Working Paper

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The Development of EU and EU Member States' External Competitiveness

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Highlights

- We revisit EU competitveness scores using post-crisis data.

- While EU market share were at their 2000 level in 2007, they deteriorated afterwards, even for high-end and high-tech products.

- EU exports still embody 85% of value added created in the EU, despite increasing fragmentation of value chains. Therefore European exports are still predominently "Made in Europe".

- EU manufacturing exports increasingly include value added in services.

- Competitveness in services is an important determinant of future European industry.

RESEARCH AND EXPERTISE
ON THE WORLD ECONOMY

▌ Abstract

We revisit competitiveness issues using recent data and show that the global financial crisis has taken a toll on European producers that before 2007 were maintaining their market positions. The EU competitiveness in goods has recently deteriorated, even in the upper and high-tech segments of the world market. The decline recorded by European exporters is attributable purely to performance and not to adverse orientation of their exports. However, European exports are predominantly "Made in Europe" and include an increasing share of services. The within Europe advantages in manufacturing seem to have been exhausted and further gains imply moves outside the EU with an enhanced focus on the competitiveness in services as an important determinant of future European industry.

▌ Keywords

Competitiveness, trade in value added.

▌ JEL

F14, F15.

Working Paper ▌

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The Development of EU and EU Member States' External Competitiveness

Angela Cheptea*, Charlotte Emlinger**, Lionel Fontagné#, Gianluca Orefice**,
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1. Introduction

According to Curran and Zignago (2009) who exploited detailed data up to 2005, European Union[1] external competitiveness had been resilient to the emergence of new competitors, contrasting with the deindustrialisation observed in the US and to a lesser extent in Japan. This positive outlook was based on the fact that, on the whole, the EU had managed to exploit its advantage in top quality (and to a much smaller extent technological) products, and had done so by exploiting the diversity of its comparative advantage within the enlarged Union, ranging from low cost producing locations to laboratories at the top of their respective fields in several domains.

The purpose of the present paper is to revisit these issues using up to date data and taking account of new developments in the analysis of Global Value Chains (GVC). We consider the dramatic macroeconomic counter-performances in Europe since 2008, contrasting them with resilient emerging markets and a slightly recovering US economy. How much has the crisis taken its toll on European exporters? Has the market positioning of top products been an advantage in the crisis, or has it penalised export performance? Have emerging markets benefited from a sluggish Europe and destroyed the export positions of weakened European exporters? Have services smoothed or exacerbated these evolutions?

Our analysis uses the most recent data and methods to address these questions. Detailed trade data from BACI (a database developed by CEPII using UN COMTRADE as source data; see Gaulier and Zignago, 2010) are exploited to assess the market positioning of traded products and their technological content.[2] The World Input-Output database (WIOD), the new input-output database developed with EU funding, is used to determine how value chains are organised and what this means for specialisation. Finally, CHELEM (another database developed by CEPII) is used to assess trade in goods and services within a common framework. Our methodology relies on shift-share decomposition of the changes in market shares (Cheptea, Fontagné and Zignago, 2014), the measurement of market positioning based on unit values proposed in Fontagné, Gaulier and Zignago, (2008), and the measurement of specialisation in value added (Stehrer, 2012).

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[1] EU with 27 Member States.

[2] Contrary to Curran and Zignago (2009), goods trade figures used in our paper include mineral products HS25, HS26 and mineral fuels HS27. This has to be kept in mind when looking at the results. The inclusion of these products was motivated by the presence of oil exporting country as Russia, in the sample. However this does not change the overall message because the volatility of mineral prices does not influence dramatically the dynamics of market shares. The main difference is only on the levels of the market shares because of the weight of oil producing countries in total trade.

While export positions have withstood better than might have been feared in the medium run, there has been a shift during the crisis. All EU market share losses recorded since 2000 occurred since 2007. No market segment was sufficiently resilient to the crisis. Overall, though, European trade performance has remained substantial compared to Japan and the US. But recent evolutions to the extent that these are not only due to the economic cycle could pose future challenges. We show clearly that EUthe EU lost 1.3 percentage points of its world market share between 2007 and 2010. This contrasts with a stable market share between 2000 and 2007. This loss corresponds to 8% and the trend of the EU is now similar to that of the US (-8%) and Japan (-7%), which contrasts with the situation before the crisis when European market shares were very resilient compared to US or Japanese shares. All EU Member States except the new Member States are following such trend: during 2007-2010, the largest losses in world market shares (in absolute terms) were posted by Italy, Germany and the UK.[3] The picture is similar in percentage terms: Italy lost 14% of its market share over the period 2007-2010, the UK 9%, Germany and France 6% each. European competitiveness was hinging on of top range and high tech products; however, even these two segments have evolved poorly for European producers since 2007 although less than the other segments. In the upper segment of the market, Germany lost 12% market share during 2007-2010; and the corresponding figures are 18% for Spain, 17% for Italy, 15% for Sweden, 14% for France. In high tech products, Finland forfeited is position as the main producer of cell phones losing 49% of its world market share over 2007-2010, while Hungary lost 10%, Germany, Ireland and Sweden 7% each, and the UK 5%. On the other hand, EU products increasingly comprise services. This suggests that competitiveness in services is an important determinant of future European industry. In fact, we conclude also that the pattern of specialisation in European industry is changing due to the break up of value chains. We show in this paper that industry is no longer only about industrial activities: European manufacturing industry relies increasingly on services: services are exported indirectly by the manufacturing sector. However, this means also that European industrial competitiveness is relying increasingly on competitiveness in services. Policies to revamp competition and innovation in services at the European level are at the core of any future revamp of the competitiveness of the manufacturing sector.

The recently developed data on trade in value added show that the international integration of the EU has increased: EU exports embodied less EU value added in 2011 than in 1995 and more foreign value added. However, EU exports still embody some 85% of value added created in the EU, therefore, European exports are still predominantly "Made in Europe". At the same time, the EU is also providing more inputs to other countries' exports, indicating that this fragmentation of production is a two-way process.

From the perspective of individual EU members there is a wide range of vertical specialisation across countries, ranging from a domestic content of slightly less than 80% (e.g. UK, Romania, Greece) to close to 50% (e.g. Czech Republic, Hungary, Belgium) and even lower for Luxembourg. Differentiating between intra- and extra-EU vertical specialisation we see that in 2011 the EU share in foreign value added of these countries' exports ranged from more than 60% (e.g. Luxembourg and Austria) to slightly above 30% (e.g. Greece and Lithuania). Although intra-EU integration is still stronger than integration with extra-EU countries, over time the latter has grown more than the first.

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[3] Romania, Estonia, Lithuania, Poland posted small gains (0.1 percent of the world market each) over the period 2007-2010; in the remaining New Member States there were no gains.

The rest of the paper is organised as follows.[4] Section 2 shows that, during the crisis, trade in services has been more resilient than trade in goods. Section 3 describes the changes in the specialisation of European countries during the crisis. We consider seriously the role of services, the market and technological positioning of European exports, and the role of GVC. The concentration of market share losses since the crisis is analysed in Section 4. Section 5 concludes.

## 2. Recent evolution of trade in goods and services

As stated in the introduction, this paper aims to analyse changes in the specialisation patterns of the EU with a particular focus on the increasing role of services and the "servitization" of the manufacturing sector. Hence, this section discusses the historical evolution of trade in services since the late 1960s, focusing on the comparison of trade in services and trade in manufactured goods. We show the changing pattern of trade in services and goods during the recent economic crisis.

We start by comparing historical patterns of trade in goods and trade in services. The exponential increase in both trade in goods and trade in services since the early 1960s has not mirrored changes in the domestic economies of advanced countries. Trade in goods still plays a crucial role in worldwide trade patterns (Figure 1) while services now represent the largest share of the domestic economies in advanced countries. The share of trade in services over trade in goods has been continuously increasing since the early 1970s: in 1973 trade in services represented less than 20% of trade in goods; in 2013 it counts for almost 25%.

Two main reasons explain this increase in trade in services. First, new communication technologies have allowed service tasks to be traded internationally and/or relocated abroad (offshoring of services), with an implied increase in the value of trade in services (Amiti and Wei 2005). Second, there has been increasing liberalisation of trade in services: preferential trade agreements (PTAs) in services have proliferated since 2000 (Roy 2011). Before 2000 only five PTAs on services were registered with the World Trade Organization (WTO); since 2000, 85 additional agreements have been notified with others under negotiation and due to be notified.[5] Further, the commitments on services usually go beyond those made by governments under the GATS; this suggests an even bigger effort by governments to liberalise trade in services.

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[4] This paper is complemented by an on-line appendix replicating the paper's results but taking account of intra-EU trade (not included here), and providing results (with and without intra-EU trade) for individual member states. We refer, for example, to 'OLA-A1' to indicate Table A.1 in the on-line appendix.

[5] An important feature concerning preferential agreements on services is that they can be negotiated outside the multilateral system.

Figure 1. Historical patterns of trade in goods and services worldwide.
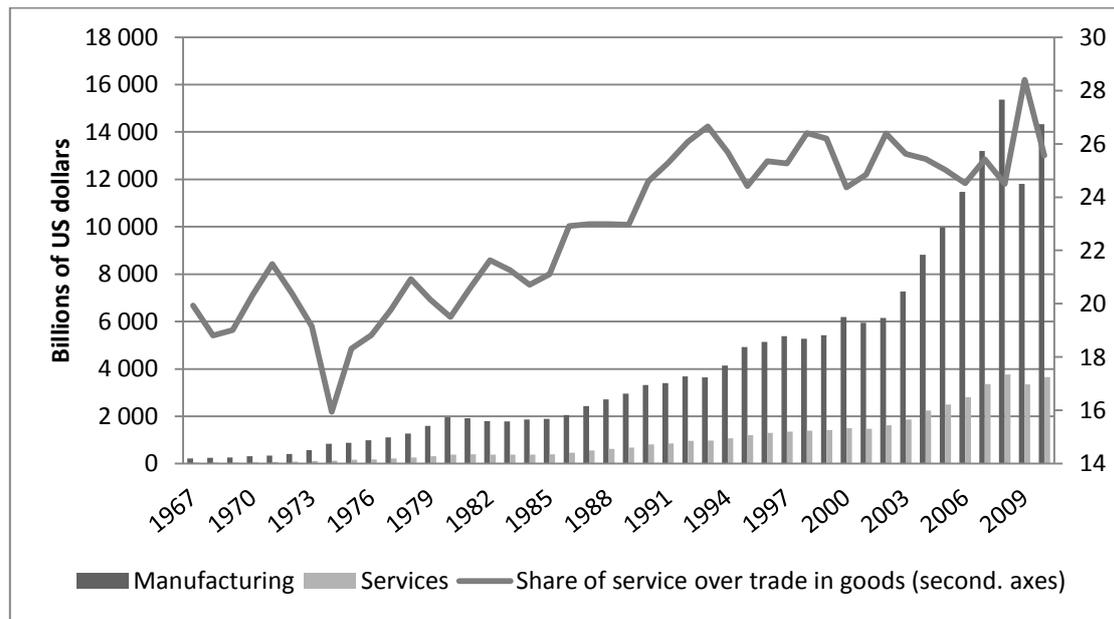
Source: Authors calculations on CHELEM (CEPII)

We can thus conclude that the role of trade in services has increased strong in recent decades, which calls for detailed analysis of EU specialisation in trade in services. We next investigate whether the recent economic crisis has affected the pattern of trade in services and which service sectors have suffered the most.

While trade in goods collapsed in 2008 with the onset of the economic crisis, trade in services was more resilient and suffered to a lesser extent. Figure 1 shows that in 2007 to 2008 the downward trend in trade was more pronounced for goods than services: after 2007 trade in goods collapsed by almost 40% while trade in services fell by "only" 20%.

The economic rationale for the resilience of trade in services during the crisis is its nature compared to trade in goods. Demand for many traded services is less cyclical, and production of services does not depend on the financial sector as the production of goods does (Borchert and Mattoo 2009). This argument is supported by the trend lines in Figure 2 where trade in services is disaggregated by sector.

The volume of trade in services strictly related to trade in goods (i.e. transport sector and financial services sector) shrank consistently after the crisis; while service sectors unrelated to trade in goods (communication and informatics services) have suffered less and have maintained their pre-crisis values.

Figure 2. Historical pattern of trade in services – sector disaggregation
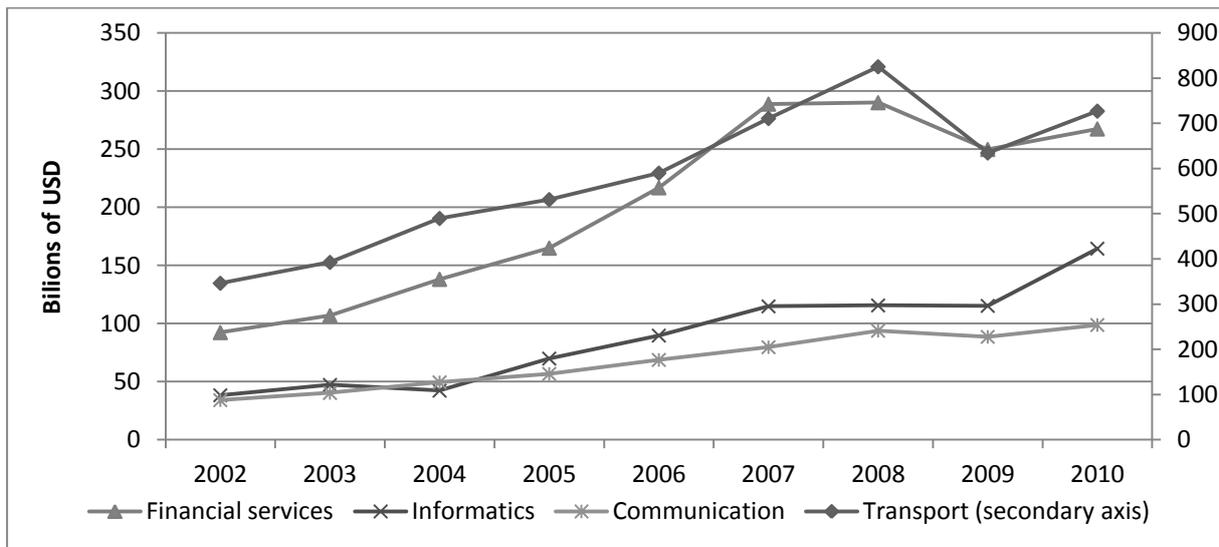
Source: Authors calculations on CHELEM (CEPII)

Given its resilience, trade in services represents an opportunity for government to recover from the crisis by driving national specialisation towards those service sectors not badly affected by the economic crisis. This conclusion is based on simple trade in services data and, thus, represents only a part of the complex process of "servitization" of manufacturing exports because such figures hide –the fact that services are mostly embodied in goods and therefore traded indirectly through trade in goods. In next chapter we show that an increasing part of EU trade in goods is actually value added from services. This is driven by the increasing externalisation of services by manufacturing firms and by the increasing service content in many manufactured goods.

Finally, has the recent economic crisis affected world trade patterns by sector (Table 1) and country (Table 2) differently? Figure 1 shows that trade in goods increased over recent decades with a steep rise in 2000-2007 followed by a reduction in 2008-2010. There are several reasons for the rise in 2000-2007, including: (i) China's entry to the WTO, (ii) the huge number of PTAs signed in this period around the world (WTO, 2011), (iii) increased demand for exports from developing countries (Brazil, China, India and Russia among others). Conversely, there is only one reason for the reduction in trade in goods in 2008-2010: the recent financial crisis and the consequent contraction in demand for exports. This is only a general picture of overall trade in goods, and more detailed (sector specific) analysis is provided in Tables 1 and 2, which show the structure of world trade by sector (NACE classification), and importing market.

Table 1 shows the industry specific shares (over total trade) in 2000, 2007 and 2010 and their changes in (percentage points, p.p.) in the periods 2000-2007, 2000-2010 and 2007-2010. Comparing the periods before and after the crisis (i.e. 2000-2007 vs 2007-2010) we do not observe any important changes: the crisis did not affect the sectoral pattern of trade. Only "Basic Metals and Metal Products" and "Machinery NEC" experienced reductions in the period 2007-2010 greater than changes in the pre-crisis period. All other sectors showing negative changes in 2007-2010 had experienced negative changes in the pre-crisis period.

However, the crisis has changed countries' trade patterns. Table 2 shows country shares in world imports for the same time periods as in Table 1. Contrasting with the pre-crisis period, the EU market was particularly hit by the crisis years (2007-2010). Brazil and the South American countries were less affected and managed to offset pre-crisis losses in market share. Notice also the role of North America and USA, traditionally large destination markets which contracted respectively from 29.2% and 24.4% of word imports in 2000 to 18.6% and 15.4% in 2010. Finally, Asia's leading position as a destination market was confirmed, increasing from 31% market share in 2000 to 37.5% in 2010 (with a positive change in the 2007-2010 period). This profound reshaping of world trade may have played a role in the redistribution of exporters' market share: we will investigate this issue below.

The aim of this section was to provide a brief historical context to the worldwide increasing role of trade in services (over trade in goods) and to highlight the role of the recent economic crisis on trade in services and manufacturing goods. We show that the role of trade in services (as a share of trade in goods) increased greatly in the period 1980-1995 and persisted even during the crisis (resilience of trade in services). We also provide descriptive evidence that the crisis did affect less the sector composition of world trade in goods than the geographic orientation of world trade, with Asian countries experiencing increasing market shares after the crisis, and the EU and North America experiencing a reduction in market shares.

In what follows we focus on country specific patterns of trade specialisation (macro sector and within service sub-sector comparisons), to show which countries' macro specialisation changed during the crisis.

Table 1. The sectoral composition of world trade in goods

NACE industry name	Shares of world imports, %			Changes in shares, p.p.		
	2000	2007	2010	2000-2007	2007-2010	2000-2010
Agriculture, Hunting, Forestry and Fishing	2.82	2.53	2.80	*-0.29*	*0.28*	*-0.01*
Basic Metals and Fabricated Metal Products	7.27	10.03	9.18	*2.76*	*-0.85*	*1.91*
Chemicals and Chemical Products	8.92	9.79	10.40	*0.87*	*0.61*	*1.48*
Coke, Refined Petroleum and Nuclear Fuel	3.16	4.69	5.27	*1.54*	*0.58*	*2.11*
Electrical and Optical Equipment	25.96	20.68	20.27	*-5.29*	*-0.4*	*-5.69*
Electricity, Gas and Water Supply	0.14	0.16	0.15	*0.02*	*-0.01*	*0.01*
Food, Beverages and Tobacco	4.37	4.17	4.56	*-0.21*	*0.39*	*0.18*
Leather, Leather and Footwear	1.24	1.10	1.08	*-0.14*	*-0.02*	*-0.16*
Machinery, Nec	8.15	9.21	8.67	*1.05*	*-0.54*	*0.51*
Manufacturing, Nec; Recycling	3.21	2.91	2.96	*-0.30*	*0.05*	*-0.25*
Mining and Quarrying	10.59	13.94	15.31	*3.35*	*1.37*	*4.72*
Other Community, Social and Personal Services	0.01	0.01	0.01	*0.00*	*0.00*	*0.00*
Other Non-Metallic Mineral Products	1.07	1.04	0.99	*-0.03*	*-0.05*	*-0.08*
Pulp, Paper, Paper , Printing and Publishing	2.31	1.71	1.59	*-0.60*	*-0.12*	*-0.72*
Renting of M&Eq and Other Business Activities	0.01	0.01	0.01	*0.00*	*0.00*	*0.00*
Rubber and Plastics	2.12	2.17	2.28	*0.05*	*0.11*	*0.16*
Textiles and Textile Products	5.95	4.46	4.21	*-1.48*	*-0.25*	*-1.74*
Transport Equipment	11.71	10.64	9.67	*-1.07*	*-0.98*	*-2.04*
Wood and Products of Wood and Cork	0.99	0.76	0.59	*-0.23*	*-0.17*	*-0.40*
Total (sum of the above)	100.00	100.00	100.00	*0.00*	*0.00*	*0.00*

Source: Authors calculations using BACI data (CEPII).

Table 2. The composition of world trade by destination markets

Importer	Shares of world trade, %			Changes in share, p.p.		
	2000	2007	2010	2000-2007	2007-2010	2000-2010
EU27	18.40	19.31	17.46	*0.91*	*-1.85*	*-0.93*
North America	29.19	21.84	18.64	*-7.35*	*-3.2*	*-10.55*
USA	24.39	18.29	15.46	*-6.09*	*-2.83*	*-8.92*
Latin-Central America	7.16	6.41	7.03	*-0.75*	*0.62*	*-0.13*
Brazil	1.21	1.11	1.55	*-0.1*	*0.44*	*0.34*
Rest of Europe	5.48	7.99	7.38	*2.51*	*-0.61*	*1.9*
Russia	0.87	2.16	1.96	*1.29*	*-0.21*	*1.09*
Middle East and Africa	5.85	8.34	8.80	*2.49*	*0.46*	*2.95*
Asia	31.01	33.33	37.55	*2.32*	*4.23*	*6.55*
Japan	7.34	5.71	5.42	*-1.62*	*-0.29*	*-1.92*
China	3.94	7.42	9.51	*3.48*	*2.1*	*5.57*
India	0.95	2.22	2.48	*1.27*	*0.25*	*1.52*
ASEAN	7.70	7.26	8.03	*-0.44*	*0.76*	*0.33*
South Korea	3.06	3.29	3.46	*0.23*	*0.16*	*0.4*

Source: Authors calculations using BACI data (CEPII).

3. European countries' specialisation during the crisis

External trade performance and trade specialisation are often presented in terms of market share and its evolution. We conduct such an analysis in Section 4. However, decreasing world market shares for the rich countries is to some extent the natural outcome of the emergence of new competitors. This is not necessarily bad news for the longest industrialised countries since emerging markets increase the size of the pie to be shared among exporters. For this reason we systematically benchmark EU performance against changes in the market shares of the US and Japan, two big economies facing the same challenges.

Essentially, changes in market shares can be seen as the result of two forces: countries' export abilities (comparative advantages), and international competition (absolute advantages). These are the two levels of analysis addressed in this paper.

