufacturing is very low. In terms of synchrony with the business cycle it would belong to Group 6, where it would be an outlier as regards the standard deviation.

Table III.3: descriptive statistics of the cyclical component of sectors

SECTOR	Group	Max.	Min.	Std. Dev.	Cross-correlation
Textiles	1	5.8	-5.1	2.18	0.85
Rubber & plastics	1	3.5	-4.3	1.38	0.83
Metal products	1	3.5	-3.8	1.44	0.88
Machinery and equipment n.e.c.	1	4.5	-4.5	1.93	0.85
Electric motors	1	5.3	-4.2	1.80	0.81
Motor vehicles	1	5.5	-6.5	1.93	0.81
Electricity distribution and control apparatus	1	4.5	-4.4	1.69	0.88
Basic metals	2	5.1	-7.7	2.68	0.77
Instruments and appliances for measuring	2	9.2	-4.8	2.50	0.77
Tobacco	2	12.7	-7.4	2.77	0.54
Office machinery	2	12.4	-6.8	3.09	0.60
Insulated wire	2	14.2	-6.3	3.43	0.68
Accumulators, primary cells and primary batteries	2	7.7	-5.0	2.48	0.60
Electronic components	2	18.6	-8.2	4.00	0.70
Watches and clocks	2	12.0	-12.7	5.33	0.82
Food products	3	4.8	-2.8	1.02	0.43
Wood and wood products	3	4.7	-4.4	2.00	0.51
Pulp, paper and paper products	3	3.3	-3.1	1.13	0.71
Publishing, printing and reproduction of recorded media	3	2.8	-2.3	0.99	0.60
Chemicals and chemical products	3	2.8	-3.1	1.30	0.59
Non-metallic mineral products	3	5.3	-3.5	1.64	0.59
Lighting equipment and electric lamps	3	6.2	-3.6	1.78	0.62
Electrical equipment n.e.c.	3	4.7	-4.5	1.80	0.66
Medical and surgical equipment and orthopaedic appliances	3	3.7	-4.2	1.44	0.51
Optical instruments	3	3.2	-3.1	1.11	0.56
Other transport equipment n.e.c.	3	7.2	-5.1	1.99	0.47
Leather and leather products	4	7.9	-9.7	2.99	0.31
Coke, refined petroleum products and nuclear fuel	4	6.6	-6.6	2.46	0.36
Industrial process control equipment	4	7.4	-7.9	2.71	-0.11
Aircraft and spacecraft	4	5.0	-4.4	1.83	0.32
Wearing apparel	5	11.6	-12.9	4.62	0.43
TV and radio transmitters	5	18.2	-10.8	4.37	0.41
TV and radio receivers, sound/video recording apparatus	5	14.4	-8.7	4.09	0.38
Motorcycles and bicycles	5	13.5	-15.4	4.81	0.29
Repairing of ships and boats	6	22.2	-24.1	7.20	0.01
Railway and tramway locomotives and rolling stock	6	14.5	-19.4	5.68	-0.20

Source: own calculation from Eurostat short-term indicators data.

Group 1 exhibits strong synchrony with total manufacturing and the amplitude of the cycle is relatively small. Textiles, rubber and plastic, metal products, motor vehicles, electric motors and electricity distribution and control apparatus are the sectors in this group. Although all of them have in common the characteristics mentioned, a more precise view can be obtained from the graphs in:

http://europa_eu.staging.entr.cec.eu.int/enterprise/enterprise_policy/competitiveness/2_Indicators/Indicators%20of%20the%20competitiveness.htm.

These graphs show that at certain periods of time the impact of the cycle is particularly strong on some sectors[32]. The trough for motor cars in 1993, machinery in 1988 and 1999, and electric motors in 1999 are examples of this. The same applies to some peaks for these or other sectors (e.g. metal products in 1995).

To some extent group 3 exhibits similar characteristics to those of group 1. In fact, the amplitude of the cycle is smaller, although the synchrony with the general business cycle is less manifest. Some strong cyclical movements can be spotted among the capital goods (lighting equipment and electric lamps, electrical equipment n.e.c. and other transport equipment n.e.c.) in this group in the early 2000s, just to cite the most recent examples.

The other four groups of sectors have in common a quite distinct cyclical behaviour relative to the general business cycle, but substantial differences can be observed among them.

Sectors in group 4, 5 and 6 are characterized by medium-low and low (group 6) synchrony with the general business cycle. As regards amplitude, this increases gradually from group 4 to group 6. They exhibit the strongest difference with the general business cycle. This obviously refers to the average amplitude and synchrony, as in some cases (wearing apparel and motorcycles and bicycles) the highest variation takes place before 1990. Contrary to the above three groups, group 2 is different from the general business cycle in amplitude, as the synchrony is the second highest among the six clusters.

III.4 Growth factors: capital and technology

Indicators on the use of labour inputs have been presented in the previous section. The present section presents indicators of other factors of production, namely, gross fixed capital formation (GFCF), human capital and *technology*. The indicators presented are the average annual growth rate of GFCF, the educational attainment of employment, R & D expenditure as percentage of value added, and two indicators calculated from the number of patents.

III.4.1 Gross Fixed Capital Formation

Investment in physical capital is the first of the growth drivers presented in this section. Capital formation increases production capacity and, by improving labour productivity, contributes to the competitiveness of firms and sectors. Furthermore, capital goods drive in technology, materialize innovation, incorporate intangibles (e.g. software) into the production process, and facilitate change and re-organization. In addition, investment decisions are

[32] As a matter of fact, the standard deviation is an indicator of the average amplitude over the whole sample.

forward-looking and, therefore, closely linked to the medium and long term expectations of the sector.

This section presents average annual growth rates of GFCF over 1995-2004. The results, in form of a ranking of sectors according to GFCF growth, are shown in Graph III.21[33]. Although presented at a relatively aggregated level of sectors, this graph shows some features of sectoral growth in the last ten years. Interestingly, the first four sectors in the ranking of investment growth are services (highlighted in blue), and all services activities, with the exception of other community, social and personal services, exhibit growth rates higher than manufacturing. The first sector is transport, storage and communication, which basically provides services to other businesses, and to a lesser extent, yet significant (e.g. post and telecommunications services), to consumers (see Section IV.2.1). As a matter of fact, this sector encompasses activities that manage the movement of goods and persons, and facilitate the transmission of information and knowledge, which are crucial for the competitiveness of EU businesses in both the internal and international markets, as well as to meet consumers' needs in a context of increasing mobility. Within this sector, communications, basically telecommunications, account for 40% of GFCF, and land transport for 28%. Also within that sector, supporting and auxiliary transport activities is a sizeable sub-sector of increasing importance for the efficiency of all transport activities, as it includes storage and management of transport infrastructures. As a matter of fact, this sub-sector increased steadily its share, and, on average, accounts currently for 22% of GFCF in the sector as a whole[34]. The second market services sector at the top of the ranking is wholesale and retail trade. The average annual growth rate of 4.5% in GFCF over the last decade should contribute to improving labour productivity in sectors, in which (particularly in the case of retail trade and sales and repair of motor vehicles) EU's performance is lower than in other industrialized countries (see Section III.3). The investment dynamism of the two other services sectors, education and public administration, occurs in two areas, accumulation of human capital and public infrastructure, which create externalities from which all other sectors and the economy as a whole benefit.

Manufacturing sectors exhibit a mixed picture, which in some cases clearly mirrors the sectoral trends described in Section III.3. This is clearly the case of textiles and textiles

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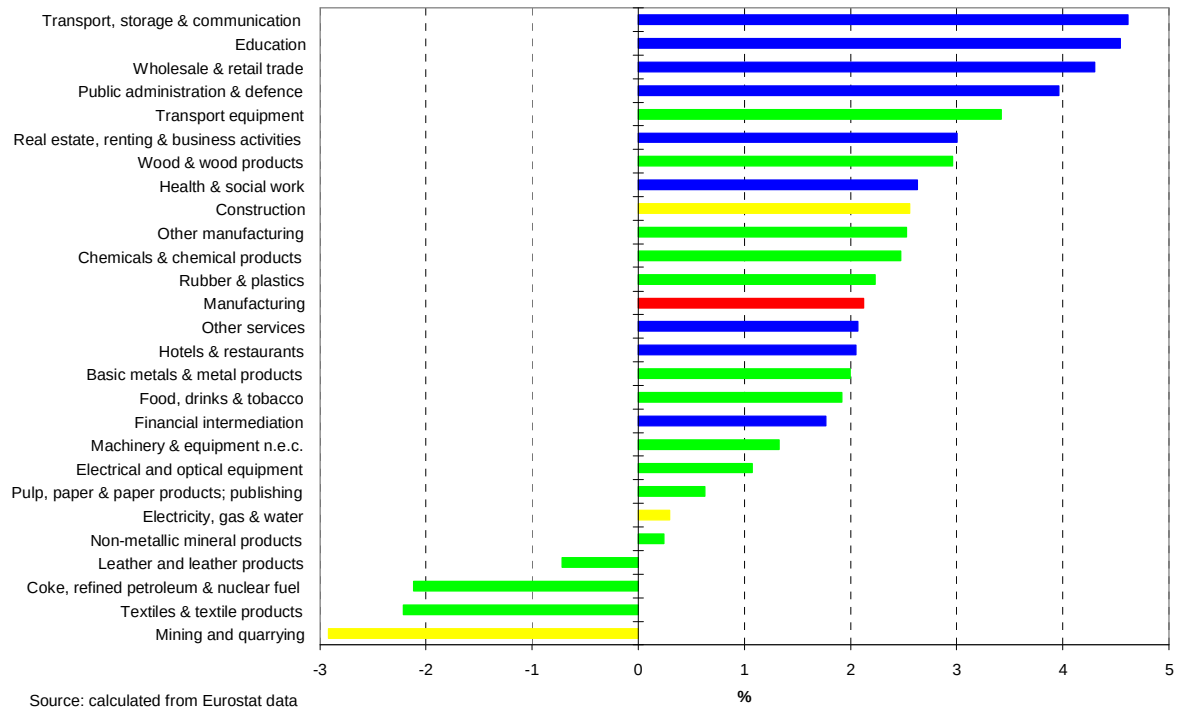
33 GFCF growth rate is calculated for an aggregate of the following 12 EU countries: Austria, Belgium, Germany, Denmark, Finland, Greece, Ireland, Italy, Netherlands, Poland, Sweden and UK. The EU-12 growth rate is the weighted average of the individual countries' growth rates. The aggregate has been calculated as a chained index; the weights are shares of each country and sector in EU-12, where this is calculated using PPS for GFCF for 1995. Due to lack of data Sweden is excluded in 2003, and Sweden, Germany and Italy in 2004. Furthermore, Netherlands is excluded in all years for sector "leather and leather products". This indicator is calculated from National Accounts data and can be presented only at Section and, for manufacturing, sub-Section level of NACE Rev.1 (see list C in the Annex, Table VI.1). In other words, the number of manufacturing sectors considered is 14. To check for the robustness of the results the average annual growth rate of GFCF over 1995-2004, 1995-2002 and 1995-2003, which have different country coverage, are presented in:
http://europa_eu.staging.entr.cec.eu.int/enterprise/enterprise_policy/competitiveness/2_Indicators/Indicators%20of%20the%20competitiveness.htm.
The pair-wise correlation coefficient among the three series of growth rates is between 0.91 and 0.94.

34 These percentages are presented to give information on the composition of the relatively highly aggregated sectors for which GCFC growth rates were calculated. The percentages are calculated for the second half (1999-2003) of the period considered for the calculation of the GFCF series and refer to a reduced number of countries: Austria, Belgium, Germany, Denmark, Finland, Italy, Sweden and United Kingdom. The figures presented in the text correspond to the average of this period.

products, and leather and footwear, two sectors for which the negative growth in investment goes in line with the equally negative developments of production and employment. The same applies to coke, oil refining and nuclear fuel, a sector which exhibits negative growth in value added and stagnation in the index of production. All other manufacturing sectors exhibit, to various degrees, positive growth rates. Wood and wood products and transport equipment are the most dynamic sectors, followed by chemical industry and other manufacturing activities (including furniture). Rubber and plastic products completes the list of manufacturing sectors that have growth rates higher than the average. Despite the fact that the GFCF series covers some of the biggest EU countries it has to be bore in mind that the country coverage of this series and of the production data is different. Thus the association between these two indicators must be interpreted cautiously. The correlation coefficient (0.74) between the average annual growth rates of GFCF and production confirms that, on average, the dynamism (or lack of) in the various sectors is reflected in both output and investment expenditure[35].

Graph III.21: EU Gross Fixed Capital Formation annual growth rate (%) (1995-2004)



Source: calculated from Eurostat data.

III.4.2 Human capital

While physical capital has traditionally played a crucial role in models of economic growth, the idea that labour inputs, as measured, for example, by the number of hours worked, are not homogeneous has gained importance in the explanation of economic growth. Thus human

35 The small number of observations (only manufacturing sectors are considered) and the way the correlation is measured do not allow drawing formal conclusions as regards the relation of investment to the change in output. The correlation refers to the average growth rates over the whole period, no lags are included, the effect of the business cycle on the different sectors is not taken into account, and the GFCF variable includes replacement investment.

capital appears as an additional factor of production, which contributes to explain differences in economic growth across countries. The stock of human capital makes different the productivity of individuals, and is frequently presented in relation to two components, namely health and education. The purpose of this Section is to present an indicator of human capital at sectoral level related to the second of these two components, education, which in modern economies is a crucial component of the process of production.

To the extent that human capital consists of the stock of knowledge, skills and experience embodied in the labour force, a usually calculated proxy for it is based on the process of accumulation of knowledge via formal education. This has the advantage of being easily available although it is, in any case, a rough approximation of human capital, which does not take into account the postschooling accumulation of human capital from training at the workplace and experience (learning by doing)[36]. In this chapter the indicator used is the distribution of employment in each sector by educational attainment[37].

Graph III.22 shows the distribution of employment by educational attainment for EU-25 by sector in 2005. Sectors[38] are ranked, in descendent order, according to the percentage of employment with high education. The difference across sectors is basically in the dichotomy "high-low" educational attainment. Focusing on high and low education levels broadly speaking three groups of sectors can be identified. First are sectors with predominance of high education employment. In the first places are services sectors, like computer and related activities, financial sectors, and other business activities, followed by manufacturing activities as chemicals, radio, TV and telecommunications equipment, medical, precision and optical instruments. At the other end of the distribution are the sectors characterized basically by the prevalence of low education: from wearing apparel, textiles, and wood and wood products, up to pulp and paper. Other sectors –from supporting transport activities through other transport equipment and printing and publishing- are in an intermediate position, with a similar share of high and low education, and in any case it is important to bear in mind that medium education is the prevalent (between 50 and 60%) educational attainment in all sectors, with the single exception of computer and related activities. Needless to say, in interpreting these figures it has to be bore in mind that the meaningful indicator should be the flow of services from the human capital stock, which is related to the utilization rate of the human capital stock, rather than the capital stock itself.

Besides the relevance of human capital for the analysis of growth and growth-related issues, the education level of the labour force is important to assess competitiveness, particularly in the international context. By facilitating the adoption and development of technology and ideas human capital makes businesses and sectors competitive. Labour intensive sectors

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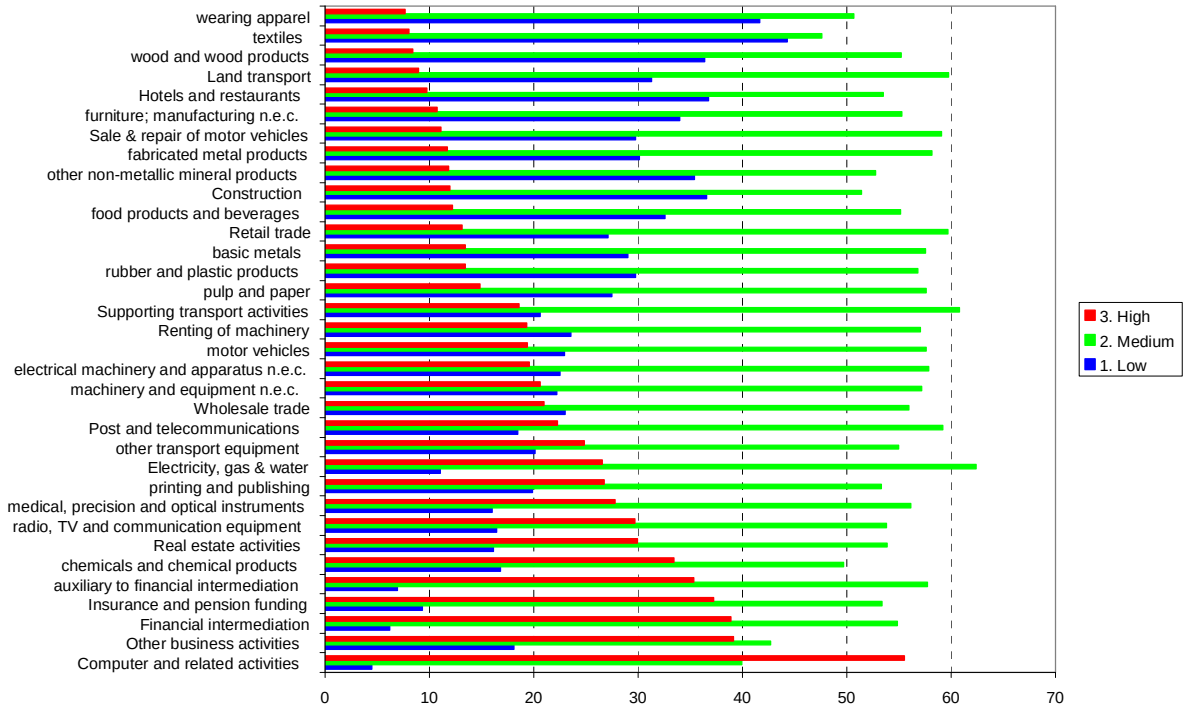
36 For a discussion of proxies for human capital in empirical studies, see A. Greiner, W. Semmler, and G. Gong (2005), The forces of economic growth – A time series perspective, Princeton University Press, Section 4.3. On different ways to measure the stock of human capital, including a discussion on the limitations of educational attainment as a proxy for human capital, see OECD (1998), Human capital investment, Centre for Educational Research and Innovation, Paris

37 Educational attainment is measured as the percentage of employment that has attained high, medium and low education, which correspond to ISCED 0-2, 3-4, and 5-6 categories respectively. The source is the Eurostat Labour Force Survey.

38 Sectors shown are from 15 to 74 and correspond to list B in the Annex, Table VI.1. Non-market sectors are excluded. Some sectors (e.g. leather and leather products, oil refining and office machinery) are excluded because the sample size for the specific sector and educational attainment category is not big enough.

characterized by low education employment may be particularly sensitive to competition from low wage developing countries. Examples of manufacturing sectors that are in this situation are wearing apparel, textiles, furniture and other manufacturing, and fabricated metal products, which, besides, exhibit poor performance in external trade in terms of the Revealed Comparative Advantage index (see Chapter IV). On the other side, chemicals, the manufacturing sector with the highest component (33%) of high education employment, and also characterized as capital intensive, is in the first places regarding revealed comparative advantage. Yet it is worth mentioning that unit labour cost, and not uniquely the wage differences, is the relevant indicator to assess price competitiveness, and that gains from trade, for both high and low wage countries, are determined by comparative, rather than absolute, advantage.

Graph III.22: employment by educational attainment (%)



Source: calculated from Eurostat's Labour Force Survey data.

III.4.3 Technology: R&D and patents

The two indicators presented so far refer to capital, both physical and human, two important factors of production and engines of growth, which have played an important role in the analysis of growth. GFCF, a flow variable, measures the process of accumulation of physical capital, while the educational attainment of the labour force is an indicator of the stock of human capital. The present Section extends the statistical coverage of factors of growth to present explicit indicators of technology, a factor considered as a residual in neoclassical models of growth. The indicators presented here refer, on the one hand, to the inputs for the production of inventions and, on the other, to the output of this process. More precisely, the first indicator is based on R&D expenditure and the second one on the number of patents.

III.4.3.1 R & D expenditure

The resources devoted to the production of inventions in the form of research and development expenditure, as a percentage of value added, is used as indicator of technological effort in each industry[39]. The results are presented, for manufacturing sectors, in the form of a ranking in Graph III.23. Although static, the data reveal the high variation in R&D intensity, which leads to the various technology categories used in the analysis of sectors[40]. Broadly speaking, Graph III.23 shows a group of sectors in which the research and development inputs account for more than 5% of value added. This group includes ICT sectors, chemicals and pharmaceuticals, scientific instruments, transport equipment and machinery. The rest of sectors belong to a category of lower R&D intensity, among which it is worth mentioning the last five in the ranking: printing and publishing, wood and products of wood, textiles, fabricated metal products, and pulp and paper.

As presented in the graph, this indicator reveals the relative R&D intensity of the various manufacturing sectors, but is not an indication of the actual R&D effort carried out in these sectors in the EU relative to its main international competitors. However, the latter is a major determinant of competitiveness and growth, particularly for sectors in the first places of the ranking. The relative growth of sectors in the EU has been presented in Section III.3, while the comparative advantage of sectors will be analyzed in Chapter V. Nevertheless, it is worth mentioning here that the performance of the EU in R&D intensive sectors is mixed. To take a few examples: chemicals, including pharmaceuticals, and aircraft and spacecraft are in the first ranks of growth and revealed comparative advantage indices. As regards radio, TV and telecommunications equipment it has to be said that it includes three sub-sectors in which the EU exhibits contrasting performance: electronic valves and tubes and telecommunication equipment are particularly dynamic sectors in terms of growth, which is not the case of radio and TV receivers. However, as regards revealed comparative advantage telecommunications equipment is in an intermediate position and the two other sectors in the last places of the ranking.

As the R&D expenditure indicator shows the R&D intensity of each sector, relative to the other, but does not measure the relative effort of the EU vis-à-vis international competitors, it can be used for descriptive purposes and to understand the technology of each sector. Furthermore, a drawback of this indicator is that it measures the input into the innovative process, but does not capture the actual result of this. The indicator in next Section provides more comprehensive information on the actual effectiveness of the R&D effort.

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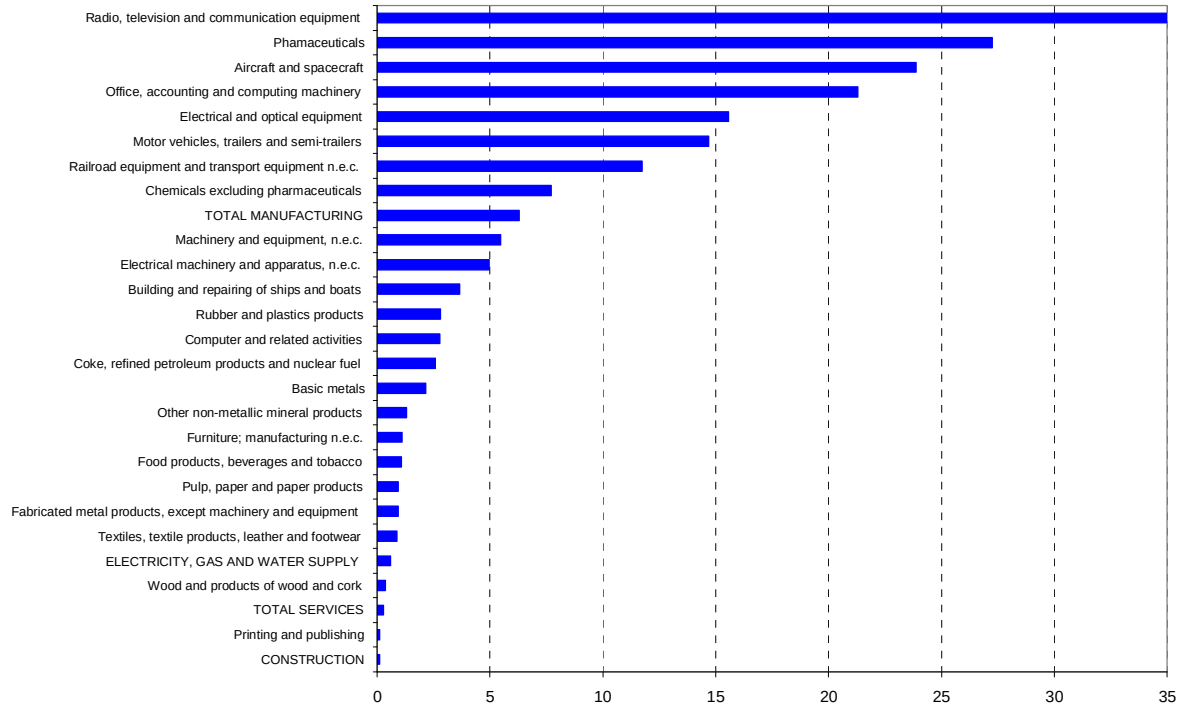
[39] The basic source is OECD ANBERD and STAN databases. A number of sectors have been broken down into further detail using corresponding percentages for intramural R&D expenditure from Eurostat New Cronos database. The aggregate is EU-9 composed of Belgium, Germany, Spain, France, Italy, Netherlands, Finland, Sweden, and United Kingdom.

[40] For example, Chapter V analyzes international trade in four technology categories of sectors.

Graph III.23: EU R&D expenditure as % of value added (2001)



Source: calculated from OECD and Eurostat data.

III.4.3.2 Patents

Patent statistics are the basis for indicators pertaining to the output side of the knowledge production function, and despite the drawbacks of this indicator[41], the information is of interest in various respects. Various aspects make patents particularly useful as a proxy for technology and technological developments. Patent statistics refer to the actual output of the innovation process undertaken by firms and sectors. They provide information on a large number of sectors and technologies and, what is particularly interesting, they permit a good coverage of developments over time. Availability of data for a large number of countries also allows the calculation of the relative performance of the EU, or any other country and region, relative to the World.

Two indicators based on the number of patents are used in this section. The first indicator, namely PAT1, compares the ratio of patents to employment in a sector, relative to the same ratio for total manufacturing[42]. PAT1 is used to make comparisons among sectors within the

41 Griliches, Z. (1990), Patent statistics as economic indictors: a survey, Journal of Economic Literature, Vol. XXVIII, pp. 1661-1707 discusses a number of issues related to patents, including the advantages and drawbacks. See also Pavitt, K (1985), Patent statistics as indicators of innovative activities: possibilities and problems, Scientometrics, Vol. 7, Nos 1-2, pp. 77-99; Silverman, Brian S. (2002), Technological resources and the logic of corporate diversification, Routledge, capter 4; and Griliches, Z.(ed.) (1984), R&D, patents and productivity, The University of Chicago Press.

42 The first indicator compares the number of patents in a sector with the employment of the same sector, relative to total manufacturing patents and employment respectively:

EU. The second indicator, PAT2, compares the number of patents of a given sector in EU with the number of patents of the same sector in the World, and is, therefore, an indicator of the EU relative performance[43].

Graph III.24 shows EU[44] sectors ranked in descendent order according to the value of PAT1[45]. As PAT1 relates the number of patents in a sector relative to employment, it measures, across sectors, innovation intensity, which, as it was the case with R&D, varies substantially across sectors: from the highest values of the index in three ICT sectors (office machinery, telecommunications equipment, and electronic valves and tubes) to the nearly negligible value for clothing, wood and woo products, and printing and publishing. As a matter of fact, although the sectoral classification for R&D and PAT1 is different, the correlation between the two indicators is perceptible from the two Graphs.

$$PAT1 = \frac{PAT_{i,EU} / PAT_{T,EU}}{L_{i,EU} / L_{T,EU}}$$

where:

$PAT_{i,EU}$: patents filed by sector EU "i"
$PAT_{T,EU}$: patents filed by EU "all sectors"
$L_{i,EU}$: employment of EU sector «i»
$L_{T,EU}$: total employment in the EU
Values greater (lower) than 1 indicate that the sector is more (less) research intensive than the other.

