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Abstract

Global trade patterns are changing rapidly. Emerging economies are increasing their share of exports overall and intensifying competition in nearly all sectors. Low-cost advantage initially helped emerging economies, particularly China, penetrate low technology labour intensive sectors. More recently, emerging economies have started to compete in higher value-added sectors where European industries have traditionally had comparative advantage. Greater trade integration has also led to a dispersion of value chains well beyond national borders, increasing the granularity of trade. In this rapidly changing context, it is valuable to predict the future profile of EU exports so that the results can inform current policy. Using a model based approach this report examines the future profile of EU exports at sector and aggregate level in terms of trade volumes and quality competitiveness. A value chain approach allows then to quantify impacts on sectoral value added and GDP.

Keywords: Trade patterns, gravity, scenarios, quality of trade, GDP impact

JEL classification: F14, F17, F63

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1. Introduction

Global trade patterns are changing rapidly for various reasons. Emerging economies are increasing their share of GDP in the world economy and therefore also their share in world total exports, thus leading to an intensification of trade relations across the globe, which might further lead to changes in patterns of specialisation across world regions and countries. Furthermore, due to the rising importance of global value chains, trade volumes are increasing as products are shipped across borders several times, leading also to an increase in the granularity of trade. This global trade integration might further intensify competition in higher value-added activities where European industries have traditionally had a comparative advantage. This is the basis that the recent Commission communication on industrial policy, 'For a European Industrial Renaissance' (European Commission, 2014), refers to. In this communication the basis on which the EU needs to compete on global markets is described as: 'With scarce natural and energy resources and ambitious social and environmental goals, EU companies cannot compete on low price and low quality products. They must turn to innovation, productivity, resource-efficiency and high value-added to compete in global markets. Europe's comparative advantage in the world economy will continue to lie in high value-added goods and services, the effective management of value chains and access to markets throughout the world' (European Commission, 2014). In this rapidly changing context, it is important to know where EU industry will stand in global export markets in the future, based on past and current trends of trade patterns and capacities. An assessment of how global trade patterns will evolve in the future and – related to that – how comparative advantage might change for the EU can inform the policy debate on future developments in EU external competitiveness. The exercise might potentially highlight areas where action might need to be taken in order to maintain comparative advantage in high value-added sectors and activities. The export performance of an economy is also an important indicator of GDP growth potential. Hence, an indication of the EU's future external competitiveness can also provide an insight into the growth potential at Member State and EU level.

In this context, external competitiveness is defined as how successful a country is in third markets compared to other countries (see e.g. European Commission, 2010).[1] The most commonly used measures of external competitiveness are world market share and revealed comparative advantage (RCA), both of which can be calculated from standard trade data. As these world market shares and RCAs change not only because of domestic developments, but also because of changes in the situation of all competitor countries, a proper assessment of likely future developments in world market shares and RCAs requires consideration of global developments. Furthermore, it is also necessary to explicitly consider the competitiveness of EU exports in terms of their quality, relative to world exports. This aspect can be measured with unit export values (UEV), which can give an indication of the quality premium of EU exports compared to those of other countries across sectors.

RCA indicators can also be calculated on the basis of *trade in value added* (TVA) for individual sectors. Trade in value added-based measures of world market shares and RCAs discount the value of gross

[1] Note that a broader definition of 'competitiveness' is '…the ability of the economy to provide its population with high and rising standards of living and high rates of employment on a sustainable basis' (see European Commission, 2002).

exports, taking into account the foreign value added of intermediate imports used in the production of a product or service in order to isolate the domestic component of exports. Hence, first they can provide a more accurate picture of a country's true comparative advantage in a particular sector, and second, give an accurate account of how much a country's exports relate to income and therefore GDP growth. These measures need to be calculated on the basis of world input-output tables.

The overall objective of the study is therefore to give an assessment of the likely future developments of EU exports not just at the broad macroeconomic level, but also at a more detailed sectoral level, pinpointing potential future strengths and weaknesses in future EU exports. The study however also goes beyond that and not only considers developments in exports at the industry level, but also provides an investigation of each industry's exports in terms of quality, specifically by breaking down exports into high, medium and low unit-value segments, and their likely developments in the future. Finally, using insights from input-output analysis, the projections of exports into the future will be translated into estimates of their potential impact on GDP and GDP growth.

2. Past developments and trends

2.1. LONG-TERM HISTORICAL TRENDS

In this section, the history of EU trade and specialisation patterns over the past 50 years or so is described, using the Comptes Harmonisés sur les Echanges et L'Economie Mondiale (CHELEM) dataset. These data include global trade data for 70 sectors from 1967 onwards. Specifically, the analysis focuses on how world market shares (WMS) and Revealed Comparative Advantages (RCAs) have evolved since the 1960s. It includes a comparative analysis of the RCA development of the EU, compared to that of other major economies. Methodologically, this is based on providing descriptive trends of world market shares and revealed comparative advantages, as outlined in Box 2.1.

BOX 2.1 / TRADE PERFORMANCE INDICATORS

The ***export structure*** is measured as the share of a specific industry *i* in total exports of country *j* at time *t*, formally

$$\mathrm{XTS_{ijt}} = \frac{\mathrm{EXP_{ijt}}}{\mathrm{EXP_{jt}}}$$

The ***world trade share*** of a specific industry in a country, a specific industry group in a country or the country as a total is defined as the exports of this country and industry as a percentage of global exports in this industry. Formally, the world trade shares (WTSs) are therefore defined as

$$\mathrm{WTS_{ijt}} = \frac{\mathrm{EXP_{ijt}}}{\mathrm{EXP_{it}}}$$

where WTS_{ijt} refers to the world trade share of industry i of country (or country group) j at time t; EXP_{ijt} refers to exports (which can either be measured in gross value terms or in value-added terms) of industry i in country j at time t; and EXP_{it} refers to global exports of industry i at time t. Hence, the indicator measures the share of an industry's exports in that industry's total global export flows.

As a measure of ***revealed comparative advantage (RCA)*** the Balassa Index is presented. This index, which is based on exports only, is defined as

$$\mathrm{RCA_{ijt}} = \frac{\frac{\mathrm{EXP_{ijt}}}{\mathrm{EXP_{jt}}}}{\frac{\mathrm{EXP_{it}}}{\mathrm{EXP_{t}}}} = \frac{\mathrm{XTS_{ijt}}}{\mathrm{XTS_{it}}} = \frac{\frac{\mathrm{EXP_{ijt}}}{\mathrm{EXP_{it}}}}{\frac{\mathrm{EXP_{jt}}}{\mathrm{EXP_{t}}}} = \frac{\mathrm{WTS_{ijt}}}{\mathrm{WTS_{jt}}}$$

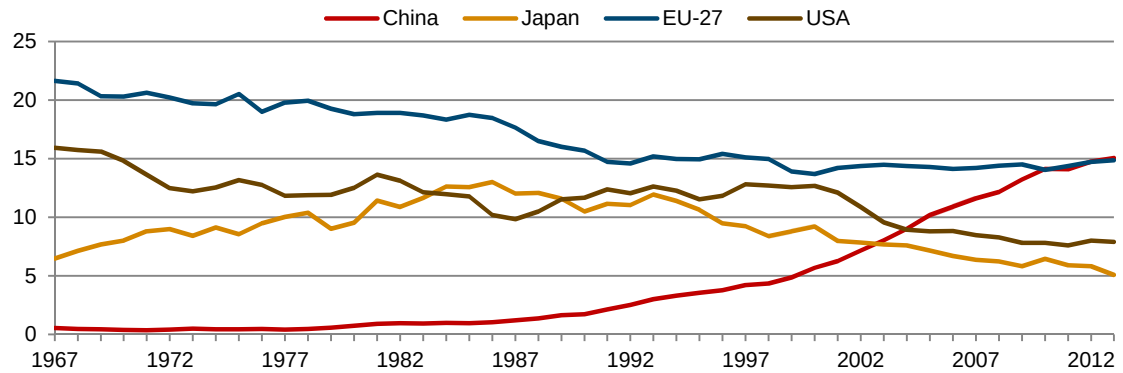
where $\mathrm{RCA_{ijt}}$ refers to the revealed compared advantage of industry i of country (or country group) j at time t; $\mathrm{EXP_{ijt}}$ refers to the exports of industry i of country j at time t; and $\mathrm{EXP_{it}}$ refers to global exports of that industry. Similarly, $\mathrm{EXP_{jt}}$ and $\mathrm{EXP_{t}}$ refer, respectively, to total exports of country j, and to total global exports at time t. Hence, the indicator compares the position of an industry in a particular country's export basket, relative to that industry's position in global exports. Alternatively, it shows the country's world trade share in a specific industry, relative to that country's share in global export flows. A value larger than 1 indicates that a country has a comparative advantage (CA) in the industry, i.e. is specialised relatively more in this industry's exports than the world average.

Historical trends in world market shares

Figure 2.1 shows the evolution of the global market shares of the EU and other major economies over the past 50 years or so, using the CHELEM dataset. This dataset includes global trade data for 70 sectors from 1967 onwards. The world market shares are calculated as the share of exports of a country in total manufacturing, relative to the manufacturing exports of all countries.

The EU-28 in this period lost 5 percentage points (a 25% drop) between 1968 and 1990. From 1990 on, however, the EU-28 market share has stagnated at around 15%. The US and Japanese trends are quite different. The US market shares dropped from 15.5% to 8% over the whole period, with a steady share of around 13% in the 1990s, followed by a dramatic decrease of around 6 percentage points in the 2000s. Gatto et al. (2011) provide an in-depth analysis of this decline, and point to the general decline of the US share in world income and the relevance of several industries for explaining this downward trend. Mandel (2012) also points to the changing composition of trade products and the diminished share of the US in global output. Both papers, however, point out that these factors should not be seen as a decline in the country's ability to compete in global exports. Japan's trend follows an inverted U-shaped curve: after an increase from around 7% to 12% in the second half of the 1980s, in the last 15 years of observations Japanese exports experienced similar tendencies as their US counterparts. Again, the general decline of Japan in the global output plays a role, and this is further aggravated by the long-term stagnation of the Japanese economy since the 1990s. Together, from the beginning of the 1990s, the US and Japan appear to have lost around 14 percentage points of the world market – a figure consistent with the almost 13-point rise in Chinese market share – from 2% to 15% of world share – in the period 1990–2013. These changes have been more significant since 2000. In that respect, for example Bayoumi (2011) points to the role of trade liberalisation, increasing vertical specialisation and general income convergence. In particular the fact that emerging market economies have become major players in global trade is an important cause. Furthermore, the role of shifting patterns towards higher-technology intensive industries is mentioned as an important factor.

Figure 2.1 / Evolution of export market shares in %



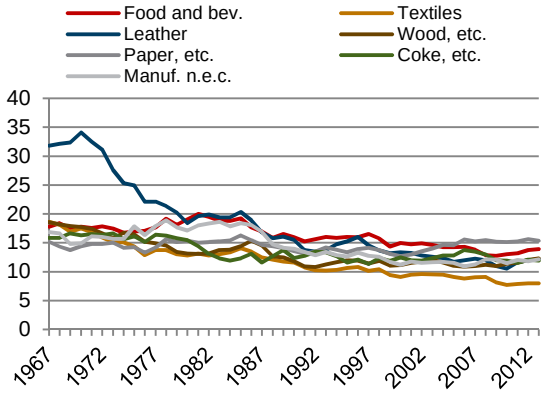
Note: Extra-EU trade.
Source: CHELEM; authors' calculations.

Therefore, Figure 2.2 presents the EU-28's export market shares at a more detailed industry level for 14 manufacturing sectors. As a matter of fact, half of the sectors have experienced the same tendencies as are seen in the aggregate figures above, with a decrease until the beginning of the 1990s, followed by a

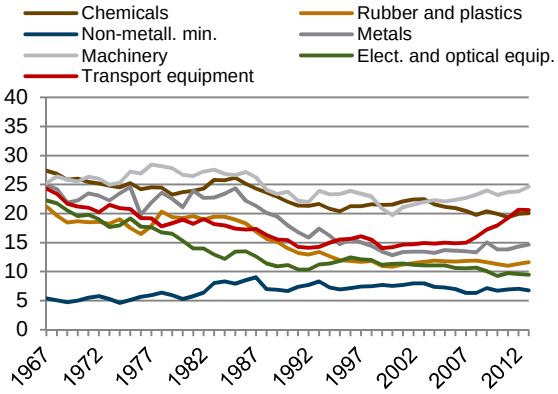
period of relatively constant market share. Textiles and leather (including footwear) continued to suffer from outside competition even after the 1990s, losing an additional 4 percentage points over the period.[2] Machinery and equipment, transport and paper and printing are the only sectors that have gained market share, and have compensated for the losses in the market shares of other industries by gaining altogether around 6 percentage points over the past 10 to 15 years. These sectors are characterised by a higher technology content, which makes it possible to succeed with product differentiation and product quality, instead of competing on cost.

Figure 2.2 / Evolution of EU-28 export market shares, by industry in %

Panel A Low-tech industries (incl. coke)



Panel B: Medium-low, medium-high and high-tech industries



Source: CHELEM; authors' calculations.

The corresponding evolution of world market shares for Japan and the US is presented in Figure 2.3. It is interesting to note that the sector-level tendencies for Japan are also, to some extent, well represented by the aggregate market share observed in Figure 2.1, as the bell-shaped curve is also observed for many Japanese industries. One important thing to note about Japan is that most of the industries lost market share after 1985. The evolution of US total market share, however, hides a more distinct composition effect, at least over the early period 1967–90. Panel D of this figure shows that market share in most of the medium-high and high-tech industries shrank – sometimes dramatically – over this period. After the 1990s, the shares of all the industries (except coal and petroleum) kept decreasing.

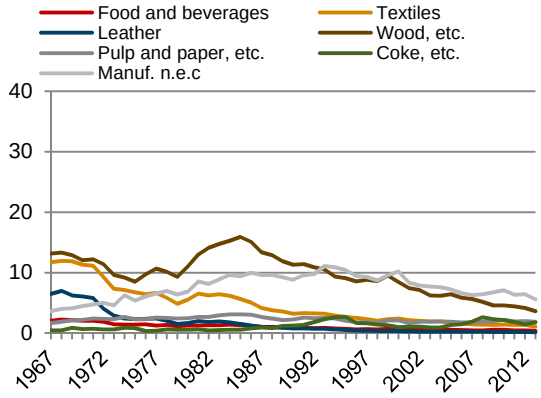
Finally, China's overall market share is characterised by a rather strong performance in most sectors during the period. Note, however, that while the market share growth in some sectors (the lower-tech industries like textiles, wood and paper and printing) started back in the mid-1980s, the dramatic growth in some others (more capital intensive, such as machinery or electrical and optical equipment) started only in the mid-1990s or the early 2000s. While the growth dynamics of the former industries has steadily been slowing down since the 1990s, the latter have so far maintained their dynamics. Nevertheless, some sectors such as transportation or chemicals – classified as medium-high and high-tech intensive (see e.g. OECD, 2011) in new technology and research and development (R&D) – relatively speaking under-performed in China, compared to other industries, even in the last years of

[2] These trends were also driven by the Multifibre Arrangement, which gradually expired in the period 1995–2005.

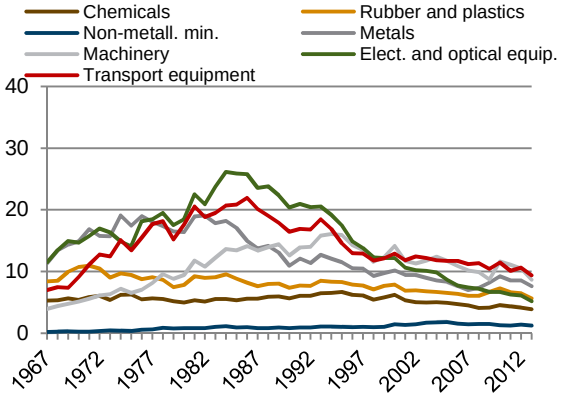
observations. Hence, one could classify the development of sectors in China over the past 50 years into three distinct waves. The first showed a rapid growth in the low-tech industries, which started in the mid-1980s and has been slowing down in recent years. The second wave is related to the expansion of more capital-intensive industries, which started to increase their world market shares around 10 years later. Finally, starting in the mid-1990s, a third wave seemed to gain momentum in the mid-2000s: it concerns industries generally regarded as being at the forefront of technological developments. To some extent, today's China appears to be experiencing a path in its export development that shows similarities to the development trajectory of Japan in the 1970s and the 1990s.

Figure 2.3 / Evolution of world market shares, by industry, for Japan and the US in %

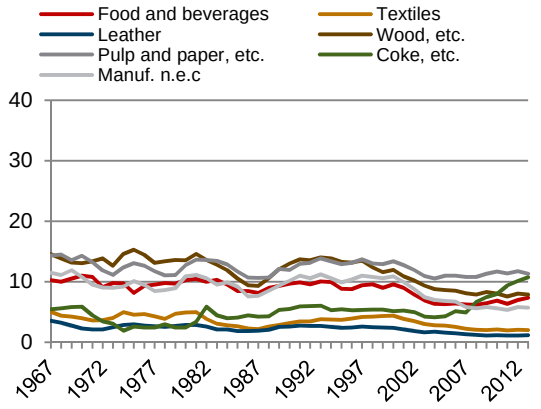
Panel A: Low-tech industries (incl. coke)



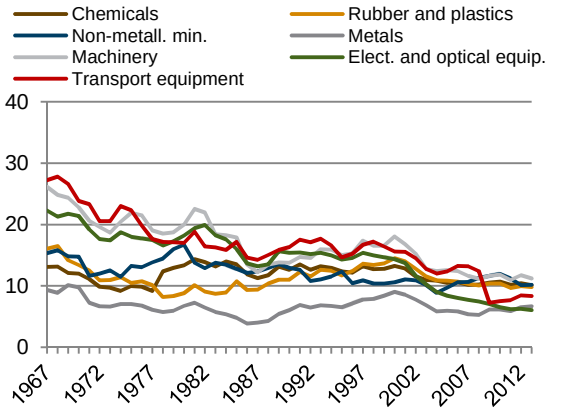
Panel B: Medium-low, medium-high and high-tech industries



Panel C: Low-tech industries (incl. coke)



Panel D: Medium-low, medium-high and high-tech industries



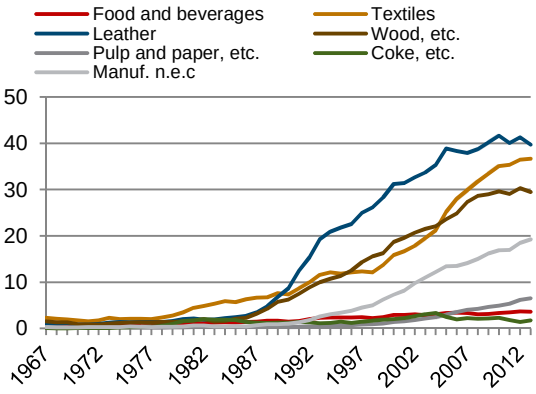
Source: CHELEM; authors' calculations.

To summarise, in the long-term perspective the EU-28 seems to have performed better than the USA and Japan in terms of retaining its share of exports at a time when emerging countries – and particularly China – have been increasing their market shares significantly. Most industries in the EU-28 experienced a decline in their market shares in the 1970s and 1980s, but since then that has more or less stabilised (with the exception of the textiles industry). However, some industries – chemicals and machinery – have kept their relatively high world market shares since the 1990s, with the transport

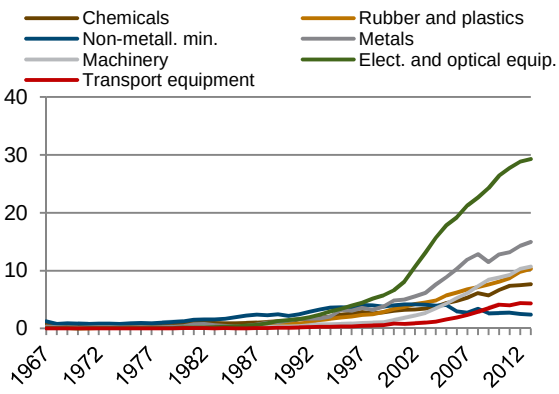
equipment industry gaining significant market shares recently. This is distinct from the changes in the US and Japan, which also experienced declines in market shares in these industries. Furthermore, the US and Japan have also recently suffered severe declines in market share in the electronics industry, which is not the case for the EU-28. However, unlike the US and Japan, the EU-28 never had a strong comparative advantage in this industry.

Figure 2.4 / Evolution of Chinese market shares in %

Panel A: Low-tech industries (incl. coke)



Panel B: Medium-low, medium-high and high-tech industries



Source: CHELEM; authors' calculations.

The evolution of revealed comparative advantage in historical perspective

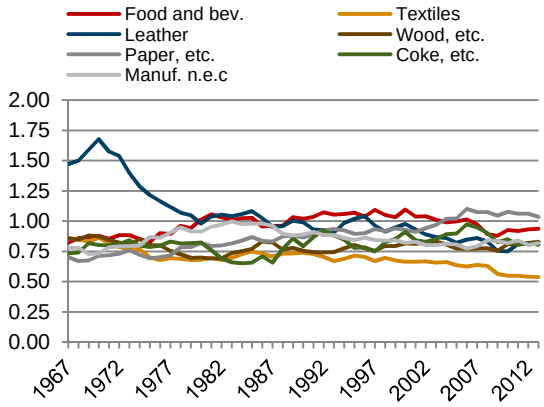
Variations in market shares over time indicate changes in foreign competitiveness of an exporting country compared to other exporting countries, in some industry. Although (differentiated evolution of) market shares might be linked to specialisations, it could nevertheless be misleading to link uniformly high market shares to high specialisations (and low shares to non-specialisation). Rather, specialisation of countries is better understood in terms of cross-industry allocation of resources, compared to the allocation in other countries. Since neither data on the resources used nor data on production across sectors are available over such a long time span, instead the allocation of resources across industries will be approximated by comparing one country's export structure across its different industries with the structure prevailing in other countries, leading to the indicator of revealed comparative advantage. Specialisations are better understood, however, from the Balassa measure of revealed comparative advantage. (Box 2.1 presents the RCA index in more detail). This indicator compares the export share of an industry in one typical country to the export share of the same industry in world exports. A value larger than 1 indicates that a country has a comparative advantage (CA) in this industry, as it is specialised relatively more in this industry's exports than in the rest of the world.

Figure 2.5 presents the results for the extra-EU-28 trade of EU countries. It appears that the position of two-thirds of the EU industries on the extra-EU markets has not changed over time. In particular, the chemicals and machinery and equipment industries remain the two sectors where the EU has the highest specialisation, with a ratio that has been 50% higher than for the rest of the world, at least since the 1990s. Note, however, that while specialisation in chemicals has been decreasing slightly in recent years, the machinery and equipment sector is still experiencing an increasing trend. Besides, after a

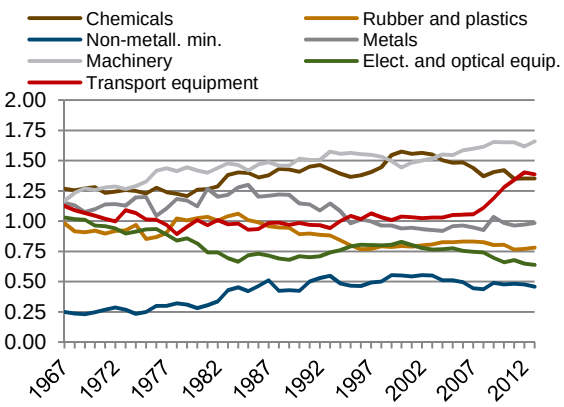
long period of stagnation, one can also observe a significant increase in the RCA for the transportation industry in recent years. Finally, there is another upward trend, this time for the paper and printing industry, reaching a value above 1 at the end of the period. All in all, most of the results related to RCAs in figures appear to be relatively consistent with the above market share figures.

Figure 2.5 / Evolution of revealed comparative advantages of EU-28

Panel A: Low-tech industries (incl. coke)



Panel B: Medium-low, medium-high and high-tech industries



Source: CHELEM; authors' calculations.

Figure 2.6 shows the RCAs for the benchmark countries (US, Japan and China). The main results that stand out are as follows. As in the case of the EU-28, since the 1990s the US and Japan (also China, though to a lesser extent) have been experiencing an upward trend in specialisation related to machinery and equipment. This is also the case for transportation, albeit at the end of the period; it appears that the US transport equipment sector has suffered enormously from the 2008 crisis, compared to the transport sector in the rest of the world. Besides, unlike the EU, in the 2000s, specialisation in chemicals appeared to be trending upward for the US and Japan. Also, most recently the US has been allocating its resources to the coke and petroleum/gas industry, with a dramatic increase – by a factor of three – between the mid-2000s and 2013 (a move that is also driven by a price effect in the earlier years).[3]

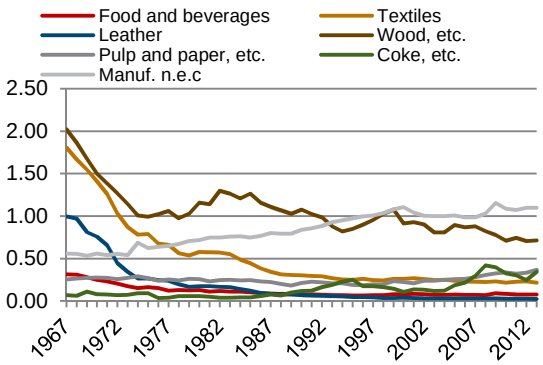
Again, the situation is different for China: in the 1990s there was a shift towards specialisation in favour of physical capital-intensive industries followed – from the mid-2000s on – by a specialisation in human-capital and innovative industries. All this change is observed at the expense of labour-intensive industries, for which a turning point in specialisation can be identified around the end of the 1980s (textiles) and the beginning of the 1990s (leather and footwear).

[3] Note that the actual decline in oil prices is not reflected in the data, which end in 2013.

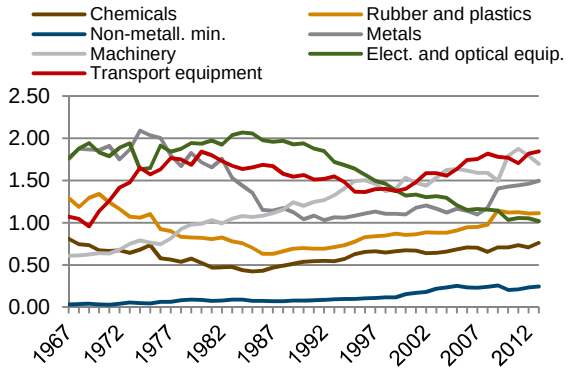
Figure 2.6 / Revealed comparative advantage in Japan, the US and China

Japan

Panel A: Low-tech industries (incl. coke)

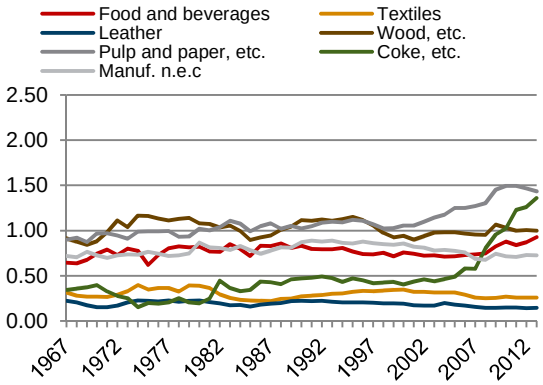


Panel B: Medium-low, medium-high and high-tech industries

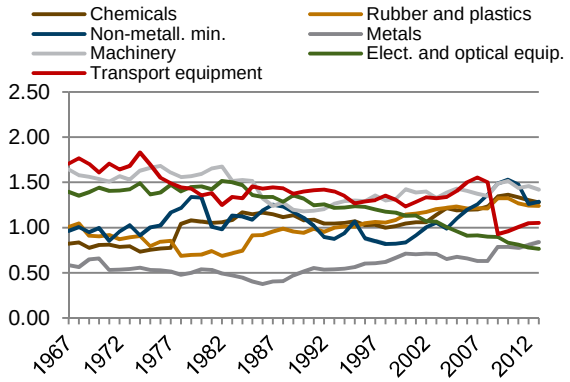


USA

Panel C: Low-tech industries (incl. coke)

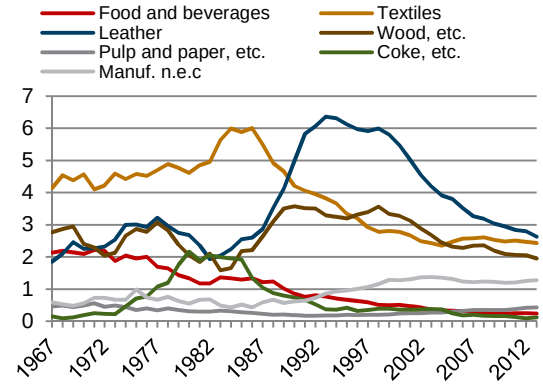


Panel D: Medium-low, medium-high and high-tech industries

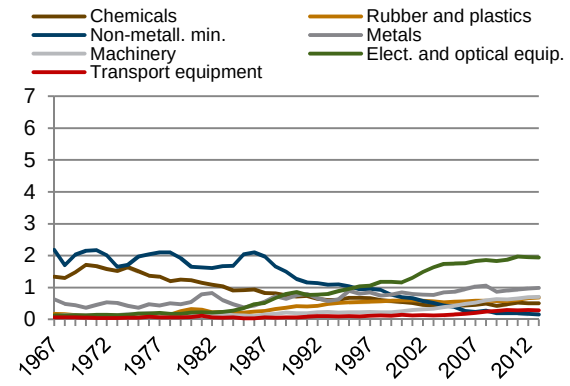


China

Panel E: Low-tech industries (incl. coke)



Panel F: Medium-low, medium-high and high-tech industries



Note: For China the scale of RCAs ranges from 0 to 7.
Source: CHELEM; authors' calculations.

2.2. DEVELOPMENTS IN GROSS EXPORTS OF MANUFACTURING AND SERVICES AT WORLD LEVEL SINCE 1995

Another aspect of the evolution of world trade might be that, apart from trade in manufactured products, trade in services has increased over time, though from a lower level. This subsection therefore provides an overview of the relative importance of services trade and specialisation patterns based on data from the World Input-Output Database (WIOD).

Table 2.1 / Export volumes and structures

	in million USD		in %	
	1995	2011	1995	2011
Agriculture etc.	128019	376347	3.2	2.6
Mining and utilities	264929	1683144	6.6	11.4
Manufacturing – Low tech	668578	2005144	16.7	13.6
Manufacturing – Medium-low tech	469584	2078991	11.8	14.1
Manufacturing – Medium-high and high tech	1643610	5456489	41.1	37.0
Construction	7893	39886	0.2	0.3
Services – Distribution, etc.	260903	945959	6.5	6.4
Services – Transport and communication	281247	916934	7.0	6.2
Services – Business services	248216	1169785	6.2	7.9
Non-market services	21593	77036	0.5	0.5
Total	3994571	14749715	100.0	100.0

Note: Excluding intra-EU trade.
Source: WIOD; authors' calculations.

Table 2.1 provides an indication of the world export structures, where exports are differentiated between ten industry aggregates. Since 1995 the overall value of world trade (measured at current USD) has almost quadrupled, despite the severe trade slump in the aftermath of the global financial and economic crisis of 2008. Manufacturing exports account for about two-thirds of world exports, a share which has declined only slightly in recent decades. This decline has, however, mostly been due to a sharp increase in the shares of mining and utilities (mostly driven by changes in prices) and, to a lesser extent, trade in services. For the latter, the share increased to more than 20% in 2013. Within manufacturing, the share of medium- to low-tech industries has tended to increase as compared to the other industries, which again reflects price changes in the coke and petroleum industry. The most important traded services are wholesale trade (19%) and business services with about 25%. The next most important items are financial intermediation (15%), inland transport (10%) and water transport (9%). In total, these categories account for about 80% of services trade flows. The growth rates of these categories range from 6% to 11% (for trade measured in current USD).

Table 2.2, Table 2.3 and Table 2.4 report world market shares, export structures and revealed comparative advantage, respectively, for the EU-27, USA, Japan and China. In Table 2.4 (which results from the two previous tables) one finds that the EU-27 has a comparative advantage in medium-high and high-tech industries which remained stable over the period considered. Moreover, it has been able to improve its revealed comparative advantage in transport and communication and business services, and to improve its position in distribution services (for which, however, a comparative disadvantage is still reported). The US is mostly characterised by a significantly higher RCA in business services, which also increased over time, but with a somewhat lower RCA in transport and communication services and medium- to high-tech industries. Japan is still very much specialised in medium-low and medium-high to high-tech industries, and also in distribution and communication services, but not at all in business

services. Finally, China, as expected, shows a very strong specialisation in low-tech industries (though with a significant decline over the period considered), but also in medium-high and high-tech industries, for which the RCA increased from 0.66 to 1.40. RCAs are still far below 1 in the service industries, however.

Table 2.2 / World market shares by broad export categories

	EU-27		USA		Japan		China	
	1995	2011	1995	2011	1995	2011	1995	2011
Agriculture, etc.	11.0	9.0	21.3	14.7	0.3	0.2	5.3	4.7
Mining and utilities	7.7	2.3	3.9	2.0	0.4	0.2	1.7	0.7
Low tech	23.9	18.1	13.7	8.8	2.6	1.2	9.9	21.8
Medium-low tech	23.3	18.2	11.7	11.4	14.3	8.5	5.3	11.6
Medium-high and high tech	27.1	23.0	20.2	12.9	19.2	9.2	2.8	19.8
Construction	46.1	48.8	0.9	0.2	0.0	0.0	9.9	22.3
Distribution, etc.	15.6	18.8	34.5	18.0	13.8	9.4	2.7	12.6
Transport and communication	32.7	36.2	23.0	13.6	13.2	8.2	3.8	10.9
Business services	31.3	40.8	35.4	26.7	4.0	2.0	0.6	5.9
Non-market services	35.2	25.5	26.6	34.9	1.2	0.9	2.0	3.0
Total	24.3	21.0	19.2	12.5	12.1	6.1	4.2	14.1

Note: Excluding intra-EU trade.
Source: WIOD; authors' calculations.

Table 2.3 / Export structures by broad export categories

	EU-27		USA		Japan		China	
	1995	2011	1995	2011	1995	2011	1995	2011
Agriculture, etc.	1.5	1.1	3.6	3.0	0.1	0.1	4.0	0.9
Mining and utilities	2.1	1.3	1.4	1.8	0.2	0.4	2.6	0.6
Low tech	16.4	11.7	12.0	9.6	3.6	2.7	39.3	20.9
Medium-low tech	11.3	12.2	7.2	12.9	13.9	19.8	14.8	11.6
Medium-high and high tech	45.9	40.6	43.4	38.3	65.0	56.0	27.0	51.7
Construction	0.4	0.6	0.0	0.0	0.0	0.0	0.5	0.4
Distribution, etc.	4.2	5.8	11.8	9.3	7.4	10.0	4.3	5.7
Transport and communication	9.5	10.7	8.4	6.8	7.7	8.4	6.4	4.8
Business services	8.0	15.4	11.5	16.9	2.0	2.6	0.8	3.3
Non-market services	0.8	0.6	0.8	1.5	0.1	0.1	0.3	0.1

Note: Excluding intra-EU trade.
Source: WIOD; authors' calculations.

Table 2.4 / Revealed comparative advantages by broad export categories

	EU-27		USA		Japan		China	
	1995	2011	1995	2011	1995	2011	1995	2011
Agriculture, etc.	0.45	0.43	1.11	1.18	0.03	0.04	1.26	0.33
Mining and utilities	0.32	0.11	0.20	0.16	0.04	0.04	0.40	0.05
Low tech	0.98	0.86	0.72	0.70	0.21	0.20	2.35	1.54
Medium-low tech	0.96	0.87	0.61	0.91	1.18	1.40	1.26	0.82
Medium-high and high tech	1.12	1.10	1.06	1.04	1.58	1.51	0.66	1.40
Construction	1.90	2.33	0.05	0.02	0.00	0.00	2.35	1.58
Distribution, etc.	0.64	0.90	1.80	1.44	1.14	1.55	0.65	0.89
Transport and communication	1.34	1.72	1.20	1.09	1.09	1.34	0.91	0.77
Business services	1.29	1.94	1.85	2.14	0.33	0.33	0.13	0.42
Non-market services	1.45	1.21	1.39	2.79	0.10	0.15	0.47	0.21

Note: Excluding intra-EU trade.
Source: WIOD; authors' calculations.

2.3. TRENDS IN MANUFACTURING GROSS EXPORTS SINCE 1995

This section provides a detailed comparison of export structures in the EU and its major international competitors. It focuses on the development of exports for the EU-28 (for extra-EU-28 exports) and individual Member States (including intra-EU trade) NACE Rev. 1 two-digit industry levels since 1995. The description is based on data for gross exports and is stated in terms of share of global exports and RCA. The data source for this analysis is the Base pour l'analyse du commerce international (BACI) dataset provided by the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII), which is based on countries' customs data reported by UN-COMTRADE. It provides free-on-board (FOB or FOB equivalent) data on exports (import) in value (1,000s of USD) at the six digits of the Harmonised System Nomenclature (HS, 1992 version) from 1995 to 2013, for all pairs of countries/territories in the world. To convert these data from the HS six-digit level into industry, the correspondence table from the World Input-Output Database (WIOD) has been used (see www.wiod.org).

Global trends

To start with, Table 2.5 presents the shares of each country or country group in world trade flows,[4] the shares by industry and the cross-dimension, i.e. shares by countries and country groups and industries.

Table 2.5 / Shares in total world exports 2013, in %

	EU-28	China	Japan	USA	Other EU	North America	South America	Asia	Oceania	Africa	Other	Total
Food, Beverages and Tobacco	1.3	0.4	0.0	0.8	0.4	0.5	0.9	0.9	0.4	0.2	0.0	5.7
Textiles and Textile Products	0.5	2.4	0.1	0.2	0.3	0.2	0.0	1.4	0.0	0.2	0.0	5.2
Leather, Leather Products and Footwear	0.2	0.8	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.0	1.5
Wood and Products of Wood and Cork	0.2	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.7
Pulp and Paper, Printing and Publishing	0.5	0.2	0.1	0.4	0.1	0.2	0.1	0.1	0.0	0.0	0.0	1.8
Coke, Refined Petroleum and Nuclear Fuel	1.3	0.2	0.2	1.2	1.1	0.3	0.2	1.8	0.1	0.3	0.1	6.7
Chemicals and Chemical Products	3.7	1.2	0.9	2.3	1.2	0.6	0.2	2.5	0.1	0.2	0.1	12.8
Rubber and Plastics	0.5	0.7	0.3	0.4	0.1	0.2	0.0	0.5	0.0	0.0	0.0	2.8
Other Non-Metallic Mineral	0.3	0.4	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	1.2
Basic Metals and Fabricated Metal	1.8	1.6	0.8	1.0	1.9	0.7	0.6	1.3	0.4	0.7	0.1	10.8
Machinery, nec	3.3	2.1	1.3	1.5	0.5	0.5	0.1	1.0	0.0	0.0	0.0	10.4
Electrical and Optical Equipment	3.0	7.8	1.8	2.4	0.8	1.3	0.0	6.2	0.1	0.1	0.1	23.6
Transport Equipment	3.9	0.8	1.8	2.4	0.4	1.7	0.2	1.5	0.1	0.1	0.1	12.9
Manufacturing, nec; Recycling	0.7	1.3	0.2	0.5	0.3	0.3	0.1	0.5	0.1	0.1	0.0	4.0
Total manufacturing	21.2	20.1	7.4	13.1	7.4	6.5	2.6	18.2	1.2	1.9	0.5	100.0

Source: BACI; authors' calculations.

Even excluding intra-regional flows, the EU-28 was still the most important manufacturing exporter in 2013, accounting for slightly more than a fifth of these trade flows. But nowadays, the EU-28 is closely followed by China (20.1%) and the Asian countries (18.2%). The remaining two major economies, the USA and Japan, account for 13.1% and 7.4%, respectively. By industry (see last column), these world trade flows are dominated by electrical and optical equipment, which takes about a quarter of world

[4] These figures exclude trade within the regions identified in the table.

trade, and other medium-high to high-tech sectors, which account for about 10–13% of world extra-regional export flows. These industries include chemicals (12.8%), machinery (10.4%), electrical and optical equipment (23.6%) and transport equipment (12.9%). Thus these four industries together account for more than 70% of world extra-regional trade flows. Trade flows in these industries are dominated by the more advanced countries and regions, presented in more detail below.

Table 2.6 / Change in shares in total world exports 1995–2013, in percentage points

	EU-28	China	Japan	USA	Other EU	North America	South America	Asia	Oceania	Africa	Other	Total
Food, Beverages and Tobacco	-0.5	0.0	0.0	-0.5	0.0	-0.1	0.1	-0.2	-0.1	-0.1	0.0	-1.2
Textiles and Textile Products	-0.7	0.4	-0.2	-0.3	-0.1	-0.3	-0.1	-1.0	-0.1	-0.2	0.0	-2.5
Leather, Leather Products and Footwear	-0.2	0.2	0.0	0.0	0.0	0.0	-0.1	-0.2	0.0	0.0	0.0	-0.4
Wood and Products of Wood and Cork	0.0	0.1	0.0	-0.1	0.0	-0.3	0.0	-0.2	0.0	0.0	0.0	-0.7
Pulp and Paper, Printing and Publishing	-0.4	0.1	-0.1	-0.5	-0.1	-0.6	0.0	0.0	0.0	0.0	0.0	-1.6
Coke, Refined Petroleum and Nuclear Fuel	0.8	0.1	0.1	0.9	0.9	0.2	0.2	1.2	0.0	0.1	0.1	4.5
Chemicals and Chemical Products	-0.3	0.9	-0.6	-0.3	0.0	0.0	0.0	1.4	0.0	0.0	-0.1	1.0
Rubber and Plastics	0.0	0.5	-0.1	-0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.4
Other Non-Metallic Mineral	-0.3	0.3	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2
Basic Metals and Fabricated Metal	-0.3	1.1	-0.4	-0.2	0.6	-0.2	0.0	0.4	0.1	0.3	0.0	1.4
Machinery, nec	-1.1	1.8	-1.4	-0.7	-0.3	0.1	0.0	0.2	0.0	0.0	0.0	-1.4
Electrical and Optical Equipment	-1.0	6.4	-3.7	-2.2	0.2	0.2	0.0	1.2	0.0	0.1	-0.1	1.0
Transport Equipment	0.4	0.7	-2.1	-0.6	0.2	-0.5	0.1	0.7	0.0	0.1	0.0	-1.1
Manufacturing, nec; Recycling	0.1	0.6	-0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Total manufacturing	-3.5	13.2	-8.9	-4.7	1.5	-1.4	0.2	3.5	-0.2	0.5	-0.1	0.0

Source: BACI; authors' calculations.

Table 2.6 shows the respective changes in these shares between 1995 and 2013 in percentage points. The EU-28 lost 3.5% of the world market share for total manufacturing extra-regional exports, mostly because of China (+13.2 percentage points (ppt)) and Asian countries (+3.5ppt). The EU-28 losses in terms of world market share have been lower than for the USA (-4.7ppt) and Japan (-8.9ppt). World export structures have also changed, with the share of exports by the coke and refined petroleum industry in extra-regional trade flows increasing by 4.5ppt and that of the basic and fabricated metals industry by 1.4ppt. Concerning the above-mentioned medium-high to high-tech industries, one finds that these shares increased in the case of the chemicals industry (+1ppt) and the electrical and optical equipment industry (+1.1ppt), but declined for machinery (-1.4ppt) and transport equipment (-1.1ppt).[5]

For a more detailed insight into the changes in world market shares by industry, relevant figures for 2013 are presented in Table 2.7. The EU-28 is still the most important exporter in five industries, including chemicals (28.6%), machinery (32.0%) and transport equipment (30.5%). These market shares are well above the overall share for the EU-28 (21.2%) (see Table 2.5). This also applies to food, beverages and tobacco (22.6%), and pulp and paper (29.8%). In all other industries – apart from the two exceptions of coke and petroleum and basic and fabricated metals – the second largest exporter is China, though the differences in some industries are relatively small.

[5] These broad changes also hold when excluding the coke and petroleum industry.

Table 2.7 / World market shares by industry, 2013, in %

	EU-28	China	Japan	USA	Other EU	North America	South America	Asia	Oceania	Africa	Other
Food, Beverages and Tobacco	22.6	6.5	0.7	13.5	7.3	8.1	15.3	15.7	6.9	2.9	0.7
Textiles and Textile Products	8.9	45.8	1.3	3.1	6.2	3.5	0.5	27.0	0.2	2.9	0.6
Leather, Leather Products and Footwear	15.7	51.1	0.2	1.9	2.5	1.3	3.6	20.8	0.4	2.1	0.6
Wood and Products of Wood and Cork	20.7	19.6	0.1	7.9	10.8	15.6	6.6	12.6	2.8	2.7	0.6
Pulp and Paper, Printing and Publishing	29.8	12.6	3.0	20.5	6.5	10.7	6.2	8.2	1.0	1.0	0.5
Coke, Refined Petroleum and Nuclear Fuel	19.6	2.2	2.3	17.3	16.7	5.0	3.5	26.6	0.8	4.8	1.1
Chemicals and Chemical Products	28.6	9.7	6.7	17.9	9.3	4.5	1.3	19.5	0.6	1.3	0.6
Rubber and Plastics	18.6	26.1	10.0	13.6	4.9	5.9	0.9	18.6	0.3	0.5	0.7
Other Non-Metallic Mineral	24.1	32.7	7.7	9.6	6.2	4.6	1.6	11.3	0.2	1.2	0.7
Basic Metals and Fabricated Metal	16.4	15.0	7.1	9.1	17.7	6.2	5.9	11.7	4.1	6.1	0.7
Machinery, nec.	32.0	20.6	12.1	14.2	4.9	4.7	0.7	9.6	0.4	0.5	0.4
Electrical and Optical Equipment	12.7	33.2	7.6	10.3	3.2	5.7	0.2	26.2	0.3	0.5	0.3
Transport Equipment	30.5	5.9	14.1	18.3	3.4	12.9	1.6	11.6	0.4	1.0	0.5
Manufacturing, nec; Recycling	18.0	33.2	4.3	12.9	6.5	6.3	1.4	13.2	1.3	2.2	0.5

Source: BACI; authors' calculations.