The absolute advantage is driven by export composition (destination or sector) and external competitiveness. The comparative advantage of countries is a somewhat different issue. Comparative advantage refers to a country's relative performance across sectors, regardless of its overall performance. Accordingly, countries specialise and become net exporters (importers) in sectors where they have advantage (disadvantage) in technology, market positioning, or production costs. In relation to specialisation, we investigate not market share, but how the country allocates its resources to alternative sectors, product categories or product ranges. Specialisation in a sector is counteracted by "de-specialisation" in another activity. It is generally acknowledged that a country's observed specialisation mirrors its comparative advantages, which are not directly observable.

Among the wide range of indices of comparative advantage proposed in literature, we rely on two measures: (i) the CEPII index, and (ii) the RCA or *Balassa* index (see section 3.B for a description of this index). The CEPII index, used in Section 3.A, compares actual sector specific national trade balances with a theoretical balance assuming an absence of specialisation. This theoretical balance is computed by spreading the overall balance across sectors according to their respective shares in the country's total trade.

The formula used to compute contributions to the trade balance normalised by total trade (in per thousands), is:

$$CEPII = \frac{1000}{X_{tot} + M_{tot}} \left[\left(X_{sec} - M_{sec} \right) - \left(X_{tot} - M_{tot} \right) \frac{X_{sec} + M_{sec}}{X_{tot} + M_{tot}} \right]$$

where X_{sec} and M_{sec} respectively represent the country's exports and imports in a certain sector; X_{tot} and M_{tot} respectively respect the country's total exports and imports. Data on trade in services come from balance of payments data, thus we do have information on partner countries.[6] A positive (negative) value of this index shows that the country has a comparative advantage (disadvantage) in the sector analysed, since the actual trade balance is higher (lower) than the expected one in absence of any specialisation.

We use this index of comparative advantage to describe the evolution of EU competitiveness in international markets and to assess whether EU competitiveness has been affected by the recent economic crisis. This section provides measures of trade specialisation for the EU and some benchmark countries at different levels of disaggregation. We also consider trade in value added. Note that, unless otherwise stated, we consider the EU as a single economy, hence we do not consider intra-EU trade.

We examine the recent changes in European specialisation understood as changes in the allocation of resources across activities reflected by trade data, in three stages. First, we compare specialisation in goods and services from a broad sectoral perspective (section 3.A). Second, we focus on goods, taking advantage of highly disaggregated nature of the product classification to investigate specialisation processes within products, in market segments (section 3.B). Third, we investigate the manufacturing sector more deeply and consider the fragmentation of value chains (section 3.C). We then "reconcile" trade in goods and services and show that trade in goods provides indirect benefit to trade in services via trading production factor services.

Although data on trade in services is less detailed than the data on trade in goods, given the crucial and increasing role of services, it is worth taking a broader perspective and addressing EU specialisation in services, before our more detailed analysis of trade in manufactured goods. We examine the EU as a whole and then compare with USA, Japan and the BRIC (Brazil, Russia, India, China) countries, and also individual EU Member States.

The results in section 3.A show that EU trade specialisation is moving towards trade in services, but retains comparative advantage in the manufacturing sector. This double comparative advantage is exceptional in a comparison with the USA and Japan, which have single sector specialisations in services and manufacturing respectively.

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[6] Thus, we cannot remove intra-EU trade in services to compute our index of specialisation and also cannot calculate the traditional Balassa index for the services sector.

Section 3.B discusses the EU comparative advantage in high value added products - high-tech and high value products. However, this advantage was not sufficient to shield against the adverse evolutions in the world market since the crisis.

Section 3.C investigates whether the trade patterns and comparative advantages observed so far change if we take a value added perspective. We focus on the domestic value added content of a country's exports. We show that EU exports embodied less domestic value added (i.e. value added created in the EU) in 2011, and thus more foreign value added, compared to 1995. International fragmentation of production has been particularly pronounced in high tech manufacturing (where the EU has comparative advantage). Finally, we show that the figure for comparative advantage based on the domestic content of a country's exports is very similar to the figure obtained using gross exports. More importantly, we show that domestic services account for an increasingly high share of value added in manufacturing exports. In 2011, services accounted for 39% of domestic valued added in EU exports of manufacturing goods – an increase of 4.5 p.p. since 1995. This is an example of so-called "servitization" of EU industrial exports.

3.1.   EU specialisation in services versus goods

We start our analysis of EU trade specialisation by focusing on macro-sector specialisation in the EU, compared with other large developed countries (US, Japan) and using the BRIC countries as a benchmark. We replicate the analysis for individual EU Member States (detailed tables for Member States in the OLA A.4- A.5). We compare specialisation in goods and specialisation in services. We adopt a traditional approach that takes account only of direct exports of services. As already noted, we extend this approach in later sections by taking account of indirectly traded services, i.e. services embodied in exported goods. For goods, we distinguish between primary and manufactured products. Overall, this section shows that, for specialisation, the EU differs from both developing and other developed countries.

Figure 3 shows sector specific contributions to the trade balance (CEPII index of comparative advantage[7]) for three macro sectors (primary, manufacturing, services) in the period 2000-2010; Figure 4 uses the same time span and shows contributions to the trade balance for three within service sub-categories (travel, transport, other services).

In line with the comparative advantage of a high income economy shifting from manufactures to services, the EU shows increasing trade specialisation in services from 2002, and slightly decreasing specialisation in manufacturing and primary sector goods – see Figure 3. Among the three sub-categories in the services sector, the EU seems to be focused on pure service activities (i.e. all services except travel and transport) – see Figure 4. A similar pattern emerges for the USA: in 2000 to 2010 the USA experienced strong comparative advantage in services as a consequence of increased specialisation in travel and other services (i.e. financial, telecommunications, etc.).

However, contrasting with the USA, the EU has managed to keep an industrial base, taking advantage of the diversity of its comparative advantages, ranging from high tech to moderate wages. The main difference between the EU and the USA is accordingly that the EU has

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[7]
  See previous section for details.

developed an advantage in services while maintaining a non negligible advantage in manufacture while the USA shows a negative CEPII index for manufacturing industry across the entire period 2000-2010. Note that this simple approach uses gross exports of goods and services as reported by customs (for goods) or balance of payments data (for services) and does not include indirect exports of services.

The increase in European comparative advantage in the services sector is not a consequence of the recent crisis; Figure 3 shows that EU specialisation in services compared to goods began before the crisis but has not increased since 2007. The evidence is similar for India, which has maintained a positive CEPII index for services in the period 2000-2010.

In contrast to the EU and the USA and to what is expected from a high income country, Japan shows very strong specialisation in manufacturing only, and a negative CEPII index for both the services and primary sectors. However, Figure 4 shows that Japan has been increasing its specialisation in services consistently since 2003, particularly in "other services", which includes financial and communications services among others.

The structure of comparative advantage for the developing countries such as the BRICs, is peculiar. China shows indeed strong and increasing advantage in manufacturing sector from 2002 to 2010 (perhaps as a consequence of WTO accession in 2001) and a reduction in primary sector specialisation. In the whole period 2000-2010 China's leading sector measured by the CEPII index was manufacturing. India has experienced an important change in its leading sector: pre-2006 manufacturing had the highest comparative advantage index; after 2006 services became India's leading sector. Brazil and Russia show clear and increasing specialisation in their primary sectors along the whole period considered.

Finally, the analysis of comparative advantage for single EU Member States (in OLA) shows wide differences in trade specialisation among EU Member States and a trend towards a polarised structure in macro-sector specialisation. Older industrialised Member States have lost their traditional comparative advantage in manufacturing (Belgium-Luxembourg, Germany, France and Italy have decreased CEPII indexes and/or reduced market shares), while new Member States are working towards achieving comparative advantage in services (Estonia, Latvia, Lithuania and Slovakia). The UK stands out for its high and increasing specialisation in services.

This section showed the peculiar double-sector (services and manufacturing) specialisation in the EU and introduces the detailed description/comparison of EU comparative advantages. This section focused on the role of trade in services, which has been shown to be increasingly important for the EU, especially the financial and telecommunications sectors.

Figure 3 International specialisation of the EU and its competitor (CEPII index) – Macro sectors aggregation
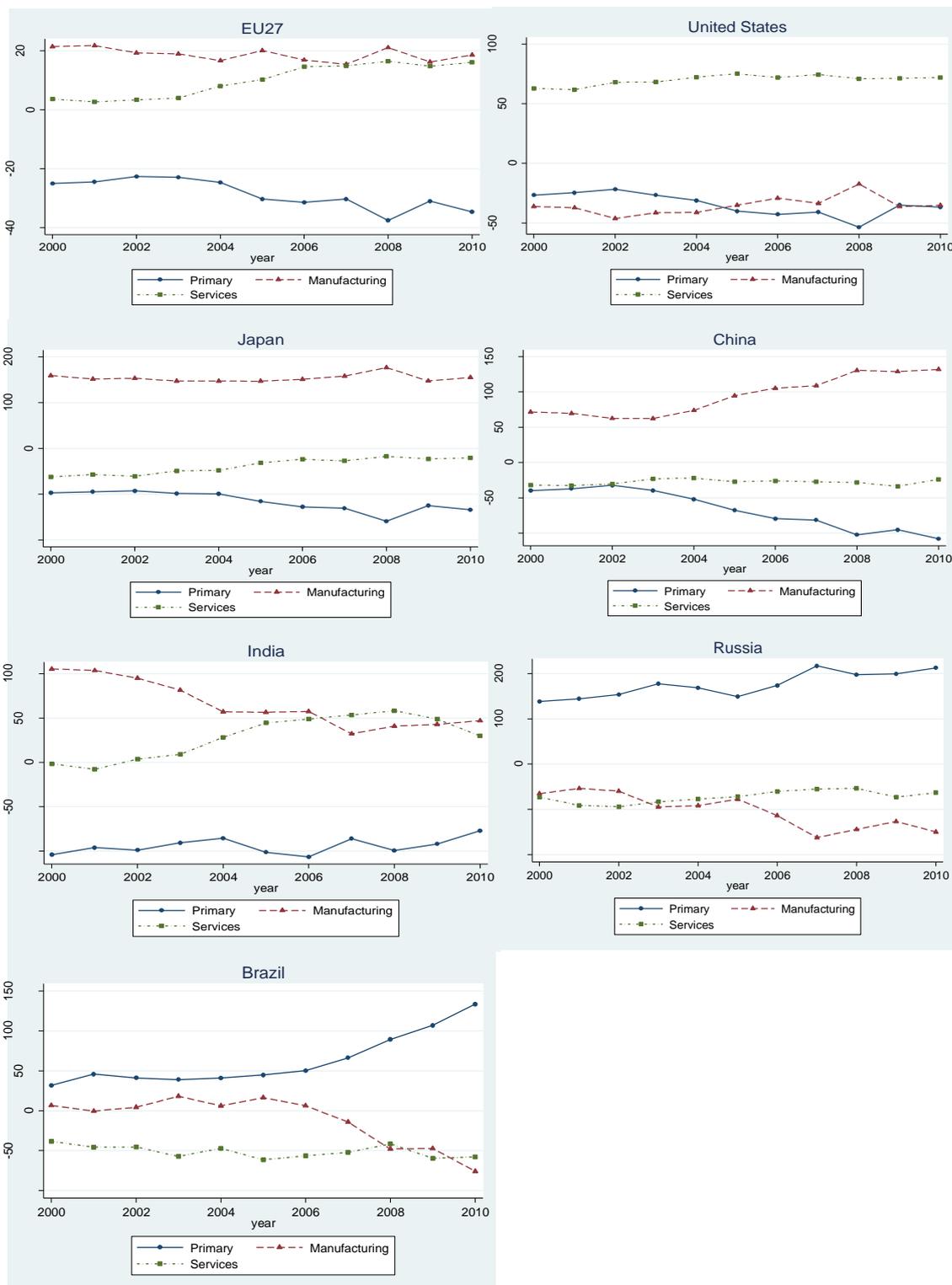
Source: Authors calculations using CHELEM data (CEPII).

**Figure 4. International specialisation of the EU and its competitors (CEPII index) –
Within service sub-categories specialisation**
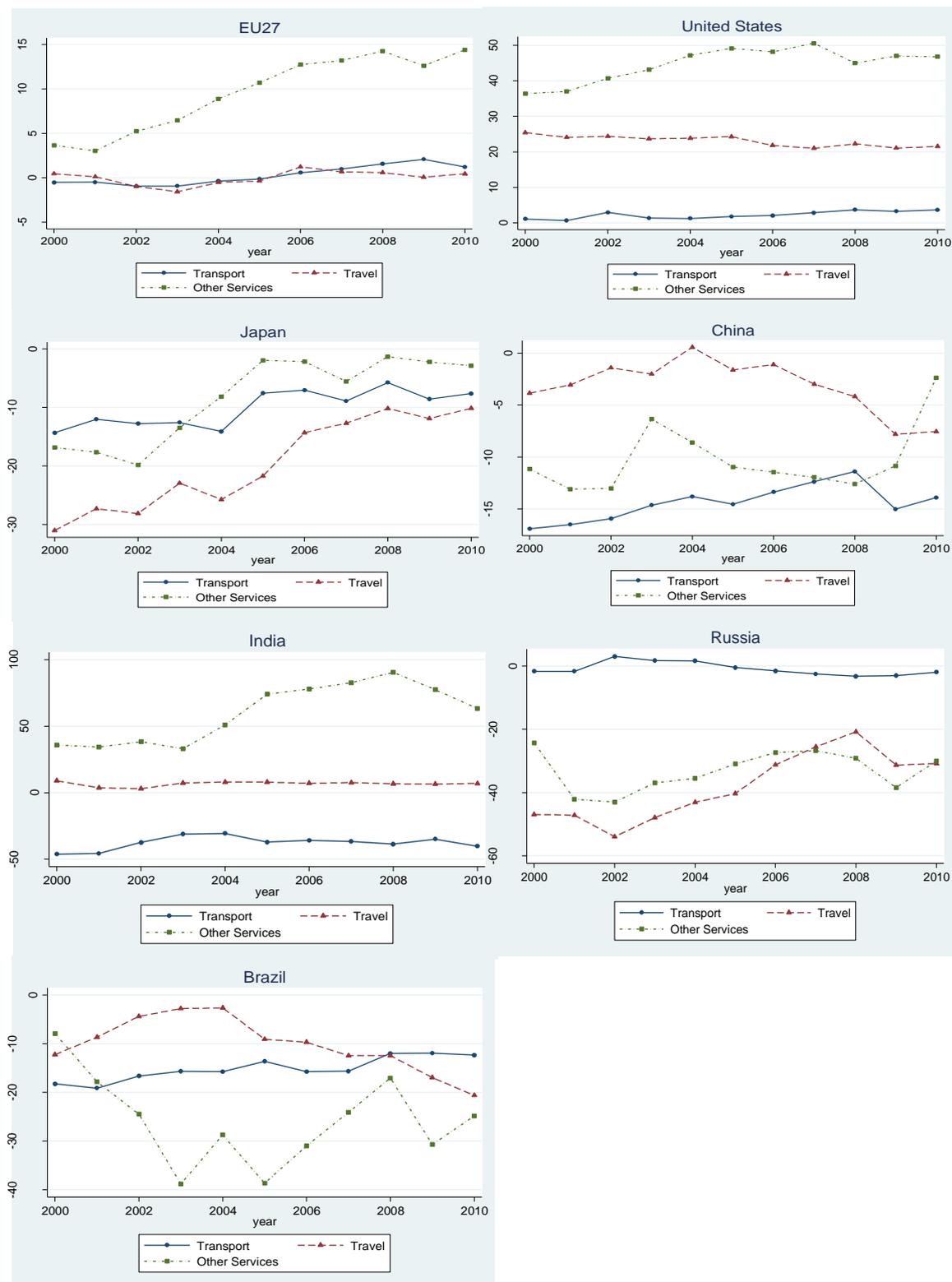
Source: Authors calculations using CHELEM data (CEPII).

3.2. EU specialisation by sector, technological level and market segment

In this section we investigate the composition of trade in goods in the EU and its main partners, at a high level of product disaggregation. This analysis is guided by the hypothesis that the EU, as a developed and high income economy, should have and advantage in exporting high value added goods. This should be reflected in good performance for high-tech and top range products. Here, top range products refer to high-priced goods: exporters manage to sell their products in foreign markets despite their high price, which points to the presence of non-price attributes such as brand, high perceived quality, efficient after-sales service, and variety of differentiated products in the same product category.[8] It is in this market segment that European exporters perform best. High tech products are defined not by their price, but by their technological content.

First, we consider the breakdown of European exports across main economic sectors using the NACE Rev.1 classification of economic activities detailed in Appendix A.3, and their correspondence with the HS 6-digit classification of traded goods.

EU exports are largely concentrated in four sectors: chemicals, machinery, electrical & optical equipment, and transport equipment.[9] The sectoral composition of EU exports has been relatively stable over the 2000-2010 decade with a few notable changes, most of which occurred before the financial crisis in 2008. The exception is chemical products whose share in EU exports increased more rapidly during the crisis (+1.4 p.p.).

We next consider products differentiated according their technological content, using the OECD-Eurostat classification (see Appendix A.3). We distinguish four broad categories of products embedding: high-level production technologies (HT), middle-high technologies (MHT), middle-low technologies (MLT), and low technologies (LT). Since the classification proposed by OECD-Eurostat does not cover all the products traded by countries, we include an additional category for non-classified products.[10]

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[8] As detailed below, we split the distribution of world prices for each product into three equal-sized market segments and consider the upper market segment where prices are highest.

[9] The sectoral breakdown of EU trade is more uneven on the import side. 40% of European imports consist of mining & quarrying, and electrical & optical equipment.

[10] Examples of non-classified products according to the technological content are: live animals, fresh and chilled fish, coal, crude oil, electrical energy. These are mainly primary products categorized as low-tech by alternative classifications (e.g. Lall, 2000).

Figure 5. The composition of EU' extra-EU exports by main economic sectors (NACE Rev.1)

The structure of EU27's exports by sector (%)
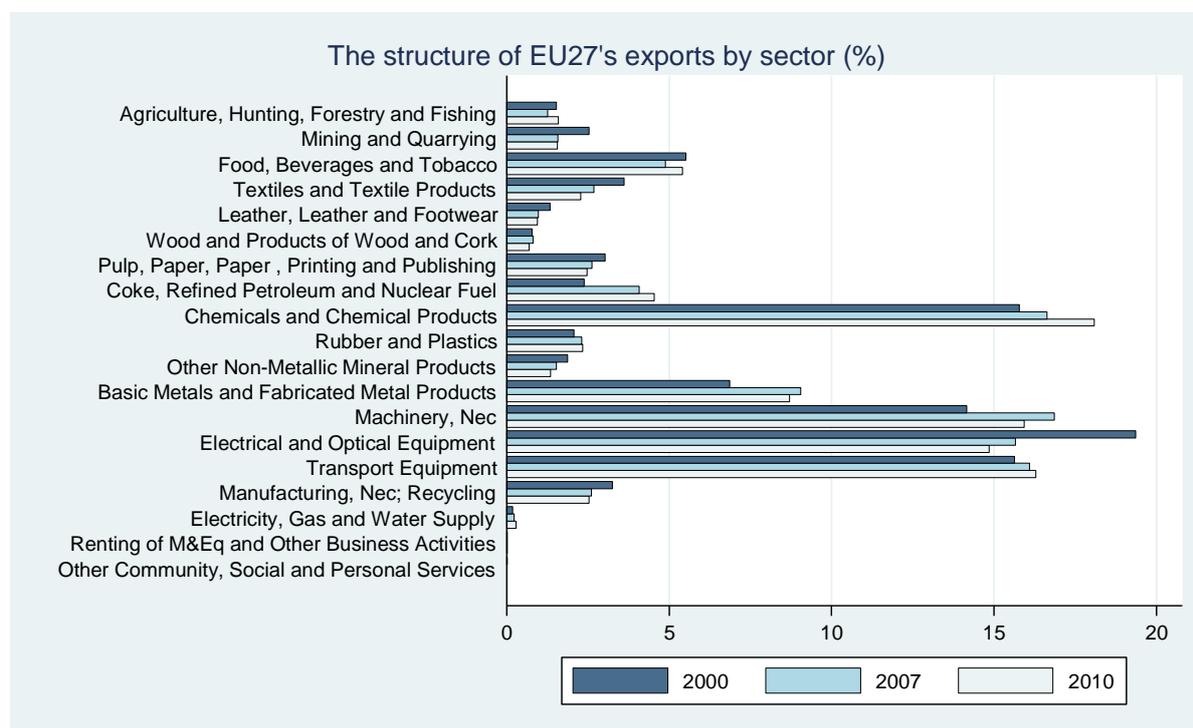
Note: Results are reported for economic sectors of the NACE Rev.1 classification (see Appendix A.3) for which positive trade flows are observed. Intra-EU trade flows are excluded from computations.

Figure 5 presents the share of exports in each of these five categories for the EU and its main trading partners. As expected for a developed economy, Europe exports mainly high-tech and middle-high tech products. These two categories account for two-thirds of Europe's exports. During the 2000s there was however a slight shift in EU exports towards *lower-tech* products. Between 2000 and 2007 the share of high-tech exports decreased by 3.5 p.p., while the share of medium-high and medium-low technology exports increased by 3.6 p.p. and 4 p.p., respectively. This evolution was halted during the crisis years (2008-2010) or even reversed for high-tech products (reduction of 3.5 p.p. before 2007 vs. increase of 0.9 p.p. after 2007). At the same time, the share of low-tech exports shrank from 17.6% to 14.4%, although the reduction in the share of non-classified goods (mostly categorised as low-tech under alternative classifications) suggests that this change might have been more pronounced.

In 2000 high-tech products represented more than a third of US and Japanese exports and almost half of exports from ASEAN. By 2010 these shares had dropped by respectively 9, 13, and 16 p.p., pointing to a huge shift in comparative advantage from traditional high-income exporters of high tech goods towards emerging economies benefiting from low wages and increasing technology levels. Note that the technological level of exports from China and India increased. Brazil and Russia, however, suffered a decrease. In 2000 low-tech products accounted for 40% of Chinese exports and 57% of Indian exports.