43 The second indicator compares the number of patents of a given sector in EU with the same sector in the World, and it is defined by the following ratio:

$$PAT2 = \frac{PAT_{i,EU} / PAT_{T,EU}}{PAT_{i,W} / PAP_{T,W}}$$

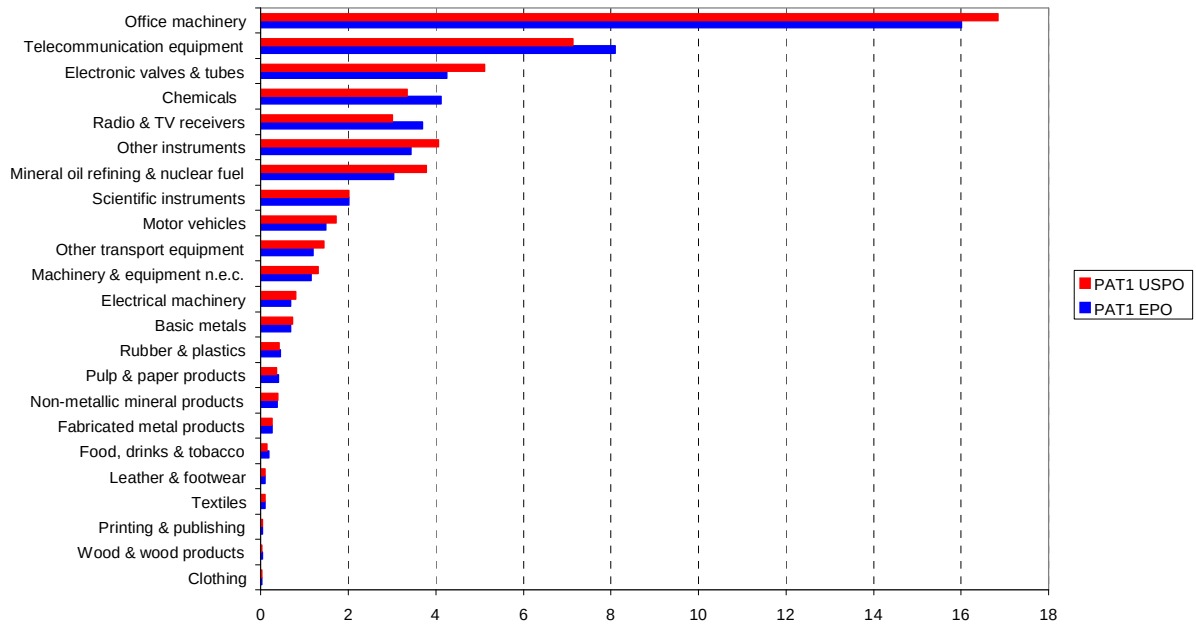
where:

$PAT_{i,EU}$: number of patents filed by EU sector « i »
$PAT_{T,EU}$: number of patents filed by EU "all sectors"
$PAT_{i,W}$: number of patents filed by World sector « i »
$PAT_{T,W}$: number of patents filed by World "all sectors"

44 The patents considered in the calculation of these indicators are patents filed by sector with the USPO and the EPO. A more appropriate source would be the so-called *triadic* patens. However, these are not available by sector. The sectors considered are basically 2-digit industries from NACE Rev.1 nomenclature of economic activities, with more detail for some sectors: ICT and chemical (see list C in the Annex, Table VI.1).

45 The indicators are calculated from US (USPO) and EU (EPO) patents offices are highly correlated. The indicator is for EU-15, for which longer time series are available, and used later to look at changes in the indicator over time.

Graph III.24: R&D intensity - PAT1* (mean 1999-2002)



(*) Ratio of patents to employment in a sector, relative to the same ratio for total manufacturing.

Source: calculated from Eurostat data and "Groningen Growth and Development Centre, 60-Industry Database, September 2006, http://www.ggdc.net".

From the point of view of the analysis of competitiveness and performance is more interesting the second indicator, PAT2. Indeed, by comparing performance of EU sectors with performance of the same sectors in the World, this indicator measures specialization or competitiveness in the patenting process in the EU economy. The results for this indicator are shown in Graph III.25, in which sectors are ranked according to PAT2 calculated from the European Patent Office (EPO), which is presented along with the same indicator calculated from the US Patent Office (USPO). Although, in general the two rankings are similar, there are differences in five sectors, namely wood and wood products, oil refining, food and drinks, pharmaceuticals and chemicals, for which the propensity to patent in the US is higher than in the EU[46].

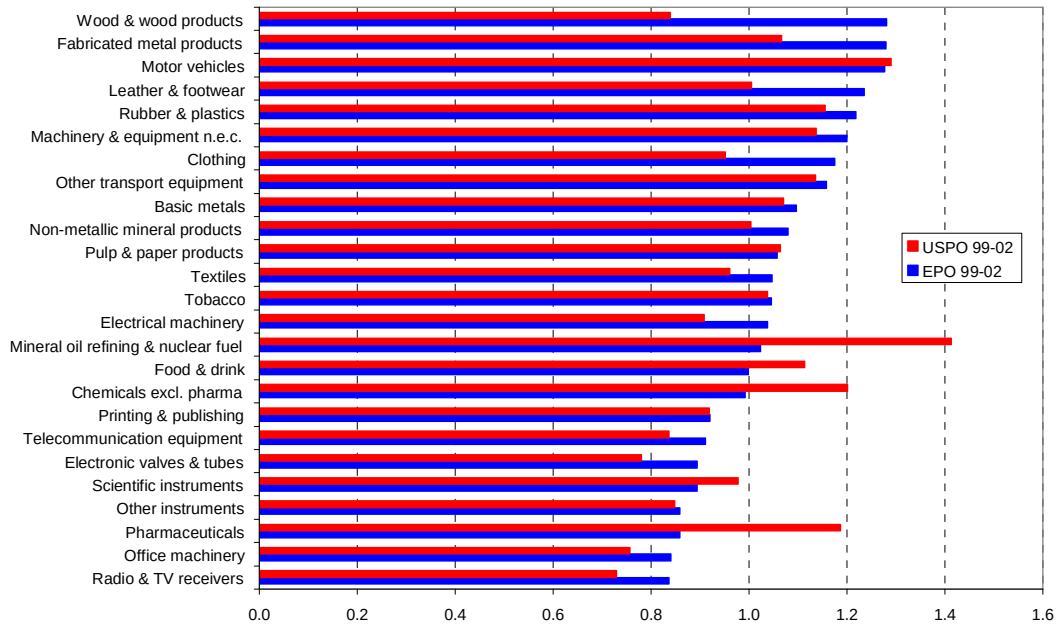
However, the most interesting information from Graph III.25 refers to the relative position of EU sectors, or their competitiveness in the process of producing inventions. Interestingly, the graph shows the weakness of the EU in the most R&D intensive sectors. The value of the index is below 1 in ICT sectors, scientific and other instruments, and pharmaceuticals, though these results need to be nuanced as regards pharmaceuticals, as this sector's relative good performance in patenting can be appreciated from the high index in the US. The same applies to chemicals, a sector in an intermediate position in the EU (index close to 1), but with much better results when the data from USPO are used. Two other sectors exhibit better performance with USPO data, but the difference with EPO data is less marked: these are scientific instruments and food and drinks. All in all, EU's competitiveness in high tech

[46] The two indicators are significantly correlated when oil refining is taken out of the sample. NACE 36 is not considered as long series of employment data are not available.

sectors would require more resources and better results in the production of *technology* to strengthen comparative advantage and to improve gains from international trade in this area. It is also interesting to note that R&D intensive sectors in which the EU exhibits good results according to PAT2, like other transport equipment (which includes aircraft and spacecraft), motor vehicles, machinery and equipment n.e.c., along with the already mentioned chemicals and pharmaceuticals, are also characterized by good performance in Revealed Comparative Advantage (see Chapter V).

The sectors at the top of the ranking in Graph III.25 are, with the few exceptions mentioned above, sectors in the group of non-high tech industries. Wood and wood products, metal products, leather and footwear, clothing, basic metals, non-metallic mineral products, and textiles exhibit a PAT2 index greater than 1. Furthermore, all these sectors are examples of the *country bias*, with a propensity to patent more in the EU than in the US.

Graph III.25: EU patents relative to World - PAT2* (mean 1999-2002)



Source: calculated from Eurostat data

(*) Ratio of the number of patents in a given sector in the EU to the total number of patents in all sectors in the EU, relative to the same ratio in the world.

Source: calculated from Eurostat data.

To complete the picture of EU performance in technology it is interesting to look at the changes that have taken place over 1977-2002, which have taken the EU to the situation presented in Graph III.25. This is done by calculating the difference in the absolute value of PAT2 taken up at the beginning and the end of the period mentioned above.

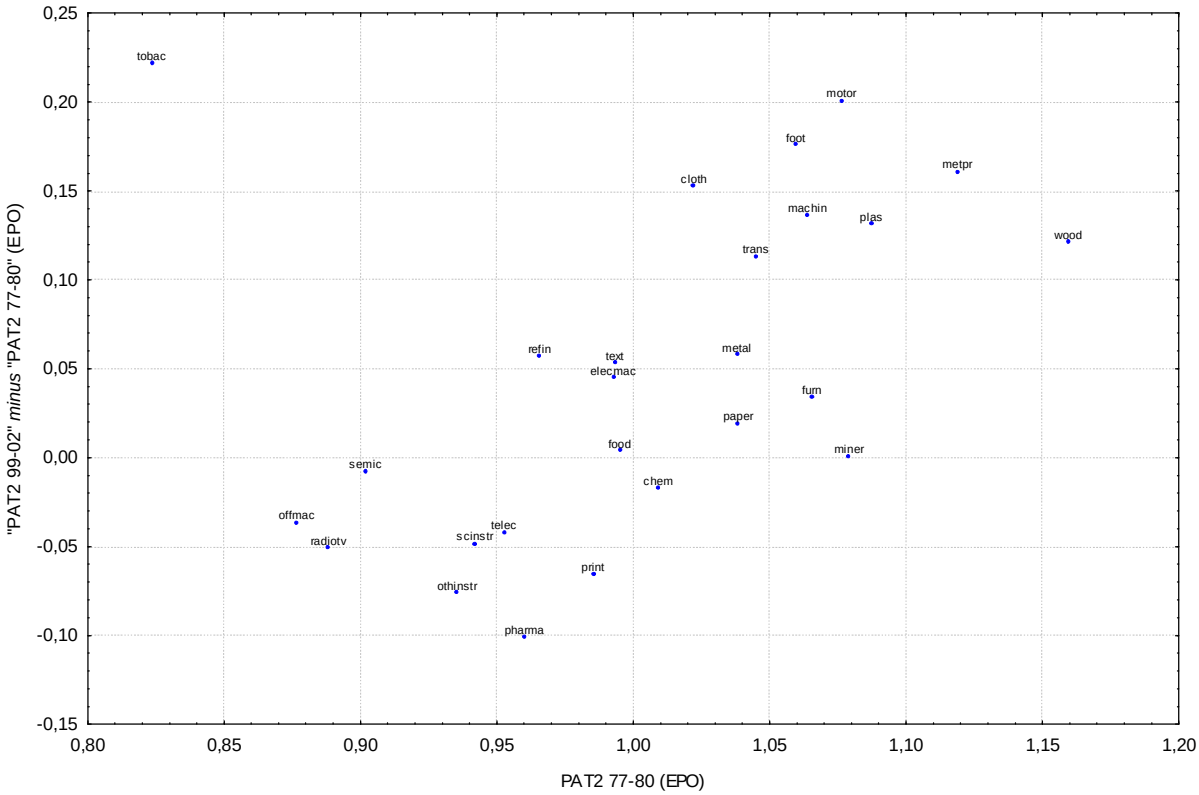
Graph III.26 shows the absolute value of the indicator at the beginning of the sample and its change over the whole period[47]. On average EU has moved in the direction of reinforcing its position of the beginning of the period: with a few exceptions, well placed sectors have

[47] See Table VI.1 in the annex for the complete name of sectors presented in the Graph.

improved their position over time, and sectors at the bottom of the ranking in 1977-1980 have worsened. Examples of top sectors are metal products, motor cars, machinery and equipment n.e.c., wood and wood products, leather and footwear, and rubber and plastics. Two sectors, printing and publishing, and pharmaceuticals, which were in a relatively neutral position, have, on the contrary, moved backwards.

However, Graph III.26, which covers a long period of time, masks the change in the patenting profile that took place in the 1990s. The most significant changes are highlighted in Graph IV.27, which presents the difference in PAT2 between the two sub-periods (1977-1990 and 1990-2002) against the absolute position at the beginning of the period (1977). Sectors highlighted in blue show the change in PAT2 until 1990, while those in red show the changes between 1990 and 2002[48]. The contrast between the two sub-samples is clear here. During the first period prevailed the process of reinforcement described in the previous paragraph. This process was mitigated in the 1990s. Furthermore, with a few exceptions, the situation has, to a certain extent, been re-inversed, in that sectors with weaker performance at the beginning of the period have improved during the 1990s. This indicates a change in the output of R&D to adapt it to developments of new technologies (ICT)[49], although this moderate change was not enough to substantially modify the conclusions from Graph III.26.

Graph III.26: EU sectors by PAT2(*) and change over time



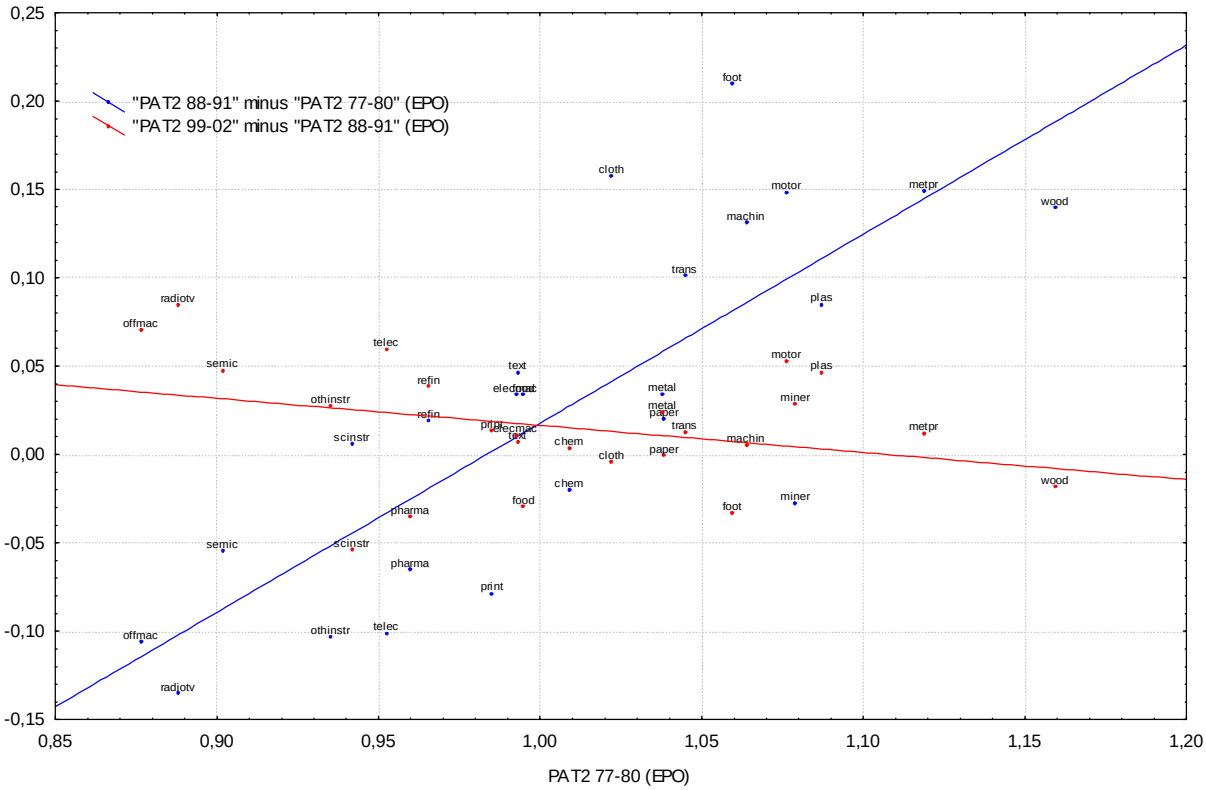
(*) Ratio of the number of patents in a given sector in the EU to the total number of patents in all sectors in the EU, relative to the same ratio in the world.

48 Two outliers, tobacco and furniture and other manufacturing, have been excluded from the graph.

49 Despite the drawbacks of this indicator, its utility is enhanced by the fact that, contrary to R&D, long time series are available for EU, which permits looking into developments over time and the adaptation of the EU to technological challenges.

Source: calculated from Eurostat data.

Graph III.27: EU sectors by PAT2(*) in 1977-1980 and change over time



(*) Ratio of the number of patents in a given sector in the EU to the total number of patents in all sectors in the EU, relative to the same ratio in the world.

Source: calculated from Eurostat data.

IV Demand-side indicators

IV.1 Introduction

All indicators presented so far refer to the supply-side. They describe the structural characteristics of sectors and provide insight into the growth and competitiveness of EU industries. This chapter focuses on the demand-side, with the objective to provide information on sectoral characteristics and growth from a different standpoint and to put in perspective the structural changes that characterize industrialized countries. The emphasis of the chapter is on the product structure and developments of main categories of demand, namely intermediate, consumption and investment. The chapter is organized as follows. Section IV.2 looks into structural aspects of demand at sector level. Section IV.3 is dedicated to private consumption demand, and focuses on the relative growth of the various goods and services consumed and the change in the structure over time. Finally, Section IV.4 deals with the structure and developments over time of investment demand.

IV.2 Structural characteristics of sectoral demand

This Section provides a structural picture of demand for goods and services at sectoral level, with emphasis on three issues: first, the use of goods and services from the demand point of view; secondly, the product composition of four demand components, namely intermediate demand, private and public consumption, and investment; and third the geographical origin for goods and services.

IV.2.1 Demand orientation of sectors

The data presented in this section characterize sectors in terms of the demand destination of their output. The use of goods and services is of interest to analyze and forecast sectoral developments as well as to identify factors that, from the demand side, determine sectoral growth. Graph IV.1 shows the percentage of the output of each sector that goes to intermediate, consumption and investment demand respectively[50]. Sectors are sorted by the percentage accounted for by intermediate demand. The picture is mixed, as a number of sectors exhibit a clearly defined profile (their output goes entirely or mostly to one single demand category), while for other the use of their output is distributed between two or three categories of demand. Obviously, the nature of the goods and services produced, and the relatively high level of sectoral aggregation, influence the results obtained.

Intermediate demand is the destination of more than 75% of the output of sixteen sectors[51] (from uranium and thorium ores to fabricated metal products), most of which are extractive and manufacturing activities, but also services like, for instance, financial intermediation, other business services, and renting of machinery. These are clearly sectors producing

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[50] The graph is based on data for ten countries: Portugal, Finland, Germany Denmark, Belgium, Austria, Italy, France, Netherlands and Sweden. The criterion to select these countries was the availability of symmetric Input-Output Tables for 2000. The only exception is Portugal, the data for which refer to 1999. The distribution was calculated using exclusively data for domestic demand (intermediate, consumption and investment); exports are not considered. Consumption encompasses private and public consumption. The EU-10 aggregate is calculated using PPS for GDP.

[51] Strictly speaking this refers to groups of products rather than to economic activities.

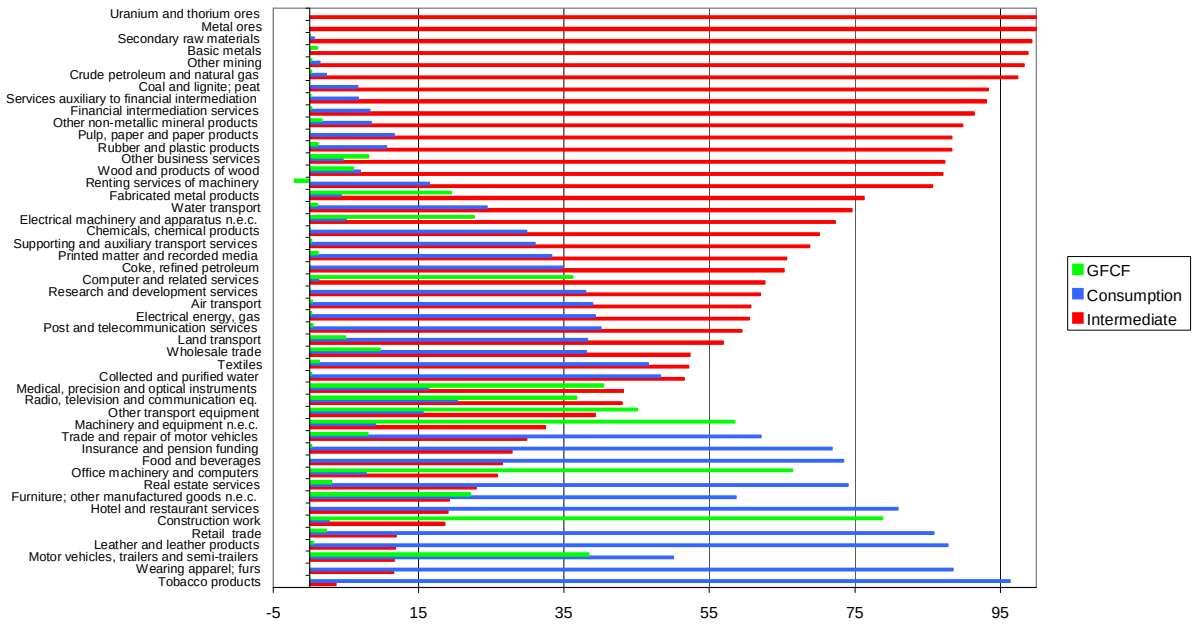
intermediate goods and services, which implies, on the one hand, that their activity depends directly on the activity other sectors, and, on the other, that by providing intermediate inputs for production of other goods and services, play an important role in the competitiveness and performance of their main customers.

A second group of sectors is clearly oriented towards consumption demand. Among manufacturing activities, obvious examples are food, clothing, leather and tobacco. Some services activities are also in this group: insurance and pension services, real estate, hotels and restaurants, and retail trade. These sectors play a determinant role to meet basic needs of the consumers and the supply of high quality and low price goods and services is a key factor for raising the standard of living of consumers.

In the group of sectors with a clear orientation towards investment demand the most evident example is construction. Office machinery and computer and machinery n.e.c. are two other clear cases in this group.

Finally, there is a larger group of sectors with a mixed profile, whose output is shared by two demand segments. This is explained by the level of sectoral aggregation and by the fact that they produce products with multiple uses, or a variety of differentiated products to meet specific niches of demand. Examples are textiles and collected and purified water (intermediate demand and consumption demand); other transport equipment, radio and TV equipment, and medical, precision and control instruments (intermediate demand and investment demand).

Graph IV.1: Use of sectoral output (%)



Source: calculated from Eurostat's Input-Output tables.

IV.2.2 Structure of demand

The second aspect of demand, which is presented in this Section, is the share of the different products and services in each of the four demand categories. The results are shown in Table

IV.1. The columns of the table represent the structure of the four components of domestic demand, and measure, the goods and services purchased, on average, by the expenditure of €100 in each of the categories of demand. More precisely, the first column ("intermediate") reflects the use of intermediate inputs by all sectors; the second column ("private consumption") is the structure of consumption by households; the third column ("public consumption") represents the structure of consumption of public administrations; and finally, the fourth column ("GFCF") is the structure of investment demand by all sectors (both market and non-market activities) and households.

The most significant items for each demand component are highlighted. Public consumption is obviously highly concentrated on three sectors, namely public administration and defence, and education and health services. The same applies to investment demand, which, to a large extent, consists of construction work, various types of machinery and metal products, as well as computer and related activities and other business services. On the whole, these sectors account for more than 75% of total Gross Fixed Capital Formation. Private consumption spreads its impact over a larger number of sectors. The fact that services account for more than 65% of households' consumption reflects the result of the process of change in households' consumption, in which goods like food and clothing have seen their shares decreasing in favour of more services (see next section). The column "intermediate demand" represents the average cost structure of the economy as regards consumption of inputs by all sectors in their production process. The sectoral distribution is more uniform than in the three other cases. It is worth mentioning the key role of business services as supplier of inputs to all sectors of the economy. This sector accounts for nearly 13% of all intermediate consumption of the economy[52].

Table IV.1: EU structure of demand (%) (2000)

Product	Intermediate	Private consumption	Public consumption	GFCF
Products of agriculture	***2.9***	1.7	0.0	0.4
Products of forestry	0.2	0.1	0.0	0.0
Fish and other fishing products	0.1	0.1	0.0	0.0
Coal and lignite; peat	0.1	0.0	0.0	0.0
Crude petroleum and natural gas	***2.3***	0.1	0.0	0.0
Uranium and thorium ores	0.0	0.0	0.0	0.0
Metal ores	0.1	0.0	0.0	0.0
Other mining and quarrying products	0.4	0.0	0.0	0.0
Food products and beverages	***3.2***	***9.0***	0.1	0.0
Tobacco products	0.0	0.4	0.0	0.0
Textiles	1.2	1.0	0.0	0.1
Wearing apparel; furs	0.3	***2.1***	0.0	0.0
Leather and leather products	0.2	0.9	0.0	0.0
Wood and products of wood	1.3	0.1	0.0	0.3
Pulp, paper and paper products	1.8	0.3	0.0	0.0
Printed matter and recorded media	1.9	1.4	0.0	0.1
Coke, refined petroleum products	***2.0***	1.6	0.0	0.0
Chemicals, chemical products	***4.7***	1.6	1.8	0.0
Rubber and plastic products	***2.1***	0.4	0.0	0.1
Other non-metallic mineral products	***2.0***	0.3	0.0	0.2
Basic metals	***3.5***	0.0	0.0	0.1
Fabricated metal products	***3.5***	0.3	0.0	***3.4***
Machinery and equipment n.e.c.	***2.3***	0.7	0.0	***11.5***
Office machinery and computers	0.5	0.2	0.0	***3.7***
Electrical machinery and apparatus n.e.c.	***2.0***	0.2	0.0	2.2

[52] The cost structure for each of sectors was presented in detail in Chapter II. Here we assume the existence of a highly aggregated sector, which consolidates all producing activities of the economy.

Radio, television and communication equipment	1.6	0.7	0.0	3.3
Scientific and other instruments	0.8	0.3	0.3	2.7
Motor vehicles, trailers and semi-trailers	***2.7***	***3.6***	0.0	***7.2***
Other transport equipment	1.0	0.3	0.1	2.4
Furniture; other manufactured goods n.e.c.	0.5	1.9	0.2	1.9
Secondary raw materials	0.1	0.0	0.0	0.0
Electrical energy, gas, steam and hot water	***2.5***	***2.3***	0.0	0.0
Collected and purified water, distribution services of water	0.3	0.4	0.0	0.0
Construction work	***3.4***	0.5	0.2	***42.3***
Trade, maintenance and repair services of motor vehicles	1.1	***4.0***	0.1	1.3
Wholesale trade and commission trade services	***4.2***	***4.7***	0.5	3.2
Retail trade services	0.8	***10.5***	1.2	0.8
Hotel and restaurant services	1.0	***7.1***	0.0	0.0
Land transport; transport via pipeline services	***2.3***	***2.5***	0.2	0.9
Water transport services	0.2	0.1	0.0	0.0
Air transport services	0.6	0.7	0.0	0.0
Supporting and auxiliary transport services	***2.7***	1.2	0.5	0.0
Post and telecommunication services	***2.6***	***2.5***	0.0	0.1
Financial intermediation services	***6.0***	0.8	0.0	0.1
Insurance and pension funding services	0.7	***2.7***	0.0	0.0
Services auxiliary to financial intermediation	1.3	0.2	0.0	0.0
Real estate services	***3.6***	***18.4***	1.2	2.0
Renting services of machinery and equipment	1.7	0.5	0.0	-0.2
Computer and related services	***2.1***	0.1	0.0	***4.5***
Research and development services	0.8	0.0	1.6	0.0
Other business services	***12.6***	0.9	0.2	***4.6***
Public administration and defence services	0.4	0.3	**38.1**	0.3
Education services	0.3	1.0	**21.0**	0.0
Health and social work services	0.6	***3.6***	**29.9**	0.0
Sewage and sanitation services	0.8	0.8	0.2	0.0
Membership organisation services n.e.c.	0.3	0.1	0.3	0.0
Recreational, cultural and sporting services	1.3	***2.3***	2.1	0.5
Other services	0.4	1.7	0.1	0.0
Private households with employed persons	0.0	0.8	0.0	0.0
Total	100	100	100	100
Note: the most significant items of each component of demand are highlighted				
Source: calculated from Eurostat's Input-Output Tables.				

