Trade Integration, Production Fragmentation and Performance in Europe – Blessing or Curse?
A Comparative Analysis of the New Member States and the EU-15

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Abstract

Fundamental changes in the global trade landscape in terms of considerably expanding trade volumes and rapidly advancing global fragmentation of production processes have opened up new opportunities for many economies. The ensuing analysis determines whether these new opportunities have actually translated into real gains and have helped foster economic performance in terms of economic growth, employment generation and labour productivity improvements. It uses the WIOD database for all EU-27 countries and shows that between 1995 and 2007, vertical specialisation intensified in all EU member countries (but the UK) and that it intensified the most in the new Member States. Moreover, it demonstrates that export growth is beneficial to performance, particularly in the new Member States. Likewise, stronger participation in global production processes is performance-enhancing. Furthermore, results indicate that export growth and the degree of vertical specialisation tend to reinforce each other. In particular, the effects of export growth on macroeconomic performance tend to be even higher if vertical specialisation is high.

CONTENTS

TABLES AND FIGURES

1. Introduction

In the course of the last couple of decades, the global economy bore witness to two major phenomena which fundamentally altered the global trade landscape. Firstly, since the 1970s, trade volumes have expanded dramatically. In particular, from the early 1970s onward up to 2012, the volume of total exports increased 8-fold (which is equivalent to an annual average growth rate of about 5%) while, more spectacularly, the volume of manufactures grew almost 13-fold (which is equivalent to an annual average growth rate of 6%)[1].

Secondly, the very nature of trade changed fundamentally as production processes have become increasingly more fragmented and stretch across many countries in a vertical chain with individual countries specialising in particular stages of the overall production process. Traditionally, specialisation was horizontal as firms or countries produced particular goods (or services) from scratch and then exported them. However, specialisation has become increasingly vertical, as countries use imported intermediate inputs to produce goods they later export. In this respect, Hummels et al. (2001), who revived and popularised the term 'vertical specialisation' suggested by Balassa (1967) to describe the process of joint fragmentation and globalisation of production processes, focus on the share of imported inputs in production and analyse a group of OECD countries and emerging market economies[2]. They emphasise that in a span of 20 years only, the vertical specialisation share of exports of the entire sample increased by almost 30% (from 0.165 in 1970 to 0.21 in 1990). Their results also point to non-negligible cross-country differences and show that except for Japan, whose vertical specialisation share of exports declined, all countries in their sample experienced an increase in the vertical specialisation share of exports, with Australia, Canada, France, the UK and the US experiencing the most pronounced increases of 25% and more. In a similar vein, Amador and Cabral (2008a) analysed total world vertical specialisation between 1967 and 2005 and point to very specific regional and sectoral developments and differences. For example, they highlight that the share of Asia in total vertical specialisation has increased sharply in the course of the past two decades while the share of North America has shrunk somewhat, particularly since the mid-1980s. Moreover, they put the high-tech sector at the very core of the globally observable trend towards growing vertical specialisation. In particular, vertical specialisation activities in the high-tech sector almost quadrupled in the course of the past two decades, amounting to almost 80% of total trade related to vertical specialisation[3].

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[1]   See World Trade Organization, International Trade Statistics.

[2]   The group of OECD countries comprises all G-7 countries plus Australia, Denmark and the Netherlands while the group of emerging market economies comprises Ireland, Korea, Taiwan and Mexico.

[3]   In addition, there is growing evidence that individual countries or country groups strongly integrate into the world economy and more intensely participate in the global production chain. In this respect, Dean et al. (2007) address China's rising prominence in international trade and analyse its rapidly growing importance in the global production chain. They highlight that between 1997 and 2002, China's vertical specialisation share in exports increased by around 23%. Similarly, Chen and Chang (2006) study processes of vertical specialisation in Taiwan and South Korea and demonstrate that the vertical specialisation share of exports increased in Taiwan by around 20 percentage points between 1981 and 1996 and in South Korea by around 24 percentage points between 1980 and 1995. Changing patterns in vertical specialisation are analysed by Amador and Cabral (2008b) for Portugal from 1980 to 2002. They point to fluctuations in vertical specialisation, which stood at 38% in 1980, slipped thereafter and reached as low as 31%

In contrast, Campa and Goldberg (1997) use the share of imported inputs in production to quantify the extent of and change in vertical integration for all manufacturing industries in the United States, Canada, the United Kingdom, and Japan. They provide evidence of substantial cross-industry heterogeneity in the degree of vertical specialisation and emphasise that there is a lot of variation in the degree to which industries rely on imported inputs. Moreover, they show that while the relative ranking of manufacturing industries in terms of imported input shares remained fairly stable for each country between the early 1970s and the mid-1990s, the country-specific ranking differed significantly across countries. In addition, they demonstrate that the generally low level of and decline in vertical specialisation reported for Japan is not uniform across all industries. Alternatively, Yeats (1998) analyses trade activities in parts and components of OECD countries to quantify the size of and change in global production sharing between 1978 and 1995. He concludes that trade in parts and components has grown considerably at a rate of 10% annually between the late 1970s and the mid-1990s.

These fundamental changes in the global trade landscape have opened up new opportunities for many, predominantly economically lagging, economies. In particular, as has been argued, enhanced participation in global trade and stronger presence in global markets fosters more efficient resource allocation and capacity utilisation, provides access to larger markets and offers opportunities to exploit economies of scale and specialisation effects and helps technologically lagging economies gain knowledge of and access to leading-edge technologies, whose adoption help improve overall productivity and initiate a process of catching-up. Additionally, as a consequence of accelerated international product fragmentation individual countries no longer have to master entire production processes before they can emerge as serious competitors in global markets. Instead, it is sufficient to gain expertise and competitiveness in one (or more) stages of the entire production process to join the international production network and profit from the gains of trade. These potential opportunities have raised the hopes of politicians that well-designed and formulated economic policy instruments embracing and fostering easier access to international markets and stronger participation in globally fragmented value chains helps foster economic development and catching up.