Again there are significant changes over time, as is highlighted in Table 2.8. China has been able to increase its market share in all industries (with the sole exception of coke and petroleum) hugely – by between 9.7ppt for basic and fabricated metals and more than 20ppt in textiles, footwear, non-metallic mineral products, and electrical and optical equipment.[6]

Table 2.8 / Changes in world market shares, by industry, 1995–2013, in percentage points

	EU-28	China	Japan	USA	Other EU	North America	South America	Asia	Oceania	Africa	Other
Food, Beverages and Tobacco	-3.6	1.9	-0.5	-4.3	0.9	0.7	4.5	0.4	0.1	-0.4	0.3
Textiles and Textile Products	-6.0	20.2	-2.3	-3.5	0.2	-2.1	-0.7	-3.6	-0.9	-1.1	-0.3
Leather, Leather Products and Footwear	-6.9	21.5	-0.7	-1.9	0.7	-1.1	-3.0	-8.3	-0.7	0.1	0.3
Wood and Products of Wood and Cork	8.3	14.0	-0.2	-5.6	6.1	-12.1	0.7	-10.9	-0.1	-0.7	0.4
Pulp and Paper, Printing and Publishing	2.3	10.3	-1.1	-4.5	-0.1	-12.1	2.0	3.0	0.2	0.1	0.1
Coke, Refined Petroleum and Nuclear Fuel	-2.5	-0.4	-1.4	6.4	7.6	-3.4	1.6	-2.4	-0.6	-5.1	0.3
Chemicals and Chemical Products	-4.6	6.6	-5.8	-4.0	-0.9	-0.6	0.0	9.8	-0.1	0.1	-0.6
Rubber and Plastics	-5.2	17.2	-6.1	-7.5	0.0	0.1	0.0	1.2	-0.2	0.2	0.3
Other Non-Metallic Mineral	-16.9	24.4	-6.8	-2.6	1.0	-1.7	-0.7	3.2	-0.4	0.6	-0.2
Basic Metals and Fabricated Metal	-5.5	9.7	-5.3	-3.3	3.4	-2.9	-1.0	2.1	0.0	2.8	0.0
Machinery, nec	-5.8	17.7	-10.6	-4.3	-1.6	1.2	0.0	3.1	-0.1	0.3	0.0
Electrical and Optical Equipment	-5.1	26.7	-16.9	-10.0	0.9	0.7	-0.1	3.9	-0.1	0.3	-0.4
Transport Equipment	5.2	5.2	-14.1	-2.8	1.7	-2.5	0.8	5.7	-0.1	0.8	0.0
Manufacturing, nec; Recycling	-2.1	11.9	-4.0	-5.3	1.9	-0.1	-0.3	-3.0	0.3	0.7	-0.1

Source: BACI; authors' calculations.

[6] Note that these figures are measured in terms of gross exports.

Despite the decline in the overall market share, the EU-28 has been able to increase its market shares in the wood and wood products industry (+8.3ppt), pulp and paper industry (+2.3ppt) and transport equipment (+5.2ppt). The most significant losses in market share are observed in the textile industry (-6.0ppt), non-metallic mineral products (-16.9ppt) and basic and fabricated metals (-5.5ppt). It is further interesting to note that Japan lost significant market share in such medium-high to higher-tech industries as machinery (-10.6ppt), electrical and optical equipment (-16.9ppt), and transport equipment (-14.1ppt). These losses have been less dramatic for the US, for which market share declined in food, beverages and tobacco (-4.3ppt), rubber and plastics (-7.5ppt), and electrical and optical equipment (-10.0ppt). The implications of these developments in terms of the export structures of these countries and regions are shown in Table 2.9.

Table 2.9 / Export structure, 2013, in %

	EU-28	China	Japan	USA	Other EU	North America	South America	Asia	Oceania	Africa	Other
Food, Beverages and Tobacco	6.0	1.8	0.5	5.8	5.6	7.0	33.7	4.9	31.6	8.6	7.1
Textiles and Textile Products	2.2	11.8	0.9	1.2	4.4	2.8	1.1	7.7	0.9	7.8	5.7
Leather, Leather Products and Footwear	1.1	3.8	0.0	0.2	0.5	0.3	2.1	1.7	0.5	1.6	1.8
Wood and Products of Wood and Cork	0.7	0.7	0.0	0.4	1.1	1.8	1.9	0.5	1.7	1.1	0.9
Pulp and Paper, Printing and Publishing	2.5	1.1	0.7	2.8	1.6	2.9	4.3	0.8	1.4	0.9	1.7
Coke, Refined Petroleum and Nuclear Fuel	6.2	0.7	2.1	8.9	15.3	5.2	9.2	9.8	4.5	16.7	13.7
Chemicals and Chemical Products	17.3	6.2	11.7	17.5	16.2	8.9	6.4	13.7	6.5	8.5	14.8
Rubber and Plastics	2.5	3.6	3.8	2.9	1.9	2.5	1.0	2.9	0.6	0.7	3.8
Other Non-Metallic Mineral	1.3	1.9	1.2	0.9	1.0	0.8	0.8	0.7	0.2	0.7	1.5
Basic Metals and Fabricated Metal	8.3	8.0	10.4	7.5	25.9	10.2	24.7	6.9	35.4	34.0	14.9
Machinery, nec	15.8	10.7	17.2	11.3	6.9	7.5	2.9	5.5	3.7	2.5	7.8
Electrical and Optical Equipment	14.1	39.1	24.4	18.6	10.3	20.6	1.7	33.9	4.8	6.0	11.4
Transport Equipment	18.5	3.8	24.6	18.0	5.9	25.5	8.1	8.2	4.1	6.4	11.1
Manufacturing, nec; Recycling	3.4	6.6	2.3	3.9	3.5	3.9	2.2	2.9	4.3	4.6	4.0

Source: BACI; authors' calculations.

For the EU-28 exports in chemicals (17.3%), machinery (15.8%), electrical and optical equipment (14.1%) and transport equipment (18.5%) account for about two-thirds of exports. This is even more pronounced in the case of the US, for which these four industries account for almost 70% of total extra-regional exports, and even more so for Japan, with a respective share of about 84%. Similarly, large shares are observed for North America (i.e. Canada) and the Asian countries, with larger shares in either one or two of these industries. This is less the case for China, as the share of textile exports (11.8%) is still quite high whereas the share of chemicals (6.2%), machinery (10.7%) and particularly transport equipment (3.8%) is rather low. The other country groups show rather 'traditional' export structures, mostly driven by natural resource endowments.

The respective changes in export structures over the period 1995–2013 are presented in Table 2.10. Disregarding the coke and petroleum industry, for the EU-28 one observes a shift towards chemicals (+1.4ppt) and particularly towards transport equipment (+4.3ppt). Similar shifts can be observed for the US and Japan, though these are more pronounced with respect to the chemicals industry (+3.0ppt and +2.6ppt, respectively), and less for the transport equipment industry (+1.5ppt and +0.4ppt, respectively). An important difference is the much larger decline in export shares in the electrical and optical

industry: -7.1ppt in the case of the US and -9.7ppt in the case of Japan. This is mostly driven by the changing patterns of the Chinese export structures, which experienced a decline of 17.0ppt in exports of the textiles industry and an increase of 17.7ppt in exports of the electronics industry. A significant increase is also observed in the machinery industry, with +5.8ppt. Concerning the other country groups, a quite common pattern is for export structures to shift away from the lower-tech industries (like food, textiles, leather, wood and pulp and paper), with the corresponding increases being more homogeneous.

Table 2.10 / Change in export structure, 1995–2013, in percentage points

	EU-28	China	Japan	USA	Other EU	North America	South America	Asia	Oceania	Africa	Other
Food, Beverages and Tobacco	-1.3	-2.9	0.0	-1.0	-1.9	0.6	2.7	-2.3	-1.7	-7.0	2.9
Textiles and Textile Products	-2.5	-17.0	-0.8	-1.6	-3.5	-2.7	-2.9	-8.3	-5.2	-13.1	-4.7
Leather, Leather Products and Footwear	-0.6	-4.3	-0.1	-0.2	0.0	-0.3	-3.1	-2.0	-1.0	-0.9	0.7
Wood and Products of Wood and Cork	0.0	-0.4	0.0	-0.6	-0.1	-3.2	-1.6	-1.8	-1.2	-2.2	0.4
Pulp and Paper, Printing and Publishing	-1.3	-0.1	-0.1	-2.0	-2.3	-7.0	-1.7	-0.4	-0.5	-1.2	-0.7
Coke, Refined Petroleum and Nuclear Fuel	4.3	-0.1	1.6	7.5	11.9	2.9	7.4	5.6	2.3	2.2	11.0
Chemicals and Chemical Products	1.4	0.8	2.6	3.0	-4.5	1.2	0.1	6.0	0.3	-0.7	-7.4
Rubber and Plastics	0.2	0.6	1.5	0.1	-0.1	0.8	0.1	0.1	-0.1	0.2	2.3
Other Non-Metallic Mineral	-1.0	0.2	0.0	-0.1	-0.2	-0.3	-0.6	0.0	-0.4	0.2	-0.5
Basic Metals and Fabricated Metal	0.0	0.8	3.2	0.9	2.8	-0.6	-2.3	0.8	8.3	13.0	3.6
Machinery, nec	-2.3	5.8	0.7	-1.0	-6.2	2.4	-0.7	0.3	-1.0	1.0	0.8
Electrical and Optical Equipment	-2.1	17.7	-9.7	-7.1	1.3	6.5	-0.7	-0.1	-1.3	2.6	-10.8
Transport Equipment	4.3	2.3	0.4	1.5	2.0	-1.6	3.4	2.7	-0.4	4.6	2.0
Manufacturing, nec; Recycling	0.7	-3.5	0.7	0.6	1.0	1.2	-0.1	-0.7	1.9	1.3	0.6

Source: BACI; authors' calculations.

Table 2.11 / Revealed comparative advantages,* 2013

	EU-28	China	Japan	USA	Other EU	North America	South America	Asia	Oceania	Africa	Other
Food, Beverages and Tobacco	1.07	0.32	0.10	1.03	0.99	1.24	5.96	0.86	5.58	1.51	1.25
Textiles and Textile Products	0.42	2.28	0.18	0.24	0.84	0.54	0.21	1.48	0.16	1.50	1.09
Leather, Leather Products and Footwear	0.74	2.54	0.03	0.15	0.33	0.20	1.39	1.14	0.30	1.07	1.17
Wood and Products of Wood and Cork	0.98	0.98	0.02	0.60	1.47	2.40	2.56	0.69	2.27	1.41	1.15
Pulp and Paper, Printing and Publishing	1.41	0.63	0.41	1.57	0.88	1.65	2.42	0.45	0.78	0.49	0.95
Coke, Refined Petroleum and Nuclear Fuel	0.93	0.11	0.31	1.32	2.27	0.78	1.37	1.46	0.67	2.49	2.04
Chemicals and Chemical Products	1.35	0.48	0.91	1.37	1.27	0.69	0.50	1.07	0.51	0.67	1.16
Rubber and Plastics	0.88	1.30	1.35	1.04	0.66	0.91	0.36	1.02	0.21	0.26	1.35
Other Non-Metallic Mineral	1.14	1.63	1.04	0.73	0.84	0.71	0.64	0.62	0.17	0.63	1.28
Basic Metals and Fabricated Metal	0.77	0.75	0.97	0.70	2.41	0.95	2.30	0.64	3.29	3.16	1.38
Machinery, nec	1.51	1.02	1.65	1.09	0.66	0.72	0.28	0.53	0.36	0.23	0.74
Electrical and Optical Equipment	0.60	1.65	1.03	0.79	0.44	0.87	0.07	1.44	0.20	0.25	0.48
Transport Equipment	1.44	0.29	1.91	1.40	0.46	1.98	0.63	0.63	0.32	0.49	0.86
Manufacturing, nec; Recycling	0.85	1.66	0.59	0.99	0.89	0.97	0.55	0.73	1.08	1.15	1.01

Note: * Balassa Index.
Source: BACI; authors' calculations.

Taking these indicators together yields the revealed comparative advantage as already indicated in Box 2.1. Table 2.11 shows this indicator for 2013, as well as its changes between 1995 and 2013 across countries and industries. Given the interpretation and previous discussion, it is not surprising to find that the EU-28 shows a strong RCA in machinery (1.51), transport equipment (1.44) and chemicals (1.35); a still existing but less pronounced RCA is observed for food, beverages and tobacco (1.07) and pulp and paper (1.41).

Table 2.12 / Change in revealed comparative advantages,* 2013

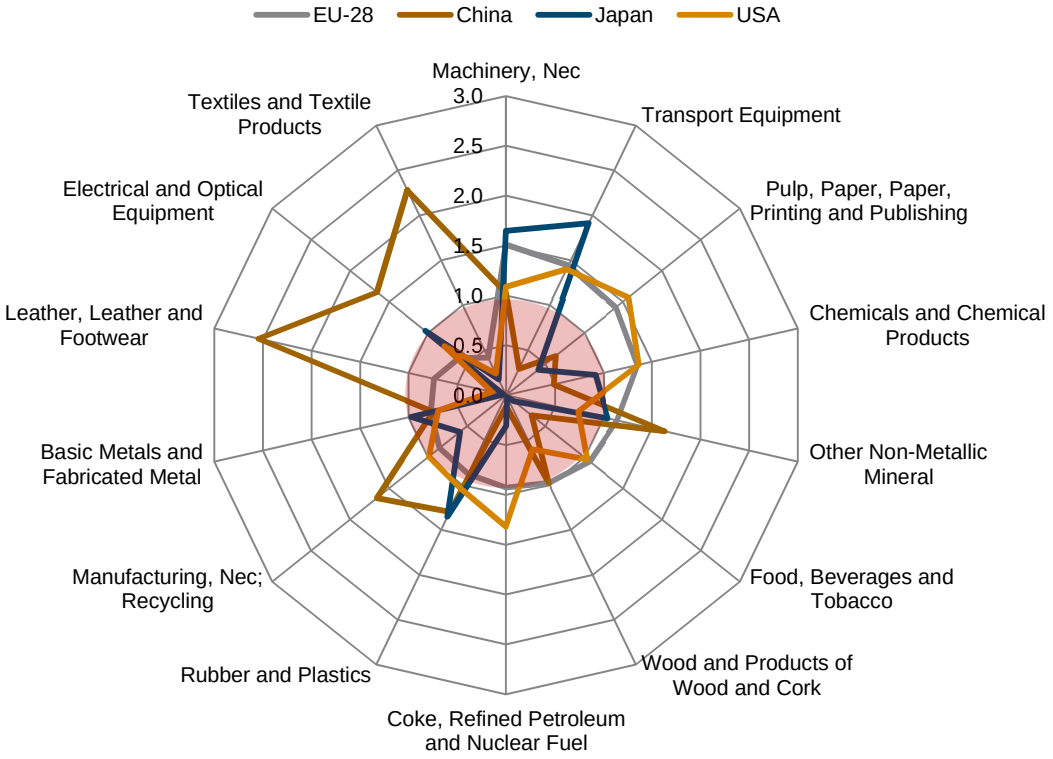
	EU-28	China	Japan	USA	Other EU	North America	South America	Asia	Oceania	Africa	Other
Food, Beverages and Tobacco	0.01	-0.36	0.02	0.03	-0.10	0.31	1.46	-0.17	0.75	-0.74	0.64
Textiles and Textile Products	-0.18	-1.46	-0.05	-0.13	-0.18	-0.17	-0.31	-0.59	-0.62	-1.21	-0.26
Leather, Leather Products and Footwear	-0.17	-1.79	-0.03	-0.07	0.04	-0.10	-1.36	-0.83	-0.46	-0.27	0.58
Wood and Products of Wood and Cork	0.48	0.15	0.00	-0.15	0.66	-1.11	0.12	-0.90	0.23	-0.90	0.82
Pulp and Paper, Printing and Publishing	0.29	0.28	0.16	0.17	-0.25	-1.24	0.65	0.10	0.22	-0.10	0.25
Coke, Refined Petroleum and Nuclear Fuel	0.03	-0.27	0.08	0.71	0.71	-0.30	0.56	-0.51	-0.36	-4.22	0.79
Chemicals and Chemical Products	0.01	0.03	0.14	0.14	-0.49	0.04	-0.03	0.42	-0.01	-0.12	-0.72
Rubber and Plastics	-0.08	-0.01	0.37	-0.14	-0.18	0.17	-0.02	-0.15	-0.10	0.04	0.71
Other Non-Metallic Mineral	-0.52	0.41	0.15	0.05	-0.05	-0.09	-0.32	0.07	-0.25	0.23	-0.20
Basic Metals and Fabricated Metal	-0.11	-0.03	0.20	0.00	-0.05	-0.20	-0.58	-0.01	0.40	0.93	0.18
Machinery, nec	-0.02	0.61	0.25	0.05	-0.45	0.28	-0.03	0.09	-0.04	0.11	0.16
Electrical and Optical Equipment	-0.12	0.71	-0.48	-0.35	0.04	0.25	-0.03	-0.07	-0.07	0.10	-0.50
Transport Equipment	0.42	0.19	0.18	0.21	0.18	0.03	0.29	0.24	-0.01	0.37	0.21
Manufacturing, nec; Recycling	0.04	-1.46	0.08	-0.03	0.10	0.16	-0.15	-0.37	0.34	0.14	-0.04

Note: * Balassa Index.
Source: BACI; authors' calculations.

To compare the EU-28 with other major economies, a spider plot is presented in Figure 2.7. As already seen above, Japan has a much more pronounced pattern of RCAs, with particularly high values in machinery (1.65) and transport equipment (1.91), as well as in rubber and plastics (1.35). The pattern of the USA is closer to that of the EU-28, though it has higher values in pulp and paper (1.57) and slightly lower values in transport equipment (1.40). Finally, China shows a more distinct pattern, with very high values in the textiles (2.28) and leather industry (2.54), in other non-metallic mineral products (1.63), and also in electronic products (1.65).

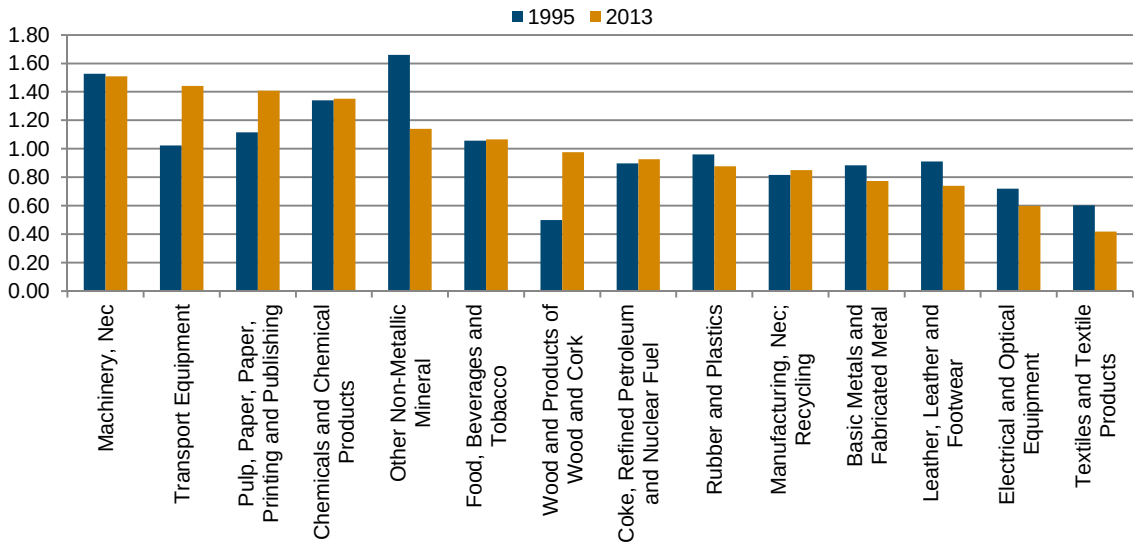
These patterns of RCAs have changed over time. The EU-28 could keep its position in machinery and chemicals, but lost it in other non-metallic mineral products, mostly due to strong increases in China and Japan. It could furthermore build up its RCAs in transport equipment (where the EU-28 shows an RCA of 1) and the pulp and paper industry. In other industries where the EU-28 started with a comparative disadvantage, that disadvantage has increased further, with the exception of wood and wood products. Japan and the US have experienced stronger declines in their RCAs in electrical and optical equipment, but less strong increases in RCAs in transport equipment (in which these countries had a comparative advantage back in 1995). For China, the RCAs decreased in the lower-tech industries (textiles and leather) and strongly increased in machinery and electrical and optical equipment.

Figure 2.7 / Revealed comparative advantages* in selected countries, 2013



Note: * Balassa Index; industries are ranked clockwise according to RCA of EU-28.
Source: BACI; wiiw calculations.

Figure 2.8 / Revealed comparative advantages* of EU-28, 1995 and 2013

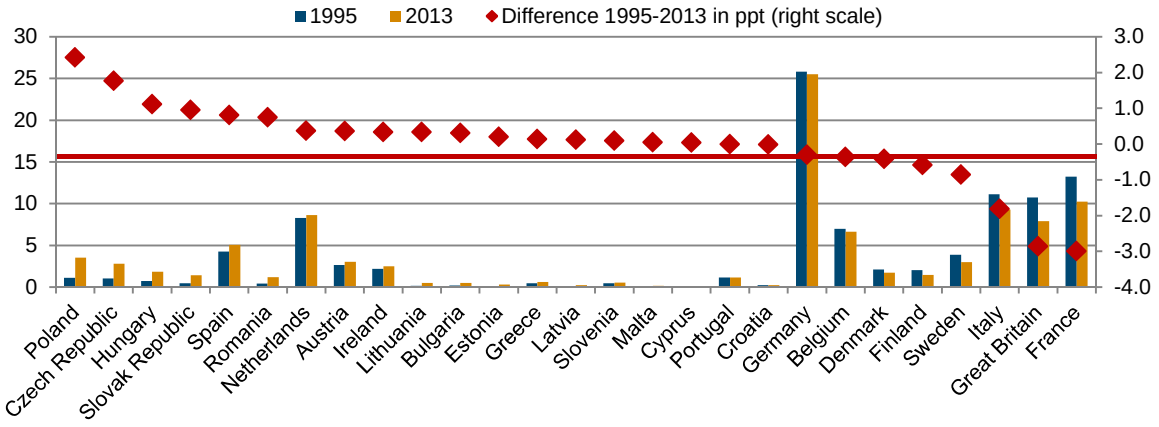


Note: * Balassa Index minus 1; industries are ranked according to RCA in 2013.
Source: BACI; wiiw calculations.

Intra-EU trends: regional concentration of manufacturing exports

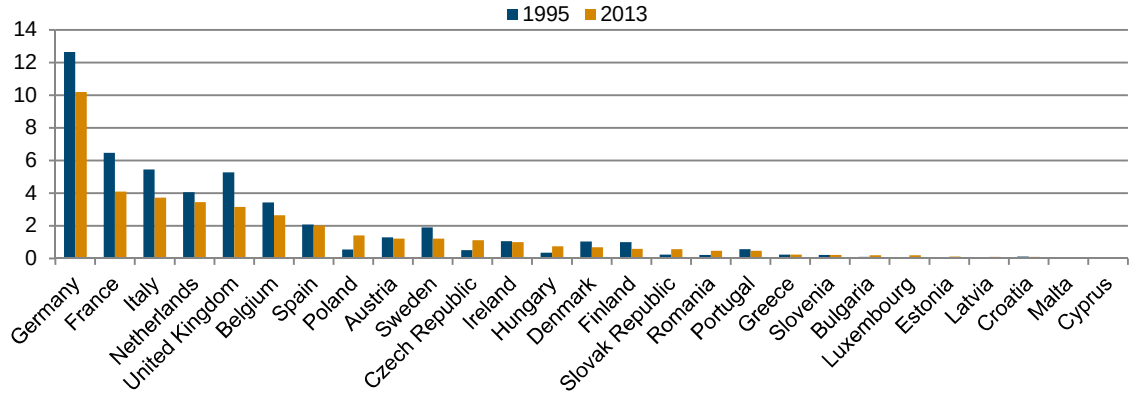
It is not just overall patterns of trade that have changed across the global landscape, but there have also been important shifts within the EU manufacturing landscape. In particular, manufacturing production has become more concentrated in the now so-called 'EU manufacturing core', including Germany, Austria and Central and Eastern European countries, which are characterised by a stable or even increasing share of manufacturing in GDP, a specialisation in higher-tech manufacturing, and a strong integration of production networks (see Stehrer et al., 2015). An analogous pattern is found when we look at EU Member States' exports. Figure 2.9 presents the share of each country in total EU exports (now including intra-EU trade) in 1995 and 2013. Germany accounts for about 25% of total EU exports, with the next-ranking countries having shares of about 10% (Italy, France) or slightly less (Netherlands, Belgium, the UK). All other countries account for less than 5% each of EU exports. However, there have been some important shifts in this geographic structure of exports over time. The graph therefore also shows the changes in export shares (in percentage points) over this period (the red diamonds). One set of countries – Poland, the Czech Republic, Hungary and the Slovak Republic, and also Spain and Romania – increased their shares by between 1 and 2.5 percentage points. Other countries – in particular Italy, Great Britain and France – lost shares of between 1 and 3 percentage points. This again confirms other results, which focus on the geography of manufacturing production patterns (Stehrer et al., 2015), showing that there has been tendency towards a concentration of manufacturing production – accompanied by a geographical concentration of manufacturing exports – across Europe. Finally, Figure 2.10 presents the EU Member States' market shares in 1995 and 2013: these have been generally declining, with a few exceptions – particularly the Central and Eastern European countries.

Figure 2.9 / Contribution to EU exports by Member State, in %



Source: BACI; authors' calculations.

Figure 2.10 / Contribution to EU exports by Member State, in %



Source: BACI; authors' calculations.

2.4. COMPETITIVENESS IN QUALITY

Indicators of export quality

So far patterns and trends of exports have been presented at the rather broad industry level. However, within each industry a large number of products are traded which are competing on world market share. Both the range of products delivered (the differentiation of products) and the quality of each product therefore needs to be taken into account in any analysis of world trade patterns. This section, therefore, presents an analysis of the development concerning the quality competitiveness of export flows, based on unit export values (UEV). This allows an examination of within-sector developments. An increase or decrease in the global market share of a particular industry can be driven, for example, by a particular set of products that might have specific characteristics: for example, they may be mass products or more sophisticated products. Considering these trade flows for individual products, one can compare the unit values at which an exporter sells these products on a specific market to the unit values of other exporters into that market. Products which can be sold at relatively higher prices compared to the other competitors can be interpreted as being of higher quality. In doing so, one has to rely on the very detailed trade data, which provide the values and quantities of particular products sold in other markets. By calculating the unit values, i.e. the value divided by the quantity, and by comparing these unit values to those of other trading partners, one arrives at a relative measure of quality in exports. In this report, an index will be calculated using the CEPII BACI dataset already used above. The BACI dataset also provides quantities traded in tonnes (or tonnes equivalent) from which it is possible to construct values per tonne variables (i.e. unit values) at the product level. In the standard literature, it is common to consider unit values as approximating to the price of products. In this chapter, following the suggestion by Feenstra and Romalis (2014), it is argued that unit values are related to costs and quality. Unit values would then approximate to the quality-adjusted price of products.

BOX 2.2 / CALCULATION OF EXPORT UNIT-VALUE SEGMENTS

To compute export values per segment, the following procedure is undertaken for each individual product (at the HS six-digit level) in the BACI database. First, for each bilateral export flow, the unit value is calculated by dividing the export value by the quantity measure, which is denoted as UV_h^{rc}, where UV denotes the unit value, h is the product under consideration, and r and c denote the exporting and importing countries, respectively. Considering all exporting countries, $r = 1, \dots, R$ of product h into market c therefore provides a ranking according to unit values. The 'upper segment' (indexed by *u*) concerns the top 25% of products with the highest unit values; the 'lower segment' (indexed by ℓ) includes the 25% of products with the lowest unit values; while the 'middle-UV segment' (indexed by *m*) covers the remaining 50% of the products. Thus for each product *h*, each flow at the bilateral level has been assigned to a specific segment *s* with $s \in \{u, m, \ell\}$. The flow can be denoted by $X_{rc,h}^s$.

From this, the measure that is studied in here concerns the performance of each country, compared to the performance of the rest of the countries in each of the segments. The relative performance of a country is best shown by its world market share in exports, now defined for each of the three segments of the market. At the HS six-digit product level, this is calculated as:

$$sh_{r,h}^s = \left[X_{r,h}^s \Big/ \sum_{r'} X_{r',h}^s \right]$$

with *r* denoting the exporter and *r'* denoting all of the exporters of product *h* in segment *s*.

Aggregations can be performed for products associated with particular industries, and these would result in world market shares by industry and quality segment. Similarly, higher aggregation can also be performed over all products from all industries to produce a country's market share by quality segment.

In a nutshell (for details see Box 2.2), this approach considers the unit values of the export flows (i.e. export values divided by quantities, calculated at the HS six-digit level) of a country into a specific destination market (e.g. another country), and compares these with the unit values of exports of other countries in this market. These unit values are ranked and then divided into three segments for each destination country and each detailed HS6 product: a high unit-value segment, a middle segment and a low segment. The high unit-value segment comprises the top 25% of all products, by exporter, with the highest unit values; the low segment is composed of the 25% of products with the lowest values; and in between, products are assigned to the middle segment of the market.[7] Once each bilateral export flow at the detailed product level is assigned to one of these segments, an aggregation is made by segment and by exporting country (or alternatively, by an exporting group of countries, such as the EU-28), thus allowing us to calculate the share of exports in the high unit-value segment. Furthermore, the aggregation can be calculated for some industries or sub-industries whenever appropriate.

[7] After setting price distributions, two checks on the data have been undertaken. First, when the number of observations per market (HS6 product*destinations) and per year did not exceed eight, the flow was removed. In 2007, this constituted around 20% of the flows. Second, a number of observations were considered as outliers and have also been removed, as they did not lie in the range [1stQtile+(1.5*(interquartile)); 3rdQtile+(1.5*(interquartile)]. This removed another 8% of the flows in 2007. In total, out of 6.6 million observations, around 4.7 million were kept, accounting for a total of more than 80% of the trade *values* considered in the study.

Based on this approach, in what follows two measures are investigated which are related to the export sales for each of the three segments of the market. Particular attention is devoted to the high unit-value segment, where quality competition is supposed to play a significant role.

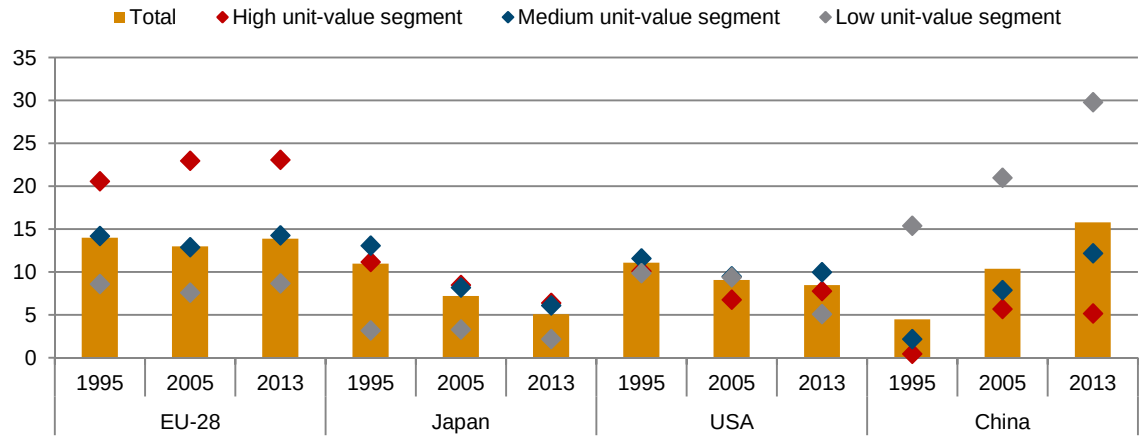
As an example, consider dolls (HS 950210): first, 10% of Chinese total exports in this product are classified in the high unit-value markets; thus, about 90% of all Chinese exports of this product to other countries are exported in the middle and low segments. Accordingly, the first indicator that is examined can be interpreted as *export intensity* in the high unit-value segment. Basically, this measure shows the share of exports in the high unit-value segment within the total exports of a country, for each product. This can be interpreted as a measure of specialisation in the high unit-value segment: the higher this export share for a given detailed HS six-digit product, the more a country specialises in the high unit-value market segment.

The second indicator considers the world market share of each country in exports in the high unit-value segment. For example, the overall Chinese market share in exports of dolls in the high unit-value segment is around 80% (which, granted, is rather an extreme case). The second measure is therefore related to the performance of a country within each of the segments of the market, compared to that of the rest of the world: it basically represents the *world market share* in each of the three segments.

World market shares by unit-value segments

As already mentioned, the classification of each flow – and of its corresponding value by exporter and year – into each of the three segments enables one to compute aggregate values by segment for each exporting country, the second indicator mentioned in Box 2.2. This allows one to compute market share for each segment, shown in Figure 2.11 for total manufacturing exports.

Figure 2.11 / Market shares in unit-value segments, in %



Source: BACI; authors' calculations.

In this graph, the red diamonds denote the market shares for the high unit-value segment; the grey ones are related to the low unit-value segment; and the blue diamonds show the medium segment. Finally, the yellow bars correspond to the overall market shares. It can clearly be seen that the EU-28 succeeds in having the highest market shares in the high and middle unit-value segments of global markets. Besides, the market shares related to high unit values increased by about 3 percentage points (around 15%) between 1995 and 2005 and have remained stable since.

Table 2.13 presents these market shares for each industry and for the EU-28's main competitors. By way of illustration, Figure 2.12 then singles out the findings for three important exporting industries: transport, machinery and chemicals. Interestingly, the EU-28 has gained market share in the high unit-value segment in all three industries. However, while its market share has been increasing in the low and middle-market segments in transport, its share has stagnated in the medium market and has decreased significantly in the low unit-value segment of the market in machinery and chemicals. In the latter case, trade revenues from quality clearly appear to be increasing over time. However, it seems that it is mostly cost reductions that are driving market-share increases in transport.

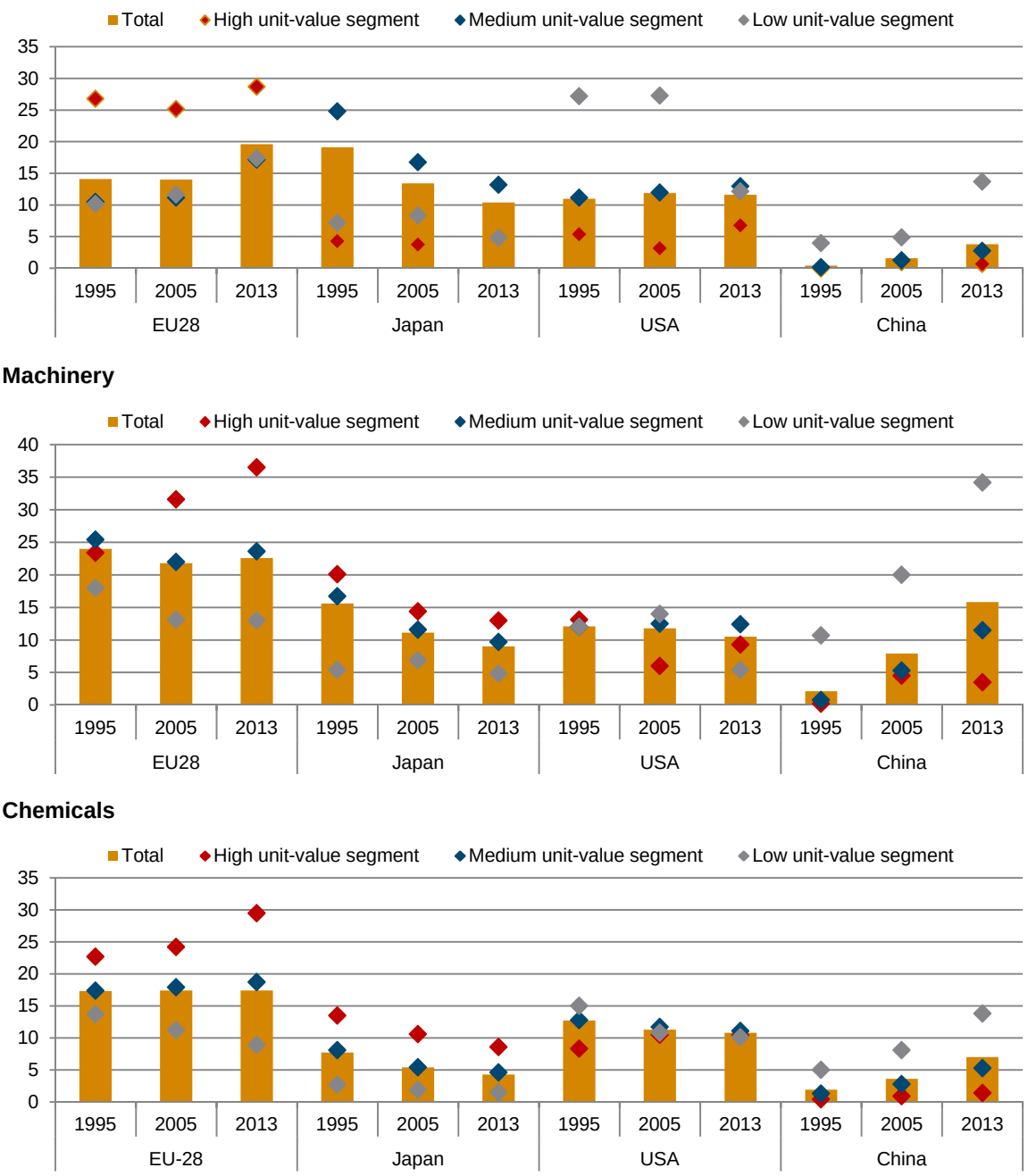
Following the theoretical outline (see Appendix B), however, an increase in market share in the high unit-value segment might be due not only to an increase in revenues from quality, but, at a given quality, also to relative cost reductions within the upper tier of the market. Therefore, in order to see better whether quality has played a role, it is important to isolate it from other factors (such as relative costs) impacting on market share in this segment. One way of doing this is to compare the performance of the EU's extra-EU exports in the high unit-value segment, relative to its performance in the low unit-value segment. A relative difference in performance across the upper and the lower segments of the market would give an indication of the role of quality (see Appendix B). Following this idea, there appears to have been a clear increase in the performance of the EU-28 in the high unit-value segment in 2005 and (to a lesser extent) 2013, relative to the 1995 base year (see Figure 2.11). Interestingly, in Japan the share in all segments fell in 2013, particularly in the high unit-value segment. The US experienced a rebound in the high unit-value segment of the market in 2013, but even that does not compensate for the dramatic decrease observed between 1995 and 2005. Finally, China appears to be outperforming the rest in the low segment of the market – even more so in 2013 than in 1995 and 2005. Interestingly, China's upgrading tendency over the period appears in the middle market more than in the upper tier of the market, where its market share has stagnated over the past 10 years.

Table 2.13 / Market shares by unit-value segments and industry, in %, 1995– 2013

		EU-28				China				Japan				USA			
	Year	Total	High	Medium	Low	Total	High	Medium	Low	Total	High	Medium	Low	Total	High	Medium	Low
Food, Beverages and Tobacco	1995	14.1	16.4	14.6	10.5	3.0	0.6	2.6	6.4	0.7	1.9	0.5	0.2	9.0	14.9	7.8	9.0
	2005	12.4	24.5	12.9	5.3	3.9	1.7	3.3	6.7	0.5	1.9	0.4	0.1	6.3	6.8	6.2	6.4
	2013	13.2	26.5	14.0	6.6	4.1	2.9	3.3	6.4	0.4	1.3	0.4	0.1	6.6	7.5	7.0	5.3
Textiles and Textile Products	1995	8.7	21.6	9.2	2.4	16.8	1.0	8.5	40.0	2.2	6.1	2.4	0.1	3.5	2.3	4.2	2.6
	2005	7.0	21.9	6.9	1.7	27.9	12.0	22.2	46.3	1.4	5.6	1.2	0.3	2.8	3.6	3.0	1.9
	2013	6.2	33.6	8.1	1.2	36.1	2.9	17.6	56.9	0.9	4.7	1.4	0.1	2.1	4.1	3.1	1.0
Leather, Leather Products and Footwear	1995	14.6	29.8	15.5	3.9	20.8	1.3	12.1	54.6	0.5	1.5	0.4	0.1	2.7	2.7	3.2	1.2
	2005	9.9	22.8	9.5	2.4	32.6	24.1	25.2	55.6	0.2	0.6	0.2	0.1	2.1	1.8	2.8	0.8
	2013	10.2	48.1	10.7	1.6	40.8	0.8	15.5	75.0	0.2	0.7	0.2	0.0	1.4	2.1	2.2	0.4
Wood and Products of Wood and Cork	1995	7.2	13.8	8.1	3.9	4.2	1.3	3.4	6.5	0.1	1.0	0.1	0.0	8.4	13.2	10.8	2.5
	2005	10.9	26.1	10.9	7.2	9.1	3.0	6.7	16.8	0.1	0.3	0.1	0.0	4.4	5.9	5.4	1.7
	2013	13.9	25.0	15.5	9.2	13.7	5.6	13.2	15.9	0.1	0.3	0.1	0.0	4.9	3.7	6.9	1.3
Pulp and Paper, Printing and Publishing	1995	13.2	15.1	13.2	12.7	1.0	0.1	0.6	2.6	2.3	8.4	2.3	0.3	13.3	15.2	13.1	13.3
	2005	15.3	28.3	15.2	11.2	4.1	0.4	3.1	7.8	1.8	5.5	1.8	0.7	11.2	19.5	11.0	9.1
	2013	16.0	27.4	16.8	11.2	8.2	2.6	6.6	12.9	1.8	2.8	2.0	1.0	11.4	22.8	11.9	7.5
Coke, Refined Petroleum and Nuclear Fuel	1995	12.0	20.3	10.9	14.0	1.5	0.7	1.8	0.7	2.5	1.5	3.1	1.4	6.2	6.5	6.9	4.7
	2005	12.3	14.9	11.9	12.9	2.0	2.9	2.5	0.6	0.7	0.6	0.8	0.4	4.2	6.3	4.9	2.2
	2013	13.2	12.3	11.0	17.9	1.7	0.5	2.0	1.1	1.4	0.6	2.0	0.2	10.0	3.8	12.7	4.6
Chemicals and Chemical Products	1995	17.3	22.7	17.4	13.7	1.9	0.4	1.3	5.0	7.7	13.5	8.1	2.7	12.7	8.3	12.8	15.0
	2005	17.4	24.2	17.9	11.2	3.6	0.9	2.8	8.1	5.4	10.6	5.4	1.9	11.3	10.5	11.7	10.8
	2013	17.4	29.5	18.7	8.9	7.0	1.4	5.3	13.8	4.3	8.6	4.6	1.5	10.8	10.4	11.1	10.1
Rubber and Plastics	1995	11.8	12.8	13.1	7.0	4.7	0.2	1.9	16.9	8.2	19.0	8.4	0.9	11.1	7.4	10.4	15.6
	2005	11.1	22.5	11.9	4.6	10.3	1.0	5.4	26.7	6.3	24.9	5.9	0.6	10.5	9.3	11.1	9.4
	2013	11.6	19.8	13.7	5.3	16.5	1.5	8.8	35.8	6.2	23.2	6.8	0.9	8.6	8.9	10.1	5.6
Other Non-Metallic Mineral	1995	20.1	29.3	21.6	13.1	5.5	0.4	2.2	16.5	7.0	14.6	8.4	0.8	6.2	8.2	5.9	6.6
	2005	16.9	39.5	18.0	8.5	12.7	2.5	7.4	26.7	5.1	13.0	6.0	1.1	6.3	6.0	6.2	6.6
	2013	15.8	32.2	18.4	8.6	22.1	5.2	14.8	37.2	4.7	10.2	6.4	0.9	6.2	12.7	6.9	3.9
Basic Metals and Fabricated Metal	1995	12.3	15.0	12.5	10.0	3.4	0.6	2.3	9.3	7.2	12.7	7.6	2.7	7.2	6.6	7.3	7.4
	2005	11.1	17.6	12.3	5.7	7.5	2.4	4.7	16.6	5.8	12.2	6.3	2.5	5.9	8.1	5.7	5.8
	2013	10.4	17.0	11.1	6.2	11.0	13.4	4.8	26.2	4.8	4.8	5.0	4.2	6.2	4.7	7.5	3.3
Machinery, nec	1995	24.0	23.4	25.4	18.0	2.1	0.2	0.8	10.7	15.6	20.1	16.7	5.4	12.1	13.1	12.0	12.0
	2005	21.8	31.6	22.0	13.1	7.9	4.5	5.3	20.0	11.1	14.4	11.6	6.9	11.8	6.0	12.5	14.0
	2013	22.6	36.5	23.6	13.0	15.8	3.5	11.5	34.2	9.0	13.0	9.7	4.8	10.5	9.3	12.4	5.4
Electrical and Optical Equipment	1995	10.4	15.0	11.6	4.4	4.5	0.8	1.6	15.5	18.9	18.4	22.8	6.7	15.9	17.7	17.5	9.8
	2005	9.5	17.2	9.5	5.3	18.2	11.1	15.1	31.2	9.6	10.3	10.8	5.4	10.3	8.8	10.6	10.2
	2013	9.1	12.0	9.4	6.4	31.3	9.8	31.9	44.6	5.7	5.6	6.8	2.9	7.4	7.1	8.9	3.6
Transport Equipment	1995	14.1	26.8	10.5	10.2	0.4	0.0	0.2	4.0	19.1	4.3	24.8	7.2	11.0	5.4	11.2	27.2
	2005	14.0	25.2	11.2	11.7	1.6	1.0	1.3	4.9	13.4	3.8	16.8	8.4	11.9	3.2	12.0	27.3
	2013	19.6	28.7	17.2	17.4	3.8	0.7	2.8	13.7	10.4	5.1	13.2	4.8	11.6	6.8	13.0	12.2
Manufacturing, nec; Recycling	1995	12.8	16.1	15.0	5.1	14.4	1.6	7.9	37.9	4.5	11.1	4.5	0.9	10.9	13.5	12.1	6.2
	2005	11.5	18.6	12.7	4.6	20.7	20.7	14.7	36.1	3.6	5.3	3.2	3.6	7.5	4.8	9.0	5.2
	2013	12.4	21.7	13.5	6.5	25.4	3.2	17.6	52.0	3.1	3.3	3.6	1.9	9.0	13.9	11.1	2.1

Source: BACI; authors' calculations.

Figure 2.12 / Market shares and quality segments for selected industries, in %



Source: BACI; authors' calculations.

Table 2.14 provides this information at the sectoral level. Interestingly, the EU-28 managed to increase its market share – both relative to overall market share and share in the high unit-value segment, and also in absolute terms – in the lower-tech industries like food and beverages, textiles, leather, wood and pulp and paper. This can be interpreted as indicating a successful upgrading of production in these industries.