IV.2.3 Geographical origin of goods and services

The sectoral picture of demand for goods and services provided in the two previous Sections will be completed in this section by looking at the geographical origin of the goods and services used for consumption, investment, and as inputs to the production process in the EU. The geographical origin is relevant, not only to measure accurately the impact that demand

developments may have on sectoral production in the EU, but also to underline the role of international trade as supplier of goods and services to meet the demand of businesses and households in the EU. The indicator presented in this section is the share of non-EU imports in EU consumption, investment and intermediate demand. The indicator is calculated from EU countries' Input-Output Tables and it is presented only for manufacturing goods, as imports of services from non-EU countries are, currently, with the exception of water transport services, much less relevant[53].

The results are presented in Table IV.2. This able shows the penetration of non-EU imports into the EU market, which varies significantly across products and categories of demand, from low percentages in tobacco, printed matter and metal products, to the highest one in ICT products. The value of the indicator is presented only for the *most relevant* cells. In other words, the cells retained are those pertaining to products which basically go to the corresponding demand category (e.g. food products to intermediate and consumption demand; basic metals to intermediate demand). One example of *less relevant* cell is leather products that go to intermediate demand, for which the data would show a high percentage (26.7%) of non-EU imports. This could provide a biased picture, as this product goes basically to private consumption. Furthermore, retaining the *most relevant* cells contributes to minimize the possible error originated by the assumption used to estimate the geographic origin of imports.

High penetration of imports can be found in the three demand segments. However, this is more obvious in investment, where, with the exception of metal products, motor vehicles and furniture and other manufacturing, the role of foreign suppliers of capital equipment for EU businesses is sizeable. It has already been underlined that this is an example of the opportunities offered by international trade to reinforce and improve the production capabilities of EU enterprises, and, to make these more competitive. Office machinery, other transport equipment, scientific and other instruments, radio, TV and telecommunications equipment, and electrical machinery are, in that order, the products with the highest penetration of non-EU imports in EU investment demand.

As regards private consumption, the most relevant products of non-EU origin are radio, TV and telecommunications equipment, clothing, scientific and other instruments (including optical equipment and watches), leather and footwear, furniture and textiles. Finally, the degree of penetration in intermediate demand ranges from 2% in printed matter and recorded media, through the highest percentages of, also in this segment of demand, ICT goods, with 37.8% for radio, TV and communication equipment, and 41.9% for office machinery and computers. Also in these two segments of demand the role of international trade, to give consumers and services access to a greater variety, in both price and quality, of goods has to be underlined.

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[53] The indicator is based on the assumption that the distribution of imports, of each product in each country, between EU and non-EU origin is the same for each category of demand (intermediate, consumption and investment). It is calculated in two steps. First the share of imported goods, of all origin, in the corresponding categories of demand is calculated separately for each country. The second step consists of breaking down "imports" into EU and non-EU origin, using the above assumption, and the information provided by Input-Output themselves for total imports (regardless of the demand destination) by group of products. The aggregate created encompasses nine countries: Austria, Belgium, Denmark, Germany, Finland, France, Poland, Portugal and the United Kingdom. The data used is for 2000, with the exception of Portugal (1999) and Finland and UK (2001). As regards the UK the data used are from the *use* matrix, although imports were broken down into EU and non-EU origin using 1995 data from the *symmetric* matrix. The aggregation of the nine countries was done using PPS for GDP.

Table IV.2: Imports from non-EU by demand categories (% of demand)			
Product	**Intermediate**	**Private consumption**	**Investment(*)**
Food products and beverages	5.8	5.4	-
Tobacco products	-	2.8	-
Textiles	17.8	21.1	-
Wearing apparel; furs	-	36.2	-
Leather and leather products	-	31.1	-
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	10.3	-	-
Pulp, paper and paper products	8.8	-	-
Printed matter and recorded media	2.0	3.3	-
Coke, refined petroleum products and nuclear fuels	9.1	10.8	-
Chemicals, chemical products and man-made fibres	16.1	11.4	-
Rubber and plastic products	8.3	-	-
Other non-metallic mineral products	4.9	-	-
Basic metals	15.7	-	-
Fabricated metal products, except machinery and equipment	5.3	-	5.7
Machinery and equipment n.e.c.	14.8	-	15.2
Office machinery and computers	41.9	30.3	43.8
Electrical machinery and apparatus n.e.c.	17.0	-	21.4
Radio, television and communication equipment and apparatus	37.8	44.2	27.5
Medical, precision and optical instruments, watches and clocks	21.3	34.6	31.1
Motor vehicles, trailers and semi-trailers	-	8.7	11.1
Other transport equipment	28.9	-	34.4
Furniture; other manufactured goods n.e.c.	17.4	22.2	15.2
(*) Gross Fixed Capital Formation			
Source: calculated from Eurostat's Input-Output Tables, 2000.			

IV.3 Private consumption

The indicators presented in Section IV.2 provide an overall picture of demand for goods and services, but the data refer to one single year, and they mask the change that takes place in industrialized countries particularly as regards the mix of products and services in total expenditure. The purpose of this section is to show the dynamics in consumption of the various categories of goods and services, and their effect on the structure of private consumption. Income and price elasticity of demand for the various categories of goods and services are presented to characterize the various categories of goods and services and to explain the contrasting growth rates of these.

The structure of private consumption expenditure is presented in Table IV.3, which shows the share of the various goods and services items, for EU-25 and 2004, in descendent order[54]. There is a relatively high concentration of expenditure: the first seven categories of goods and services (from food to actual rentals for housing) account for 50% of total private consumption. Among these, *basic* items –housing, food and clothing- amount to 31.5% of total expenditure. The other items are related to vehicles –both purchase and operation of personal transport equipment- and catering. To assess the consumption pattern presented in the table it is interesting to take into consideration the elasticity of demand for the various categories of goods and services. Graph IV.2 presents the income and price elasticity of the demand for nine categories of products and services[55]. Food, beverages and tobacco, with relatively low income elasticity (0.4), and clothing, with higher income elasticity (0.9) but still lower than 1, fall in the category of basic goods (*necessities*) whose demand increases more than proportionately, relative to income, as the economy grows. All the other items presented in the graph, namely education, gross rent, fuel & power, house operations, medical care, recreation, transport and communication and other items, exhibit an income elasticity greater than 1 (*luxuries*). While these values cannot be interpreted separately from other factors affecting changes in demand, they do indicate the effect on demand of increases in income, and they actually contribute to explain the change in the composition of private consumption over time, which is described below.

Two qualifications are necessary as regards the above results. First, the elasticity average value for EU discussed so far masks the heterogeneity existing across EU countries. The group food, beverages and tobacco exhibits the largest variation in income elasticity, which ranges between 0.12 (Luxembourg) and 0.72 (Latvia). As a matter of fact, the level of development determines the responsiveness of the demand for food, beverages and tobacco to *changes* in income (see Graph IV.3). In all other expenditure items the range of variation of income elasticity is narrower, but the same inverse relation can be observed between income per capita and income elasticity. The case of recreation, which is, after food, the category with the largest variation across countries, is presented in Graph IV.4. Second, at the level of product aggregation used here, it is clear that[56] the expenditure categories encompass items which, individually, would exhibit different income elasticity. A precise example of the heterogeneity within the expenditure categories presented in Graph IV.2 is the group food, beverages and tobacco, for which a breakdown into eight different products, and the corresponding demand elasticity, are available (Graph IV.5). With an income elasticity of 0.23, bread and cereals is the most inelastic product, in contrast with beverages and tobacco (0.55). The variation across countries, as well as the relationship between income elasticity

54 The statistical nomenclature is COICOP (Classification of Individual Consumption by Purpose) and in most cases (e.g. food, clothing, and household textiles) it is easy to identify the supplying sectors where they come from. Some items of the table, however, are a mixture of different categories of products and services: e.g. furniture and furnishing, carpets and other floor coverings; and glassware, Tableware and household utensils. Furthermore, although the table is presented at 3 digits of COICOP, two items - communications and education- correspond to the 2-digit level, as the 3-digit level items (postal services and pre-primary and primary education) are not comprehensive and, besides, according to the data available the value of the expenditure would be zero.

55 The graph presents the un-weighted mean of the elasticity calculated at country level. The aggregation level corresponds roughly to the 2-digit level of COICOP. The countries are Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden and United Kingdom.

56 Although the mean is un-weighted there is little variation across EU countries, and this does not affect the classification of goods into luxuries and necessities, which, as can be expected, is the same in all EU countries.

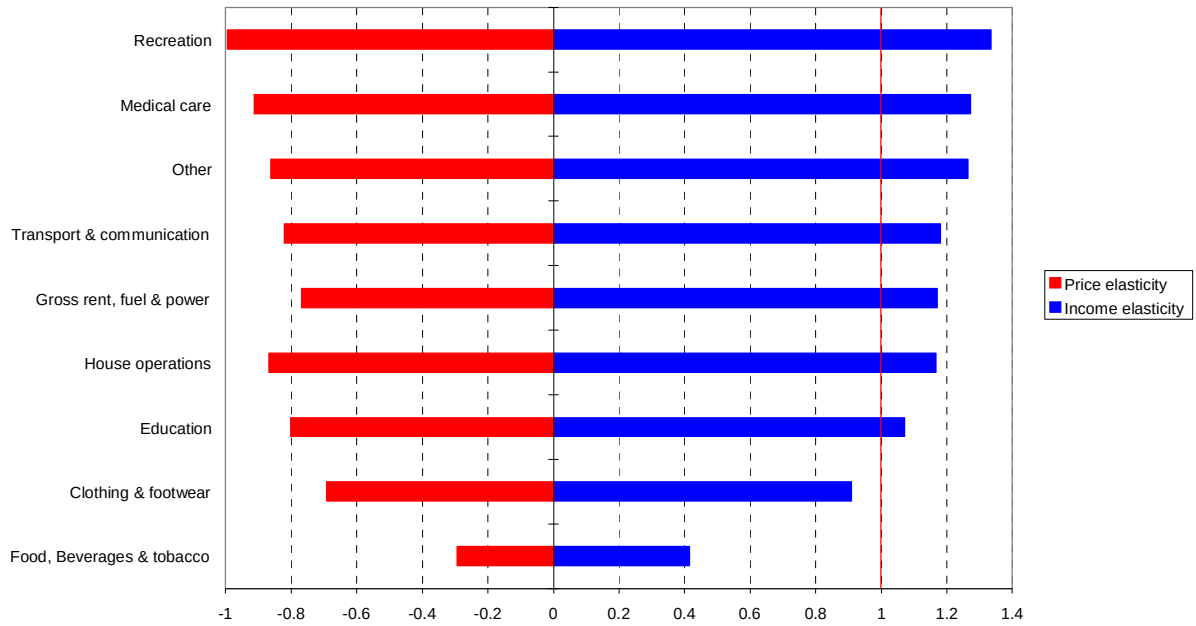
and income per capita, which follows the same pattern mentioned above, is presented in Graphs IV.6 and IV.7.

Table IV.3: EU-25 shares in total private consumption (2004)

Code	Product / Service	%
cp011	Food	11.5
cp042	Imputed rentals for housing	10.9
cp111	Catering services	7.5
cp072	Operation of personal transport equipment	6.5
cp031	Clothing	4.9
cp071	Purchase of vehicles	4.5
cp041	Actual rentals for housing	4.3
cp045	Electricity, gas and other fuels	3.5
cp094	Recreational and cultural services	3.5
cp08	Communications	2.9
cp125	Insurance	2.8
cp051	Furniture and furnishings, carpets and other floor coverings	2.4
cp121	Personal care	2.4
cp073	Transport services	2.4
cp022	Tobacco	2.0
cp093	Other recreational items and equipment, gardens and pets	2.0
cp126	Financial services n.e.c.	1.8
cp091	Audio-visual, photographic and information processing equipment	1.8
cp056	Goods and services for routine household maintenance	1.7
cp021	Alcoholic beverages	1.6
cp095	Newspapers, books and stationery	1.6
cp112	Accommodation services	1.6
cp044	Water supply and miscellaneous services relating to the dwelling	1.5
cp061	Medical products, appliances and equipment	1.4
cp062	Out-patient services	1.4
cp127	Other services n.e.c.	1.2
cp012	Non-alcoholic beverages	1.2
cp043	Maintenance and repair of the dwelling	1.2
cp124	Social protection	1.1
cp032	Footwear including repair	1.1
cp123	Personal effects n.e.c.	1.0
cp053	Household appliances	0.9
cp10	Education	0.9
cp063	Hospital services	0.7
cp054	Glassware, Tableware and household utensils	0.6
cp052	Household textiles	0.5
cp096	Package holidays	0.5
cp055	Tools and equipment for house and garden	0.4
cp092	Other major durables for recreation and culture	0.4
	Total	100.0

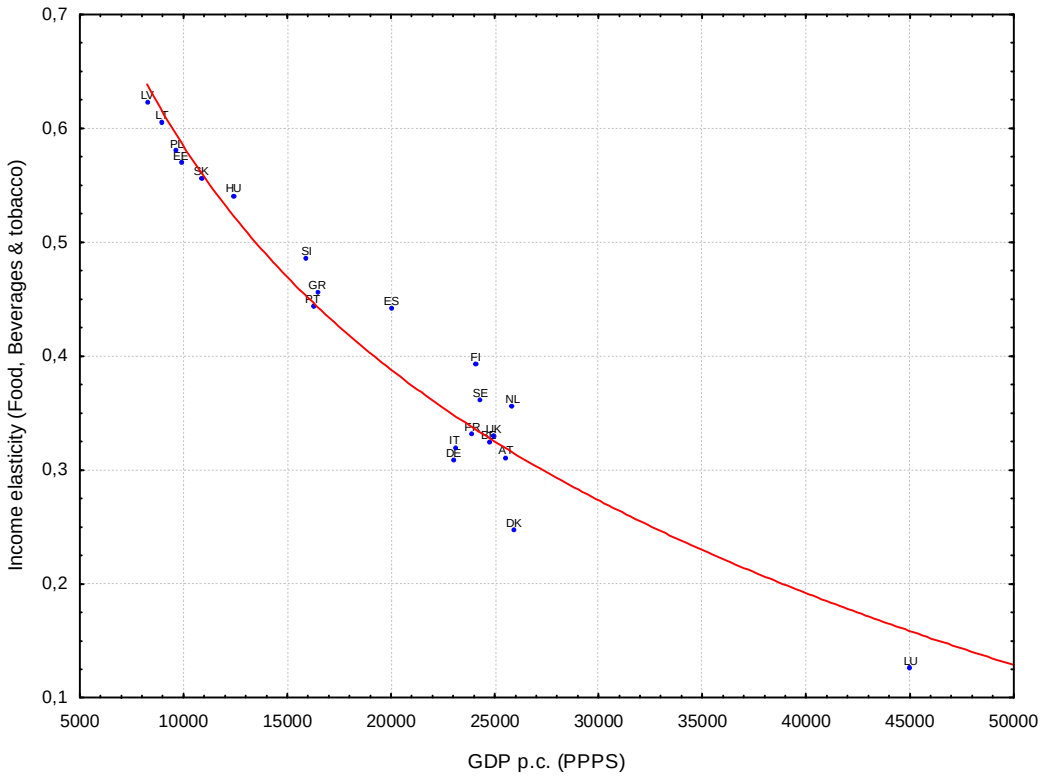
Source: Eurostat, National Accounts.

Graph IV.2: EU average income and price elasticity of demand



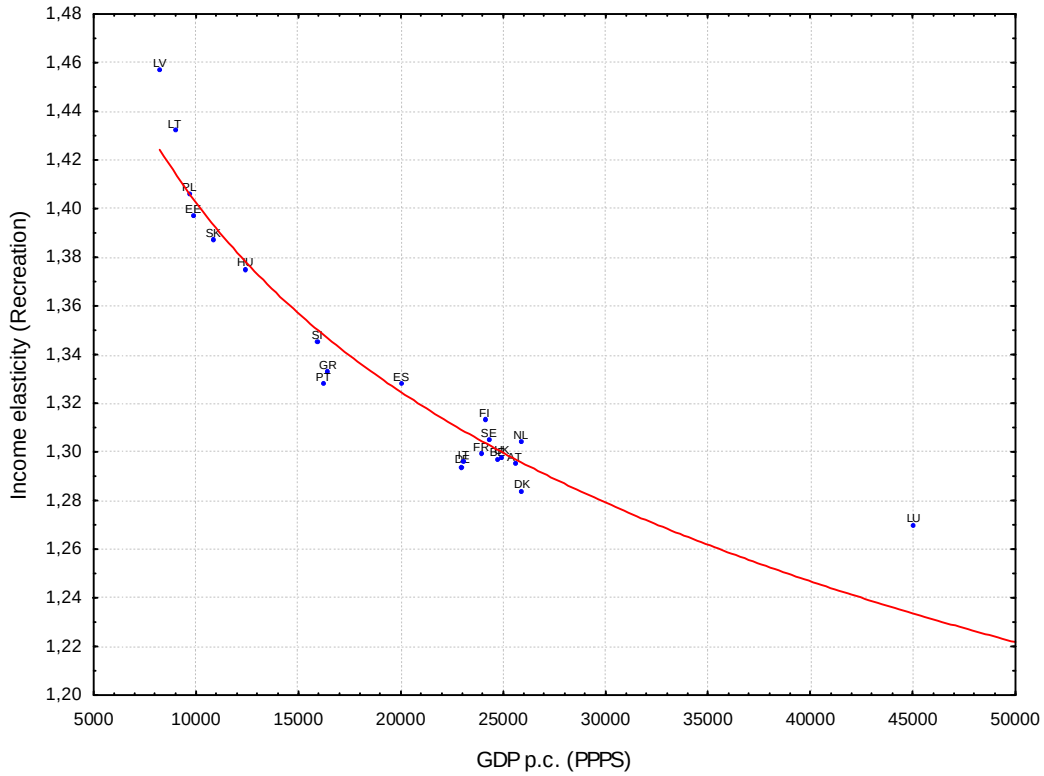
Source: calculated with data from James Seale Jr., Anita Regmi and Jason Bernstein (2003), International Evidence on Food Consumption Patterns, United States Department of Agriculture, Technical Bulletin, 1904, October.

Graph IV.3: Food, beverages and tobacco – Income elasticity vs. GDP per capita in EU countries



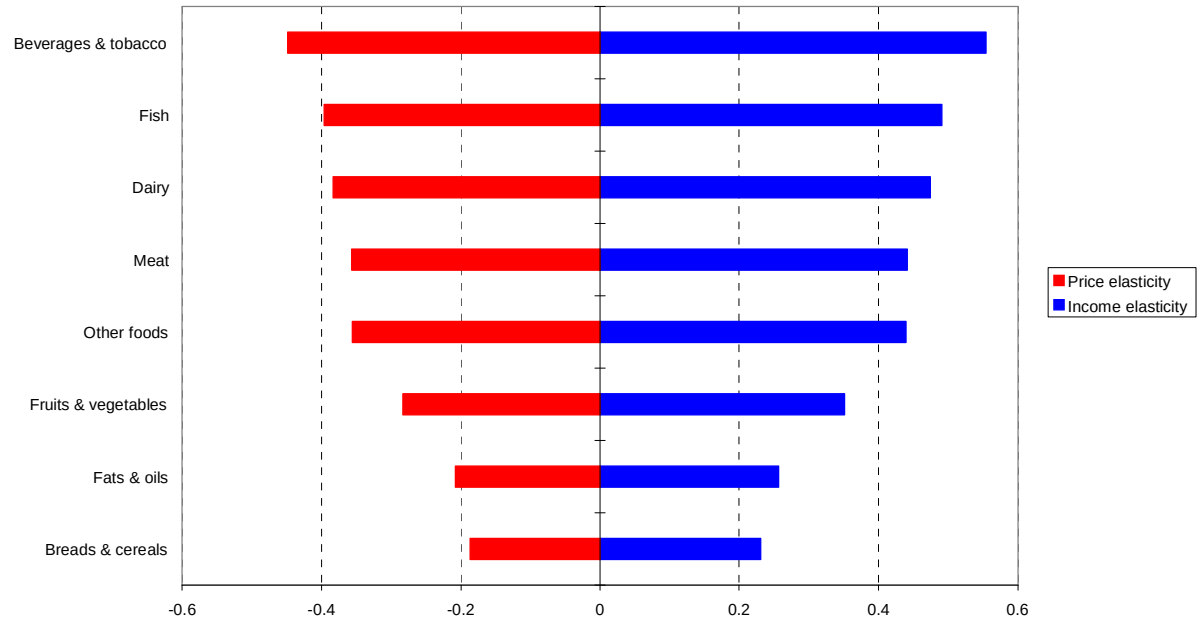
Source: calculated with data from James Seale Jr., Anita Regmi and Jason Bernstein (2003), International Evidence on Food Consumption Patterns, United States Department of Agriculture, Technical Bulletin, 1904, October.

Graph IV.4: Recreation - Income elasticity vs. GDP per capita in EU countries



Source: calculated with data from James Seale Jr., Anita Regmi and Jason Bernstein (2003), International Evidence on Food Consumption Patterns, United States Department of Agriculture, Technical Bulletin, 1904, October.

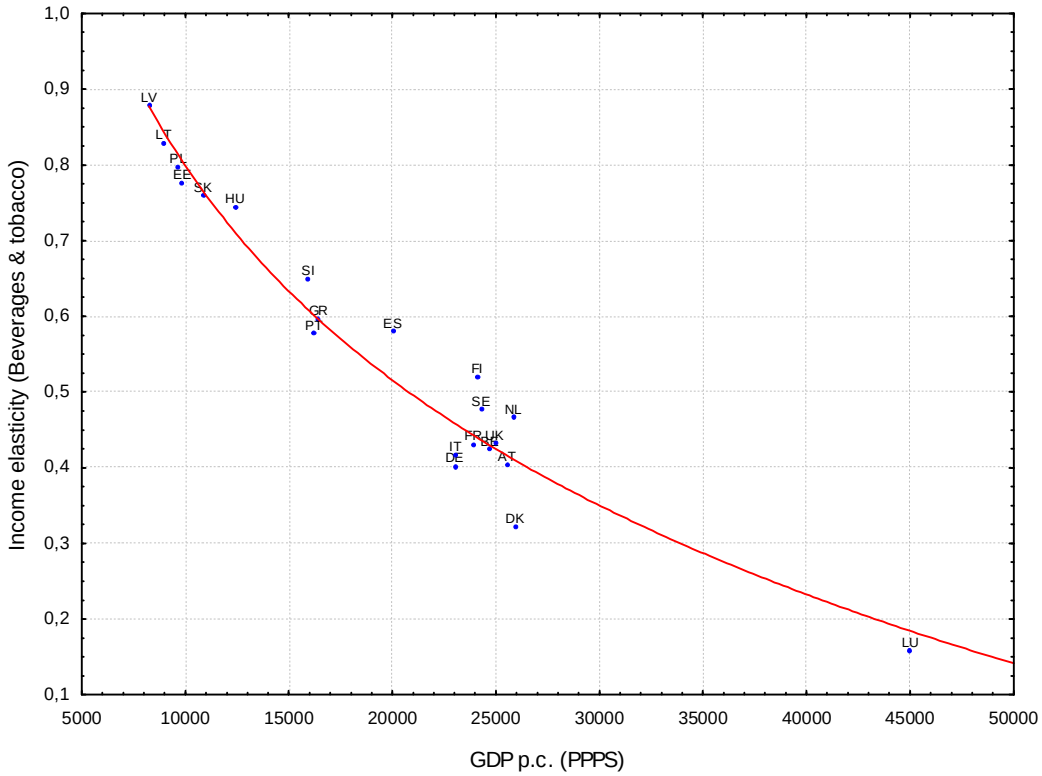
Graph IV.5: EU average income and price elasticity of demand - Food, beverages and tobacco products



Source: calculated from Unitated States Department of Agriculture data

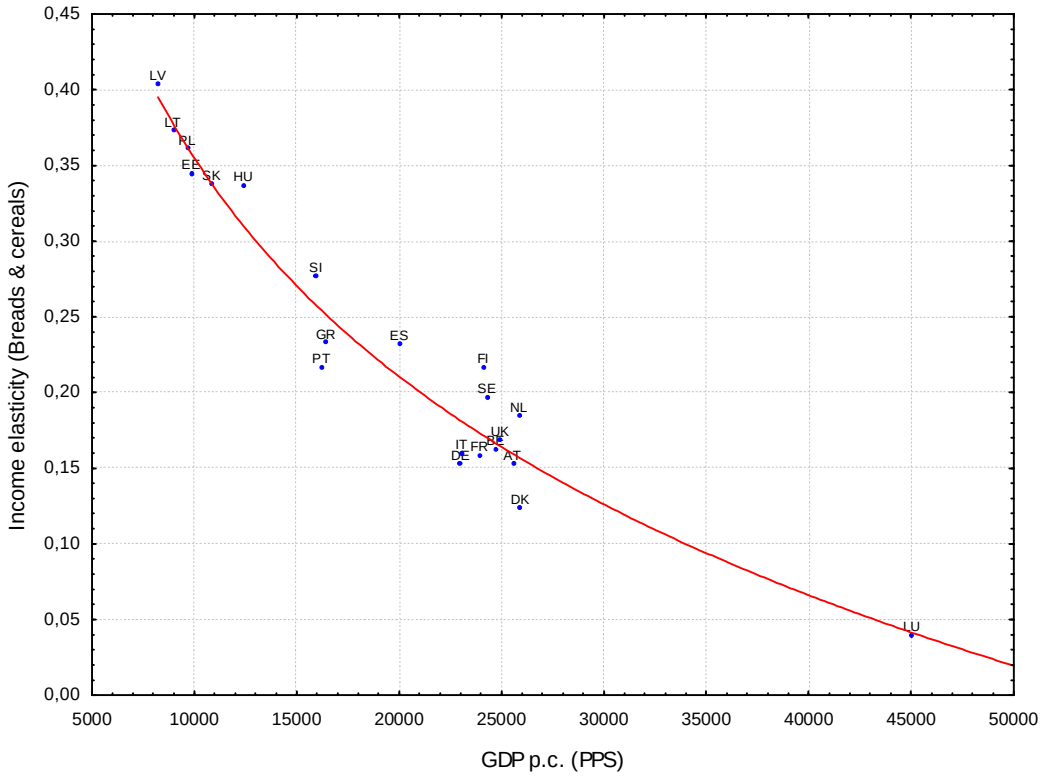
Source: calculated with data from James Seale Jr., Anita Regmi and Jason Bernstein (2003), International Evidence on Food Consumption Patterns, United States Department of Agriculture, Technical Bulletin, 1904, October.

Graph IV.6: Income elasticity vs. GDP per capita in EU countries - Beverages and tobacco



Source: calculated with data from James Seale Jr., Anita Regmi and Jason Bernstein (2003), International Evidence on Food Consumption Patterns, United States Department of Agriculture, Technical Bulletin, 1904, October.