Hence, against that backdrop, the ensuing analysis attempts to determine whether opportunities arising from the more recent changes in the global trade landscape have actually translated into real gains. In particular, it identifies in how far countries and industries benefit from both the expansion of trade volumes and intensified vertical specialisation and experience improvements in output and value-added growth, employment growth and labour productivity growth. It uses the World Input-Output Database (WIOD) which provides industry-level data on, among other things, performance and trade-related indicators for 40 different countries from 1995 to 2011 allowing for a detailed analysis concerning patterns and impacts of vertical specialisation. The ensuing analysis focuses on the European Union (EU-27) which experienced similar processes of trade expansion, integration and fragmentation

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in 1992 but recovered again thereafter and settled at around 38% in 2002. Moreover, they point to non-negligible cross-industry dynamics and differences in manufacturing. Breda et al. (2007) conduct a comparative analysis of the change in the import content of a set of European countries comprising Belgium, France, Germany, Italy, the Netherlands, Spain and the United Kingdom between 1995 and 2000, which together account for around 80% of EU GDP and almost 80% of EU trade in goods and services. Their results are indicative of important cross-country differences which are in line with previous findings of a negative relationship between country size and the degree of vertical specialisation: while smaller countries (such as the Netherlands or Belgium) are characterised by relatively high degrees of vertical specialisation, larger countries (such as France or Germany) exhibit relatively low degrees of vertical specialisation. Moreover, they emphasise that except for France, all countries in their sample intensified their participation in global production chains, with Germany experiencing the strongest increase in the import content of exports, from 22% in 1995 to almost 28% in 2000.

particularly in course of the creation of the Single Market and East-West integration after the break-down of the iron curtain. On the one hand, the EU has more strongly integrated into the world economy and has emerged as one of the key global players and trading partners. In this respect, the EU currently accounts for around 40% of world trade in merchandise[4]. On the other hand, as a consequence of increased integration of Eastern European economies into the European Union since the mid-1990s, within-EU integration strengthened significantly over the last two decades. More specifically, the analysis describes general processes of internationalisation and vertical specialisation and identifies their effects on the economic performance of three different country groups: i) the EU as a whole (excluding Croatia), ii) the group of new Member State which quickly integrated into the EU economy after the mid-1990s, and iii) the group of EU-15 countries. That way, potential differences across groups in the effects of internationalisation and vertical specialisation can be identified and analysed. Finally, the analysis focuses on the period from 1995 until 2007 to explicitly rule out potentially distortive effects of the global financial crisis, which hit the global economy after the bankruptcy of Lehmann Brothers in September 2008 and culminated in the global recession in 2009.

The descriptive analysis demonstrates that in line with the globally observable acceleration of production fragmentation, between 1995 and 2007 vertical specialisation (defined here as the foreign value-added content of exports) intensified in all EU-27 countries but the UK, which experienced a slight decline only. Moreover, as a result of their rapid integration into the EU, new Member States experienced the strongest increases, with vertical specialisation expanding the most in Hungary, the Czech Republic, the Slovak Republic, Poland and Bulgaria by between 12 and 19 percentage points. It is apparent that the high-tech sector lies at the very core of their increases in vertical specialisation. On the contrary, with increases of at most 11 percentage points, the increase in the degree of vertical specialisation was more moderate among EU-15 countries.

Moreover, the econometric analysis shows that both enhanced trade expansion and vertical specialisation tend to stimulate income growth, employment generation and labour productivity improvements. However, new Member States and EU-15 countries benefit differently. For instance, new Member States benefit the most from stronger trade expansion. On the contrary, EU-15 countries tend to gain more from more intense vertical specialisation, which is a result of prevailing differences in specialisation patterns of production. More specifically, results suggest that new Member States tend to predominantly specialise in assembly activities while EU-15 countries are located higher up the global production and value chain. Finally, results show that export growth and the degree of vertical specialisation tend to reinforce each other, i.e. the effects of export growth on macroeconomic performance tend to be even higher if vertical specialisation is high which is particularly the case in the manufacturing sector and the high-tech sector, though major differences across the two country groups are obvious, particularly for the high-tech sector.

The rest of the paper is organised as follows: section 2 discusses related empirical evidence on the effects of both trade expansion and increased vertical specialisation on economic performance and demonstrates that both stronger trade expansion and fragmentation are found to be beneficial to growth, employment and labour productivity. Section 3 sheds light on changing patterns of vertical specialisation among EU countries since the mid-1990s while section 4 identifies the specific income, employment and productivity effects of both trade expansion and fragmentation and points to non-negligible differences between the new Member States and the group of EU-15 countries. Finally, section 5 concludes.

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[4]   See World Trade Organization, International Trade Statistics.

2. Related literature

The growing role of trade in the global economy and the observed change in its nature has aroused interest of policy makers and economists alike as to its specific effects on income, economic growth, employment, wages or labour productivity. Generally, despite the challenges it poses, there is mounting evidence that enhanced openness to and participation in international trade has multiple desirable effects.

Theoretically, there are two arguments in favour of a positive effect of increased openness on growth: firstly, following the Ricardian tradition, the exploitation of comparative advantages through specialisation fosters growth. Secondly, as advocated by the endogenous growth tradition, the exploitation of economies of scale or knowledge and technology spillovers results in higher growth. Empirically, evidence seems to point to a positive relationship between trade and income. For instance, Frankel and Romer (1999) demonstrate that trade has a non-negligible and significant effect on income. Specifically, they calculate that an increase in the ratio of trade to GDP by one percentage point increases income per capita by between 0.5 and 2%. And despite the heavy criticism this analysis received for its proxy of trade, empirical analyses that corrected for its methodological shortcomings reach similar conclusions. For example, Noguer and Sicart (2005) use data from World Trade Database and find that trade has a large and significant effect on income. In particular, they find that a 1% increase in the trade share of GDP is associated with an around 1% increase in income per capita. Similarly, Brückner and Ledermann (2012) analyse the trade-income nexus in Sub-Saharan Africa and conclude that, in the short run, a 1 percentage point increase in trade (as the ratio of trade over GDP) is associated with a 0.5% increase in growth per year.