Table 2.14 / Change in market share by unit-value segments and industry in percentage points, 1995–2013

	EU-28				China				Japan				USA			
	Total	High	Medium	Low	Total	High	Medium	Low	Total	High	Medium	Low	Total	High	Medium	Low
Food, Beverages and Tobacco	-0.9	10.1	-0.6	-3.9	1.1	2.3	0.7	0.0	-0.3	-0.6	-0.1	-0.1	-2.4	-7.4	-0.8	-3.7
Textiles and Textile Products	-2.5	12.0	-1.1	-1.2	19.3	1.9	9.1	16.9	-1.3	-1.4	-1.0	0.0	-1.4	1.8	-1.1	-1.6
Leather, Leather Products and Footwear	-4.4	18.3	-4.8	-2.3	20.0	-0.5	3.4	20.4	-0.3	-0.8	-0.2	-0.1	-1.3	-0.6	-1.0	-0.8
Wood and Products of Wood and Cork	6.7	11.2	7.4	5.3	9.5	4.3	9.8	9.4	0.0	-0.7	0.0	0.0	-3.5	-9.5	-3.9	-1.2
Pulp and Paper, Printing and Publishing	2.8	12.3	3.6	-1.5	7.2	2.5	6.0	10.3	-0.5	-5.6	-0.3	0.7	-1.9	7.6	-1.2	-5.8
Coke, Refined Petroleum and Nuclear Fuel	1.2	-8.0	0.1	3.9	0.2	-0.2	0.2	0.4	-1.1	-0.9	-1.1	-1.2	3.8	-2.7	5.8	-0.1
Chemicals and Chemical Products	0.1	6.8	1.3	-4.8	5.1	1.0	4.0	8.8	-3.4	-4.9	-3.5	-1.2	-1.9	2.1	-1.7	-4.9
Rubber and Plastics	-0.2	7.0	0.6	-1.7	11.8	1.3	6.9	18.9	-2.0	4.2	-1.6	0.0	-2.5	1.5	-0.3	-10.0
Other Non-Metallic Mineral	-4.3	2.9	-3.2	-4.5	16.6	4.8	12.6	20.7	-2.3	-4.4	-2.0	0.1	0.0	4.5	1.0	-2.7
Basic Metals and Fabricated Metal	-1.9	2.0	-1.4	-3.8	7.6	12.8	2.5	16.9	-2.4	-7.9	-2.6	1.5	-1.0	-1.9	0.2	-4.1
Machinery, nec	-1.4	13.1	-1.8	-5.0	13.7	3.3	10.7	23.5	-6.6	-7.1	-7.0	-0.6	-1.6	-3.8	0.4	-6.6
Electrical and Optical Equipment	-1.3	-3.0	-2.2	2.0	26.8	9.0	30.3	29.1	-13.2	-12.8	-16.0	-3.8	-8.5	-10.6	-8.6	-6.2
Transport Equipment	5.5	1.9	6.7	7.2	3.4	0.7	2.6	9.7	-8.7	0.8	-11.6	-2.4	0.6	1.4	1.8	-15.0
Manufacturing, nec; Recycling	-0.4	5.6	-1.5	1.4	11.0	1.6	9.7	14.1	-1.4	-7.8	-0.9	1.0	-1.9	0.4	-1.0	-4.1

Source: BACI; authors' calculations.

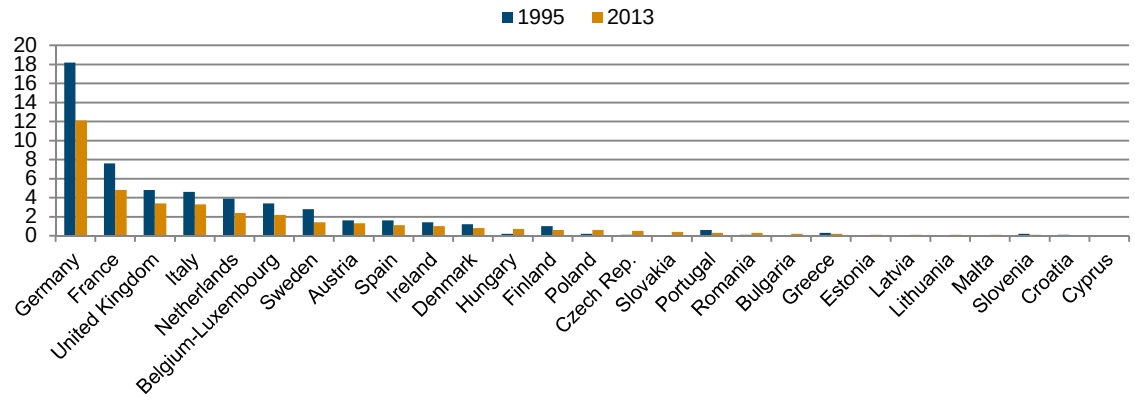
The only industry among the higher-tech sectors is the machinery industry. China, as a counter-example, increased its market share across all industry, mostly in the lower unit-value segment. In Japan, the decline in market share mostly took place due to a decrease in the high unit-value segment, whereas the patterns for the US are more mixed. For example, there has been a relatively strong decline in the high unit-value segment in the electronics industry, whereas in the transport equipment industry market share has declined particularly strongly in the low unit-value segment.

High unit-value segment exports by EU Member States

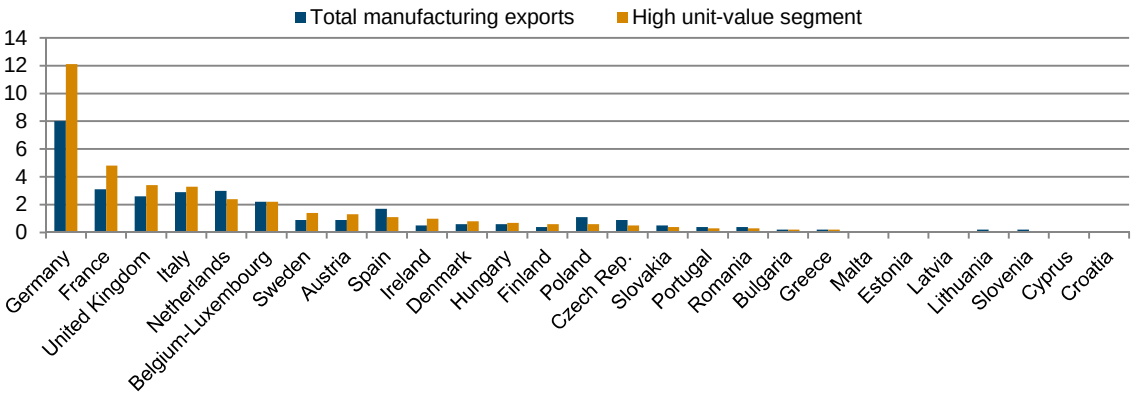
Finally, in Figure 2.13 and Figure 2.14 the world market shares of EU Member States (including intra-EU trade) in the high unit-value segment are compared over time and also to those in total manufacturing. First, in most cases overall market share even in the high unit-value segments declined in most countries, with the exception of a few Central and Eastern European countries. However, as shown in the lower panel of Figure 2.13, countries like Germany, the UK, France and Italy still show a relatively high world market share in high unit-value exports, compared to their overall share.

Figure 2.13 / World market share in high unit-value segment of EU Member States (including intra-EU trade), in %

Comparison over time



Comparison to world market share in total manufacturing exports

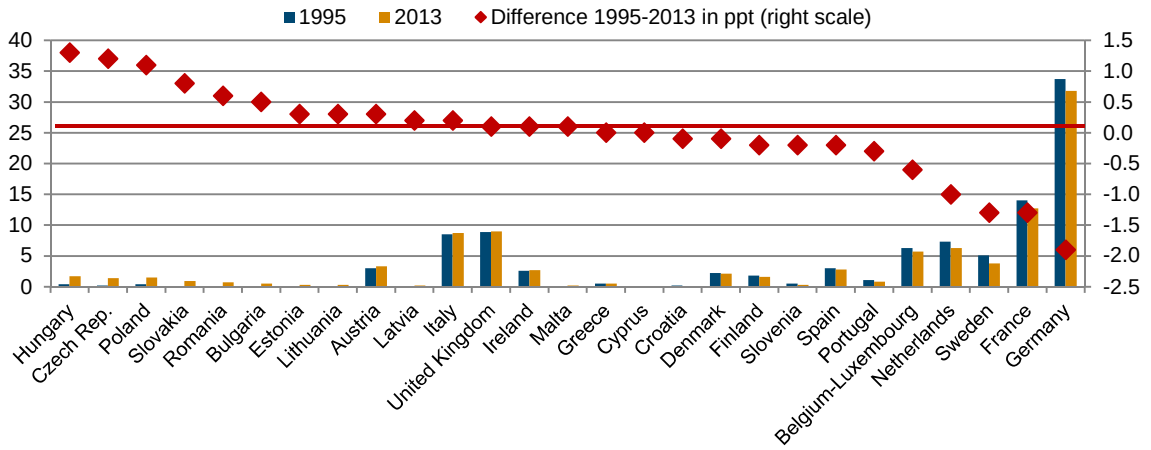


Note: Countries ranked according to market shares in 2013.
Source: BACI; authors' calculations.

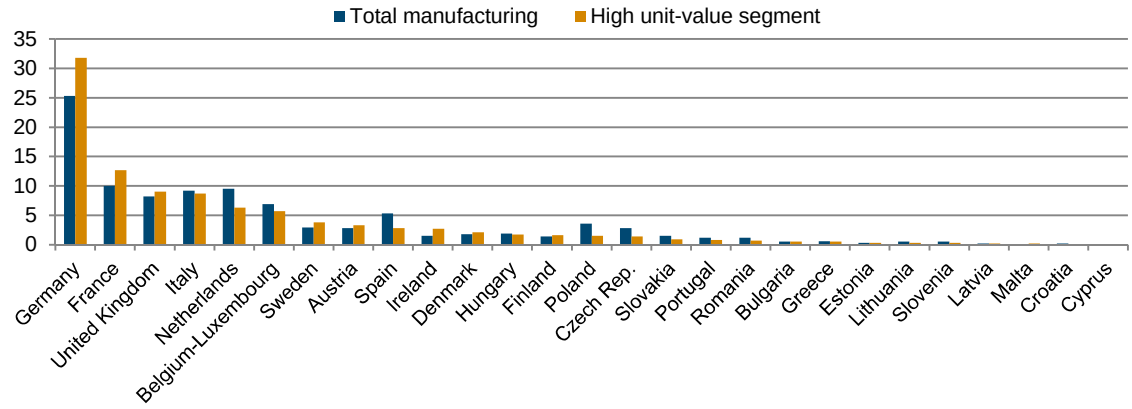
Figure 2.14 reports the contribution of EU members to the high unit-value segment exports of the EU (including intra-EU trade). As above, this pattern is dominated by the large countries like Germany, France, Italy and the UK. However, consistent with the above, there have been changes over time, in the sense that the Central and Eastern European countries have gained shares in this segment of exports, whereas some of the more advanced countries significantly lost ground, particularly the Netherlands, Sweden, France and Germany. Again, despite these developments, those countries still show higher contributions to the high unit-value exports of the EU, compared to overall exports (see lower panel of Figure 2.14).

Figure 2.14 / Contribution to EU exports in high unit-value segment, in %

Comparison over time



Comparison to total manufacturing exports, 2013



Note: Countries ranked according to market shares in 2013.
Source: BACI; authors' calculations.

Specialisation in the upper segment

The discussion above also points towards different specialisation patterns in the various unit-value segments – and particularly the high unit-value segment – across countries and over time. Box 2.3 provides a method to compare the specialisation of countries in favour of the high unit-value segment. Applying a Balassa-type measure, one can compute the ratio of a country's export share in the high unit-

value segment of a specific industry as a proportion of world exports in the high unit-value segment of that industry. A figure greater than 1 indicates a specialisation in the high unit-value segment. Table 2.15 presents the figures for the EU-28, China, Japan and the US in 1995 and 2013.

It is striking that for the EU-28, in each of the industries except one (coke and petroleum), the specialisation indicator is greater than 1. This means that, for each of the industries in Europe, exports are more directed towards the high unit-value market than are the exports from the rest of the world. At the other end of the spectrum, China is the country where, in 2013, a figure well below 1 is observed in every industry except one (metal industry). For the majority of industries (12 industries), the ratio is even below 0.5. That is, even in recent years (2013) and in most of its industries, China's relative exports in the high unit-value segment appear to be less than half the ratio for the rest of the world in this market segment. In between these two extremes, the Japanese situation in 2013 tends to be in line with that of the EU, with around nine industries showing ratios higher than 1. The US case is a bit different, with more than half of the industries specialising in the high unit-value segment in 2013.

Table 2.15 / Specialisation index for the high unit-value segment

	EU-28		China		Japan		USA	
	1995	2013	1995	2013	1995	2013	1995	2013
Food, Beverages and Tobacco	0.97	1.58	0.22	0.57	2.15	2.56	1.27	0.85
Textiles and Textile Products	3.20	5.42	0.10	0.14	3.29	4.94	0.77	1.87
Leather, Leather Products and Footwear	2.37	3.85	0.08	0.04	3.35	3.72	1.11	1.24
Wood and Products of Wood and Cork	2.26	1.70	0.52	0.42	6.59	3.71	1.60	0.68
Pulp and Paper, Printing and Publishing	1.20	1.46	0.14	0.32	3.32	1.33	1.03	1.61
Coke, Refined Petroleum and Nuclear Fuel	1.20	0.83	0.43	0.25	0.37	0.34	0.68	0.33
Chemicals and Chemical Products	1.10	1.43	0.24	0.19	1.35	1.87	0.52	0.79
Rubber and Plastics	1.13	1.43	0.04	0.13	2.27	3.10	0.65	0.86
Other Non-Metallic Mineral	1.12	1.52	0.08	0.27	1.72	1.56	0.79	1.46
Basic Metals and Fabricated Metal	1.08	1.39	0.25	1.47	1.39	0.85	0.69	0.60
Machinery, nec	0.90	1.52	0.12	0.26	1.13	1.35	0.95	0.82
Electrical and Optical Equipment	1.40	1.19	0.19	0.32	0.92	0.88	1.06	0.86
Transport Equipment	2.33	1.73	0.13	0.28	0.27	0.57	0.59	0.68
Manufacturing, nec; Recycling	1.20	1.57	0.13	0.14	2.15	1.01	1.09	1.34

Source: BACI; authors' calculations.

Second, it is interesting to look at the changes between 1995 and 2013. Here, one finds that in two-thirds of the industries the EU-28 has upgraded its exports towards the upper segment more than the rest of the world has. This is very remarkable for the textile and leather industries, where the EU-28 – while already specialising in the high unit-value segment at the beginning of the period (i.e. 1995) – increased its ratio by around 40%. It is noticeable that among the three main industries in which Europe specialises (transport, machinery and chemicals), both machinery and chemicals have experienced a further upgrading into the upper market in recent years. Transport, however, saw its products downgraded (into the middle and low markets) in the same period. This observation is consistent with the market share per segment figures presented in the above section.

The same tendency towards upgrading in nine industries is also observed for China, however. Nevertheless, as mentioned above, the Chinese specialisation into the upper market is still very low in absolute values. The same is true of upgrading for Japan and the US, although to a lesser extent.

BOX 2.3 / CALCULATION OF AN INDEX OF SPECIALISATION INTO THE UPPER SEGMENT OF THE MARKET

Based on the indicators discussed in Box 2.3, it is straightforward to define such a measure at the industry level to obtain the proportion of the total exports of an industry as a whole that go to the upper segment of world markets:

$$R\_X^u_{ri} = \frac{X^u_{r,i}}{(X^u_{r,i} + X^m_{r,i} + X^\ell_{r,i})}$$

where, for each segment *s*, $X^s_{ri} = \sum_h X^s_{ri,h}$. A simple way to compare the high unit-value segment ratio of a country's exports with that of its competitors is to normalise the above measure to that corresponding to the rest of the world's exports. The proposed measure would then become:

$$qRCA_{ri} = \frac{R\_X^u_{ri}}{R\_X^u_{World,i}}$$

This measure resembles the traditional Balassa measure for revealed comparative advantage, except that it expresses a country's relative intensity in exporting into the high unit-value segment, compared to the rest of world. It measures then the specialisation towards the high unit-value market (i.e. high quality) for a country in a given industry, compared to the rest of the world.

Conclusions

In summary, the overall picture to emerge is that the EU-28 is performing quite well in terms of its foreign competiveness in the high unit-value segments – corresponding to high-quality segments – of global export markets. This has been indicated by various measures showing that EU-28 export intensities in high unit-value segments by product are relatively high and comparable to those of Japan. But whereas Japan's export intensities are tending to decline, those of the EU-28 are more stable. Compared to the other major economies, the US and particularly China show lower intensities. A second indicator shows that the EU-28's world market share in the high unit-value segment is far above that of the other major economies and has been increasing over time, whereas Japan's share has declined (from an overall lower starting level). The Chinese rise in overall market share is mostly due to an increase in the low unit-value segment. This pattern can also be observed across most industries. It is further interesting to note that Chinese market shares in the high unit-value segment increased particularly in the lower-tech industries. These results are also confirmed by applying a measure for revealed comparative advantage for quality segments. Across EU Member States one finds that this structural upgrading is significant in the Central and Eastern European countries.

2.5. STRUCTURES OF SERVICES EXPORTS IN THE GLOBAL ECONOMY

A similar analysis can be undertaken for trade in services. This section draws on data from the World Input-Output Database (WIOD), which provides services trade data by industry. First, in Table 2.16 the overall structure of services trade is presented. In terms of relevance, the service activities of wholesale trade (19%), inland transport (10%), water transport (9%), financial intermediation (15%) and other business activities (25%) account for the lion's share in services extra-EU trade; together these five categories account for 80% of services trade globally. Financial intermediation and other business

activities are also characterised by the highest growth rates, together with sale, maintenance and repair and retail trade – though the latter two categories are much less important with respect to overall shares.

Table 2.16 / Export volumes and structures of service industries

	in million USD		in %		Growth
	1995	2011	1995	2011	rate
Sale, maintenance and repair	2671	14482	0.4	0.5	11.1
Wholesale trade	152719	554865	20.5	19.0	8.4
Retail trade	18128	86440	2.4	3.0	10.3
Hotels and Restaurants	30277	118760	4.1	4.1	8.9
Inland Transport	82050	295738	11.0	10.1	8.3
Water Transport	80630	266752	10.8	9.1	7.8
Air Transport	56791	167888	7.6	5.8	7.0
Other Transport Activities	40574	103482	5.4	3.5	6.0
Post and Telecommunications	21202	83074	2.8	2.8	8.9
Financial Intermediation	85720	450927	11.5	15.4	10.9
Real Estate Activities	11994	57690	1.6	2.0	10.3
Renting and Other Business Activities	162496	718858	21.8	24.6	9.7
Total	745250	2918955	100.0	100.0	8.9

Note: Excluding intra-EU trade.
Source: WIOD; authors' calculations.

Table 2.17 to Table 2.19 provide detailed information on world services of the EU-27 compared to major economies (similar to the indicators provided for manufacturing trade above). In terms of market share, the EU is performing better than most of the other countries. Overall EU-27 market share increased from 27.3% to 33.1% between 1995 and 2011; over the same period, the market share of the US declined from 31.1% to 20% according to these data. That of Japan is relatively small – 9.5% in 1995 and 6.3% in 2011. This is similar for China, which, however, is experiencing increased market share – from 2.1% in 1995 to 9.4% in 2011. For the EU-27 the market share is increasing in many service industries, significantly so in a number of cases (transport activities, post and telecommunication, and financial intermediation).

Table 2.17 / Market share in services trade

	EU-27		USA		Japan		China	
	1995	2011	1995	2011	1995	2011	1995	2011
Sale, maintenance and repair	53.8	53.8	1.2	0.5	0.8	0.4	0.0	0.0
Wholesale trade	14.6	17.4	52.2	25.9	13.4	13.4	0.0	13.2
Retail trade	32.4	29.2	0.2	0.1	5.7	4.9	0.0	17.6
Hotels and Restaurants	6.0	19.5	1.6	0.9	7.6	7.2	12.3	14.1
Inland Transport	25.6	26.1	19.3	13.5	7.5	4.8	2.6	5.3
Water Transport	40.8	50.9	13.2	2.9	26.4	15.3	1.8	14.9
Air Transport	37.0	31.5	33.1	22.0	6.7	6.4	4.1	16.5
Other Transport Activities	32.5	39.6	20.0	21.1	13.1	8.1	10.1	5.6
Post and Telecommunications	17.7	29.9	53.0	22.1	2.3	0.7	3.7	13.6
Financial Intermediation	24.6	48.0	52.7	35.0	5.9	1.8	0.4	0.4
Real Estate Activities	19.6	8.8	4.8	1.7	0.2	0.0	0.0	0.0
Renting and Other Business Activities	34.9	36.3	26.2	21.4	2.9	2.1	0.6	9.3
Total services	27.3	33.1	31.3	20.0	9.5	6.3	2.1	9.4

Note: Excluding intra-EU trade.
Source: WIOD; authors' calculations.

Table 2.18 / Export structures in services trade

	EU-27		USA		Japan		China	
	1995	2011	1995	2011	1995	2011	1995	2011
Sale, maintenance and repair	0.7	0.8	0.0	0.0	0.0	0.0	0.0	0.0
Wholesale trade	11.0	10.0	34.2	24.7	28.9	40.1	0.0	26.8
Retail trade	2.9	2.6	0.0	0.0	1.5	2.3	0.0	5.5
Hotels and Restaurants	0.9	2.4	0.2	0.2	3.2	4.6	23.5	6.1
Inland Transport	10.3	8.0	6.8	6.8	8.7	7.7	13.4	5.7
Water Transport	16.2	14.0	4.6	1.3	30.1	22.1	9.0	14.4
Air Transport	10.3	5.5	8.1	6.3	5.4	5.8	14.6	10.1
Other Transport Activities	6.5	4.2	3.5	3.7	7.5	4.5	25.8	2.1
Post and Telecommunications	1.8	2.6	4.8	3.2	0.7	0.3	5.0	4.1
Financial Intermediation	10.4	22.4	19.4	27.1	7.1	4.4	2.0	0.7
Real Estate Activities	1.2	0.5	0.2	0.2	0.0	0.0	0.0	0.0
Renting and Other Business Activities	27.9	27.0	18.3	26.4	6.8	8.1	6.6	24.4

Note: Excluding intra-EU trade.
Source: WIOD; authors' calculations.

Table 2.19 / Revealed comparative advantages (RCAs) in services trade

	EU-27		USA		Japan		China	
	1995	2011	1995	2011	1995	2011	1995	2011
Sale, maintenance and repair	2.0	1.6	0.0	0.0	0.1	0.1	0.0	0.0
Wholesale trade	0.5	0.5	1.7	1.3	1.4	2.1	0.0	1.4
Retail trade	1.2	0.9	0.0	0.0	0.6	0.8	0.0	1.9
Hotels and Restaurants	0.2	0.6	0.1	0.0	0.8	1.1	5.8	1.5
Inland Transport	0.9	0.8	0.6	0.7	0.8	0.8	1.2	0.6
Water Transport	1.5	1.5	0.4	0.1	2.8	2.4	0.8	1.6
Air Transport	1.4	1.0	1.1	1.1	0.7	1.0	1.9	1.8
Other Transport Activities	1.2	1.2	0.6	1.1	1.4	1.3	4.7	0.6
Post and Telecommunications	0.6	0.9	1.7	1.1	0.2	0.1	1.8	1.4
Financial Intermediation	0.9	1.4	1.7	1.8	0.6	0.3	0.2	0.0
Real Estate Activities	0.7	0.3	0.2	0.1	0.0	0.0	0.0	0.0
Renting and Other Business Activities	1.3	1.1	0.8	1.1	0.3	0.3	0.3	1.0

Note: Excluding intra-EU trade.
Source: WIOD; authors' calculations.

In terms of services export structures, the major industry for the EU-27 is renting and other business activities, with almost 30% in both years; this is followed by a number of other industries – wholesale trade, transport, and financial intermediation. Particularly this last industry increased its share from 10.4% to 22.4% over the period considered. Compared to other countries, the US shows a high share of wholesale trade, but also financial intermediation – again a strong increase, from 19.4% to 27.1% – and renting and other business activities (with a share of 18.3% in 1995 and 26.4% in 2011). The Japanese structure is biased towards wholesale trade and water transport. The data for China show large shares also in the transport sectors, and strongly increasing shares in wholesale trade, and renting and other business activities.

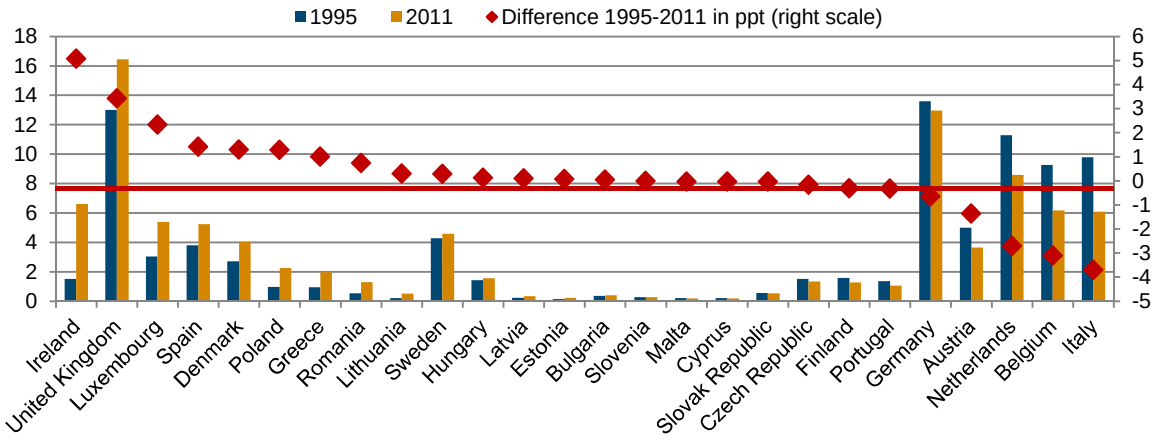
These structures and developments are reflected in the evolution of RCAs. Concerning the EU-27, in 2011 RCAs were larger than 1 in sale and repair, transport activities, financial intermediation, and other business activities. However, in this last case the trend has been declining (as indeed for sale and repair). RCAs have also decreased in a couple of other activities, like retail trade, inland transport and

air transport. In post and telecommunication activities they have increased, but have not yet passed the threshold of 1. In some cases the trend is in the opposite direction, e.g. in the US the RCA for business services has increased to above 1. Significant changes in RCAs are also observed for China, with declines observed in some transport activities, but a strong increase in renting and other business activities.

EU Member States: concentration of services trade

As with manufacturing trade above, now we turn to the allocation of services exports across EU Member States. In Figure 2.15 the share of each country's services exports within total EU services exports (including intra-EU trade) is presented. In this case, the largest services exporters are the United Kingdom, with 16%, and Germany, with 13%. These two countries are followed by the Netherlands with 10%, Ireland with 6.5% and Belgium and Italy with 6%.

Figure 2.15 / Geographic export shares in EU-27, 2011



Source: BACI; authors' calculations.

As with manufacturing, one can observe strong shifts in the geographic structure of services exports. Whereas some countries gained share – Ireland (5ppt), the United Kingdom (3.5ppt) and Luxembourg (2.5ppt) –others have experienced significant losses: Austria (-1ppt), the Netherlands (-2.5ppt), Belgium (-3ppt) and finally Italy (-3.5ppt).

Conclusions

Generally, the results indicate that the EU is increasing its world market share. This also holds true for most service industries, with specialisation patterns shifting towards the knowledge-intensive business services, particularly financial intermediation. Across EU members one finds a tendency for specialisation in services exports that is partly opposed to the patterns found for manufacturing exports.

3. Determinants of export performance and comparative advantage

The aim of this section is to investigate the main drivers of export performance which might be used further in a forecast exercise in the next section. The strategy is to reveal determinants of export levels using different methods, and to evaluate them with respect to their performance indicators, particularly in 'predicting' world market share (WMS) and revealed comparative advantages. As a first step, after testing of the models, these are evaluated in terms of their ability to predict world market share and RCAs, comparing the indicators from predicted export levels (according to the model specification) to those levels actually measured.

3.1. PANEL DATA MODELLING

As a first exercise, a panel data approach is undertaken, i.e. regressing the respective output indicators on potential economic determinants such as human and physical capital endowments, productivity, vertical specialisation, level of development, etc., as well as price and cost competitiveness indicators such as unit labour costs.

Outline of approach

The following econometric analysis uses the World Input-Output Database (WIOD), which is based on the NACE Rev. 1 industry classification and covers the time horizon from 1995 to 2009 (see Dietzenbacher et al., 2013; Timmer, 2012 for further details). Theoretically, the ensuing analysis draws on different trade theories that have traditionally been used to explain observable trade patterns. In this respect, the analysis accounts for the importance of relative factor endowments, as advocated by the traditional Heckscher–Ohlin model. The model postulates that countries specialise in the production and export of goods in which they have a comparative advantage brought about by the relative abundance of a particular input factor. Thus it might be expected that countries which are relatively well endowed with high-skilled workers will export products that are highly skill intensive in their production process. The importance of differentiating the labour force by skills is emphasised by, for example, a study by Landesmann et al. (2009) for a sample of EU economies, which demonstrates that a higher share of both high- and medium-skilled labour is conducive to the export growth of industries. Moreover, the study points to a stronger effect for high-skilled workers than for medium-skilled workers, suggesting that a skilled workforce is conducive to export performance. Furthermore, the analysis takes account of the Ricardian tradition, which argues that comparative cost advantages and, consequently, trade patterns are determined by cross-country differences in technology – as proxied by labour productivity. In this respect, several empirical studies have identified a negative relationship between external industrial competitiveness and labour costs (e.g. Liu and Shu, 2003) or unit labour cost (ULC) (determined by both the cost of labour and labour productivity) (e.g. Ito and Shimizu, 2013; Guerrieri and Cafferelli, 2012; Landesmann et al., 2009), suggesting that high labour costs are obstructive to external competitiveness.

Furthermore, following the study by Carlin et al. (1999) – which stresses that in short-run analyses of determinants of exports, rather than analysing the overall ULC, individual components of ULC should be analysed separately, in order to account for different short-term effects – the ensuing analysis uses the component parts of ULC to shed light on their individual roles for industrial export competitiveness. In addition, the analysis also accounts for phenomena that have become more recent defining factors on the international landscape – like the growing 'servitisation' of manufacturing or the acceleration of global production sharing ('servitisation' refers to the process of creating value by adding services to products). For instance, there is evidence that strong backward linkages of manufacturing industries with service industries are associated with significantly better export performance by manufacturing industries, but that, differentiated by sourcing strategy, domestic backward linkages are statistically less relevant than foreign ones (e.g. Wolfmayr, 2012). Furthermore, empirical evidence emphasises that the proliferation of global production sharing – referred to as production fragmentation – is an important determinant of export performance (e.g. Guerrieri and Caffarelli, 2012; Vogiatzoglou, 2012). For instance, Guerrieri and Caffarelli (2012) study the role of fragmentation and openness in the export performance of EU-27 Member States between 2000 and 2009 and find that a country that moves from the first to the last quartile of the fragmentation distribution would experience an increase in its export share of 0.17 percentage points. For a detailed account of the role of services in manufacturing production in the EU, see Stehrer et al. (2015).

Methodologically, a step-wise procedure is pursued to account for the potential sensitivity of results to the inclusion of particular control variables which show non-negligible correlation with other control variables. In particular, the log of labour compensation per employee shows non-negligible correlation with log labour productivity, which could bias results. Against this backdrop, the following econometric specification (in its fullest form) is estimated to shed light on determinants of export performance:

$$\mathrm{LnEXP}_{ijt} = \alpha_0 + \beta_1 \mathrm{LnLabProd}_{ijt} + \beta_2 \mathrm{SH}_{\mathrm{HS}_{ijt}} + \beta_3 \mathrm{SH}_{\mathrm{MS}_{ijt}} + \beta_4 \mathrm{BSCostSh}_{ijt} + \beta_5 \mathrm{SH}_{\mathrm{FVAiX}_{ijt}} +$$

$$\beta_6 \mathrm{LnLabCompPE}_{ijt} + \beta_7 \mathrm{CapCoeff}_{ijt} + \varphi_{ij} + \epsilon_{ijt} \quad (1)$$

where LnEXP_{ijt} refers to log gross exports. Furthermore, the following set of control variables is included:

› $\mathrm{LnLabProd}_{ijt}$ refers to the log of labour productivity, value-added based on 1995 prices;

› $\mathrm{SH\_HS}_{ijt}$ and $\mathrm{SH\_MS}_{ijt}$ refer to the shares of high-skilled and medium-skilled labour in total employment, respectively, with the share of low-skilled labour as a reference group;

› $\mathrm{BSCostSh}_{ijt}$ captures the extent of backward linkages of manufacturing sectors with service sectors. It is measured as the cost share of business services in manufacturing gross output. For the ensuing analysis, the focus is on business services linkage effects, with business services comprising renting services of machinery and equipment without operator, etc., computer and related services, research and development services and other business services, all subsumed under category 71t74 in WIOD, according to NACE Rev. 1 and financial services (NACE-J);

› $\mathrm{SH\_FVAiX}_{ijt}$ is a measure for the degree of vertical specialisation of industry i in country j at time t, defined as the share of foreign value-added in exports in total exports (for technical details, see Foster-McGregor and Stehrer, 2013).

› $\mathrm{CapCoeff}_{ijt}$ denotes the capital coefficient, defined as the share of capital stock in gross output (in %);

› $\mathrm{LnLabCompPE}_{ijt}$ refers to the log of labour compensation per employee (in continuous purchasing power parity (PPP)) as a measure for input cost competitiveness;[8]

› φ_{ij} are country-industry fixed effects to control for time-invariant country-industry characteristics, while ϵ_{ijt} refers to the error term.

Results

First, the preliminary results are presented in Table 3.1 below. Results are presented in a step-wise procedure: the first columns report results for the base specification, while the second columns also include log labour compensation per employee, which shows non-negligible correlation with log labour productivity which could affect the results.

These results suggest that export levels are positively associated with higher labour productivity, higher shares of medium and high-educated workers, and a more intensive vertical integration. The share of business services, however, turns out to be insignificant, or even slightly negative when additional variables are included. The capital coefficient does not have a significant impact.

Table 3.1 / Determinants of export levels: 1995–2007, total country sample

	(1) lnEXP	(2) lnEXP	(3) lnEXP
Ln labour productivity	0.576***	0.577***	0.294***
	(36.74)	(35.99)	(14.23)
Share high-skilled labour	0.031***	0.031***	0.022***
	(15.87)	(15.67)	(11.24)
Share medium-skilled labour	0.022***	0.022***	0.017***
	(14.74)	(14.61)	(11.55)
Share of business services	-0.005	-0.005	-0.007**
	(-1.32)	(-1.35)	(-2.10)
Vertical specialisation	0.048***	0.048***	0.044***
	(41.21)	(40.79)	(38.18)
Capital coefficient		0.000	-0.000***
		(0.27)	(-3.80)
Ln labour cost per employee			0.517***
			(20.71)
Constant	2.767***	2.765***	2.722***
	(31.94)	(31.76)	(32.26)
Observations	7,219	7,219	7,219
R-squared	0.498	0.498	0.528
Number of *i*	558	558	558

Note: Includes country-industry fixed effects; t-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1.
Source: WIOD; authors' calculations.

[8] Hence, as suggested by Carlin et al. (1999), both component parts of ULC (i.e. $\mathrm{LnLabProd}_{ijt}$ and $\mathrm{LnLabCompPE}_{ijt}$) are included separately, in order to identify their individual, and potentially different, roles in export performance. The overall effect of ULC can also be calculated as follows: the coefficient of $\mathrm{LnLabCompPE}_{ijt}$ minus the coefficient of $\mathrm{LnLabProd}_{ijt}$.

Figure 3.1 presents the market share and RCA indicator calculated from the 'fitted' export levels, and compares them with those indicators from the actually observed export flows, using scatter diagrams. Dots along the 45-degree line would indicate that the 'fitted' indicators are the same as the observed ones. Dots above this line indicate that the model predicts larger market share or RCA, whereas dots below this line indicate that these are lower. Considering market share, one finds that the model predicts quite well, although in some sectors the world market shares for larger countries deviate significantly from the actual figures. Furthermore, when the RCAs are considered, this becomes even worse – particularly for larger industries, like machinery, transport equipment and electrical and optical equipment. However, concerning RCAs one also observes that most of the 'dots' are in either the north-eastern quadrant (suggesting that both the 'fitted' and the actually observed RCAs are above 1, i.e. the country-industry is characterised by a comparative advantage) or the south-western quadrant (suggesting that both the 'fitted' and the actually observed RCA are below 1, i.e. the country-industry is characterised by a comparative disadvantage). However, there are also some notable exceptions to this (such as in the rubber and plastics industry (NACE Rev. 1 25), and in some of the medium-high tech industries.

3.2. GRAVITY MODELLING

Outline of approach

As an alternative to the panel approach, in this section a gravity model of trade is tested, which includes the most important determinants of trade flows. For this exercise, one has to bear in mind that this model will then be used further to calculate predictions, and thus a second requirement is to obtain a rather parsimonious model structure based on variables for which forecast values are available or can be constructed. The analysis presented below is based on the BACI database, providing bilateral flows of gross exports, as in Section 2.2 above. Explanatory variables are taken from the Penn World Tables (PWT 8.0). The analysis covers the period 1995–2011 (as 2011 is the latest year for which GDP data and other explanatory variables are available from the PWT 8.0 for this large set of countries) and focuses on manufacturing exports. Methodologically, a rather parsimonious version of a standard gravity approach is taken, specified as follows:

$$\ln \mathrm{Exp}_{\mathrm{REPPARjt}} = \alpha_0 + \beta_1 \ln \mathrm{GDP}_{\mathrm{REPjt}} + \beta_2 \ln \mathrm{POP}_{\mathrm{REPt}} + \beta_3 \ln \mathrm{GDP}_{\mathrm{PARt}} + \beta_4 \ln \mathrm{POP}_{\mathrm{PARt}}$$

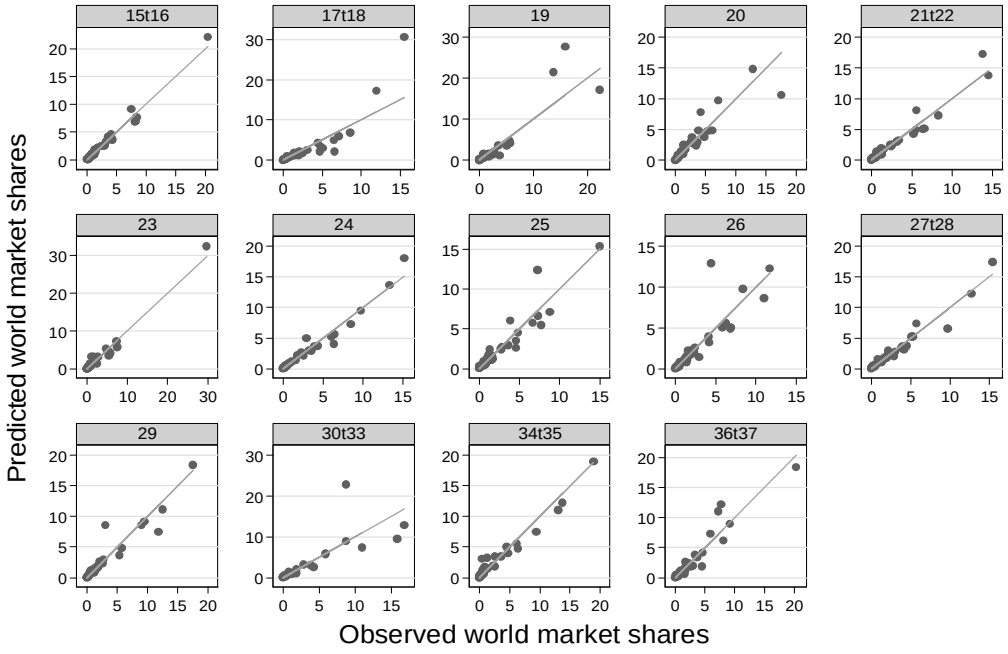
$$+\beta_5 \ln \mathrm{HC}_{\mathrm{REPt}} + \beta_6 \ln \mathrm{HC}_{\mathrm{PARt}} + \beta_z \ln \mathrm{K}_{\mathrm{REPt}} + \beta_8 \ln \mathrm{K}_{\mathrm{PARt}} + \beta_{10} \ln \mathrm{CS}_{\mathrm{REPt}} + \beta_{10} \ln \mathrm{CS}_{\mathrm{PARt}} + \mathrm{Dummies} + \epsilon_{\mathrm{REPPARjt}}$$

where $lnExp_{REPPARjt}$ denotes the log of the gross exports from the reporter to the partner country in industry *j* at year *t*. The set of explanatory variables includes GDP and total population at the country level, $lnTOTVA_{ct}$ and $lnPOP_{ct}$, respectively, for both reporter and partner countries. This gravity model is extended by including further reporter and partner characteristics. Specifically, the model includes an indicator of human capital endowment $lnHC_{ct}$ and of capital intensity lnK_{ct} calculated from the capital stock data and GDP taken from the Penn World Tables (PWT 8.0). Furthermore, an interaction term between human capital endowment and capital intensity is included, capturing the effects of capital-skill complementarities. The model also includes country-pair-industry fixed effects capturing time-invariant effects (like geographical distance, common language, common borders, etc.). When estimating the model at the industry level, i.e. only considering bilateral export flows for each individual industry, and

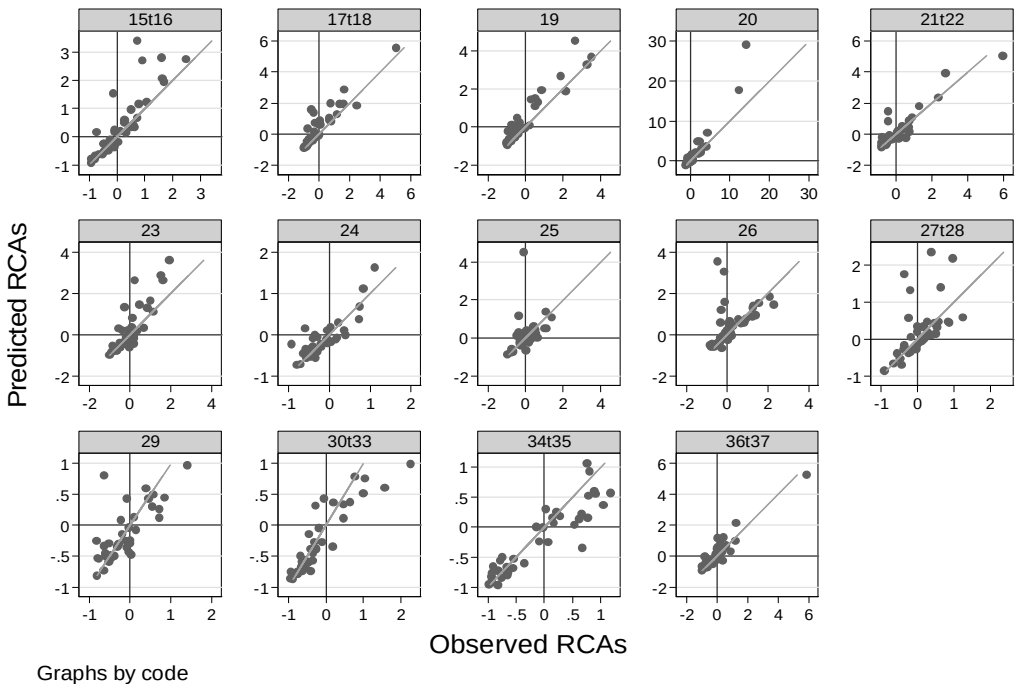
thus allowing for industry-specific coefficients, only country-pair fixed effects are used. The model is estimated for bilateral exports across a broad world region, as in the analysis undertaken in Section 2.2.

Figure 3.1 / Actual market shares and RCAs from observed and fitted export flows for 2007, based on panel approach

World market shares



Revealed comparative advantages



Source: Authors' calculations.

Results

Table 3.3 provides the results from the gravity regressions when a set of country-pair-industry fixed effects are included, in which case all time-invariant variables are eliminated. The first column presents the results when all manufacturing industries are included simultaneously, whereas the other columns show results when regressions are run for each sector individually (in which case only country-pair fixed effects are included).

The model including all industries indicates that, as expected, trade flows increase with the size of the regions (whether measured as total GDP or total population) for both reporter and partner countries. Human capital endowment has a positive effect on the exports of reporters; however, no significant effect is found with respect to the partners. Capital intensity shows up negatively for both reporter and partner, whereas the interaction effect capturing capital-skill complementarities is significantly positive with respect to reporters, but negative with respect to partners. Across industries, the results are fairly consistent, though there are a few exceptions; however, for most of the higher-tech industries, which account for the bulk of trade flows, results point in the same direction.

Table 3.2 / Sign and correlation test

	Correlation coefficient	RCA and predicted RCA larger than 1	RCA and predicted RCA smaller than 1	RCA larger and predicted RCA smaller than 1	RCA smaller and predicted RCA larger than 1
Food, Beverages and Tobacco	0.995	66.8	24.2	3.9	5.2
Textiles and Textile Products	0.987	58.7	37.1	1.9	2.3
Leather, Leather Products and Footwear	0.980	62.3	36.8	0.6	0.3
Wood and Products of Wood and Cork	0.947	70.6	26.5	2.9	0.0
Pulp and Paper, Printing and Publishing	0.969	67.4	30.6	0.0	1.9
Coke, Refined Petroleum and Nuclear Fuel	0.910	66.1	30.0	1.9	1.9
Chemicals and Chemical Products	0.981	58.1	41.6	0.3	0.0
Rubber and Plastics	0.984	58.7	35.2	1.6	4.5
Other Non-Metallic Mineral	0.954	56.5	39.4	1.9	2.3
Basic Metals and Fabricated Metal	0.990	64.5	31.0	1.9	2.6
Machinery, nec	0.989	59.4	40.0	0.3	0.3
Electrical and Optical Equipment	0.992	57.1	37.1	2.3	3.5
Transport Equipment	0.984	63.2	36.8	0.0	0.0
Manufacturing, nec; Recycling	0.961	46.5	46.1	5.5	1.9
Total manufacturing	0.972	61.1	35.2	1.8	1.9
EU-28	0.954	64.5	35.0	0.0	0.5
China	0.985	65.0	32.7	1.8	0.5
Japan	0.992	56.0	42.4	0.2	1.4
USA	0.962	61.1	32.0	3.9	3.0

Source: Authors' calculations.