Graph IV.7: Income elasticity vs. GDP per capita in EU countries - Breads & cereals



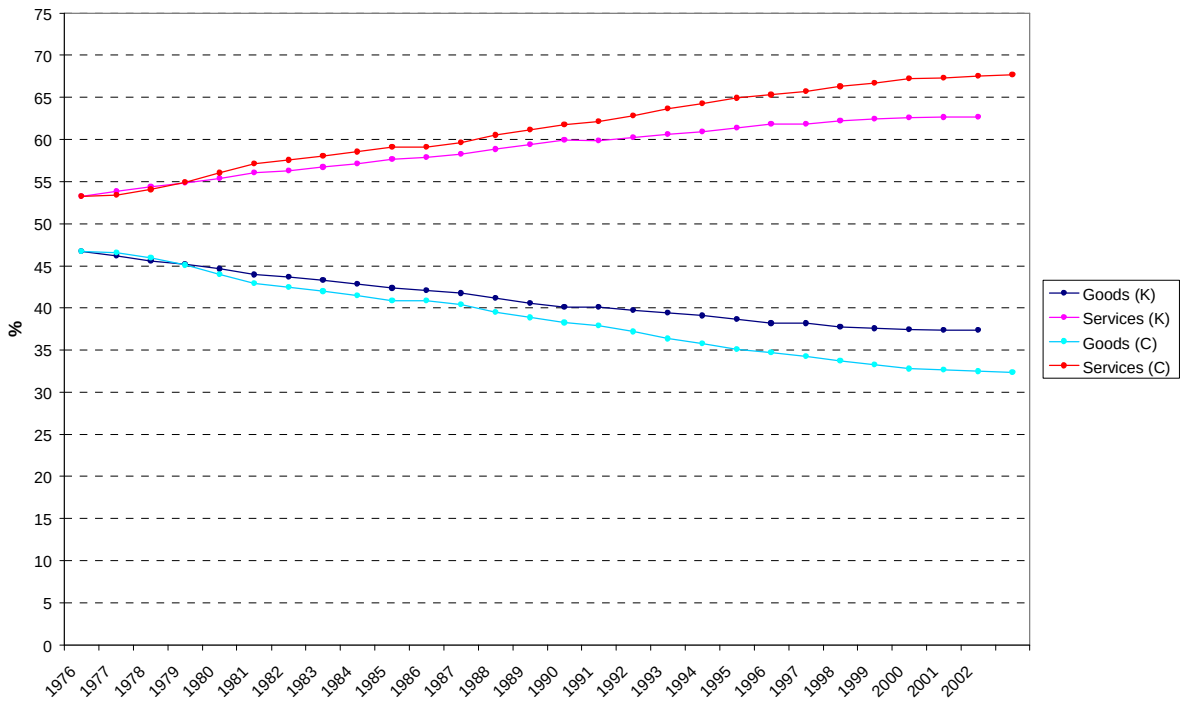
Source: calculated with data from James Seale Jr., Anita Regmi and Jason Bernstein (2003), International Evidence on Food Consumption Patterns, United States Department of Agriculture, Technical Bulletin, 1904, October.

However, the most interesting aspect of private consumption for the analysis of sectors is to look at how expenditure in the various items evolves over time. A general picture is given by Graph IV.8, which stresses the nature of a fundamental change, consisting of a gradual increase of services, at the expense of goods[57], in the distribution of private consumption expenditure, which, from the supply side is matched by a movement, in *relative terms*, from the production of goods towards the production of services. Broadly speaking, the higher income-elasticity of the demand for services contributes to explain this change in the composition of private consumption. However, Graph IV.8 shows another feature of interest in the developments of consumption of goods and services, which has to do with the evolution of the relative prices of these two categories of expenditure. Over the whole period considered, the price of services, relative to manufacturing, increases steadily. This is reflected in the fact that the gap between the shares of goods and services is narrower in constant prices. In other words, the increasing (decreasing) share of services (goods) is magnified, in nominal terms, by the fact that services become, in relative terms, more expensive than goods over time. More precisely, the gap between the share of services and goods in 1976 was 6.5 percent points, which widened to 35 points in 2002: 10 percent points of the latter are accounted for by the developments of relative prices. This trend is common to all developed countries and can therefore be observed also for the EU-15 and EU-25 aggregates, although in these cases the data available cover a shorter period of time. For

[57] *Goods* encompass the following COICOP items: cp01 “food and non-alcoholic beverages”; cp02 “alcoholic beverages, tobacco and narcotics”; cp03 “clothing and footwear”; and cp05 “furnishings, household equipment and routine maintenance of the house”. *Services* include: cp04 "housing, water, electricity, gas and other fuels"; cp06 "health"; cp07 "transport"; cp08 "communications"; cp09 "recreation and culture"; cp10 "education"; and cp11 "restaurants and hotels". Item cp12 "miscellaneous goods and services" was not included in the calculations.

example, for EU-15 the average annual growth rate of prices over 1991-2004 is 1.4% for goods and 2.4% for services[58]. The share of goods and services in total private consumption expenditures, at current prices, was 37.8 and 62.1% in 1991, and 32.2 and 67.7% in 2004. The influence of the relative prices narrows the gap, as the shares in 2004, at constant prices, were 34.6 and 65.4%. Nevertheless, one qualification is necessary as regards price developments in services. The aggregated trend masks the variation among various types of services. The most remarkable, at the level of aggregation used here, is the case of communications, which exhibits a substantially different performance from the other services activities. Indeed, since the mid-1990s the price index for this sector decreases under the influence of favourable technological and productivity developments and increasing competition[59]. This stresses the different nature of the various services activities and the uneven technological developments that characterize their growth.

Graph IV.8: Share of goods and services in private consumption in constant (K) and current (C) prices - EU-6



Source: Eurostat – National Accounts

A ranking of products and services classified by annual growth rate is presented in Graph IV.9. Although the high growth rate of some of the top products in the ranking may be influenced by the low consumption at the beginning of the period, it clearly reflects the strong development of a range of goods and services in the 1990s and 2000s. Among them the following can be mentioned: ICT goods (e.g. CD-players, photographic equipment, personal computers and software) and a series of services that have developed intensively (e.g. private mail and parcel delivery; financial services of banks, investment counsellors, administrative charges of private pension funds). Other items that exhibit growth rates above 5% are household appliances, vehicles, electricity, gas and other fuels, and alcoholic beverages.

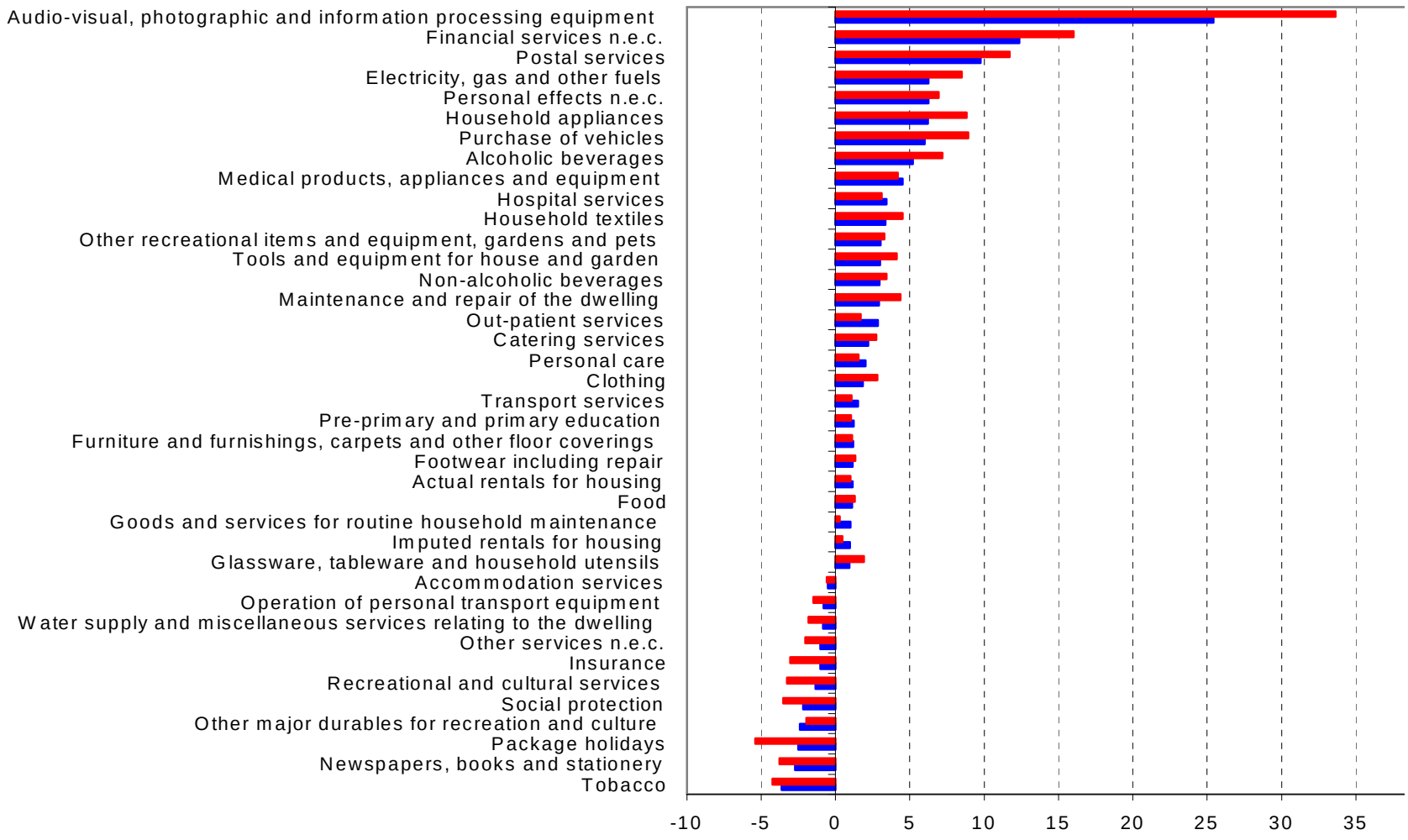
58 These prices refer to the implicit deflator obtained from the series in current and constant prices. The aggregates for goods and services were calculated as a chained index. The same approach was used to deflate the EU-6 expenditure in goods and services.

59 On productivity growth in communications services see European Commission (2003), O'Mahony and Van Ark (ed.), EU productivity and competitiveness – An industry perspective, OPOCE, Luxembourg.

Although changes in the structure of private consumption take place slowly over long periods of time the distinct growth in consumption of the various categories of goods and services shown above leads to a gradual shift of private consumption towards goods and services characterized by high income elasticity. To capture the size and the main direction of this change it is interesting to look at long time series of data. Although only for an aggregate of six EU countries[60] the relative importance of the various categories of products and services, and their relative change over time can be appreciated in Graph IV.10. The share of food and non-alcoholic beverages experienced over the period of 27 years shown in the graph a significant decrease, to which it should be added the negative evolution of other categories of goods, namely, alcoholic beverages, clothing and footwear, and furniture and other household equipment. All other categories, various types of services, developed in the opposite direction, with gains in the share of private consumption. As a matter of fact, the process of economic growth, the increase in income per capita, demographic transformations, and social and cultures changes are at the origin of the fundamental modification in private consumption demand that is described here.

[60] Austria, Denmark, Finland, France, Italy and UK.

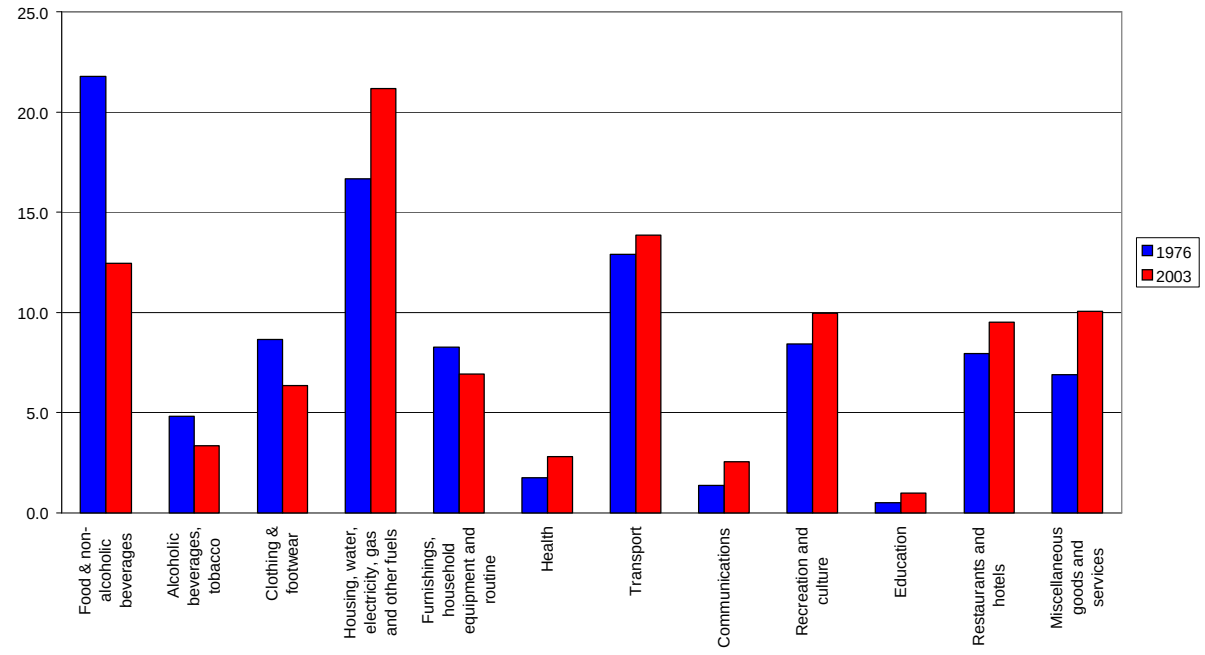
Graph IV.9: Private consumption - average annual growth(*) rate in (%)



(*) constant prices

Source: Eurostat – National Accounts.

Graph IV.10: Private consumption shares in EU-6



Source: Eurostat – National Accounts.

IV.4 Investment demand

The approach to track investment demand is the same as the one in Section IV.3, although, in this case, the classification of products does not provide a detailed picture of growth by product categories. The groups of goods considered are as follows: metal products and machinery; transport equipment; construction work: housing; construction work: other constructions, and other products[61].

The structure of investment demand by product for EU is represented in Graph IV.11, which shows the share of the various categories of products and services in GFCF. Above 50% of investment corresponds to construction work; 25% to metal products and machinery; transport equipment and other products account for 9% and 13% respectively.

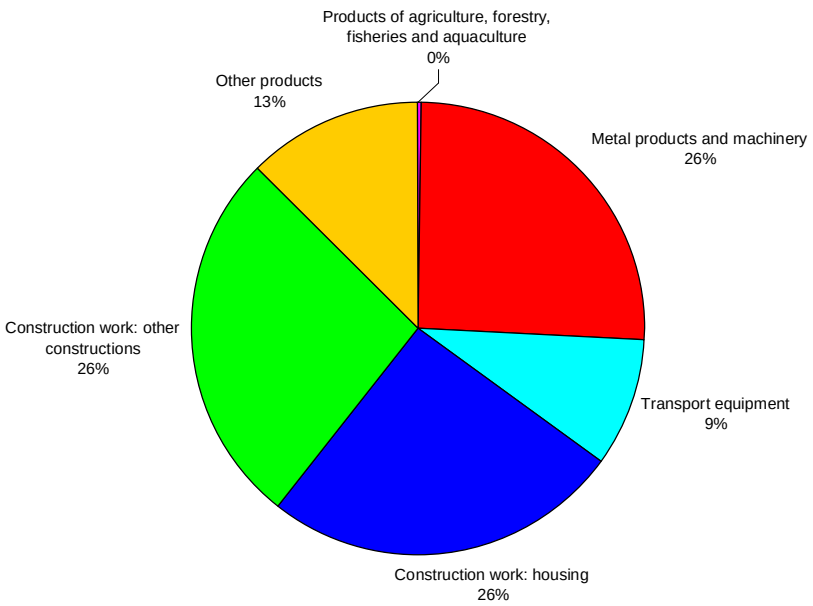
As regards developments over time, two aspects are emphasized here. The first one is the relative dynamics of the various categories of goods, and the second one the cyclical profile of GFCF. The relative growth is represented in Graph IV.12 for both EU-15 over 1990-2005 and EU-25 over 1995-2005. Interestingly, the growth rate of investment in construction work is below the average of total GFCF, while all other categories of goods exhibit high growth

61 The demand side products are defined in terms of CPA (a nomenclature of products) and most of the supply side indicators are defined in terms of a classification of economic activities (such as NACE Rev.1 or ISIC Rev.3). The correspondence between the investment goods (demand side) and the sector classification (supply side) is as follows: construction work corresponds with NACE 45; transport equipment with NACE 54 (motor vehicles) and 55 (other transport equipment); metal products and machinery with NACE 28 through 33 and 36.

rates, which in the case of transport equipment and other products are above 4 and 6% respectively. These developments have two main implications: on the one hand, demand for sectors producing these goods proved to be particularly dynamic, although, as regards the impact on EU domestic production of capital equipment, the supply of some of these goods is, partially, as was shown in Section IV.2.3, of foreign origin. The second aspect to underline is that to the extent that investment in machinery incorporates technological advances and innovation into the production process, the relatively high growth in investment, which, from the supply side, was reflected in Section III.4.1, allows EU sectors keeping up with technological developments and competition. In this respect, the geographical diversification of suppliers facilitates EU sectors' access to a variety of capital equipment in the best conditions of price and quality.

The second aspect of interest for the analysis of sectors is the high cyclical profile of GFCF. This is shown in Graphs IV.13 and IV.14 which present the growth rate[62] of investment demand for metal products and machinery, and transport equipment respectively in the UK (1970-2005), EU-15 (1991-2005) and EU-25 (1995-2005). The need to take into consideration the cyclical ups and downs of this variable in short and medium term analysis of sectoral growth and competitiveness is patent from these graphs.

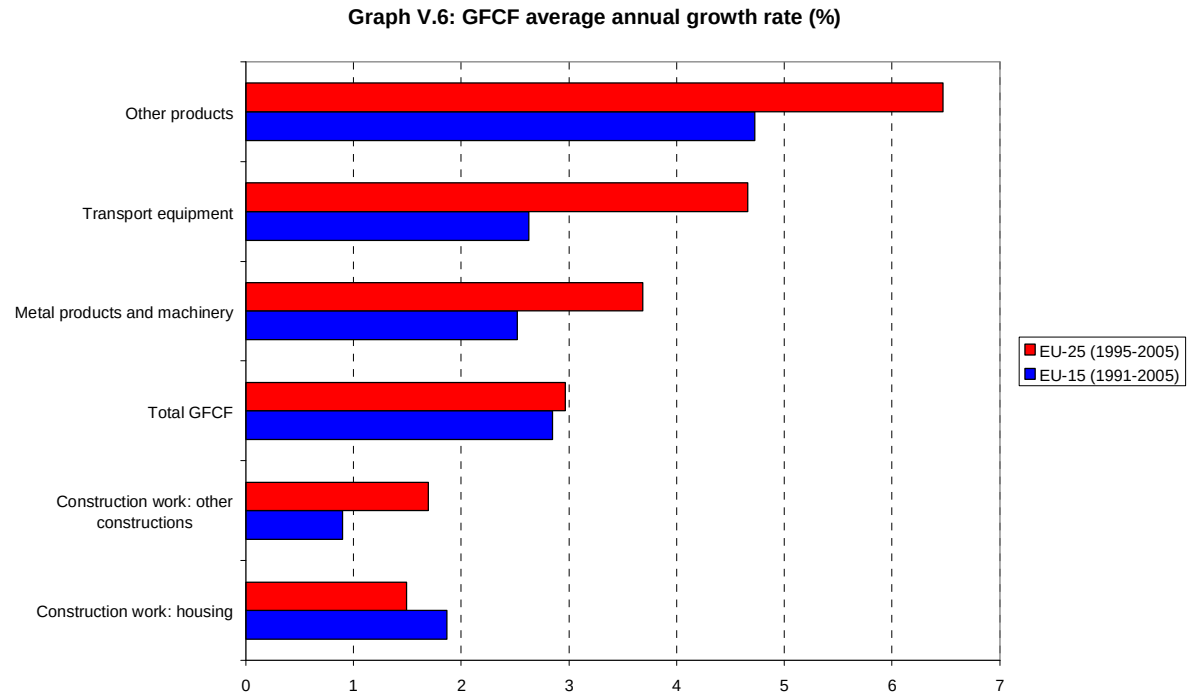
Graph IV.11: Structure of Gross Fixed Capital Formation by sectoral origin of goods (%) EU-25 (2005)



Source: Eurostat – National Accounts.

62 Growth rates of time «t» over «t-4».

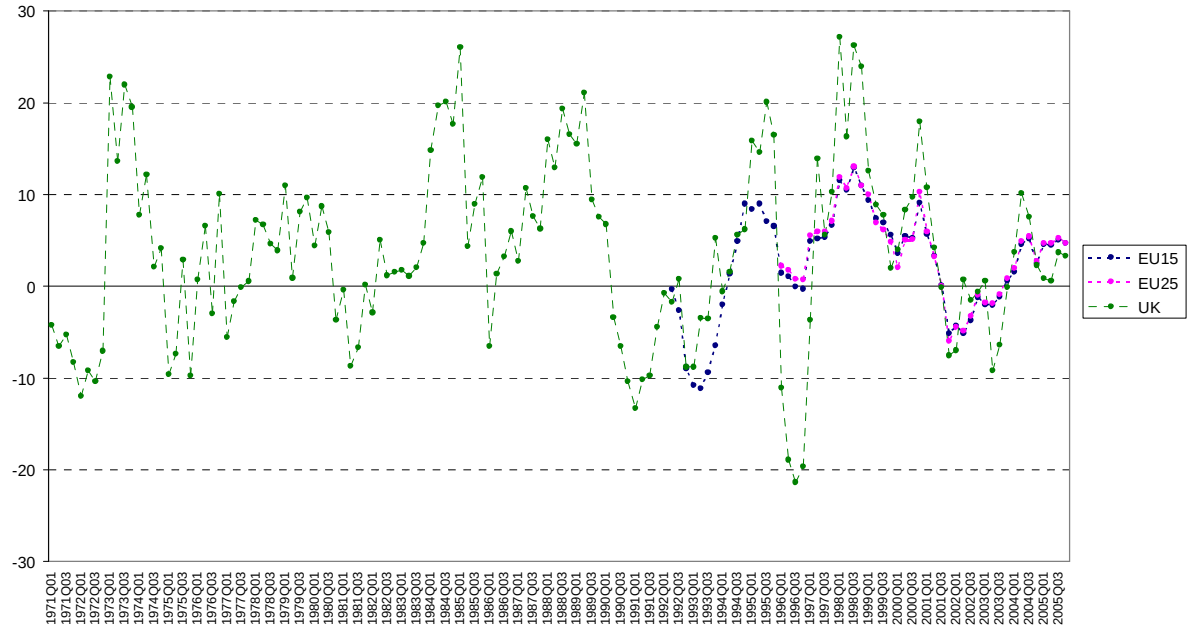
Graph IV.12: GFCF average annual growth rate (*) (%)



(*) constant prices.

Source: Eurostat – National Accounts.

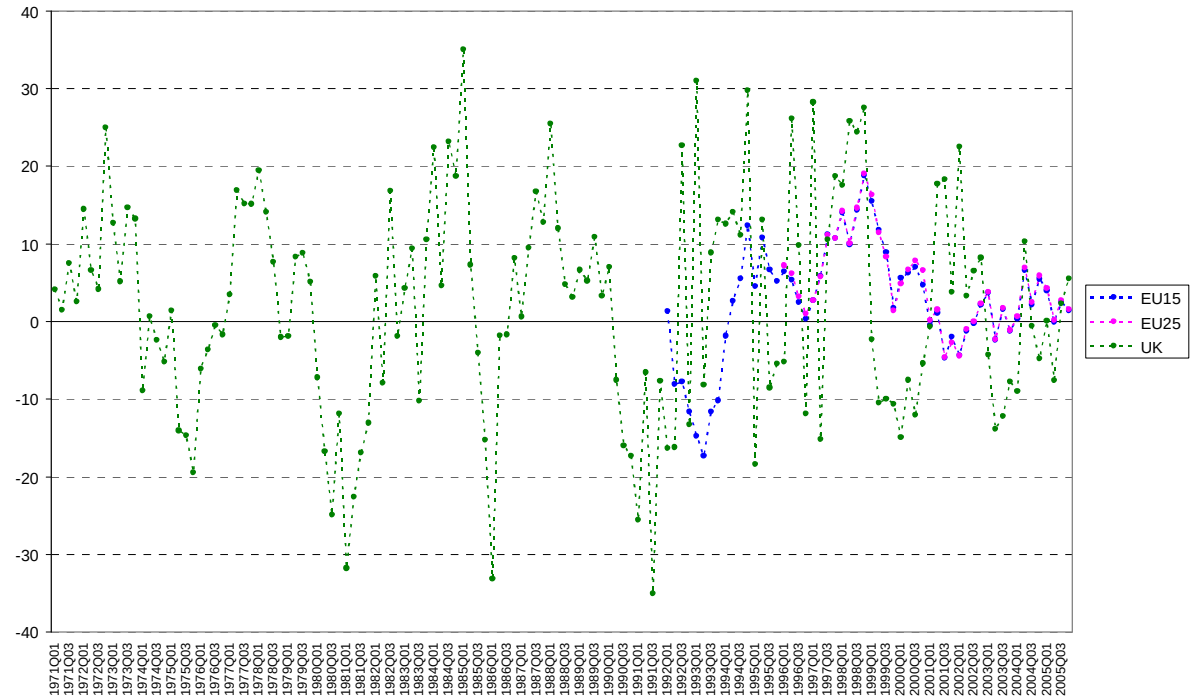
Graph IV.13: Investment demand for metal products and machinery - growth rate(*) (t/t-4) (1971-2005)



(*) constant prices.

Source: Eurostat – National Accounts.

Graph IV.14: Investment demand for transport equipment - growth rate(*) (t/t-4) (1970-2005)



(*) constant prices.

Source: Eurostat – National Accounts.

V. International aspects of competitiveness

V.1 Introduction

EU exports to the rest of the World account, on average, for 17% of total manufacturing production, and this share is substantially higher for some industries[63]. The present chapter analyses EU-25 performance in external trade by manufacturing sector. This chapter is organised as follows. Section V.2 provides an overview of world trade using a trade matrix where the world is divided into nine geographical regions. Section V.3 analyses EU-25, US, Japan, China and India's external trade performance on the basis of an indicator of Revealed Comparative Advantage (RCA). Furthermore, an index of Relative Trade Balance (RTB) is presented for EU-25. Section V.4 reviews evidence of intra-industry trade (IIT) in the external trade flows of EU-25. A world trade matrix, which shows trade between EU-25 and four groups of countries, clustered according to their income per capita, is presented and EU-25 IIT is measured and discussed. This provides insight into the factors that play a role in external trade and the nature of threats and challenges the EU-25 could be facing; Section V.5 looks into the composition of EU-25 trade by labour skill and technology categories and presents the RCA index for these categories of products; finally, Section V.6 presents indicators on foreign direct investment across sectors.

V.2 World trade structure

The EU-25 is a major player in world trade in manufactured goods: exports originating in EU-25 countries, including intra-EU-25 trade, account for almost half of total world exports. Of total world trade, one third takes place between the EU-25 countries. Asia and North America are the two other main players[64]. Together the EU-25, North America and Asia account for 89% of total world trade flows. Furthermore, trade between *contiguous* regions is also important, and reflects factors such as distance between trading partners, transport costs, and the existence of common borders. The North America-Latin America block's share in total world trade is 12%, while Europe (i.e. the three regions into which the continent is divided) account for 40% of total world trade flows. Furthermore, in addition to the neighbouring effect the contribution of the "internal market" is a determinant factor to explain the intensity of trade within EU-25.

The main destination of EU-25 exports is North America (32%) and Asia (19%), see Table V.2.The non-EU European regions are the second largest market (25%) for EU-25 exports.

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63 See European Commission (2005), "EU sectoral competitiveness indicators", Graph VI.A.1.

64 The regions in the matrix are composed of the following countries. **Other Western Europe**: Norway, Switzerland. Central and Eastern Europe: Byelorussia, Bulgaria, Kazakhstan, Romania, Russian Federation, Ukraine, Turkey. **North America**: Canada, USA. **Latin America**: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay, Venezuela, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Cuba, Dominican Republic, Panama. **Middle East**: Iran, Israel, Jordan, Kuwait, Lebanon, Omar, Qatar, Saudi Arabia, United Arab Emirates. **Asia**: China, Hong Kong, India, Indonesia, Japan, South Korea, Malaysia, Pakistan, Philippines, Singapore, Thailand, Vietnam. **Oceania**: Australia, New Zealand. **Africa**: Algeria, Angola, Benin, Burkina Faso, Burundi, Cameron, Central African Republic, Congo, Cote d'Ivoire, Egypt, Ethiopia, Gabon, Guinea, Guinea Bissau, Kenya, Lybia, Mali, Morocco, Mozambique, Niger, Nigeria, Rwanda, Senegal, South Africa, Togo, Tunisia, Uganda, Tanzania, Zaire, Zimbabwe.