Consumer products are not "made in" only one country. To some extent, and to borrow from a recent WTO initiative, they are "made in the world". Different countries contribute to the production of the same good, depending on their individual specialisation in a segment of the value chain. This microeconomic evidence is out of line with how trade statistics traditionally are collected: trade statistics refer to gross trade. The consequences have been profound in China due to its increased participation in the GVC of high-tech sectors. With 25% of world's exports and 11% of world's imports in 2010 China remains a net exporter of high-tech products. While the share of high-tech products in Chinese exports increased 9 p.p., between 2000 and 2010, their contribution to China's imports has been constant (around 24-25%). This discrepancy between in the structure of Chinese exports and imports points to an increased share of domestic value added in Chinese exports of high-tech goods. Thus, 35% of products exported by China in 2010 are high-tech, and only 26% are low-tech products. In the case of Indian exports, the shift has been mainly from low-tech (-22 p.p.) to medium-low tech (+16 p.p.) products. To what extent this shift in comparative advantage is an illusion is investigated below using the WIOD database on trade in value-added.

In addition to the major shift in comparative advantage for high-tech goods, the race for primary products has had a huge impact on primary resources exporters. Brazil and Russia increased their exports of primary products by 20 p.p. and 14 p.p. respectively to the detriment of exports in all other product categories. In both countries this evolution took place mostly after the financial crisis in 2007. Although extraction of primary products may require use of mid-tech or high-tech equipment, they are subject to little technological transformation. Therefore, it is reasonable to associate an increased specialisation in these products to an overall downgrading in the technological content of a country's exports.

Table 3. Decomposition of exports by technological content (shares in %)

Exporter	2000				2007				2010			
	HT	MHT	MLT	LT	HT	MHT	MLT	LT	HT	MHT	MLT	LT
EU27	24.6	39.2	14.4	17.6	21.1	42.8	18.4	14.6	22.0	41.9	18.2	14.4
North America	29.8	35.5	11.9	15.2	24.1	36.0	16.4	12.4	22.2	34.6	18.0	12.7
USA	35.3	35.4	11.3	13.1	29.3	38.0	14.7	11.4	26.4	37.0	16.9	12.0
Latin-Central America	14.9	26.2	14.8	20.9	11.7	22.6	18.5	18.8	11.2	21.2	16.7	17.9
Brazil	12.1	23.2	18.3	29.8	6.5	22.9	18.9	27.5	4.9	18.3	13.1	27.0
Rest of Europe	11.3	19.4	27.5	15.1	9.9	18.6	30.5	12.1	10.8	16.9	29.5	11.7
Russia	2.1	11.1	40.8	7.7	1.3	9.6	35.3	5.3	1.2	7.8	33.5	4.7
Middle East and Africa	3.9	6.8	16.3	9.6	2.7	8.1	17.1	7.2	2.4	9.2	17.7	6.8
Asia	35.2	26.8	12.5	21.3	30.6	28.9	17.6	18.3	30.1	28.2	18.5	18.3
Japan	33.5	49.8	11.9	4.5	22.0	57.2	17.0	3.5	20.4	55.1	20.6	3.7
China	25.1	19.0	11.7	40.3	32.0	23.3	15.3	27.8	34.2	24.1	14.1	26.1
India	5.6	15.3	13.3	57.4	6.9	18.4	28.7	36.4	8.3	17.9	29.3	35.2
ASEAN	46.7	13.4	10.6	20.3	35.0	19.5	17.0	18.2	30.9	19.9	18.5	19.4
South Korea	35.1	27.9	21.2	15.0	34.0	35.6	24.7	5.4	31.8	34.2	28.7	4.9

Notes: Authors' calculations using BACI data. NT -high-tech products, MHT - medium-high tech products, MLT - medium-low tech products, LT - low-tech products. Non-classified products (according to their technology content) are not shown here.

Another important feature of observed trade flows is the market positioning of a country's exports. Emerging economies have diversified and now export most of the products exported by high income countries. However, this does not mean that the two groups of countries compete head-on, since the market positioning of their exports is different (Fontagné et al., 2008). Many products may be classified under a given heading of customs nomenclatures, but their price and market segments are different. In absence of observed prices, the unit values of the products exchanged between countries can be generally computed and used as to indicate market positioning. Unit values are obtained by dividing the value of a trade flow in monetary terms, by its value in physical terms (quantity). It should be emphasised that market positioning provides a more general indicator than quality. Unit values also reflect costs and market segmentation (Hallak & Schott 2011). There are several features that lead to higher prices, such as preferences for certain "made in" labels, market power of large firms, and other market imperfections. Crucial to this analysis is that consumers agree to pay a higher price for a given variety of the same category of good, exported by a certain country.

Unlike price data, which vary across contracts, unit value is unique to each individual trade flow (a product k exported by country i to country j in year t). We divide each product's world trade into three broad groups (market segments) according to the unit value of individual trade flows: high, middle and low unit-value/market positioning. This procedure relies on the distribution of product-level unit values as developed in Fontagné et al. (2008).

Table 3 summarises the composition of exports by product unit-value/market segment for the EU and its main partners, which is a different categorization than the technological level of product. In 2000 European exports were distributed almost equally across the three market

segments, with 35% in the top market segment. In the decade to 2010, Europe has increased its specialisation in top-range products (which reached 40% of exports by 2010), and reduced specialisation in low-value products. The US, Japan, and the ASEAN countries have also upgraded their products, but have not achieved EU performance. These countries rely considerably more on mid-value products, which account for 41%-43% of their exports. China and South Korea have maintained their specialisation in bottom-range products. Russia and the Middle East and African countries have seen spectacular structural shifts during the financial crisis in the late 2000s.

Table 4. Decomposition of exports by products' unit-values (UV), shares in %

Country	2000			2007			2010		
	Low UV	Mid UV	High UV	Low UV	Mid UV	High UV	Low UV	Mid UV	High UV
EU27	29.7	34.4	35.1	23.8	33.2	42.4	24.7	34.4	40.2
North America	32.1	42.9	23.2	27.0	44.4	24.2	25.1	46.8	25.8
USA	32.8	39.9	25.9	27.0	40.6	28.0	25.7	43.3	28.5
Latin-Central America	42.1	40.7	16.2	39.5	42.5	17.2	32.1	52.5	14.9
Brazil	39.9	41.1	18.8	41.4	44.6	13.9	31.7	53.6	14.6
Rest of Europe	41.8	38.5	17.0	41.6	33.5	24.0	28.0	43.8	27.2
Russia	50.3	34.3	11.6	55.6	34.0	9.9	28.0	51.8	19.8
Middle East and Africa	34.3	44.3	10.6	53.8	27.5	16.2	25.0	59.4	13.7
Asia	36.1	39.8	21.2	37.2	37.0	20.6	36.5	39.7	21.3
Japan	22.4	43.8	32.0	22.6	43.2	30.1	20.7	42.2	34.6
China	44.3	39.9	15.2	48.5	34.9	14.7	46.5	39.1	13.3
India	41.3	30.1	15.8	36.1	41.8	21.6	33.9	37.1	15.3
ASEAN	37.7	40.0	19.1	31.7	36.9	23.1	29.9	41.1	27.5
South Korea	41.1	37.8	20.3	39.3	37.0	23.5	41.7	39.7	18.4

Notes: Authors' calculations using BACI data. Non-classified products (according to the distribution of unit values) are not shown here.

We should stress that prices reflect production costs (Khandelwal 2010), potentially flawing this measure. Our measure is based on observed trade flows and points to the fact that different producers are exporting the same category of good, in the same year, to the same market, but at very different prices. Since we observe different flows, these products must be (vertically) differentiated. Otherwise, in the presence of a homogenous good, only the cheapest exporter would be observed in the data or the market share of the expensive exporter should shrink. If a country's exports are in the high-price range, but product attributes do not justify this pricing, its market share will shrink. Hallak (2006) defines product quality as a demand shifter that captures all the attributes of a product valued by consumers, and finds that cross-country variation in unit values can be attributed to differences in quality so-defined. In light of this finding, the figures in Table 4 can be considered proxies for quality.

Next we analyse the international specialisation of the EU across products by focusing on comparative advantages and disadvantages. Figure 6 displays the EU's RCA computed at sector level according to the NACE Rev.1 and using the CEPII index. It offers a more detailed insight into the evolution of EU specialisation in manufactured and primary goods, analysed in section 3.3.1. Figure 6 shows that the EU has strong comparative advantage in

machinery (46.3), transport equipment (42.6), and chemical products (41.2). Europe's main comparative disadvantage is mining and quarrying (-94.1), and electrical and optical equipment (-21.9) and textiles (-20.6). Despite the financial crisis, its advantage in these sectors increased. The recent financial crisis contributed to deterioration in Europe's position for these sectors (except transport equipment and chemicals). Combining the results in Figures 5 and 6, we can conclude that the EU is exporting products in which it has net comparative advantage relative to other countries. Thus, despite its strong disadvantage in electrical and optical equipment, this is one of the EU's leading export sectors (Figure 5).

Figure 6. The CEPII measure of RCA for EU, excluding intra-EU flows
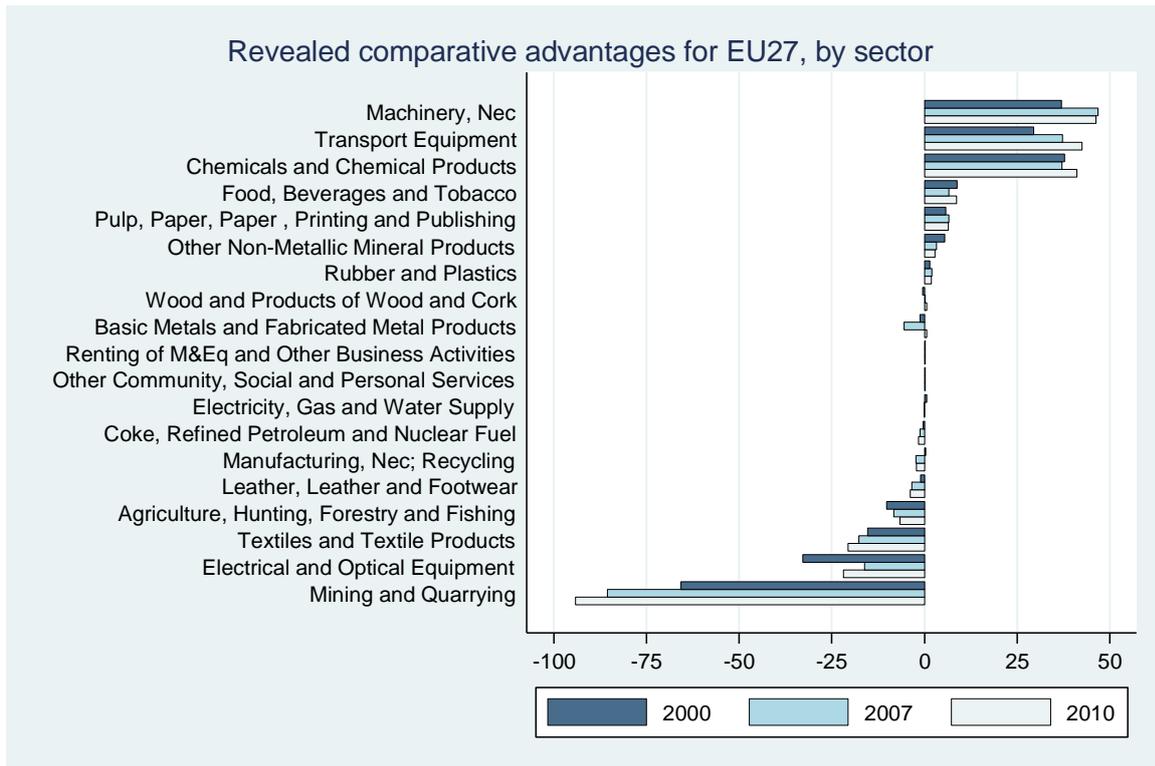
Note: Sectors are defined according to the NACE Rev.1 classification. Computations are using the CEPII index and excluding intra-EU27 flows. RCA are expressed in ‰ of extra-EU27 total trade. Sorted by results in 2010. Positive values denote net exports, negative values denote net imports.

Another second RCA indicator, initially proposed by Balassa, computes countries' specialisation by comparing the share of a given industry in the country's total exports, with the same share for a benchmark country or reference group. Here we consider the rest of the world as the reference group:

$$RCA\_Balassa_i^k = \frac{X_i^k / \sum_k X_i^k}{\sum_i X_i^k / \sum_i \sum_k X_i^k}$$

where *X* denotes either gross exports or the domestic content of exports (used to compute the RCA index), *k* is the sector and *i* is the country of interest. We use detailed bilateral trade data from the BACI dataset to compute this index. Results for the EU are shown in Figure 7. While the CEPII RCA uses both export and import data and takes account of intra-industry

trade, the Balassa indicator of comparative advantage relies on export data only. The CEPII RCA indicator adjusts for the size of each sector, but unlike the Balassa indicator, makes no reference to the structure of trade at the global level. The value range of the two indicators is also different. The CEPII RCA measure is expressed as a percentage (here per thouthands for sake of presentation) of the country's total trade and can take positive and negative values. The Balassa RCA measures the structure of a country's exports relative to the structure of world trade and, therefore, can take only positive values. A value close to 1 means that the contribution of the considered sector to the country's overall exports is very close to its share in global demand. A Balassa RCA indicator larger (lower) than 1 points to the country's specialisation in (disengagement from) specific products. This indicator ignores the fact that a leading export sector may also rely heavily on imported parts and components, which downgrades the country's performance in that sector. Thus, the strong EU comparative advantage in pulp and paper products and other non-metallic minerals (Figure 7) is considerably weakened if we control for intra-industry trade (Figure 6). Nevertheless, the overall ranking of sectors according to the RCA computed by the two methods is quite similar.

Figure 7. The Balassa measure of RCA for EU, excluding intra-EU flows
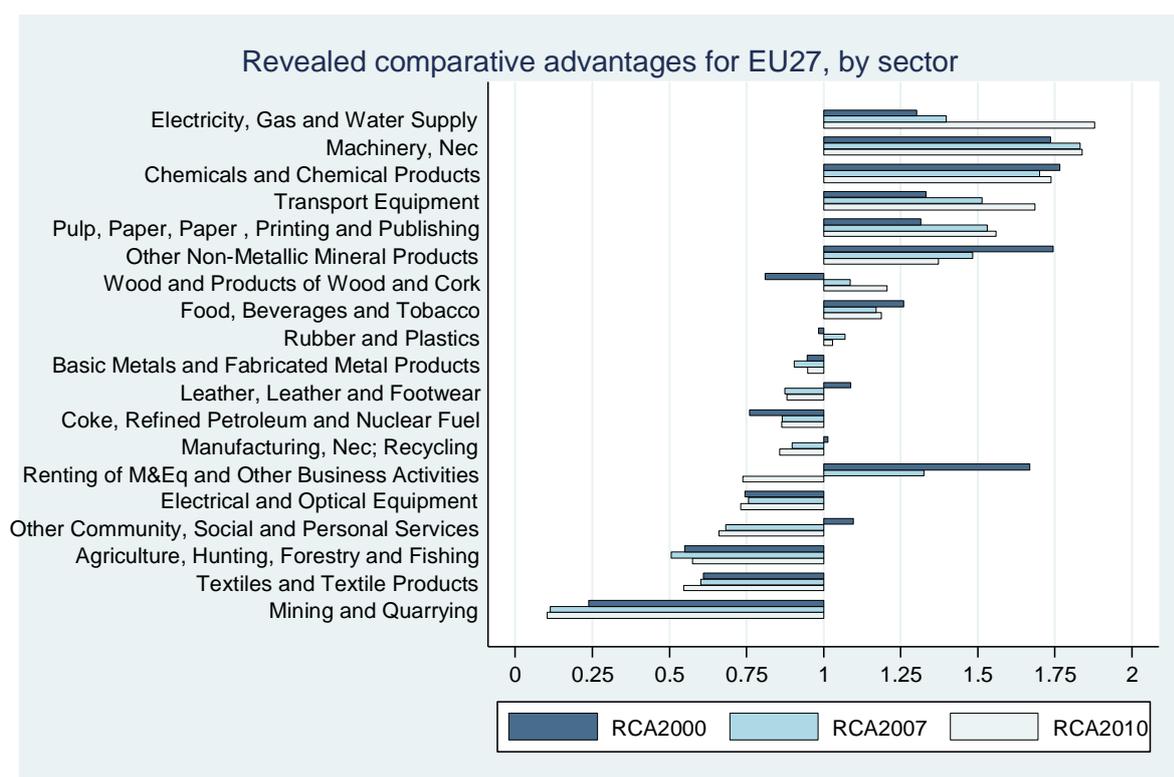
Note: Sectors are defined according to the NACE Rev.1 classification. Computations using the Balassa index and excluding intra-EU27 flows. Sorted by results in 2010. Positive values denote net exports, while negative values denote net imports.

3.3. EU specialisation and global value chains

The proliferation of GVC in recent years has changed the landscape of global trade significantly, particularly in sectors such as transport equipment and electronic products. This increasing importance in global production linkages suggests we should re-examine traditional trade statistics based on gross value of trade. The value added content in exports should be split according to the location of production: not all intermediate products (or even intermediate services) are produced domestically. In what follows we obtain two important results. First, there is intra-European fragmentation of production processes. Most products exported by the EU are truly *made in Europe*. Second, *services are indirectly exported* through trade in goods.

A first glance at the positioning of exporters along the value added chain is provided by the classification of products traded according to their level of transformation. This is achieved here using the Broad Economic Categories (BEC) classification.[11] According to this classification, trade in final products represents two-thirds of global trade. Indeed, descriptive evidence on GVC can be obtained only by considering Tables 5 and 6 together.

Tables 5 and 6 show the breakdown of exports and imports, for individual traders, into final and intermediary products. A country heavily engaged in GVC will import more intermediate products (hence a larger share of these products in its total imports) and export a disproportionate share of final products. With 78% of exports and 63% of imports, the EU is exporting (relatively) more final products than the US (69%), Japan (68%) or ASEAN (63%). On the other hand, the EU is importing (relatively) more intermediate products than the US, pointing to the role of value chains for European producers.

However, this is indeed in Asia that the presence of GVC is captured by this data, pointing to the role of the so-called 'Factory Asia', with China leading this group in terms of share of intermediate products in imports (50%).

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[11] The correspondence between each BEC product category and product usage (final/intermediate) is shown in the Appendix, Table A.4.

Table 5. Decomposition of exports by product usage (shares in %)

Exporter	2000		2007		2010	
	Final	Intermediate	Final	Intermediate	Final	Intermediate
EU27	76.0	24.0	78.2	21.8	77.8	22.2
North America	64.4	35.6	66.6	33.4	66.9	33.1
USA	63.0	37.0	67.6	32.4	68.7	31.3
Latin-Central America	62.2	37.8	60.5	39.5	57.1	42.9
Brazil	72.6	27.4	67.1	32.9	56.2	43.8
Rest of Europe	64.7	35.3	64.5	35.5	63.2	36.8
Russia	56.9	43.1	48.4	51.6	46.0	54.0
Middle East and Africa	34.8	65.2	34.7	65.3	36.5	63.5
Asia	69.0	31.0	70.7	29.3	70.5	29.5
Japan	66.6	33.4	69.5	30.5	68.4	31.6
China	82.3	17.7	80.3	19.7	78.7	21.3
India	82.4	17.6	82.1	17.9	83.3	16.7
ASEAN	59.5	40.5	61.4	38.6	63.0	37.0
South Korea	75.1	24.9	71.2	28.8	70.9	29.1

Source: Authors' calculations using BACI data.

Table 6. Decomposition of imports by product usage (shares in %)

Country	2000		2007		2010	
	Final	Intermediate	Final	Intermediate	Final	Intermediate
EU27	61.1	38.9	63.8	36.2	62.6	37.4
North America	67.8	32.2	68.3	31.7	68.3	31.7
USA	68.8	31.2	68.2	31.8	67.8	32.2
Latin-Central America	69.3	30.7	73.5	26.5	73.0	27.0
Brazil	62.2	37.8	64.1	35.9	68.6	31.4
Rest of Europe	78.4	21.6	79.7	20.3	78.6	21.4
Russia	78.5	21.5	84.3	15.7	79.9	20.1
Middle East and Africa	74.0	26.0	78.0	22.0	78.3	21.7
Asia	59.8	40.2	56.5	43.5	56.3	43.7
Japan	62.7	37.3	57.6	42.4	59.2	40.8
China	62.6	37.4	51.9	48.1	50.3	49.7
India	54.2	45.8	55.9	44.1	56.7	43.3
ASEAN	53.8	46.2	58.2	41.8	61.8	38.2
South Korea	56.4	43.6	56.9	43.1	56.4	43.6

Source: Authors' calculations using BACI data.

As already mentioned, to account for the effects of GVC and global production linkages we need indicators for domestic and foreign value added content of exports derived from international input-output tables. This allows country and industry-specific usage of intermediates by partner countries and industries to be tracked, as well as deliveries of specific industry intermediates from a specific country to other industries and countries and to final users. Combining data on value added created in each sector disentangles the

foreign value added content of a country's exports that enter the product via imports of intermediates. This value added content in a country's exports in gross terms can be split further into the contribution of individual sectors (e.g. services) and partners. This section reports some important developments in EU manufacturing and services exports in value added terms over the period 1995-2011, using the WIOD. The WIOD combines information from national suppliers and use detailed trade data to construct global input-output tables. The database covers 41 countries and about 85% of world trade for the period 1995-2011. For a more detailed description see Appendix A.2.

3.3.1. Vertical specialisation of the EU

A first important question from a value added trade perspective is to what extent a country's exports embody domestically created value added and to what extent exports are used as intermediates from other countries and, therefore, embody value added created in foreign economies. Specifically, the concern is how much of the extra-EU manufacturing exports embody value added created in the EU referred to as the 'domestic content of exports' and how this has changed over time, given the tendency of increasing international fragmentation of production and the rise of emerging countries such as China and India. To examine this we use a widely used indicator, domestic and foreign value added content of trade, which is similar to Hummels, Ishii and Yi's (2001) measure of vertical specialisation (the 'import content of exports'), but refers to value added. [12]

As argued above, a country's exports embody both value added created in the domestic economy and value added originally created in a foreign economy which is imported via intermediate inputs; an important example is raw materials or parts and components imported from other regions in the world. It has been argued that this type of trade in intermediates has increased in recent decades and national domestic shares in national exports have decreased. Figure 8 presents the share of domestically produced value added in a country's exports for the EU (including only extra EU exports) compared to the US, Japan and China. National exports include both intermediate and final goods exports since the interest is in the domestic value added content of these exports irrespective of whether they are used for final consumption or further production in the other countries (see Koopman, Wang and Wei (2013) for a further decomposition in this respect). In this figure exports are further split into manufacturing and services since the former might have different international sourcing structures.