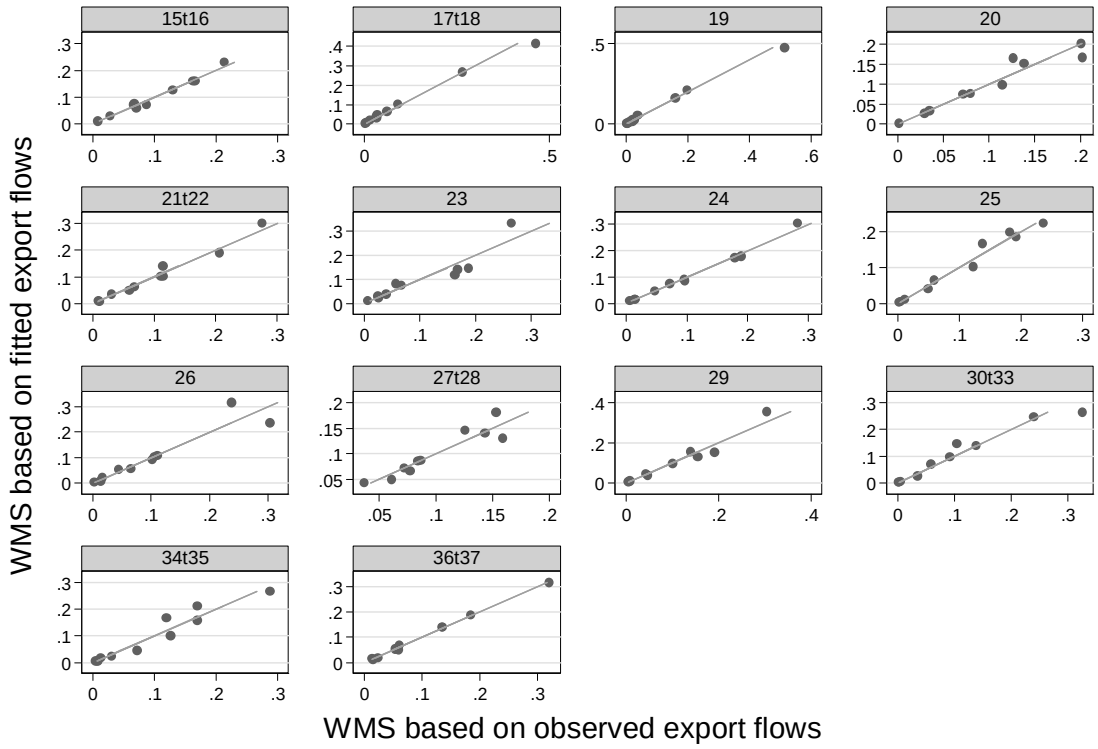
Table 3.3 / Results from panel regressions with country-pair-industry and time fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	All	15t16	17t18	19	20	21t22	23	24	25	26	27t28	29	30t33	34t35	36t37
VARIABLES	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP
Ln GDPj	0.549***	0.576***	0.583***	0.388***	0.519***	0.791***	0.0325	0.789***	0.641***	0.545***	0.693***	0.682***	0.542***	0.625***	0.278***
	(0.0139)	(0.0294)	(0.0369)	(0.0484)	(0.0575)	(0.0366)	(0.0943)	(0.0241)	(0.0306)	(0.0446)	(0.0383)	(0.0345)	(0.0392)	(0.0571)	(0.0399)
Ln POPj	0.238**	-1.380***	-1.265***	0.284	-1.531***	-3.095***	2.039***	0.116	0.587***	-0.306	-0.316	1.319***	2.595***	2.043***	2.241***
	(0.0938)	(0.198)	(0.249)	(0.327)	(0.387)	(0.247)	(0.636)	(0.163)	(0.206)	(0.301)	(0.258)	(0.232)	(0.264)	(0.385)	(0.269)
Ln GDPi	0.651***	0.660***	0.446***	0.666***	0.926***	0.498***	1.136***	0.358***	0.592***	0.550***	0.810***	0.419***	0.426***	0.522***	1.109***
	(0.0139)	(0.0294)	(0.0369)	(0.0484)	(0.0575)	(0.0366)	(0.0943)	(0.0241)	(0.0306)	(0.0446)	(0.0383)	(0.0345)	(0.0392)	(0.0571)	(0.0399)
Log POPi	0.0544	0.986***	-0.532**	-1.290***	-1.194***	-0.240	3.466***	0.795***	0.697***	-0.0838	-0.0296	0.0628	-0.959***	0.0419	-0.959***
	(0.0938)	(0.198)	(0.249)	(0.327)	(0.387)	(0.247)	(0.636)	(0.163)	(0.206)	(0.301)	(0.258)	(0.232)	(0.264)	(0.385)	(0.269)
Ln HCj	1.909***	-0.705**	-0.385	1.277**	2.698***	1.612***	0.524	0.962***	2.252***	0.773	1.136**	3.443***	5.098***	4.447***	3.601***
	(0.160)	(0.338)	(0.425)	(0.557)	(0.661)	(0.422)	(1.085)	(0.278)	(0.352)	(0.513)	(0.441)	(0.396)	(0.451)	(0.657)	(0.459)
Ln HCi	-0.0722	-0.690**	-2.462***	-2.752***	-0.552	1.230***	3.415***	1.020***	-0.191	-0.394	-0.584	-0.246	1.770***	-0.0718	-0.501
	(0.160)	(0.338)	(0.425)	(0.557)	(0.661)	(0.422)	(1.085)	(0.278)	(0.352)	(0.513)	(0.441)	(0.396)	(0.451)	(0.657)	(0.459)
Ln Ki	-0.383***	0.401***	-0.199*	-0.601***	-1.103***	0.163	-0.544*	0.212***	-0.408***	0.0720	0.218*	-0.0214	-1.475***	-0.663***	-1.411***
	(0.0420)	(0.0889)	(0.112)	(0.146)	(0.174)	(0.111)	(0.285)	(0.0729)	(0.0924)	(0.135)	(0.116)	(0.104)	(0.119)	(0.173)	(0.120)
Ln Kj	-0.336***	0.0190	-0.00972	0.232	-0.264	-0.860***	0.117	-0.603***	-0.451***	-0.591***	-0.353***	-0.571***	-0.762***	-0.263	-0.347***
	(0.0420)	(0.0889)	(0.112)	(0.146)	(0.174)	(0.111)	(0.285)	(0.0729)	(0.0924)	(0.135)	(0.116)	(0.104)	(0.119)	(0.173)	(0.120)
Ln HCj x Ln Kj	0.261***	-0.396***	-0.362***	0.137	0.484***	-0.220**	0.112	0.122*	0.326***	0.198*	0.0374	0.685***	1.065***	0.747***	0.717***
	(0.0370)	(0.0782)	(0.0982)	(0.129)	(0.153)	(0.0975)	(0.251)	(0.0642)	(0.0813)	(0.119)	(0.102)	(0.0917)	(0.104)	(0.152)	(0.106)
Ln HCi x Ln Ki	-0.299***	-0.275***	-0.881***	-0.754***	-0.577***	-0.112	0.714***	0.158**	-0.317***	-0.529***	-0.0969	-0.300***	-0.281***	-0.596***	-0.331***
	(0.0370)	(0.0782)	(0.0982)	(0.129)	(0.153)	(0.0975)	(0.251)	(0.0642)	(0.0813)	(0.119)	(0.102)	(0.0917)	(0.104)	(0.152)	(0.106)
Constant	-20.08***	-2.348	26.95***	8.800	32.30***	48.24***	-122.8***	-29.41***	-41.18***	-5.166	-8.589	-39.56***	-47.74***	-55.82***	-44.86***
	(2.110)	(4.463)	(5.603)	(7.350)	(8.719)	(5.560)	(14.30)	(3.661)	(4.639)	(6.769)	(5.817)	(5.228)	(5.952)	(8.668)	(6.048)
Observations	23,940	1,710	1,710	1,710	1,710	1,710	1,710	1,710	1,710	1,710	1,710	1,710	1,710	1,710	1,710
R-squared	0.619	0.809	0.484	0.455	0.531	0.679	0.575	0.895	0.856	0.600	0.808	0.824	0.769	0.672	0.814
Number of *i*	1,260	90	90	90	90	90	90	90	90	90	90	90	90	90	90

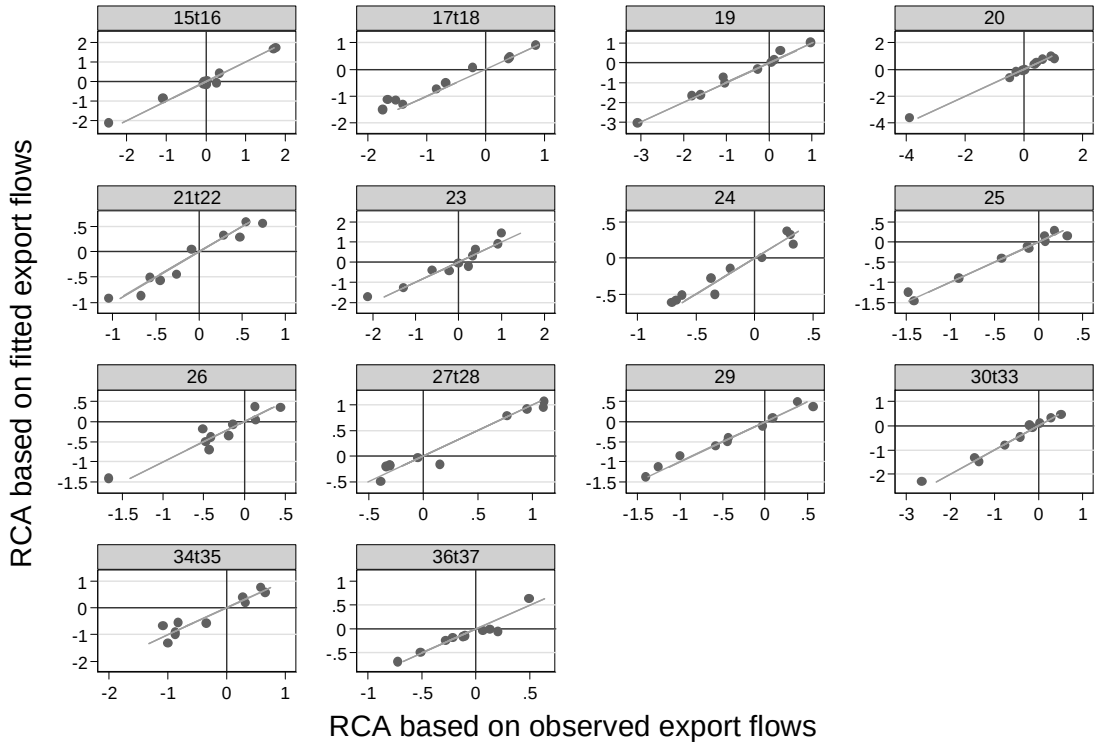
Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' calculations.

Figure 3.2 / Actual versus 'fitted' indicators based on gravity approach, 2011

World market shares



Revealed comparative advantages (in logs)



Source: Authors' calculations.

For an evaluation of the model outcome with respect to their predictive power, the world market share and RCA indicators derived from the actual flows are compared with those from the fitted export flows. Figure 3.2 presents the scatterplots with respect to indicators derived from the observed export flows and those derived from the 'fitted' flows (as in Figure 3.1); more specifically, it shows the scatterplots for the logarithmic actual and 'fitted' RCAs, which therefore centre around zero. Apparently, there is a rather close relationship between these two indicators, as most of the points align along the 45-degree line. The correlation between the actual and the fitted indicators for world market shares and RCAs is larger than $\rho = 0.95$ in all cases.

This implies that in most cases the RCAs based on the fitted values and the actual RCAs are in either the first (north-east) or the third (south-west) quadrant. The 'fitted' and the actual RCAs differ qualitatively if one of them is larger (smaller) than 1 and the other smaller (larger) than 1, which is referred to as the 'sign test'. Results are reported in Table 3.2 by industry and for four major exporters. As one can see, the model predicts RCAs quite well, with only a few cases where RCAs and predicted RCAs are qualitatively different. For example, for all industries RCAs are qualitatively predicted correctly in about 96% of all cases; and for the EU-28 that is the case in more than 99% of cases.

3.3. FURTHER RESULTS

In Appendix C further results from gravity regressions used later in the scenario exercise are provided. These specifications include (i) a gravity model for manufacturing at Member State level, including intra-EU trade, (ii) a gravity model for services trade based on WIOD for broad regions, and (iii) a gravity model for services trade at EU Member State level, including intra-EU trade.

Gravity model for manufacturing trade: EU Member States

The model is calculated including trade between individual EU Member States and thus includes intra-EU trade. However, intra-regional trade flows in other world regions are not considered. The reason for this choice is that if we proceeded with scenarios that included countries with rather small trade volumes and volatile developments (e.g. some African or South American countries), that could make the predictions less robust. The most important difference to the above is that now the population variables become negatively significant. As trade across EU members accounts for a larger share of trade for most EU Member States, this result suggests that larger countries are less open (smaller countries are more open) and, together with the positive coefficients for GDP, that GDP per capita is an important driver of export flows. Furthermore, the indicator of capital intensity now becomes significantly positive for the reporters, but with a negative interaction effect. This result might suggest the stronger production sharing across EU Member States. The sign and correlation tests reported are again quite good, with only about 5% of cases where RCA is predicted with the wrong sign. However, the correlation coefficient is still about 0.95. These sign tests also perform well at the country level: only for Cyprus and Hungary is the error larger, with about 10% of cases where fitted RCAs do not correspond to the observed RCAs in terms of their sign.

Gravity model for export flows in high unit-value segments

Finally, the model has been estimated for the bilateral export flows in the high unit-value segments, as defined above (see Appendix C) for broad country groups and including trade between EU members. Generally one finds that human capital endowment variables in both the reporter and particularly the partner country play a larger role. Across industries, the variable capturing capital skill complementarities is positive and significant more often.

Gravity model for services trade: broad country groups

The same model is estimated for services trade taken from WIOD, as described above. Concerning GDP and population, the results are again positively significant – with the exception of population in the reporter countries, which becomes insignificant. Maybe surprisingly, the variable capturing human capital endowment is significantly negative; however, it is significantly positive for various service industries, particularly business services (NACE Rev. 71t74). Human capital endowment in the partner country has a significant positive effect on trade flows. Physical capital intensity is important only for a few services trade categories (like transport), whereas it is often positive with respect to the partners. Interaction effects between human and physical are mostly positive, though again with some exceptions. The correlation between fitted and observed RCAs is about 0.75, but is higher in most categories. In about 10% of cases RCAs are not predicted qualitatively correctly.

Gravity model for services trade: EU Member States

Further, the model has been estimated for services trade including trade at EU Member State level. Again the signs of the coefficients are as expected. The capital intensity, however, shows a negative sign. However, particularly the human endowment index has a strong positive effect. Concerning RCAs, the correlation coefficient is 0.83; in around 10% of all cases the model does not predict the correct RCA. By country, this failure rises to beyond 10% in 12 cases.

4. Scenarios of future developments

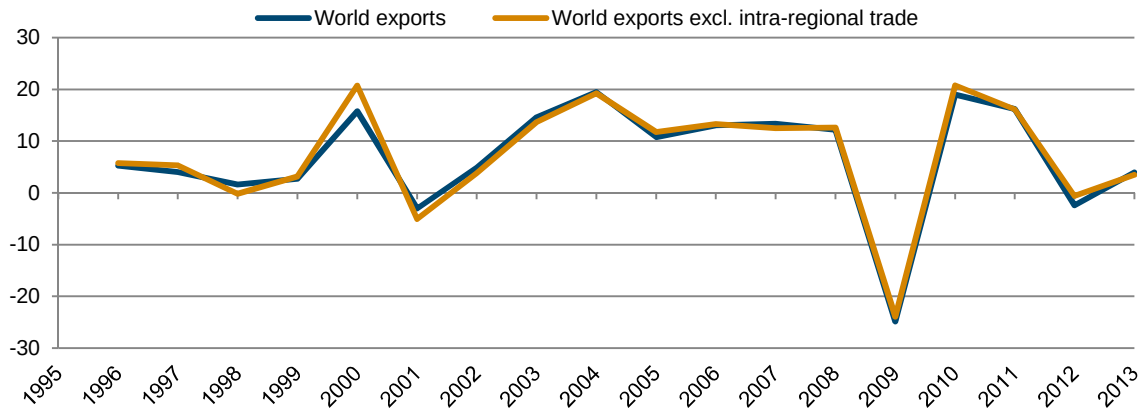
The purpose of this section is to predict future developments in export performance and external competitiveness for world market share and RCA as indicators. The above exercises reveal that both approaches – the panel approach and the gravity approach – perform reasonably well with respect to their predictive power concerning world market share and RCA. However, it also turns out that the gravity approach performs slightly better. Furthermore, the gravity approach has the added advantage that it allows more recent data to be used (the gross trade data are available for 2013), and can be based on variables which are more conducive to a scenario analysis. Basically, the scenarios can be based on broad macro-trends; by contrast, when applying panel modelling one needs to assume future developments for each of the variables at the sectoral level. Therefore, in this section trend scenarios and scenarios based on gravity modelling are compared. Specifically, overall world market share and the patterns which emerge for 2025 are compared with those for 2013.

4.1. TREND ANALYSIS – MANUFACTURING

Trend growth rates

As a first step, exponential (log-linear) trends are used to provide a trend scenario of trade and market share. This relies on the assumption of an exponential growth dynamics, as outlined in more technical detail in Box 4.1.

Figure 4.1 / Growth rates of world gross exports, in %



Source: BACI; authors' calculations.

The overall (exponential) growth rate of gross exports (in current USD) over the period 1995–2013 is about 7%, though there have been strong fluctuations, as shown in Figure 4.1.[9] These growth rates were at about 4.5% in the period 1995–2002 (with an exceptionally high growth rate in 2000) and at

[9] The average growth rate without the crisis is 8.8%.

almost 14% in the period after 2002 and up to 2009. Though growth rates regained similar levels in 2010 and 2011, growth weakened appreciably in the last two years considered. More or less the same dynamics is found when excluding intra-regional trade within the 11 broad world regions. In the framework of exponential trends, an average growth rate of 7% means that world exports (in current USD) are doubling within a time frame of about 10 years.

BOX 4.1 / EXPONENTIAL TRENDS

The exponential growth process is described as

$$x(t) = x(0)\exp(gt)$$

where $x(t)$ is the variable of interest at time t, $x(0)$ is the starting value and g denotes the growth rate. Taking logs gives the log-linear trend

$$\ln x(t) = \ln x(0) + gt$$

The rate at which the level of exports doubles is given by $t = \ln 2 / g$.

Of course, these trends differ across countries (or regions) and industries. Table 4.1 therefore reports the respective growth rates by broad region for total manufacturing (last row), total industries (last column) and region by industry. Concerning regions, the highest growth rates are observed for China, with an overall growth rate of 13.4%. All other countries, except for Japan, follow with growth rates of between 6% and 9%; Japan has had a much lower growth rate in exports – 3%. Looking at industries' gross export dynamics, the growth rates range from 3.7% in wood and pulp and paper, and 5.2% in textiles, to about 7–8%, mostly in the medium- to higher-tech industries. Figure 4.2 compares these world growth rates by industry with those of the EU-28's growth rates in extra-EU-28 exports.

Table 4.1 / Growth rates of world exports, in %

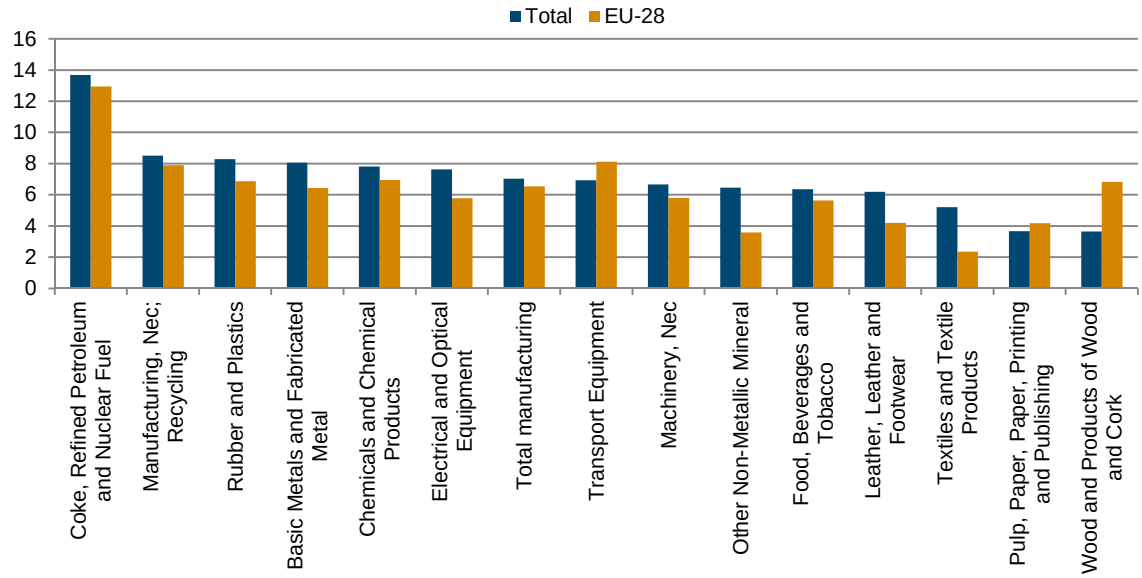
	EU-28	China	Japan	USA	Total
Food, Beverages and Tobacco	5.6	8.2	3.4	4.8	6.4
Textiles and Textile Products	2.4	8.5	-0.5	1.1	5.2
Leather, Leather Products and Footwear	4.2	9.2	-1.8	2.3	6.2
Wood and Products of Wood and Cork	6.8	10.8	-0.7	0.9	3.7
Pulp and Paper, Printing and Publishing	4.2	13.1	2.1	2.7	3.7
Coke, Refined Petroleum and Nuclear Fuel	12.9	12.8	11.1	16.3	13.7
Chemicals and Chemical Products	7.0	14.2	4.4	6.7	7.8
Rubber and Plastics	6.9	14.4	5.8	6.0	8.3
Other Non-Metallic Mineral	3.6	14.1	3.0	5.2	6.5
Basic Metals and Fabricated Metal	6.4	14.0	5.1	6.5	8.1
Machinery, nec	5.8	17.8	3.3	5.3	6.7
Electrical and Optical Equipment	5.8	16.8	1.2	3.9	7.6
Transport Equipment	8.1	18.8	3.1	6.2	6.9
Manufacturing, nec; Recycling	7.9	11.0	4.9	6.7	8.5
Total manufacturing	6.5	13.4	3.0	5.7	7.0

Source: BACI; authors' calculations.

World gross exports have grown faster than EU-28 gross exports in all industries, with the exception of transport equipment (+1.2ppt above world growth rate), wood and wood products (+3.2ppt) and pulp and

paper (+0.5ppt). In particular, lower growth rates are observed for other non-metallic mineral products, leather and footwear and textiles and textile products, in line with the shifts in EU-28 market shares and RCAs, as discussed in detail in Section 2.2.

Figure 4.2 / Growth rates of world and EU-28 gross exports, by industry, in %



Note: Industries ranked by growth rates of world exports by industry.
Source: BACI; authors' calculations.

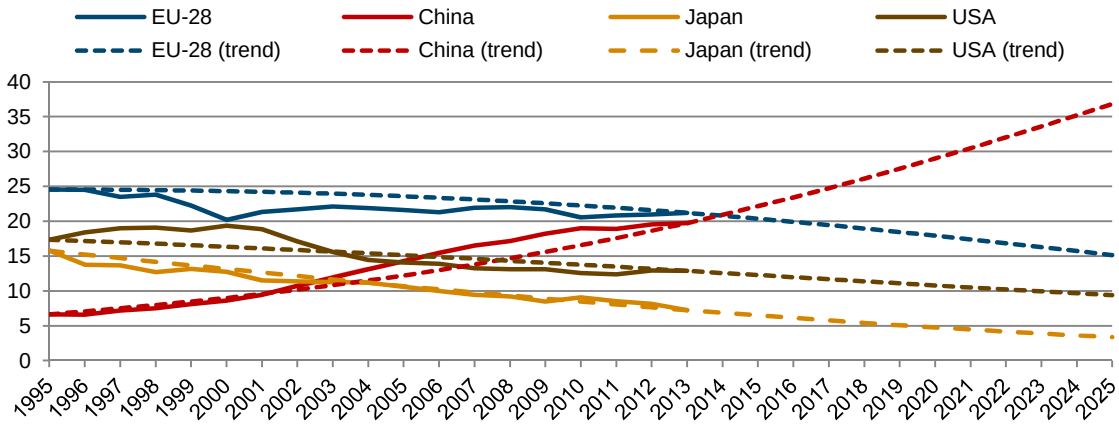
As for the other countries, the USA – with an overall growth rate that is 1.3ppt below the world growth rate for gross exports – is fairly consistent in terms of how its growth rates compare to world growth rates: US growth rates in all industries are below world growth rates except in coke and refined petroleum. The difference in US and world growth rates is less pronounced in transport equipment and pulp and paper, but US rates are significantly lower than world growth in electrical and optical equipment, textiles and textile products, and leather and footwear. The growth rate of Japanese gross exports is 4ppt below the world average, with the difference being less pronounced in rubber and plastics and pulp and paper. Significantly lower growth rates are observed for leather and footwear and textiles and textile products, and also electrical and optical equipment. Finally, the Chinese growth rate for exports is 6.4ppt above the world average, with particularly big differences observed for transport equipment (+11.9ppt above the world growth rate in this industry), machinery (+11.1ppt) and the electrical and optical industry (+9.2ppt).

Thus, the overall picture to emerge is that China is the country with the highest overall growth rates. These are particularly strong (compared to world growth rates) in transport equipment, machinery, and electrical and optical equipment. Concerning this last industry, Japan and the USA in particular show significantly lower growth dynamics, whereas the growth differential for the EU-28 is lower (though it starts from a significantly lower market share). Concerning the other two industries, the EU-28 is the only grouping to achieve above the world growth rates in transport equipment; and in machinery it has had a smaller (though still negative) growth differential than the US and (particularly) Japan. In the lower-tech industries, particularly textiles and leather and footwear, all these countries show much lower growth rates: only China has a higher rate than the world average.

Trend scenario results – manufacturing industries

Following these trends, how might the situation look in 2025? Based on the exponential growth rates just discussed (Table 4.1), Table 4.2 and Table 4.3 present the export performance indicators, market shares, export structures and RCAs in 2025 and show how these would differ from 2013 (the last year for which data are available).

Figure 4.3 / Scenario of world market shares (based on exponential trends) in %



Source: Authors' calculations.

Concerning market share, the EU-28 will have lost 6ppt over this period, resulting in an overall market share of 15% in 2025. This loss is more pronounced than for Japan and the USA, which will have lost 3.9ppt and 3.5ppt, respectively, resulting in market shares of 3.4% and 9.5%, respectively, in 2025. This significantly more pronounced loss in market share in the EU-28 comes as a surprise, because overall growth rates for gross exports have been slightly better there than in the USA and Japan (see Table 4.1). The result is therefore probably driven by the growth differences across industries.

Table 4.2 / Export performance indicators, 2025

	Market shares				Export structure					RCA			
	EU-28	China	Japan	USA	EU-28	China	Japan	USA	World	EU-28	China	Japan	USA
Food, Beverages and Tobacco	20.9	7.8	0.5	10.7	5.2	0.8	0.5	4.3	3.8	1.4	0.2	0.1	1.1
Textiles and Textile Products	5.8	59.3	0.6	1.7	1.3	5.3	0.6	0.6	3.3	0.4	1.6	0.2	0.2
Leather, Leather Products and Footwear	11.2	64.6	0.1	1.1	0.8	1.9	0.0	0.1	1.1	0.7	1.8	0.0	0.1
Wood and Products of Wood, etc.	21.3	35.2	0.1	4.3	0.6	0.4	0.0	0.2	0.5	1.4	1.0	0.0	0.5
Pulp and Paper, Printing and Publishing	23.0	29.7	1.9	13.9	1.7	0.9	0.6	1.6	1.1	1.5	0.8	0.6	1.5
Coke, Refined Petroleum, etc.	16.8	1.8	1.5	21.5	12.7	0.6	5.1	26.1	11.4	1.1	0.1	0.4	2.3
Chemicals and Chemical Products	22.5	18.1	3.8	13.5	16.9	5.6	13.0	16.4	11.4	1.5	0.5	1.1	1.4
Rubber and Plastics	13.4	44.4	6.0	8.5	2.4	3.3	5.0	2.5	2.8	0.9	1.2	1.8	0.9
Other Non-Metallic Mineral	12.4	57.9	3.6	5.8	0.9	1.7	1.2	0.7	1.1	0.8	1.6	1.1	0.6
Basic Metals and Fabricated Metal	11.8	26.5	4.3	6.5	7.6	7.0	12.6	6.8	9.8	0.8	0.7	1.3	0.7
Machinery, nec	18.8	51.1	5.3	7.8	13.2	14.8	16.7	8.9	10.6	1.2	1.4	1.6	0.8
Electrical and Optical Equipment	6.5	61.8	2.2	4.1	12.1	47.8	18.4	12.4	28.4	0.4	1.7	0.6	0.4
Transport Equipment	28.1	19.3	7.0	13.2	20.8	5.9	23.5	15.8	11.2	1.9	0.5	2.1	1.4
Manufacturing, nec; Recycling	15.9	41.8	2.6	9.6	3.7	4.0	2.8	3.6	3.6	1.0	1.1	0.8	1.0
Total manufacturing	15.1	36.8	3.4	9.4									

Source: Authors' calculations.

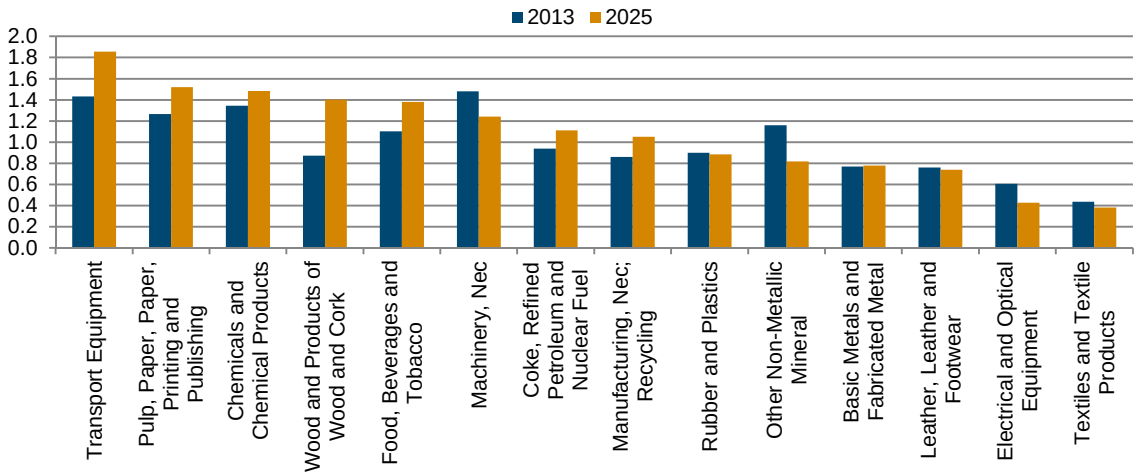
The losses in market share are particularly significant in machinery (-12.6ppt). Market share losses are also very pronounced in other non-metallic mineral products (-12.2ppt), though it accounts for a much smaller share of total gross exports. Market share losses in the other industries range from about -6ppt (in chemicals, rubber and plastics and electrical and optical equipment), -5ppt in leather and footwear, and between 2ppt and 3ppt in the other industries. The only industry to be characterised by a larger market share in 2025 is wood and products of wood. In the case of the US, the market share losses are much less differentiated across industries, ranging from -0.8ppt in leather and footwear to -6.1ppt in machinery and transport equipment industry. This is similarly the case for Japan.

Table 4.3 / Export performance indicators: difference from 2013

	Market shares				Export structure					RCA			
	EU-28	China	Japan	USA	EU-28	China	Japan	USA	World	EU-28	China	Japan	USA
Food, Beverages and Tobacco	-2.5	1.4	-0.2	-2.5	-1.0	-1.0	0.0	-1.5	-1.9	0.3	-0.1	0.0	0.1
Textiles and Textile Products	-3.5	13.8	-0.7	-1.4	-1.0	-6.5	-0.4	-0.7	-1.8	-0.1	-0.7	0.0	-0.1
Leather, Leather Products and Footwear	-4.9	13.9	-0.1	-0.8	-0.3	-1.9	0.0	-0.1	-0.4	0.0	-0.8	0.0	0.0
Wood and Products of Wood, etc.	2.8	16.1	-0.1	-3.4	0.0	-0.3	0.0	-0.2	-0.3	0.5	0.0	0.0	-0.1
Pulp and Paper, Printing and Publishing	-3.8	17.8	-0.9	-5.4	-0.7	-0.2	-0.1	-1.2	-0.8	0.3	0.2	0.2	0.0
Coke, Refined Petroleum, etc.	-3.0	-0.4	-0.7	4.6	6.4	-0.2	3.1	17.3	4.7	0.2	-0.1	0.1	1.0
Chemicals and Chemical Products	-6.0	8.5	-2.8	-4.1	-0.3	-0.6	1.3	-1.1	-1.4	0.1	0.0	0.2	0.1
Rubber and Plastics	-5.7	18.7	-3.8	-4.9	-0.1	-0.3	1.2	-0.4	0.0	0.0	-0.1	0.4	-0.1
Other Non-Metallic Mineral	-12.2	25.6	-4.0	-3.7	-0.5	-0.2	-0.1	-0.2	-0.1	-0.3	-0.1	0.0	-0.1
Basic Metals and Fabricated Metal	-4.5	11.7	-2.7	-2.5	-0.7	-1.0	2.2	-0.7	-1.0	0.0	0.0	0.3	0.0
Machinery, nec	-12.6	30.9	-6.6	-6.1	-2.3	4.1	-0.5	-2.5	0.2	-0.2	0.4	-0.1	-0.2
Electrical and Optical Equipment	-6.4	29.0	-5.3	-6.1	-2.1	8.7	-6.0	-6.2	4.9	-0.2	0.0	-0.4	-0.4
Transport Equipment	-2.3	13.5	-6.8	-4.8	2.3	2.1	-1.1	-2.2	-1.7	0.4	0.2	0.2	0.0
Manufacturing, nec; Recycling	-2.3	8.9	-1.7	-3.2	0.3	-2.5	0.4	-0.3	-0.4	0.2	-0.5	0.2	0.0
Total manufacturing	-6.0	17.1	-3.9	-3.5									

Source: Authors' calculations.

Figure 4.4 / Revealed comparative advantage of EU-28 for 2013 and 2025, based on trend model



Note: Ranked according to RCAs in 2025.
Source: Authors' calculations.

These changes in market shares are, of course, to a large extent driven by the Chinese export dynamics, which would increase the Chinese share of world manufacturing exports by 17.1ppt, to a

share of 36.8%. Chinese market share in machinery and electrical and optical equipment would increase by 30.9ppt and 29ppt, respectively, resulting in a world market share of more than 50% in machinery and more than 60% in electrical and optical equipment. Chinese market shares are also increasing strongly in most other industries – by 15ppt on average, the only exceptions being food, beverages and tobacco (+1.4ppt) and chemical and chemical products (+8.5ppt).

Concerning RCAs, the EU-28 can be expected to gain RCAs in food, pulp and paper, chemicals and transport equipment, where it should successfully strengthen its comparative advantages. In wood and wood products, the results suggest that revealed comparative advantage could shift above 1, thus indicating a shift in the structure of comparative advantage. The results, however, also suggest that the EU-28 is losing its RCA in machinery, though the figure remains above 1 (indicating a still existing, though declining, specialisation); and there is a further loss in electrical and optical equipment.

Scenarios for EU Member States – manufacturing industries

In a similar way, the scenarios for individual EU Member States (including intra-EU trade) can be calculated.[10] As before, first the growth rates of exports at the industry level are calculated for individual EU Member States (reported in Table 4.4). The growth rates for gross exports over this period are particularly high for the EU-12 Member States, with growth rates of above 10% (with the exception of Slovenia, Malta and Cyprus). For the other countries, the growth rates range from less than 4% to 7%.

Table 4.4 / Growth rates for the trend scenario

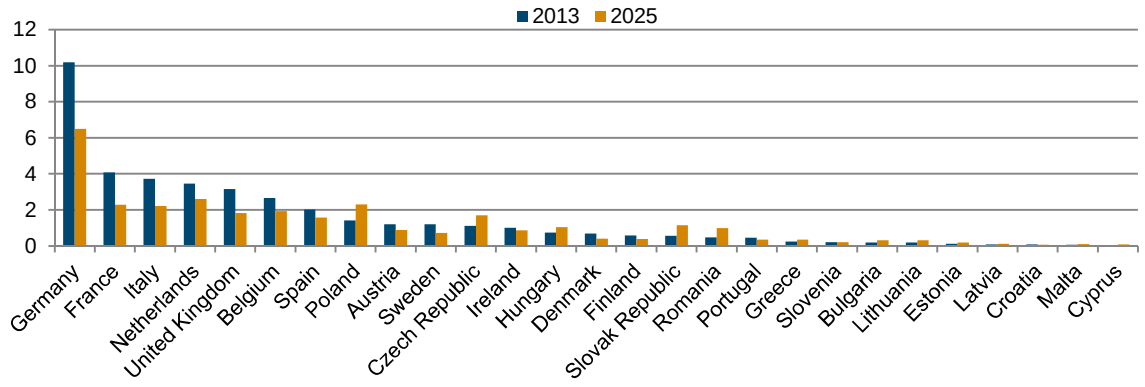
	15t16	17t18	19	20	21t22	23	24	25	26	27t28	29	30t33	34t35	36t37	Total
Austria	10.4	1.2	3.2	4.8	4	12.4	8.7	5.7	2.1	6.4	6.1	6.3	7	6.1	6.4
Belgium	5.3	0.5	10	3.5	2.9	13.4	7.2	4.4	1.8	3.7	5.3	4.3	2.9	6	5.4
Bulgaria	11.1	9.1	6.6	8.9	9.9	16.1	7.4	16.9	11.5	9.4	13.5	18.8	18.7	15.2	11.3
Croatia	5.8	-0.5	1.8	4.5	3.7	7.4	4	6.1	6.9	8	10.5	7.8	5.1	6.3	5.4
Cyprus	0.7	-6.4	1.9	8.3	9.3	20.3	16.1	7.6	7	11.6	7.6	10.2	7.3	12.4	8.3
Czech Republic	10.2	3.8	4.6	5.5	8.9	10.5	8.8	12.8	5.3	8.1	11.8	15.7	15.5	11.3	11.2
Denmark	3.1	3	5.6	0.4	1.6	11.7	7.8	3.2	1.3	3.9	3.6	5.3	3.1	3.4	4.5
Estonia	9.3	6.7	8.3	10	14.5	9.7	10.4	16	9.1	11.3	17.4	17	11.5	10.6	11.6
Finland	4.1	0.4	3.2	0.8	0.8	14.4	7.9	5.4	3.5	5.7	5.1	1.7	1.3	2.3	3.8
France	3.9	0.6	6.8	1.7	2.9	11	5.5	3.8	1	3.1	3.6	2.9	4.8	6.8	4.2
Germany	6.3	1.6	4.5	6.2	3.2	9.3	5.6	6.2	3.8	5.4	5	5.3	6.9	5.6	5.6
Greece	4.2	-2.4	2.1	1.3	5.7	17.4	8.9	6.2	1.5	6.1	6.1	7.5	4.3	8.7	7.1
Hungary	7.1	1.1	4.1	5.1	10.6	10.5	10.5	13.5	9.4	6.6	12.7	14.5	13.7	8.7	10.9
Ireland	3.4	-1.3	2.1	5.7	-0.2	10.8	10.6	3.5	1.8	3	5.3	3.9	8.8	5.5	6.5
Italy	6.4	1.4	3.2	2.4	3.9	11.5	6.9	4.3	1.6	5.7	4.6	3.7	4.5	4.7	4.7
Latvia	11.3	4.5	4.5	10	12.9	9.1	9.2	19.7	13.4	8.4	11.3	16.3	9.7	10.7	10.1
Lithuania	11.8	6.4	6.2	8.5	13.3	16	11.7	19.4	11	8.5	14.6	11.8	13.7	12.2	12.1
Malta	11.9	-2.5	-7.2	7.7	3.6	18	14.5	5.7	7.6	7.4	8.8	3.9	8.6	6.7	8
Netherlands	4.3	3.2	7.6	2	1.6	12.8	6.1	4.3	2.1	4.6	5.9	5.8	4.4	5.9	5.9
Poland	13.5	3	5.3	6.7	13.7	14	11.5	16.9	9.9	9	14.2	15.7	15.6	11.3	12.1
Portugal	7.8	0.6	1.6	2.4	4.3	12	8.2	10.8	4.3	9.9	7.9	4.6	6.1	9.9	5.7
Romania	12.2	6.8	8.7	11.8	8.6	8.9	7.4	20.9	2.3	6.2	13.1	20	19.9	10.6	11.2
Slovak Republic	10.6	5.2	8.5	4.7	6.7	13.2	5.7	11	4.5	7.1	12.7	18.6	18.3	11.4	11.8
Slovenia	7.8	-1.8	0.5	3	3.2	23.5	9.8	7.4	4.7	6.5	7.4	7.6	7.6	5.2	6.7
Spain	7.8	5.5	3	4.5	4.9	14.4	9.1	6.5	4.4	7	6.7	5.1	5.2	7.2	6.6
Sweden	7.1	3.8	5.6	1.6	2.3	12.1	6.2	4.2	3.1	3.9	4.1	3.8	3.2	5.3	4.3
United Kingdom	3.2	0.1	2.4	2.5	2	10.2	4.1	3.6	-0.1	4.9	3	0.6	6.4	7.6	3.9
EU-28	5.5	1.8	4.3	4	3.1	12.2	6.5	5.9	3	5.3	5.2	5.1	6.3	6.6	5.7

Source: BACI; authors' calculations.

[10] In these calculations intra-regional trade flows of other regions, as defined in Section 2.2, are not taken into account. Comparing the results for 2013 shows that the resulting world market shares do not differ fundamentally. Further, in these calculations trend growth rates of extra-regional exports are used.

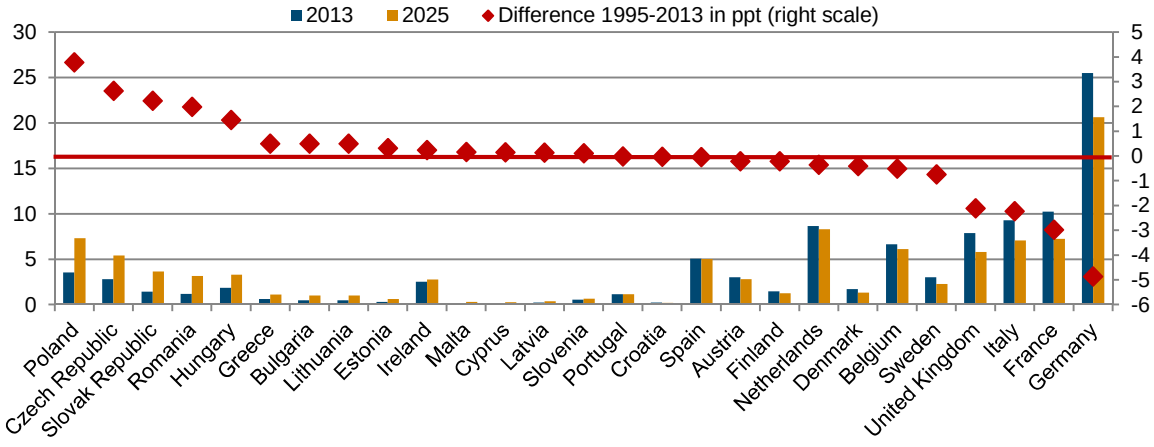
Figure 4.5 presents the resulting world market shares for the EU-28 Member States in 2013 and 2025, using the trend growth rates at industry level. World market shares for most countries are decreasing, with a few exceptions among EU-12 Member States. In Figure 4.6, each country's share of EU exports and the change in this share over time are presented. The results suggest that export activities are beginning to be more concentrated in Central and Eastern European countries, while the United Kingdom, Italy and France (and also Germany) can be expected to lose share.

Figure 4.5 / EU Member States' world market shares, including intra-EU trade (trend scenario)



Source: Authors' calculations.

Figure 4.6 / Contributions to EU exports, including intra-EU trade (trend scenario), in %

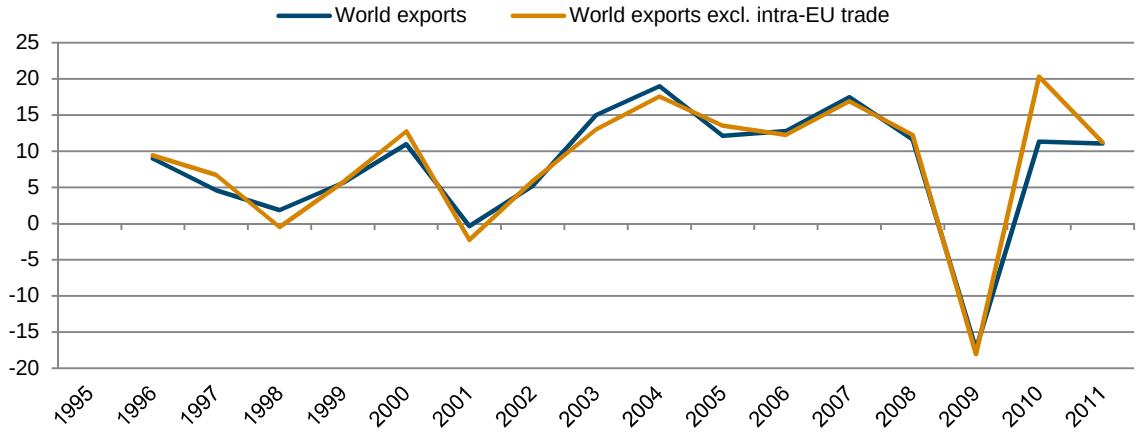


Source: Authors' calculations.

4.2. TREND ANALYSIS – SERVICES

As above, Figure 4.7 presents the growth rates for gross exports in services, which were around 5% on average until about 2002, but then increased to a higher level of about 15% over the period 2003–07. As with manufacturing trade a big slump was observed in the crisis period (though slightly less pronounced).

Figure 4.7 / Growth rates of world gross exports, in %



Source: WIOD; authors' calculations.