Similar patterns characterize imports (Table V.3). The main origin of EU-25 imports is Asia (43%), followed by North America (23%), while imports from the rest of Europe as a whole account for a slightly smaller part (22%) of total imports.

Table V.1: Manufactured products world trade matrix (2003) (%)

Exporting region \ Importing region	EU-25	Other Western Europe	Central and Eastern Europe	North America	Latin America	Middle East	Asia	*- China*	*- India*	Oceania	Africa	Total
EU-25	33.5	1.9	1.9	4.8	0.9	1.2	2.9	*1.1*	*0.2*	0.4	1.2	48.7
Other Western Europe	1.4	0.0	0.1	0.3	0.1	0.1	0.3	*0.1*	*0.0*	0.0	0.0	2.2
Central and Eastern Europe	1.1	0.0	0.3	0.1	0.0	0.1	0.2	*0.1*	*0.0*	0.0	0.1	2.0
North America	2.6	0.2	0.1	5.7	2.1	0.3	2.3	*0.6*	*0.1*	0.3	0.1	13.7
Latin America	0.5	0.0	0.0	3.0	0.8	0.1	0.3	*0.1*	*0.0*	0.0	0.1	4.8
Middle East	0.1	0.0	0.0	0.2	0.0	0.1	0.1	*0.0*	*0.0*	0.0	0.0	0.6
Asia	4.9	0.2	0.4	6.6	0.6	0.8	11.7	*5.8*	*0.3*	0.6	0.4	26.3
- China	*2.1*	*0.1*	*0.2*	*2.7*	*0.3*	*0.3*	*5.3*	*0.0*	*0.1*	*0.2*	*0.2*	*11.2*
- India	*0.2*	*0.0*	*0.0*	*0.2*	*0.0*	*0.1*	*0.2*	*0.1*	*0.0*	*0.0*	*0.0*	*0.9*
Oceania	0.1	0.0	0.0	0.1	0.0	0.0	0.3	*0.1*	*0.0*	0.1	0.0	0.8
Africa	0.5	0.0	0.0	0.1	0.0	0.0	0.1	*0.0*	*0.0*	0.0	0.1	1.0
Total	44.9	2.3	2.9	21.1	4.5	2.6	18.2	*8.1*	*0.6*	1.5	2.1	100.0

Notes: The matrix is calculated from export data. It does not include crude oil and other products from mining and quarrying. The values on each cell are percentage shares in total world trade. The main diagonal of the matrix (shaded cells) represents intra-region trade (e.g. exports from EU countries to EU countries). The matrix shows separately two countries, China (China and Hong Kong; intra-China trade was set to zero) and India, which are also included in *Asia*. For the country coverage of the regions, see footnote 64.

Source: calculated from the COMTRADE database.

Table V.2: Manufactured products world trade matrix – Export destination (2003)

Exporting region \ Importing region	EU-25	Other Western Europe	Central and Eastern Europe	North America	Latin America	Middle East	Asia	*- China*	*- India*	Oceania	Africa	Total
EU-25	0.0	12.3	12.8	31.6	5.8	7.7	19.2	*7.5*	*1.2*	2.7	8.0	100
Other Western Europe	65.3	0.0	3.0	12.3	2.4	2.7	12.1	*4.6*	*0.5*	0.9	1.3	100
Central and Eastern Europe	66.0	2.2	0.0	8.3	1.1	5.9	12.9	*7.6*	*1.8*	0.2	3.5	100
North America	32.8	2.1	1.3	0.0	26.5	3.4	28.9	*7.8*	*1.0*	3.3	1.8	100
Latin America	13.4	1.0	1.2	74.5	0.0	1.2	6.9	*3.3*	*0.4*	0.3	1.6	100
Middle East	25.8	2.9	3.7	42.3	3.3	0.0	18.2	*7.1*	*1.9*	1.2	2.6	100
Asia	33.9	1.1	2.4	45.6	4.3	5.6	0.0	*40.0*	*1.8*	4.3	2.8	100
- China	*18.5*	*0.5*	*1.9*	*24.0*	*2.3*	*2.5*	*47.0*	*0.0*	*0.8*	*1.7*	*1.6*	*100*
- India	*26.7*	*1.0*	*2.9*	*23.7*	*2.1*	*15.2*	*21.7*	*10.1*	*0.0*	*1.3*	*5.5*	*100*
Oceania	21.1	0.7	0.7	21.3	2.2	6.5	45.7	*10.5*	*3.0*	0.0	1.9	100
Africa	58.9	2.5	1.8	14.4	2.1	3.2	15.2	*2.8*	*2.3*	1.9	0.0	100

Notes: based on data in Table V.1 (net of intra-region trade). For the country coverage of the regions, see footnote 64.

Source: calculated from the COMTRADE database.

Table V.3: Manufactured products world trade matrix – Import origin (2003)

Exporting region \ Importing region	EU-25	Other Western Europe	Central and Eastern Europe	North America	Latin America	Middle East	Asia	*- China*	*- India*	Oceania	Africa
EU-25	0.0	81.0	76.2	31.2	23.3	46.0	44.7	*14.1*	*28.5*	29.9	62.5
Other Western Europe	12.6	0.0	2.5	1.7	1.4	2.4	4.1	*1.2*	*1.8*	1.4	1.5
Central and Eastern Europe	9.5	1.5	0.0	0.9	0.5	3.8	3.2	*1.5*	*4.7*	0.2	2.9
North America	23.0	7.3	4.0	0.0	56.5	10.7	35.5	*7.7*	*12.5*	19.4	7.5
Latin America	4.8	1.7	1.8	19.8	0.0	2.0	4.3	*1.7*	*2.7*	0.9	3.3
Middle East	1.3	0.7	0.8	1.6	0.5	0.0	1.6	*0.5*	*1.7*	0.5	0.8
Asia	43.4	6.7	13.9	43.2	16.9	32.4	0.0	*72.1*	*41.9*	46.5	20.9
- China	*18.2*	*2.7*	*8.5*	*17.5*	*7.0*	*10.9*	*81.1*	*0.0*	*15.0*	*13.8*	*9.2*
- India	*2.0*	*0.4*	*1.0*	*1.3*	*0.5*	*5.2*	*2.9*	*1.1*	*0.0*	*0.8*	*2.5*
Oceania	1.2	0.2	0.2	0.9	0.4	1.7	4.7	*0.9*	*3.2*	0.0	0.7
Africa	4.3	0.9	0.6	0.8	0.5	1.1	1.9	*0.3*	*3.1*	1.2	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	*100.0*	*100.0*	100.0	100.0

Notes: based on data in Table V.1 (net of intra-region trade). For the country coverage of the regions, see footnote 64.

Source: calculated from the COMTRADE database.

V.3 EU-25 sectoral performance and Revealed Comparative Advantage

This Section discusses the EU performance in external trade using an index of Revealed Comparative Advantage (RCA) and an index of Relative Trade Balance (RTB). These two indicators are used to describe EU competitiveness in external trade in goods. These indices, calculated from actual trade flows, are assumed to reveal the strong sectors in each of the countries and regions for which they are calculated, and give insight into the comparative advantage of these. The use of various sectoral classifications aims at facilitating the identification of the nature of the comparative advantage underlying the specialization of the countries: manufacturing is split into 28 groups of products in this section, and into technology and labour skills categories in Section V.5. The RCA index[65] for a sector

[65] The RCA indicator for product "i" is defined as follows:

$$RCA_i = \frac{\frac{X_{EU,i}}{\sum_i X_{EU,i}}}{\frac{X_{W,i}}{\sum_i X_{W,i}}}$$

where X=value of exports; the reference area ("W") is EU-25 plus 38 other countries (see the list below); the source used is the UN COMTRADE database. In the calculation of RCA, X_{EU} are exports to the rest of the World (intra-EU trade is excluded). As regards X_W, this measures exports to the rest of the World by the countries included in the reference area. The latter consists of EU-25 plus the following countries: Algeria, Argentina, Australia, Bangladesh, Brazil, Canada, Chile, China, Colombia, Costa Rica, Croatia, Egypt, Hong Kong, India, Indonesia, Israel, Japan, Kazakhstan, South Korea, Malaysia, Mexico, Morocco, New Zealand, Norway, Other Asian countries, n.e.s., Pakistan, Peru, Philippines, Romania, South Africa, Singapore, Sri Lanka, Switzerland, Thailand, Tunisia, Turkey, USA, Venezuela.

compares the share of that sector's exports in EU's total manufacturing exports, with the share of the same sector's exports in total manufacturing exports of a group of reference countries. Values higher (lower) than 1 imply that a given industry performs better (worse) than the reference area, and are interpreted as a signal of comparative advantage. The RCA indicator is used to rank groups of products according to their comparative advantage in the EU[66]. The RTB is used to measure performance developments over time. The RTB index compares the trade balance (exports minus imports) for a group of products to the total trade (exports plus imports) of that group of products[67].

The 28 groups of products are ranked according to the value of the RCA index in Graph V.1. The graph also shows for each sector, between brackets, the labour skills taxonomy to which it belongs[68] and the share in total manufacturing exports. The RCA values correspond to the average of years 2002, 2003 and 2004. Products[69] in the top of the ranking are characterised by high RCA. The following six are top products in EU-25 performance: pharmaceuticals, machinery and equipment n.e.c., aircraft and spacecraft, non-metallic mineral products, printing and publishing, and scientific instruments. Altogether, these account for an average of 34 % of total manufacturing exports. Eight products find themselves at the bottom of the graph: radio and television receivers, electronic valves and tubes, office machinery, clothing, textiles, other instruments, railroad and other transport equipment and basic metals. Finally, the value of the index for some products is close to 1, showing neither comparative advantage nor disadvantage. Examples of these products are: furniture and other manufacturing, other electrical machinery n.e.c., mineral oil refining and nuclear fuel, motor vehicles, and food, drinks and tobacco. In any case, in interpreting these results the following issues are important. First, the level of sectoral aggregation, which may mask different performance in various categories of goods within the same group of products. This is particularly relevant as regards the presence of a variety of brands and quality levels for the same type of goods. A second aspect has to do with country heterogeneity within the EU, as the performance of the EU as a whole is explained in some cases by the performance of a few EU countries. The third aspect to take into consideration is the fact that the results presented here are static and do not capture developments over time[70], although these can reveal changes in the

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66 The list of products is list C (see Annex VI).

67 The RTB indicator for product "i" is defined as follows:

$$RTB_i = \frac{(X_i - M_i)}{(X_i + M_i)}$$

where X=value of exports and M=value of imports
This indicator is based on EU-25 trade with the rest of the world. The source of the data is Eurostat's COMEXT database.

68 HS: high-skilled; HIS: high-intermediate skilled; LIS: low-intermediate skilled; LS: low skilled. For further details on this taxonomy see Mary O'Mahony and Bart van Ark (ed.), EU productivity and competitiveness: An industry perspective – Can Europe resume the catching-up process?, European Commission (2003), Chapter II.

69 Although this chapter is based on statistics on products, the sectoral classification used in Graph V.1 corresponds to list C (see Table VI.1 in Chapter VI on statistical nomenclatures). The data, originally presented according to SITC (Standard International Trade Classification) or CPA (Statistical Classification of Products by Activity in the European Economic Community), have been converted to ISIC Rev.3. Nevertheless it has to be underlined that these data are on *products* and, strictly speaking; do not correspond to trade *by economic activities.*

70 For time series of the RCA index see European Commission (2006), European competitiveness report.

competitive position of sectors. Finally, the weight of each sector in the export structure of the EU should be bore in mind to get a balanced assessment of the EU sectoral performance in external trade.

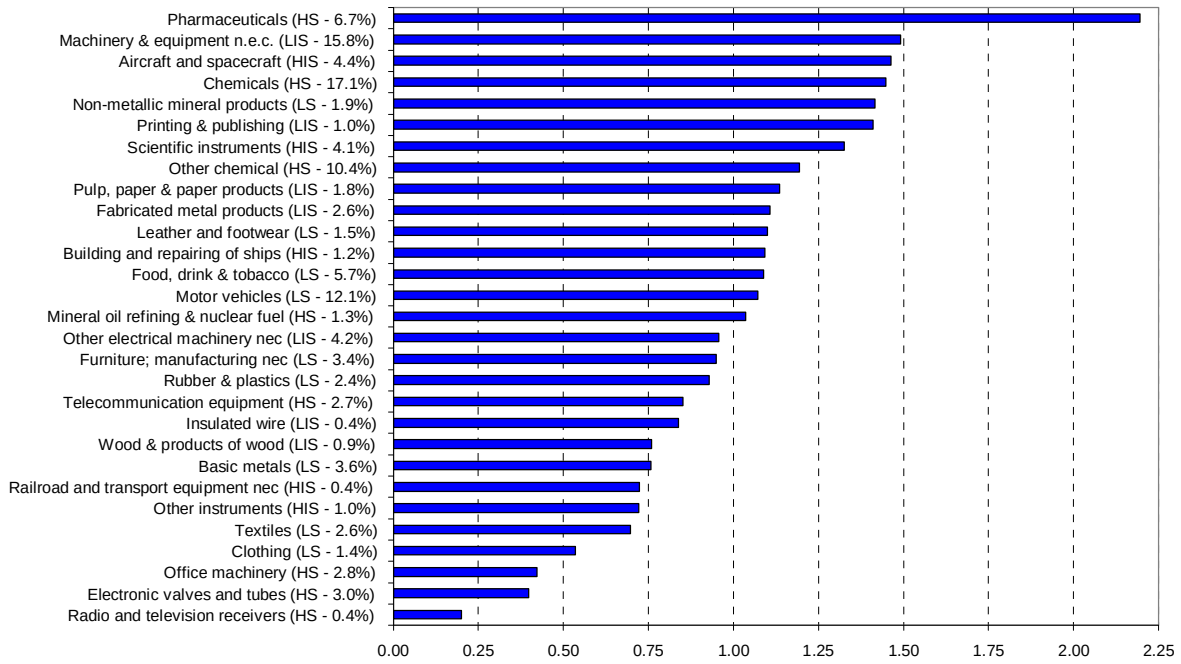
The profile of specialization (RCA index) in the EU is compared to the one of US, Japan, China and India in Graphs V.2 through V.6. The circle of "radius 1" is highlighted to facilitate the identification of the sectors characterized by comparative advantage, which are located outside this circle. The different specialization profile is clear from the graphs. Aircraft and spacecraft, scientific instruments, and printing and publishing are the three sectors that exhibit the highest RCA index in the US. Japan is characterized by high RCA in capital equipment (railroad equipment, shipbuilding) motor vehicles, and other instruments. As regards China and India, the sectoral specialization profile is strongly oriented toward textiles, clothing and leather, although China exhibits high RCA also in sectors like radio and TV receivers, office machinery and telecommunications equipment.

The relative trade balance (RTB) indicator, shown in Graph V.7, presents the evolution of industry performance between 1999 and 2004[71]. The strong competitiveness performance of chemicals is confirmed by the high value of its RTB index. The same applies to scientific instruments, printing and publishing, non-metallic mineral products, and machinery and equipment n.e.c.. Motor vehicles, which exhibits a slightly positive RCA index, in Graph V.1, is among the sectors with the highest RTB index.

As for the products performing less well, the RTB indicator confirms the poor performance of clothing, office machinery, radio and TV receivers and railroad equipment, which are the sectors with the lowest RTB index. Leather and footwear, wood and products of wood, basic metals, and electronic valves and tubes are characterized also by negative RTB values.

[71] RCA and RTB are positively correlated. The coefficient of correlation is 0.77 and statistically significant. Due to lack of data RCA cannot be always calculated for the same reference area and past years. The evolution of product performance over time for EU can be analyzed using RTB, which is less demanding in terms of data, although for EU-25 time series are shorter. For EU-15 RTB was presented in European Commission (2005), EU sectoral competitiveness indicators over the period 1989-2002.

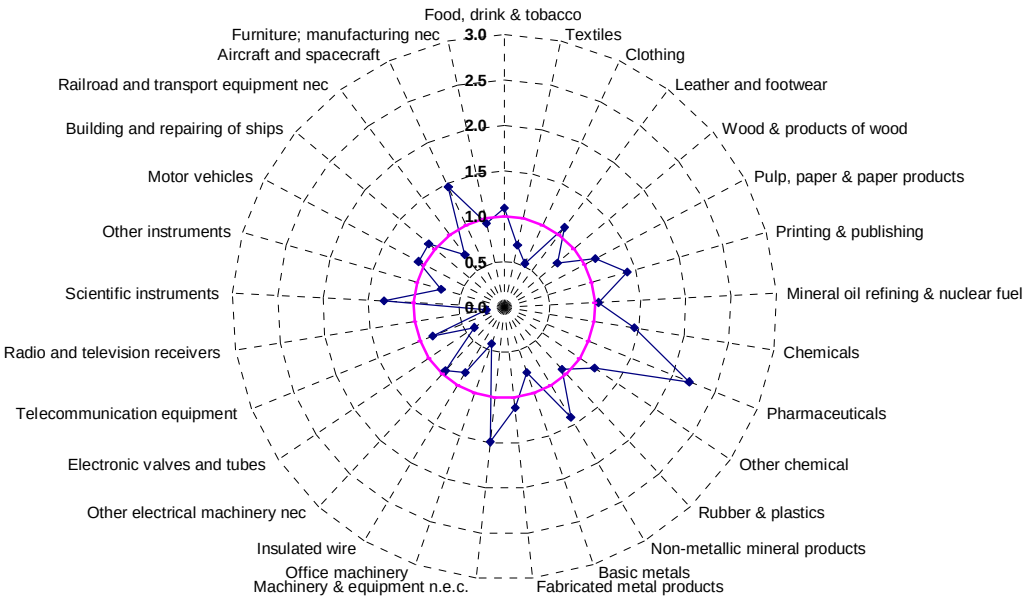
Graph V.1: EU-25 trade in manufactured products - Revealed Comparative Advantage index (2002-2004)



HS: high skills; HIS: high-intermediate skills; LIS: low-intermediate skills; LS: low skills.

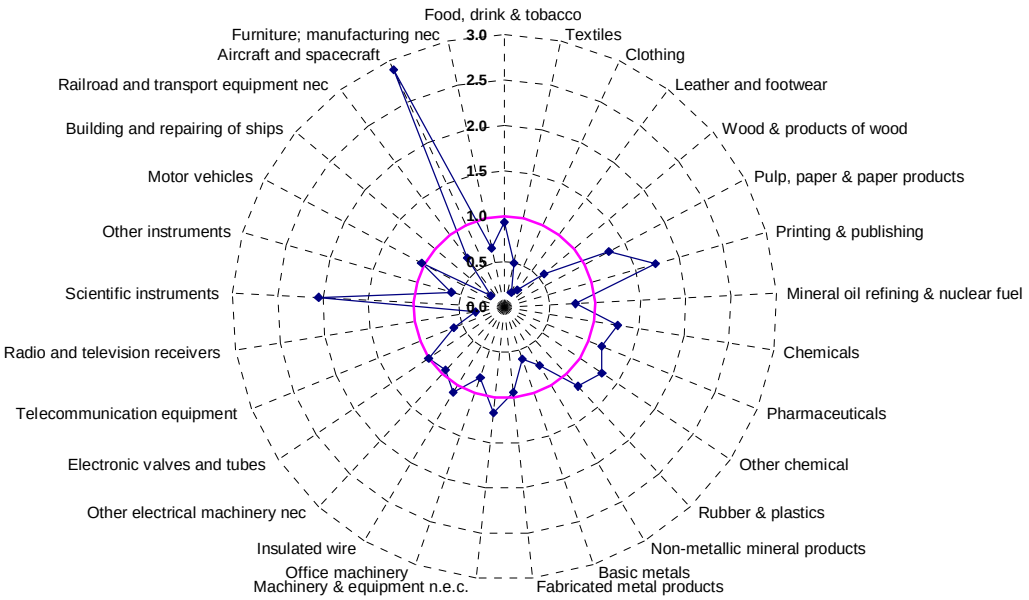
Source: calculated from COMTRADE database.

Graph V.2: EU-25 trade in manufactured products - RCA (average 2002-2004)



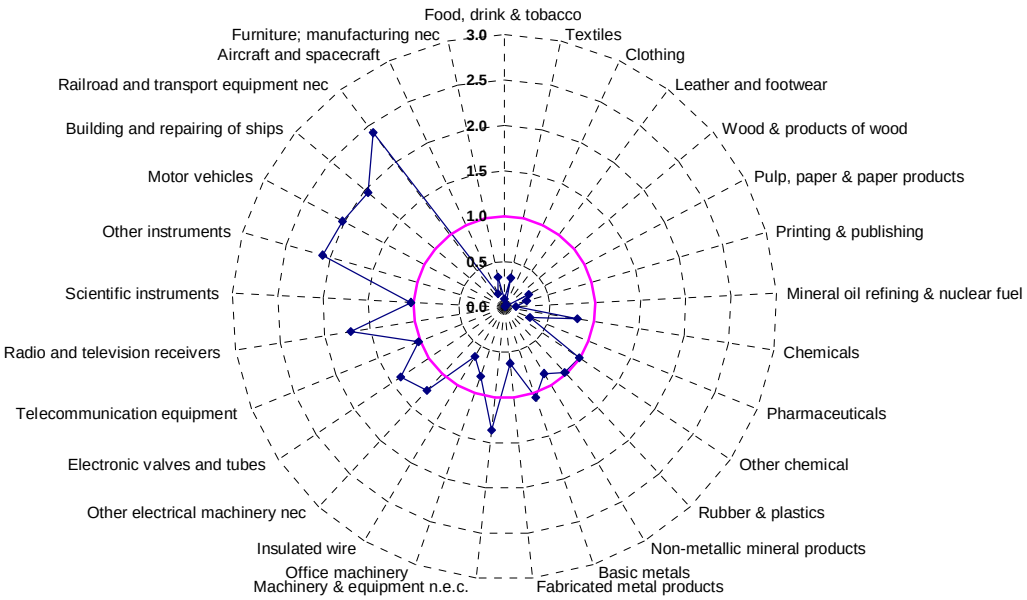
Source: calculated from COMTRADE database.

Graph V.3: US trade in manufactured products - RCA (average 2002-2004)



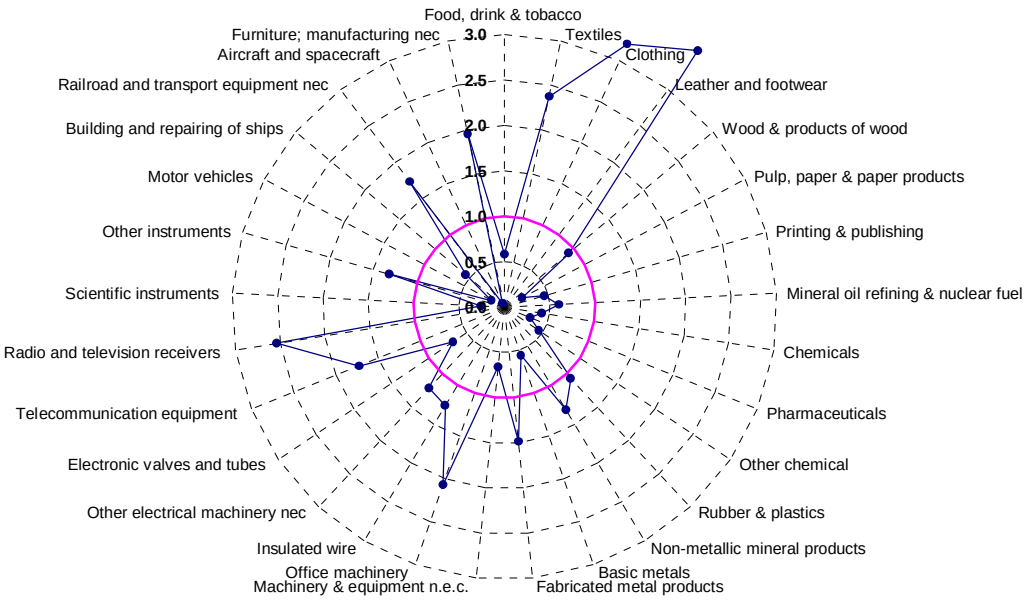
Source: calculated from COMTRADE database.

Graph V.4: Japan's trade in manufactured products - RCA index (average 2002-2004)



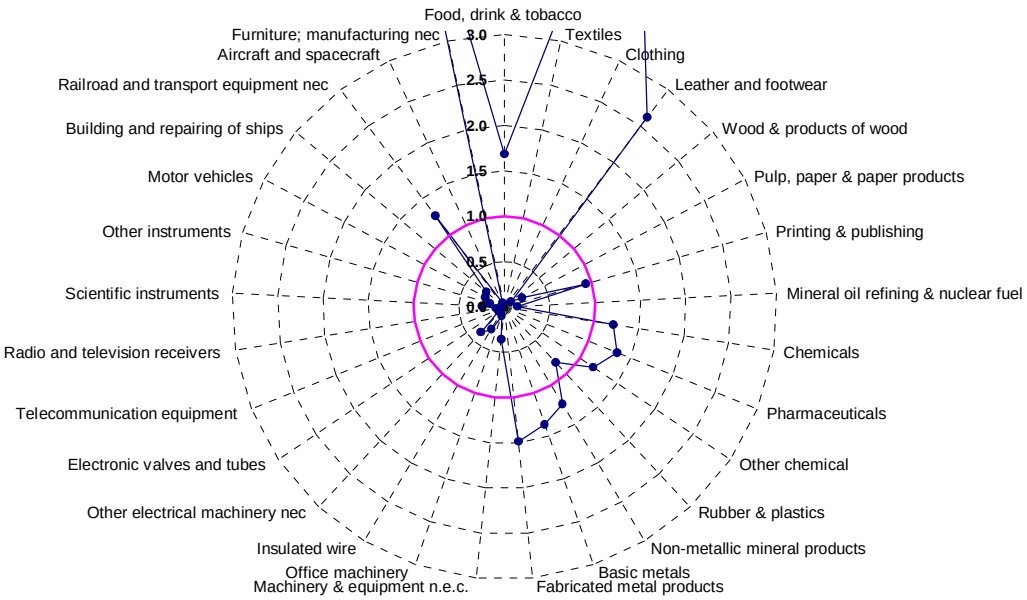
Source: calculated from COMTRADE database.

Graph V.5: China's trade in manufactured products - RCA index (average 2002-2004)



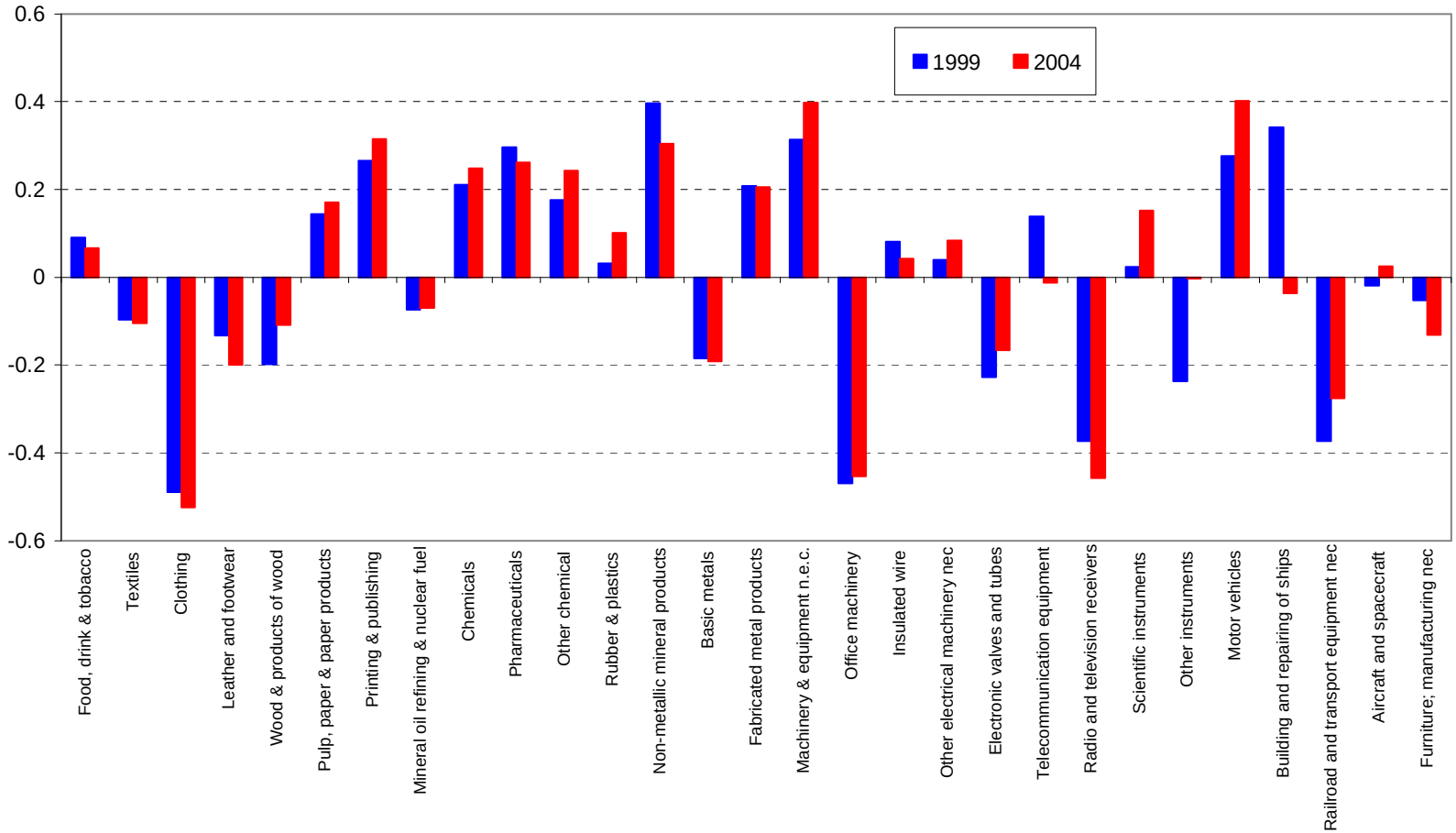
Source: calculated from COMTRADE database.