Moreover, a positive relationship is also found between trade and labour productivity, with causation running from trade to labour productivity. For example, for different proxies of trade exposure and openness, Ades and Glaeser (1999), Frankel and Romer (1999), Alesina et al. (2000) or Alcalá and Ciccone (2004) all find a positive and significant causal effect of trade on labour productivity.

Additionally, empirical evidence points to a positive trade-employment nexus. For instance, Souse et al. (2012) shed light on the relationship between trade and employment and quantify the number of jobs in the EU that are supported by sales of goods and services to the rest of the world. They highlight that exports are important drivers of job creation in the EU. In particular, between 2000 and 2007, extra-EU trade supported an additional 3 million jobs, bringing the total number of trade-supported jobs to 25 million in 2007. Moreover, they point to non-negligible cross-country differences in the contribution of trade to job creation, with the new Member States experiencing the strongest declines as a result of their rapid integration into the EU and the far-reaching structural reforms they underwent. In addition, they point to differences across broad product categories and the rising importance of service trade: while the number of jobs supported by extra-EU trade of manufactured goods increased by almost 7%, those embodied in service-related trade increased by almost 35%.

In contrast, empirical evidence on the performance effects of vertical specialisation is still pretty scarce but conclusive nevertheless. All available evidence points to a positive effect of increased vertical specialisation on growth, employment and productivity. For instance, OECD, WTO and UNCTAD (2013) analyse the group of G20 economies to shed light on some of the implications of the proliferation of global value chains. They highlight that, since the income derived from trade flows within global value chains has increased greatly between 1995 and 2009, all G20 economies have benefited from the emergence of global value chains. Likewise, similar conclusions are derived by the analysis of IMF (2013) which uses the WIOD database and highlights that between 1995 and 2009, value-added exports (i.e. income generated by exporting) have increased from initially 15% of world GDP to 22% in 2009 before slightly contracting again in 2009, as a result of the global financial crisis. Moreover, their econometric analysis demonstrates that stronger vertical integration (as proxied by higher levels of value-added exports relative to GDP) is associated with swifter growth.

Timmer et al. (2013) use the WIOD database to analyse the effect of increasing production fragmentation on jobs in the EU-27. They stress that between 1995 and 2008 manufacturing GVC-related jobs dropped by 1.8 million due to heavy job losses in the manufacturing sector and the agricultural sector. In contrast, developments in the service sector, which experienced an increase in GVC-related jobs by 3.5 million, more than compensated for the losses in the manufacturing sector. And except for the Czech Republic, whose GVC-related job creation in manufacturing outperformed the GVC-related job creation in services, this pattern of higher GVC-related job growth in services seems uniform across all EU countries. Similarly, Jiang and Milberg (2013) apply the WIOD database for 39 countries to shed light on the employment effects of a country's participation in global value chains (GVC). Their analysis shows that in 2009 alone, GVC trade generated a total demand for about 88 million jobs, of which half was the result of vertical specialisation. Moreover, they point to non-negligible cross-country differences and highlight that in 2009 vertical specialisation created the highest demand for labour in Germany, China, the Netherlands and the US but the lowest one in small economies like Estonia, Malta, Latvia or Cyprus. In addition, they show that between 1995 and 2009 vertical specialisation alone created an additional 16 million jobs which is equal to a 36% increase from the initial level in 1995. The majority of jobs related to vertical specialisation were created in China, Germany, Mexico and India.

In addition to positive income and employment effects, the proliferation of global value chains and the associated vertical specialisation also entail positive labour productivity effects. In this respect, Zhang and Sun (2007) analyse the effect of China's rapidly growing importance in the global production chain on its labour productivity. They demonstrate that an increase in the degree of vertical specialisation resulted in an increase in overall labour productivity which therefore improved China's relative competitive position in global markets. In a similar vein, van Ark et al. (2013) use the WIOD database to identify the labour productivity effect of production activities for the global market in the EU-27. They demonstrate that such production-for-the-global-market activities are important sources of labour productivity growth and account for a quarter of labour productivity growth in Europe.

3. Trade expansion and integration: evidence from the pre-crisis period

In what follows, the European experience with trade expansion and trade integration between 1995 and 2007 will be discussed separately for the group of new Member States on the one hand and the group of EU-15 countries on the other. In this respect, section 3.1 sheds light on the evolution of annual export growth rates while section 3.2 focuses on changing patterns in trade integration and discusses the extent of and changes in the degree of vertical specialisation for individual countries as well as industries. The ensuing analysis is based on the WIOD Database and covers the period prior to the onset of the global financial crisis from 1996 to 2007.

3.1. EXPORT GROWTH

Annual export growth rates (in nominal US-$) for all 12 new EU Member States are depicted in Figure 1 below from 1996 up to 2007.

Figure 1 / Annual export growth rates: EU-12 (in %), 1996-2007
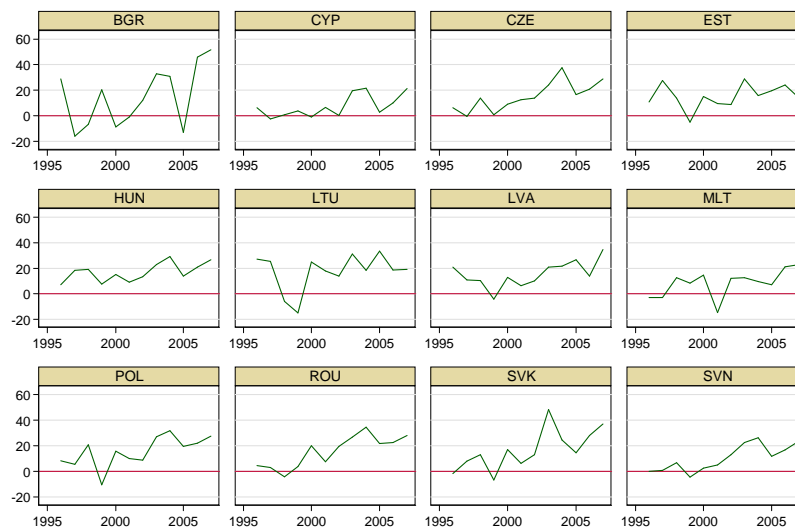
Source: WIOD, own calculations.