Table 4.5 presents the growth rates of the individual service sectors for selected countries. The trend growth rates have been at about 10% for the EU-27 and thus higher than for the US (5.7%) or Japan (6%). China again shows the highest growth rates, with about 17% (though starting from low levels). With respect to service industries, the highest growth rates are observed for sale, maintenance and repair (10.6%) and financial intermediation (10.4%). The EU-27 in addition shows high growth rates in hotels and restaurants and in post and telecommunication.

Table 4.5 / Growth rates of world exports for selected countries, 1995–2011, in %

	EU-27	China	Japan	USA	Total
Sale, maintenance and repair	10.6	0.0	5.9	5.2	10.6
Wholesale trade	9.2	101.7	8.0	3.7	8.1
Retail trade	9.1	105.1	8.8	5.5	9.8
Hotels and Restaurants	15.9	9.4	8.2	5.0	8.5
Inland Transport	8.1	12.5	5.2	5.8	8.0
Water Transport	8.9	20.8	4.1	-2.1	7.5
Air Transport	5.8	15.5	6.5	4.2	6.8
Other Transport Activities	7.1	2.2	2.9	6.2	5.9
Post and Telecommunications	11.8	16.6	0.8	3.1	8.5
Financial Intermediation	14.6	11.5	3.0	7.8	10.4
Real Estate Activities	4.8	3.4	-20.6	3.2	9.8
Renting and Other Business Activities	9.5	26.0	7.2	8.0	9.3
Total services	9.7	17.8	6.0	5.7	

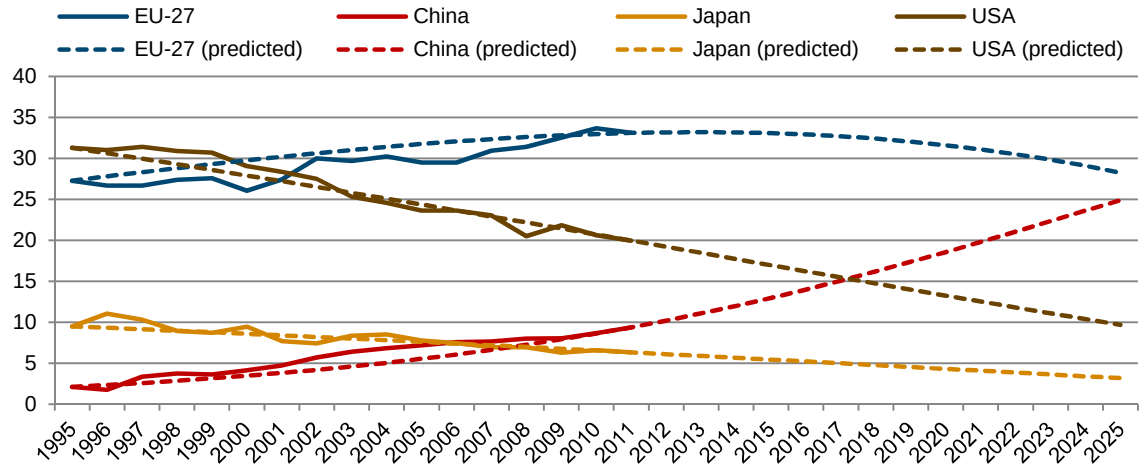
Source: WIOD; authors' calculations.

Trend scenario results – service industries

When applying the growth rates for total services and projecting export levels into the future, the market shares would develop as indicated in Figure 4.8. Given the high exponential growth rates in China, its market share would increase to 25%, whereas the EU-27's would decrease to 27%. The market shares of the US and Japan in 2025 are predicted to be 10% and 4%, respectively.[11]

[11] In this case, attempts to apply growth rates for individual service industries resulted in rather inconsistent patterns due in part to very large growth rates in some countries and industries.

Figure 4.8 / Scenario of world market shares (based on trend model), in %

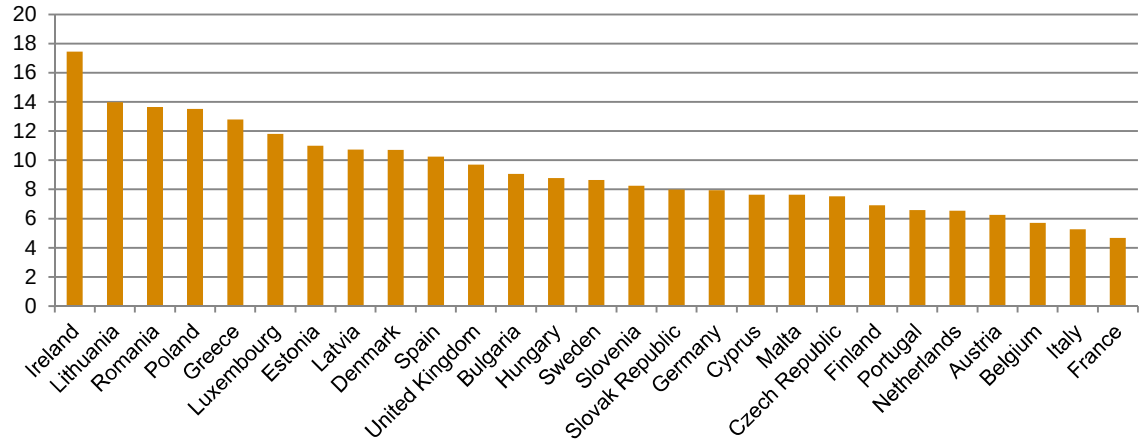


Source: WIOD; authors' calculations.

Scenarios for EU Member States – service industries

A similar approach is applied at the EU Member State level, i.e. including intra-EU trade. Figure 4.9 presents the growth rates of services exports for EU-27 Member States, including intra-EU trade. These range from high rates of almost 18% (as in Ireland) to growth rates of 4% in France.

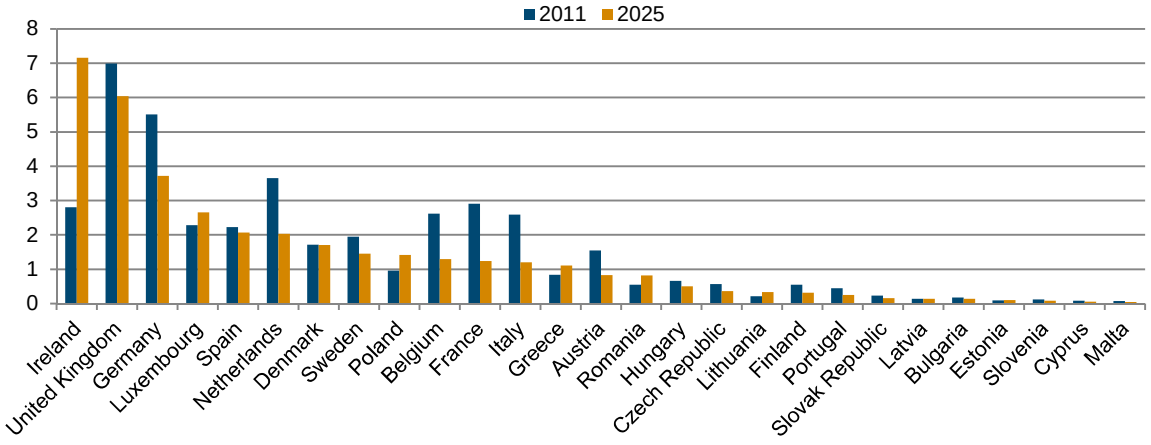
Figure 4.9 / Growth rates of services exports (including intra-EU trade) 1995–2011, in %



Source: WIOD; authors' calculations.

As above, applying these trend growth rates to arrive at predictions of world market shares, one gets world market shares in 2025 as shown in Figure 4.10. They are declining in all countries (with the exception of Ireland, for which they increase substantially according to the trend) by between 1ppt and 1.5–2ppt: the United Kingdom, Germany, the Netherlands, Belgium, France and Italy. Again, this general decline is also caused by the increasing market share of China, as shown above.

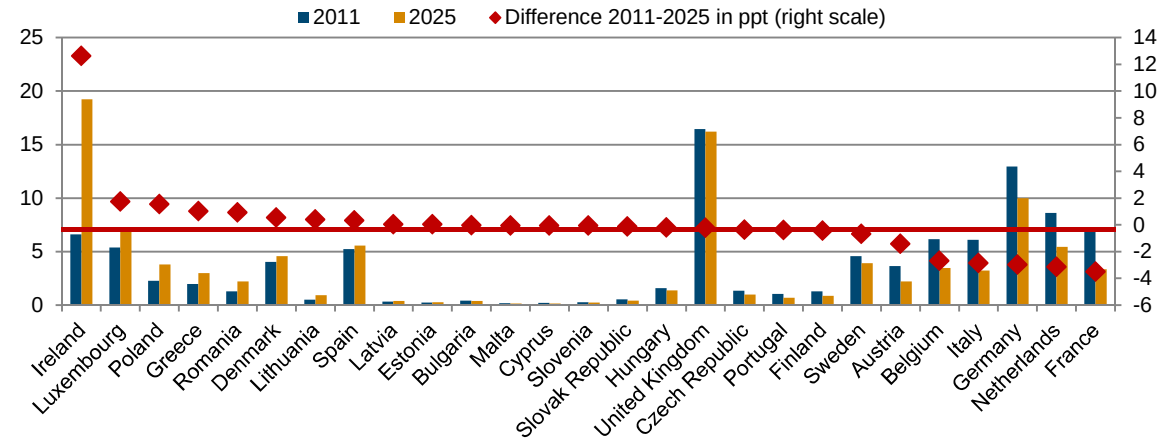
Figure 4.10 / World market shares according to trend scenario, 2011 and 2025, in %



Source: WIOD; authors' calculations.

Figure 4.11 presents the shares of EU Member States in EU (total) services exports. This is particularly dominated by the increase of Ireland, which – according to the trend scenario – would gain about 12 percentage points. The countries significantly losing shares are Belgium, Italy, Germany, the Netherlands and France, with losses of about 2ppt to 4ppt.

Figure 4.11 / Geographic structure of EU-27 services exports



Source: WIOD; authors' calculations.

4.3. SCENARIOS BASED ON GRAVITY APPROACH – MANUFACTURING

Trend growth rates

A similar exercise is now undertaken based on the gravity approach discussed in Section 3.2 above, where an out-of-sample prediction of export flows is calculated up to 2025. Again, from this scenario involving levels of gross exports flows, the indicators as listed above are calculated. Using the results of this model and the predicted values of population, GDP, human capital index and capital-output ratio in

these regions, one can calculate the associated trade flows. For these predictions, trend growth rates over the period 1995–2011 have been calculated using the PWT 8.0 data.[12] These growth rates are reported in Table 4.6.

Table 4.6 / Trend growth rates of determinants

	GDP	Population	Human capital	Capital-output ratio
EU-28	2.2	0.3	0.5	1.5
China	9.4	0.7	1.1	2.4
Japan	0.7	0.1	0.4	1.4
USA	2.4	1.0	0.2	1.0
Other Europe	5.7	0.1	0.0	0.0
North America	3.6	1.4	0.7	0.0
South America	3.2	1.3	0.8	1.6
Asia	4.5	1.5	1.0	2.6
Oceania	3.1	1.3	0.2	0.1
Africa	4.6	2.4	0.4	0.6

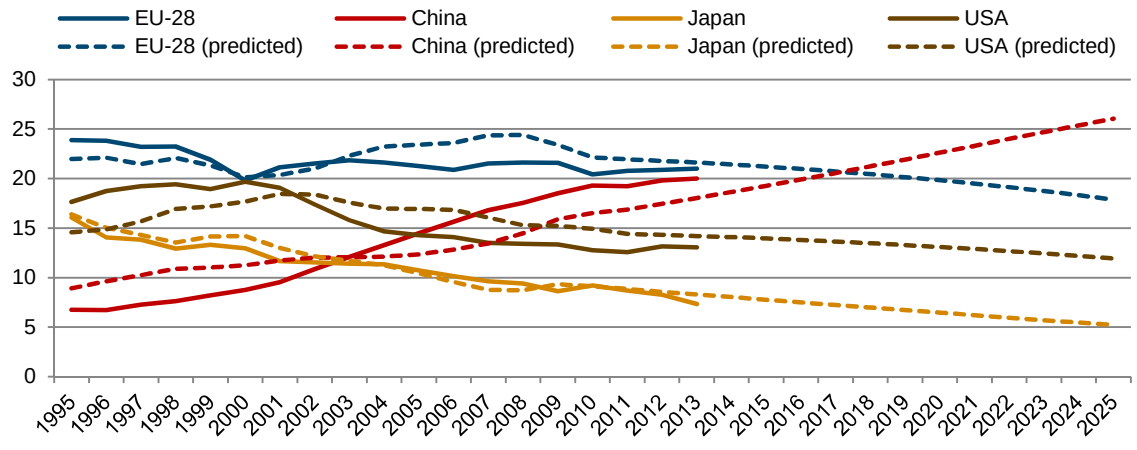
Note: Trend growth rates of human capital for Other Europe and North America and for capital intensity in case of Other Europe are negative and have been set to 0.
Source: PWT; authors' calculations.

Scenario results

Figure 4.12 presents the evolution of world market shares based on the gravity approach, in a similar way to the information contained in the trend scenarios.

Concerning market shares, the EU-28 would again be expected to face a decline in its market share to about 18% in 2025, and thus about 3ppt higher than the scenario that applies exponential trends. The rise of China is predicted to be far less than the trend scenario, at about 26% (compared to 36% in the trend scenario). (Here one should note, however, that the gravity model for 2013 predicts the share of China at about 18%, compared to 20% based on observed export flows.) The market shares for the US and Japan are therefore also slightly higher, at about 12% and 5%, respectively.

Figure 4.12 / Scenario of world market shares (based on gravity model), in %



Source: Authors' calculations.

[12] 2011 is the latest year available in the PWT 8.0.

Table 4.7 / Export performance indicators, 2025

	Market shares				Export structure					RCA			
	EU-28	China	Japan	USA	EU-28	China	Japan	USA	World	EU-28	China	Japan	USA
Food, Beverages and Tobacco	22.9	9.7	1.2	10.7	4.3	1.3	0.8	3.0	2.6	1.3	0.4	0.2	0.9
Textiles and Textile Products	9.9	49.2	1.6	2.9	1.0	3.5	0.6	0.5	2.2	0.6	1.9	0.3	0.2
Leather, Leather Products and Footwear	15.4	54.9	0.3	2.2	0.5	1.3	0.0	0.1	0.8	0.9	2.1	0.1	0.2
Wood and Products of Wood and Cork	24.8	25.7	0.2	6.1	0.6	0.4	0.0	0.2	0.4	1.4	1.0	0.0	0.5
Pulp and Paper, Printing and Publishing	31.0	18.7	3.4	13.4	1.9	0.8	0.7	1.2	1.1	1.7	0.7	0.6	1.1
Coke, Refined Petroleum and Nuclear Fuel	9.4	2.3	2.8	9.1	7.8	1.3	7.9	11.3	13.9	0.5	0.1	0.5	0.8
Chemicals and Chemical Products	25.2	17.7	5.3	13.9	14.4	6.9	10.3	11.9	9.4	1.4	0.7	1.0	1.2
Rubber and Plastics	16.7	36.7	6.5	13.3	2.4	3.6	3.2	2.9	2.5	0.9	1.4	1.2	1.1
Other Non-Metallic Mineral	29.1	35.6	6.8	8.1	1.2	1.0	0.9	0.5	0.9	1.6	1.4	1.3	0.7
Basic Metals and Fabricated Metal	16.3	22.5	6.4	6.5	9.2	8.7	12.3	5.5	9.9	0.9	0.9	1.2	0.5
Machinery, nec	29.9	33.9	6.8	12.0	19.5	15.2	15.1	11.8	11.1	1.7	1.3	1.3	1.0
Electrical and Optical Equipment	10.0	46.3	4.4	11.4	13.9	44.1	20.8	23.7	27.8	0.6	1.8	0.8	1.0
Transport Equipment	24.9	11.9	9.3	19.8	18.9	6.2	24.2	22.6	13.7	1.4	0.5	1.8	1.7
Manufacturing, nec; Recycling	18.7	35.7	4.0	13.8	4.3	5.6	3.1	4.8	3.7	1.0	1.4	0.8	1.2
Total manufacturing	17.9	26.0	5.2	11.9									

Source: Authors' calculations.

Concerning individual industries and the EU-28, the market share losses are again particularly significant in machinery, with -5.5ppt (see Table 4.8). Market share losses are also pronounced in chemicals (4.7ppt) and electrical and optical equipment (3.3ppt). The wood and wood products industry would be expected to increase its world market share by about 3.9ppt. These changes in market shares are again largely driven by the Chinese export dynamics. The Chinese share of world manufacturing exports is expected to increase to about 26% (thus less than under the trend scenario). Furthermore, the pattern across industries is less pronounced: Chinese market shares in machinery and electrical and optical equipment would increase by 16.7ppt (compared to 30.9ppt in the trend scenario) and 17.5ppt (compared to 29ppt in the trend scenario). Nonetheless, the market shares in these two industries are expected to be 33.9% in machinery and about 46.3% in electrical and optical equipment. Chinese market shares will also increase strongly in most other industries, according to these calculations.

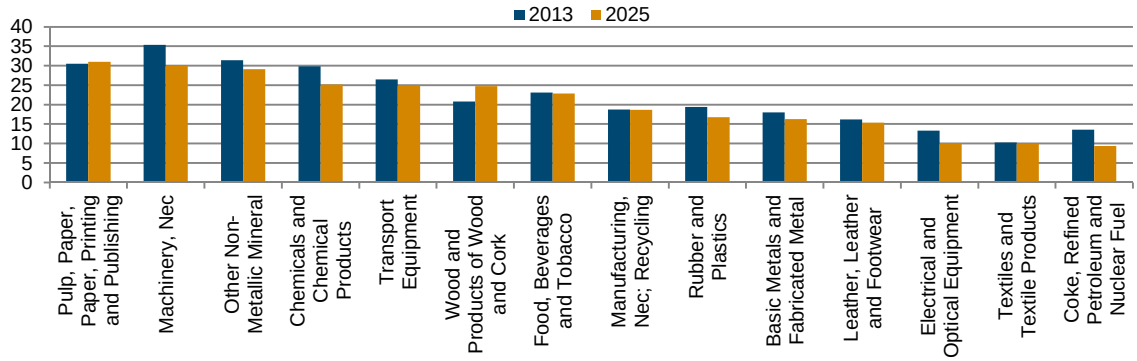
Table 4.8 / Export performance indicators, difference from 2013

	Market shares				Export structure					RCA			
	EU-28	China	Japan	USA	EU-28	China	Japan	USA	World	EU-28	China	Japan	USA
Food, Beverages and Tobacco	-0.2	2.1	0.1	-1.7	-1.1	-0.9	0.1	-1.4	-2.1	0.2	0.0	0.1	0.0
Textiles and Textile Products	-0.3	6.6	-0.4	-0.8	-0.9	-6.2	-0.4	-0.6	-2.1	0.1	-0.5	0.1	0.0
Leather, Leather Products and Footwear	-0.8	6.3	-0.1	-0.5	-0.3	-1.8	0.0	-0.1	-0.5	0.1	-0.6	0.0	0.0
Wood and Products of Wood and Cork	3.9	7.8	0.0	-1.4	-0.1	-0.3	0.0	-0.2	-0.3	0.4	0.0	0.0	0.0
Pulp and Paper, Printing and Publishing	0.5	7.6	-0.2	-4.9	-0.7	-0.4	-0.1	-1.2	-0.8	0.3	0.1	0.2	-0.2
Coke, Refined Petroleum and Nuclear Fuel	-4.2	-0.7	0.3	-2.4	3.8	0.3	6.0	6.2	7.7	-0.1	-0.1	0.2	0.0
Chemicals and Chemical Products	-4.7	7.6	-2.1	-3.1	-2.2	0.2	-0.3	-2.5	-2.4	0.0	0.1	0.1	0.0
Rubber and Plastics	-2.7	12.5	-3.2	-2.9	-0.1	-0.1	0.0	-0.3	-0.2	0.0	0.1	0.1	0.0
Other Non-Metallic Mineral	-2.3	10.4	-2.1	-1.7	-0.4	-0.5	-0.2	-0.2	-0.2	0.2	0.0	0.2	0.0
Basic Metals and Fabricated Metal	-1.7	7.4	-1.8	-1.9	-0.2	-0.7	1.2	-1.2	-1.0	0.1	0.0	0.2	0.0
Machinery, nec	-5.5	16.7	-5.1	-3.4	0.6	4.2	-1.4	-0.8	-0.1	0.0	0.3	-0.1	-0.1
Electrical and Optical Equipment	-3.3	17.5	-4.5	-2.9	-0.8	6.0	-4.5	-0.3	2.5	-0.1	0.2	-0.2	-0.1
Transport Equipment	-1.6	6.7	-5.5	-1.3	1.8	2.2	-0.7	1.8	-0.1	0.2	0.2	0.0	0.2
Manufacturing, nec; Recycling	-0.1	3.4	-1.1	0.0	0.6	-2.1	0.5	0.6	-0.6	0.2	-0.4	0.1	0.2
Total manufacturing	-3.7	8.0	-3.1	-2.3									

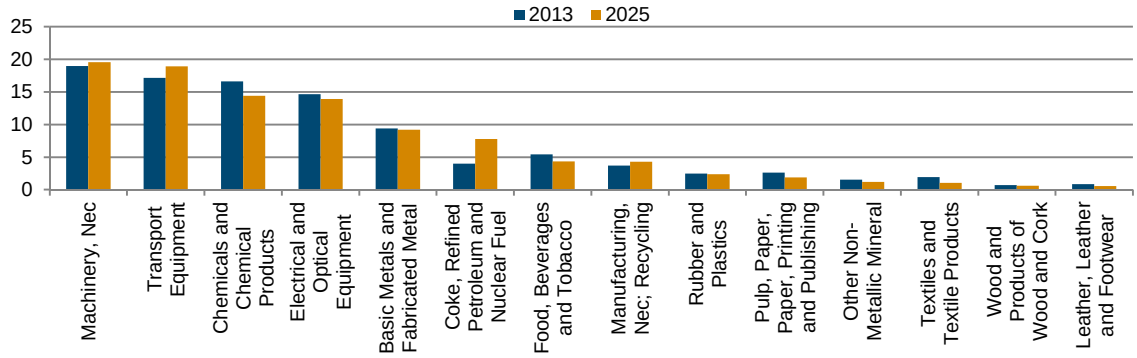
Source: Authors' calculations.

Figure 4.13 / Indicators based on gravity scenario for EU-28, in %

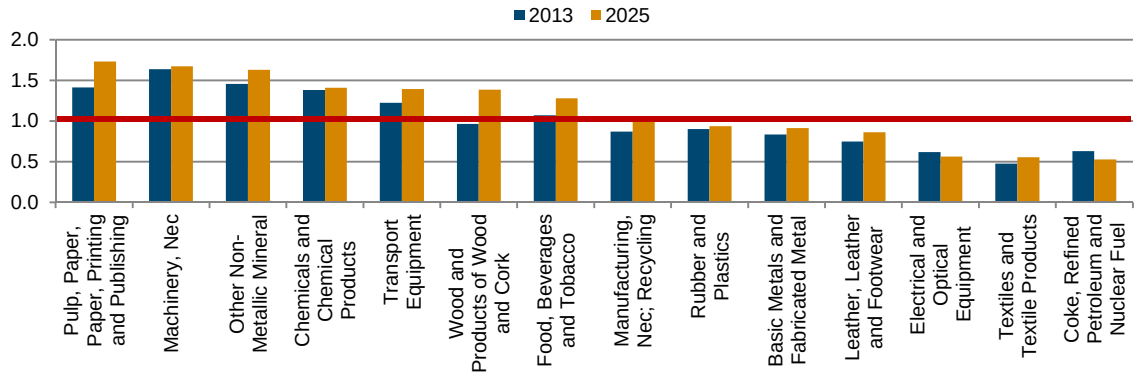
Market shares



Export structure



Revealed comparative advantages



Note: RCAs based on fitted values; industries ranked according to values in 2025.
Source: Authors' calculations.

Export indicators for the EU-28 are summarised in Figure 4.13. With respect to the evolution of RCAs, the EU-28 would again be expected to gain RCAs in food, beverages and tobacco, pulp and paper, chemicals and transport equipment, where it would successfully strengthen its comparative advantages. In wood and wood products, the results again suggest that revealed comparative advantage could shift above 1. The results also suggest, however, that the EU-28 is losing its RCA in machinery, though the level of RCA remains above 1 (indicating a still existing, though declining, specialisation), and that there will be a further loss in electrical and optical equipment. However, though these trends are qualitatively similar to those in the trend analysis, the predicted shifts are much less pronounced.

Scenarios for EU Member States

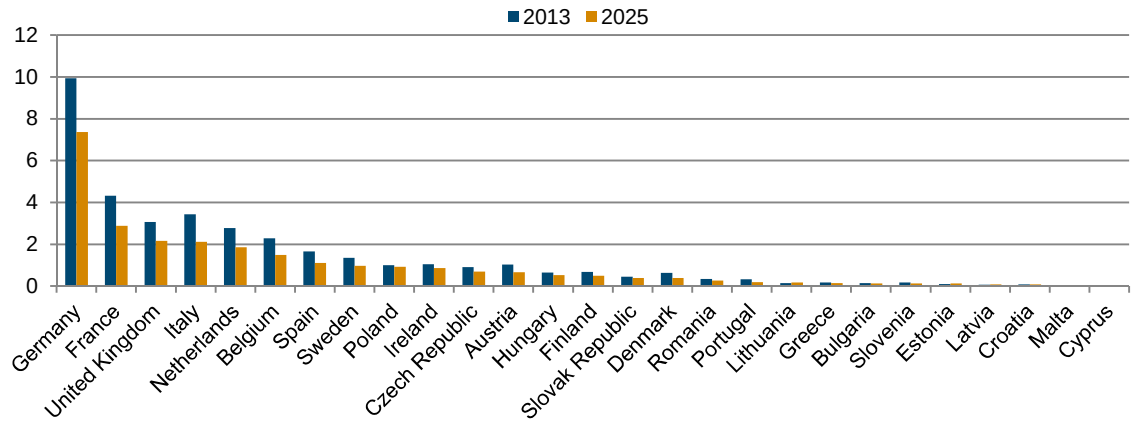
As above, a scenario is calculated based on the results of the gravity model including individual EU Member States (and therefore intra-EU-28 trade). The growth rates of the explanatory variables are presented in Table 4.9.

Table 4.9 / Growth rates underlying scenario calculations

	GDP	Population	Human capital index	Capital-output ratio
Austria	2.1	0.4	0.4	0.9
Belgium	1.9	0.4	0.3	2.4
Bulgaria	2.4	-0.7	0.3	1.3
Cyprus	2.9	1.4	0.2	1.3
Czech Republic	2.8	0.1	0.3	0.5
Germany	1.4	0.0	1.1	1.1
Denmark	1.3	0.4	0.1	2.3
Spain	2.5	1.0	0.9	3.9
Estonia	4.5	-0.5	0.6	1.7
Finland	2.7	0.3	0.4	0.2
France	1.6	0.6	0.8	2.6
United Kingdom	2.2	0.5	0.4	1.9
Greece	1.9	0.4	0.8	0.9
Croatia	2.6	-0.4	0.4	1.9
Hungary	2.2	-0.2	0.5	3.0
Ireland	4.8	1.4	0.4	1.1
Italy	0.8	0.4	0.5	1.6
Lithuania	4.4	-0.6	0.7	2.2
Luxembourg	3.6	1.5	0.3	1.1
Latvia	4.2	-0.7	0.6	1.1
Malta	2.5	0.5	0.7	4.1
Netherlands	2.1	0.5	0.2	2.2
Poland	4.3	0.0	0.3	-2.2
Portugal	1.6	0.3	0.7	3.6
Romania	2.5	-0.4	0.3	2.8
Slovak Republic	4.2	0.1	0.0	-1.3
Slovenia	3.0	0.2	0.2	1.6
Sweden	2.7	0.4	0.3	-0.3

Source: PWT 8.0; authors' calculations.

Figure 4.14 / EU Member States' market shares (gravity scenario), in %

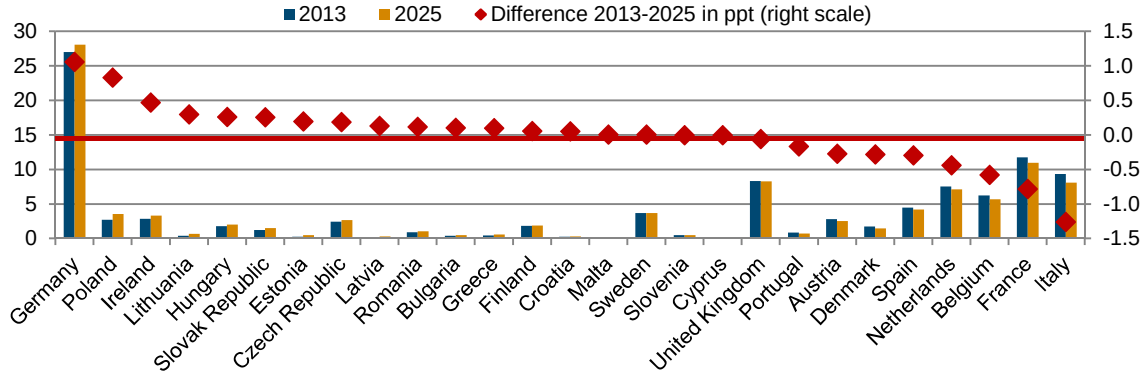


Source: BACI; PWT 8.0; authors' calculations.

The overall market shares (for total manufacturing exports) are presented in Figure 4.14. Unlike in the trend scenario, market shares decline for all EU-28 Member States.

Finally, Figure 4.15 presents the developments in the contribution of individual EU Member States' exports to total EU exports (including intra-EU trade). The scenario suggests that the ongoing geographical concentration continues, with countries like Germany, Poland, Ireland, the Baltics countries and Eastern European countries gaining share. A number of other countries, particularly Italy and France, lose share.

Figure 4.15 / EU Member States' shares in EU exports (scenario based on gravity approach), in %

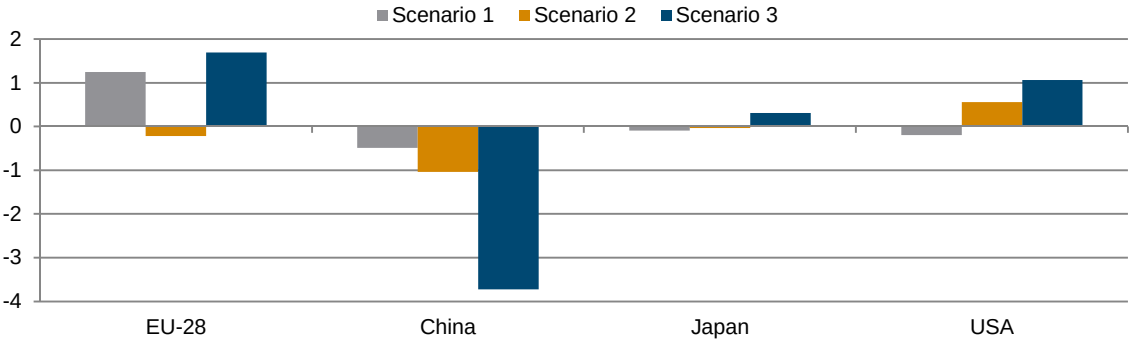


Source: BACI; PWT 8.0; authors' calculations.

Alternative scenarios and robustness checks

The above results are based on the specific assumptions about future developments concerning the explanatory variables, as presented in Table 4.6. To relax these assumptions in this section, three scenarios are presented that provided results for alternative developments. In the first scenario, it is assumed that the growth rates for the EU-28 variables for GDP, human capital and capital intensity increase by 20%. In scenario 2, these growth rates are assumed to be 20% higher for all countries except the EU-28 and China. And finally, in scenario 3, the growth rates for China are assumed to be 20% lower than those in Table 4.6, in line with other studies pointing towards a somewhat diminished dynamics in China.

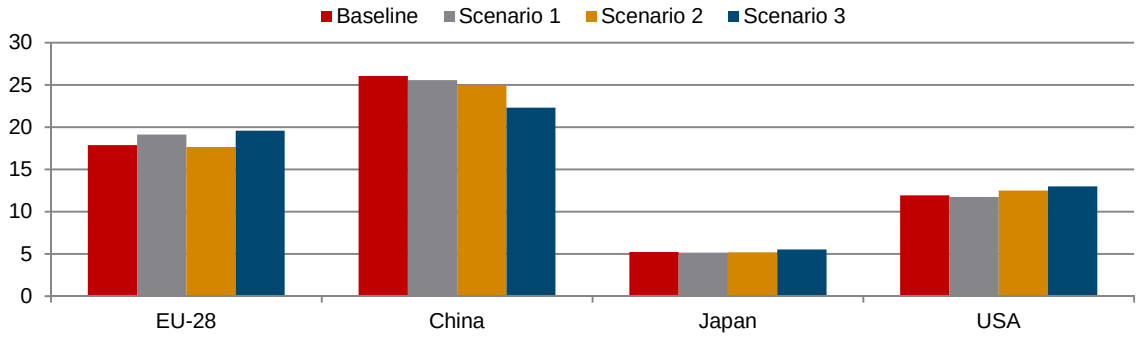
Figure 4.16 / Deviations in market shares from benchmark, in percentage points



Source: Authors' calculations.

Figure 4.16 presents the results as deviations in the 2025 market shares from the benchmark scenario. In the first scenario (higher growth dynamics in the EU-28) the EU-28 would increase its market share by about 1ppt compared to the benchmark, whereas China would lose about 0.5ppt and the US would lose only a minor share. In scenario 2, the US would gain about 0.5ppt market share, as compared to the benchmark, with China losing about 1ppt; in this case the EU-28 is hardly affected. Finally, in the scenario with a lower growth dynamics in China, the EU-28 would gain more than 1.5ppt market share, as compared to the benchmark scenario, and the US would gain about 1ppt. Japan would also gain slightly, but only less than 0.5ppt. China would lose world market share by about 3.5ppt as compared to the benchmark scenario.

Figure 4.17 / World market shares in manufacturing exports in 2025, in %



Source: Authors' calculations.

Figure 4.17 summarises the results concerning world market shares in 2025 for the baseline and the three alternative scenarios. These results suggest that the EU-28's world market shares in 2025 would be between 18% and almost 20%, and those for the US between 12% and 13%; meanwhile those for Japan do not depend very much on the different scenarios, at about 5%. The market shares for China range between 26% in the baseline scenario to 22% in scenario 3 (assuming diminished growth dynamics in China).

Table 4.10 / Export performance indicators for EU-28, deviations from baseline in 2025 in percentage points

	Market shares			Export structure			RCAs		
Scenario	1	2	3	1	2	3	1	2	3
Food, Beverages and Tobacco	0.3	-0.6	0.4	-0.3	0.0	0.0	-0.1	0.0	-0.1
Textiles and Textile Products	0.1	0.0	0.5	-0.1	0.0	0.0	0.0	0.0	0.0
Leather, Leather Products and Footwear	0.4	0.3	0.9	0.0	0.0	0.0	0.0	0.0	0.0
Wood and Products of Wood and Cork	1.0	0.5	1.2	0.0	0.0	0.0	0.0	0.0	-0.1
Pulp and Paper, Printing and Publishing	1.4	-1.0	1.5	0.0	0.0	0.0	0.0	0.0	-0.1
Coke, Refined Petroleum and Nuclear Fuel	-0.2	0.9	1.7	-0.7	0.8	-0.1	0.0	0.1	0.0
Chemicals and Chemical Products	1.4	-1.1	1.3	-0.1	-0.4	0.1	0.0	0.0	-0.1
Rubber and Plastics	1.0	-0.1	1.4	0.0	0.0	0.0	0.0	0.0	0.0
Other Non-Metallic Mineral	1.3	-0.1	1.9	0.0	0.0	0.0	0.0	0.0	0.0
Basic Metals and Fabricated Metal	0.9	-0.4	1.0	-0.2	0.2	-0.1	0.0	0.0	0.0
Machinery, nec	2.8	-0.7	3.2	0.8	-0.5	0.1	0.0	0.0	0.0
Electrical and Optical Equipment	1.0	-0.1	1.3	0.2	-0.2	0.0	0.0	0.0	0.0
Transport Equipment	2.2	-1.2	0.8	0.6	-0.1	0.1	0.0	-0.1	-0.1
Manufacturing, nec; Recycling	0.7	0.7	1.0	-0.2	0.2	-0.1	0.0	0.1	0.0

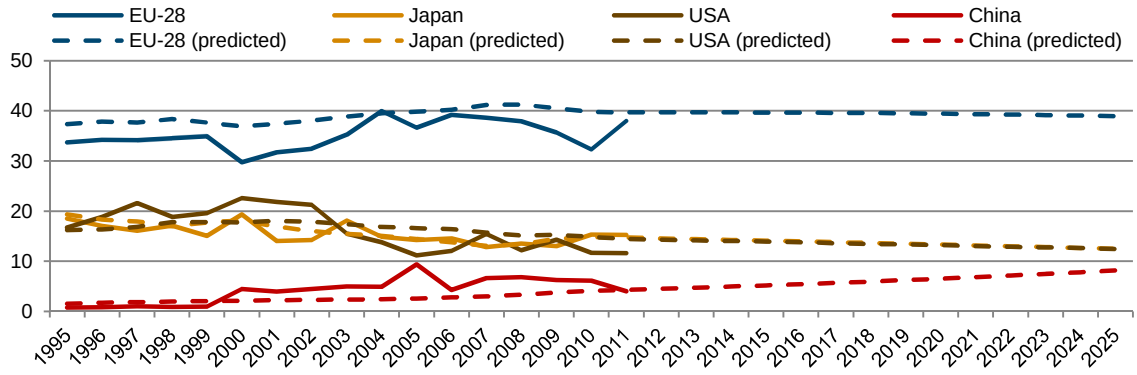
Source: Authors' calculations.

Table 4.10 presents the outcomes of the three scenarios with respect to individual industries for the EU-28. Specifically the table shows the deviation from the baseline in the 2025 export performance indicators. Concerning market share and export structures, those industries most affected are machinery and transport equipment; larger deviations from the benchmark are also observed for chemicals, other non-metallic mineral products and pulp and paper. However this does not have a significant impact on RCAs for the EU-28.

Scenarios for high unit-value segments

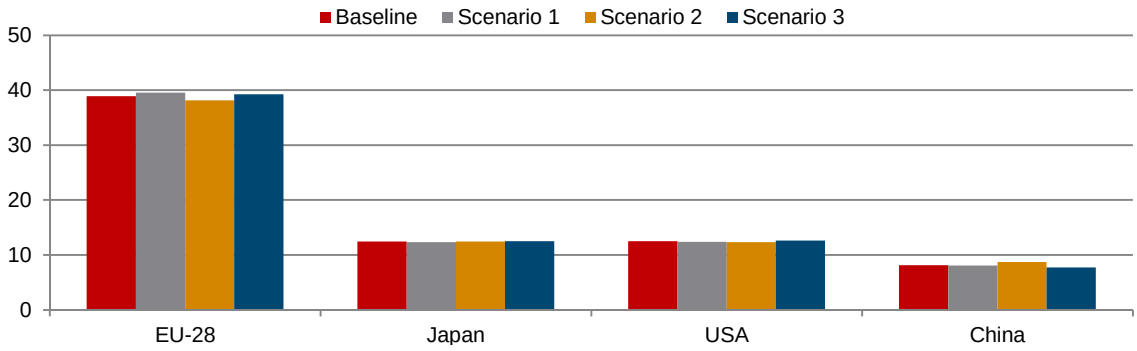
Now the possible changes in market share in the high unit-value segments are presented, based on the gravity approach. Figure 4.15 shows the evolution in the world market shares in goods that belong to the high unit-value segment. The results suggest that for the EU-28, the market share in this segment is expected to remain fairly stable between 2013 and 2025, at about 40%. This needs to be seen in relation to the predicted overall evolution of market shares, as presented in Figure 4.12: these are expected to decline from about 25% to 18%. China is expected to increase its market share in this segment to about 8% in 2025, which seems to be mostly at the expense of the market shares of Japan and the USA: for those countries, further small declines are expected, with a final figure of about 12 - 13% in 2025.

Figure 4.18 / World market shares in high unit-value segment, in %



Source: BACI; PWT 8.0; authors' calculations.

Figure 4.19 / World market shares in high unit-value segment in scenarios 1–3 in 2025, in %



Source: BACI; PWT 8.0; authors' calculations.

These developments in world market share in the high unit-value segment are very robust according to the three scenarios as outlined above (see Figure 4.16).

The evolution of the market shares will, however, differ across individual industries, as presented in Table 4,11. Some industries are expected to face a significant increase between 2011 and 2025: the market share in wood and machinery might increase by more than 10ppt during this period. However, some other individual industries could face a steep decline in their market share in the high unit-value segments, particularly the electrical and optical equipment industry (-5.2ppt) due to a breakthrough by China (+15.6ppt), but also basic metals and fabricated metal (-7ppt). In 2025, the industries for which the EU-28 is expected to have the larger market shares in the high unit-value segments are leather and footwear (64.2%), transport equipment (62%), chemicals (41%), machinery (40.4%) and pulp, paper and publishing (42.6%).

Table 4.11 / Export performance indicators in 2025 and difference from 2013 in percentage points

Market shares in 2025

	Market share (in %)			
	EU-28	China	Japan	USA
Food, Beverages and Tobacco	32.6	3.7	2.9	12.2
Textiles and Textile Products	50.0	7.5	11.5	6.7
Leather, Leather Products and Footwear	64.2	1.5	1.8	5.2
Wood and Products of Wood, etc.	32.1	6.7	0.3	3.4
Pulp and Paper, Printing and Publishing	42.6	1.7	9.2	27.9
Coke, Refined Petroleum, etc.	15.5	0.7	1.5	1.9
Chemicals and Chemical Products	41.0	2.8	11.7	11.7
Rubber and Plastics	27.3	1.7	44.1	13.0
Other Non-Metallic Mineral	36.2	3.5	24.0	14.1
Basic Metals and Fabricated Metal	24.5	4.6	13.9	8.0
Machinery, nec	40.4	2.5	30.9	11.1
Electrical and Optical Equipment	25.9	7.1	13.3	13.6
Transport Equipment	62.0	1.3	11.2	13.0
Manufacturing, nec; Recycling	27.7	12.5	9.1	11.8

Difference 2013–25

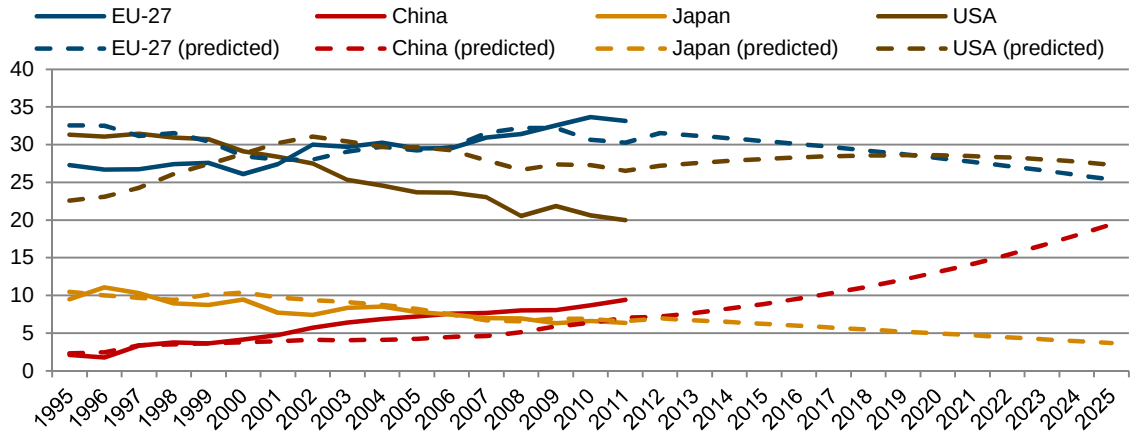
Food, Beverages and Tobacco	4.9	-0.3	1.4	-2.1
Textiles and Textile Products	-4.2	4.2	-0.2	1.5
Leather, Leather Products and Footwear	-1.7	4.3	1.5	1.9
Wood and Products of Wood, etc.	10.0	5.0	1.0	4.4
Pulp and Paper, Printing and Publishing	4.3	-0.4	1.2	-5.7
Coke, Refined Petroleum, etc.	30.9	15.2	-0.2	1.9
Chemicals and Chemical Products	-4.7	2.4	-0.2	0.4
Rubber and Plastics	0.8	-0.2	-11.3	7.6
Other Non-Metallic Mineral	11.1	2.4	-0.4	-5.4
Basic Metals and Fabricated Metal	-7.0	-0.9	-4.9	1.0
Machinery, nec	10.3	11.2	-13.5	-4.1
Electrical and Optical Equipment	-5.2	15.6	-5.1	-0.9
Transport Equipment	-3.1	2.6	-6.8	-2.7
Manufacturing, nec; Recycling	0.7	1.3	-3.9	1.5

Source: BACI; PWT 8.0; authors' calculations.

4.4. SCENARIOS BASED ON GRAVITY APPROACH – SERVICES

The developments in world market share for services exports, based on the gravity model, are presented in Figure 4.20. However, the model does not seem to predict the 2011 market share of the US properly, as its world market share based on the fitted values is about 6–7ppt above the actual one. Nonetheless, as with the trend scenario, the model predicts an increase in the Chinese market share to about 20% (as compared to 25% in the model assuming exponential trends), and a decline in the EU-27 market share to about 25%, which is in range with the value from the exponential trend model (28%). A big difference is observed for the US, as the gravity model predictions would suggest a market share for it of about 28% and rather stable (though one has to keep in mind that the starting value is predicted at a much higher level). This is much larger than the prediction from the exponential model, where the US market share declines to only about 10%.

Figure 4.20 / Scenario of world market shares in services (based on gravity model), in %



Source: Authors' calculations.

Table 4.12 provides results based on gravity modelling for individual service industries. However, these need to be interpreted with caution, as the model does not predict some starting values very accurately. Thus only discussing broad trends, one finds that the EU-27 would lose market share in almost all service industries with the exception of post and telecommunications and real estate activities, though the decline would be from rather large market shares in 2011. On the other hand, China would be expected to gain market share in almost all service industries, whereas the dynamics for Japan is much less pronounced. For the US, one observes a rather heterogeneous pattern across service industries. Concerning the EU-27 export structure, this would be expected to shift towards the knowledge-intensive business services, particularly renting and other business services.