Graph V.6: India's trade in manufactured products - RCA index (average 2002-2004)



Source: calculated from COMTRADE database.

Graph V.7: EU-25 external trade performance in manufactured goods (X-M)/(X+M)



Source: calculated from Eurostat's COMEXT database.

V.4 Intra-Industry trade (IIT)

In Section V.3 trade was analyzed in terms of sectors or broad categories of products. On this basis the EU and its main competitors appear specialized in various of these categories. Part of international trade consists of countries exchanging products of different industries (inter-industry trade) reflecting different factor (labour and capital) endowments and technology. On this basis *different* countries export *different* goods: for example, chemicals for textiles or motor cars for food. In Section V.2, the international trade network was presented in terms of trade flows between *geographical* regions. However, income per capita of countries plays an important role to determine trade patterns, and in fact an important part of trade takes place between *similar* countries of comparable levels of development which exchange similar products (Intra-Industry Trade, IIT).

Intra-industry trade is explained by factors like economies of scale and demand for differentiated products, rather than by comparative advantage. If trade is predominantly inter-industry then the re-allocation of resources between industries in the event of an international demand shock is more costly than when trade is predominantly intra-industry because resources would need to be re-allocated within industries.

Table V.4: World trade matrix – Income level (2003)

Importing region / Exporting region	EU-25	High non-EU-25	Upper medium	Low medium	Low	Total
EU-25	33.5	9.1	1.8	3.6	0.6	48.7
High non-EU-25	6.7	14.6	3.2	5.5	0.7	30.7
Upper medium	0.7	3.8	0.2	0.8	0.2	5.7
Low medium	3.3	6.8	1.0	1.1	0.5	12.7
Low	0.6	1.0	0.1	0.3	0.2	2.2
Total	44.9	35.3	6.3	11.3	2.2	100

Note: for the country groupings, see footnote 72.

Source: Calculated from the COMTRADE database.

Of total world trade, 63.9% takes place among the group which is composed of the EU-25 and other high-income countries (Table V.4) [72]. If upper-medium countries are included, this share rises to 73.6%. The differences in technology and factor endowments lead countries to specialise in activities in which they have a comparative advantage and explain inter-industry trade (e.g. cars for clothing). While trade between different countries (e.g. high and upper-medium income countries on one hand, and low and low-medium income countries on the

[72] The classification used is from the World Bank. Country groups are as follows. **High non-EU-25**: Israel, Kuwait, Qatar, United Arab Emirates, Hong Kong, Japan, South Korea, Singapore, Norway, Switzerland, Canada, USA, Australia, New Zealand. **Upper-medium**: Argentina, Chile, Costa Rica, Gabon, Lebanon, Libya, Malaysia, Mexico, Oman, Panama, Russian Federation, Saudi Arabia, Uruguay, Venezuela. **Low-medium**: Algeria, Belorussia, Bolivia, Brazil, Bulgaria, China, Colombia, Cuba, Dominican Republic, Ecuador, Egypt, El Salvador, Guatemala, Honduras, Iran, Jordan, Kazakhstan, Morocco, Paraguay, Peru, Philippines, Romania, South Africa, Thailand, Tunisia, Turkey, Ukrainia. **Low**: Angola, Benin, Burkina Faso, Burundi, Cameron, Central African Republic, Congo, Côte d'Ivoire, Ethiopia, Guinea, Guinea Bissau, India, Indonesia, Kenya, Mali, Mozambique, Nicaragua, Niger, Nigeria, Pakistan, Rwanda, Senegal, Togo, Uganda, Tanzania, Vietnam, Zaire, Zimbabwe.

other) can be expected to consist, to a large extent, of exchange of different goods, the intense exchange of goods between high-income countries suggests a different pattern of trade. IIT also involves trade between high-income and lower income countries, as well as between lower income countries themselves.

Some remarks are necessary when intra-EU trade is excluded from the data. While the largest share of EU-25 trade (both exports and imports) concerns trade with high income countries, low-medium income countries take a significant place among EU-25 trade origin and destination (Tables V.5 and V.6). 60% of extra-EU exports go to other high-income countries, and 41.6% of imports originate from these. However, 24% of extra-EU exports are destined to low-medium income countries, and 29% of imports originate from these too.

Table V.5: World trade matrix – Income level: destination of exports (2003)

Importing region / Exporting region	EU-25	High non-EU-25	Upper medium	Low medium	Low	Total
EU-25		60.0	11.9	23.9	4.2	100
High non-EU-25	41.6		19.7	34.1	4.5	100
Upper medium	13.5	69.0		14.6	2.9	100
Low medium	28.8	58.1	8.7		4.4	100
Low	28.0	52.6	6.8	12.6		100

Note: for the country groupings, see footnote 72.

Source: Calculated from the COMTRADE database.

Table V.6: World trade matrix – Income level: origin of imports - 2003

Importing region / Exporting region	EU-25	High non-EU-25	Upper medium	Low medium	Low
EU-25		43.9	29.4	35.5	31.3
High non-EU-25	59.1		51.9	54.1	35.8
Upper medium	6.5	18.4		7.9	7.8
Low medium	29.4	32.6	16.5		25.2
Low	4.9	5.1	2.2	2.5	
Total	100	100	100	100	100

Note: for the country groupings, see footnote 72.

Source: Calculated from the COMTRADE database.

The most widely used measure of intra-industry trade is the Grubel-Lloyd (GL) index[73]. The values of the index range from 0 (no IIT) to 1 (all trade is intra-industry). The GL index for EU-25 trade with four groups of countries, classified by their level of income[74], is presented in Graph V.8. As expected, the value of the Grubel-Lloyd index increases with the level of income of the trade partner: 0.31 (trade with low-income countries), 0.44 (trade with low-medium income countries), 0.45 for trade with upper-medium income countries, and 0.72 for trade with high-income countries. In other words, trade with industrialised countries has a large component of intra-industry trade, and trade with lower income countries has a larger component of inter-industry trade.

[73] The GL index for product "i" (where X and M stand for exports and imports, respectively) is defined as follows:

$$GL_i = 1 - \frac{|X_i - M_i|}{X_i + M_i}$$

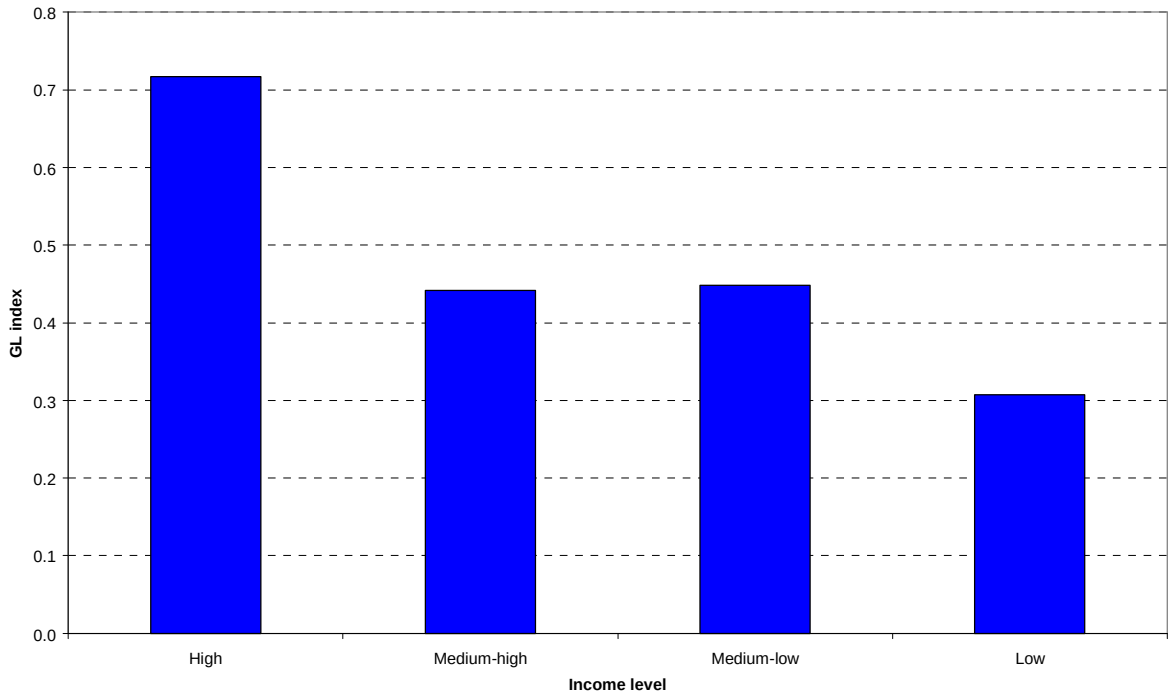
The GL index can be defined across products as follows:

$$GL = 1 - \frac{\sum_i |(X_i - M_i)|}{\sum_i (X_i + M_i)}$$

In this section IIT is studied on the basis of EU-25 trade broken down into a total of 262 products. These are products defined in terms of CPA (Classification of Products by Activity) nomenclature at 4-digit level. The index is sensitive to the level of product aggregation: it increases with the level of aggregation, without necessarily implying trade in similar products. The index is useful for comparisons across products and over time, but it can overstate the size of IIT trade and can mask different levels of IIT trade within a given group of products.

[74] **High non-EU**: Andorra, Aruba, Australia, Bahamas, Bahrain, Bermuda, Brunei, Canada, Cayman Islands, Greenland, Guam, Hong Kong, Iceland, Israel, Japan, Kuwait, Liechtenstein, Macao, New Zealand, Norway, Qatar, San Marino, Saudi Arabia, South Korea, United Arab Emirates, USA, Virgin Islands. **Upper-medium**: Argentina, Barbados, Belize, Bostwana, Chile, Costa Rica, Croatia, Equatorial Guinea, Gabon, Grenada, Lebanon, Lybia, Malaysia, Mauritius, Mayotte, Mexico, Oman, Panama, Russian Federation, Seychelles, South Africa, St. Lucia, St. Vincent, St. Ch. Nevis, Trinidad & Tobago, Turkey, Uruguay, Venezuela. **Low-medium**: Albania, Algeria, Angola, Armenia, Azerbaijan, Belarrusia, Bolivia, Bosnia Herzegovina, Brazil, Bulgaria, Cape Verde, China, Colombia, Cuba, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Fiji, Gaza & Jericho, Georgia, Guatemala, Honduras, Indonesia, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Kiribati, Maldivas, Marshall Islands, Morocco, Namibia, Paraguay, Peru, Philippines, Romania, Serbia & Montenegro, Sri Lanka, Surinam, Swailand, Syria, Thailand, Tonga, Tunisia, Turkmenistan, Ukraine, Vanuatu. **Low**: Afghanistan, Bangladesh, Benin, Bhutan Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, Comoros, Congo, Eritrea, Côte d'Ivoire, Ethiopia, Ghana, Guinea, Guinea Bissau, Haiti, India, Kenya, Kyrghyzstan, Lao, Leshoto, Liberia, Madagascar, Malawi, Mali, Mauritania, Moldova, Mongolia, Mozambique, Nepal, Nicaragua, Niger, Nigeria, North Korea, Pakistan, Papua N.G., Rwanda, Senegal, Sierra Leone, Solomon Islands, Somalia, Sudan, Tadjikistan, Tanzania, Togo, Uganda, Uzbekistan, Vietnam, Zaire, Zambia, Zimbabwe.

Graph V.8: Grubel-Lloyd index by income level of EU-25 trade partners (2004)



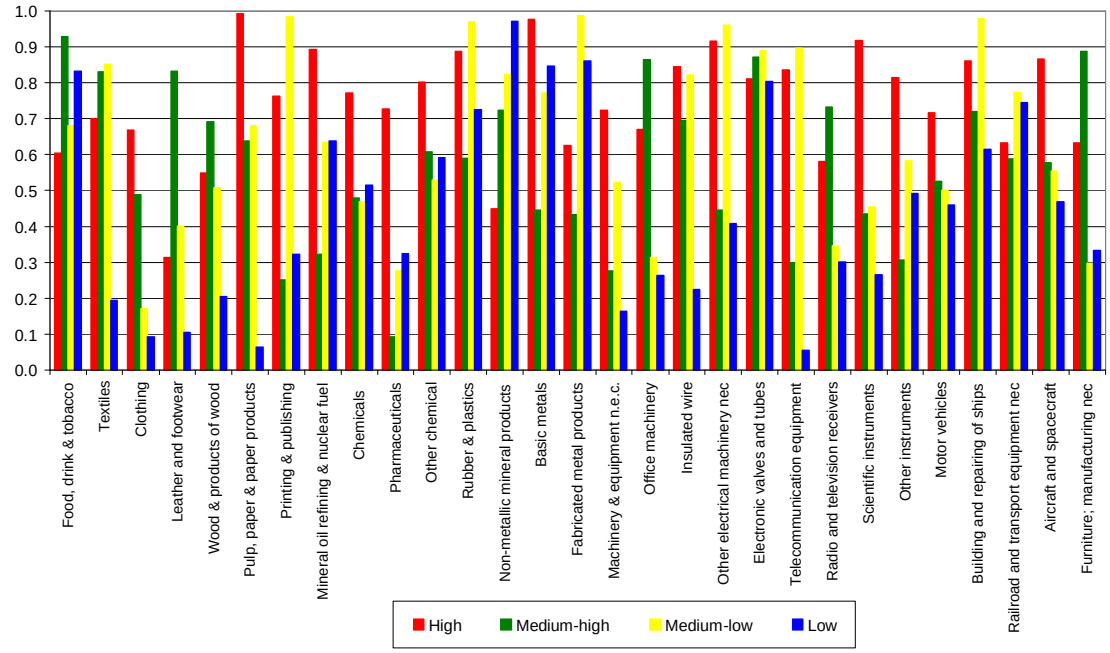
Note: for the country groupings, see footnote 74.

Source: Calculated from Eurostat's COMEXT database.

The prevalence of IIT across all products in trade with high-income countries is confirmed by the results of the cross-country grouping presented in Graph V.9, although there are some exceptions concerning products such as leather and footwear and food, drinks and tobacco, for which the lowest values in the GL index corresponds to trade with high-income countries. Also, with low income countries there are exceptions, but this group of countries accounts for a very low part of EU-25 trade.

To the extent that inter-industry trade is determined by comparative advantage, it is the segment of products characterised by the lowest GL index values with low-intermediate income countries that are exposed to the strongest *threat*. Examples are food, drink and tobacco, clothing and machinery and equipment n.e.c.. Nevertheless, in some products (e.g. insulated wire and electronic valves and tubes) the GL index with low-intermediate income countries is nearly as high as with high income countries. This suggests that IIT does not concern exclusively trade between high-income countries, and that low-intermediate income countries play in some cases a dual role, competing with high income countries in certain segments of the market.

Graph V.9: EU-25 IIT with partners by income level (2004)

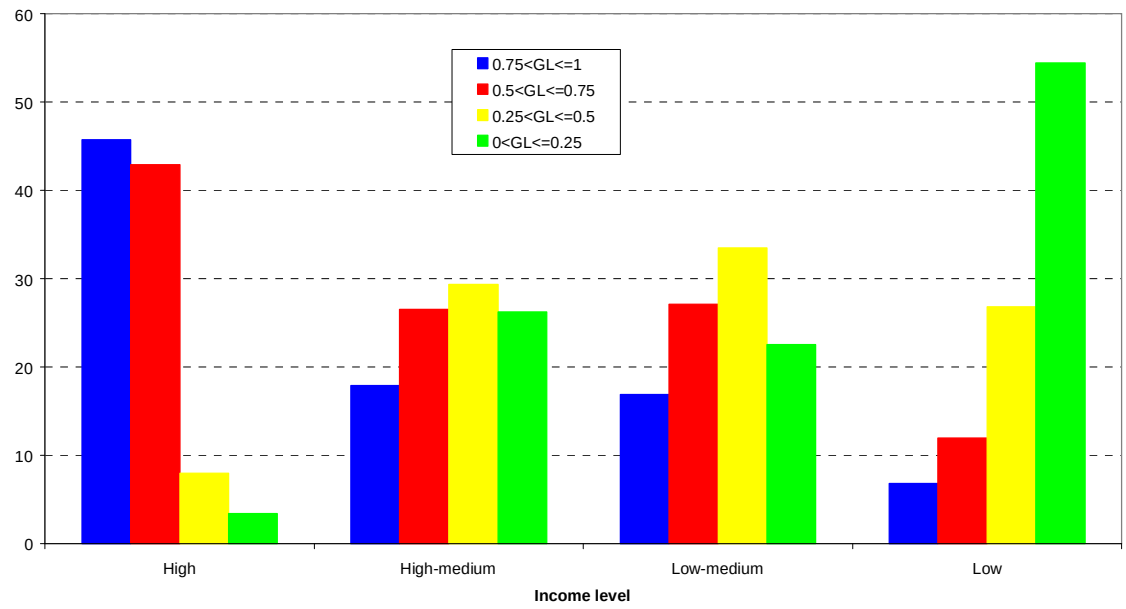


Note: for the country groupings, see footnote 74.

Source: calculated from Eurostat's COMEXT database.

A more aggregated view of the nature of EU-25 trade with the four groups of countries is obtained by dividing the Grubel-Lloyd index in four intervals and distributing the total EU-25 trade (exports + imports vis-à-vis the rest of the world) over these intervals. This is shown, in percentages, in Graph V.10. With high-income countries EU-25 trade is mostly IIT. With upper-medium and low-medium income countries trade is more balanced in terms of the intensity of IIT/Inter-industry trade. Trade with low-income countries is basically inter-industry.

Graph V.10: Distribution (%) of EU total trade (exports + imports) by Grubel-Lloyd index and income level of partners (2004)



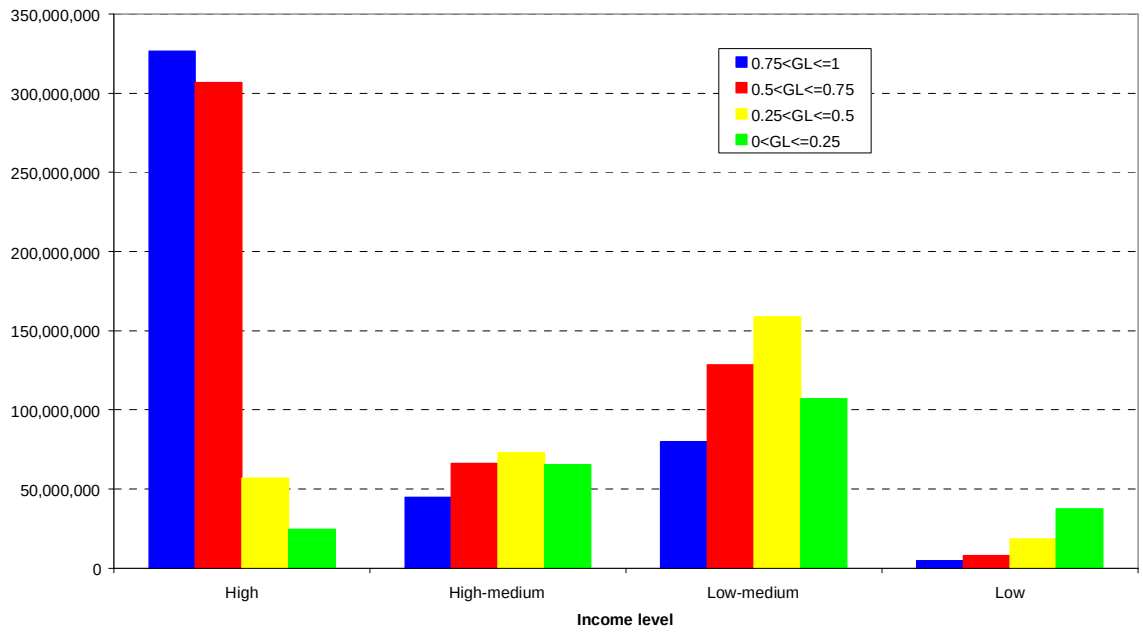
Note: for the country groupings, see footnote 74.

Source: calculated from Eurostat's COMEXT database.

Finally, the trade data in Graph V.11 provide a measure of the main challenges and opportunities for EU-25 in international trade. The largest share of EU-25 total trade is with high-income countries exchanging similar goods. At the other end is trade with low income countries which is basically inter-industry; it consists of the exchange of goods of different industries in which the level of wages plays an important role[75]. However, the volume of trade with these countries is very low. It is important to underline the role of low-medium income countries, which rank in the second place as trade partners. Since trade with these countries is a mixture of intra-industry and inter-industry, it suggests a wide range of possibilities for both areas to gain from trade. As for the *threat* posed by low wage countries, it ought to be stressed that inter-industry trade accounts for only a low share of total EU-25 trade with the rest of the world.

[75] A discussion of trade by labour skills categories is in Section IV.5.

Graph V.11: EU total trade (exports + imports, €1000) by Grubel-Lloyd index and by income level of partners (2004)



Note: for the country groupings, see footnote 74.

Source: calculated from Eurostat's COMEXT database.

One recent concern has been competition for EU-25 industries from low-intermediate income countries. As noted previously, EU-25 trade with these countries has a dual nature in that it consists of both intra-industry and inter-industry trade. This reflects the dual structure of some countries (China is a representative example) which are able to produce and export products based on low-wage comparative advantage and on standardized technology that permits product imitation. Section V.5 shows that this dual structure is also reflected in the product mix that characterises EU-25 trade with these countries.

V.5 Labour skills and technology

The ranking of products in Graph V.1 is based on the comparative advantage as revealed by their performance in external trade. The present Section complements the discussion of the previous sections with evidence on the labour skills use and technology content of European industries and trade.

EU-25 exports and imports according to labour skills categories[76] are presented in Graphs V.12 and V.13. By considering the level of income of trading partners this approach can help

[76] The classification of sectors by labour skills is as follows. **High skills**: Mineral oil refining, coke & nuclear fuel, Chemicals, Office machinery, Electronic valves and tubes, Telecommunication equipment, Radio and television receivers; **High-intermediate**: Scientific instruments, Other instruments, Other transport equipment, Building and repairing of ships and boats, Aircraft and spacecraft, Railroad equipment and transport equipment nec; **Low-intermediate**: Wood & products of

identify segments of EU-25 trade that are most sensitive to imports from low-income countries.

Although the highest share (34%) in EU exports corresponds to low labour skills products there is some polarization as exports of high labour skills products account for a significant (27%) part of EU sales abroad. In any case the distribution is biased towards low labour skills categories of products as Graph V.12 shows. In all cases the share of the two lowest categories of labour skills is higher than 50%, and for total exports, regardless of geographic destination, the share of these two categories is 61%. To a considerable extent, the EU's export structure mirrors the production structure (see Table V.7) of the EU manufacturing industry. Products of low and low-intermediate labour skills are a significant part of exports of manufactures because they are also a significant part of value added in manufacturing. Products of high labour skills account for 16.5% of value added in manufacturing and for 27% of exports of manufactures. But products of low and intermediate-low labour skills account for 77.6% of value added and for 60.1% of total exports. Hence, relative to the production structure, exports show a bias towards a greater content of labour skills.

Table V.7: EU-25 Distribution of manufacturing industry value added by labour skills categories (2001-2003)

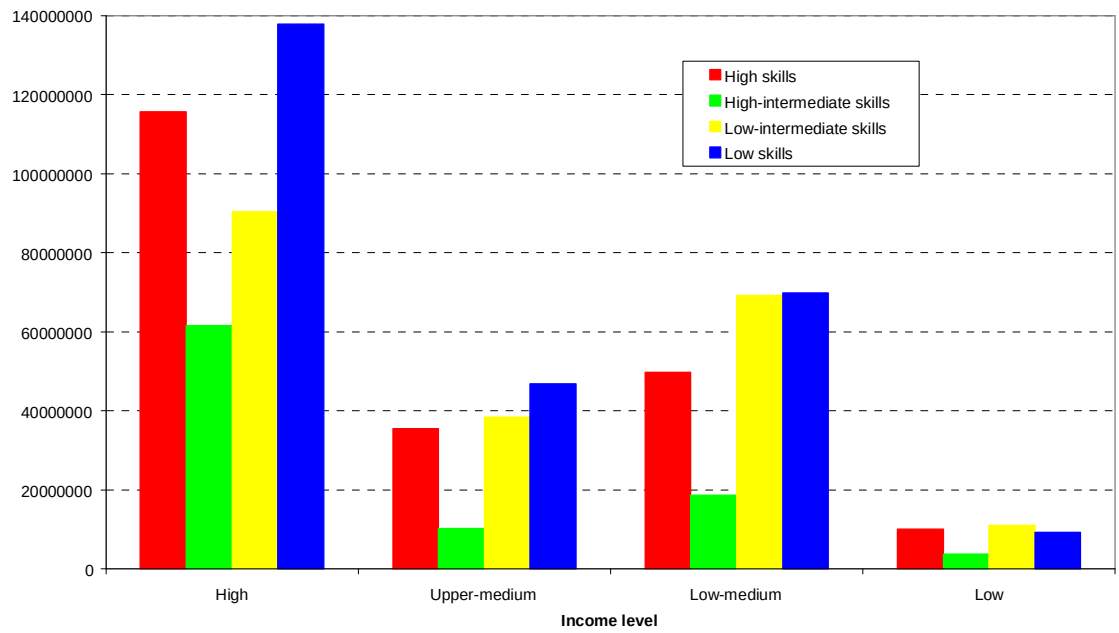
Labour skills	EU-25
High	16.5
High-intermediate	6.0
Low-intermediate	35.8
Low	41.8
Total	100

Source: calculated from data in Section II.2.

The polarization is more patent for imports, for which high and low labour skills products, altogether, account for 71% of total exports regardless of geographic destination. However, this polarization is particularly obvious in trade with upper-medium and low-medium income countries. Furthermore, as expected, the great majority of imports from low income countries are in low labour skills products (Graph V.13).