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[12] For a technical discussion of these measures see Foster-McGregor and Stehrer (2013) and Appendix Section A.2.

Figure 8. Share of domestic value added in gross exports for selected countries, in %
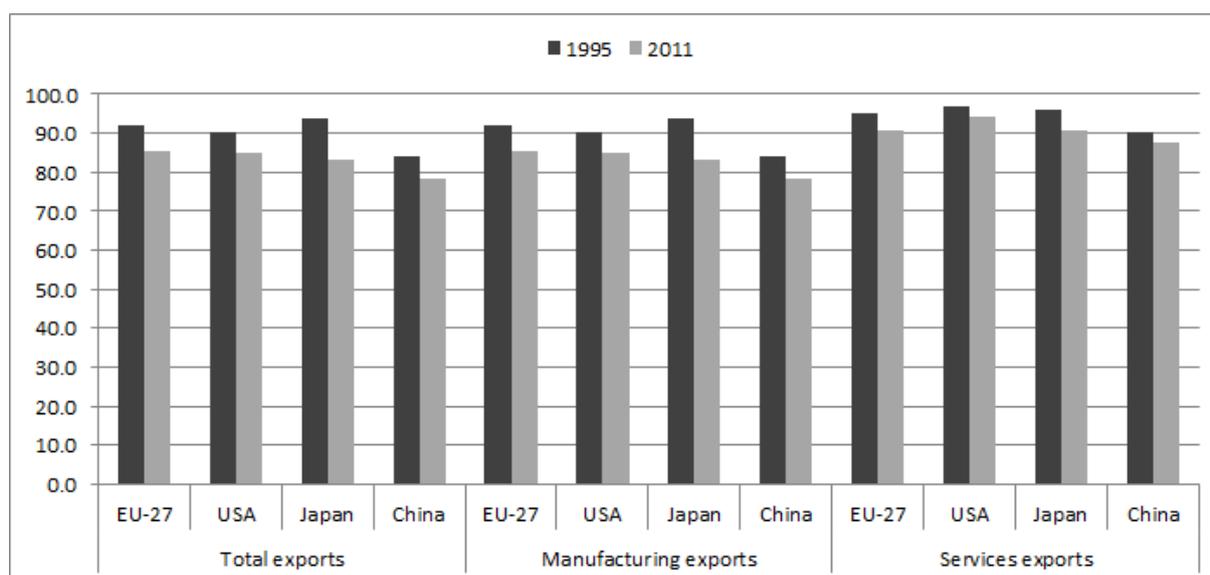
Note: Manufacturing comprises sectors NACE Rev. 1 15 to 37; Services include NACE Rev. 1 50 to 95.

Source: WIOD data; wiiw calculations

We consider total exports first. The share of domestically produced value added in the EU in 1995 was at the level of 92% and decreased to 85.3% in 2011. Thus, although most EU exports are "Made in Europe", this has decreased by about 8 p.p. due to increasing international fragmentation of production. The trends are similar in other countries.[13] In the US, the domestic share declined from 90% to 85.1% whereas the decline in Japan was even stronger from almost 94% to 83%. China started at a somewhat lower level of 84.2% which declined to 78.2% in 2011. As manufacturing constitutes the bulk of these exports these patterns do not change much if we consider only manufacturing (defined as NACE Rev. 1 15 to NACE Rev. 1 37). However, if we focus on services exports (NACE Rev. 1 50 to NACE Rev. 1 95) then domestic shares are slightly larger. For the EU, the domestic share in services exports declined from 95% to 91% which is by about 2 p.p. lower than the US, but similar to the figures for Japan. China has a smaller domestic value added content in services compared to the advanced economies (88% in 2011).

Finally, the decline in the domestic shares in services exports is smaller than for manufacturing exports, evidence that services are less tradable, and international production fragmentation is relatively more pronounced in the manufacturing and transport sectors as shown below. The arguments related to country level apply to individual sectors. What is argued at the level of countries can of course be argued at the level of individual industries. Figure 9 shows the domestic shares in exports (both intermediate and final goods) by sector for the EU.[14] With the exception of coke, refined petroleum and nuclear fuel, the manufacturing sectors show quite high shares of domestic value added in their exports. Again, the trend is decreasing across all industries, which is in line with increased

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[13] Results for all countries included in the WIOD database and years 1995, 2000, 2007, and 2011 are presented in Appendix Table A.19.

[14] Detailed data for all industries and selected countries are reported in Appendix Section A.20.

international fragmentation. During 1995 and 2011, the share in most sectors fell by 5-9 p.p. and in fuel by 15 p.p., which reflects fuel price changes.

Figure 9. Share of domestic value added in EU27 manufacturing gross exports by sector, in %
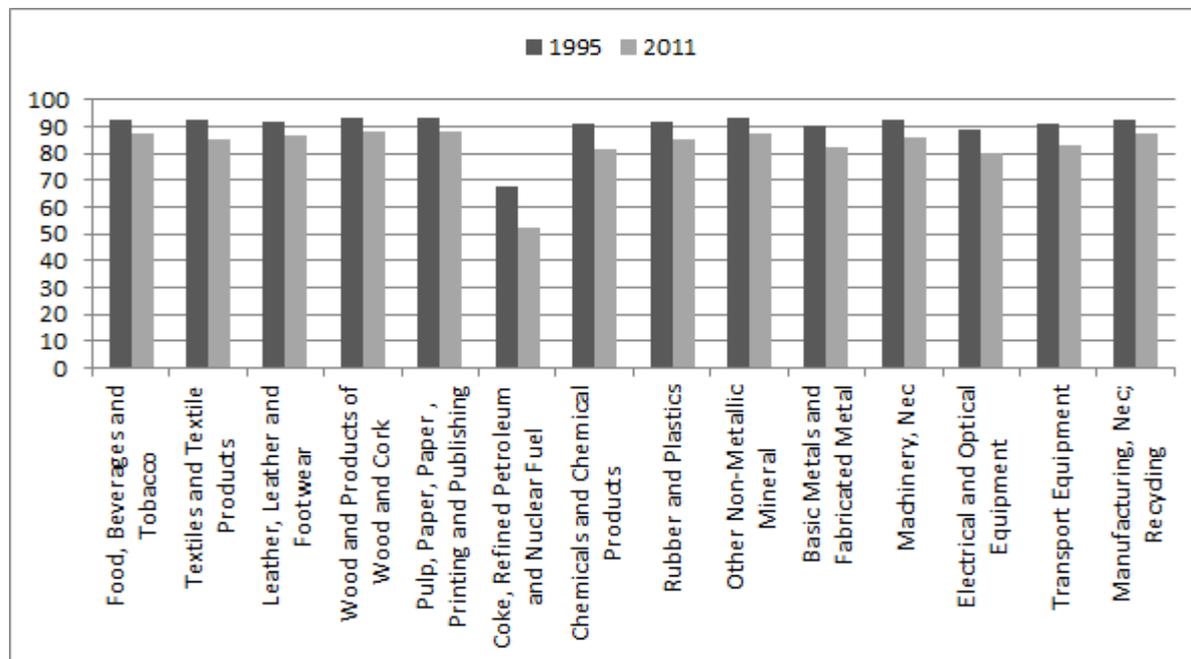
Source: WIOD data; wiiw calculations

Figure 10. Share of domestic value added in EU27 commercial services gross exports by sector, in %
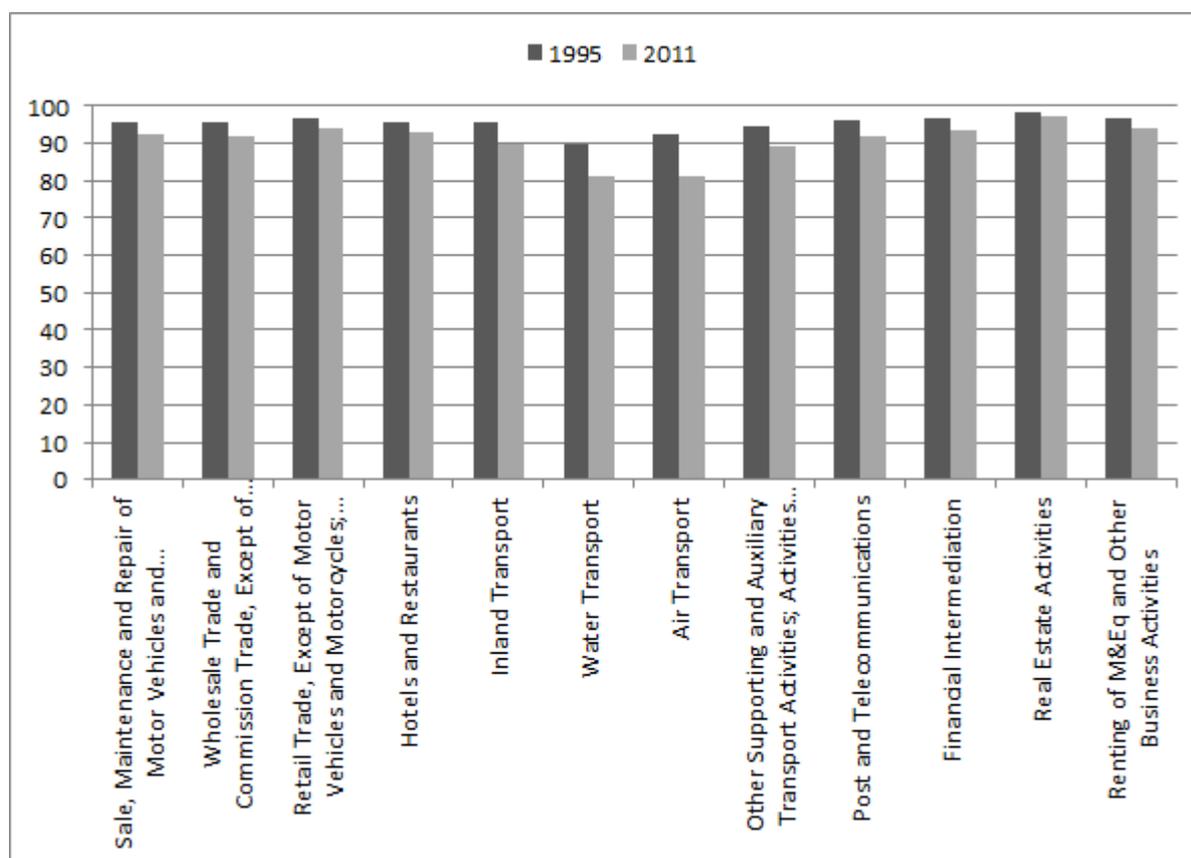
Source: WIOD data; wiiw calculations.

Figure 10 provides the same information for commercial services. As already indicated, the domestic content embodied in services is generally larger than in manufacturing, and this holds for most individual services sectors. The pattern for water and air transport differs, with lower domestic content around 90% in 1995 and 80% in 2011. However, the general trend is again that the domestic value added content of services exports was declining over the period considered. Note also that the corresponding increase in foreign value added content in exports of services might be due to the manufacturing inputs, which are characterised by increased foreign sourcing (as described above) and inter-industry linkages.

Next we study in more detail the extent to which individual industries have been affected by the ongoing fragmentation of production. Figure 11 presents the changes in domestic value added shares in EU exports by industry, which allows comparison between manufacturing and services. In line with the information presented in Figures 9 and 10 above, the manufacturing industries with the greatest increase in international fragmentation of production apart from coke and refined petroleum, are chemicals and chemical products, electrical and optical equipment, basic metals, and transport equipment. It is interesting that these are mostly high tech or medium-high tech industries where trade in parts and components is important or which rely on foreign inputs in the form of raw materials. With respect to services, the industries showing the biggest reductions in domestic content are air

and water transport and electricity, gas and water supply, probably driven by price movements for inputs such as energy and oil.

Finally, we investigate whether the observed patterns and changes are common to or different across countries. This can be inferred from the detailed information provided in OLA Table A.20. Here we highlight four sectors that show interesting patterns (Figure 12).

The selected sectors are textiles and textile products where we find increasing domestic content in exports from China indicating that this country will likely take on more and more intermediate production stages of this industry. Next is electrical and optical equipment where increased domestic content in US exports contrasts with rapidly declining share in all other countries, particularly the EU. The relatively low domestic shares for China are in line with the role of China as an assembler of electrical products. In transport equipment the EU and Japan show relatively large though declining (especially in the EU) domestic content. In this case the domestic share is much lower and declining much faster. Finally, for renting and other business activities figures for China show much lower (though slightly rising) domestic content compared to the more advanced countries where domestic content is still above 95% although showing a slight (1-2 p.p.) decline.

Figure 11.Change in domestic value added content of EU exports by sector, in p.p., 1995-2011
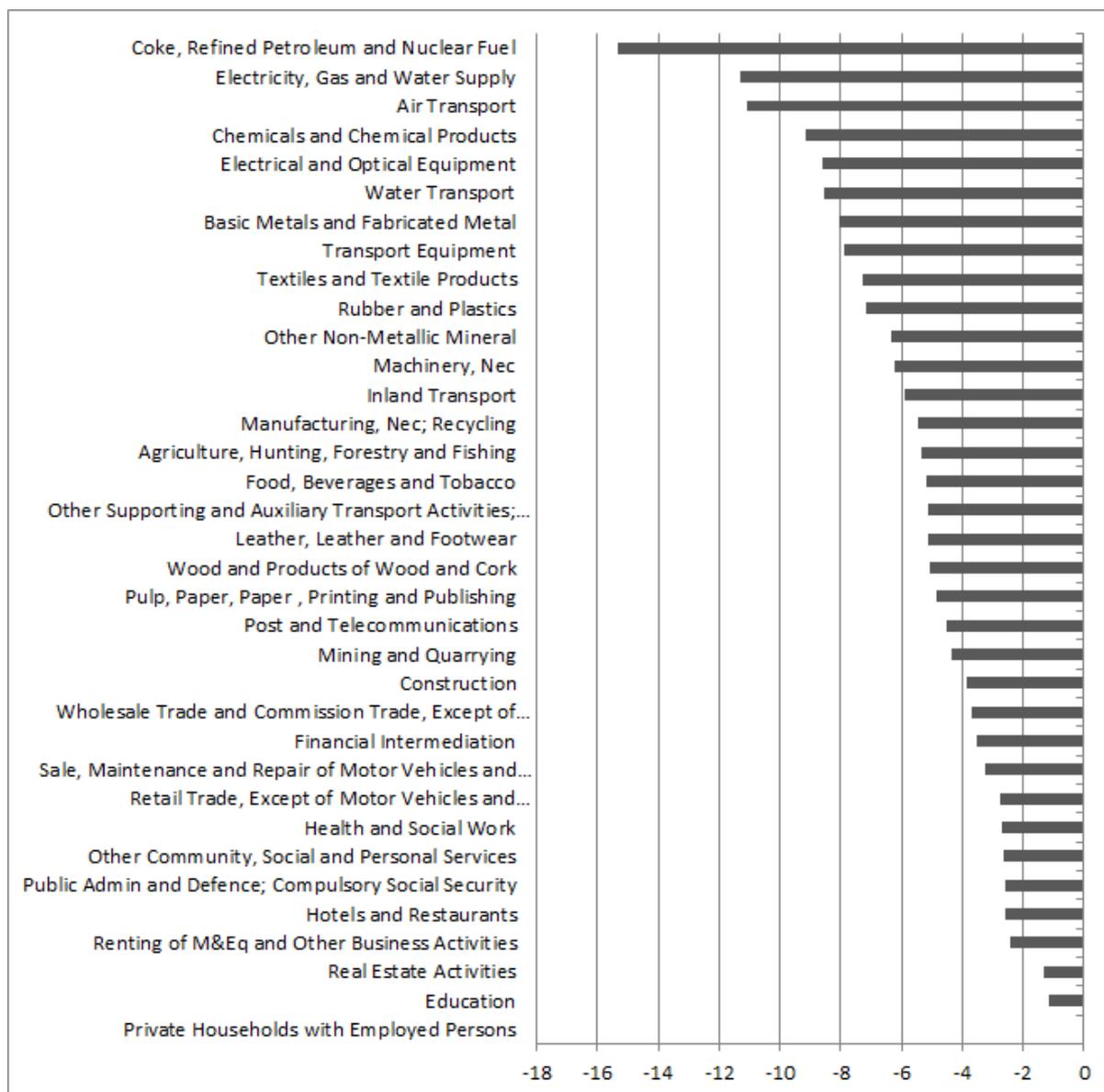
Source: WIOD data; wiiw calculations

Figure 12.Share of domestic value added in selected countries and sectors, in % of gross exports
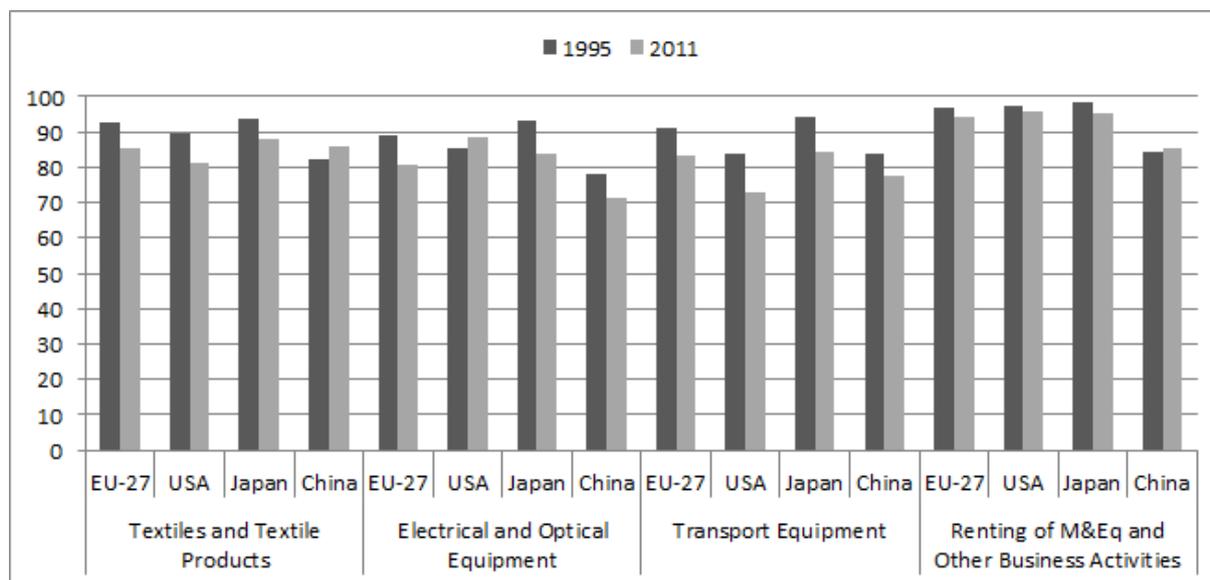
Source: WIOD data; wiiw calculations

3.3.2. Vertical specialisation of the EU and "servitization" of exports

A part of the domestic value added content of exports is not created within manufacture, but requires inputs from other sectors, particularly services (where knowledge intensive business services are quite important). Thus, although services are less directly tradable, they can be traded indirectly embedded in manufacturing exports. Estimation of the domestic and foreign services content of manufacturing exports shows that in 1995 about 35% of the value of gross manufacturing exports is value added created in the services sectors. This increased to almost 40% in 2011. To account for the decrease in the domestic value added content of exports, Figure 13 presents the share of domestic value added created in the service sectors and embodied in EU manufacturing exports to countries outside the EU as a percentage of the domestic value added embodied in these exports. It can be seen that domestic services account for an increasingly high share of value added exported in manufacturing exports. In 2011, services accounted for 39% of domestic valued added in total manufacturing extra-EU exports, an increase of 4.5 pp since 1995. Across industries, the shares are between 35% and 40% for the manufacturing sectors, and have been increasing in all sectors since 1995.

Figure 13. Shares of value added created in EU services sectors in % of EU value added content of manufacturing extra-EU exports
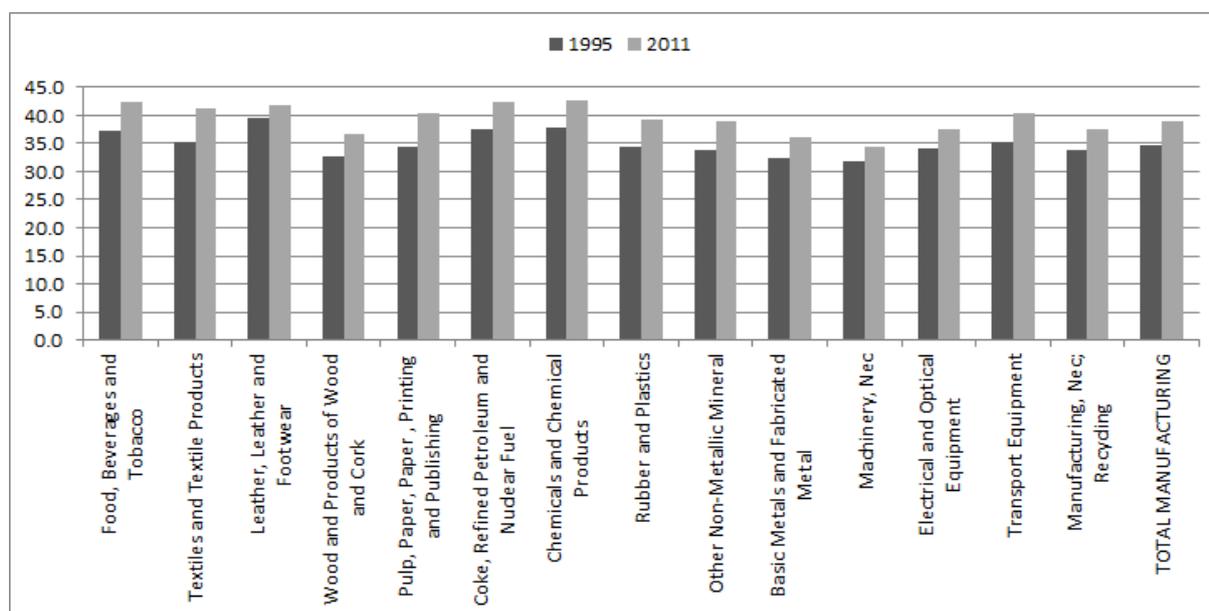
Source: WIOD data; wiiw calculations

3.3.3. Geographical patterns of vertical specialisation

The value added embodied in a country's exports that is imported from other countries is described as 'vertical specialisation' (e.g. Hummels et al., 2001; Foster-McGregor and Stehrer, 2013). From the perspective of the EU we are interested in whether the extent of vertical specialisation has increased, whether this process has been fairly even across supplying countries or whether significant changes have occurred among supplying countries. The availability of world input-output tables allows us to disentangle foreign value added content in a country's exports by country of origin. Figure 14 shows the foreign value added embodied in EU exports, by country of origin, as a percentage of gross exports for the years 1995 and 2011.