Table 4.12 / Export performance indicators in 2025 and difference from 2013 in percentage points

Indicator in 2025

	Market shares				Export structure				RCA			
	EU-28	China	Japan	USA	EU-28	China	Japan	USA	EU-28	China	Japan	USA
Sale, maintenance and repair	22.9	9.7	1.2	10.7	0.9	0.0	0.0	0.0	3.2	0.0	0.1	0.0
Wholesale trade	9.9	49.2	1.6	2.9	15.1	1.9	62.3	73.4	0.4	0.1	1.8	2.1
Retail trade	15.4	54.9	0.3	2.2	3.9	1.0	2.6	0.0	0.8	0.2	0.5	0.0
Hotels and Restaurants	24.8	25.7	0.2	6.1	0.8	2.6	4.3	0.0	0.6	1.9	3.0	0.0
Inland Transport	31.0	18.7	3.4	13.4	1.2	0.4	1.8	1.6	0.4	0.1	0.6	0.5
Water Transport	9.4	2.3	2.8	9.1	5.0	1.8	5.9	1.5	1.7	0.6	2.0	0.5
Air Transport	25.2	17.7	5.3	13.9	2.7	1.4	6.5	2.6	1.0	0.5	2.5	1.0
Other Transport Activities	16.7	36.7	6.5	13.3	0.6	0.2	0.9	1.5	0.8	0.2	1.1	1.8
Post and Telecommunications	29.1	35.6	6.8	8.1	0.7	2.5	0.8	0.3	0.6	2.0	0.6	0.3
Financial Intermediation	16.3	22.5	6.4	6.5	14.5	0.6	3.5	10.6	2.0	0.1	0.5	1.4
Real Estate Activities	29.9	33.9	6.8	12.0	0.2	0.0	0.0	0.0	0.6	0.0	0.0	0.1
Renting and Other Business Activities	10.0	46.3	4.4	11.4	54.5	87.5	11.5	8.4	1.4	2.2	0.3	0.2
Total services	25.4	19.4	3.7	27.3								

Difference from 2013

	Market shares				Export structure				RCA			
	EU-28	China	Japan	USA	EU-28	China	Japan	USA	EU-28	China	Japan	USA
Sale, maintenance and repair	-59.3	9.7	0.9	10.1	-0.7	0.0	0.0	0.0	0.6	0.0	0.0	0.0
Wholesale trade	-10.6	47.0	-9.8	-43.2	-6.9	-7.9	5.6	17.2	-0.2	-0.2	0.1	0.4
Retail trade	-14.8	47.4	-3.3	2.1	-0.4	-3.4	0.1	0.0	-0.2	-0.8	0.0	0.0
Hotels and Restaurants	6.9	22.6	-3.7	-9.6	-0.3	-5.3	-0.1	-0.1	0.1	-1.2	1.4	0.0
Inland Transport	-23.9	11.7	-9.0	3.2	-2.1	-1.9	-1.5	-1.7	-0.2	-0.3	0.0	0.0
Water Transport	-18.5	-7.6	-6.7	-20.2	-8.0	-4.9	-7.7	-1.2	-0.1	-0.3	0.1	0.1
Air Transport	-4.5	12.8	-1.4	-22.5	-1.0	-3.9	0.7	-1.8	0.1	-0.7	1.1	0.0
Other Transport Activities	3.5	16.9	4.7	-9.4	-0.9	-0.8	-0.7	-0.7	-0.2	-0.4	0.1	0.5
Post and Telecommunications	20.0	35.6	6.7	4.7	0.0	-1.8	0.4	-1.0	0.2	-0.6	0.4	-0.5
Financial Intermediation	-24.3	6.3	4.5	-6.8	1.6	-0.2	-0.3	-5.9	0.7	0.0	0.1	-0.2
Real Estate Activities	16.0	10.6	-4.4	11.0	-0.1	0.0	0.0	-0.1	0.3	0.0	0.0	0.0
Renting and Other Business Activities	-30.3	45.7	1.9	-34.0	19.0	30.1	3.6	-4.7	0.1	0.1	0.0	-0.3
Total services	-5.8	11.7	-3.0	-0.2								

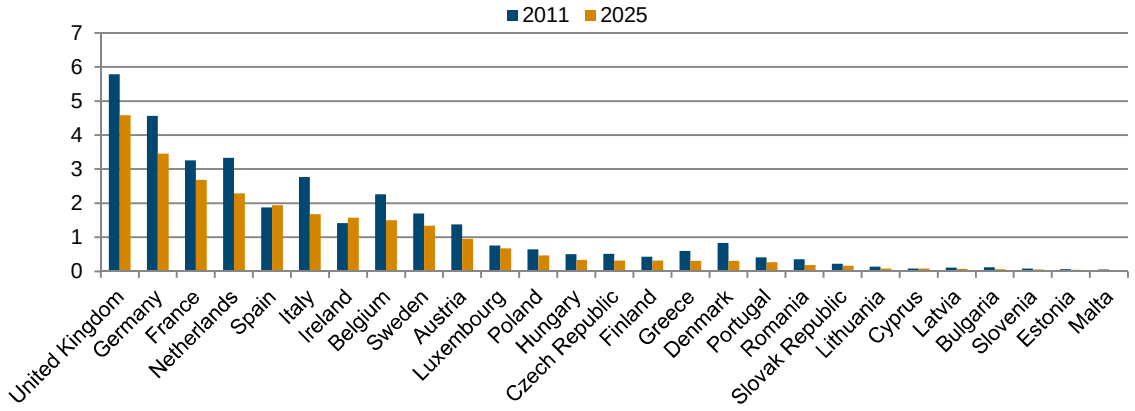
Source: Authors' calculations.

EU Member State level

The overall market shares (for total manufacturing exports) are presented in Figure 4.21. Unlike the trend scenario, market share declines for all EU-27 Member States.

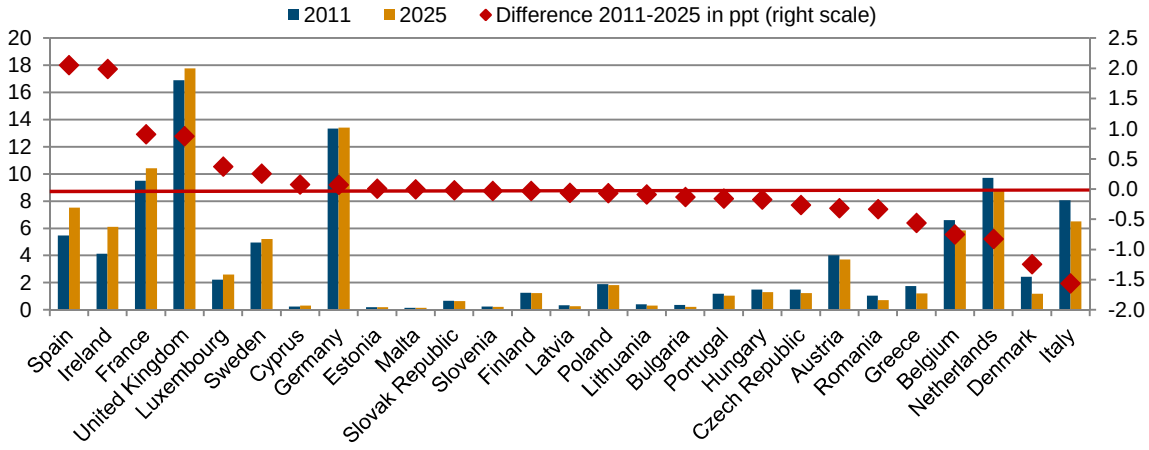
Finally, Figure 4.22 resents developments in the contribution of individual EU Member States' exports to total EU exports (including intra-EU trade). The scenario suggests that the ongoing geographical concentration continues, with countries like Germany, Poland, Ireland, the Baltic countries and Eastern European countries gaining share. A number of other countries, particularly Italy and France lose share.

Figure 4.21 / EU Member States' shares in EU exports (scenario based on gravity approach), in %



Source: WIOD; PWT 8.0; authors' calculations.

Figure 4.22 / EU Member States' shares in EU exports (gravity scenario)



Source: BACI; PWT 8.0; authors' calculations.

4.5. SUMMARY OF SCENARIOS

These results suggest that – mostly due to the dynamics in emerging countries, and particularly China – the share of EU exports in total world exports will further decline. A simple trend analysis based on exponential growth rates of gross exports (excluding intra-regional trade in the broad regions defined above) suggests that the EU share will decline to about 15% in 2025 (from about 25% in 1995). However, the EU will be able to maintain larger shares in world exports than the US (with a projected share of 10% in 2025) and Japan (with a projected share of less than 5%). This is mostly due to a significant increase in the Chinese market share to more than 35% in 2025 (from about 7% in 1995). However, this exercise, based on exponential trends, might exaggerate the Chinese developments, with their impressive growth rates since the mid-1990s and particularly in the new century. Applying a gravity approach, these trends in world market shares are somewhat dampened, so the predicted share of the EU in world gross exports is 18% in 2025; similarly the US is projected to again achieve a market share

of about 12% in 2025. Under this scenario, China is expected to reach a market share of about 27%. The decline in the Japanese market share is slightly less pronounced, with that country still showing a market share of 5% in 2025.

Concerning specialisation patterns, the trend scenarios point towards an intensification along already existing comparative advantages, with the (by definition) opposing trend in those industries in which the EU has already recently displayed a comparative disadvantage. Important industries in the former group are transport equipment, chemicals and chemical products, pulp and paper, printing and publishing, and also food and beverages. Only the machinery industry shows a decline in revealed comparative advantage, though according to the trend scenario it retains a comparative advantage in 2025 (i.e. an RCA larger than 1). An important deepening of the revealed comparative disadvantage (i.e. an RCA of less than 1 becomes even smaller) is predicted for electrical and optical equipment. These trends are, however, much less pronounced when the gravity approach is applied, including endowment variables. In this case, significant increases in already existing comparative advantages are only observed for pulp, paper and printing and for food and beverages (and, to a much lesser extent, for transport equipment). Other sectors which 'jump' from a comparative disadvantage to a comparative advantage are basic and fabricated metals and wood and wood products (similar to the outcome of the trend analysis). Again comparative disadvantages in the electrical and optical equipment industry become slightly more nuanced. In summary, then, these results are in line with the finding in Section 2.1 that the structure of revealed comparative advantage over time tends to be rather stable, with only a few exceptions, as found in the historical long-time series analysis above.

Considering various scenarios with respect to differentiated dynamics of GDP, human and physical capital endowment growth, the market shares for the EU-28 vary by about 1–2 percentage points. The most important changes are to be found by reducing growth rates in China by 20%, which results in an increase in the EU-28 market share of about 1.8 percentage points. There are, however, only small changes in the structure of exports and specialisation measured by RCAs observed across these scenarios.

Concerning the scenarios at EU Member State level, the trend scenarios differ qualitatively from the gravity approach. Whereas the former predicts increasing world market share for some of the EU-12 Member States, the latter would predict declining world market share for all countries. At the industry level, RCAs are again rather constant over time, with (again) the EU-12 members showing a slightly more dynamic pattern. This results in a further concentration of EU exports, with particularly Germany, Poland, Ireland, Hungary and other Central and Eastern European countries gaining share, whereas Italy, France, Belgium and the Netherlands lose some of their share of overall EU exports.

With respect to the high unit-value segment, scenarios suggest that the EU-28 will keep its high market share in this segment at about 40%, with relatively small changes also found for the other major economies. Particularly China is expected to increase its market share in the high unit-value segment to about 8% (compared to 27% for total trade).

Finally, concerning services, the trend scenario suggests that the EU market share will decline to 25% in 2025, with a much stronger decline predicted for the US (to 10%); China will increase its market share to about 25%. This is, however, considerably dampened when the gravity model is applied. It would suggest a market share for the EU and the US of slightly above 25%, and for China of 20%.

5. Sector diagnostics and GDP impact

The analysis presented so far has focused on EU-27 export structures and their past and potential future developments in total and for manufacturing (also for services, though the main focus is on manufacturing). In this section analysis shifts to the impact of this export performance on value-added creation and GDP growth. So far, exports have been considered in gross terms; however, recent literature on value-added trade points to the importance of considering the impact of production sharing and intermediates trade in order to arrive at more distinct figures for trade in value-added terms. In the next subsection, some indicators on value-added trade at industry level are presented and compared to the indicators based on gross exports. This is followed by a discussion of the value-added impact of exports and the sectoral dimensions of that. Finally, these aspects are summarised in a discussion concerning potential classifications of sectors.

5.1. ASPECTS OF SECTORAL VALUE-ADDED TRADE

Recently a sizeable literature has emerged concerning trade flows in value-added terms, rather than in gross terms. This takes account of the role of vertical specialisation, i.e. countries use foreign inputs, delivered as intermediate products, in order to manufacture their output, which is then used as further intermediates, absorbed as final demand or exported (where again it can be used as intermediates or finally absorbed). So far this study has considered exports in gross terms. In this section, we first provide a comparison of how these results would change if exports are considered in value-added terms; and, secondly, we highlight some important aspects when considering trade flows from the perspective of a value chain. A wide literature has considered value-added trade at the aggregate level; a smaller but increasing literature considers this in more detail at the industry level. In Box 5.1 various concepts and measures are summarised.

Domestic content of exports

This section provides an overview of important aspects of trade from the value-added perspective at the level of manufacturing industries. Starting with the first concept, Table 5.1 resents the shares of domestic value-added in the EU-27s extra-EU gross exports, together with a comparison of world market shares and RCA indicators.

Over time, the share of the domestic content of EU-27 extra-EU manufacturing gross exports declined from 91% to 82%, indicating the stronger integration of production and supply chains in the world economy. Expressed in world market share, the EU-27's share in gross exports declined from 25.7% to 20.9%, whereas in value-added terms the decline has been from 28.2% to 23.1%. Thus, while the decline in world market share has been slightly stronger, when expressed in domestic value-added content the world market share is about 2ppt higher. Similar developments are observed for the exports of individual manufacturing industries. In terms of revealed comparative advantage indicators, there is not much difference when we compare the gross and the value-added concept. The reason for this is that in value-added terms, all export flows are scaled down, and as these ratios are not too different

across industries and countries or regions this does not affect the relative shares used to calculate RCA.[13]

Table 5.1 / Indicators based on the domestic content of exports

	Share of domestic content in total exports		World market shares				Revealed comparative advantages			
			Gross exports		Domestic content		Gross exports		Domestic content	
	1995	2011	1995	2011	1995	2011	1995	2011	1995	2011
Food, Beverages and Tobacco	92.5	87.3	28.7	22.6	30.0	23.0	1.1	1.1	1.1	1.0
Textiles and Textile Products	92.7	85.5	17.1	10.0	19.9	11.1	0.7	0.5	0.7	0.5
Leather, Leather Products and Footwear	92.2	87.1	26.1	19.9	29.4	21.0	1.0	1.0	1.0	0.9
Wood and Products of Wood and Cork	93.0	88.0	14.2	22.4	15.6	23.2	0.6	1.1	0.6	1.0
Pulp and Paper, Printing and Publishing	93.4	88.5	28.7	35.9	30.3	37.0	1.1	1.7	1.1	1.6
Coke, Refined Petroleum and Nuclear Fuel	67.9	52.6	16.5	14.8	14.9	12.4	0.6	0.7	0.5	0.5
Chemicals and Chemical Products	91.1	82.0	32.9	26.0	35.5	28.3	1.3	1.2	1.3	1.2
Rubber and Plastics	92.2	85.0	26.9	20.8	29.6	22.7	1.0	1.0	1.0	1.0
Other Non-Metallic Mineral	93.7	87.3	40.3	27.4	41.9	28.8	1.6	1.3	1.5	1.2
Basic Metals and Fabricated Metal	90.5	82.4	21.5	18.6	23.6	20.6	0.8	0.9	0.8	0.9
Machinery, nec	92.4	86.1	39.9	33.4	42.0	36.8	1.6	1.6	1.5	1.6
Electrical and Optical Equipment	89.1	80.5	17.9	13.6	20.4	15.5	0.7	0.6	0.7	0.7
Transport Equipment	91.1	83.2	28.2	29.0	30.6	32.0	1.1	1.4	1.1	1.4
Manufacturing, nec; Recycling	92.6	87.2	26.1	12.6	29.0	14.9	1.0	0.6	1.0	0.6
Total manufacturing	91.0	82.3	25.7	20.9	28.2	23.1				

Source: WIOD; authors' calculations.

BOX 5.1 / INDICATORS OF INDUSTRY-SPECIFIC VALUE-ADDED EXPORTS: AN OVERVIEW

There are various ways of measuring and calculating industry-specific value-added exports. In this box, three different measures are identified. The following notation is used: $\mathbf{L}$ denotes the global NCxNC Leontief inverse (with *N* being the number of sectors and *C* the number of countries); $\mathbf{v}^c$ is a 1xNC vector of value-added coefficients with coefficients for countries other than *c* set to 0; similarly, $\mathbf{v}_i^c$ denotes a 1xNC vector of value-added coefficients with all items apart from the one for country *c* and industry *i* set to 0.

The first indicator measures the **domestic content of value added embodied in gross exports of industry *i***. This includes value added generated in other sectors of the economy (e.g. services). Formally this can be calculated as

$$\mathrm{DVAiX}_i^c = \mathbf{v}^c \, \mathbf{L} \, \mathbf{x}_i^c$$

where $\mathbf{x}_i^c$ is an NCx1 vector including gross exports of country *c* and sector *i* and 0's otherwise. Correspondingly the foreign content of a country's exports is $\mathrm{FVAiX}_i^c = \mathbf{v}^{-c} \, \mathbf{L} \, \mathbf{x}_i^c$.

A second indicator, **value-added exports of industry *i***, considers the value added generated in country *c* and industry *i* to satisfy final demand in all other countries (irrespective of which sector). Formally,

$$\mathrm{VAX}_i^c = \mathbf{v}_i^c \, \mathbf{L} \, \mathbf{f}^{-c}$$

[13] In an extreme case, if gross export flows across all countries and industries are scaled down by the same proportion, the RCAs would be unchanged.

where $\mathbf{f}^{-c}$ is an NCx1 vector including final absorption in all countries apart from *c* and in all sectors. The remaining part,
$\mathrm{VAD}_i^c = \mathbf{v}_i^c\ \mathbf{L}\ \mathbf{f}^c$ is the value added which is absorbed domestically. (Instead of using foreign absorption in the other countries, one might also use a country's total exports, which are then used further or are finally absorbed. Formally, that is calculated as $\mathrm{VAXX}_i^c = \mathbf{v}_i^c\ \mathbf{L}\ \mathbf{x}^c$. (When taking a single-country perspective, gross exports are part of final demand and no double-counting issue is present.)

Thirdly, one can consider the **value added generated in country *c* to satisfy final demand for a product finally delivered by sector *i*** in other countries or the domestic economy, respectively:

$$\mathrm{FGVC}_i^c = \mathbf{v}^c\ \mathbf{L}\ \mathbf{f}_i^{-c} \qquad \text{or} \qquad \mathrm{DGVC}_i^c = \mathbf{v}^c\ \mathbf{L}\ \mathbf{f}_i^c$$

Here $\mathbf{f}_i^{-c}$ denotes an NCx1 vector including final absorption of products of industry *i* in all countries (either domestically provided or imported) apart from *c*, and $\mathbf{f}_i^c$ is a similar vector with absorption of this product in country *c* (again either domestically provided or imported). Taken together, one arrives at the global value chain (GVC) income measure proposed in Timmer et al. (2013, 2014), i.e.

$$\mathrm{GVC}_i^c = \mathbf{v}^c\ \mathbf{L}\ \mathbf{f}_i$$

This is referred to as 'industry *i* global value chain income'.

The following relationships between these measures hold at the aggregate level:

$$\mathrm{EXP}^c = \sum_i \mathrm{DVAiX}_i^c + \sum_i \mathrm{FVAiX}_i^c$$

$\mathrm{VAX}^c = \sum_i \mathrm{VAX}_i^c$ (provides the measure of Johnson and Noguera (2012) to calculate the value-added export (VAX) ratio)

$$\sum_i \mathrm{DVAiX}_i^c = \sum_i \mathrm{VAXX}_i^c$$

$$\sum_i \mathrm{FGVC}_i^c = \mathrm{VAX}^c = \sum_i \mathrm{VAX}_i^c$$

$$\sum_i \mathrm{DGVC}_i^c = \sum_i \mathrm{VAD}_i^c$$

$$\mathrm{GDP}^c = \sum_i \mathrm{GVC}_i^c = \sum_i \mathrm{FGVC}_i^c + \sum_i \mathrm{DGVC}_i^c = \mathrm{VAX}^c + \mathrm{VAD}^c$$

Manufacturing industries' value-added exports

The second measure considers the value added generated in country *c* and industry *i* to satisfy final demand in any sector in other countries. Thus, whereas the domestic content discussed above includes the value added generated in other sectors to produce a given country's exports in a specific sector, this measure only considers value added created in this specific sector. (As an example, the value added generated in the textile industry to produce upholstery for car seats used in the car industry and absorbed in a car sold abroad falls within the value-added exports of the textile industry.)

Table 5.2 / Indicators based on industry value-added exports

	Share in industry GDP		World market shares: Value added		World market shares: Value-added exports		Revealed comparative advantages: Value added		Revealed comparative advantages: Value-added exports	
	1995	2011	1995	2011	1995	2011	1995	2011	1995	2011
Food, Beverages and Tobacco	9.5	15.1	27.6	20.2	27.0	20.6	0.9	0.9	1.0	0.9
Textiles and Textile Products	18.7	32.3	29.5	15.5	19.5	10.7	0.9	0.7	0.7	0.5
Leather, Leather Products and Footwear	24.6	41.1	40.1	21.8	29.2	20.7	1.3	0.9	1.0	0.9
Wood and Products of Wood and Cork	13.9	21.8	28.8	22.6	22.1	20.9	0.9	1.0	0.8	0.9
Pulp and Paper, Printing and Publishing	15.9	24.8	33.3	26.2	29.3	28.9	1.1	1.1	1.1	1.3
Coke, Refined Petroleum and Nuclear Fuel	13.8	25.2	20.0	14.5	15.1	11.0	0.6	0.6	0.5	0.5
Chemicals and Chemical Products	27.3	41.4	33.3	25.0	31.8	24.6	1.1	1.1	1.1	1.1
Rubber and Plastics	21.3	32.9	32.5	25.3	28.3	22.9	1.0	1.1	1.0	1.0
Other Non-Metallic Mineral	15.1	20.2	33.5	21.7	35.3	25.8	1.1	0.9	1.3	1.2
Basic Metals and Fabricated Metal	25.1	36.5	30.5	24.4	27.0	22.9	1.0	1.0	1.0	1.0
Machinery, nec	31.8	40.9	38.2	33.1	41.4	35.2	1.2	1.4	1.5	1.6
Electrical and Optical Equipment	29.7	42.3	28.2	19.2	21.9	16.4	0.9	0.8	0.8	0.7
Transport Equipment	25.5	37.6	31.1	28.8	28.6	28.4	1.0	1.2	1.0	1.3
Manufacturing, nec; Recycling	17.0	23.1	37.2	29.0	29.7	16.9	1.2	1.2	1.1	0.8
Total manufacturing	22.1	32.8	31.1	23.5	27.8	22.1				

Source: WIOD; authors' calculations.

Table 5.2 provides some indicators based on this measure. First, it gives a better indication of the dependency of an industry on total foreign final demand. For total manufacturing, this 'value added trade openness' increased from 22% in 1995 to 33% in 2011, again reflecting the fact that European manufacturing has become more internationalised, this time in terms of market access. This can also be seen for individual manufacturing industries, though to a varying degree, with increases ranging from 6ppt to almost 17ppt. The share of EU-27 manufacturing value added declined from 31.1% to 23.5%, whereas the share measured in terms of value-added exports fell by slightly less, from 27.8% to 22.1%. This pattern of the decline in terms of value-added exports being smaller than the decline in manufacturing value added is observed for all industries (with one exception), underpinning the argument that EU-27 manufacturing has performed relatively well in external markets.

Table 5.3 / Indicators based on gross exports

	Share in industry GDP		World market shares: Value added		World market shares: Value-added exports		Revealed comparative advantages: Value added		Revealed comparative advantages: Value-added exports	
	1995	2011	1995	2011	1995	2011	1995	2011	1995	2011
Food, Beverages and Tobacco	10.0	16.3	27.6	20.2	26.9	20.1	0.9	0.9	1.0	0.9
Textiles and Textile Products	22.2	37.1	29.5	15.5	20.0	10.8	0.9	0.7	0.7	0.5
Leather, Leather Products and Footwear	27.0	45.4	40.1	21.8	29.3	20.7	1.3	0.9	1.1	1.0
Wood and Products of Wood and Cork	16.5	27.6	28.8	22.6	22.6	21.3	0.9	1.0	0.8	1.0
Pulp and Paper, Printing and Publishing	19.3	31.5	33.3	26.2	28.7	28.6	1.1	1.1	1.1	1.3
Coke, Refined Petroleum and Nuclear Fuel	16.9	32.2	20.0	14.5	15.3	10.7	0.6	0.6	0.6	0.5
Chemicals and Chemical Products	35.1	53.7	33.3	25.0	31.6	23.7	1.1	1.1	1.2	1.1
Rubber and Plastics	25.9	43.1	32.5	25.3	28.0	22.8	1.0	1.1	1.0	1.1
Other Non-Metallic Mineral	17.4	24.4	33.5	21.7	34.6	25.3	1.1	0.9	1.3	1.2
Basic Metals and Fabricated Metal	31.4	49.4	30.5	24.4	26.1	22.3	1.0	1.0	1.0	1.0
Machinery, nec	35.5	49.9	38.2	33.1	40.7	35.2	1.2	1.4	1.5	1.6
Electrical and Optical Equipment	36.2	54.4	28.2	19.2	21.1	15.5	0.9	0.8	0.8	0.7
Transport Equipment	28.0	43.8	31.1	28.8	27.0	28.1	1.0	1.2	1.0	1.3
Manufacturing, nec; Recycling	18.6	27.9	37.2	29.0	29.7	17.2	1.2	1.2	1.1	0.8
Total manufacturing	26.2	41.1	31.1	23.5	27.1	21.6				

Source: WIOD; authors' calculations.

Concerning RCAs, the structures are again rather similar. RCAs in terms of value-added exports are higher in pulp and paper, other non-metallic mineral products and machinery.

Manufacturing industries' global value chain income

Table 5.4 presents some indicators based on the EU-27's GVC income in each industry. The share of GVC income due to demand for the related products in foreign markets increased again in all industries, with the exception of other non-metallic mineral products; for total manufacturing, the share increased from 23% to 34%. World market shares are again similar to those reported for the other indicators, and accordingly decreased in most industries (the exception being wood and wood products). More or less the same holds when we consider the foreign markets only, but with the declines being smaller in percentage point terms. This indicates that the EU performed relatively well in serving inputs for products sold abroad. The stronger decline in total GVC income results from both a stronger global integration of production (mirroring the increasing foreign content) and the faster-growing markets abroad. Finally, patterns and dynamics of revealed comparative advantages are again rather consistent with the patterns already described for the other indicators.

Table 5.4 / Indicators based on manufacturing industries' GVC income

			World market shares				Revealed comparative advantages			
	Share of foreign		Total		Foreign		Total		Foreign	
	1995	2011	1995	2011	1995	2011	1995	2011	1995	2011
Food, Beverages and Tobacco	15.1	23.8	29.4	21.4	25.8	22.0	0.9	0.9	1.0	1.0
Textiles and Textile Products	22.5	40.9	31.7	18.2	20.7	13.2	1.0	0.7	0.8	0.6
Leather, Leather Products and Footwear	26.8	47.0	39.2	21.7	27.6	20.7	1.2	0.9	1.0	1.0
Wood and Products of Wood and Cork	9.1	8.6	30.5	39.8	17.6	14.9	0.9	1.6	0.7	0.7
Pulp and Paper, Printing and Publishing	11.4	16.0	42.8	34.4	31.1	27.8	1.3	1.4	1.2	1.3
Coke, Refined Petroleum and Nuclear Fuel	13.4	19.5	24.6	18.2	10.1	6.8	0.8	0.7	0.4	0.3
Chemicals and Chemical Products	20.8	39.1	40.2	34.5	34.6	31.3	1.2	1.4	1.3	1.5
Rubber and Plastics	19.9	30.5	36.7	27.8	28.5	21.1	1.1	1.1	1.1	1.0
Other Non-Metallic Mineral	14.4	11.3	42.1	41.7	30.8	18.4	1.3	1.7	1.2	0.9
Basic Metals and Fabricated Metal	15.2	20.4	36.1	30.2	24.4	18.3	1.1	1.2	0.9	0.9
Machinery, nec	35.8	42.5	34.9	28.9	36.3	28.4	1.1	1.2	1.4	1.4
Electrical and Optical Equipment	34.3	48.0	26.3	19.3	21.8	16.5	0.8	0.8	0.8	0.8
Transport Equipment	29.0	41.3	33.7	29.7	29.2	26.6	1.0	1.2	1.1	1.3
Manufacturing, nec; Recycling	18.8	25.3	39.5	29.7	26.8	16.0	1.2	1.2	1.0	0.8
Total manufacturing	23.1	33.9	32.6	25.1	26.7	21.0				

Source: WIOD; authors' calculations.

5.2. EXPORTS, INCOME AND GROWTH

This section shows how manufacturing gross exports are linked to income and growth. We look at how much value added is created in an economy by exporting one unit of output of a given manufacturing sector. This question is therefore closely linked to Section 5.1 and the measure of the domestic content of the exports of a country's manufacturing industry. However, for this purpose the domestic content of the exports of a country's manufacturing industry is expressed relative to a country's GDP, thus providing an indication of how important these exports are for income creation. Furthermore, this

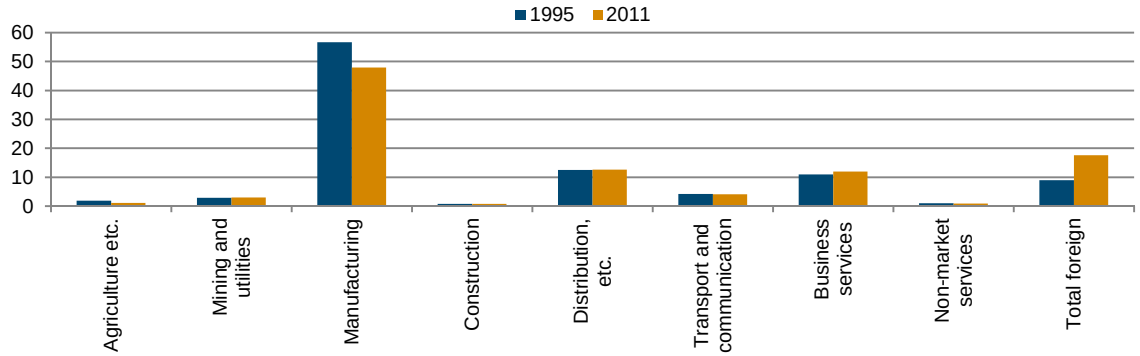
approach allows one to split the value added created due to exports to specific sectors of the economy, as outlined below.

Value-added multipliers and the structure of the value-added content of manufacturing exports

As a first step, Table 5.5 presents the so-called value-added multipliers, indicating how much value added is created when a unit of final output is sold (note that final output can be either domestic absorption or exports).[14] Interpreting the results in terms of gross exports, these figures indicate that for each unit (euro) of exports (or final absorption), between around EUR 0.80 and 0.90 of value added is created (with the exception of NACE 23 coke and refined petroleum, which is characterised by a large foreign component). The remaining part is due to the foreign inputs used in production which created the foreign value added.[15] Therefore, in terms of value-added creation, a very similar amount of total value added is created in the economy by a unit of exports. When we consider how much value added is created in the individual sectors, these multipliers are lower because of the structure of domestic vertical integration. The multipliers are particularly low for food and beverages: this industry sources heavily from agriculture. It is further important to note that relatively large figures are observed for those activities that deliver services inputs. These values range between 0.1 and 0.14 across almost all manufacturing industries, indicating that for each unit of exports around EUR 0.30 on average is created in service sectors (including distribution, transport and communication and business services). Table 5.8 provides this information in a similar way for services exports.

A slightly different interpretation is provided in Table 5.7, which shows the structure of the value-added content of each industry's exports, i.e. it shows the value added created in a specific industry (as indicated in the rows of the table) by the exports of the specific industry, indicated in each column in terms of total value of exports (i.e. including the foreign value-added content) and in terms of the value-added content only. It is important to note that in all industries the value added created in the exporting sector itself accounts for less than 50% of the total domestic value added created in the economy. The only exception to this is basic and fabricated metals (NACE Rev. 1 industry 27t28), for which value added created in the industry account for 54% of the total domestic content of exports. Figure 5.1 presents this information for the total of manufacturing exports for 1995 and 2011.

Figure 5.1 / Structure of value-added content of EU-27 manufacturing exports



Source: WIOD; authors' calculations.

[14] Formally, this is calculated as $m_i^c = v^c \mathbf{L} \mathbf{1}_i^c$.

[15] Note that these numbers also indicate the domestic content of exports.

Table 5.5 / Value-added multipliers for EU-27 manufacturing industries, 2011

	15t16	17t18	19	20	21t22	23	24	25	26	27t28	29	30t33	34t35	36t37
Agriculture, etc.	0.11	0.01	0.01	0.07	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
Mining and utilities	0.03	0.03	0.02	0.03	0.03	0.10	0.03	0.03	0.07	0.04	0.02	0.02	0.02	0.02
Food, Beverages and Tobacco	0.32	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Textiles and Textile Products	0.00	0.42	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Leather, Leather Products and Footwear	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wood and Products of Wood and Cork	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Pulp and Paper, Printing and Publishing	0.01	0.01	0.01	0.01	0.46	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Coke, Refined Petroleum, etc.	0.00	0.00	0.00	0.00	0.00	0.17	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chemicals and Chemical Products	0.01	0.02	0.01	0.01	0.01	0.01	0.39	0.05	0.01	0.01	0.01	0.01	0.01	0.01
Rubber and Plastics	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.39	0.01	0.01	0.01	0.01	0.02	0.01
Other Non-Metallic Mineral	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.00	0.00	0.00
Basic Metals and Fabricated Metal	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.02	0.44	0.08	0.04	0.07	0.05
Machinery, nec	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.42	0.01	0.02	0.01
Electrical and Optical Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.02	0.40	0.02	0.01
Transport Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.33	0.00
Manufacturing, nec; Recycling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.38
Construction	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Distribution, etc.	0.16	0.16	0.17	0.13	0.13	0.08	0.13	0.13	0.12	0.11	0.11	0.11	0.14	0.14
Transport and communication	0.05	0.04	0.05	0.05	0.05	0.04	0.04	0.04	0.06	0.04	0.04	0.03	0.04	0.04
Business services	0.13	0.11	0.11	0.10	0.14	0.08	0.14	0.12	0.11	0.10	0.11	0.13	0.12	0.11
Non-market services	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Foreign countries	0.13	0.15	0.13	0.12	0.12	0.47	0.18	0.15	0.13	0.18	0.14	0.20	0.17	0.13
Total domestic manufacturing	0.39	0.49	0.49	0.48	0.51	0.22	0.46	0.50	0.49	0.51	0.56	0.50	0.49	0.53
Total domestic	0.87	0.85	0.87	0.88	0.88	0.53	0.82	0.85	0.87	0.82	0.86	0.80	0.83	0.87

Source: WIOD; authors' calculations.

Table 5.6 / Value-added multipliers for EU-27 service industries, 2011

	50	51	52	H	60	61	62	63	64	J	70	71t74
Agriculture, etc.	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mining and utilities	0.01	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.01	0.01	0.01	0.01
Low tech	0.01	0.01	0.02	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01
Medium-low tech	0.02	0.01	0.01	0.01	0.02	0.02	0.03	0.02	0.01	0.01	0.01	0.01
Medium-high and high tech	0.04	0.01	0.01	0.01	0.02	0.01	0.03	0.01	0.02	0.01	0.00	0.01
Construction	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.03	0.01
Sale, maintenance and repair	0.57	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00
Wholesale trade	0.03	0.56	0.01	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01
Retail trade	0.02	0.01	0.59	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01
Hotels and Restaurants	0.00	0.01	0.00	0.54	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
Inland Transport	0.02	0.03	0.01	0.01	0.56	0.03	0.02	0.06	0.01	0.00	0.00	0.01
Water Transport	0.00	0.00	0.00	0.00	0.00	0.41	0.00	0.00	0.00	0.00	0.00	0.00
Air Transport	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.01	0.00	0.00	0.00	0.00
Other Transport Activities	0.01	0.03	0.01	0.01	0.05	0.14	0.09	0.51	0.01	0.00	0.00	0.01
Post and Telecommunications	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.60	0.02	0.00	0.01
Financial Intermediation	0.02	0.03	0.03	0.02	0.03	0.02	0.02	0.03	0.02	0.67	0.03	0.02
Real Estate Activities	0.04	0.04	0.07	0.04	0.02	0.02	0.02	0.03	0.03	0.03	0.80	0.03
Renting and Other Business Activities	0.09	0.10	0.09	0.07	0.08	0.07	0.10	0.10	0.11	0.13	0.04	0.76
Non-market services	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Non-tradable market services	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
Foreign countries	0.07	0.08	0.06	0.07	0.10	0.19	0.19	0.10	0.08	0.07	0.03	0.06
Total domestic manufacturing	0.07	0.04	0.03	0.03	0.05	0.04	0.06	0.05	0.05	0.02	0.05	0.03
Total domestic	0.93	0.92	0.94	0.93	0.90	0.81	0.81	0.90	0.92	0.93	0.97	0.94

Source: WIOD; authors' calculations.

Table 5.7 / Structure of value-added content of manufacturing export (in % of domestic content of exports), 2011

	15t16	17t18	19	20	21t22	23	24	25	26	27t28	29	30t33	34t35	36t37	Total
Agriculture, etc.	12.5	0.9	1.4	8.4	1.2	0.3	0.4	0.7	0.3	0.3	0.2	0.2	0.3	1.0	1.4
Mining and utilities	3.1	3.1	2.1	3.1	3.3	18.3	4.1	3.6	8.5	4.7	2.4	2.2	2.6	2.6	3.6
Food, Beverages and Tobacco	37.0	0.4	2.1	0.5	0.3	0.3	0.6	0.3	0.2	0.2	0.2	0.2	0.2	0.3	3.1
Textiles and Textile Products	0.1	49.4	1.4	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.2	0.6	1.8
Leather, Leather Products and Footwear	0.0	0.2	45.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.6
Wood and Products of Wood and Cork	0.2	0.1	0.2	45.0	0.4	0.1	0.2	0.2	0.4	0.3	0.2	0.2	0.3	3.5	0.7
Pulp and Paper, Printing and Publishing	1.3	0.9	1.0	1.0	51.6	0.6	1.1	1.1	0.9	0.6	0.7	0.8	0.7	1.3	2.9
Coke, Refined Petroleum, etc.	0.4	0.4	0.3	0.5	0.3	32.6	1.1	0.6	0.6	0.4	0.3	0.3	0.3	0.4	1.5
Chemicals and Chemical Products	1.1	2.2	1.6	1.7	1.5	2.6	47.8	6.0	1.4	1.1	0.9	1.1	1.2	1.3	8.3
Rubber and Plastics	0.9	0.7	1.6	0.6	0.6	0.8	0.9	45.5	0.6	0.7	1.1	1.2	2.1	1.3	2.5
Other Non-Metallic Mineral	0.5	0.3	0.2	0.6	0.2	0.3	0.4	0.5	47.9	0.6	0.4	0.6	0.6	0.5	1.3
Basic Metals and Fabricated Metal	1.3	1.1	1.4	2.2	1.0	1.9	1.5	2.4	2.1	53.8	9.1	5.4	7.9	6.0	9.6
Machinery, nec	0.7	0.7	0.6	0.9	0.7	1.1	0.7	1.1	1.1	1.5	48.4	1.3	2.4	1.1	8.9
Electrical and Optical Equipment	0.4	0.4	0.4	0.4	0.5	0.8	0.6	0.6	0.5	0.8	2.1	49.5	2.1	0.7	8.1
Transport Equipment	0.3	0.3	0.3	0.3	0.2	0.4	0.3	0.4	0.3	0.4	0.7	0.5	40.1	0.5	7.7
Manufacturing, nec; Recycling	0.2	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.3	1.2	0.4	0.3	0.5	43.2	1.5
Construction	1.0	1.0	0.9	1.1	0.9	1.3	0.9	0.9	1.4	1.1	0.9	0.9	1.0	1.0	1.0
Distribution, etc.	17.8	18.6	19.9	15.1	14.8	15.5	15.6	15.5	13.3	13.9	13.3	14.0	16.6	16.1	15.3
Transport and communication	5.6	5.2	6.0	5.8	5.6	7.1	5.0	5.0	6.5	4.8	4.3	4.3	4.9	5.0	5.0
Business services	14.4	12.9	12.5	11.2	15.3	14.4	16.9	13.9	12.7	12.4	13.3	15.6	14.8	12.5	14.5
Non-market services	1.1	0.9	0.8	1.0	1.0	1.1	1.3	1.0	1.0	0.9	0.9	1.1	1.1	0.9	1.1
Total domestic	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total domestic manufacturing	44.4	57.4	56.4	54.2	57.8	42.0	55.7	59.4	56.4	61.9	64.6	61.6	58.7	60.9	58.2

Source: WIOD; authors' calculations.

Table 5.8 / Structure of value-added content of services export (in % of domestic content of exports), 2011

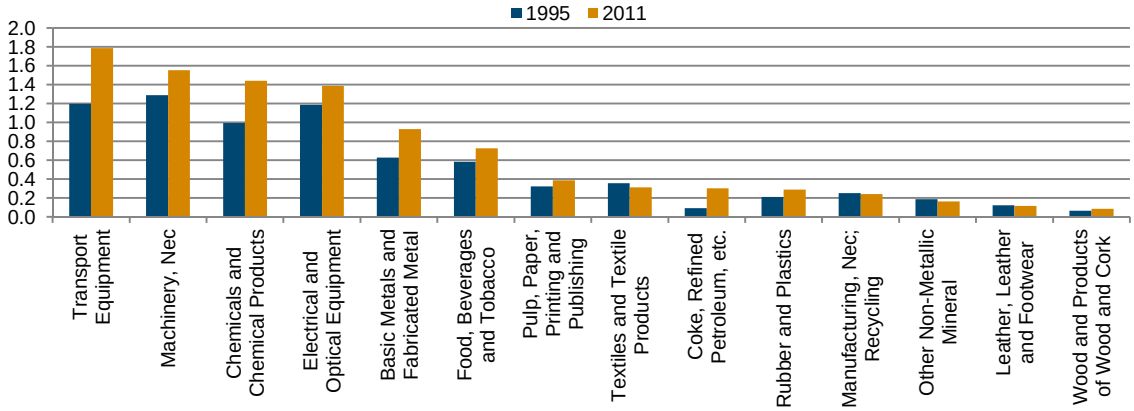
	50	51	52	H	60	61	62	63	64	J	70	71t74	Total
Agriculture, etc.	0.2	0.4	0.4	2.7	0.2	0.4	0.3	0.3	0.1	0.1	0.1	0.1	0.3
Mining and utilities	1.5	1.4	1.9	2.0	2.2	1.6	2.3	1.7	1.4	0.8	0.9	0.9	1.3
Low tech	1.2	1.5	1.6	5.7	0.9	1.2	1.2	1.3	1.2	1.0	0.4	1.4	1.3
Medium-low tech	2.5	1.6	1.2	1.4	2.8	2.2	3.7	1.9	1.4	0.6	0.8	0.9	1.4
Medium-high and high tech	3.8	1.4	1.1	1.3	2.0	1.7	3.2	1.6	2.2	0.6	0.5	1.1	1.3
Construction	1.0	0.9	1.1	1.0	0.9	1.0	1.0	2.0	1.8	0.9	3.4	0.9	1.0
Sale, maintenance and repair	61.2	0.7	0.7	1.0	1.8	0.7	0.8	1.0	0.6	0.4	0.2	0.5	1.2
Wholesale trade	2.8	61.2	1.6	3.5	2.0	2.1	2.7	1.9	1.7	0.8	0.6	1.3	7.6
Retail trade	1.8	1.2	62.8	3.1	1.4	1.3	1.8	1.2	1.4	0.6	0.4	0.8	2.7
Hotels and Restaurants	0.5	0.7	0.5	58.2	0.6	0.8	1.3	1.6	0.4	0.4	0.1	0.5	2.0
Inland Transport	1.9	3.2	1.4	1.3	62.1	3.2	2.6	6.6	1.0	0.5	0.2	0.7	6.4
Water Transport	0.1	0.1	0.0	0.0	0.1	50.2	0.2	0.4	0.0	0.0	0.0	0.0	6.4
Air Transport	0.1	0.2	0.1	0.1	0.2	0.4	45.6	0.9	0.2	0.2	0.0	0.1	2.4
Other Transport Activities	1.5	3.2	1.1	0.9	5.5	17.0	10.9	56.6	1.0	0.5	0.2	0.6	6.2
Post and Telecommunications	1.3	1.5	1.5	1.1	1.1	1.0	1.4	1.5	65.8	2.5	0.5	1.5	3.3
Financial Intermediation	2.5	3.1	2.9	2.3	2.9	2.4	3.0	2.8	2.6	71.2	3.4	2.2	18.4
Real Estate Activities	4.0	4.4	7.7	4.8	2.4	2.1	2.6	3.3	3.4	3.5	82.7	2.8	3.7
Renting and Other Business Activities	10.1	11.3	10.0	7.5	9.0	9.0	12.9	11.1	11.5	13.7	4.1	80.6	30.7
Non-market services	0.8	0.9	0.8	0.8	1.1	0.8	1.4	1.0	1.1	0.9	0.6	1.2	1.0
Non-tradable market services	1.1	1.1	1.4	1.4	0.9	0.9	1.2	1.3	1.3	0.9	0.7	1.8	1.2
Total domestic	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: WIOD; authors' calculations.

Exports contribution to GDP

These considerations finally lead to the question of how much extra-EU-27 gross exports in a specific manufacturing industry contribute to overall GDP of the EU-27. Figure 5.2 reports these figures, which are the domestic content of the extra-EU exports of the respective industry relative to GDP. Overall, manufacturing gross exports in 1995 contributed about 7.5% to GDP, increasing to 9.7% in 2011.