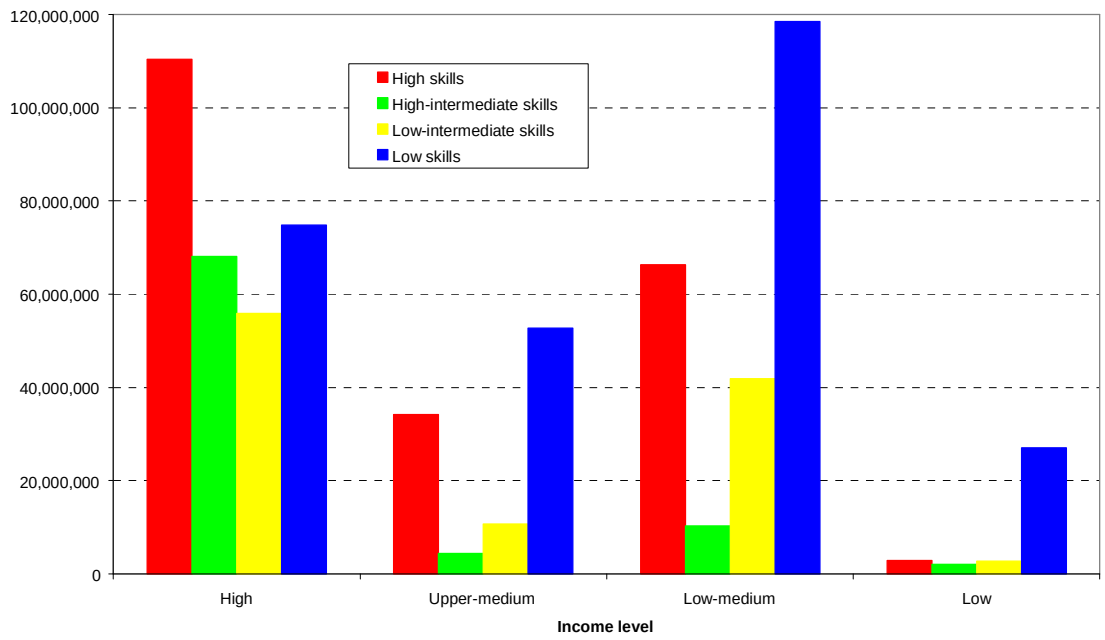
wood and cork, Pulp, paper & paper products, Printing & publishing, Fabricated metal products, Machinery and equipment n.e.c., Insulated wire, Other electrical machinery and aparatus nec; **Low**: Food, drink and tobacco, Textiles, Clothing, Leather and footwear, Rubber & plastics, Non-metallic mineral products, Basic metals, Motor vehicles, Furniture, miscellaneous manufacturing; recycling. See O'Mahony and Van Ark (2003), EU productivity and competitiveness: an industry perspective, European Commission, 2003.

Graph V.12: EU-25 exports (€1000) by income level of partners and labour skill category (2004)



Source: calculated from Eurostat's COMEXT database.

Graph V.13: EU-25 imports (€1000) by income level of partners and labour skill category (2004)



Source: calculated from Eurostat's COMEXT database.

A summary of the distribution of EU trade with the four groups of countries, and the relative trade balance for all combinations of income levels and labour skills is shown in Table V.8. The data show that as the income level of trade partners increases the share of trade in products embodying higher levels of labour skills increases. More than half of trade with low income countries is in products of low levels of labour skills and the distribution is notably skewed. With low-medium and upper-medium income countries, the share of products of high labour skills is higher, although the participation of the two lowest categories of labour skills is still high: 67.4% and 63.8% respectively. Finally, with high income countries the largest share corresponds to products of high-labour skills, although the distribution is more uniform and low labour skills products account for 29.8% of total trade with these countries.

This explains the sign of the relative trade balance (RTB) index. The trade balance of the EU with low and low-medium income level countries is clearly negative for products embodying low labour skills but notably positive for the other product categories with one exception: the trade balance for products of high skills against low-medium income countries.

Trade with high-income countries is evenly distributed between the two highest and the two lowest categories of labour skills and the trade balance is strongly positive for low labour skills products (0.296), and, to a lesser extent, low-intermediate labour skills.

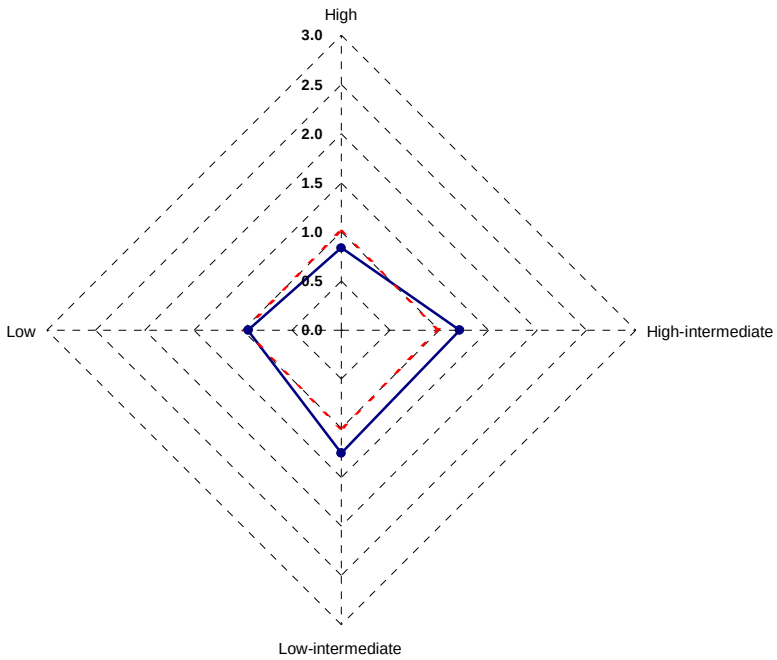
Table V.8: EU-25 trade by labour skills category and relative trade balance (2004)

	Income level of EU-25 trade partner countries							
	High		Upper-rmediumr		Low-medium		Low	
Labour skills	Total trade	(X-M)/(X+M)	Total trade	(X-M)/(X+M)	Total trade	(X-M)/(X+M)	Total trade	(X-M)/(X+M)
High	31.6	0.023	29.9	0.020	26.1	-0.142	18.8	0.553
High-intermediate	18.1	-0.050	6.3	0.393	6.5	0.291	8.3	0.303
Low-intermediate	20.5	0.237	21.1	0.567	25.0	0.246	20.2	0.595
Low	29.8	0.296	42.7	-0.059	42.4	-0.258	52.7	-0.492
Total	100	0.135	100	0.125	100	-0.066	100	-0.010

Source: calculated from Eurostat's COMEXT database.

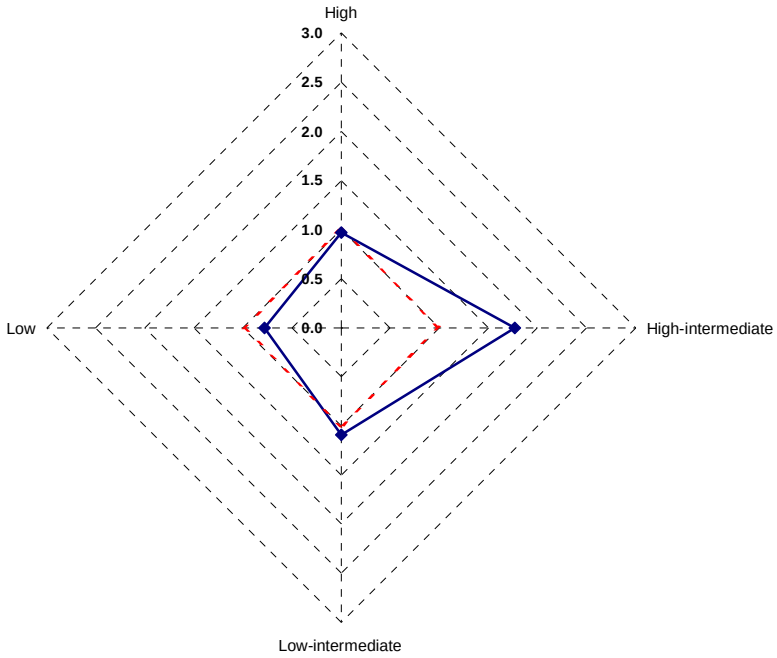
In this context it is interesting to refer to the specialization profile of a few, but significant, countries. The RCA index of EU, US, Japan, China and India for each of the four categories of products is shown in Graphs V.14 through V.18. India exhibits high RCA in low skills and China shows a dual specialization, with the RCA index taking values greater than 1 in both high and low labour skills. The US and Japan are strongly specialized in high-intermediate labour skills. EU-25 exhibits a more balanced specialization profile, although it shares with the US and Japan the fact that RCA for high-intermediate and low-intermediate labour skills is greater than 1.

Graph V.14: EU-25 RCA index by labour skills category (2002-2004)



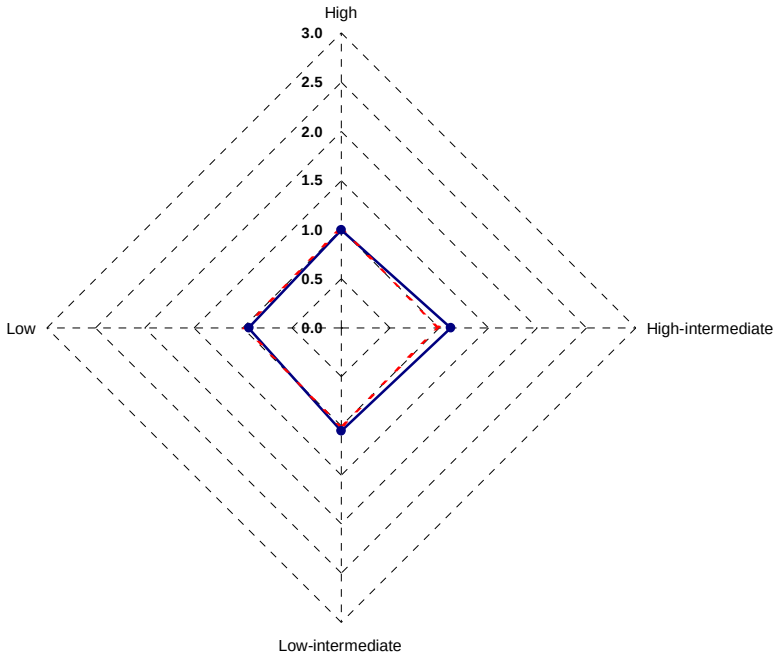
Source: calculated from COMTRADE database.

Graph V.15: USA RCA index by labour skills category (2002-2004)



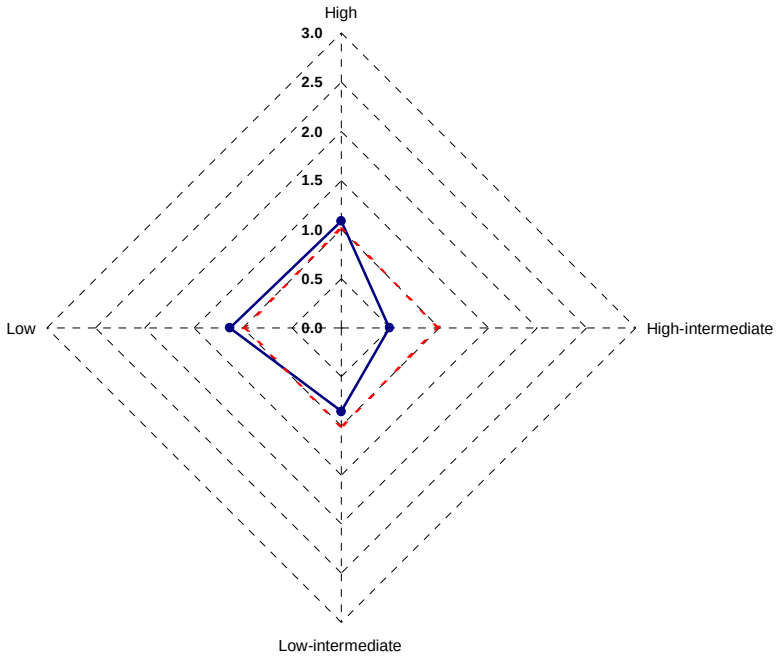
Source: calculated from COMTRADE database.

Graph V.16: Japan RCA index by labour skills category (2002-2004)



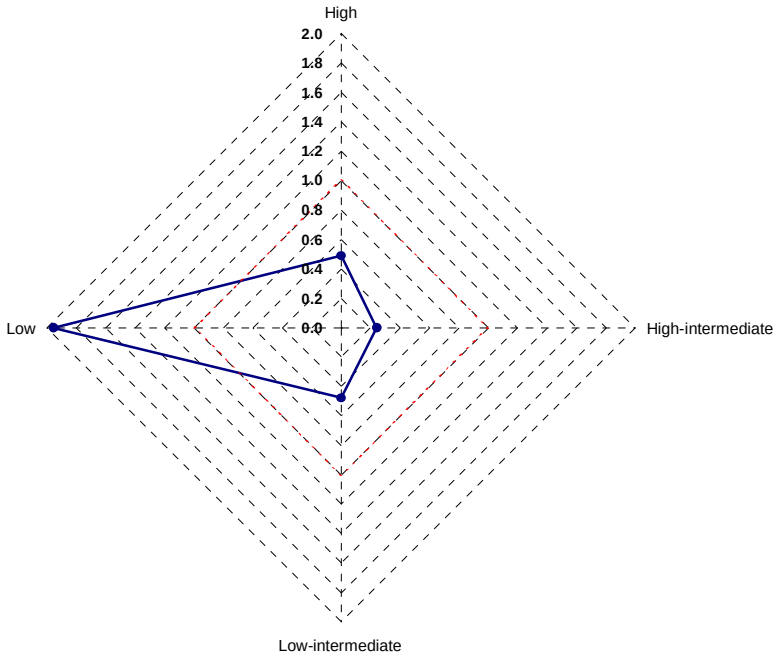
Source: calculated from COMTRADE database.

Graph V.17: China RCA index by labour skills category (2002-2004)



Source: calculated from COMTRADE database.

Graph V.18: India RCA index by labour skills category (2002-2004)

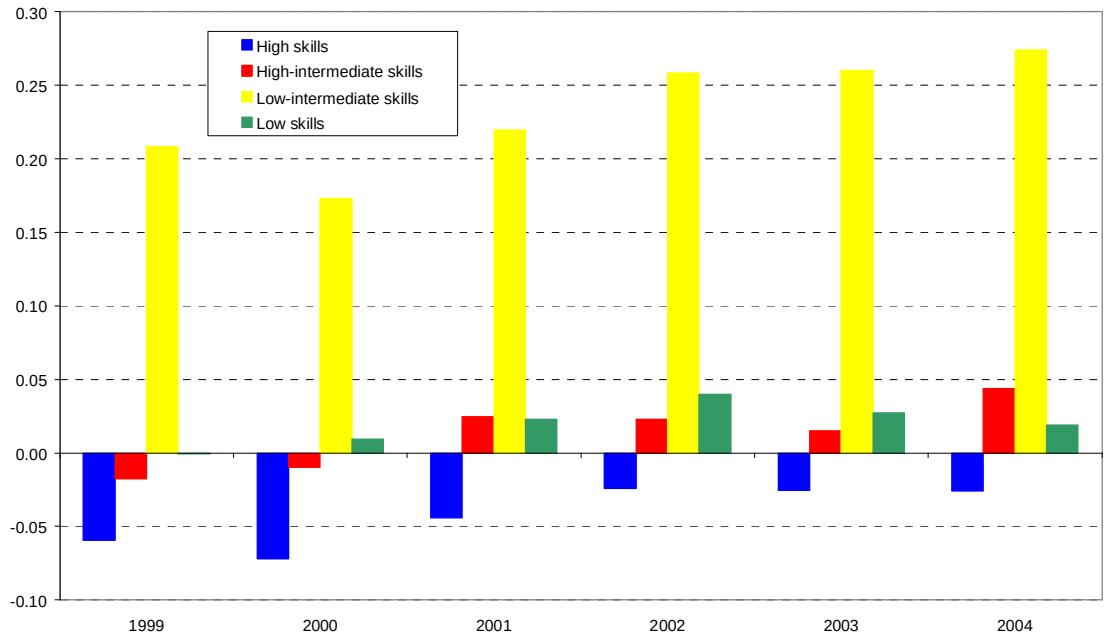


Source: calculated from COMTRADE database.

Graph V.19 shows developments in the relative trade balance (RTB) index over the period 1999-2004. This period of time is short to assess changes over time, as the indicator exhibits a cyclical pattern. However, the graph shows a slight improvement in the trade balance in product of high labour skills. Longer term developments, over 1989-2001, of this indicator for the EU-15[77] show that the improvement in high labour skills is patent. As regards low-intermediate labour skills products, the EU exhibits a positive RTB index, the values of which have been oscillating between 0.2 and 0.3 for the EU-15 in the period 1989-2002.

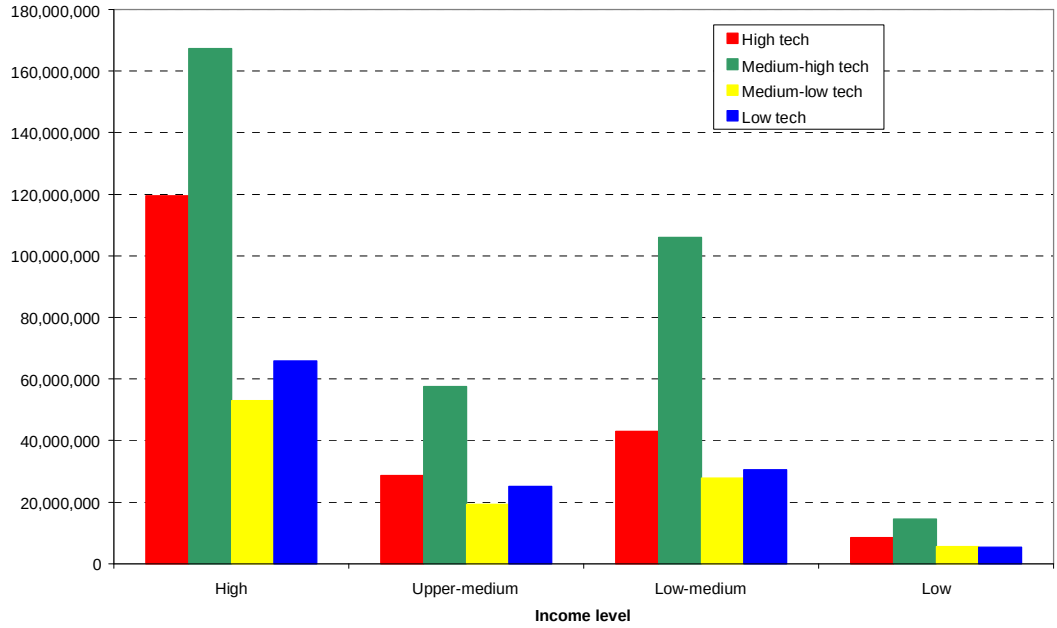
[77] See European Commission (2005), EU sectoral competitiveness indicators, OPOCE, Luxembourg, Graph V.9.

Graph V.19: EU-25 trade by labour skills category (X-M)/(X+M)



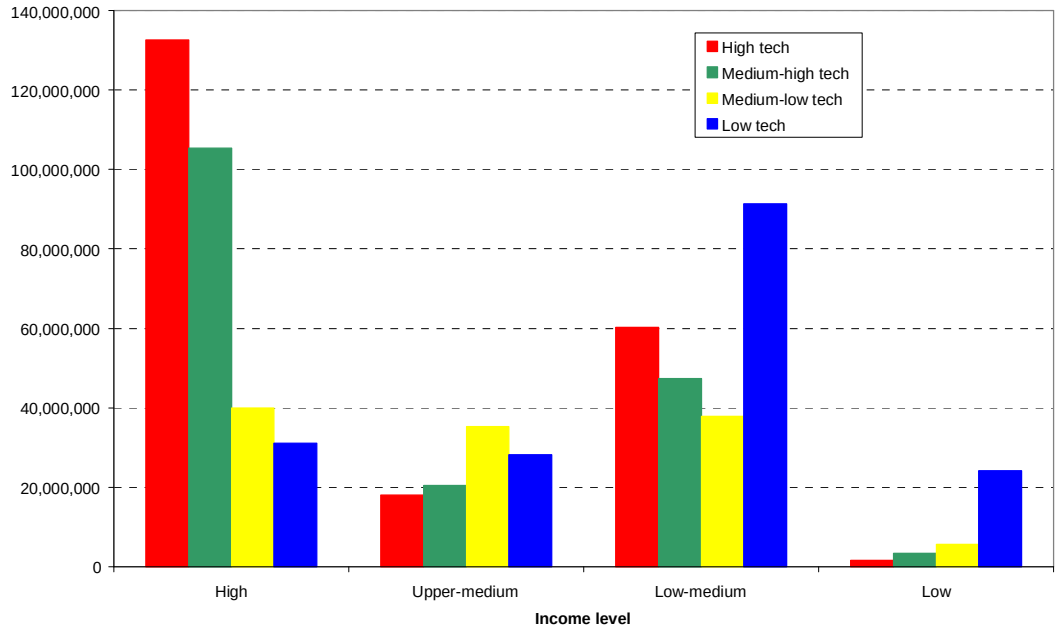
Source: calculated from Eurostat's COMEXT database

Graph V.20: EU-25 exports (€1000) by income level of partners and technology category (2004)



Source: calculated from Eurostat's COMEXT database.

Graph V.21: EU-25 imports (€1000) by income level of partners and technology category (2004)



Source: calculated from Eurostat's COMEXT database.

The prevalence of products of low and intermediate-low labour skills in EU-25 exports (recall that they represents up to 61 % of total exports) raises the issue of the technology nature of the goods traded.

Graphs V.20 and V.21, similar to those for labour skills, represent this situation. But, in contrast, the distribution of EU-25 exports is different from the one for labour skills. In this case it is skewed towards the highest levels of technology, and the largest share corresponds to medium-high technology products[78].

As in the case of labour skills, a summary is provided in Table V.9. The best EU-25 performance, across the four groups of countries, is achieved in medium-high technology products, with the exception of low technology products for which the highest RTB index is in trade with high income countries.

[78] The classification of sectors into technology categories is as follows. **High:** Pharmaceuticals, Office, accounting and computing machinery, Radio, television and communication equipment, Medical, precision and optical instruments, Aircraft and spacecraft. **Medium-High:** Chemicals excluding pharmaceuticals, Machinery and equipment n.e.c., Electrical machinery and apparatus, n.e.c., Motor vehicles, trailers and semi-trailers, Railroad equipment and transport equipment n.e.c. **Medium-Low:** Coke, refined petroleum products and nuclear fuel, Rubber and plastic products, Other non-metallic mineral products, Basic metals, Fabricated metal products, Building and repairing of ships and boats. **Low:** Food products, beverages and tobacco, Textiles, textile products, leather and footwear, Wood and products of wood and cork, Pulp, paper, paper products, printing and publishing, Manufacturing n.e.c.; Recycling (See *OECD Science, Technology and Industry Outlook 2004)*

Table V.9: EU-25 trade by technology category and relative trade balance (2004)

	Income level of EU-25 trade partner countries							
	High		Upper-medium		Low-medium		Low	
Labour skills	Total trade	(X-M)(X+M)	Total trade	(X-M)(X+M)	Total trade	(X-M)(X+M)	Total trade	(X-M)(X+M)
High tech	35.3	-0.052	20.1	0.229	23.2	-0.167	14.7	0.686
Medium-high tech	38.1	0.227	33.5	0.476	34.5	0.382	25.9	0.626
Medium-low tech	13.0	0.142	23.4	-0.292	14.8	-0.154	16.3	0.003
Low tech	13.6	0.357	22.9	-0.057	27.4	-0.499	43.0	-0.635
Total	100	0.135	100	0.124	100	-0.066	100	-0.010

Source: calculated from Eurostat's COMEXT database.

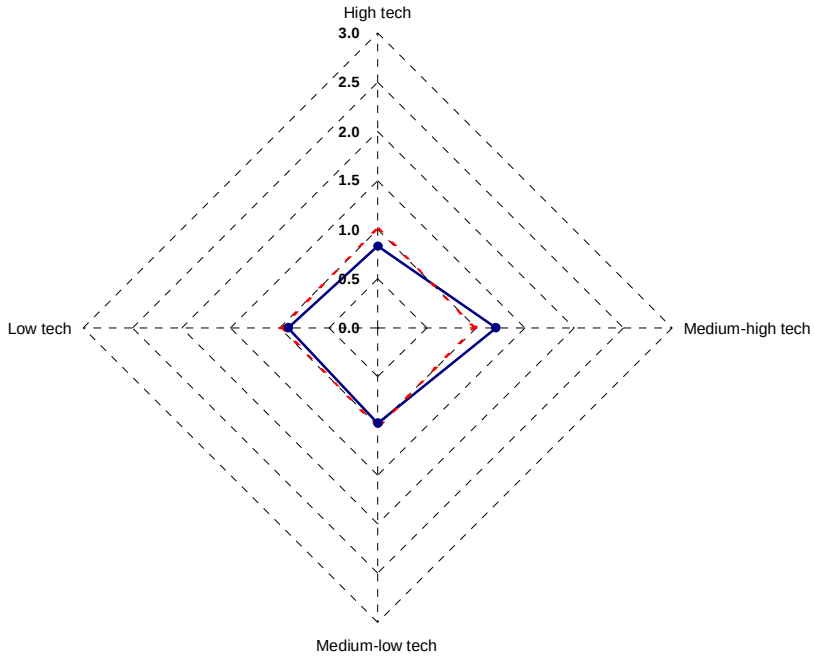
As it was done for products grouped according to labour skills categories, EU-25 performance in technology categories can be compared to the one of the same countries selected above (Graphs V.22 to V.26). Also in this case various specialization profiles can be identified. US exhibit the highest RCA index in high and medium high technology products. Also in this case Japan's comparative advantage is particularly strong in one group of products, namely, medium-high technology. As regards India and China, a similar situation to the one observed for labour skills can be identified here. India's comparative advantage is particularly strong in low technology products, while China exhibits the same dual structure, with high RCA, in this case, in both high and low technology products. Graph V.22 shows the more balanced profile of EU, with higher RCA in medium-high technology products.

Finally, Graph V.28, based on the RTB indicator, confirms the strong position of the EU in medium-high technology products[79]. This graph shows a relative improvement in high technology products, though the index exhibits always negative values, and the stable, although oscillating, position of the EU in medium-high technology products[80].

79 A longer-term perspective of the evolution of this indicator, for EU-15, is shown in Graph V.12 of *EU sectoral competitiveness indicator, European Commission, 2005*.

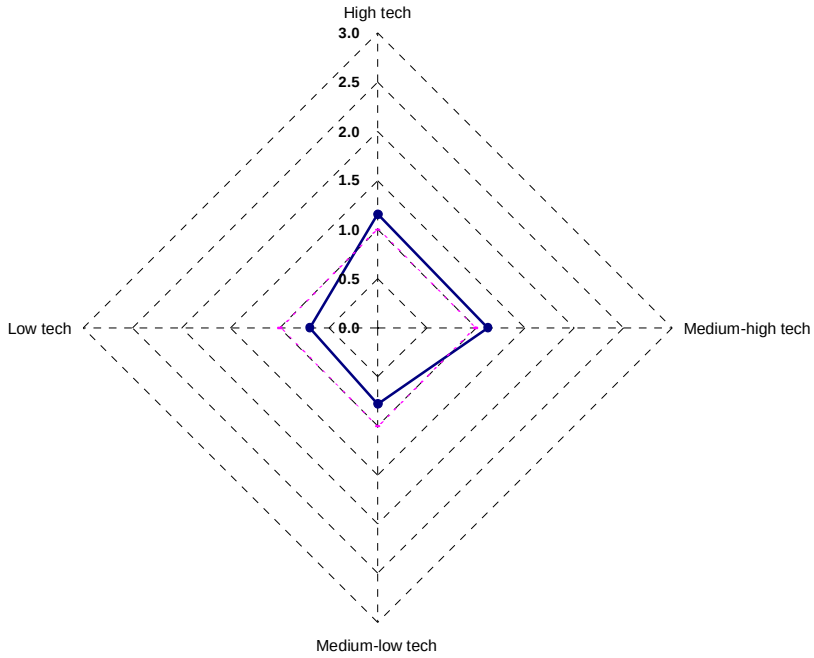
80 The apparently contradictory result that the largest share of EU exports is, on the one hand in high and medium-high technology products, and, on the other, in low and low-intermediate labour skills products was discussed in *EU sectoral competitiveness indicators (2005)*, Section V.5.