Generally, it shows that except for Hungary, whose exports continuously expanded by around 17 per cent annually on average between 1996 and 2007, all new EU Member States experienced a one-time dip in export growth in either 1997 (the Czech Republic), 1998 (Romania), 1999 (Estonia, Lithuania, Latvia, Poland, Slovakia and Slovenia), 2000 (Cyprus) or in 2001 (Malta). These one-time decreases in export growth were generally related to economic crisis in these economies. Drops in export growth were most pronounced in Lithuania and Malta, whose export volumes contracted by 18 and 15 per cent, respectively. The pronounced fall in export growth in Lithuania was the result of the collapse in trade with Russia while the Maltese economy, which is one of the most open economies in the EU, was

particularly strong hit by the strong drop in external demand due to the global recession of the early 2000s. However, after the one-time dips in the early 2000s, exports in Lithuania and Malta expanded by between 15 to 20 per cent on average. Given its economic vulnerability and the repeated recessions it faced which gave rise to highly erratic annual export growth rates, Bulgaria appears to be a special case: high export growth in 1996 of around 29 per cent was followed by negative growth of 16 and 7 per cent, respectively, in 1997 and 1998, and by another strong expansion of 20 per cent in 1999. In 2000 and 2001, export volumes again contracted before three consecutive years of high export growth followed between 2002 and 2004. In 2005, export growth again turned negative for a year before two years of spectacularly high export growth commenced.

Figure 2 depicts annual export growth rates for all individual EU-15 countries for the period between 1996 and 2007. It points to two different export-related episodes: export growth rates were rather low and sometimes even negative between 1996 and 2001. After 2001 when the global recession was overcome and new players and trading partners came onto the scene, however, export growth rates were considerably higher in almost all EU-15 countries, both as a result of the opening up of new export markets and the expansion of existing export markets. In particular, export growth rates reached as high as 20 per cent (or even higher in Luxembourg). In that respect, Ireland is an exception since it escaped the recession of the early 2000s so that its annual export growth rates remained positive and relatively high throughout the entire period under consideration. Similarly, with positive but rather erratic annual export growth rates, Greece stands out too.

Figure 2 / Annual export growth rates: EU-15 (in %), 1996-2007
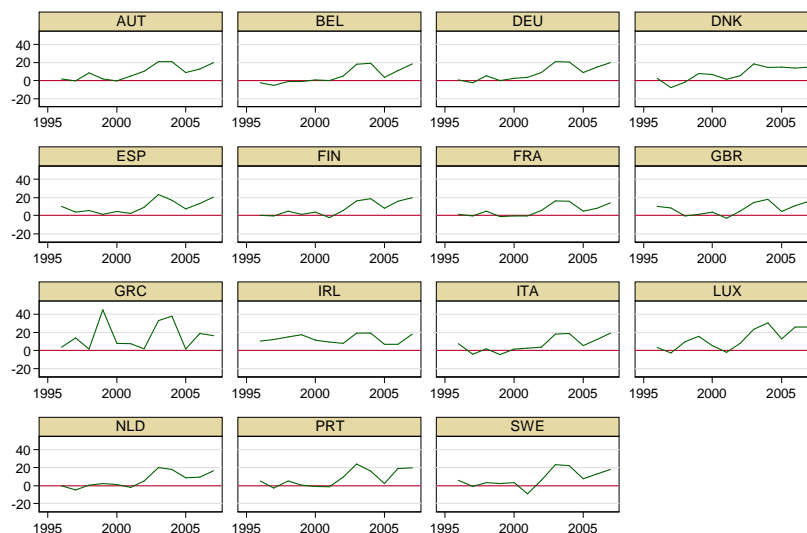
Source: WIOD, own calculations.

3.2. VERTICAL SPECIALISATION

As outlined above, previous analyses on the degree and global proliferation of trade fragmentation used different indicators of vertical specialisation, partly dictated by data availability and quality. The ensuing analysis uses the foreign value-added content of exports to capture the degree of vertical specialisation (for technical details see Foster-McGregor and Stehrer, 2013). And in order to shed light on cross-country and cross-industry differences in the degree of and changes in vertical specialisation, results will

be reported and discussed for each country and industry separately. In this respect, Table 1 refers to the group of new Member States while Table 2 refers to the group of EU-15 countries. Both tables report for each country in each country group separately the degree of vertical specialisation for the years 1995, 2000 and 2007 for three different industry groups: the total economy, the manufacturing sector only (NACE 15t16 to NACE 36t37) and the group of high-tech sectors only (NACE 29 to NACE 34t35), which Amador and Cabral (2008a) put at the very core of the globally observable trend towards accelerating vertical specialisation.

Table 1 highlights that among all new Member States the degree of vertical specialisation in 1995 ranged between around 17% and almost 51% for the total economy. Generally, there is a tendency of larger economies to be characterised by lower degrees of vertical specialisation. More specifically, the degree of vertical specialisation was lowest in Poland (with only 17%), followed by Romania (with 23%) and Cyprus (with 27%) but was highest in Malta with almost 51%, followed by Estonia (with around 38%) and Slovenia (with almost 34%). The high degree of vertical specialisation in Malta is the result of the high degree of vertical specialisation in the Electrical and optical equipment industry (NACE 30t33), which is the economy's largest – and apparently highly vertically specialised - manufacturing industry. Moreover, between 1995 and 2007, as a result of their rapid integration into the European economy, vertical specialisation intensified greatly in all new Member States, except for Malta and Lithuania which experienced slight losses in their degrees of vertical specialisation. With increases of more than 10 percentage points, vertical specialisation intensified the most in Bulgaria, Poland, Slovakia and the Czech Republic and most spectacularly in Hungary with an almost 20 percentage point increase (see section 3.3. for a detailed discussion of industries which lie at the very core of observable increases in vertical specialisation in this set of countries).