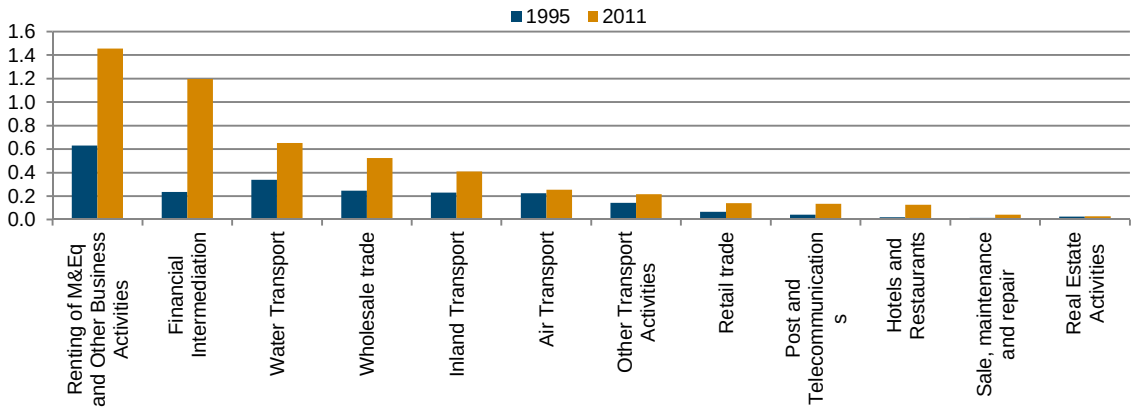
Figure 5.2 / Contribution of manufacturing extra-EU exports to GDP, in %



Source: WIOD; authors' calculations.

The most important industries in this respect are the transport equipment industry (1.8%), machinery (1.6%), chemicals and chemical products and electrical and optical equipment (both about 1.4%). The other industries contribute less than 1% of EU-27 GDP through their extra-EU exports. The importance of value added created through exports has increased over time for almost all industries, with just a few exceptions like textiles and clothing. These increases have been particularly strong for transport equipment (from 1.2% to 1.8%), chemicals and chemical products (from 1% to 1.4%). The contributions of exports in the machinery, basic and fabricated metals and electrical and optical equipment industries have increased by about 0.3ppt though from different levels.

Figure 5.3 / Contribution of services extra-EU exports to GDP, in %



Source: WIOD; authors' calculations.

When considering these numbers, it is again important to note that – as outlined above – the value added is created only partly in the industry actually doing the exporting; otherwise it is spread over a number of industries and – due to vertical integration within the EU – various countries, though to varying degrees.

Analogous information on services is presented in Figure 5.3. Whereas in 1995 services exported contributed about 2.2% to overall GDP, this had more than doubled to 5.2% in 2011. In 2011, renting and other business services and financial intermediation contributed by far the greatest share of services exports to GDP. These industries also experienced the largest increases in that respect.

5.3. SECTOR DIAGNOSTICS

In light of the results presented in this study (and the distinct characteristics of the industries), one question that arises in this context is: which sectors are in need of support or should be supported? In the following, various criteria are discussed which might allow us to classify sectors according to their relevance with respect to certain goals. The first set of indicators shows some industry-specific variables with respect to their (relative) performance; the second set reviews some of the indicators developed in the study; and the third set presents information concerning potential contributions to GDP growth.

Industry-performance parameters

First, a common taxonomy might be used to classify industries according to their technology intensity, which in most cases also relates to skills intensity. This would categorise chemicals, machinery, electrical and optical equipment, and transport equipment as medium-high to high-tech industries, which are also characterised by a high R&D and innovation intensity. In this context, however, it needs also to be noted that in all other industries there might be special activities which are also very R&D and innovation intensive (e.g. specialised functional clothing). This aspect has been captured in this study by considering the high unit-value segments in specific industries. Table 5.9 provides first the growth rates for labour productivity in the manufacturing sectors, with those industries that have significantly higher growth rates than total manufacturing being highlighted. This group of sectors (apart from coke and refined petroleum) includes chemicals, electrical and optical equipment, and transport equipment, i.e. the industries classified as high tech. The machinery and wood and wood products industries show labour productivity growth rates close to the manufacturing average. These are also the industries which, together with pulp and paper and coke and refined petroleum, pay above-average wages.

Table 5.10 provides similar information for the service industries considered. Labour productivity growth rates are generally lower than in manufacturing; these tend to be above average in wholesale trade, transport activities, post and telecommunications, but very low (and even slightly negative) in others.[16] The industries with above-average labour compensation are wholesale trade, air and water transport, other transport activities, plus financial intermediation and business services.

[16] There is an intrinsic problem in calculating productivity growth rates in services, as output is less well defined and price deflators are perhaps not very precise.

Table 5.9 / Performance parameters in manufacturing

	Taxonomy	Growth rates for value-added labour productivity 1995–2007	Labour compensation per employee* 1995	2011
Food, Beverages and Tobacco	Low tech	2.2	0.84	0.83
Textiles and Textile Products	Low tech	2.7	0.51	0.52
Leather, Leather Products and Footwear	Low tech	1.4	0.49	0.51
Wood and Products of Wood and Cork	Low tech	3.6	0.66	0.62
Pulp and Paper, Printing and Publishing	Low tech	2.7	1.14	1.06
Coke, Refined Petroleum, etc.	Medium-low tech	3.4	1.09	1.60
Chemicals and Chemical Products	Medium-high and high tech	4.6	1.48	1.51
Rubber and Plastics	Medium-low tech	3.1	1.07	0.93
Other Non-Metallic Mineral	Medium-low tech	3.3	0.97	0.92
Basic Metals and Fabricated Metal	Medium-low tech	2.5	1.05	0.99
Machinery, nec	Medium-high and high tech	3.6	1.11	1.19
Electrical and Optical Equipment	Medium-high and high tech	7.2	1.26	1.19
Transport Equipment	Medium-high and high tech	3.7	1.29	1.26
Manufacturing, nec; Recycling	Low tech	1.4	0.83	0.71
Total manufacturing		3.7		

Note: * Total manufacturing = 1.
Source: WIOD SEA; authors' calculations.

Table 5.10 / Performance parameters in services

	Taxonomy	Growth rates for value-added labour productivity 1995–2007	Labour compensation per employee 1995	2011
Sale, maintenance and repair	Distribution, etc.	1.1	0.89	0.88
Wholesale trade	Distribution, etc.	2.2	1.11	1.04
Retail trade	Distribution, etc.	1.3	0.72	0.71
Hotels and Restaurants	Distribution, etc.	-0.6	0.85	0.76
Inland Transport	Transport and communication	2.0	0.90	0.90
Water Transport	Transport and communication	11.0	0.93	1.17
Air Transport	Transport and communication	2.8	1.27	1.32
Other Transport Activities	Transport and communication	1.3	1.06	1.07
Post and Telecommunications	Transport and communication	6.6	1.00	0.93
Financial Intermediation	Business services	3.3	1.52	1.59
Real Estate Activities	Distribution, etc.	-0.3	0.88	0.97
Renting and Other Business Activities	Business services	-0.4	1.17	1.16
Total services		1.3		

Source: WIOD SEA; authors' calculations.

Indicators in terms of value-added creation and exports

Table 5.11 provides a summary of the indicators used throughout the study, capturing the specific characteristics of manufacturing industries. Considering aspects of value-added creation and growth, one might examine how much value added is created in each industry for producing its gross output. In Table 5.11 this is indicated in the second column by the value-added coefficients (i.e. value added

divided by gross output) for each manufacturing industry separately. These range from slightly higher than 0.20 (not considering coke and refined petroleum) in transport equipment to about 34 in pulp and paper, other non-metallic mineral, and machinery. However, this coefficient only indicates the extent to which the industry is vertically integrated, and therefore might be insufficient to account for the full amount of value added created in the production process. Concerning value added created in the production process in all production stages, it is more informative to consider, for example, the value-added multiplier presented in the next column. Here it turns out that the value added created in the EU-27 by the production of a unit (a euro) of final absorption is rather similar across industries, ranging from 0.80 in electrical and optical equipment (again not considering coke and petroleum) to 0.88 in wood and wood products and pulp and paper, closely followed by a range of other industries with a value-added multiplier of 0.87. This indicator (or more exactly, 1 minus the indicator) mostly captures the share of extra-EU sourcing of intermediates (expressed in value-added terms). Hence, less vertically integrated industries in the global context show a larger domestic value-added multiplier.

Similarly, consideration of the industries' contribution to GDP reflects not only the value added created by a unit of exports, but also the overall level of exports. Interpreting this as how much these industries' exports contribute to EU GDP, one finds that the industries characterised as medium-high to high tech are those that contribute the most.

Further, one might consider trade-related indicators and the forecasts examined in this study. Table 5.11 summarises the information on market shares, export structure and RCAs over the whole period. The trends and results suggest that some industries (highlighted in red) might be particularly hard hit by the upcoming trends in terms of market share. These include all the medium-high and high-tech industries, together with rubber and plastics (not considering coke and petroleum). These industries are those where emerging countries, notably China, might position themselves more prominently in the world market (as e.g. in textiles and electronics in the earlier phases). However, despite this loss of market share, specialisation patterns are expected to shift towards the machinery and transport equipment industries (together with basic metals and machinery nec), whereas other industries lose out in the overall export basket in relative terms.

It is now interesting to note that, despite this shift towards medium-high and high-tech industries (together with some others characterised as medium-low tech), specialisation patterns as indicated by revealed comparative advantage (thus compared to the overall world export basket) are shifting towards other industries, driven by the strong decreases in world market share (or, put differently, by the rising importance of other emerging countries in these industries). Using a simple criterion, the cells in the columns indicating RCAs in Table 5.11 are highlighted in green if the RCA indicator increases (suggesting an increase in revealed comparative advantage) and yellow if these are more or less stable or decrease only slightly. The medium-high and high-tech industries would therefore be characterised by a relative stability of RCAs (with the exception of chemicals).

Moreover, in Table 5.12 a further potential indicator – the share of services in exports – is presented. Distribution and business services, with about 15%, are the most important services delivering value added to the manufacturing industries. However, there is a wide range of service intensities across these industries. The share of services ranges from 33% in machinery to 40% in food and beverages and leather and footwear, with differences mostly driven by the share of distribution activities. Concerning business services, for example, its share in manufacturing industries' exports ranges from

11% in wood and wood products to about 17% in manufacturing. There is, however, no particularly clear pattern across industries (see Stehrer et al., 2015 for a more detailed account).

A similar overview of key indicators to capture the specificities of service industries is provided in Table 5.13 below. In terms of common taxonomy, service industries are classified into three different groups: distribution (comprising sale, maintenance and repair, wholesale trade, retail trade, hotels and restaurants, and real estate activities), transport and communication (comprising inland transport, water transport, air transport, other transport activities, as well as post and telecommunications) and business services (comprising financial intermediation, renting and other business activities).

In terms of value-added creation and growth, column two reports value-added coefficients (i.e. value added divided by gross output) for each service industry separately. Generally, value-added coefficients differ widely, ranging from as low as around 35 in water transport to as high as around 76 in real estate activities. However, as highlighted above, this particular indicator captures imperfectly the full extent of value added created in the entire production process. Hence, the value-added multiplier is reported in column three, which captures the value added created in all production stages of the entire production process. As with the findings for manufacturing industries, the value-added multiplier is fairly similar across service industries. In particular, with the exception of the water transport and air transport industries, where the value-added multiplier is as low as 0.81, it ranges between 0.90 (for inland transport and other transport activities) and 0.97 (in real estate activities). This suggests that transport industries are globally more strongly vertically integrated than, for instance, real estate activities.

With respect to the various industries' contribution of gross exports to GDP, column four points to a diverse picture. Generally, industries classified as business services (i.e. financial intermediation and renting and other business activities) contribute most. In particular, a 1% increase in the exports of financial intermediation is associated with an increase in EU GDP growth of 1.2%, while for renting and other business activities the figure is 1.45%. In contrast, all other service industries show contributions of gross exports to GDP of below 1%, with real estate activities and sale, maintenance and repair contributing the least.

Furthermore, Table 5.13 also reports trade-related indicators and their forecasts, in terms of world market share, export structure and RCAs for 1995, 2013 and 2025. It suggests that, with few exceptions (i.e. real estate activities, hotels and restaurants, and inland transport are all expected to gain world market share), service industries will be negatively affected by expected future trends. More specifically, water transport, closely followed by financial intermediation, sale, maintenance and repair, or renting and other business activities are expected to lose the most in terms of world market share. In addition, the export structure is expected to shift more strongly towards distribution in general, but also towards individual service industries like renting and other business activities, or inland transport.

Table 5.11 / Classification of manufacturing industries

Industry (NACE Rev. 1)	Taxonomy	Value-added coefficient (in % of gross output) (EU-27) 2011	Value-added multiplier 2011	Contribution of gross exports to GDP 2011	World market shares 1995	World market shares 2013	World market shares 2025*	Export structure 1995	Export structure 2013	Export structure 2025*	RCA 1995	RCA 2013	RCA 2025*
Food, Beverages and Tobacco	Low tech	23.7	0.87	0.73	26.6	23.4	25.3	7.4	6.3	4.4	1.08	1.10	1.70
Textiles and Textile Products	Low tech	31.1	0.85	0.31	15.5	9.3	8.5	4.8	2.3	1.3	0.63	0.44	0.60
Leather, Leather Products and Footwear	Low tech	29.5	0.87	0.11	23.0	16.1	13.0	1.7	1.1	0.7	0.94	0.76	0.90
Wood and Products of Wood and Cork	Low tech	29.5	0.88	0.08	10.4	18.5	18.2	0.7	0.7	0.5	0.42	0.87	1.20
Pulp and Paper, Printing and Publishing	Low tech	34.3	0.88	0.39	24.4	26.8	30.5	3.7	2.4	2.2	1.00	1.27	2.00
Coke, Refined Petroleum and Nuclear Fuel	Medium-low tech	7.1	0.53	0.30	22.7	19.9	8.5	2.0	6.3	7.9	0.93	0.94	0.60
Chemicals and Chemical Products	Medium-high & high tech	27.9	0.82	1.44	33.3	28.5	23.5	16.0	17.2	14.7	1.36	1.35	1.60
Rubber and Plastics	Medium-low tech	31.2	0.85	0.29	24.7	19.1	14.7	2.4	2.5	2.4	1.00	0.90	1.00
Other Non-Metallic Mineral	Medium-low tech	34.0	0.87	0.16	41.3	24.6	22.2	2.4	1.4	1.4	1.68	1.16	1.50
Basic Metals and Fabricated Metal	Medium-low tech	28.3	0.82	0.93	21.9	16.3	16.8	8.5	8.3	11.1	0.89	0.77	1.10
Machinery, nec	Medium-high & high tech	33.7	0.86	1.55	36.7	31.4	22.4	17.8	15.5	16.6	1.49	1.48	1.50
Electrical and Optical Equipment	Medium-high & high tech	29.8	0.80	1.39	18.0	12.9	6.8	16.4	14.3	12.7	0.73	0.61	0.50
Transport Equipment	Medium-high & high tech	21.4	0.83	1.79	24.5	30.4	21.2	13.9	18.5	19.4	1.00	1.43	1.40
Manufacturing, nec; Recycling	Low tech	32.2	0.87	0.24	20.4	18.2	18.6	2.7	3.4	4.6	0.83	0.86	1.20
Total manufacturing					24.6	21.2	14.9						

Note: * Predicted values based on industry-specific gravity model.
Source: WIOD; BACI, authors' calculations.

Table 5.12 / Structure of service content of manufacturing export (in % of domestic content of manufacturing exports)

	15t16	17t18	19	20	21t22	23	24	25	26	27t28	29	30t33	34t35	36t37	Total
Distribution, etc.	17.8	18.6	19.9	15.1	14.8	15.5	15.6	15.5	13.3	13.9	13.3	14.0	16.6	16.1	15.3
Transport and communication	5.6	5.2	6.0	5.8	5.6	7.1	5.0	5.0	6.5	4.8	4.3	4.3	4.9	5.0	5.0
Business services	14.4	12.9	12.5	11.2	15.3	14.4	16.9	13.9	12.7	12.4	13.3	15.6	14.8	12.5	14.5
Non-market services	1.1	0.9	0.8	1.0	1.0	1.1	1.3	1.0	1.0	0.9	0.9	1.1	1.1	0.9	1.1
Total	40.0	38.6	40.0	34.3	37.7	39.4	39.8	36.3	34.8	33.1	32.7	36.0	38.5	35.6	36.8

Source: WIOD; authors' calculations.

Table 5.13 / Classification of service industries

		Value-added coefficient (EU-27) in %	Value-added multiplier	Contribution of gross exports to GDP	World market shares			Export structure			RCA		
	Taxonomy	2011	2011	2011	1995	2013	2025*	1995	2013	2025*	1995	2013	2025*
Sale, maintenance and repair	Distribution	52.1	0.93	0.04	53.8	53.8	22.9	0.7	0.8	0.9	2.0	1.6	3.2
Wholesale trade	Distribution	50.9	0.92	0.53	14.6	17.4	9.9	11.0	10.0	15.1	0.5	0.5	0.4
Retail trade	Distribution	55.6	0.94	0.14	32.4	29.2	15.4	2.9	2.6	3.9	1.2	0.9	0.8
Hotels and Restaurants	Distribution	50.2	0.93	0.13	6.0	19.5	24.8	0.9	2.4	0.8	0.2	0.6	0.6
Inland Transport	Transport and communication	46.5	0.90	0.41	25.6	26.1	31.0	10.3	8.0	1.2	0.9	0.8	0.4
Water Transport	Transport and communication	35.4	0.81	0.65	40.8	50.9	9.4	16.2	14.0	5.0	1.5	1.5	1.7
Air Transport	Transport and communication	27.3	0.81	0.25	37.0	31.5	25.2	10.3	5.5	2.7	1.4	1.0	1.0
Other Transport Activities	Transport and communication	39.5	0.90	0.22	32.5	39.6	16.7	6.5	4.2	0.6	1.2	1.2	0.8
Post and Telecommunications	Transport and communication	48.8	0.92	0.13	17.7	29.9	29.1	1.8	2.6	0.7	0.6	0.9	0.6
Financial Intermediation	Business services	50.3	0.93	1.20	24.6	48.0	16.3	10.4	22.4	14.5	0.9	1.4	2.0
Real Estate Activities	Distribution	76.4	0.97	0.03	19.6	8.8	29.9	1.2	0.5	0.2	0.7	0.3	0.6
Renting and Other Business Activities	Business services	57.6	0.94	1.45	34.9	36.3	10.0	27.9	27.0	54.5	1.3	1.1	1.4

Note: * Predicted values based on industry-specific gravity model.
Source: WIOD; authors' calculations.

Finally, in terms of industries' revealed comparative advantages, expected future changes in the RCAs of service industries are diverse and are slightly less optimistic than in manufacturing industries (see Table 5.13). Particularly, RCAs are expected to increase in sale, maintenance and repair, water transport, real estate activities, and both business services industries (i.e. financial intermediation, and renting and other business activities). RCAs are expected to remain fairly stable in the majority of distribution industries (i.e. wholesale trade, retail trade, hotels and restaurants, and air transport), but are expected to drop – partly dramatically – in inland transport, other transport activities, and post and telecommunications.

Exports and GDP growth

The above results are now used to study the impact of exports and their prospective developments on GDP and GDP growth. The high-tech industries – chemicals, machinery, electrical and optical equipment, and transport equipment – are those with the largest contribution to GDP, mainly because of their importance in the overall export basket of the EU. These industries are – along with a few others – characterised by relatively high growth rates in exports since 1995 and for the projection period. By combining this information, we can calculate the contribution to GDP growth (i.e. multiplying the growth rate by the contribution to GDP). The results are presented in the penultimate column of Table 5.14 and can be interpreted as the percentage point contribution to GDP growth. The largest contribution would come from the transport equipment industry, with 0.15ppt, followed by machinery with 0.12ppt and chemicals and electrical and optical equipment (0.09ppt), closely followed by rubber and plastics (0.07ppt). Total manufacturing exports as projected would therefore contribute 0.7ppt to the overall GDP growth rate of the EU. Since, in the scenarios, a GDP growth rate of 2.2% was assumed, this would imply that about 45% of GDP growth would be driven by exports.[17]

Table 5.14 / Implications for GDP growth – manufacturing exports

	Contribution to GDP 2011	Growth rate of gross exports 1995–2013	Growth rate of exports according to baseline scenario	Annual contribution to GDP growth (in ppt)	Annual contribution to GDP growth (in %)
Food, Beverages and Tobacco	0.73	5.6	5.6	0.04	2.6
Textiles and Textile Products	0.31	2.4	2.2	0.01	0.4
Leather, Leather Products and Footwear	0.11	4.2	3.5	0.00	0.3
Wood and Products of Wood and Cork	0.08	6.8	6.2	0.01	0.3
Pulp and Paper, Printing and Publishing	0.39	4.2	5.2	0.02	1.3
Coke, Refined Petroleum, etc.	0.30	12.9	11.4	0.03	2.2
Chemicals and Chemical Products	1.44	7.0	6.4	0.09	5.9
Rubber and Plastics	0.29	6.9	7.6	0.02	1.4
Other Non-Metallic Mineral	0.16	3.6	5.5	0.01	0.6
Basic Metals and Fabricated Metal	0.93	6.4	8.0	0.07	4.8
Machinery, nec	1.55	5.8	7.9	0.12	7.9
Electrical and Optical Equipment	1.39	5.8	6.7	0.09	6.0
Transport Equipment	1.79	8.1	8.1	0.15	9.4
Manufacturing, nec; Recycling	0.24	7.9	8.8	0.02	1.4
Total manufacturing	9.72	6.5	7.2	0.70	45.5

Source: WIOD; authors' calculations.

[17] A decomposition analysis based on the Leontief framework over the period 1995–2011 suggests that the contribution of value-added exports to GDP has been about 33%. The difference might be explained by the fact that in the above calculations value-added coefficients and the global input-output structure are assumed to be constant.

Similar information for services exports is provided in Table 5.15. The most important contributions to GDP stem from financial intermediation and other business activities, as already reported above. Combined with the projected growth rates, the contributions to GDP would amount to 0.16ppt and 0.13ppt, respectively. In total, services exports would contribute 0.46ppt (or 30%) to GDP growth, according to these calculations.

Table 5.15 / Implications for GDP growth – services exports

	Contribution to GDP 2011	Growth rate of gross exports 1995–2013	Growth rate of exports according to baseline scenario	Annual contribution to GDP	Annual contribution to GDP growth (in %)
Sale, maintenance and repair	0.04	10.6	7.5	0.00	0.2
Wholesale trade	0.53	9.2	10.6	0.06	3.6
Retail trade	0.14	9.1	10.4	0.01	0.9
Hotels and Restaurants	0.13	15.9	-0.2	0.00	0.0
Inland Transport	0.41	8.1	4.5	0.02	1.2
Water Transport	0.65	8.9	5.6	0.04	2.4
Air Transport	0.25	5.8	-0.1	0.00	0.0
Other Transport Activities	0.22	7.1	5.9	0.01	0.8
Post and Telecommunications	0.13	11.8	6.8	0.01	0.6
Financial Intermediation	1.20	14.6	13.0	0.16	10.0
Real Estate Activities	0.03	4.8	8.2	0.00	0.2
Renting and Other Business Activities	1.45	9.5	9.2	0.13	8.7
	5.18	9.7	9.0	0.46	29.9

Source: WIOD; authors' calculations.

6. Policy implications

This chapter provides rich evidence concerning the development of the EU's revealed comparative advantages and its world market share across a wide number of industries, and also quality segments. The long-term analysis presented in Section 2.1 indicates that the EU-28 has successfully defended its global market shares since the 1990s, despite the increasing importance of emerging countries, particularly China. This is especially the case for industries that are characterised as 'high tech', which perform better than others in terms of R&D intensity, productivity growth and above-average wages per employed person. These industries comprise machinery, transport equipment, and chemicals. In these industries, the EU-28 has also managed to maintain – or even increase – its strong position in the world markets and its specialisation. The only exception is the electrical and optical equipment industry, which is characterised by relatively low world market shares and a comparative disadvantage. Nonetheless, taken together the four high-tech industries account for about two-thirds of the EU-28's extra-EU exports. Other industries that perform well in the international markets are pulp, paper, printing and publishing, and wood and wood products, where the EU-28 has gained revealed comparative advantages, though the contribution of these industries to overall exports is rather low. This is also reflected in their contribution to overall GDP.

With respect to future developments, the world market share of the EU-28 is expected to decrease to about 18% from about 21% in 1995, based on the gravity model. However, these results suggest that the EU-28 export structure will shift further towards the high-tech industries generally. Specifically, a further increase in specialisation is expected for machinery and transport equipment, as also for other smaller industries like pulp, paper and publishing, and wood and wood products. The chemical industry is expected to keep its revealed comparative advantage position at a fairly constant level. This is also the case for the electrical and optical equipment industry, which is, however, characterised by a revealed comparative disadvantage. The results also suggest that the EU-28 industries will be able to keep their strong position in the high unit-value segments of world export markets. Finally, it is expected that the ongoing trends towards geographical concentration of manufacturing activities and exports will continue. The results in particular suggest that countries of the EU manufacturing core – and particularly the Central and Eastern European Member States – will gain in importance for EU manufacturing exports.

The disaggregation of the manufacturing sector and the focus on individual industries is of key importance, given that past and future trends (as well as the EU's relative position) vary considerably across these industries. This sectoral perspective has the advantage that more specific policy recommendations can be derived, given that the requirements of industries are typically very heterogeneous. As Hausmann and Rodrik (2006) argue, the overwhelming majority of public inputs needed by firms are highly specific to their activity. The large number of specialised agencies and institutions in charge of regulating, advising or otherwise supporting firms is evidence of these specific needs. There may be complementary measures of a truly horizontal nature, which may be regarded as key policy instruments to support the competitiveness of European industry – such as endowment with appropriate skills and a good educational and vocational training system, R&D policies, the exchange rate policy, or indeed the completion of a Single Market. However, it is very doubtful that these

measures alone are sufficient to meet the main challenges posed by an intensification of economic integration and the emergence of new players in the global trade arena (see e.g. Aghion et al., 2011). The broad findings of this report indicate that the major long-term challenges that were identified in the European Competitiveness Report 2013 (European Commission, 2013) are still relevant. The challenges identified in that report were: (i) defending current technological leadership positions (and therefore industrial leadership); (ii) the competitive pressure from emerging economies (which evolves differently across industries); (iii) the development of Europe's 'industrial commons' (Pisano and Shih, 2009) and (iv) responding to the growing tendencies towards geographical concentration in manufacturing within the EU.

Support policies need to be tailored to the specific needs of an industry:

Neither the Single Market nor any other horizontal measure will satisfy the needs of individual industries. There are industries which may be termed 'sunset industries', in which the EU is clearly not revealing comparative advantages. These industries include, for example, the textile and the leather industry. In such circumstances, policy needs to focus on niches in which European firms may still be successful in international markets. Typically, such niches can be occupied by technological leadership and quality advantages. Examples include various protective clothing within the textile industry.

A particularly special case is the electrical and optical equipment industry, where the EU historically lacks comparative advantage. As shown in the report, the revealed comparative disadvantage in this industry deepened between 1995 and 2013, and the situation is projected to have deteriorated further by 2025. Given that this is one of the advanced manufacturing industries, the EU's relatively weak position (compared to the US or Japan) should give grounds for some concern. As one of the most technology-intensive industries, the electrical and optical equipment industry is the source of major innovation and technological progress. The digital revolution, also termed the 'fourth industrial revolution' (or 'industry 4.0'), is likely to emerge primarily from this industry. Therefore to neglect this promising industry – i.e. to fail to be a competitive producer as well as a user – on the grounds that there is a lack of comparative advantage would be risky, to say the least. It would clearly imply a lot of missed opportunities, because the EU has the technological potential to excel in this domain and there are a number of firms that do excel in the development and production of electrical products.

Therefore, the European Electronics Strategy, established in 2013, can be seen as a major initiative to support an important branch of the European electrical industry. However, as so often with EU initiatives, there is a risk that the funding will be inadequate to make any noticeable impact. Though broad in scope, with almost all Member States participating, the public impetus will be relatively small: the EU is expected to contribute EUR 1.2 billion, hoping that Member States will match this amount. Clearly, a more determined policy would be warranted in this respect. Moreover, any supply-side measures in this area need to be supplemented with demand-side support for new and innovative products. This support could come in the form of public procurement measures, in which governments and European institutions act as lead users (von Hippel, 1986; Edler and Georghiou, 2007).

Finally, for a large number of industries the RCA analysis suggests substantial comparative advantages. These are the well-known strongholds of European manufacturing, including the machinery, transport equipment, and chemical industries. For these industries, the supporting innovation systems, as well as the educational systems in many Member States, seem to be functioning well. Here the issue is mainly

to ensure the quality of existing innovation support from the public domain, and also to transfer successful institutional arrangements to other Member States. Moreover, what has been said with regard to demand-side policies and public procurement also applies here, as these industries are also high-technology intensive and therefore also dependent on continuing demand.

Keeping value-added generation within the European Union

Employment generation in the industrial sector will likely be a very difficult task, given that competitive pressure will force European firms to keep on increasing productivity. Therefore the labour intensity of European manufacturing must be expected to continue its decline. In order not to aggravate this trend, the framework conditions must be set with a view to maximising value-added generation in European manufacturing within the boundaries of the Union. The EU is, in a way, well positioned in this respect, as the international mobility of firms with regard to production location could be fostered across Member States. This would give firms the chance to benefit from efficiency gains related to offshoring. By contrast, the shift of existing production and other value-added generation activities to countries outside Europe should be kept to a minimum by supporting measures to strengthen EU competitiveness, like the Single Market or the Services Directive.

Another important aspect here is training – and vocational training in particular. The cross-country analysis of export performance (and other studies researching the performance of manufacturing industries in Europe in general) clearly indicates that the availability of both high-skilled and medium-skilled workers is an important factor. For many firms, employees and their skills are the most valuable asset, because part of their technological and innovation capacity is embodied not in machinery and processes, but in their workforce. This is important because workers are less mobile than companies, and if technological capabilities are embodied in the workforce this represents a unique locational advantage. Moreover, it implies that a firm's technology is not fully transferable to other locations. If production depends heavily on the specific skills of workers, a move to a low-cost destination will imply not only cost savings, but also a decline in productivity.

This argument obviously requires Member States to implement the appropriate education and training policies to ensure that the necessary skills are available among European workers. In the context of manufacturing, it is worth mentioning that such policies should target not only the high-skill segment of the workforce, such as technicians: medium-skilled workers are also of crucial importance. Therefore particular attention should be paid to vocational training. A successful model of initial vocational training (IVT) is the dual system that is common in Germany and Austria. Under this system, young people (after having completed nine years of schooling) can enter into a private-law vocational training contract with a company; this is typically of three years' duration. Actual training takes place mainly within the company, but is supplemented by training at (part-time) vocational schools. Binding requirements in the training directives ensure a uniform standard concerning the training quality (Hippach-Schneider et al., 2007). Moreover, the in-house training at firms implies that apprentices gain highly specialised skills for which there is actual demand in industry. Therefore the creation or expansion of such dual IVT systems in EU Member States would support European industry in global competition. After all, a well-trained workforce can be seen as a key element of the industrial commons, which are a country's collective R&D, engineering and manufacturing capabilities. As such, it is also justified for both the government and the private sector to contribute to investment in skills.

Coordination of (specific) activities within a smart specialisation concept

The concept of 'smart specialisation' offers a promising route to improve current productive assets and potentially also create new ones (Foray et al., 2009). This concept is basically a bottom-up approach that enables regions to discover – in cooperation with existing industry representatives – which industries may be most promising. The value added of the smart specialisation strategy is the discovery of areas with latent comparative advantage. This approach also suggests focusing resources on a few activities within a region. In a way, smart specialisation may be seen as the regional variant of the kind of industry-specific policies suggested above. One thing that should be mentioned in this context is that there needs to be well-organised coordination of support activities in order to avoid a situation where all regions 'jump on' the same industry/technology bandwagon within their smart specialisation efforts.

It should also be mentioned that to some extent, even in the smart specialisation concept, the problem of picking a winner remains: it is an unavoidable feature of any active innovation and industrial policy that the most promising areas or industries have to be selected. However, this is not so different from other policy areas, because politics is always about setting priorities, and a decision to support one thing often implies a decision not to back the alternatives.

However, it might be important that these smart specialisation efforts could help overcome the existing tendency for there to be a clustering of manufacturing activities in a few core countries or regions: smart specialisation may assist in spreading manufacturing activities, and perhaps the value added-intensive activities of these and related sectors, more evenly across Europe. This is facilitated by the rising importance of European Value Chains (EVCs) – as part of global value chains – which allow for finer-grained specialisation by countries and regions within specific value chains.

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Appendix A – Additional tables and figures

Table A.1 / Industries and aggregates used (based on NACE Rev. 1/ISIC Rev. 3)

RNr	RNrAgg	DescrAgg	NACE Rev. 1	Description
1	1	Agriculture, etc.	AtB	Agriculture, Hunting, Forestry and Fishing
2	2	Mining and utilities	C	Mining and Quarrying
3	3	Low tech	15t16	Food, Beverages and Tobacco
4	3	Low tech	17t18	Textiles and Textile Products
5	3	Low tech	19	Leather, Leather Products and Footwear
6	3	Low tech	20	Wood and Products of Wood and Cork
7	3	Low tech	21t22	Pulp and Paper, Printing and Publishing
8	4	Medium-low tech	23	Coke, Refined Petroleum and Nuclear Fuel
9	5	Medium-high and high tech	24	Chemicals and Chemical Products
10	4	Medium-low tech	25	Rubber and Plastics
11	4	Medium-low tech	26	Other Non-Metallic Mineral
12	4	Medium-low tech	27t28	Basic Metals and Fabricated Metal
13	5	Medium-high and high tech	29	Machinery, nec
14	5	Medium-high and high tech	30t33	Electrical and Optical Equipment
15	5	Medium-high and high tech	34t35	Transport Equipment
16	3	Low tech	36t37	Manufacturing, nec; Recycling
17	2	Mining and utilities	E	Electricity, Gas and Water Supply
18	6	Construction	F	Construction
19	7	Distribution and other services	50	Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel
20	7	Distribution and other services	51	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles
21	7	Distribution and other services	52	Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods
22	7	Distribution and other services	H	Hotels and Restaurants
23	8	Transport and communication	60	Inland Transport
24	8	Transport and communication	61	Water Transport
25	8	Transport and communication	62	Air Transport
26	8	Transport and communication	63	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies
27	8	Transport and communication	64	Post and Telecommunications
28	9	Business services	J	Financial Intermediation
29	7	Distribution and other services	70	Real Estate Activities
30	9	Business services	71t74	Renting of Machinery and Equipment and Other Business Activities
31	10	Non-market services	L	Public Admin and Defence; Compulsory Social Security
32	10	Non-market services	M	Education
33	10	Non-market services	N	Health and Social Work
34	7	Distribution and other services	O	Other Community, Social and Personal Services
35	7	Distribution and other services	P	Private Households with Employed Persons

Source: wiiw assessment.

Appendix B – Quality segments and market shares

To understand why the relative export share and the market share in the high unit-value segment reflect a relative valuation of quality by consumers, it is important to go back to theory. The set-up chosen follows, to some extent, Baldwin and Harrigan (2011) and Crozet, Head and Mayer (2012). Although this new literature introduces firm-level heterogeneity in quality, this is not considered in what follows because firm-level data are not available for all extra-EU exporters. Heterogeneity is measured here through three different categories of varieties: the up (high unit-value) segment, the middle segment (intermediate-unit values) and the low segment market (low unit values). Other articles have been published on the relationship between trade and quality in recent years (Di Comite et al., 2013; Vandenbussche, 2014; Feenstra and Romalis, 2014). The first two of these use cost data at a quite detailed level. For their part, Feenstra and Romalis model the supply side extensively, in order to estimate an aggregate measure for quality deduced from price data. Again, these authors produce stimulating results, which could have been reproduced here, together with our own data; but the work would then have required much more data and time.

In the set-up on which the section on unit-value segments is based, first of all a monopolistically competitive market for a category of products is assumed on the supply side, with, on the demand side, a constant elasticity of substitution (CES) sub-utility function. Consumers have imperfect information about the intrinsic quality of a product being sold: they can make a rough prediction of its quality on the basis of the price at which it is being sold, together with observation of some of its visible attributes at the time of purchase. Of course, the price might represent not just quality, but also costs (more on this below). However, it is then assumed that consumers are able to map different varieties of a good into three rough, but distinct, segments of the market: the up-price segment ($s = u$) where quality is likely to play an important role; the middle-price segment ($s = m$) where quality should matter, but significantly less so; and a low-price category ($s = \ell$) where only the cost of the good (not its quality) matters. Besides, consumers differentiate products within each segment with respect to the origin country of production (Armington Hypothesis). The CES function can be expressed by the following:

$$U_j = \left(\sum_i \sum_s \sum_v \left(b_i^s . x_{v,ij}^s \right)^{(\sigma-1/\sigma)} \right)^{\sigma/\sigma-1}$$

where σ measures the elasticity of substitution across *i*-varieties; x_{ij}^s represents the physical quantities exported from *i* to *j* in segment *s*. $b_i^s = b_i(s)$ is a preference parameter, and is an increasing function of *s*: it is the weight the consumers set for their consumption of quantities $x_{v,ij}^s$ which belong to a typical segment *s*. As Crozet et al. (2012) put it, the '$b_i(s)$ function maps quality into quantity equivalents in the utility of the consumers'. In what follows, the preference parameter relative to the low segment of the market is normalised to 1 ($b_i^\ell = 1$) and $b_i^u > b_i^m > 1, \forall i$. That is to express the idea that a purchase of a quantity of goods from the up-segment increases the utility to the consumer more than if he had to purchase from the middle segment, and still more if he had to consume from the lowest segment of the

market. Under a budget constraint of *j*-type consumers, the maximisation of utility provides the optimal demand $x_{v,ij}^{s}$ by *j*, in value, of a variety *v* belonging to the *s* segment and exported from country *i.* Further, after assuming homogeneity of producers within each producing country and within each segment, the aggregate import demand from *j* addressed to exporter *i* is represented by:

$$X_{ij}^{s} = p_{ij}^{s} x_{ij}^{s} = n_i^{s}.E_j.\left(\frac{p_{ij}^{s}}{P_j}\right)^{1-\sigma}.(b_i^{s})^{\sigma-1} \quad (1)$$

x_{ij}^{s} represents all physical quantities exported from *i* to *j* in segment *s,* n_i^{s} the number of *i* exporters of *s*-type varieties, E_j the total budget to spend on all varieties of the differentiated good. Besides, $p_{ij}^{s} = p_i^{s}\tau_{ij}$ and represents the *Cost-Insurance-Freight (CIF)* delivered price to consumers in *j*, p_i^{s} the mill price of the representative exporter from *i* related to the product of segment *s*, and τ_{ij} the transaction costs to deliver the good. Further, the variable P_j denotes the average price of all of the varieties from *all* segments supplied in market *j* (i.e $P_j = \left[\sum_i \sum_s b_i^{s1-\sigma}\, p_i^{s1-\sigma}\right]^{1/1-\sigma}$).

In monopolistic competition, and assuming producers' homogeneity within segment *s*, export prices from *s*-producers in one country are equal and can be expressed as:

$$p_{ij}^{s} = \mu.c_i(\omega_i, s).\tau_{ij} \quad (2)$$

with $\mu = \frac{\sigma}{\sigma-1}$ being the mark-up over marginal costs and $c_i(\omega, s)$ the marginal cost, a function of a vector of factor prices ω and a possible additional cost of quality specific to producing in the segment *s*. The idea here is that firms producing intrinsically high-quality goods should have higher costs than those producing low-quality and/or standardised goods. This is because, in order to produce high-quality goods, more expensive input services and more labour hours are required per unit of output produced. By expressing the additional costs due to intrinsic quality production as add-valorem costs, the marginal costs can be expressed as: $c_i(\omega_i, s) = (1 + c_s).c_i(\omega)$.

Where c_s represents the additional costs (in inputs and factor prices terms) that the producers bear to produce a variety of quality *s*. Further, $c_i(\omega)$ denotes the costs of producing a plain quality-free product. This is actually the costs that the producers of the low segment of the market bear $(\text{i.e. } c_i(\omega_i, \ell) = c_i(\omega))$ and $c_\ell = 0$. Because producers from the high segment of the market are those for whom the quality of production plays the most important role, while quality costs are lower for those in the middle market, then $(1 + c_u) > (1 + c_m)$.

By accounting for the cost function and then by replacing the price equation (2) into the demand equation (1), one obtains the following general demand function for a given *s*-type product:

$$X_{ij}^{s} = n_i^{s}.\left(\frac{b_i^{s}}{(1 + c_s)}\right)^{\sigma-1}.c(\omega)_i^{1-\sigma}\, A_{ij} \quad (3)$$

where $A_{ij} = \left[E_j.P_j^{\sigma-1}.\tau_{ij}^{1-\sigma}\right]$ represents, as in Crozet et al. (2012), the accessibility of market *j*.

Notice from equation (3) that quality pays in terms of additional exports only whenever the preference for quality with respect to its cost of production increases (i.e. increase in the relative valuation of quality by

the consumer $\frac{b_i^s}{(1+c_s)}$). In what follows, a variable $RQ_i^s = \left(\frac{b_i^s}{(1+c_s)}\right)^{\sigma-1}$ is designated to express the *R*eturns to *Q*uality in additional export-value terms. Nevertheless, all else being equal, including quality, exports are still affected by the costs of production in the exporting country.

Allocation of resources towards the up-market and signal of quality

A way to evaluate the extent of high-quality content of a country's export and the quality changes over time is then to compute the ratio of export from *i* to region *j* for the up-segment with respect to total exports (i.e. all segments). By computing this ratio with respect to equation (3) and simplifying, the following expression is obtained:

$$\frac{X_{ij}^u}{(X_{ij}^u + X_{ij}^m + X_{ij}^\ell)} = \left(\frac{n_i^u . RQ_i^u}{n_i . \overline{RQ}}\right) \quad (4)$$

Where $\overline{RQ} = \sum_s w_i^s . RQ_i^s$ shows the weighted *average return* to quality *per exporter* from *i*, with the weight being expressed as $w_i^s = {n_i^s}/{n_i}$ and $n_i = (n_i^u + n_i^m + n_i^\ell)$ being the total number of exporters from *i*. Equation (4) states that the rate of exports in the up-market is the result of the returns to 'high' quality per firm in the up-market, multiplied by the number of firms acting in this market with respect to the country's aggregate return to quality for all exporters (i.e. $n_i . \overline{RQ}$)**.** In sum, the above equation (4) shows that the share of exports of a country *i* in the up-market is the outcome of the relative allocation of resources of that country towards high-quality activities.

Market shares in the up-market and the signal of quality

The comparison of market shares within a given destination (or group of destinations) in the up-segment market signals the extent of the quality content of a country's trade with respect to that prevailing for exporters from the rest of the world. To see how market shares are related to quality, recall first that market share of a country in a given segment of the market is expressed as:

$$ms_{ij}^s = \left[{X_{ij}^s}/{\sum_h X_{hj}^s} \right]$$

where $\sum_h X_{hj}^s$ denotes total exports from all of the world to market *j* in segment *s*.