Graph V.22: EU-25 RCA index by technology category (2002-2004)



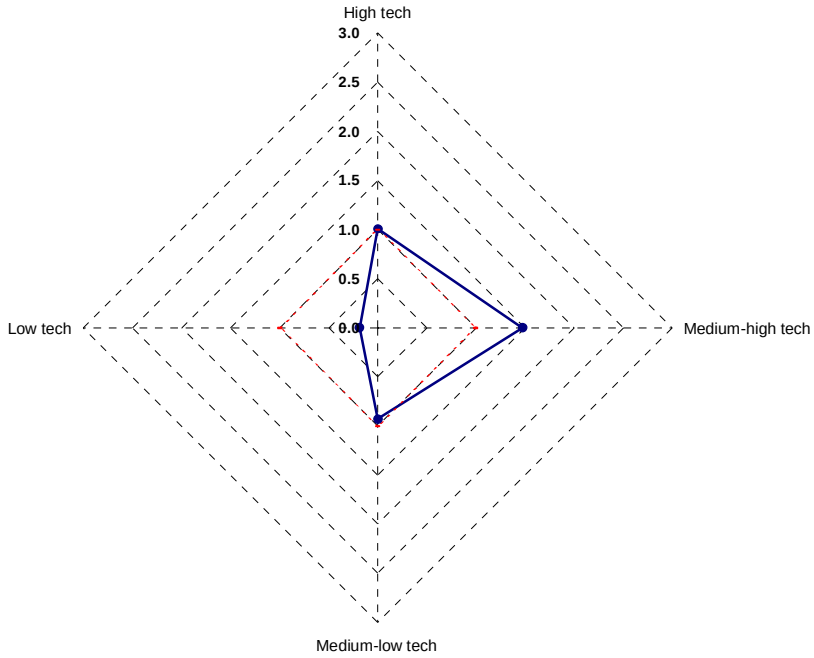
Source: calculated from COMTRADE database.

Graph V.23: US RCA index by technology category (2002-2004)



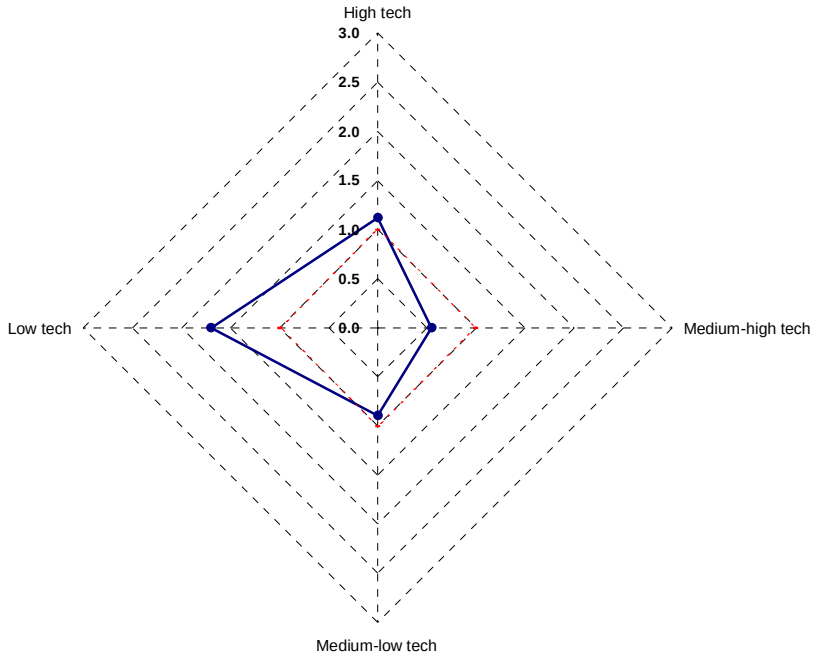
Source: calculated from COMTRADE database.

Graph V.24: Japan's RCA index by technology category (2002-2004)



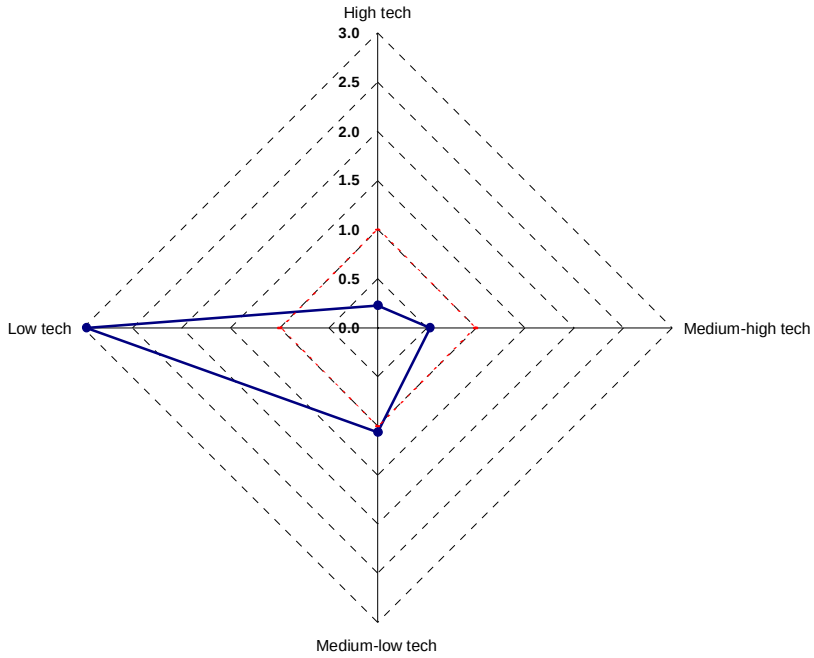
Source: calculated from COMTRADE database.

Graph V.25: China's RCA index by technology category (2002-2004)



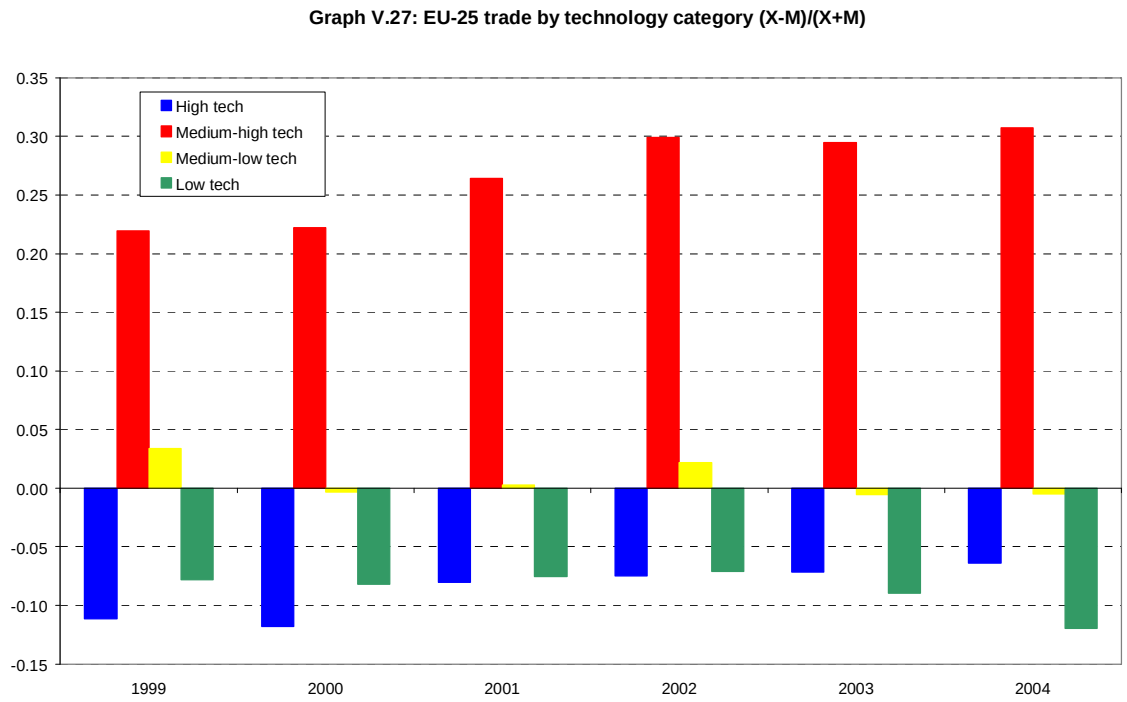
Source: calculated from COMTRADE database.

Graph V.26: India's RCA index by technology category (2002-2004)



Source: calculated from COMTRADE database.

Graph V.27: EU-25 trade by technology category (X-M)/(X+M)



Source: calculated from Eurostat's COMEXT database.

V.6 International movement of factors: a sectoral view of Foreign Direct Investment

So far this chapter has focused on international trade in manufacturing products. However, investing abroad had become a crucial factor in the internationalization of the economic activity. It complements and facilitates traditional forms of trade, facilitates breaking into new markets, and contributes to the competitiveness of sectors and companies. Although sectoral data on Foreign Direct Investment (FDI) are less abundant and detailed than those on international trade of goods it is interesting to incorporate the data available to the picture that this chapter gives on the international dimension of sectoral competitiveness. Three indicators pertaining to EU-25 FDI by sector are presented in this section: FDI intensity, EU-25 share in total FDI and the FDI balance between the stock abroad and in EU-25.

Graph V.28 gives a summary picture of FDI in the EU. The graph is based on EU-25 FDI stocks, both outwards and inwards, relative to the rest of the world. A list of fourteen sectors, from mining through market services, is used[81]. The objective of the indicator is to measure the intensity of FDI for each sector, which is calculated by comparing the share of each sector in total FDI with the share of each sector in total value added. In the graph sectors are ranked according to the EU-25 FDI *intensity* in the rest of the world. There is significant variation in the participation of sectors in FDI abroad and in the EU. Three sectors exhibit a high degree of FDI abroad: financial intermediation, mining and quarrying and petroleum, chemical rubber and plastic products. The last two sectors are, to some extent, resources-based industries[82], which explain the intensity of this way of internationalization of their activity. Office machinery and radio, TV and telecommunications equipment is the manufacturing sector with the highest intensity in FDI abroad. It is interesting to underline that the value of the RCA index for the activities under this heading is lower than 1, and three of them are at the bottom of the RCA ranking, which may indicate that the weakness of this sector in international trade of goods goes along with a stronger participation in trade of factors. Food products, motor vehicles, another resources-based industry, namely electricity, gas and water, and real estate and business activities are in intermediate positions in the ranking. Needless to say, it is apparent from this graph that financial intermediation, which includes insurance, is the most intensive sector in both FDI abroad and in the EU, which indicates the intense internationalization process that characterizes this sector.

On the contrary, the other sectors are less active in FDI in the rest of the world. It is interesting to underline that textile, a sector with negative developments in production, employment and investment in the EU, is in the last positions of the ranking, although this sector is part of an aggregate with wood and wood products, and the data do not allow looking into the specific situation of textiles separately.

The information on FDI intensity presented above refers to characteristics of the sectors (openness to international investment) and is useful to make comparisons across sectors. However, it does not capture properly the size of the FDI outside the EU. As a matter of fact, the main part of EU-25 Member States' FDI takes place within the borders of the Union. On

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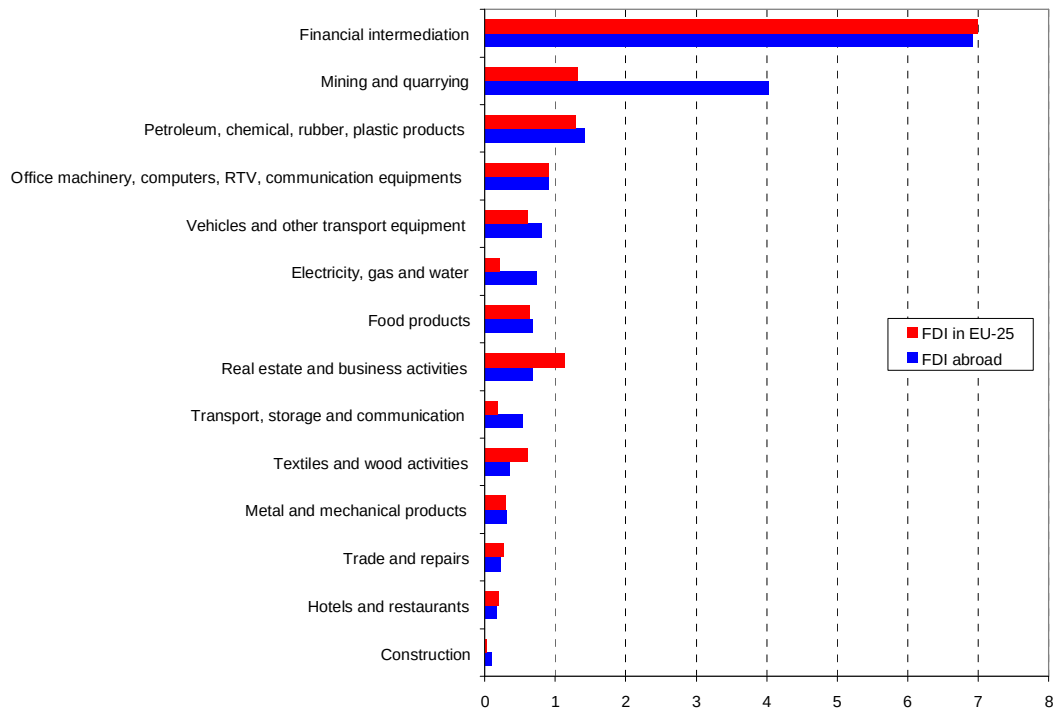
81 The sectors not considered are agriculture and fishery and non-market services. Among manufacturing sectors: leather and footwear, non-metallic mineral products, electrical machinery and scientific and other instruments are also excluded for lack of data.

82 Petroleum, chemicals and rubbers is a more heterogeneous sector, and the information available does not provide detailed information regarding the share in FDI of each of the sub-sectors. Yet it is, at least partially, related to the exploitation of natural resources.

average (see Graph V.29), 63% of the EU Member States' FDI total stock abroad is located in other EU countries, while 37% corresponds to the stock in the rest of the world. Furthermore, in some sectors the share of EU in total EU FDI is higher than 70%. This is the case of real estate and business activities (72.5%); transport, storage and communications (72.2%); hotels and restaurants (76%); and textile and wood activities (76.7%). On the contrary, construction and electricity, gas and water supply are sectors for which more than 50% of the FDI stock is outside the EU.

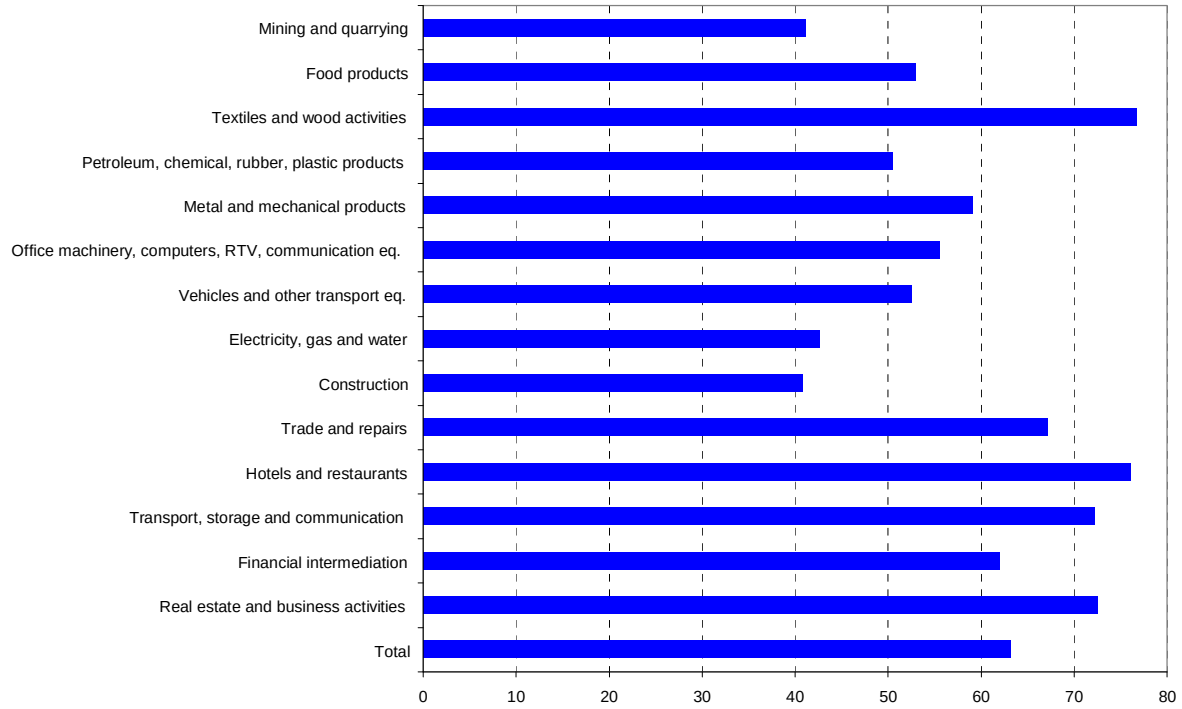
Equally important is to underline the fact that FDI flows are bi-directional, which is clear in Graph V.28, where the FDI stock in the EU is compared to value added by sector. The largest imbalance is in mining and quarrying, in which EU-25 FDI abroad is much larger than the stock in the EU. A measure of the balance between FDI abroad and in the EU is presented in Graph V.30. In electricity, gas and water supply; mining and quarrying; transport storage and communications; and in construction, the FDI stock abroad is substantially higher than the investments of the rest of the World in the EU. At the other end are textiles and wood, and real estate and business activities, for which the FDI stock in the EU is greater than the stock of investments of the EU abroad.

Graph V.28: Sectoral share in FDI stock abroad relative to share in value added - EU-25 (end of 2004)



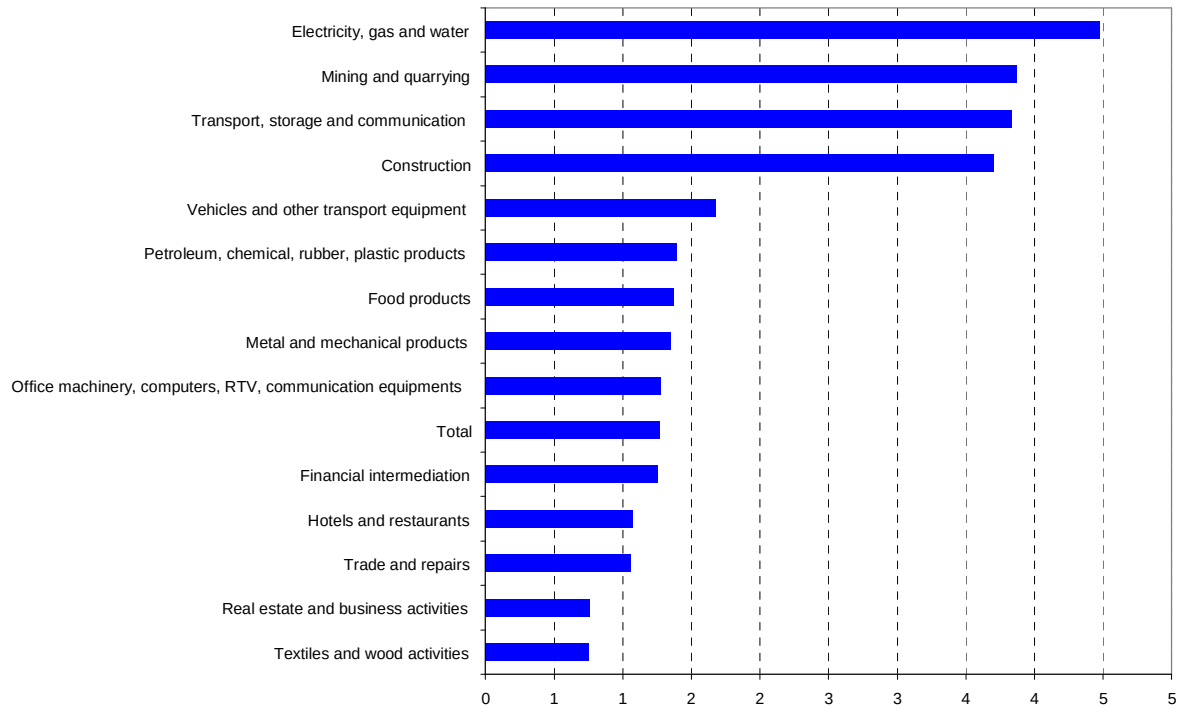
Source: calculated from Eurostat data.

Graph V.29: EU-25 share in total FDI stock (%) (2004)



Source: calculated from Eurostat data.

Graph V.30: FDI balance - EU-25 FDI stock outward / EU-25 FDI stock inward (2004)



Source: calculated from Eurostat data.

VI Annex: statistical nomenclatures

To maximise the amount of information presented in each of the four chapters of this publication, the approach taken is to use, for each indicator, the data available at the most detailed level of the nomenclature. To give an overall picture of the various groups of economic activities (industries) Table VI.1 presents the four lists of sectors used[83]. The first column presents NACE Rev.1 codes[84]. The second column is an abridged version of NACE headings. The third column contains the acronyms used in the scatter plots in Chapter III. The rest of the columns indicate the sectors included in each of the four lists: list A consists of *sub-Sections* of NACE; list B is formed by *divisions*; list C, *"2-digit+"*, is equal to list B, with five *divisions* (24, 31, 33, 35 and 74) further expanded into NACE *groups* and ad-hoc aggregates of groups. As regards the ad-hoc aggregates in list C, these are the same used in O'Mahony and van Ark (ed.), *EU productivity and competitiveness: an industry perspective*, European Commission, 2003. One exception is the subdivision of NACE item 24 "manufacturing of chemical products", which was broken down to present separately the "pharmaceuticals" sector. These aggregates are presented in boxes and highlighted in grey colour. Finally, list D is equal to list C, with divisions 31, 33 and 35 expanded to the level of *groups*; sector 24 (chemical industry) is not broken down into pharmaceuticals and other chemical. These four lists constitute the framework for the construction and presentation of the indicators. In some cases some items of a particular list are not used, for two main reasons. First, lack of data, one example of which is the indicator of human capital, which is based on list B, although some sectors are not included. Second, in some cases the choice was made to restrict the presentation of indicators to specific sub-sets of the list: for example, most of the indicators refer to manufacturing and business services, and therefore exclude agriculture, fishing, forestry, mining and non-market services.

[83] The sectoral indicators presented in this publication are calculated from statistical data on economic activities with a major exception, namely Chapter VI data on external trade in products which is obviously based on statistical data on products. Furthermore, some special cases are worth mentioning: the indicators derived from Input-Output Tables (Section III.5 and V.2) are calculated from *product by product* Tables. Chapter V (demand side indicators) is based on COICOP, a nomenclature of products and services.

[84] NACE Rev.1 is composed of various categories, namely: 17 sections (letters A through Q); 31 sub-sections (2-digit alphabetical codes); 60 divisions (2-digit codes); and 222 groups (3-digit codes).

Table VI.1: Sectoral nomenclature

Code	Sector	Acronym	A	B	C	D
a	Agriculture, hunting and forestry		X			
a1	Agriculture	Agri				
a2	Forestry	For				
b	**Fishing**		X			
c	**Mining and quarrying**	Mine	X			
ca 10	Mining of coal			X		
ca 11	Extraction of petroleum			X		
ca 12	Mining of uranium			X		
cb	**Other mining**	othmin				
cb 13	Mining of metal ores			X		
cb 14	Other mining and quarrying			X		
d	**Manufacturing**		X			
da	**Food, drinks and tobacco**		X			
da15	Food and drink	food		X	X	X
da16	Tobacco	tobac		X	X	X
db	**Textiles and textile products**		X			
db17	Textiles	text		X	X	X
db18	Clothing	cloth		X	X	X
dc	**Leather and leather products**		X			
dc19	Leather and footwear	foot		X	X	X
dd	**Wood and wood products**		X			
dd20	Wood and wood products	wood		X	X	X
de	**Pulp, paper and paper products; publishing**		X			
de21	Pulp, paper and paper products	paper		X	X	X
de22	Printing and publishing	print		X	X	X
df	**Coke, refined petroleum and nuclear fuel**		X			
df23	Mineral oil refining and nuclear fuel	refin		X	X	X
dg	**Chemicals and chemical products**		X			
dg24	Chemicals	chem		X		X
dg244	Pharmaceuticals	pharm			X	
dg24exdg244	Chemicals excl. Pharmaceuticals	chem			X	
dh	**Rubber and plastics**		X			
dh25	Rubber and plastics	plas		X	X	X
di	**Non-metallic mineral products**		X			
di26	Non-metallic mineral products	miner		X	X	X
dj	**Basic metals and metal products**		X			
dj27	Basic metals	metal		X	X	X
dj28	Fabricated metal products	metpr		X	X	X
dk	**Machinery and equipment n.e.c.**		X			
dk29	Machinery and equipment n.e.c.	machin		X	X	X
dl	**Electrical and optical equipment**		X			
dl30	Office machinery	offmac		X	X	X
dl31	Electrical machinery	elecmac		X		
dl311	*Electric motors, generators and transformers*					X
dl312	*Electricity distribution and control apparatus*					X
dl313	*Insulated wire and cable*					X
dl314	*Accumulators and batteries*					X
dl315	*Lighting equipment and electric lamps*					X

dl316	*Electrical equipment n.e.c.*					X
dl313	Insulated wire	wire			X	
dl31exdl313	Other electrical machinery and apparatus nec	elecmac			X	
dl32	Radio and TV equipment; electronic components	telecom		X		
dl321	*Electronic valves and tubes*	semic			X	X
dl322	*Telecommunication equipment*	telecom			X	X
dl323	*Radio and TV receivers*	radiotv			X	X
dl33	Scientific and other instruments	instr		X		
dl331	*Medical and surgical equipment*					X
dl332	*Instruments for measuring, testing, and navigating*					X
dl333	*Industrial process control equipment*					X
dl334	*Optical instruments,photoGraphic equipement*					X
dl335	*Watches and clocks*					X
dl331-dl333	Scientific instruments	scinstr			X	
dl334-dl335	Other instruments	othinstr			X	
dm	**Transport equipment**		X			
dm34	Motor vehicles	motor		X	X	X
dm35	Other transport equipment	trans		X		
dm351	*Building and repairing of ships and boats*					X
dm352	*Railway, tramway locomotives, rolling stock*					X
dm353	*Aircraft and spacecraft*					X
dm354	*Motorcycles and bicycles*					X
dm355	*Other transport equipment n.e.c.*					X
dm351	Shipbuilding	ships			X	
dm353	Aircraft and spacecraft	aircr			X	
dm35exdm351&dm353	Railroad equipment and transport equipment nec	rail			X	
dn	**Other manufacturing**	othman	X			
dn36	Furniture; other manufacturing	furnit		X	X	X
dn37	Recycling	recyc		X	X	X
E	**Electricity, gas and water supply**	electr	X			
E40	Electricity and hot water supply			X		
E41	Collection and distribution of water			X		
F	**Construction**	const	X			
F45	Construction			X		
G	**Wholesale and retail trade**		X			
G50	Sale and repair of motor vehicles	salemot		X		
G51	Wholesale trade	wholtr		X		
G52	Retail trade	retra		X		
H	**Hotels and restaurants**		X			
H55	Hotels and restaurants	hotel		X		
I	**Transport, storage and communication**		X			
I60	Inland transport	inltran		X		
I61	Water transport	watran		X		
I62	Air transport	airtran		X		
I63	Supporting transport activities	suptran		X		
I64	Communications	comm		X		
J	**Financial intermediation**		X			
j65	Financial intermediation	finint		X		
j66	Insurance and pension funding	insur		X		
j67	Auxiliary to financial intermediation	auxfin		X		
K	**Real estate, renting and business activities**		X			

K70	Real estate activities	reest		X		
K71	Renting of machinery and equipment	rentm		X		
K72	Computer and related activities	compu		X		
K73	Research and development	r&d		X		
K74	Other business activities			X		
	Legal, technical and advertising	legad				
	Other business activities, nec	othbus				
L	**Public administration and defence**	pubadmin	X			
M	**Education**	educ	X			
N	**Health and social work**	health	X			
O	**Other services**	othser	X			