Figure 14. Shares of EU vertical specialisation (foreign value added in exports) by partner, in %
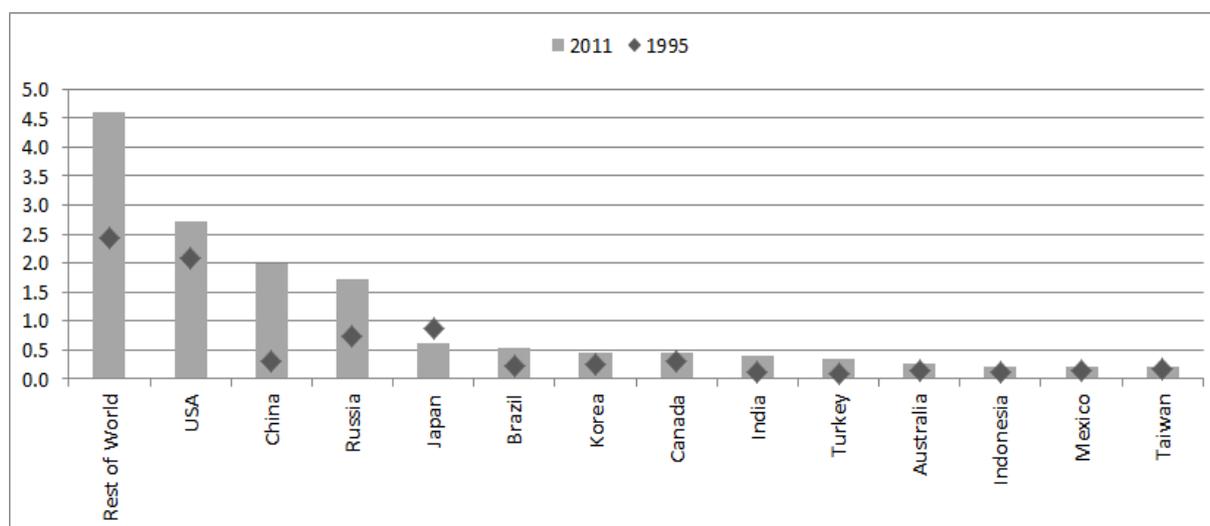
Source: WIOD data; wiiw calculations

With the exceptions of Japan, Mexico and Taiwan, shares of value added from foreign countries in EU exports have been increasing. The most significant decline is for Japan: in 2011 only about 0.6% of EU exports embodied value added from Japan compared to 0.9% in 1995. The biggest increases are for China (from less than 0.5% to 2%), Russia (from 0.75 to 1.75%) and rest of the world (from 2.5% to 4.5%).[15] For relative importance of EU foreign sourcing patterns, the US, China and Russia are the leaders together with rest of world.

Table 7 compares the EU to US, Japan and China, distinguishing between manufacturing and services exports. China (an emerging country) accounts for 13.5% of foreign value in EU exports and 17.8% in Japan's exports (right panel in Table 7). We observe also that EU shares of value added in other countries' exports have increased. The share of EU value added increased from 2.8% to 3.0% in the US, from 1.1% to 1.6% in Japan and from 2.7% to 3.4% in China (1st row left panel in Table 7). However, expressed as shares in total foreign value added, the importance of the EU in other countries' sourcing structures has declined sharply due to emergence of developing countries.[16]

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[15] It should be noted that this is a very heterogeneous group comprising other European countries like Switzerland and Norway and oil-exporting countries.

[16] In Appendix Tables OLA.21 and OLA.22 the complete vertical specialisation matrix for the countries included in the WIOD database are provided for years 1995 and 2011 with Appendix Table A.23 providing the changes of these shares in percentage points.

Table 7. Share of foreign value added in exports of reporter country by partner, 1995 and 2011

	in % of gross exports Reporter								in % of total foreign value added content of exports Reporter							
	EU27		USA		Japan		China		EU27		USA		Japan		China	
Partner	1995	2011	1995	2011	1995	2011	1995	2011	1995	2011	1995	2011	1995	2011	1995	2011
	Total exports								Total exports							
EU27	.	.	2.8	3.0	1.1	1.6	2.7	3.4	.	.	42.0	24.7	22.0	10.2	20.5	18.7
USA	2.1	2.7	.	.	1.3	1.4	1.9	2.4	26.1	18.4	.	.	25.0	9.3	14.3	13.2
Japan	0.9	0.6	1.5	0.8	.	.	3.4	2.2	10.9	4.2	22.5	6.3	.	.	25.8	11.8
China	0.3	2.0	0.3	1.9	0.3	2.8	.	.	3.7	13.5	3.9	15.7	6.4	17.8	.	.
Other	4.7	9.4	5.0	9.3	3.6	11.3	7.9	13.8	59.2	63.9	73.6	78.0	68.6	72.9	59.9	75.0
VS	8.0	14.7	6.7	12.0	5.2	15.4	13.2	18.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Manufacturing exports								Manufacturing exports							
EU27	.	.	3.8	3.8	1.2	1.8	2.9	3.6	.	.	40.1	23.3	21.6	10.8	20.0	18.3
USA	2.3	2.8	.	.	1.4	1.6	2.0	2.6	25.3	15.6	.	.	25.8	9.4	14.0	13.2
Japan	1.0	0.8	2.2	1.1	.	.	3.8	2.4	11.4	4.6	23.8	6.7	.	.	26.2	12.0
China	0.3	2.5	0.4	2.6	0.4	2.9	.	.	3.3	14.4	4.0	15.9	6.6	17.0	.	.
Other	5.4	11.5	6.8	12.7	3.7	12.6	8.7	14.9	59.9	65.4	72.3	77.4	67.6	73.6	59.8	74.8
VS	9.0	17.7	9.4	16.4	5.5	17.1	14.6	19.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Services exports								Services exports							
EU27	.	.	1.2	1.5	0.9	0.6	2.0	2.3	.	.	60.5	34.5	25.6	6.6	25.5	23.1
USA	1.6	2.7	.	.	0.7	0.8	1.3	1.4	31.6	29.4	.	.	19.3	9.1	16.8	13.6
Japan	0.4	0.3	0.3	0.2	.	.	1.8	1.0	8.7	3.1	14.6	4.7	.	.	23.1	9.8
China	0.3	1.0	0.1	0.7	0.2	2.3	.	.	6.0	10.7	3.4	16.3	5.4	25.4	.	.
Other	2.7	5.2	1.6	3.5	2.5	5.8	4.6	7.7	53.7	56.9	81.9	79.0	75.3	65.5	60.1	76.6
VS	5.1	9.2	2.0	4.4	3.4	8.9	7.7	10.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: WIOD data; wiiw calculations

3.3.4. Vertical specialisation patterns of EU Member States

We investigate patterns of vertical specialisation for individual EU Member States. A Member State's gross exports would embody domestic value added, value added created in countries outside the EU and also might include a relatively large share of value added from other EU countries which might be important if the focal country serves as a hub for exports to other countries within or outside the EU. Figure 15 provides an overview: it shows the domestic value added embodied in each countries' exports. In several countries domestic value added in 2011 was more than 70%, although for Luxembourg this share is 50% in 1995 and less than 40% in 2011. Generally, these countries' shares differ in that smaller countries tend to be more integrated and countries better endowed with natural resources (e.g. important for tourism) and countries with relatively smaller manufacturing sectors, tend to be less integrated.[17]

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[17] This can be studied by considering manufacturing and services exports only, and by including only these countries' extra-EU exports. This more detailed information is provided in the Appendix Tables OLA.24.

Figure 15.Domestic value added content of exports in % of gross exports (intra and extra) by EU Member States
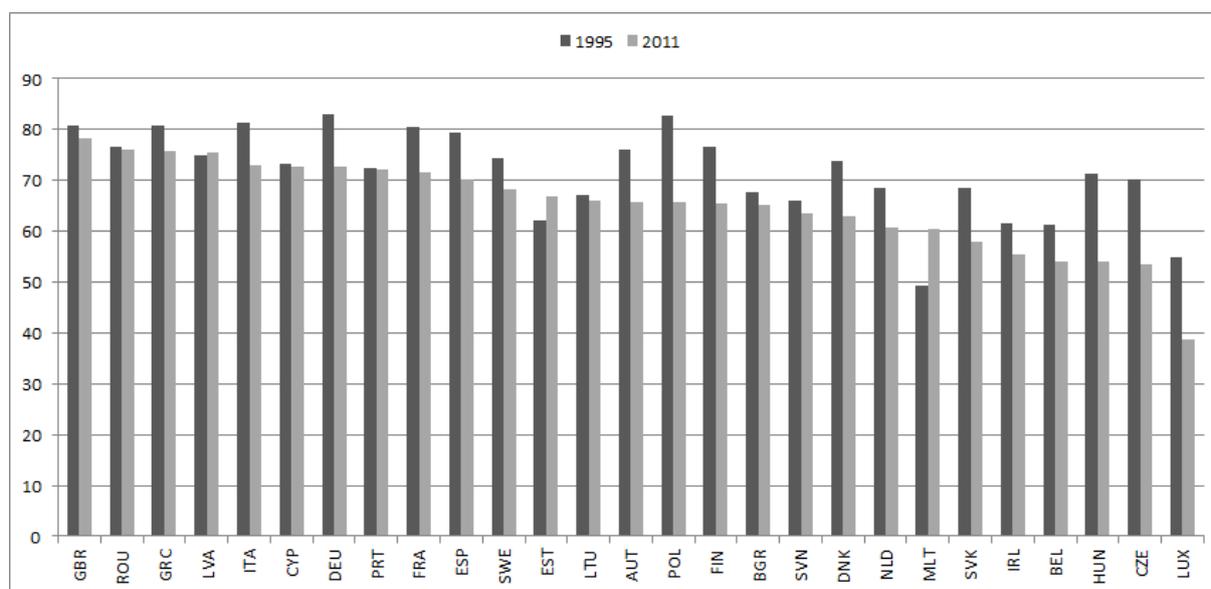
Source: WIOD data; wiiw calculations

The dynamics of integration show that it increased particularly in the Central and Eastern European countries. Most EU Member States experienced a steady decline in their share of domestic value added in manufacturing exports throughout the period. Correspondingly, the share of foreign value added in exports increased in most countries (see Figure 16). The sharpest declines (19 p.p.) in domestic value added shares were in the Czech Republic, Poland and Hungary, suggesting the increased integration of these countries into EU production networks. This explanation also applies to shares of other EU countries in individual EU country exports (see Figure 16). For example, the foreign content in exports increased by more than 15 p.p. in the Czech Republic, Hungary and Poland due to strong integration with Western European countries, particularly Germany and Austria, after 1995. For the majority of countries the changes in shares are between 5 p.p. and 10 p.p. The figures are low for Great Britain, Bulgaria, Romania and Greece, and in two small countries, Malta and Estonia, the results suggest that domestic content increased, although from rather low levels, due perhaps to changes in specialisation structures and attraction of foreign firms (e.g. the Nokia plant in Estonia) and the crisis.

Figure 16.Changes in the shares of foreign value added in exports 1995-2011, in p.p.
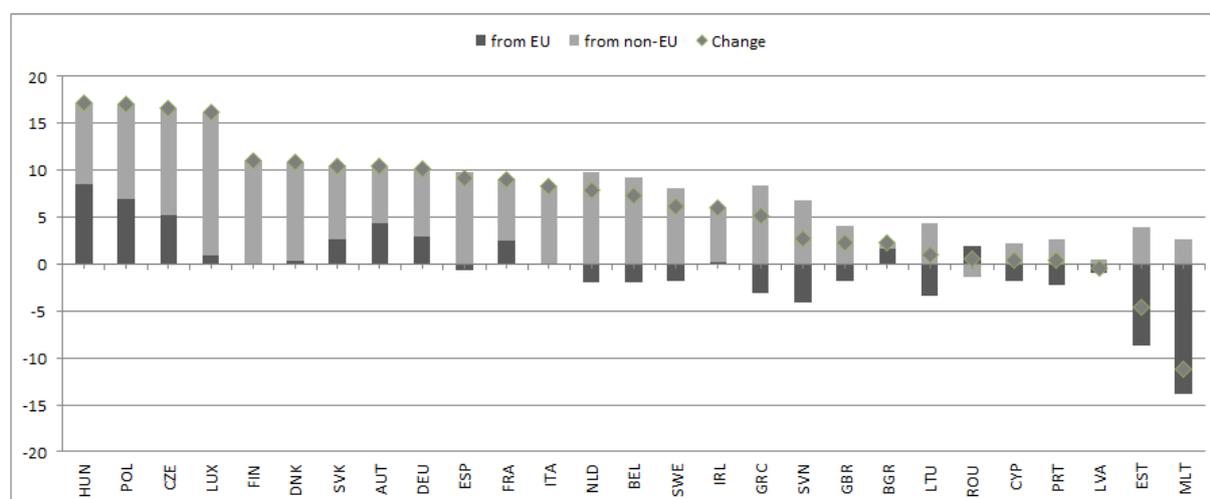
Source: WIOD data; wiiw calculations

We can differentiate between the foreign value added content of exports and respective changes, by country of origin. Figure 16 differentiates between sourcing from EU and non-EU countries. Vertical integration with non-EU countries increased for all countries except Romania; for intra-EU integration the pattern is different. In Malta, Estonia, Netherlands, Belgium, Sweden, Greece and Slovenia shares declined. In countries showing increased levels of integration with other EU Member States, integration with non-EU countries is even higher. This suggests, first, that EU countries have been increasing their integration more with non-EU countries (where larger emerging countries such as China and India again play an important role) than within Europe.[18] Second, intra-EU integration includes the Eastern European countries and Germany, Austria and France, all countries that have experienced large (positive) changes in shares of foreign value added in their exports.

Considering the changes in these patterns is not informative about actual levels of intra-EU versus extra-EU integration. Figure 17 splits EU countries foreign value added content into intra-EU and extra-EU for 2011. Shares of foreign value added stemming from intra-EU sourcing range from more than 60% in Luxembourg and Austria, to between 30% and around 40% for Lithuania, Greece and Netherlands. Generally, smaller and CEE countries and countries geographically in the middle of Europe, such as France and Germany, tend to be more integrated within Europe. Countries that are more peripheral geographically, such as Greece, Finland and Bulgaria, do not follow this pattern, although Portugal, due to its traditionally strong links with Spain, shows a high share of intra-EU sourcing.[19] On average, about half of the individual EU countries' foreign inputs are sourced from within the EU.

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[18] Although the intra-EU integration is still relatively more important.

[19] Appendix Tables OLA.25-OLA.27 provide the complete vertical specialisation matrices for 1995, 2011 and the respective changes in these shares.

Figure 17.Foreign value added content of exports by regions in %, 2011
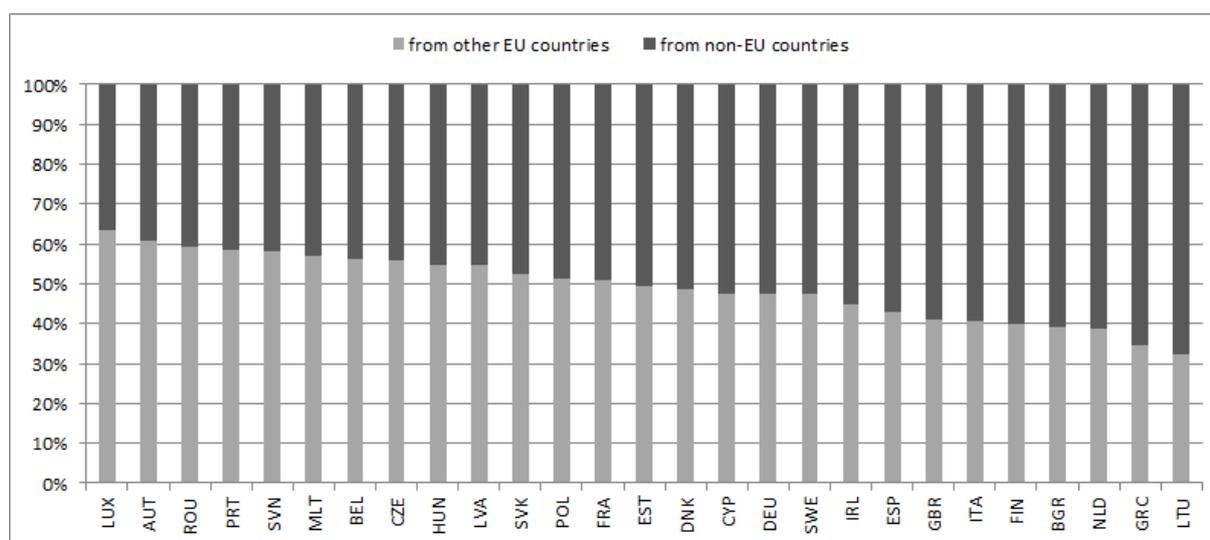
3.3.5. Revealed Comparative Advantages measures on a value added basis

Considering trade from a value added perspective raises questions about how this might change a country's position in relation to its trade structures and RCA. Based on gross trade, a country's RCA in a particular industry might be biased upwards because the value added the country contributes may be quite small. For example, if a country imports intermediates for assembly it adds only a small share of domestic value added. Its gross exports would include this value together with all previously imported intermediate inputs, which would drive up its market shares. For example, China might record RCA in the electronics industry although the actual value added created –assembly of imported parts and components – in China is small. Calculating RCA using the domestic content of exports, therefore, would take this into account. However, the above findings suggest that, across industries and countries, these differences may not be significant since, in most cases the domestic value added content is still relatively large although showing a declining trend, and also it is relatively similar across industries (e.g. smaller countries tend to have a smaller domestic content in exports, for all industries). The magnitude of the difference then becomes an empirical question.

Therefore, we compute the Balassa indicator of RCA used in section 3.3.2 to consider only the domestic value added content of these exports. Table 8 presents the RCA indicators based on gross exports, and their embodied domestic value added for 2011.[20] The difference between the indices is quite small for most sectors. This is as expected since domestic shares are quite large (80%-85%) and are relatively uniform across sectors. However, there are some distinct patterns for some industries. For the EU, for example, the small advantage in food, beverages and tobacco disappears and becomes a small disadvantage indicating that, compared to other countries, imported intermediates play a large role. In the leather and

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[20] The indicators presented here do not exactly match those reported in section 3.B since the former are based on WIOD and therefore on a different country and industry classification. However, the broad patterns are the same as those based on the BACI dataset reported above.

footwear, coke and petroleum, and rubber and plastics industries the existing comparative disadvantage increases, again indicating a comparatively larger share of extra-EU vertical specialisation. In some other cases, the RCA expressed as value added turns out to be less strong, but still positive (e.g. pulp and paper, and chemicals). In high tech industries, such as transport equipment and machinery, the index is largely unchanged. Thus, on a value added basis, EU RCA is similar to that obtained using gross exports, and especially for the medium-tech and high-tech sectors. Generally, the structure of advantages measured as value added tends to decrease for the lower tech industries and to increase for the medium and high tech industries in the advanced countries.

Comparing across countries shows that the RCA index for transport equipment in the EU is more or less the same measured as gross exports or value added, while for the US there are significant differences (RCA measured as value added is much lower). The pattern is different for the electronics industry where RCA based on domestic value added increases for the US (turns positive) and also increases for Japan.

Table 8 depicts the changes in RCA indicators for manufacturing exports, on a value added basis, for EU extra-EU exports between 1995 and 2011. RCA have been increasing in pulp and paper, transport equipment, wood and wood products but less so in machinery. In the other sectors the EU's RCA has remained constant or declined e.g. in textiles and textile products. Thus, consistent with results reported above, the EU has been successful in maintaining or improving its comparative positions in medium and high-tech sectors as measured by RCA indicators based on the concept of trade in value added.[21]

Table 8. RCAs of manufacturing exports based on gross and value added concept for selected countries, 2011

	EU27		USA		Japan		China	
	Gross exports	Value added	Gross exports	Value added	Gross exports	Value added	Gross exports	Value added
Food, Beverages and Tobacco	7.8	-0.3	-7.3	-12.3	-91.0	-91.4	-56.0	-55.4
Textiles and Textile Products	-52.2	-51.8	-77.7	-77.9	-85.6	-84.8	112.1	131.0
Leather, Leather and Footwear	-4.7	-8.8	-93.6	-94.0	-97.2	-97.3	150.3	153.6
Wood and Products of Wood and Cork	6.8	0.7	-31.8	-34.6	-77.4	-79.3	-18.7	-21.6
Pulp, Paper, Paper , Printing and Publishing	71.6	60.5	88.8	82.3	-75.6	-76.3	-76.0	-77.7
Coke, Refined Petroleum and Nuclear Fuel	-29.5	-46.4	43.1	19.2	-60.5	-72.8	-88.5	-89.8
Chemicals and Chemical Products	24.1	22.8	9.3	9.8	-25.9	-28.0	-44.5	-45.1
Rubber and Plastics	-0.8	-1.4	-14.0	-15.4	55.6	53.4	39.8	35.8
Other Non-Metallic Mineral	31.1	25.0	-26.5	-27.7	29.9	12.5	24.8	22.5
Basic Metals and Fabricated Metal	-11.1	-10.6	-26.7	-25.2	52.0	40.7	-31.8	-34.4
Machinery, Nec	59.5	59.4	27.5	27.0	39.4	38.0	-14.6	-17.6
Electrical and Optical Equipment	-35.1	-32.6	-11.3	4.9	5.7	16.4	82.7	80.7
Transport Equipment	38.6	38.9	35.5	23.1	93.4	99.5	-58.0	-57.6
Manufacturing, Nec; Recycling	-39.8	-35.4	-7.9	1.3	-70.0	-68.3	6.5	20.8

Source: WIOD data; wiiw calculations

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[21] Appendix Tables OLA.28 and OLA.29 provide the information on 1995 and 2011 for the EU compared to the US, Japan and China. Appendix Tables A.30 and A.31 show the RCA indicators for all sectors (including services) exports.