A somewhat similar picture emerges for the manufacturing sector, where in 1995 the degree of vertical specialisation was generally higher and ranged between almost 19% in Poland and around 65% in Malta (driven by the high degree of vertical specialisation in the Electrical and optical equipment industry (NACE 30t33)). Additionally, between 1995 and 2007, vertical specialisation intensified in all new Member States but Malta: in particular, it intensified the most in Hungary, Poland and Slovakia and the least in Cyprus and the Baltic countries of Lithuania and Estonia.

Table 1 / Vertical specialisation (foreign value-added content of exports): EU12, 1995-2007

	Total economy			Manufacturing			High-tech sectors		
	1995	2000	2007	1995	2000	2007	1995	2000	2007
BGR	32.4	36.5	44.5	38.8	45.2	52.6	30.0	37.2	50.9
CYP	26.9	32.3	28.3	39.2	46.0	39.9	43.6	33.9	45.0
CZE	29.9	38.4	45.9	34.9	43.3	50.5	38.1	48.8	57.3
EST	37.9	44.5	38.1	40.2	49.5	42.5	45.3	65.3	47.6
HUN	28.8	48.0	48.2	35.4	56.5	56.7	37.4	62.9	62.6
LTU	32.9	33.9	32.0	40.9	44.3	41.7	36.8	32.3	35.3
LVA	25.1	26.2	30.4	28.6	34.4	40.6	30.1	35.7	41.4
MLT	50.8	52.6	45.5	65.1	65.6	58.7	72.7	72.7	69.6
POL	17.2	26.3	32.8	19.3	29.8	36.7	21.2	34.6	40.7
ROU	23.3	26.7	27.6	26.9	31.7	33.8	22.5	31.1	33.1
SVK	31.5	42.7	47.5	36.1	46.5	52.9	39.9	51.9	60.1
SVN	33.9	36.9	42.2	36.7	39.4	46.2	42.1	45.0	50.2

Source: Own calculations (WIOD).

Similarly, a closer look at all high-tech sectors shows that in 1995, relative to the manufacturing sector, the degree of vertical specialisation was generally higher (except for Bulgaria, Lithuania and Romania) and varied from around 21% in Poland and almost 73% in Malta (due to the high degree of vertical specialisation in the electrical and optical equipment industry (NACE 30t33)). And between 1995 and 2007 only Malta and Lithuania experienced slight drops in their degrees of vertical specialisation by 3 and 1.5 percentage points, respectively, while the remaining new Member States all experienced partly remarkable increases in their degrees of vertical specialisation. With increases of more than 10 percentage points, vertical specialisation intensified greatly in Romania, Latvia, the Czech Republic and Poland and with increases of more than 20 per cent, it intensified the most in Slovakia, Bulgaria and Hungary.

A similar analysis can be conducted for the group of EU-15 countries. In 1995, for the economy as a whole, the degree of vertical specialisation among all EU-15 countries ranged between 17% and 45%. With only 17%, it was lowest in Germany (followed by Italy, France, the UK and Greece with around 19%) and highest in Luxembourg with 45%, followed by Belgium and Ireland with almost 39%. Additionally, between 1995 and 2007, vertical specialisation deepened in all EU-15 countries but the UK who experienced a slight decline of around 1 percentage point. In the span of 12 years, vertical specialisation intensified the least in Ireland, the Netherlands and Portugal (with increases of between 2 and 4 percentage points) and with an increase of between 9 and almost 11 percentage points it intensified the most in Finland, Greece, Austria, Germany and Denmark.

As for the manufacturing sector, a similar picture emerges for the group of EU-15 countries in terms of degree of vertical specialisation in 1995: it varies between around 18% in Germany to almost 51% in Luxembourg (due to the high degree of vertical specialisation in the Basic metals and fabricated metals industry (NACE 27t28)). And between 1995 and 2007, without exception, vertical integration in the manufacturing sector intensified in all EU-15 countries. Specifically, with an increase of only around 3 percentage points, it intensified the least in the UK and Luxembourg but with an increase of around 16 percentage points vertical integration intensified the most in Greece, followed by Finland, Germany, Spain and Austria (with increases of around 11 percentage points each).

Table 2 / Vertical specialisation (foreign value-added content of exports): EU15, 1995-2007

	Total economy			Manufacturing			High-tech sectors		
	1995	2000	2007	1995	2000	2007	1995	2000	2007
AUT	23.9	28.2	33.3	28.4	33.1	39.3	31.1	37.2	43.2
BEL	38.7	41.5	43.4	44.0	47.0	50.7	48.8	49.2	50.2
DEU	17.1	22.2	26.7	18.3	23.9	29.0	18.7	24.6	28.9
DNK	26.3	30.0	36.7	26.1	28.8	33.0	28.8	33.1	36.5
ESP	20.6	27.2	29.2	23.7	31.6	34.5	27.7	35.8	37.8
FIN	23.4	27.5	32.6	24.7	28.8	35.3	30.3	31.5	35.6
FRA	19.5	24.4	26.7	22.1	27.2	29.8	24.3	29.9	31.9
GBR	19.3	18.9	18.1	23.0	23.9	25.9	25.7	27.7	29.3
GRC	19.1	30.7	28.3	24.4	34.3	40.6	15.1	61.2	35.3
IRL	38.5	44.8	40.6	41.6	49.7	49.1	54.2	59.2	58.5
ITA	18.7	20.8	25.1	20.6	22.9	27.8	21.3	22.7	26.5
LUX	45.1	58.3	61.3	50.8	50.7	53.8	43.3	48.2	50.6
NLD	31.4	34.5	35.0	36.4	40.7	42.7	40.6	40.4	39.9
PRT	27.6	30.0	31.4	31.2	34.7	37.3	40.0	41.7	44.6
SWE	25.7	29.8	31.9	27.5	33.2	36.9	30.6	36.6	38.2

Source: Own calculations (WIOD).