From there it is easy to construct an indicator of the market share in the up-market, normalised to that in the low segment of the market. By slightly manipulating such an expression, it provides the following *normalised* market share for the high-segment market:

$$\frac{sh_{ij}^u}{sh_{ij}^\ell} = \left[\frac{X_{ij}^u}{X_{ij}^\ell}\right] . \left[\frac{\sum_h X_{hj}^\ell}{\sum_h X_{hj}^u}\right]$$

By replacing the up- and down-market expressions related to equation (3) in the above equation, it can be shown that:

$$\frac{sh_{ij}^{u}}{sh_{ij}^{\ell}} = \left[\frac{\left(\frac{n_i^u}{n_i^\ell} . RQ_i^u \right)}{\sum_h sh_{hj}^{\ell} . \left(\frac{n_h^u}{n_h^\ell} . RQ_h^u \right)} \right].$$

The above expression states that the up-market share of a country *i*, when normalised with respect to the down-market, is the outcome of the relative return to quality in the up-market of destination *j* (i.e. the numerator) compared to the weighted average return to quality from the rest-of-the-world exporters in that destination (i.e. the denominator). *In other words, changes in market shares in the up-market (compared to the down-market) are the outcome of changes in returns to quality compared to the rest of the world. Whenever such an indicator increases, this suggests that country* i*'s revenues from the quality activity increase more than the quality-specific revenues that go to the rest-of-the-world exporters.*

Appendix C – Additional results of gravity estimations

Manufacturing including trade with EU members

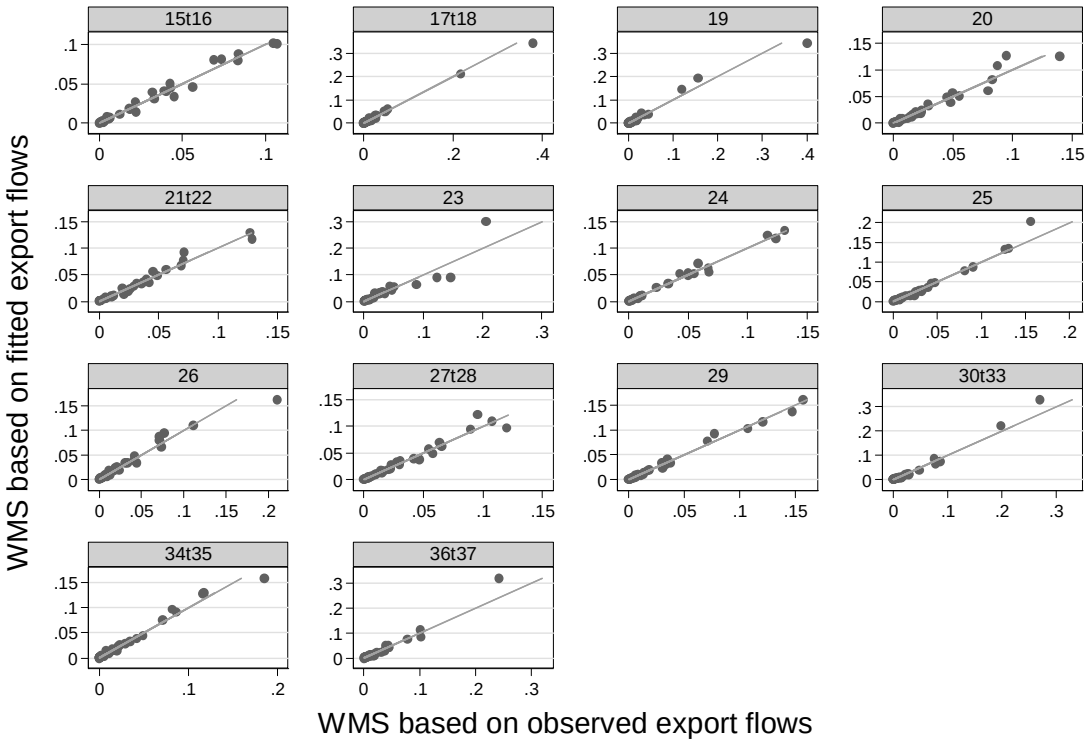
Table C.1 / Sign and correlation test

	Correlation coefficient	RCA and predicted RCA larger than 1	RCA and predicted RCA smaller than 1	RCA larger and predicted RCA smaller than 1	RCA smaller and predicted RCA larger than 1
Food, Beverages and Tobacco	0.959	70.2	26.6	2.0	1.2
Textiles and Textile Products	0.937	62.5	33.2	1.9	2.4
Leather, Leather Products and Footwear	0.955	58.2	38.7	2.7	0.4
Wood and Products of Wood and Cork	0.973	72.9	25.6	0.7	0.8
Pulp and Paper, Printing and Publishing	0.989	64.7	29.0	1.9	4.4
Coke, Refined Petroleum and Nuclear Fuel	0.881	68.2	27.2	2.4	2.2
Chemicals and Chemical Products	0.957	57.4	38.3	2.3	2.0
Rubber and Plastics	0.945	64.5	29.3	2.8	3.5
Other Non-Metallic Mineral	0.928	68.2	24.6	3.1	4.1
Basic Metals and Fabricated Metal	0.973	66.3	29.1	2.0	2.7
Machinery, nec	0.986	57.5	40.5	1.0	1.0
Electrical and Optical Equipment	0.965	52.1	43.3	2.9	1.7
Transport Equipment	0.962	59.4	33.3	4.3	2.9
Manufacturing, nec; Recycling	0.914	62.9	30.0	3.9	3.3
Total manufacturing	0.951	63.2	32.0	2.4	2.3
Austria	0.978	70.0	26.0	3.0	0.9
Belgium	0.972	65.4	30.0	2.5	2.1
Bulgaria	0.913	72.6	24.4	0.7	2.3
Croatia	0.961	69.8	25.1	3.5	1.6
Cyprus	0.674	50.7	36.4	7.1	5.8
Czech Republic	0.937	71.2	23.3	2.8	2.8
Denmark	0.973	63.1	32.3	1.8	2.8
Estonia	0.962	65.9	27.2	4.4	2.5
Finland	0.994	61.5	35.9	1.6	0.9
France	0.974	60.6	34.6	2.1	2.8
Germany	0.987	61.8	36.4	0.2	1.6
Greece	0.943	63.8	33.2	1.2	1.8
Hungary	0.926	53.9	36.4	3.9	5.8
Ireland	0.975	53.2	46.5	0.0	0.2
Italy	0.973	68.9	28.6	1.2	1.4
Latvia	0.958	63.8	30.6	1.8	3.7
Lithuania	0.931	64.1	31.1	2.5	2.3
Malta	0.805	55.3	33.9	1.6	9.2
Netherlands	0.977	56.0	41.0	0.5	2.5
Poland	0.909	72.8	24.2	0.9	2.1
Portugal	0.968	67.5	26.5	3.0	3.0
Romania	0.944	65.2	27.6	3.0	4.1
Slovak Republic	0.867	71.0	23.5	2.5	3.0
Slovenia	0.941	72.8	20.3	5.3	1.6
Spain	0.974	65.9	30.2	2.8	1.2
Sweden	0.992	61.8	34.6	2.1	1.6
United Kingdom	0.968	59.0	32.7	4.8	3.5

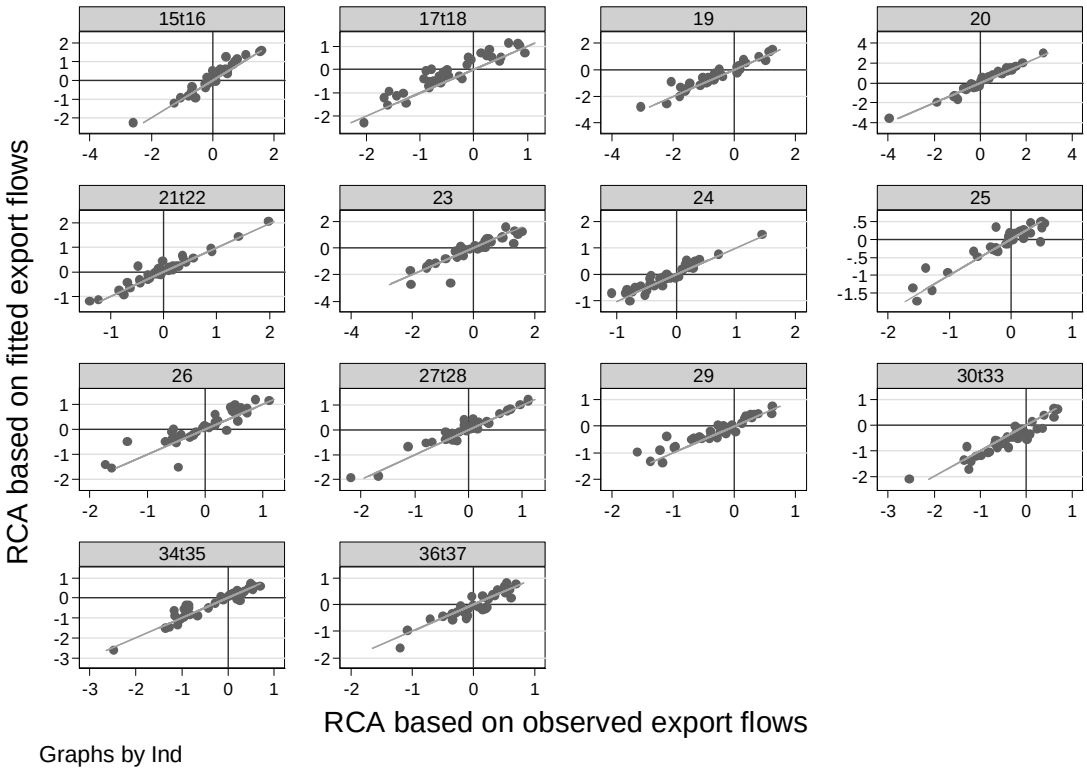
Source: Authors' calculations.

Figure C.1 / Actual versus predicted indicators

World market shares



Revealed comparative advantages (in logs)



Source: Authors' calculations.

Table C.2 / Results from gravity regressions including intra-EU-28 trade

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	All	15t16	17t18	19	20	21t22	23	24	25	26	27t28	29	30t33	34t35	36t37
VARIABLES	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP
Ln GDPj	0.750***	0.533***	0.466***	0.253***	0.567***	0.840***	0.139***	0.751***	1.084***	0.533***	0.721***	1.076***	1.454***	1.243***	0.762***
	(0.00672)	(0.0202)	(0.0192)	(0.0267)	(0.0246)	(0.0230)	(0.0478)	(0.0187)	(0.0195)	(0.0218)	(0.0217)	(0.0181)	(0.0213)	(0.0315)	(0.0206)
Ln POP j	-2.295***	-2.886***	-2.865***	-1.044***	-3.487***	-3.129***	-0.519*	0.388***	-3.727***	-2.014***	-0.801***	-2.420***	-4.165***	-2.197***	-3.098***
	(0.0400)	(0.119)	(0.113)	(0.160)	(0.149)	(0.137)	(0.288)	(0.110)	(0.116)	(0.132)	(0.128)	(0.107)	(0.126)	(0.187)	(0.122)
Ln GDPi	0.805***	0.726***	0.662***	0.872***	1.069***	0.546***	1.289***	0.595***	0.709***	0.845***	0.962***	0.669***	0.562***	0.826***	1.009***
	(0.00673)	(0.0202)	(0.0192)	(0.0267)	(0.0248)	(0.0230)	(0.0475)	(0.0187)	(0.0195)	(0.0219)	(0.0217)	(0.0181)	(0.0213)	(0.0315)	(0.0206)
Log POP i	-1.223***	-0.405***	-1.849***	-1.621***	-2.557***	-1.658***	3.400***	-1.193***	-1.167***	-2.200***	-2.547***	-1.720***	-1.394***	-1.704***	-0.149
	(0.0398)	(0.119)	(0.113)	(0.159)	(0.147)	(0.136)	(0.285)	(0.110)	(0.115)	(0.130)	(0.128)	(0.107)	(0.126)	(0.186)	(0.122)
Ln HC j	1.448***	1.576***	0.276	-0.653**	2.190***	2.017***	1.252***	2.568***	2.768***	0.657***	1.855***	1.586***	2.066***	0.592*	1.128***
	(0.0665)	(0.199)	(0.190)	(0.264)	(0.244)	(0.228)	(0.463)	(0.185)	(0.193)	(0.217)	(0.215)	(0.179)	(0.211)	(0.312)	(0.205)
Ln HC i	0.936***	1.122***	0.262	-0.405	0.486**	1.037***	2.319***	1.308***	1.378***	-0.117	-0.549**	0.974***	2.108***	1.625***	1.655***
	(0.0663)	(0.199)	(0.190)	(0.264)	(0.243)	(0.227)	(0.461)	(0.185)	(0.192)	(0.216)	(0.214)	(0.179)	(0.211)	(0.312)	(0.204)
Ln K i	0.170***	0.299***	0.0412	0.319***	-0.408***	0.436***	0.0931	-0.0552	0.151***	0.489***	0.104*	0.651***	0.0482	0.368***	-0.0913
	(0.0193)	(0.0580)	(0.0553)	(0.0765)	(0.0702)	(0.0662)	(0.132)	(0.0539)	(0.0558)	(0.0626)	(0.0623)	(0.0521)	(0.0614)	(0.0905)	(0.0594)
Ln K j	-0.0908***	0.0637	0.0169	0.303***	-0.130*	-0.190***	0.118	-0.277***	-0.0585	0.0700	0.0410	-0.200***	-0.408***	-0.298***	-0.360***
	(0.0193)	(0.0579)	(0.0553)	(0.0764)	(0.0704)	(0.0661)	(0.133)	(0.0539)	(0.0558)	(0.0626)	(0.0623)	(0.0521)	(0.0614)	(0.0906)	(0.0594)
Ln HCj x Ln Kj	-0.283***	-0.144***	-0.259***	-0.344***	-0.128**	-0.551***	-0.317***	0.283***	-0.206***	-0.642***	-0.120**	-0.486***	-0.331***	-0.492***	-0.317***
	(0.0153)	(0.0462)	(0.0440)	(0.0607)	(0.0563)	(0.0526)	(0.106)	(0.0429)	(0.0443)	(0.0498)	(0.0495)	(0.0414)	(0.0488)	(0.0720)	(0.0472)
Ln HCi x Ln Ki	-0.279***	0.197***	-0.551***	-0.274***	-0.666***	-0.177***	0.242**	0.111***	-0.427***	-0.470***	-0.471***	-0.373***	-0.420***	-0.517***	0.00978
	(0.0153)	(0.0461)	(0.0440)	(0.0608)	(0.0560)	(0.0525)	(0.106)	(0.0428)	(0.0443)	(0.0498)	(0.0495)	(0.0414)	(0.0488)	(0.0719)	(0.0472)
Constant	40.46***	40.34***	68.10***	33.29***	80.93***	62.90***	-68.87***	-3.434	58.56***	55.56***	37.79***	49.27***	68.71***	41.52***	32.50***
	(0.867)	(2.586)	(2.468)	(3.464)	(3.208)	(2.974)	(6.210)	(2.398)	(2.511)	(2.843)	(2.795)	(2.325)	(2.741)	(4.054)	(2.661)
Observations	326,923	23,670	23,832	23,063	22,757	23,508	20,978	23,862	23,572	23,120	23,662	23,781	23,863	23,568	23,687
R-squared	0.374	0.464	0.260	0.196	0.347	0.349	0.243	0.567	0.583	0.323	0.475	0.593	0.568	0.381	0.535
Number of *i*	17,630	1,260	1,260	1,260	1,258	1,260	1,252	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' calculations.

Services trade – broad country groups

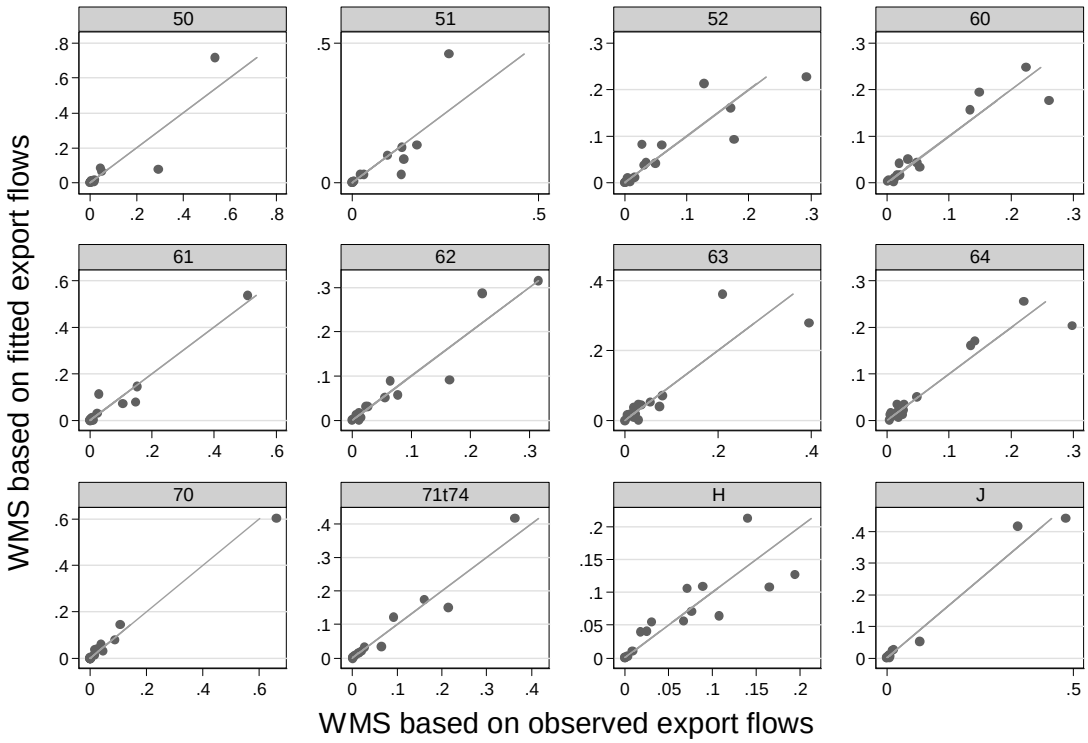
Table C.3 / Sign and correlation test

	Correlation coefficient	RCA and predicted RCA larger than 1	RCA and predicted RCA smaller than 1	RCA larger and predicted RCA smaller than 1	RCA smaller and predicted RCA larger than 1
Sale, maintenance and repair	0.717	32.5	64.3	2.4	0.8
Wholesale trade	0.950	31.4	61.2	5.9	1.6
Retail trade	0.975	42.0	45.9	10.6	1.6
Hotels and Restaurants	0.858	58.4	32.2	5.5	3.9
Inland Transport	0.894	43.5	47.1	2.4	7.1
Water Transport	0.983	34.9	59.6	0.0	5.5
Air Transport	0.916	50.6	38.0	4.7	6.7
Other Transport Activities	0.833	51.8	32.5	7.5	8.2
Post and Telecommunications	0.908	37.6	47.5	12.5	2.4
Financial Intermediation	0.937	17.6	76.1	3.1	3.1
Real Estate Activities	0.570	31.0	63.9	2.7	2.4
Renting and Other Business Activities	0.955	23.9	61.6	6.3	8.2
Total services	0.751	37.9	52.5	5.3	4.3
EU-28	0.948	40.2	45.1	8.3	6.4
China	0.751	42.6	41.2	5.9	10.3
Japan	0.977	32.8	60.8	2.5	3.9
USA	0.975	31.9	58.3	5.4	4.4

Source: Authors' calculations.

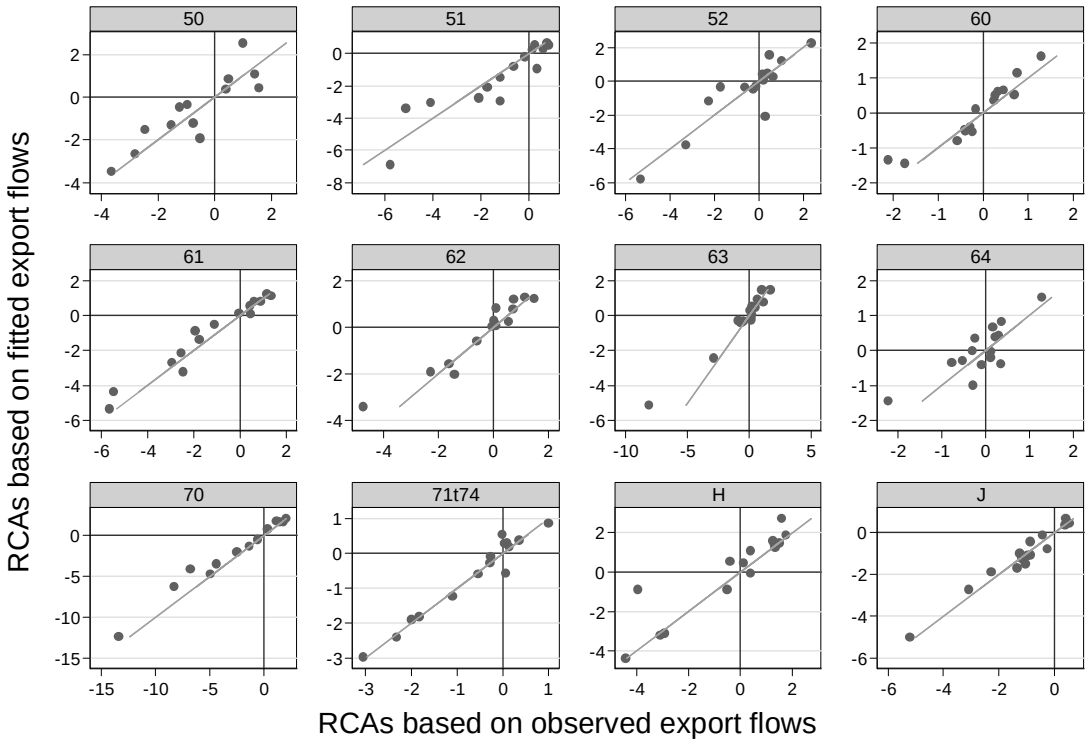
Figure C.2 / Actual versus 'fitted' indicators based on gravity approach, 2011

World market shares



Graphs by Ind

Revealed comparative advantages (in logs)



Graphs by Ind

Source: Authors' calculations.

Table C.4 / Results from gravity regressions for services trade

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	All	50	51	52	H	60	61	62	63	64	J	70	71t74
VARIABLES	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP
Ln GDPj	0.554***	0.669***	0.677***	0.650***	0.723***	0.343***	0.418***	-0.0686	-0.119	0.389***	0.838***	0.940***	1.303***
	(0.0325)	(0.130)	(0.100)	(0.117)	(0.101)	(0.0947)	(0.105)	(0.0949)	(0.105)	(0.119)	(0.126)	(0.162)	(0.0933)
Ln POP j	0.803***	5.356***	5.796***	8.562***	-3.805***	3.054***	4.763***	1.032	3.157***	-7.475***	-2.303**	-3.996***	-4.226***
	(0.296)	(1.175)	(0.915)	(1.047)	(0.933)	(0.880)	(0.976)	(0.880)	(0.963)	(1.069)	(1.115)	(1.437)	(0.861)
Ln GDPi	0.443***	0.557***	0.376***	0.292***	0.472***	0.626***	-0.0675	0.764***	0.642***	0.178	0.432***	1.190***	0.116
	(0.0319)	(0.119)	(0.100)	(0.104)	(0.0994)	(0.0954)	(0.104)	(0.0959)	(0.103)	(0.116)	(0.126)	(0.145)	(0.0938)
Log POP i	-0.195	-1.347	1.207	3.091***	0.0385	-1.789**	-4.493***	-0.416	-4.247***	0.134	4.056***	-4.458***	3.746***
	(0.290)	(1.062)	(0.907)	(0.962)	(0.887)	(0.865)	(0.948)	(0.861)	(0.948)	(1.069)	(1.147)	(1.322)	(0.845)
Ln HC j	-0.891**	-9.986***	-11.30***	-8.861***	-0.284	-1.856	-3.162**	3.981***	-0.774	11.97***	4.390**	-1.195	4.060***
	(0.418)	(1.585)	(1.298)	(1.330)	(1.269)	(1.253)	(1.407)	(1.265)	(1.370)	(1.524)	(1.729)	(1.880)	(1.214)
Ln HC i	4.079***	3.637**	5.508***	1.690	3.466***	2.932**	8.457***	3.240**	6.644***	1.817	2.164	1.455	7.092***
	(0.425)	(1.537)	(1.337)	(1.410)	(1.312)	(1.269)	(1.391)	(1.262)	(1.392)	(1.569)	(1.724)	(1.892)	(1.242)
Ln K i	0.0228	2.136***	1.633***	-0.778**	0.895***	-0.261	0.833***	0.169	-1.858***	0.366	-2.329***	-0.832*	0.691**
	(0.0932)	(0.431)	(0.286)	(0.361)	(0.281)	(0.265)	(0.290)	(0.261)	(0.294)	(0.334)	(0.364)	(0.477)	(0.274)
Ln K j	-0.249***	0.109	0.360	0.181	-0.210	-0.543**	1.316***	-0.751***	-0.351	-0.0855	-1.751***	1.732***	-2.068***
	(0.0824)	(0.317)	(0.251)	(0.266)	(0.246)	(0.246)	(0.267)	(0.243)	(0.264)	(0.297)	(0.347)	(0.400)	(0.242)
Ln HCj x Ln Kj	0.301***	0.00810	-1.614***	0.510**	0.0440	0.0999	0.380*	0.0696	1.535***	-0.363	2.320***	-0.0892	0.527**
	(0.0705)	(0.312)	(0.219)	(0.257)	(0.206)	(0.204)	(0.222)	(0.201)	(0.225)	(0.256)	(0.284)	(0.335)	(0.212)
Ln HCi x Ln Ki	0.699***	0.293	-0.325*	-0.554***	-0.152	1.473***	-0.190	1.268***	1.363***	1.617***	1.620***	-0.451	1.509***
	(0.0638)	(0.248)	(0.194)	(0.204)	(0.192)	(0.189)	(0.205)	(0.188)	(0.204)	(0.231)	(0.266)	(0.311)	(0.191)
Constant	-26.24***	-83.67***	-138.3***	-225.0***	53.59**	-34.81	-10.98	-25.70	10.12	121.2***	-57.29*	128.9***	-19.11
	(7.548)	(28.90)	(23.17)	(25.58)	(23.58)	(22.59)	(24.90)	(22.46)	(24.52)	(27.50)	(29.57)	(34.87)	(22.17)
Observations	32,760	2,366	2,761	2,553	2,610	3,052	2,808	2,907	2,841	2,804	2,752	2,224	3,082
R-squared	0.145	0.205	0.260	0.248	0.167	0.142	0.180	0.191	0.087	0.129	0.162	0.142	0.372
Number of *i*	2,063	150	170	159	162	183	180	183	179	175	171	159	192

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
Source: WIOD, PWT 8.0; authors' calculations.

Services trade at Member State level

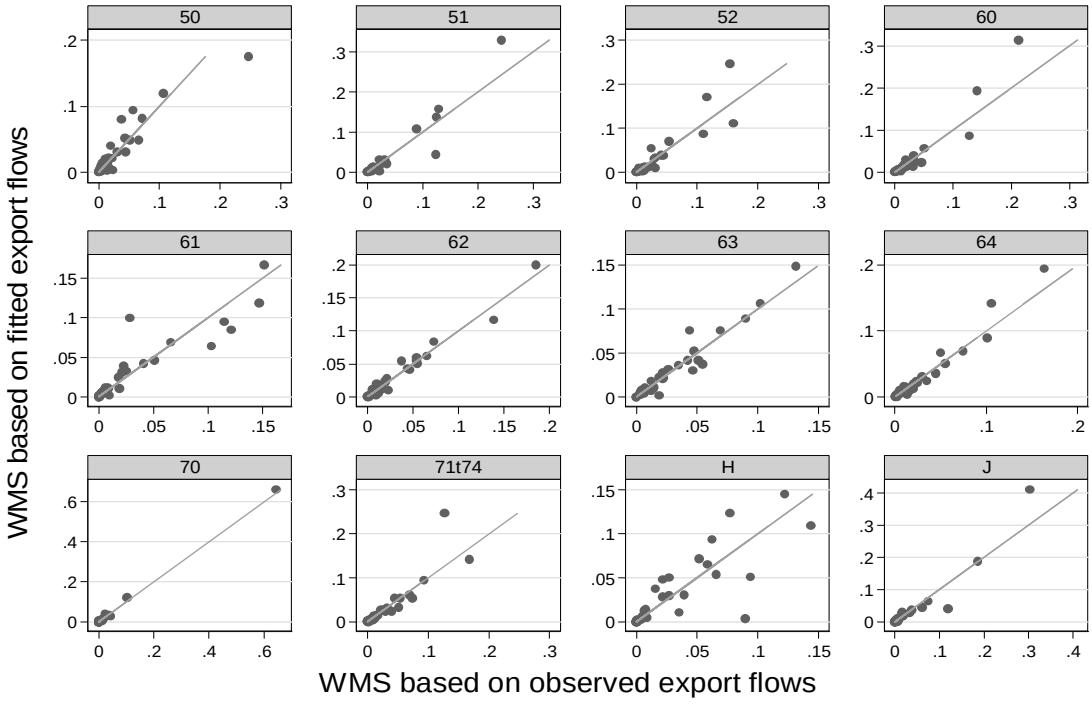
Table C.5 / Sign and correlation test

	Correlation coefficient	RCA and predicted RCA larger than 1	RCA and predicted RCA smaller than 1	RCA larger and predicted RCA smaller than 1	RCA smaller and predicted RCA larger than 1
Sale, maintenance and repair	0.788	45.2	44.9	4.7	5.2
Wholesale trade	0.961	24.0	65.4	4.2	6.5
Retail trade	0.908	43.9	47.5	5.2	3.4
Hotels and Restaurants	0.914	36.0	53.4	5.3	5.3
Inland Transport	0.936	45.6	47.6	2.6	4.2
Water Transport	0.964	32.1	63.7	1.7	2.4
Air Transport	0.932	32.6	51.1	7.3	9.0
Other Transport Activities	0.919	57.2	34.9	1.9	6.0
Post and Telecommunications	0.786	39.7	36.2	11.0	13.1
Financial Intermediation	0.963	13.3	82.4	2.3	2.0
Real Estate Activities	0.621	16.9	70.9	6.6	5.6
Renting and Other Business Activities	0.969	30.6	64.1	1.6	3.7
Total services	0.831	34.8	55.2	4.5	5.5
Austria	0.824	34.3	51.5	7.8	6.4
Belgium	0.943	38.2	51.0	4.9	5.9
Bulgaria	0.928	58.3	29.4	5.9	6.4
Cyprus	0.825	35.3	51.0	11.3	2.5
Czech Republic	0.954	38.2	40.2	8.8	12.7
Denmark	0.972	9.3	80.9	4.4	5.4
Estonia	0.962	17.6	73.0	5.9	3.4
Finland	0.932	31.4	60.8	2.9	4.9
France	0.975	31.4	60.8	4.9	2.9
Germany	0.902	34.3	49.5	3.9	12.3
Greece	0.886	25.0	69.6	4.9	0.5
Hungary	0.894	38.2	42.2	5.4	14.2
Ireland	0.954	29.4	70.6	0.0	0.0
Italy	0.818	34.3	52.0	13.7	0.0
Latvia	0.951	37.3	57.4	0.5	4.9
Lithuania	0.946	40.7	51.0	0.0	8.3
Luxembourg	0.956	11.8	76.0	0.0	12.3
Malta	0.972	46.1	49.5	3.4	1.0
Netherlands	0.967	40.7	54.4	3.4	1.5
Poland	0.703	43.1	34.3	7.8	14.7
Portugal	0.900	40.2	52.0	6.4	1.5
Romania	0.875	31.4	53.9	6.4	8.3
Slovak Republic	0.646	47.1	33.3	0.5	19.1
Slovenia	0.793	27.0	65.7	3.4	3.9
Spain	0.957	39.7	53.4	0.0	6.9
Sweden	0.970	47.5	50.0	0.0	2.5
United Kingdom	0.944	23.0	67.2	7.8	2.0

Source: WIOD; Authors' calculations.

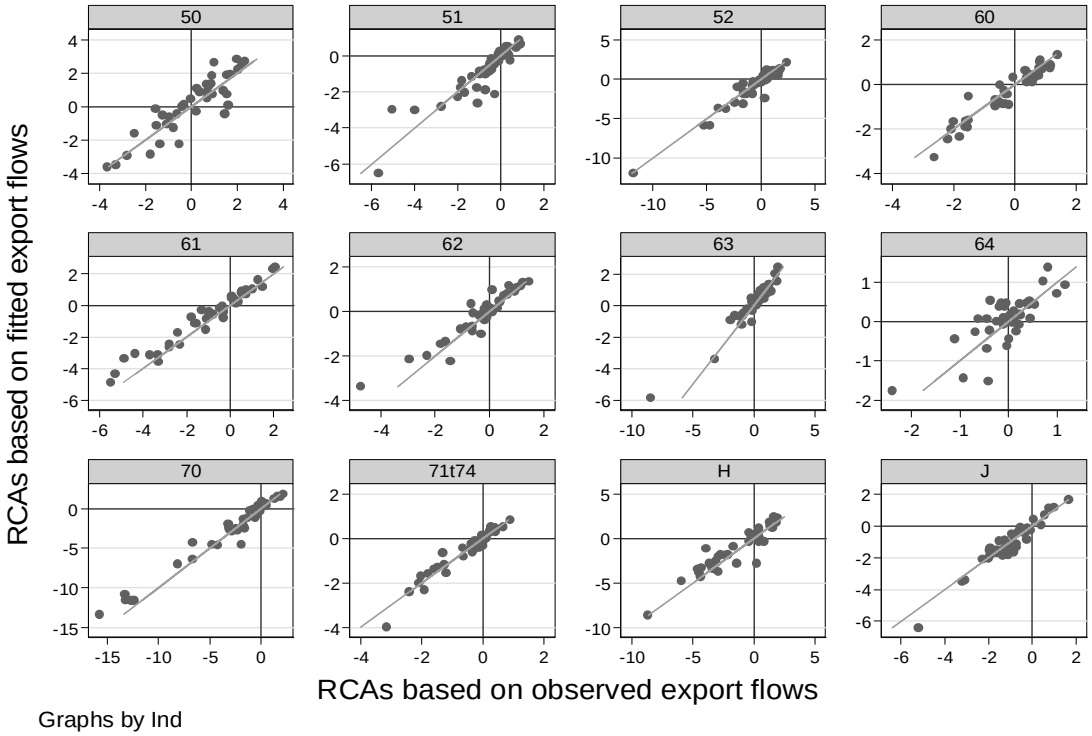
Figure C.3 / Actual versus 'fitted' indicators based on gravity approach for EU-28, 2011

World market shares



Graphs by Ind

Revealed comparative advantages (in logs)



Graphs by Ind

Source: WIOD; Authors' calculations.

Table C.6 / Results from gravity regressions for services trade, including intra-EU trade

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	All	50	51	52	H	60	61	62	63	64	J	70	71t74
VARIABLES	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP	lnEXP
Ln GDPj	0.726***	0.820***	0.915***	0.871***	0.338***	1.381***	0.699***	0.571***	0.301***	0.615***	0.234***	0.987***	0.949***
	(0.0110)	(0.0416)	(0.0326)	(0.0389)	(0.0411)	(0.0333)	(0.0429)	(0.0326)	(0.0352)	(0.0345)	(0.0419)	(0.0546)	(0.0278)
Ln POP j	1.223***	4.776***	1.292***	4.693***	-1.268***	3.098***	3.635***	1.711***	0.177	-2.524***	0.885***	-3.451***	1.309***
	(0.0765)	(0.287)	(0.222)	(0.258)	(0.285)	(0.235)	(0.305)	(0.230)	(0.245)	(0.241)	(0.291)	(0.384)	(0.196)
Ln GDPi	0.714***	0.845***	0.799***	0.740***	1.104***	0.158***	0.601***	0.899***	0.762***	0.836***	0.634***	0.851***	0.451***
	(0.0109)	(0.0402)	(0.0324)	(0.0377)	(0.0407)	(0.0333)	(0.0425)	(0.0324)	(0.0347)	(0.0343)	(0.0415)	(0.0522)	(0.0278)
Log POP i	0.138*	-0.709**	-0.462**	0.901***	1.233***	0.878***	-3.797***	-1.984***	-2.216***	1.327***	3.048***	1.788***	1.816***
	(0.0770)	(0.285)	(0.229)	(0.268)	(0.287)	(0.234)	(0.309)	(0.228)	(0.246)	(0.242)	(0.294)	(0.369)	(0.196)
Ln HC j	1.190***	-1.148***	-3.286***	-3.476***	-1.465***	2.044***	4.871***	4.430***	0.910**	4.368***	3.131***	0.141	2.755***
	(0.116)	(0.429)	(0.341)	(0.392)	(0.428)	(0.357)	(0.459)	(0.347)	(0.371)	(0.362)	(0.445)	(0.565)	(0.298)
Ln HC i	1.080***	2.432***	3.782***	1.802***	1.796***	-1.722***	-3.487***	-0.692**	4.444***	-0.332	-0.0150	1.627***	3.544***
	(0.117)	(0.436)	(0.347)	(0.403)	(0.436)	(0.358)	(0.460)	(0.349)	(0.375)	(0.366)	(0.446)	(0.554)	(0.301)
Ln K i	-0.203***	-0.850***	1.242***	-1.431***	0.357***	-0.608***	-0.438***	-0.110	-1.228***	0.636***	-1.361***	0.481**	0.629***
	(0.0363)	(0.161)	(0.108)	(0.140)	(0.136)	(0.105)	(0.135)	(0.102)	(0.109)	(0.113)	(0.139)	(0.194)	(0.0915)
Ln K j	-0.540***	-1.013***	-0.195**	-0.0465	-0.424***	-1.413***	1.218***	-0.467***	-0.632***	-0.772***	-0.955***	-0.293*	-1.359***
	(0.0331)	(0.122)	(0.0962)	(0.114)	(0.122)	(0.101)	(0.133)	(0.0982)	(0.106)	(0.104)	(0.131)	(0.163)	(0.0841)
Ln HCj x Ln Kj	-0.0314	0.891***	-1.621***	0.540***	-0.0595	0.145*	-0.394***	-0.249***	0.977***	-0.758***	1.069***	-0.585***	-0.206***
	(0.0287)	(0.127)	(0.0859)	(0.111)	(0.107)	(0.0835)	(0.107)	(0.0805)	(0.0867)	(0.0892)	(0.110)	(0.152)	(0.0726)
Ln HCi x Ln Ki	0.340***	0.595***	-0.130*	-0.446***	0.174*	1.122***	-0.869***	0.585***	1.030***	0.632***	0.647***	-0.0779	0.691***
	(0.0261)	(0.0959)	(0.0755)	(0.0889)	(0.0963)	(0.0799)	(0.104)	(0.0775)	(0.0834)	(0.0825)	(0.103)	(0.127)	(0.0663)
Constant	-43.13***	-91.38***	-34.64***	-111.7***	-19.20***	-85.79***	-15.62**	-16.94***	16.25***	-1.746	-79.93***	0.0103	-74.76***
	(1.732)	(6.460)	(5.075)	(5.878)	(6.437)	(5.314)	(6.965)	(5.163)	(5.531)	(5.459)	(6.597)	(8.545)	(4.431)
Observations	297,414	22,250	25,427	23,699	24,263	26,649	25,110	26,289	26,025	25,572	25,319	19,876	26,935
R-squared	0.225	0.291	0.315	0.245	0.192	0.288	0.153	0.299	0.200	0.265	0.122	0.203	0.430
Number of *i*	18,185	1,386	1,534	1,447	1,505	1,593	1,557	1,588	1,585	1,554	1,549	1,277	1,610

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
Source: WIOD, PWT 8.0; authors' calculations.

Table C.7 / Results from gravity regressions for high unit-value segment export flows

VARIABLES	Total	15t16	17t18	19	20	21t22	23	24	25	26	27t28	29	30t33	34t35	36t37
Ln GDPj	0.526***	0.407***	0.206*	-0.127	0.910***	0.255*	0.969***	0.835***	0.102	0.437***	0.904***	0.800***	0.699***	0.627***	0.398***
	(0.0431)	(0.104)	(0.113)	(0.188)	(0.189)	(0.150)	(0.342)	(0.0883)	(0.164)	(0.140)	(0.128)	(0.0999)	(0.138)	(0.163)	(0.134)
Ln POP j	0.376	-1.719**	0.928	2.411**	-3.130**	-0.191	-0.595	0.756	2.953***	-0.543	0.689	-1.967***	1.509*	1.964*	2.552***
	(0.294)	(0.736)	(0.726)	(1.085)	(1.251)	(1.317)	(2.609)	(0.679)	(0.898)	(0.898)	(1.027)	(0.727)	(0.795)	(1.121)	(0.883)
Ln GDPi	0.720***	0.977***	0.504***	0.951***	0.434**	0.476***	0.760**	0.366***	0.585***	0.681***	0.994***	0.770***	0.624***	0.662***	1.275***
	(0.0418)	(0.108)	(0.115)	(0.178)	(0.182)	(0.160)	(0.349)	(0.0846)	(0.122)	(0.134)	(0.135)	(0.0960)	(0.113)	(0.167)	(0.128)
Log POP i	1.057***	2.257***	0.543	-1.489	1.002	2.983***	3.478*	1.519***	1.902***	0.939	0.734	-0.00423	0.298	1.479	-0.878
	(0.251)	(0.664)	(0.709)	(1.045)	(1.213)	(0.861)	(1.979)	(0.525)	(0.720)	(0.793)	(0.812)	(0.551)	(0.669)	(0.947)	(0.765)
Ln HC j	1.988***	1.376	0.578	2.772	-2.214	-0.261	8.716**	0.599	1.353	0.340	-2.920**	4.751***	4.696***	5.765***	4.014***
	(0.421)	(1.053)	(1.023)	(1.937)	(1.947)	(1.255)	(3.507)	(0.807)	(1.280)	(1.302)	(1.244)	(0.852)	(1.062)	(1.527)	(1.238)
Ln HC i	1.884***	1.456	2.958***	2.413	5.441***	-2.507*	6.550*	1.773*	2.352**	1.030	-0.116	1.622*	3.271***	0.677	0.391
	(0.416)	(1.046)	(1.006)	(1.639)	(1.570)	(1.499)	(3.429)	(0.912)	(1.026)	(1.230)	(1.681)	(0.973)	(1.034)	(1.641)	(1.315)
Ln K i	-0.244**	-0.479*	-0.394**	-0.641**	0.451	0.285	-2.378***	0.391**	-0.475**	0.246	0.676**	0.487***	-0.436**	-0.720**	-0.858***
	(0.0975)	(0.259)	(0.195)	(0.327)	(0.431)	(0.313)	(0.909)	(0.189)	(0.230)	(0.282)	(0.310)	(0.180)	(0.218)	(0.326)	(0.271)
Ln K j	-0.607***	-0.522**	-1.086***	-0.278	-1.547***	-0.0520	-1.181	-0.440**	-0.345	-0.571*	-0.823**	-0.932***	-0.799***	-0.538	0.401
	(0.102)	(0.263)	(0.274)	(0.424)	(0.397)	(0.342)	(0.853)	(0.213)	(0.259)	(0.297)	(0.413)	(0.227)	(0.219)	(0.414)	(0.353)
Ln HCj x Ln Kj	0.233**	-0.321	0.408	1.346***	-0.177	-0.303	0.813	-0.00923	0.278	-0.155	-0.586*	0.353	0.549*	0.669*	0.707**
	(0.102)	(0.259)	(0.260)	(0.469)	(0.447)	(0.345)	(0.832)	(0.199)	(0.315)	(0.301)	(0.328)	(0.215)	(0.284)	(0.404)	(0.291)
Ln HCi x Ln Ki	0.0737	0.439*	0.212	0.206	-0.141	-0.216	0.633	0.201	0.488*	-0.513*	0.382	-0.0960	0.00346	-0.487	0.0329
	(0.0945)	(0.238)	(0.250)	(0.379)	(0.384)	(0.309)	(0.766)	(0.204)	(0.281)	(0.300)	(0.323)	(0.215)	(0.245)	(0.361)	(0.286)
Constant	-40.98***	-24.14	-34.02**	-25.77	24.74	-54.14**	-93.02*	-52.84***	-99.69***	-18.18	-42.59**	21.14	-51.50***	-83.04***	-50.94***
	(6.218)	(15.68)	(15.20)	(25.20)	(26.86)	(23.99)	(55.99)	(13.58)	(18.53)	(18.73)	(19.99)	(14.47)	(15.87)	(24.68)	(19.22)
Observations	21.133	1.530	1.530	1.514	1.508	1.528	1.315	1.530	1.517	1.518	1.530	1.530	1.529	1.524	1.530
R-squared	0.863	0.878	0.889	0.784	0.772	0.841	0.567	0.925	0.890	0.872	0.834	0.922	0.918	0.835	0.858

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
Source: WIOD, PWT 8.0; authors' calculations.

Table C.8 / Results from gravity regressions for high unit-value segment export flows, including intra-EU trade

VARIABLES	Total	15t16	17t18	19	20	21t22	23	24	25	26	27t28	29	30t33	34t35	36t37
Ln GDPj	1.095***	1.123***	0.779***	0.486***	1.129***	0.924***	0.366***	1.360***	1.407***	0.498***	1.308***	1.476***	1.580***	1.635***	1.050***
	(0.0156)	(0.0535)	(0.0406)	(0.0680)	(0.0719)	(0.0560)	(0.101)	(0.0491)	(0.0538)	(0.0539)	(0.0480)	(0.0422)	(0.0451)	(0.0665)	(0.0548)
Ln POP j	-3.416***	-4.222***	-5.582***	-2.555***	-5.803***	-1.811***	2.862***	-1.749***	-5.344***	-1.998***	-3.088***	-4.783***	-4.579***	-3.632***	-3.915***
	(0.0988)	(0.339)	(0.285)	(0.391)	(0.436)	(0.375)	(0.601)	(0.341)	(0.335)	(0.339)	(0.332)	(0.298)	(0.288)	(0.436)	(0.336)
Ln GDPi	0.674***	0.695***	0.807***	0.787***	0.721***	0.359***	0.479***	0.486***	0.554***	0.879***	0.891***	0.618***	0.561***	0.659***	0.875***
	(0.0149)	(0.0509)	(0.0403)	(0.0654)	(0.0682)	(0.0546)	(0.101)	(0.0471)	(0.0506)	(0.0518)	(0.0441)	(0.0388)	(0.0427)	(0.0634)	(0.0511)
Log POP i	0.451***	1.734***	-1.221***	-0.429	-0.331	0.988***	5.411***	-1.030***	1.100***	-0.404	-0.356	-0.651**	0.825***	-0.187	1.984***
	(0.0902)	(0.331)	(0.258)	(0.372)	(0.414)	(0.334)	(0.563)	(0.302)	(0.306)	(0.308)	(0.273)	(0.254)	(0.266)	(0.384)	(0.308)
Ln HC j	0.933***	1.200***	0.373	-2.078***	0.323	1.305***	2.026**	1.203***	0.0282	0.946**	-0.342	2.660***	2.246***	1.904***	0.725*
	(0.135)	(0.436)	(0.351)	(0.536)	(0.592)	(0.501)	(1.010)	(0.423)	(0.441)	(0.443)	(0.391)	(0.342)	(0.382)	(0.547)	(0.431)
Ln HC i	2.408***	1.864***	2.516***	1.348**	2.376***	0.894*	0.253	2.388***	3.532***	2.599***	1.651***	3.154***	3.649***	3.712***	3.213***
	(0.137)	(0.446)	(0.363)	(0.583)	(0.600)	(0.505)	(0.953)	(0.432)	(0.467)	(0.458)	(0.415)	(0.359)	(0.395)	(0.576)	(0.469)
Ln K i	0.443***	0.420***	0.341***	0.745***	0.473***	0.0702	-0.989***	0.497***	1.077***	0.242**	0.854***	1.051***	0.504***	0.322**	0.497***
	(0.0363)	(0.118)	(0.0932)	(0.138)	(0.158)	(0.134)	(0.266)	(0.115)	(0.114)	(0.117)	(0.109)	(0.0943)	(0.0987)	(0.150)	(0.115)
Ln K j	-0.387***	-0.168	-0.362***	0.103	-0.498***	-0.302**	-0.239	-0.350***	-0.456***	-0.307**	-0.403***	-0.657***	-0.528***	-0.873***	-0.426***
	(0.0374)	(0.124)	(0.0978)	(0.157)	(0.159)	(0.137)	(0.261)	(0.115)	(0.123)	(0.125)	(0.113)	(0.0994)	(0.105)	(0.156)	(0.126)
Ln HCj x Ln Kj	-0.623***	-0.310***	-0.991***	-0.681***	-0.607***	-0.430***	0.235	-0.332***	-1.081***	-0.486***	-0.909***	-0.874***	-0.802***	-0.670***	-0.730***
	(0.0300)	(0.0955)	(0.0772)	(0.115)	(0.129)	(0.110)	(0.225)	(0.0941)	(0.0958)	(0.100)	(0.0893)	(0.0791)	(0.0813)	(0.128)	(0.0913)
Ln HCi x Ln Ki	-0.195***	0.174*	-0.415***	-0.252**	-0.661***	-0.0940	-0.00319	0.0649	-0.163	-0.129	-0.191**	-0.258***	-0.356***	-0.173	-0.165
	(0.0308)	(0.101)	(0.0780)	(0.126)	(0.134)	(0.113)	(0.217)	(0.0940)	(0.103)	(0.103)	(0.0931)	(0.0815)	(0.0871)	(0.128)	(0.104)
Constant	31.22***	23.27***	99.79***	40.74***	83.36***	1.424	-152.0***	27.67***	50.19***	25.28***	36.68***	67.74***	39.13***	37.82***	11.30*
	(1.964)	(6.757)	(5.484)	(8.084)	(8.956)	(7.376)	(12.47)	(6.485)	(6.672)	(6.704)	(6.246)	(5.562)	(5.635)	(8.428)	(6.501)
Observations	288.549	21.025	21.23	20.31	20.032	20.816	17.232	21.266	20.894	20.377	21.005	21.172	21.292	20.884	21.014
R-squared	0.833	0.835	0.871	0.742	0.700	0.802	0.477	0.863	0.829	0.812	0.878	0.897	0.874	0.810	0.826

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
Source: WIOD, PWT 8.0; authors' calculations.

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