Figure 18. EU revealed comparative advantages based on value added concept, 1995 and 2011
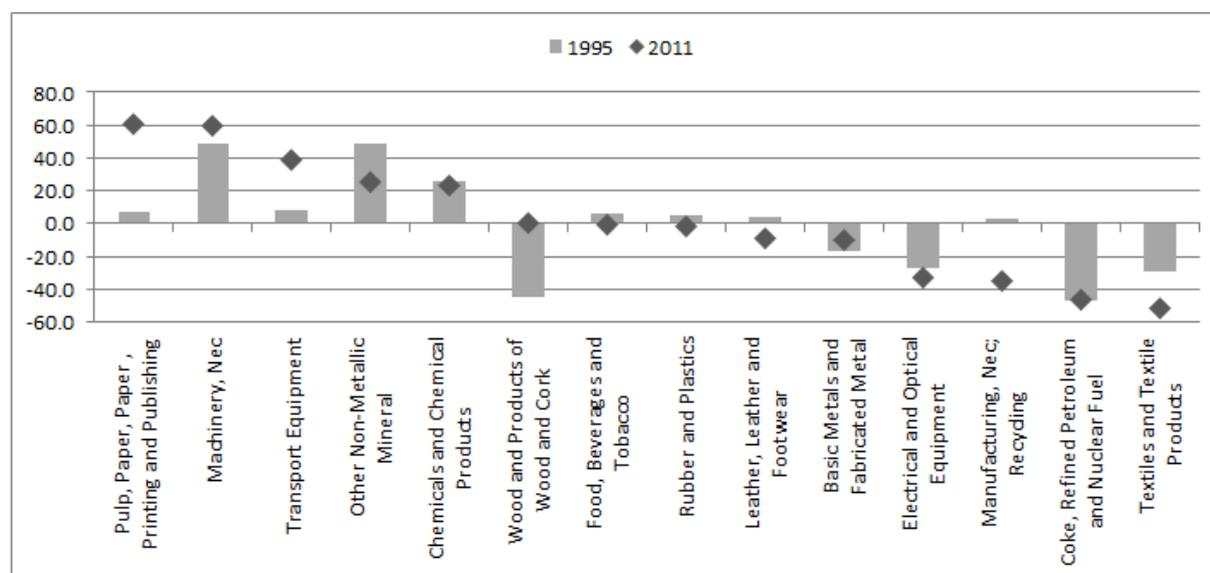
Source: WIOD data; wiiw calculations

Table 9 presents the differences for the RCA indicator based on domestic value added exports minus the RCA indicator based on gross exports, for the EU countries. Thus, a positive number indicates that RCA based on value added trade is bigger (although it may still be negative i.e. comparative disadvantage).[22] For the transport equipment industry, RCA is lower in Austria, Slovak Republic, Slovenia, Poland and Portugal compared to the gross exports calculation. This is as expected since production in these countries relies on imported intermediates (parts and components). The figure for Germany is also negative for this industry indicating reliance of German firms on foreign inputs.

In other cases, national RCA is larger based on domestic value added content compared to gross exports (positive figures in Table 9). We need to know by how much RCA differs using these different concepts of trade. We find that the correlation between these measures is rather large (above 0.9) and similar for the rank correlation. In only a few cases does revealed comparative disadvantage turn into an advantage (in 2011 this applied to 10 cases) or vice versa (in 2011 this applied to 9 cases).

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[22] Appendix Tables A.32 and A.33 provide the levels of the RCA indicator for the individual EU Member States for 1995 and 2011.

Table 9. Difference of RCAs of manufacturing exports based on gross and value added concept for EU Member States, 2011

	Food, Beverages and Tobacco 15t16	Textiles and Textile Products 17t18	Leather, Leather and Footwear 19	Wood and Products of Wood and Cork 20	Pulp, Paper, Paper, Printing and Publishing 21t22	Coke, Refined Petroleum and Nuclear Fuel 23	Chemicals and Chemical Products 24	Rubber and Plastics 25	Other Non-Metallic Mineral 26	Basic Metals and Fabricated Metal 27t28	Machinery, Nec 29	Electrical and Optical Equipment 30t33	Transport Equipment 34t35	Manufacturing, Nec; Recycling 36t37
AUT	7.4	1.2	0.5	14.8	3.4	-27.7	7.4	3.5	11.3	-14.3	1.9	6.4	-14.0	2.0
BEL	12.8	4.1	2.3	6.8	19.4	-78.0	19.1	18.5	19.9	-8.8	9.0	8.2	-5.2	-0.7
BGR	3.1	28.5	-2.1	-3.2	-5.4	-54.8	-4.3	-15.6	-2.7	6.5	3.2	1.4	3.7	9.6
CYP	-12.2	6.6	2.3	5.9	2.1		0.7	-10.0	1.4	-21.5	-5.5	-8.4	4.0	3.0
CZE	16.8	6.8	1.2	41.4	24.3	5.6	7.8	10.9	50.6	11.7	4.4	-42.6	2.1	15.8
DEU	-5.9	-3.1	-3.8	-6.2	0.1	9.9	4.0	-2.5	0.0	-6.9	-0.5	3.0	-4.8	1.6
DNK	-31.3	-1.5	-0.3	-9.8	2.3	25.7	4.4	-0.2	-4.0	-1.9	-18.6	0.1	-3.0	2.5
ESP	10.0	2.9	1.3	5.4	10.7	-80.5	9.5	7.7	17.2	10.0	6.2	1.5	-3.8	5.3
EST	-8.5	-8.4	-4.5	-54.8	-1.8	21.9	-2.9	-19.9	0.9	-6.8	-2.3	-10.4	4.8	-1.4
FIN	2.4	1.2	1.7	48.9	69.9	-60.1	7.9	6.2	5.1	-17.3	7.1	-4.4	2.5	2.6
FRA	6.4	2.0	1.9	0.6	3.6	-18.2	-0.5	-3.7	4.1	3.1	4.8	2.9	-12.1	4.6
GBR	5.5	1.5	1.5	0.0	10.9	-19.0	11.1	7.1	2.1	0.6	-0.9	3.3	-8.5	5.1
GRC	19.7	11.3	5.3	4.1	6.7	-108.8	7.9	10.0	29.9	5.1	3.8	3.1	4.3	5.5
HUN	15.3	1.6	-8.7	7.0	10.4	14.3	12.6	2.2	14.4	-1.3	36.3	-36.9	-3.0	6.9
IRL	7.2	0.5	0.9	1.6	-155.1	-0.1	9.1	1.6	3.2	0.5	1.1	-5.5	0.5	-7.0
ITA	-1.2	4.4	-3.0	-1.3	0.4	-51.4	-6.8	-4.0	-2.3	-0.2	6.0	3.3	2.3	6.4
LTU	39.5	15.2	7.3	135.2	26.0	-170.0	-24.4	3.4	7.5	7.1	11.1	10.4	9.4	66.8
LUX	-12.0	-17.1		-64.5	-51.5		1.0	-17.5	7.0	-13.6	3.5	5.0	-0.4	6.0
LVA	-7.7	-10.7	1.3	4.3	-0.6		-4.7	-13.3	-15.4	-34.9	-1.9	2.3	3.1	0.3
MLT	19.0	11.4	3.0	0.9	22.6	0.1	8.2	23.4	2.3	0.9	4.2	-51.0	16.8	45.2
NLD	23.9	1.7	1.9	7.0	21.3	-127.0	0.7	8.1	12.6	5.1	14.7	3.1	2.8	25.5
POL	11.0	-0.1	-2.6	12.2	5.1	-1.4	-1.8	-7.3	2.0	-2.8	1.8	-3.1	-13.2	15.0
PRT	-4.2	11.6	-18.6	13.2	13.6	-35.5	-1.1	-10.3	17.4	-2.5	-3.1	-1.8	-10.4	5.1
ROU	1.7	-23.0	-39.2	13.3	0.5	13.4	-4.2	-5.8	-3.3	-5.6	-4.3	0.4	7.3	11.0
SVK	11.7	2.6	-24.8	78.5	19.1	-19.4	4.5	10.1	32.4	25.8	1.3	-14.8	-22.5	18.0
SVN	3.2	-9.8	-20.4	-11.6	-5.5	0.5	10.7	-5.4	6.6	0.6	-6.5	0.0	-15.8	6.4
SWE	3.4	1.3		15.4	24.9	-83.4	12.3	0.8	1.7	8.6	5.5	0.9	0.8	3.8

Note: Includes intra-EU exports; a positive number indicates that RCA based on value added trade calculations is higher as when based on gross exports data (Difference = DVAiX-RCA minus Gross exports RCA)

Source: WIOD data; wiiw calculations

In this section, we investigated trade patterns from the perspective of value added, i.e. focusing on the domestic value added content in a country's exports which becomes more important with increased internationalisation of production. We can summarise the main results.

First, EU international integration has increased: EU exports embodied less domestic value added (i.e. value added created in the EU) in 2011 compared to 1995, and consequently, embody a larger share of foreign value added. Overall, EU exports embody about 85% of value added created in the EU, therefore, European exports are still predominantly "Made in Europe". International fragmentation of production has been particularly pronounced in the higher tech manufacturing and transport services.

Second, almost all other countries are contributing more value added to EU exports; only for Japan is there a significant decline in share in EU exports. Conversely, the EU is providing more inputs into other countries' exports indicating that this fragmentation of production is a two-way process.

Third, from the perspective of individual EU Member States there are wide differences in vertical specialisation across countries. Over time, integration with extra-EU countries has become relatively stronger than intra-EU integration; exceptions are mostly the Eastern European countries and Austria, Germany, and France where intra-EU integration is relatively strong.

Finally, we compared the RCA indicator based on the domestic content of a country's exports with the indicator derived from gross exports. In general, we find that RCA using value added is quite similar (compared to single product case studies).

4.   Recent shifts in market shares

In this section, we examine EU trade patterns in a different way, using market shares. Market shares do *not* represent country specialisation nor do they show how countries allocate their resources optimally to alternative industries, products, segments or value added. Market shares are the outcome of fierce international competition between countries. As already stressed in the introduction to Section 3, it is important to remember that the emergence of new competitors necessarily translates into market share losses which may be compensated for by new opportunities in these fast growing new markets. Also important is that exports can expand while the exporting country's market share may decrease in an expanding market. Ultimately we are interested in whether a given exporting country is increasing its exports of a certain product to a certain market more quickly (gain in market share) than its competitors. We use an econometric method based on this simple idea (see Cheptea et al., 2014). We try to explain the rapid and recent deterioration in EU market shares due to the global financial crisis and its implications for European competitiveness.

4.1.   The distribution of world market shares

This section analyses the EU's position in world markets compared to the other main individual and regional exporters. In 2010, 15% of goods traded worldwide (excluding flows between EU Member States) originated in the EU (Table 10). However, this is a smaller percentage than in 2000 (16%) meaning that EU exports have increased less than world imports, leaving room for competitors from emerging and developing countries, who have improved their positions in the global market. This adverse evolution occurred between 2007 and 2010: EU market share in 2007 was still at its 2000 level.

The most outstanding achievements have been observed for China and India, which doubled their 2000 market shares. Thus, in 2010 China reached the export level of the EU and became the world's largest individual (single-country) exporter. The redistribution of world market shares from the developed to the emerging and developing economies cannot be imputed to the financial crisis: it started long before then and continued after the crisis began in 2007. However, the EU's export performance is noteworthy despite the negative impact of the financial crisis in the late 2000s, and contrasts with the larger reductions in the shares of other developed countries, especially the US (-6 p.p.) and Japan (4 p.p.).

Table 10. Distribution of world market shares, all products (excluding intra-EU27 flows)

Country	Shares of the world market, %			Changes in share, p.p.	
	2000	2007	2010	2000-2007	2007-2010
EU27	16.3	16.2	14.9	-0.04	-1.34
North America	21.7	14.8	13.2	-6.95	-1.60
USA	16.1	10.8	10.0	-5.29	-0.89
Latin-Central America	7.3	7.3	7.5	0.03	0.23
Brazil	1.2	1.6	1.7	0.41	0.13
Rest of Europe	6.4	8.5	8.2	2.05	-0.30
Russia	2.0	3.1	3.1	1.08	0.00
Middle East and Africa	8.9	11.4	12.3	2.45	0.95
Asia	37.2	39.5	41.3	2.34	1.79
Japan	10.3	7.2	6.7	-3.10	-0.50
China	7.3	13.4	14.9	6.10	1.58
India	1.0	1.6	2.0	0.61	0.38
ASEAN	9.3	8.6	8.8	-0.72	0.27
South Korea	3.6	3.8	4.1	0.19	0.33

Source: Authors' calculations using BACI data.

Including intra-EU trade flows in the analysis, would exacerbate the decrease in EU market share (OLA Table A.34). This is because intra-EU trade has been affected more severely by the global and regional financial crises than extra-EU exports. The EU's resistance to pressure from new competitors from the emerging countries is due largely to the positive performance of German and Polish exporters in the extra-EU market (OLA Table A.59). Conversely, the positive intra-EU trade dynamic of new Member States does not compensate for the important post-2007 contraction of intra-union exports from the EU's largest countries (UK, France, Germany, Italy, and Spain) (OLA Table A.60).

Taking account of the technological level of exported products, we observe greater resilience of European market shares in the high-tech and medium-high-tech sectors (Table 11). The recent financial turmoil reduced European market share gains in these sectors (obtained between 2000 and 2007), but did not entirely reversed them. High- and medium-tech products also stand out for the largest redistributions of market shares between non-EU developed countries and emerging countries. For instance, during the 2000s, the US and Japan lost half of their world market shares in high tech products, i.e. as much as the sum of their losses in middle-high and middle-low tech products. At the same time, China gained 17.6 p.p. in the market for high-tech products, but less than half this figure in the other groups.

The evolution of European market shares has been uneven across high-, middle- and low-range products (recall that this dimension is not about technological content but price positioning of the product on the market as defined in Fontagné et al., 2008). As shown in Table 12, between 2000 and 2007, the EU gained market share in the upper (+2.7 p.p.) and middle (+0.7 p.p.) segments of the market. The crisis in the late 2000s swept these gains away and led to deterioration in the EU's position to lower than its 2000 level. The opposite evolution was observed for European low unit-value products. American and Japanese exporters suffered considerable market share losses in all market segments before the crisis, but their upper segment resisted relatively better, compared to the EU, after the crisis. With a

few exceptions, reinforcement of the export positions of developing and emerging countries was related mostly to low-value goods. For example, the Chinese share in low-market goods increased from 9% in 2000 to 23% in 2010, but and only from 5% to 8% in upper-market products. The exceptions include Russia and the Middle East and Africa countries that have been more effective at strengthening their positions in the middle- and high-value market segments. This outcome is driven mainly by positive evolutions in the fuel and basic metals sectors for Russia, and in oil products for the Middle East and Africa.

The redistribution of world market shares over the 2000-2010 period can be seen also in intermediary and final products (Table 13). For both types of products the losses suffered by developed countries have been balanced by gains for the emerging and developing countries. The size of these market share shifts has been similar for the two groups, although in relative terms, larger for intermediary products. For example, the US and Japan lost one-third of their market share in final goods and half their share in intermediary products. European market share losses in final consumer goods were lower and rose only at the end of the period.

In percentage terms, the EU lost 8% of its world market share between 2007 and 2010. This contrasts with a stable market share between 2000 and 2007. This is similar to the US (-8%) and marginally worse than Japan (-7%), which contrasts with the situation before the crisis when European market shares were very resilient compared to US or Japanese shares. All EU Member States except the new Member States contribute to this: during 2007-2010, the largest losses in world market shares (in absolute terms) were posted by Italy, Germany and the UK. European competitiveness consisted of top range and high tech products; however, even these two segments have evolved poorly for European producers since 2007. In the upper segment of the market, Germany lost 12% market share during 2007-2010; and the corresponding figures are 18% for Spain, 17% for Italy, 15% for Sweden, 14% for France. In high tech products, Finland forfeited is position as the main producer of cell phones losing 49% of its world market share over 2007-2010, while Hungary lost 10%, Germany, Ireland and Sweden 7% each, and the UK 5%.

Table 11. Distribution of world market shares, by technological content of products, excluding intra-EU27 flows

High tech products

Country	Shares of the world market, %			Δ in shares, p.p.	
	2000	2007	2010	2000-2007	2007-2010
EU27	15.46	16.17	15.76	*0.71*	*-0.41*
North America	25.03	16.80	14.06	*-8.24*	*-2.74*
USA	22.01	14.95	12.62	*-7.05*	*-2.33*
Latin-Central America	4.19	4.03	4.07	*-0.17*	*0.05*
Brazil	0.56	0.49	0.41	*-0.07*	*-0.08*
Rest of Europe	2.81	3.95	4.24	*1.14*	*0.29*
Russia	0.17	0.20	0.19	*0.03*	*-0.01*
Middle East and Africa	1.34	1.46	1.42	*0.12*	*-0.03*
Asia	50.66	57.06	59.85	*6.40*	*2.80*
Japan	13.31	7.43	6.54	*-5.88*	*-0.88*
China	7.06	20.15	24.57	*13.10*	*4.42*
India	0.22	0.53	0.81	*0.31*	*0.28*
ASEAN	16.77	14.10	13.13	*-2.66*	*-0.98*
South Korea	4.85	6.02	6.26	*1.17*	*0.24*

Table 12. Distribution of world market shares, by market segment, (excluding intra-EU27 flows)

Up-market (high unit-value) products

Country	Shares of the world market, %			Δ in shares, p.p.	
	2000	2007	2010	2000-2007	2007-2010
EU27	25.63	28.30	24.98	*2.67*	*-3.32*
North America	22.63	14.70	14.17	*-7.93*	*-0.53*
USA	18.73	12.48	11.84	*-6.25*	*-0.64*
Latin-Central America	5.28	5.16	4.68	*-0.12*	*-0.48*
Brazil	1.01	0.92	1.06	*-0.10*	*0.14*
Rest of Europe	4.89	8.37	9.26	*3.48*	*0.89*
Russia	1.06	1.27	2.57	*0.21*	*1.30*
Middle East and Africa	4.22	7.55	7.03	*3.33*	*-0.52*
Asia	35.30	33.50	36.62	*-1.81*	*3.13*
Japan	14.71	8.87	9.60	*-5.84*	*0.73*
China	4.95	8.07	8.25	*3.12*	*0.18*
India	0.72	1.45	1.28	*0.73*	*-0.16*
ASEAN	7.94	8.15	10.12	*0.21*	*1.98*
South Korea	3.25	3.64	3.14	*0.40*	*-0.50*

Source: Authors' calculations using BACI data.

Table13. Distribution of world market shares, by usage of products (excluding intra-EU27 flows)

Final products

Country	Shares of the world market, %			Δ in shares, p.p.	
	2000	2007	2010	2000-2007	2007-2010
EU27	18.96	19.31	17.88	*0.35*	*-1.43*
North America	21.46	14.96	13.60	*-6.50*	*-1.36*
USA	15.59	11.15	10.55	*-4.44*	*-0.60*
Latin-Central America	6.95	6.72	6.64	*-0.23*	*-0.08*
Brazil	1.34	1.64	1.51	*0.30*	*-0.13*
Rest of Europe	6.37	8.31	7.98	*1.94*	*-0.34*
Russia	1.78	2.30	2.21	*0.52*	*-0.09*
Middle East and Africa	4.75	5.99	6.92	*1.24*	*0.93*
Asia	39.35	42.50	44.98	*3.15*	*2.48*
Japan	10.49	7.57	7.03	*-2.92*	*-0.54*
China	9.17	16.30	18.14	*7.14*	*1.84*
India	1.29	2.04	2.59	*0.75*	*0.55*
ASEAN	8.47	8.00	8.59	*-0.48*	*0.59*
South Korea	4.11	4.08	4.47	*-0.04*	*0.40*

Intermediate products

Country	Shares of the world market, %			Δ in shares, p.p.	
	2000	2007	2010	2000-2007	2007-2010
EU27	11.24	10.34	9.41	*-0.90*	*-0.93*
North America	22.23	14.43	12.39	*-7.81*	*-2.04*
USA	17.17	10.26	8.86	*-6.91*	*-1.40*
Latin-Central America	7.90	8.44	9.20	*0.54*	*0.76*
Brazil	0.95	1.55	2.16	*0.60*	*0.62*
Rest of Europe	6.50	8.78	8.54	*2.27*	*-0.24*
Russia	2.53	4.71	4.79	*2.19*	*0.08*
Middle East and Africa	16.70	21.67	22.23	*4.97*	*0.56*
Asia	33.18	33.85	34.60	*0.67*	*0.75*
Japan	9.84	6.37	5.98	*-3.47*	*-0.40*
China	3.70	7.70	9.04	*4.01*	*1.34*
India	0.52	0.85	0.96	*0.34*	*0.11*
ASEAN	10.80	9.66	9.28	*-1.14*	*-0.37*
South Korea	2.56	3.16	3.38	*0.60*	*0.22*

Source: Authors' calculations using BACI data.

### 4.2. Competitiveness versus composition effects

In this section we identify the main drivers of market share gains and losses for the different exporters and sub-periods discussed above. We separate the effects of geographic and sectoral composition of exports on countries' competitiveness according to the method described in Cheptea et al. (2014).

Competitiveness is defined here as all changes in countries' market shares that are not induced by countries' export composition in terms of markets and sectors. Indeed, selling into the most dynamic import markets, and exporting the products with the highest growing global demand will automatically increase national market share. More precisely, we use an econometric shift-share method to decompose the growth of each country's world market share into three components: country's export competitiveness, and geographic and sectoral structures of its exports. The main questions addressed in this section are: Has recent disappointing European performance been driven by composition effects or a real loss of competitiveness? How different are these effects for the EU's main partners?