As for high-tech sectors, a different picture emerges for the group of EU-15 countries in 1995 since i) the dispersion of the degree of vertical specialisation among all EU-15 countries was somewhat higher and ranged from 15% to 54% and ii) individual countries ranked differently. Specifically, with 15% only, the degree of vertical specialisation was lowest in Greece, followed by Germany (with almost 19%) and highest in Ireland with 54%, followed by Belgium and Luxembourg with 48% and 43%, respectively. Moreover, between 1995 and 2007, except for the Netherlands, all EU-15 countries experienced increases in their degrees of vertical specialisation. In the span of 12 years, vertical specialisation intensified the least in Belgium, the UK and Ireland and intensified the most in Greece (particularly as a result of the strong increase in vertical specialisation in the Transport equipment industry (NACE 34t35)), followed by Austria, Germany and Spain.

Figure 3 / The degree of vertical specialisation among all EU countries: 1995 versus 2007
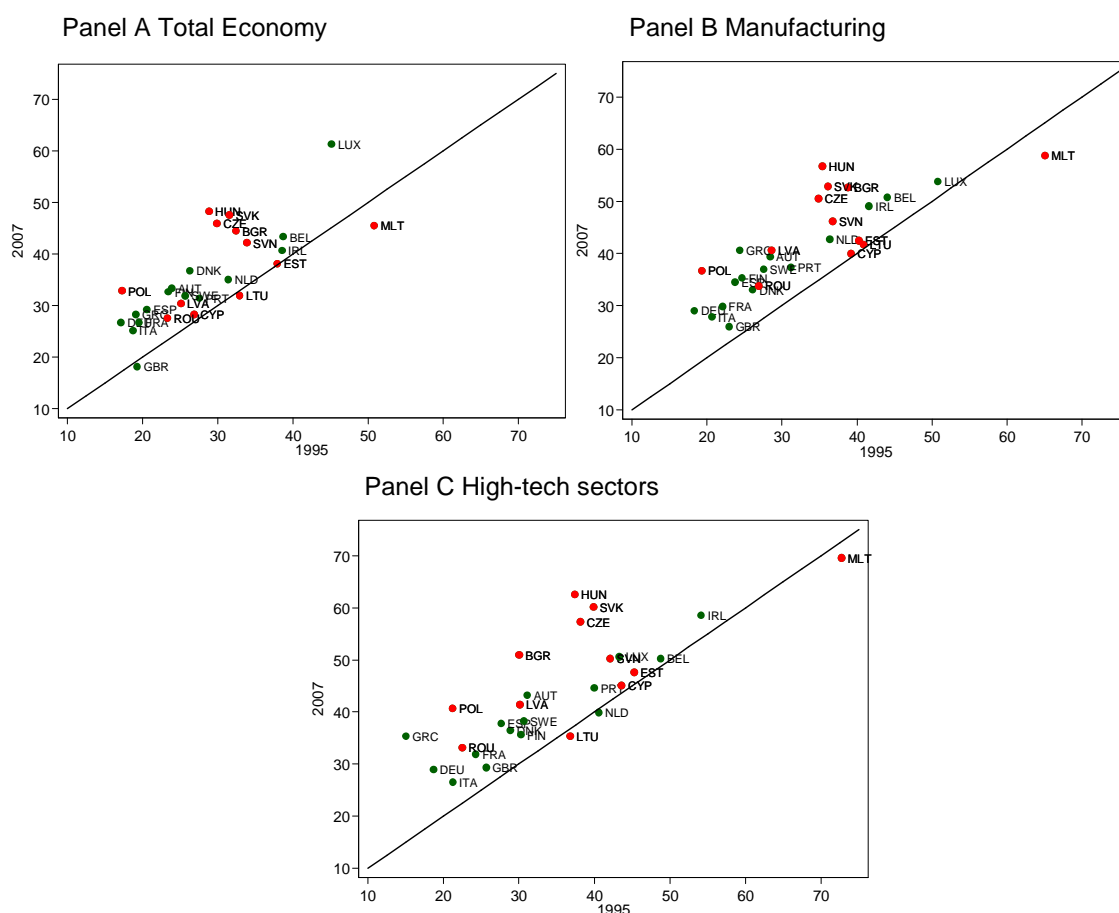
Source: WIOD, own calculations.

To provide a better overview, all these dynamics and changes in the degree of vertical specialisation between 1995 and 2007 are depicted in Figure 3 for all EU countries for the economy as a whole (Panel A), the manufacturing sector only (Panel B) and the group of high-tech sectors only (Panel C). As such, all three panels help identify prevailing differences across countries within country groups (as highlighted above) and across country groups. The horizontal axis of each panel refers to the degree of vertical specialisation in 1995 while the vertical axis refers to the degree of vertical specialisation 12 years later, in 2007. Generally, for the purpose of interpretation, industries which locate to the north-west of the 45

degree line are characterised by an increase in vertical specialisation between 1995 and 2007 while those located to the south-east are characterised by a decrease in vertical specialisation. In contrast, those industries which closely align along the 45 degree line hardly show any changes in vertical specialisation between 1995 and 2007. In this respect, all three panels demonstrate that in 1995 the majority of EU-15 countries were characterised by a comparatively low degree of vertical specialisation of between 15% and 30%. In contrast, with between 30% and 45%, the majority of new Member States were characterised by higher degrees of vertical specialisation.

Moreover, the majority of new Member States not only had higher degrees of vertical specialisation in 1995 but also experienced more pronounced increases in their degrees of vertical specialisation between 1995 and 2007, as a result of their rather rapid integration into the European economy. In particular, the degree of vertical specialisation increased the most in Hungary, the Czech Republic, Slovakia, Poland and Bulgaria by between 12 and 19 percentage points between 1995 and 2007.