Before discussing the results, we would emphasise that there are other definitions of competeveness. These include labour costs and Real Effective Exchange Rates (REER). Figure 19 plots the evolution of REER for the largest EU Member States up to 2010 which enables comparison with other data in the paper. An increase in REER corresponds to a real appreciation in the country's currency (after adjusting for geographic composition of trade and trade partners' inflation) and, thus, to loss of competitiveness. Thus, the appreciation of the Euro during the 2000s was observed not only in nominal terms and against the USD,[23] but also in real terms for most EMU countries. Before the crisis the highest appreciation rates were in Ireland (+40%), Spain and Greece (+20%). Netherlands, Italy, Portugal and Belgium also registered real appreciation. This deterioration of price competitiveness also affected Germany, France, Austria and Finland. The deterioration in euro zone countries price-competitiveness contrasts with the stable situation in the UK before the crisis. The adverse evolution for euro-zone countries has been partially corrected since the crisis began.

Overall, if these evolutions are viewed relative to the recorded changes in market shares, we observe that real exchange rate appreciation (deterioration in price-competitiveness) is far from being the main explanation of changes in the world market shares of EU exporters. An example here is Italy. During the period 2000-2007, Italy recorded appreciation of its real exchange rate and a very moderate decrease in its extra-EU market share (-0.03 p.p., see OLA Table A.59). In contrast, over the period 2007-2010), Italy's real exchange rate changed more favourably, while the country recorded the worst market share losses (in absolute terms) among EU Member States (-0.27 p.p. of the world market). The situation in the UK was similar (the UK posted the third worst change in its market share among EU Member States: -0.21 p.p.), despite the very important improvement in its price competitiveness. Finally, the second worst change in market share was recorded by Germany (-0.24 p.p.) contrasting with this country's efforts to maintain its price competitiveness. These facts suggest that the market shares losses have not been driven by price competitiveness but rather by non-price competitiveness (innovation, quality of the products, investment in new ranges of products, etc.) that has evolved unfavourably in recent years for the EU Member States.

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[23] The nominal Euro/USD exchange rate increased from about 0.8-0.9 in 2001 to 1.3-1.4 in 2010.

Figure 19. The Real effective exchange rate for selected EU27 countries (2000=100)
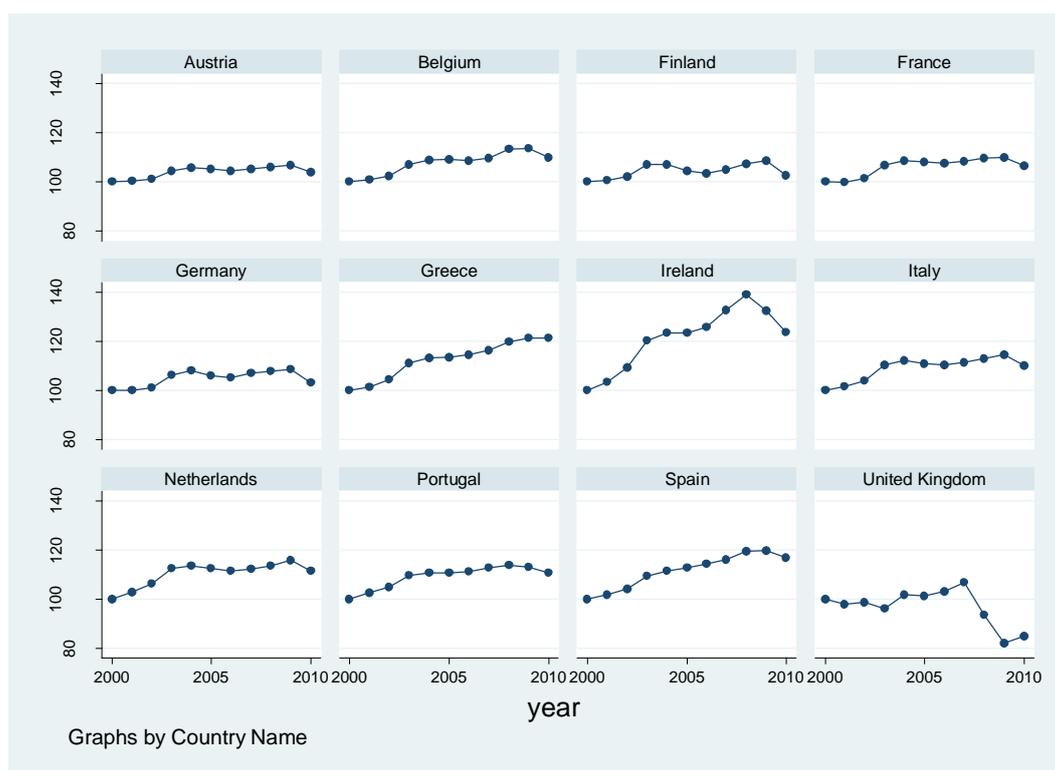
Source: IMF data. 2000 used as reference year.

We next show how EU competiveness in manufacturing has evolved using product level data. The shift-share approach, also known as the constant market share analysis or structural decomposition, is one of the simplest and more accurate ways to identify the contributions to growth: it identifies product and market composition effects, and their contribution to competitiveness. Rather than the traditional algebraic decomposition of growth rates, we adopt an econometric approach, based on the high level of disaggregation of our trade data (BACI).

We perform the analysis separately for each year, and compute market share growth across a period as the sum of annual changes. This strategy not only captures the evolution in trade between the first and last years, it also captures short-time variations in countries' export positions. However, it restricts the analysis to trade flows persisting for at least two consecutive years (necessary to compute annual growth rates). The rates of disappearing and emerging trade flows increase with the level of product disaggregation. Therefore, to limit the volumes of trade falling in either of these categories and, accordingly, increasing the share of global trade covered in the shift-share analysis, we decompose export growth on data aggregated to the 2-digit level of the HS classification. This permits us to capture over 90% of the changes in global trade between 2000 and 2010, although the percentage varies across countries. Again, to increase the comparability of export performances between European and non-European countries, intra-EU trade is excluded from the analysis.

0 displays the decomposition of global market share evolutions for the EU and its main trade partners, all products combined, before and during the financial turmoil in the late 2000s. Unlike in the previous tables, results are expressed as percentage changes in the exporter's initial market share. The first column in Table 14 gives the percentage change in the

exporter's share of the global market (g_i) from the beginning of the considered period. The contribution of exporter's competitiveness *COMPi* is shown in column 2. Columns 3 and 4 show the geographic and sectoral structure effects GEO_i and $SECT_i$.[24]

The EU's resilience before the crisis (+0.2%) is explained entirely by the favourable geographic orientation of European (extra-EU) exports (+9.3%). Competitiveness losses incurred by the US and Japan were concentrated in the pre-crisis period and can be attributed almost entirely to the poor overall competitiveness of these countries. In contrast, the 9% loss in world market share by the EU during the three crisis years is mostly the result of a deterioration in the EU's competitiveness (-8.1%).

Other European countries, including Russia (until the crisis), improved their market shares by relying on the positive contribution of both the geographical and sectoral structures of their exports. The deterioration in structural effects during the crisis period was partially compensated by the improvement in export competitiveness of these countries. The consolidation of the emerging countries' (China, India and Brazil) position in the global market has been driven by their outstanding export performance, despite negative structural contributions.

The sectoral structure of exports has a relatively low impact on the performance of European countries in the global (extra-EU) market, although it has been more penalising for some old Member States (especially Portugal and Italy).

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[24] The -0.04 p.p. change in the EU's market share in 2000 to 2007 shown in 0 corresponds to a -0.25% relative change in the EU's initial share of the world market (16.3%): -0.25%=(-0.04p.p./16.3%)*100. Ignoring the newly created and disappearing trade flows in the current section leads to a slightly different corresponding figure in 0: +0.2%. This is due to the fact that newly created flows are observed mainly for developing countries (which start exporting new products and/or to new destinations), the destination range of products exported by the EU is virtually the same throughout the period.

Table 14. Shift-share decomposition of the growth rate of world market shares, all products (percentage change)

Shift-share decomposition 2000-2007

Exporter	Mkt share growth (1)	Exporter competitiveness (2)	Geographic structure (3)	Sectoral structure (4)
EU27	0.2	-7.1	9.3	-1.4
North America	-32.6	-27.2	-6.8	-0.7
USA	-33.5	-30.6	-0.3	-3.9
Latin-Central America	1.7	8.4	-10.7	5.1
Brazil	38.9	39.4	2.1	-2.4
Rest of Europe	34.2	1.3	14.6	15.6
Russia	61.9	-6.8	27.1	36.7
Middle East and Africa	30.7	-1.9	-0.1	33.3
Asia	5.8	19.1	-1.0	-10.3
Japan	-31.5	-29.2	0.4	-3.7
China	84.8	155.7	-10.8	-19.0
India	69.2	73.7	6.0	-8.1
ASEAN	-7.0	2.1	-2.9	-6.2
South Korea	1.4	0.6	7.5	-6.3

Shift-share decomposition 2007-2010

Exporter	Mkt share growth (1)	Exporter competitiveness (2)	Geographic structure (3)	Sectoral structure (4)
EU27	-9.0	-8.1	0.6	-1.6
North America	-11.4	-7.3	-3.1	-1.3
USA	-8.8	-7.9	0.5	-1.4
Latin-Central America	2.7	3.8	-5.0	4.1
Brazil	9.8	2.2	1.1	6.2
Rest of Europe	-4.0	0.2	-6.5	2.5
Russia	-1.9	1.7	-6.5	3.2
Middle East and Africa	8.3	-5.6	4.6	9.6
Asia	5.2	7.0	1.7	-3.3
Japan	-7.7	-8.0	6.0	-5.3
China	12.0	24.0	-4.4	-5.5
India	26.0	20.4	0.2	4.4
ASEAN	4.7	0.9	4.0	-0.2
South Korea	9.6	4.2	7.9	-2.6

Notes: Authors' calculations using BACI data. All figures are in percentage of the initial market share.

The contribution of structural and competitiveness factors to European export performance differs across products. We focus on the role of these factors to explain the changes in world market shares for high-tech products and top-range products. As in the previous sections, the two dimensions are considered separately. High-tech products are defined at the most

detailed level of the product classification (see Appendix A.3), regardless of their market positioning in terms of unit values.

Table 15 summarises for each exporter the sources of gains and losses in the market for high-tech products, expressed as relative changes in their world market shares. The pre-crisis increase in the EU's world market share was the result of strong sectoral specialisation of European countries in products with a rapidly growing global demand (+23.2%), dampened by their poor competitiveness in dynamic foreign markets (-15.5%). The deterioration of the favourable sectoral positioning of European exporters since 2007 led to a slight weakening of the EU's position in this market. The high-tech sector is characterised by a high homogeneity of results across Member States (OLA Table A.97).

Top-range (upper unit-value) products are identified by ranking trade flows in each product, whatever the technological level, into three price segments on the world market, relying on unit values. The choice to analyse the market for these two groups of products separately is motivated by their large contribution to EU exports, and the good positioning and resilience of the EU in these markets before the crisis.

The role played by competitiveness and composition effects in the evolution of positions in global high-value markets is displayed in Table 16. The financial crisis in the late 2000s eroded the European advantage, but left unaltered the slightly positive structural effects, meaning that the degradation is entirely due to sinking competitiveness (-10.9%).

The positive market share growth of the EU in high-tech (+6.5% in Tabel 15) and up-market products (+4.6% in Table 16) before the crisis contrasts with the global result for the EU (+0.2% in table 14) and suggests an upward shift in embedded technology and unit values of European exports.[25] Therefore, these positive shifts cannot be interpreted as EU products simply becoming more expensive, because we observe greater resilience of EU exports for the most expensive products. The same trend is observed for Japan, but not for the US. Unlike the EU, the US and Japan lost within the decade 44% and 52% respectively of their 2000 market share in high-tech products due to a massive relocation of their assembly lines in Asia, especially China. American and Japanese losses were smaller, but still sizable in the market for high-value products, and concentrated before 2007. In both markets, these evolutions were induced by negative export competitiveness. Indeed, the strong positive structural effect, sectoral for the US and geographic for Japan, was balanced by the other structural term, leaving competitiveness (lack thereof) as the main driver of observed market share losses. The drop in these two countries' shares of the global market would have been even larger had the sectoral structure of American exports been less well adapted to world demand and had Japanese exports been less oriented towards the fast growing Asian market.

China and India show exceptional export competitiveness in both high-tech and top-range markets, although their exports are quite poorly structured at the geographic and sector levels. In Russia, on the other hand, the two-fold increase in market share in these products was mostly due to the positive sectoral positioning and geographic orientation of its exports. It benefits from a composition effect, whereby world demand has increased faster for its

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[25] Additional results for other market segments are provided in Appoendix A.6.

biggest volume exports of up-market products, while the demand for high-tech products grew more rapidly for its largest import partners.

Table15. Shift-share decomposition of the growth rate of world market shares, high-tech products (percentage change)

Shift-share decomposition 2000-2007

Exporter	Mkt share growth	Exporter competitiveness	Geographic structure	Sectoral structure
EU27	6.5	-15.5	2.2	23.2
North America	-33.2	-36.9	-2.7	8.8
USA	-32.3	-37.6	-0.2	8.7
Latin-Central America	-2.4	24.0	-20.3	-1.3
Brazil	1.6	-7.5	-9.6	21.5
Rest of Europe	42.4	7.4	2.1	29.8
Russia	139.4	3.4	110.0	10.2
Middle East and Africa	0.7	-12.1	4.4	9.9
Asia	12.4	24.0	1.9	-11.1
Japan	-45.2	-46.7	5.2	-2.3
China	186.8	269.2	-8.0	-15.5
India	173.0	56.7	21.5	43.4
ASEAN	-16.5	-1.0	-2.2	-13.7
South Korea	25.4	29.1	6.9	-9.1

Shift-share decomposition 2007-2010

Exporter	Mkt share growth	Exporter competitiveness	Geographic structure	Sectoral structure
EU27	-3.2	-9.4	-0.5	7.4
North America	-17.7	-17.1	-2.1	1.3
USA	-17.2	-17.4	-1.3	1.6
Latin-Central America	10.6	21.6	-7.6	-1.5
Brazil	-12.2	-8.8	-0.4	-3.3
Rest of Europe	7.3	-4.2	-3.1	15.5
Russia	1.2	19.4	-14.0	-1.4
Middle East and Africa	-15.6	-7.8	-12.7	4.7
Asia	5.4	7.4	1.9	-3.7
Japan	-11.8	-13.5	2.3	-0.4
China	22.7	30.2	-0.7	-5.2
India	52.3	35.7	-1.7	14.2
ASEAN	-6.4	-4.5	2.9	-4.8
South Korea	4.0	1.5	4.7	-2.2

Notes: Authors' calculations using BACI data. All figures are in percentage of the initial market share.

Table 16. Shift-share decomposition of the growth rate of world market shares, high unit-value (up-market) products

Shift-share decomposition 2000-2007

Exporter	Mkt share growth	Exporter competitiveness	Geographic structure	Sectoral structure
EU27	4.6	3.4	1.1	0.1
North America	-38.5	-36.3	-6.1	2.8
USA	-35.9	-33.2	-4.4	0.4
Latin-Central America	-20.8	-12.0	-10.5	0.7
Brazil	-39.6	-27.6	-9.8	-7.6
Rest of Europe	41.6	37.7	3.7	-0.8
Russia	89.8	12.9	23.9	35.7
Middle East and Africa	312.0	200.0	24.3	10.5
Asia	-6.7	-1.8	-0.3	-4.6
Japan	-32.1	-38.6	8.9	1.5
China	51.1	112.0	-13.7	-17.5
India	32.1	57.2	-2.0	-14.3
ASEAN	-0.2	2.2	-5.0	2.7
South Korea	25.4	26.1	6.6	-6.7

Shift-share decomposition 2007-2010

Exporter	Mkt share growth	Exporter competitiveness	Geographic structure	Sectoral structure
EU27	-9.6	-10.9	0.4	1.1
North America	-8.7	-8.6	-3.0	2.9
USA	-5.1	-6.0	-1.8	2.8
Latin-Central America	-12.1	-6.6	-4.5	-1.4
Brazil	4.6	3.4	1.8	-0.6
Rest of Europe	1.8	4.4	-8.9	7.0
Russia	-9.4	-1.4	-6.9	-1.4
Middle East and Africa	3.7	2.0	0.9	0.8
Asia	7.7	8.1	3.7	-3.9
Japan	2.1	1.6	5.7	-4.9
China	25.0	30.3	-0.8	-3.3
India	30.5	26.4	4.4	-1.1
ASEAN	2.5	1.7	5.2	-4.2
South Korea	-14.1	-11.9	2.1	-4.4

Notes: Authors' calculations using BACI data. All figures are in percentage of the initial market share.

5.   Conclusions

This paper shows that EU competitiveness has deteriorated in the most recent years: the crisis has taken a toll on European producers.. This is an unexpected outcome since EU market share has been very resilient in the past, especially compared to the US and Japan. Since the late 1990s, Japan and the US had profoundly reorganised their production on a global scale, which had a huge impact on the external trade performance of these countries, though supporting performance of the individual firms concerned. The adjustment of European producers to competition of emerging markets had been of a different kind, taking benefit of an enlarged EU the value added chains has been unbundled on a regional level. Adjustments being done, in the period 2007-2010 European, US and Japanese market share losses have now been much more in line in percentage terms, though European losses in absolute terms are larger because these apply to larger initial market shares. The performance of EU industrial products on world markets is also affecting services, which often are embodied in these products. The EU lost 8% of its world market share between 2007 and 2010, contrasting with stable market share between 2000 and 2007. All EU Member States except the new Member States are affected, even the traditional large exporters: Italy lost 14% of its market share in 2007-2010, the UK 9%, Germany and France 6%. While European competitiveness was traditionally based on top range and high tech products, even these products have lost ground since 2007. In the upper segment of the market, Germany, Spain, Italy, Sweden and France lost more than 10% of their market share between 2007 and 2010. For high tech products, the situation is similar, and exemplified by the counter-performance of Finland and the difficulties facing its main producer of cell phones.

On the other hand, since EU products increasingly embody services, there is room for a rebound, and competitiveness in services will be an important determinant of future European industry. These findings should call for more progresses in European integration in services.

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Appendix

A.1. The BACI Database

The BACI database analyses international trade at product-level and was developed by the CEPII research centre. It includes unilateral flows in 5,103 products at the 6-digit HS classification level between 221/222 trade partners, depending on the year. BACI provides trade as well as unit values (value/quantity), for all international trade flows, from 1994 to 2010. BACI trade data draw on UN COMTRADE information which reports imports as CIF (cost, insurance and freight) and exports as FOB (free on board). BACI provides reconciled FOB data on trade flows: for each product and year, exports from country i to importer j are equal to imports of j from i. This reconciliation of mirrored flows is performed for both values and quantities, and relies on estimated indicators of the reliability of countries' import and export reporting. Quantity units are converted into tons, enabling computation of similar unit values. The availability of unit values enables us to classify flows by price range and, thus, to analyse exporters' positions by price segment. BACI is available to COMTRADE users at: http://www.cepii.fr/anglaisgraph/bdd/baci.htm.

A.2. The World Input-Output Database (WIOD)

The data for the analysis are from the World Input-Output Database (WIOD), which became available in April 2012 (see www.wiod.org) and was compiled with funding from the EU 7th Framework programme. These data provide international supply and usage, and input-output tables, for a set of 41 countries (EU, Australia, Brazil, Canada, China, India, Indonesia, Japan, Korea, Mexico, Russia, Taiwan, Turkey, USA and Rest of the World) for 1995–2009. It was compiled on the basis of national accounts, national supply and use tables, and detailed trade data on goods and services, combining information for 59 products and 35 industries. Corresponding data at industry level allow value added to be split between capital and labour income. The database provides a time series for 1995-2009 which has been unofficially updated to 2011.

This results in a world input-output database for 41 countries (including Rest of the World) and 35 industries, i.e. the intermediates demand block is 1435x1435, plus additional rows for value-added and additional columns for final demand categories. The outline of this world input-output table is presented below. Each industry in a country listed vertically, sources intermediates from its domestic industries and from other countries' industries. Using value added for this country, we can obtain the level of gross output. Also, each country has demand for products from its own economy and other economies for final use, such as consumption and gross fixed capital formation. The horizontal view shows what each industry provides to industries in its own and other countries, and final demand from domestic and foreign consumers. Gross output produced in one country equals the value of the demand for each country's industries.

A countriy's domestic content in gross exports is calculated as $\mathrm{DVAiX}^r = (\mathbf{v}^r)'(\mathbf{I} - \mathbf{A})^{-1}\mathbf{x}^r$. Matrix $\mathbf{A}$ denotes the coefficient matrix, i.e. input from domestic and foreign industries per unit of gross output. Consequently $(\mathbf{I} - \mathbf{A})^{-1}$ is the global Leontief inverse. These size of these matrices is NC, where N is the number of industries and C is the number of countries. Since we are interested in the domestic value added content of exports with respect to country r, we pre-multiply with a vector containing value added per unit of output coefficients

for country r and zeros otherwise. To obtain the subset of sectors contributing to these countries' value added in exports, the coefficients of other sectors must be set to zero. Similarly, we post-multiply using a vector of the dimension NCx1 which includes country r's gross exports and zeros otherwise (see Stehrer, 2012, and Foster and Stehrer, 2013, for a detailed discussion of these concepts).