Table 3 / Vertical specialisation of EU-12 by industry, 1995-2007

NACE	Industry	1995	2000	2007
AtB	Agriculture, Hunting, Forestry and Fishing	19.73	21.01	24.62
C	Mining and Quarrying	22.23	23.90	24.98
15t16	Food, Beverages and Tobacco	24.11	26.18	28.28
17t18	Textiles and Textile Products	34.37	38.76	38.36
19	Leather, Leather and Footwear	32.84	37.23	37.35
20	Wood and Products of Wood and Cork	25.54	28.13	33.03
21t22	Pulp, Paper, Paper, Printing and Publishing	30.64	33.95	33.41
23	Coke, Refined Petroleum and Nuclear Fuel	53.08	59.51	54.07
24	Chemicals and Chemical Products	37.88	42.23	42.42
25	Rubber and Plastics	38.45	42.45	44.82
26	Other Non-Metallic Mineral	30.06	31.79	32.72
27t28	Basic Metal and Fabricated Metal	38.47	42.77	48.81
29	Machinery, nec	33.78	38.33	43.32
30t33	Electrical and Optical Equipment	40.34	47.19	51.08
34t35	Transport Equipment	34.23	42.15	47.95
36t37	Manufacturing, nec; Recycling	28.40	33.23	37.43
E	Electricity, Gas and Water Supply	31.58	31.25	36.45
F	Construction	26.13	28.42	30.47
50	Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; etc.	19.20	20.27	22.16
51	Wholesale Trade and Commission Trade, Except for Motor Vehicles etc.	17.07	17.34	18.53
52	Retail Trade, Except for Motor Vehicles and Motorcycles; etc.	14.37	15.33	14.30
H	Hotels and Restaurants	17.84	18.33	18.43
60	Inland Transport	20.12	23.52	25.39
61	Water Transport	31.68	31.94	35.57
62	Air Transport	34.54	35.65	36.61
63	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	20.60	23.10	24.30
64	Post and Telecommunications	13.61	14.76	17.01
J	Financial Intermediation	10.31	12.24	12.54
70	Real Estate Activities	7.02	8.54	12.47
71t74	Renting of M&Eq and Other Business Activities	16.13	16.02	17.07
L	Public Admin and Defence; Compulsory Social Security	13.86	13.79	13.53
M	Education	7.75	7.96	8.69
N	Health and Social Work	17.25	19.38	19.80
O	Other Community, Social and Personal Services	15.39	17.58	19.22
P	Private Households with Employed Persons			0.00

Source: WIOD, own calculations.

Moreover, to also shed light on inter-industry differences across country group considered, the degree of vertical specialisation is also reported for each industry separately for 1995, 2000 and 2007. Table 3 refers to the group of new Member States while Table 4 refers to the group of EU-15 countries.

Table 3 demonstrates for the group of new Member States that between 1995 and 2007, vertical specialisation was generally highest in the manufacturing sector (NACE 15t16 to NACE 36t37). Moreover, it highlights that the ranking of the top-five sectors with the highest degrees of vertical specialisation remained fairly stable over the span of 13 years. Specifically, it shows that in 1995, vertical specialisation was highest in the Coke, refined petroleum and nuclear fuels industry (NACE 23) with around 53%, followed by the Electrical and optical equipment industry (NACE 30t33) with around 40%, the Basic metal and fabricated metal industry (NACE 27t28), the Rubber and plastics industry (NACE 25) and the Chemicals and chemical products industry (NACE 24) all with around 38%. Five years later in 2000, all five sectors were again characterised by the highest degrees of vertical specialisation.

Furthermore, between 1995 and 2000 vertical specialisation intensified in almost all industries. It intensified the most in the Transport equipment industry (NACE 34t35) from initially around 34% to 42%, followed by the Electrical and optical equipment industry (NACE 30t33) from initially 40% to 47% and the Coke, refined petroleum and nuclear fuel industry (NACE 23) – the industry with highest degree of vertical specialisation – from initially 53% to almost 60% in 2000. However, some industries also experienced minor decreases in their degrees of vertical specialisation (i.e. the Electricity, gas and water supply industry (NACE E), followed by the Renting of M&Eq and other business activities (NACE 71t74) and the Public administration and defence industry (NACE L)).

However, between 2000 and 2007, interesting changes emerged. Firstly, vertical specialisation dropped in a larger group of industries (the Textiles and textile production industry (NACE 17t18), the Pulp, paper, printing and publishing industry (NACE 21t22), the Retail trade industry (NACE 52), the Public administration and defence industry (NACE L) as well as the Coke, refined petroleum and nuclear fuel industry (NACE 23)). Secondly, the industry with the highest degree of vertical specialisation – the Coke, refined petroleum and nuclear fuel industry (NACE 23) – experienced the most pronounced drop in vertical specialisation, almost entirely reversing any increases in vertical specialisation that occurred five years before. It however remained the industry with the highest degree of vertical specialisation. And thirdly, vertical specialisation intensified the most in the Basic metal and fabricated metal industry (NACE 27t28), the Transport equipment industry (NACE 34t35) and the Electricity, gas and water supply industry (NACE E), therefore more than compensating for the minor loss in vertical specialisation observable five years before.

On the whole, Table 3 demonstrates that between 1995 and 2007, vertical specialisation intensified in all but two industries (the Public administration and defence industry (NACE L) and the Retail trade industry (NACE 52)), whose degrees of vertical specialisation dropped very slightly only. More specifically, vertical specialisation intensified the most in the high-tech sector (NACE 29 to NACE 34t35). With a plus of almost 14 percentage points, the transport equipment industry (NACE 34t35) experienced the strongest increase in vertical specialisation, followed by the Electrical and optical equipment industry (NACE 30t33) with additional 11 percentage points.

As for the group of EU-15 countries, industry-specific degrees of vertical specialisation are provided in Table 4 for 1995, 2000 and 2007. It again shows that vertical specialisation is more pronounced in the manufacturing sector (NACE 15t16 to NACE 36t37) relative to the services sector. Only the Water transport industry (NACE 61) and the Air transport industry (NACE 62) show degrees of vertical specialisation similar to the ones observed in the manufacturing sector. Furthermore, Table 4 reveals that in contrast to the group of new Member States, in the group of EU-15 countries, the group of top-

five industries with the highest degree of vertical specialisation is composed of a different set of industries. Specifically, in 1995, vertical specialisation was highest in the Coke, refined petroleum and nuclear fuel industry (NACE 23), followed by the Transport equipment industry (NACE 34t35), the Basic metal and fabricated metal industry (NACE 27t28), the Rubber and plastics industry (NACE 25) and the Machinery industry (NACE 29).