Table A.1 Outline of the WIOD tables

Outline of world input-output table (industry by industry)

	Intermediate use			Final use			
	Country A	**Country B**	**Country C**	**Country A**	**Country B**	**Country C**	
Country A	A sources from A	B sources from A	C sources from A	A demands in A	B demands in A	C demands in A	GO in A
Country B	A sources from B	B sources from B	C sources from B	A demands in B	B demands in B	C demands in B	GO in B
Country C	A sources from C	B sources from C	C sources from C	A demands in C	B demands in C	C demands in C	GO in C
Value added	VA in A	VA in B	VA in C				
Gross output	GO in A	GO in B	GO in C				

A.3. Classifications used in the paper

Table A.2. Sectors classification in WIOD dataset (based on NACE Rev. 1)

Sector	Sector description	Technological intensity
15t16	Food, Beverages and Tobacco	Low technology
17t18	Textiles and Textile Products	Low technology
19	Leather and Footwear	Low technology
20	Wood and Products of Wood and Cork	Low technology
21t22	Pulp, Paper, Printing and Publishing	Low technology
23	Coke, Refined Petroleum and Nuclear Fuel	Medium-low technology
24	Chemicals and Chemical Products	Medium-high and high-technology
25	Rubber and Plastics	Medium-low technology
26	Other Non-Metallic Mineral	Medium-low technology
27t28	Basic Metals and Fabricated Metal	Medium-low technology
29	Machinery, n.e.c.	Medium-high and high-technology
30t33	Electrical and Optical Equipment	Medium-high and high technology
34t35	Transport Equipment	Medium-high and high technology
36t37	Manufacturing, n.e.c.; Recycling	Low technology

Notes:

High and medium-high technology sectors include NACE 35.1 (shipbuilding) which is classified as medium-low technology sector according to Eurostat-OECD classification.

Pharmaceuticals (24.4) are defined as high-tech and chemicals excl. Pharmaceuticals as medium-high tech; thus both are included in the medium-high and high technology sectors

Medium-high and high-technology industries have to be taken together due to higher aggregation in WIOD database

Table A.3. The EUROSTAT-OECD classification of products by their technological content

High-technology:

Aerospace (35.3)

Pharmaceuticals (24.4)

Computers, office machinery (30)

Electronics-communications (32)

Scientific instruments (33)

Medium-high-technology:

Electrical machinery (31)

Motor vehicles (34)

Chemicals, excluding pharmaceuticals (24, excluding 24.4)

Other transport equipment (35.2, 35.4 and 35.5)

Non-electrical machinery (29)

Medium-low-technology:

Coke, refined petroleum products and nuclear fuel (23)

Rubber and plastic products (25)

Non metallic mineral products (26)

Shipbuilding (35.1)

Basic metals (27)

Fabricated metal products (28)

Low-technology:

Other manufacturing and recycling (36 and 37)

Wood, pulp, paper products, printing and publishing (20, 21 and 22)

Food, beverages and tobacco (15 and 16)

Textile and clothing (17, 18 and 19)

Source: Eurostat, Statistics in Focus, Science and Technology, 4/2005, R&D Statistics, Luxembourg, 2005. Classification according to global technological intensity and based on NACE rev. 1.1 at 3-digit level

Table A.4. The BEC classification of products by their use

Product destination		BEC category	
1	Food and beverages		
11	Primary		
Intermediate		111	Mainly for industry
Intermediate		112	Mainly for household consumption
12	Processed		
Finished	121	Mainly for industry	
Finished	122	Mainly for household consumption	
2	Industrial supplies not elsewhere specified		
Intermediate		21	Primary
Finished	22	Processed	
3	Fuels and lubricants		
Intermediate		31	Primary
Finished	32	Processed	
Finished	321	Motor spirit	
Finished	322	Other	
4	Capital goods (except transport equipment), and parts and accessories thereof		
Finished	41	Capital goods (except transport equipment)	
Intermediate		42	Parts and accessories
5	Transport equipment and parts and accessories thereof		
Finished	51	Passenger motor cars	
Finished	52	Other	
Finished	521	Industrial	
Finished	522	Non-industrial	
Intermediate		53	Parts and accessories
6	Consumer goods not elsewhere specified		
Finished	61	Durable	
Finished	62	Semi-durable	
Finished	63	Non-durable	
7	Goods not elsewhere specified		

Note: F denotes finished products and I depicts intermediate products.

Table A.5. The NACE Rev. 1 industry classification

Code	Sector (type of products)
A+B	Agriculture, Hunting, Forestry and Fishing
C	Mining and Quarrying
15+16	Food, Beverages and Tobacco
17+18	Textiles and Textile Products
19	Leather, Leather and Footwear
20	Wood and Products of Wood and Cork
21+22	Pulp, Paper, Paper, Printing and Publishing
23	Coke, Refined Petroleum and Nuclear Fuel
24	Chemicals and Chemical Products
25	Rubber and Plastics
26	Other Non-Metallic Mineral Products
27+28	Basic Metals and Fabricated Metal Products
29	Machinery, Nec
30+33	Electrical and Optical Equipment
34+35	Transport Equipment
36+37	Manufacturing, Nec; Recycling
E	Electricity, Gas and Water Supply
F	Construction
50	Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel
51	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles
52	Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods
H	Hotels and Restaurants
60	Other Inland Transport*
61	Other Water Transport*
62	Other Air Transport*
63	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies*
64	Post and Telecommunications
J	Financial Intermediation
70	Real Estate Activities
71+74	Renting of M&Eq and Other Business Activities
L	Public Admin and Defence; Compulsory Social Security
M	Education
N	Health and Social Work
O	Other Community, Social and Personal Services
P	Private Households with Employed Persons

A.5. The diversification of exports

Appendix A.5 analyses the level of diversification of global and country-level trade using the Herfindal index initially designed to measure the level of competition among the firms within an industry.

We compute the normalised Herfindal index of diversification of world trade across exporting countries, importing countries, and exchanged products, using the following formula:

$$H = \frac{\sum_i^N s_i^2 - 1/N}{1 - 1/N}$$

*w*here s_i^2 is the share in global trade of exports/imports by country *i*, or of the world trade in product *i*. The index ranges from 0 to 1, moving from a situation with a large number of equal-sized small trade partners (product markets) to a world trade dominated by a single country (group of products). Therefore, a value close to zero indicates a more uniform world trade distribution across countries or products, i.e. more diversified trade, while an index value approaching unity reflects a highly uneven trade distribution. An increase in the Herfindahl index corresponds to an increase in the market power of the world's top exporters/importers, while a decrease in this indicates indicates the opposite. A major benefit of the Herfindahl index for measuring concentration/diversification is that it gives more weight to larger players.

Similar to the global trade index, we compute the Herfindal index of the country-level diversification of exports or imports:

$$H_c = \frac{\sum_i^{N_c} s_{c,i}^2 - 1/N_c}{1 - 1/N_c}$$

where index *c* denotes the exporting/importing country and *i* is the generic trade partner or exchanged product. A larger index corresponds to a higher concentration of the country's product within a small number of partner countries or exported/imported products.

Figure A.1 plots the level of trade diversification across partner countries for the EU and its main competitors during 2000-2010. Overall, the value of the Herfindal index is larger when computed across importing compared to exporting partners. This indicates that country-level imports are more diversified than exports in terms of trading partners. The high values of the Herfindal index for Latin and Central American countries stand out, suggesting that they trade large volumes with a limited number of partners. The geographic diversification of Latin American exports and imports doubles by the end of the period, but is still well behind the level observed for other countries. Most of the countries in the analysis managed to further diversify the geographic orientation of their exports, although this process was delayed by the onset of the crisis. The lower part of this figure shows that the diversification of import sources is more steady and homogeneous. For the EU, in 2000 the diversification of trade partners is more pronounced on the import side. The bigger presence of European exporters in markets where their positions previously were weak has led to an equalisation in the geographic diversification of European exports and imports.

Figure A.1. The level of diversification of country-level exports across partners
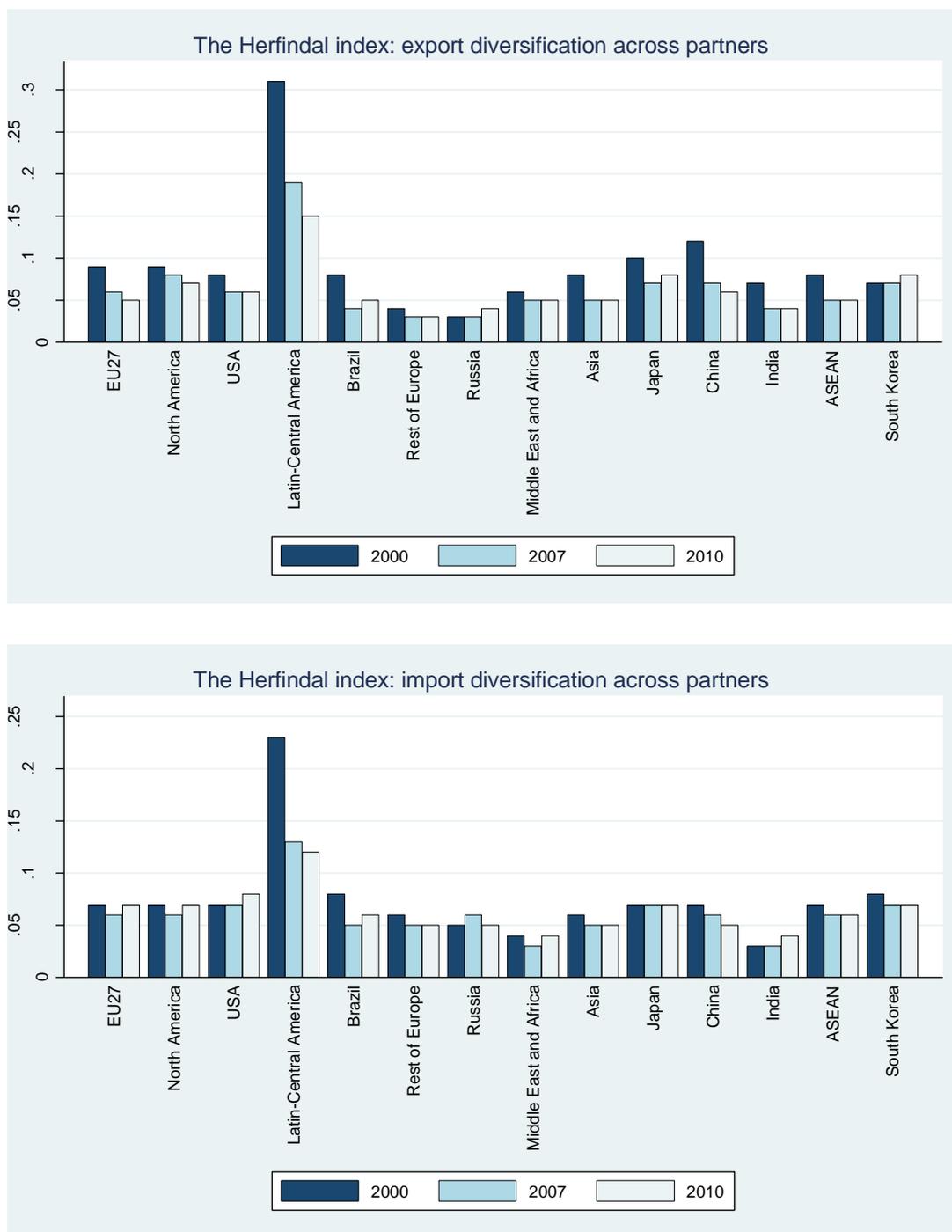
Source: Authors' calculations using BACI data.

The diversification of country-level exports and imports across sectors is displayed in Figure A.2. Differences in the magnitude of the index and its cross-country variations between imports and exports are striking. Thus, a country's specialisation in one or several sectors is reflected mostly in the sectoral diversification of its exports. The low Herfindal index for the EU and the US (0.07) contrasts with the large values observed for Russia (0.28), the Middle

East and Africa (0.36). The high level of diversification in European and American exports reflects the specialisation of these countries in a wide range of economic sectors. In contrast, Russia and the Gulf countries' exports are concentrated in a small number of sectors, mainly mineral products. Also, their heavy dependence on a narrow range of exported products increased over the decade. The picture is similar if the level of diversification is computed at the most disaggregated product level (OLA Table A.103).

The diversification of a country's exports indicates how much it depends on demand from specific trade partners or for particular types of products. Overall, a high level of concentration in a country's exports towards a few geographical destinations, or within a narrow range of sectors, renders that country's export incomes and performance on the global market more vulnerable to external economic shocks. In contrast, countries with more diversified export patterns are likely to be able to better adjust to regional and sectoral shocks. Thus, the exceptionally high growth of Chinese and Indian market shares in 0 Section 4.4.2 is due in part to the fact that these countries export a very wide range of products and to a very large number of partners. However, a country with a low diversification of exports (high Herfindal index) will still perform well if it specialises in exports of products that are in high demand. This is the case for Russia and the Middles East and Africa. Although these countries mainly export raw materials (about 70% of their exports are oil & gas, and mining & quarrying products), the high global demand for and increasing price of these products (reflected by strong sectoral structure effects in Table 14, Section 4.4.2) has allowed them to reinforce their position in the world market. Latin and Central American countries on the other hand have been penalised by low geographic diversification of their exports, oriented mostly to the shrinking (in relative terms) and severely affected by the financial crisis, US and EU markets. Therefore, the high Herfindal index computed across trade partners for these countries (Figure A.2) matches the large negative sectoral effect found in Table 14.

Figure A.2. The level of diversification of country-level exports across sectors
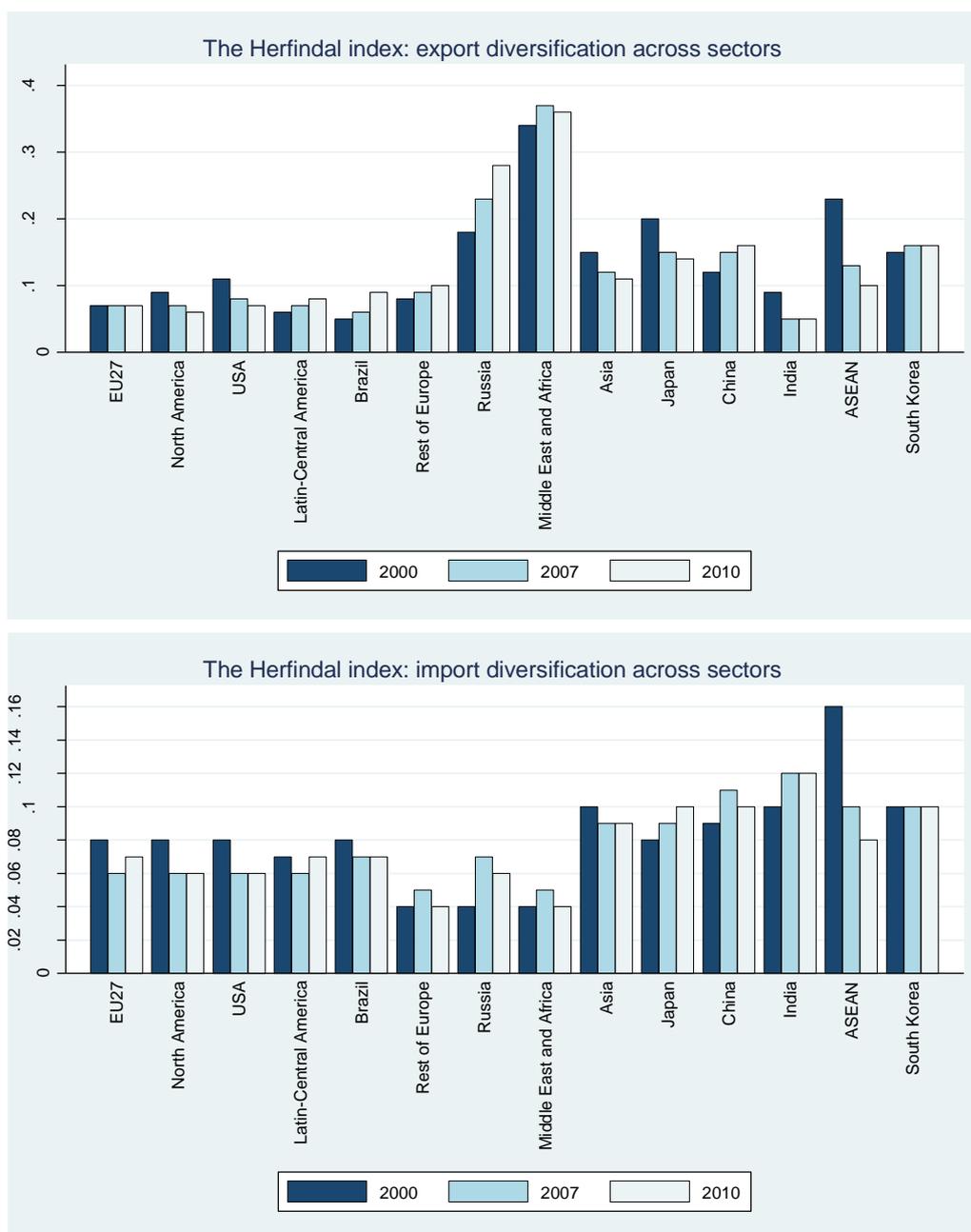
Source: Authors' calculations using BACI data.

A.6. Shift share analysis by market segment

Table A.6 Distribution of world market shares, by technological content of products, excluding intra-EU27 flows

Middle-high tech products

Country	Shares of the world market, %			Δ in shares, p.p.	
	2000	2007	2010	2000-2007	2007-2010
EU27	22.73	24.74	23.30	*2.01*	*-1.44*
North America	27.50	18.91	17.01	*-8.59*	*-1.90*
USA	20.37	14.67	13.71	*-5.70*	*-0.96*
Latin-Central America	6.81	5.88	5.96	*-0.94*	*0.09*
Brazil	0.99	1.31	1.18	*0.32*	*-0.13*
Rest of Europe	4.44	5.61	5.16	*1.16*	*-0.45*
Russia	0.81	1.07	0.91	*0.27*	*-0.16*
Middle East and Africa	2.16	3.28	4.23	*1.12*	*0.96*
Asia	35.51	40.71	43.46	*5.20*	*2.75*
Japan	18.23	14.57	13.67	*-3.66*	*-0.90*
China	4.92	11.08	13.43	*6.16*	*2.35*
India	0.56	1.07	1.35	*0.51*	*0.28*
ASEAN	4.44	5.94	6.57	*1.50*	*0.63*
South Korea	3.56	4.76	5.22	*1.20*	*0.46*

Middle-low tech products

Country	Shares of the world market, %			Δ in shares, p.p.	
	2000	2007	2010	2000-2007	2007-2010
EU27	16.20	15.75	14.19	*-0.45*	*-1.57*
North America	17.92	12.79	12.45	*-5.13*	*-0.34*
USA	12.66	8.42	8.80	*-4.24*	*0.38*
Latin-Central America	7.44	7.13	6.61	*-0.31*	*-0.52*
Brazil	1.52	1.61	1.20	*0.08*	*-0.41*
Rest of Europe	12.25	13.67	12.61	*1.43*	*-1.07*
Russia	5.77	5.83	5.48	*0.07*	*-0.35*
Middle East and Africa	10.06	10.24	11.37	*0.18*	*1.13*
Asia	32.22	36.77	39.95	*4.55*	*3.18*
Japan	8.49	6.45	7.17	*-2.04*	*0.72*
China	5.89	10.78	11.07	*4.89*	*0.29*
India	0.94	2.47	3.10	*1.53*	*0.62*
ASEAN	6.83	7.70	8.57	*0.87*	*0.86*
South Korea	5.26	4.92	6.16	*-0.34*	*1.24*

Low tech products

Country	Shares of the world market, %			Δ in shares, p.p.	
	2000	2007	2010	2000-2007	2007-2010
EU27	15.85	15.68	14.32	*-0.17*	*-1.36*
North America	18.24	12.14	11.12	*-6.09*	*-1.02*
USA	11.71	8.16	7.98	*-3.55*	*-0.18*
Latin-Central America	8.42	9.08	9.02	*0.66*	*-0.06*
Brazil	1.98	2.93	3.13	*0.94*	*0.21*
Rest of Europe	5.37	6.80	6.39	*1.43*	*-0.41*
Russia	0.87	1.10	0.98	*0.23*	*-0.11*
Middle East and Africa	4.74	5.41	5.60	*0.67*	*0.18*
Asia	43.94	47.79	50.57	*3.84*	*2.78*
Japan	2.56	1.67	1.63	*-0.89*	*-0.05*
China	16.21	24.57	26.02	*8.35*	*1.45*
India	3.25	3.93	4.74	*0.69*	*0.80*
ASEAN	10.41	10.32	11.44	*-0.09*	*1.12*
South Korea	2.97	1.35	1.33	*-1.62*	*-0.01*

Source: Authors' calculations using BACI data.

Table A.7. Distribution of world market shares, by unit-value/quality range of products, (excluding intra-EU27 flows)

Low-market (low unit-value/quality) products

Country	Shares of the world market, %			Δ in shares, p.p.	
	2000	2007	2010	2000-2007	2007-2010
EU27	13.87	10.83	12.13	-3.04	1.31
North America	20.03	11.18	10.87	-8.85	-0.30
USA	15.22	8.19	8.40	-7.02	0.21
Latin-Central America	8.80	8.08	7.97	-0.72	-0.11
Brazil	1.38	1.87	1.81	0.49	-0.05
Rest of Europe	7.70	9.87	7.54	2.16	-2.32
Russia	2.95	4.86	2.88	1.92	-1.99
Middle East and Africa	8.79	17.10	10.14	8.31	-6.96
Asia	38.57	41.11	49.64	2.54	8.52
Japan	6.60	4.53	4.55	-2.08	0.02
China	9.24	18.15	22.87	8.91	4.72
India	1.21	1.65	2.25	0.44	0.60
ASEAN	10.04	7.60	8.70	-2.45	1.11
South Korea	4.22	4.14	5.61	-0.08	1.47

Mid-market (middle unit-value/quality) products

Country	Shares of the world market, %			Δ in shares, p.p.	
	2000	2007	2010	2000-2007	2007-2010
EU27	14.01	14.71	11.70	0.70	-3.01
North America	23.29	17.90	14.06	-5.40	-3.84
USA	16.10	12.00	9.84	-4.10	-2.16
Latin-Central America	7.41	8.47	9.03	1.06	0.56
Brazil	1.23	1.96	2.13	0.72	0.17
Rest of Europe	6.18	7.74	8.18	1.56	0.44
Russia	1.75	2.90	3.69	1.15	0.79
Middle East and Africa	9.87	8.50	16.68	-1.36	8.18
Asia	37.04	39.87	37.48	2.83	-2.40
Japan	11.23	8.44	6.41	-2.79	-2.03
China	7.24	12.71	13.33	5.47	0.62
India	0.77	1.86	1.71	1.09	-0.16
ASEAN	9.29	8.61	8.29	-0.68	-0.32
South Korea	3.37	3.80	3.71	0.42	-0.09