Table 4 / Vertical specialisation of EU-15 by industry, 1995-2007

NACE	Industry	1995	2000	2007
AtB	Agriculture, Hunting, Forestry and Fishing	14.95	17.28	20.52
C	Mining and Quarrying	15.27	18.21	19.75
15t16	Food, Beverages and Tobacco	21.43	23.57	25.84
17t18	Textiles and Textile Products	28.83	30.45	30.78
19	Leather, Leather and Footwear	23.81	26.98	26.18
20	Wood and Products of Wood and Cork	24.98	28.53	29.95
21t22	Pulp, Paper, Paper, Printing and Publishing	24.27	26.65	28.14
23	Coke, Refined Petroleum and Nuclear Fuel	47.06	57.69	63.90
24	Chemicals and Chemical Products	27.53	32.46	35.51
25	Rubber and Plastics	29.91	31.35	33.88
26	Other Non-Metallic Mineral	20.03	22.95	25.40
27t28	Basic Metal and Fabricated Metal	32.44	34.46	40.74
29	Machinery, nec	29.19	32.09	34.08
30t33	Electrical and Optical Equipment	31.73	35.92	37.45
34t35	Transport Equipment	33.94	37.84	42.18
36t37	Manufacturing, nec; Recycling	25.66	27.82	31.84
E	Electricity, Gas and Water Supply	16.34	21.86	25.33
F	Construction	19.66	21.93	22.64
50	Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; etc.	13.43	16.30	17.20
51	Wholesale Trade and Commission Trade, Except for Motor Vehicles etc.	11.93	14.89	16.14
52	Retail Trade, Except for Motor Vehicles and Motorcycles; etc.	9.66	11.23	12.56
H	Hotels and Restaurants	13.45	14.43	15.30
60	Inland Transport	13.21	17.31	20.82
61	Water Transport	28.33	31.97	31.09
62	Air Transport	22.12	29.29	32.21
63	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	16.16	19.91	20.55
64	Post and Telecommunications	10.19	16.09	16.92
J	Financial Intermediation	10.61	14.11	14.86
70	Real Estate Activities	5.56	6.46	6.96
71t74	Renting of M&Eq and Other Business Activities	11.83	13.88	14.94
L	Public Admin and Defence; Compulsory Social Security	9.79	12.04	11.53
M	Education	4.16	4.93	5.29
N	Health and Social Work	9.81	11.04	12.66
O	Other Community, Social and Personal Services	12.83	15.17	14.59
P	Private Households with Employed Persons	0.00	0.00	0.00

Source: WIOD, own calculations.

Moreover, Table 4 highlights that between 1995 and 2000, vertical specialisation in the EU-15 intensified in all industries, without exception. In particular, it intensified most spectacularly in the Coke, refined petroleum and nuclear fuel industry (NACE 23) from initially 47% to almost 58%, followed by the Air transport industry (NACE 62) from initially 22% to almost 30%, the Post and telecommunications industry (NACE 64) (from initially 10% to 16%) and the Electricity, gas and water supply industry (NACE E) (from initially 16% to almost 22%).

In contrast, between 2000 and 2007, vertical specialisation intensified in all but four industries, which experienced slight drops in their degrees of vertical specialisation of below one percentage point only (i.e. the Water transport industry (NACE 61), the Leather, leather and footwear industry (NACE 19), the Other community, social and personal services industry (NACE O) and the Public administration and defence industry (NACE L)). With an increase of around 6 percentage points, vertical specialisation increased the most in the Basic metal and fabricated metal industry (NACE 27t28) and the Coke, refined petroleum and nuclear fuel industry (NACE 23), followed by the Transport equipment industry (NACE 34t35) and the Manufacturing and recycling industry (NACE 36t37) with an increase of around 4 percentage points.

Overall, Table 4 highlights for the group of EU-15 countries that, without exception, between 1995 and 2007 vertical specialisation intensified in all industries. More specifically, in the span of 13 years, vertical specialisation intensified the most in the Coke, refined petroleum and nuclear fuel industry (NACE 23) which experienced an increase in vertical specialisation of almost 17 percentage points. With an increase of around 10 percentage points, the Air transport industry (NACE 62) experienced the second-most dramatic increase in vertical specialisation, followed by the Electricity, gas and water supply industry (NACE E), the Basic metal and fabricated metal industry (NACE 27t28) and the Transport equipment industry (NACE 34t35), all with increases of around 9 percentage points.

3.3. PATTERNS OF INDUSTRY-LEVEL TRADE FRAGMENTATION IN THE CEE-5

As highlighted above (see section 3.2), between 1995 and 2007, among all EU-27 countries analysed, vertical specialisation intensified the most in Hungary, the Czech Republic, Slovakia, Poland and Bulgaria by between 12 and 19 percentage points. Hence, in order to identify the group of industries which were at the very core of the observable increase in trade integration in these countries, Figure 4 provides a comparison of industry-level degrees of vertical specialisation by country, for 1995 and 2007.

Generally, the analysis identifies several key conclusions:

›   Vertical specialisation intensified the most in manufacturing;

›   High-tech sectors are major drivers of growing vertical specialisation in manufacturing;

›   There is non-negligible cross-industry heterogeneity in changes in vertical specialisation with some industries also experiencing losses in vertical specialisation over time;

Among all new Member States, Hungary showed the most impressive increase in the degree of vertical specialisation from around 29% in 1995 to 48% in 2007, which is equal to a plus of 19 percentage points in the course of 12 years. A closer look at the change in the degree of vertical specialisation at the level of the individual industries shows that with very few exceptions only (Wholesale Trade and Commission Trade (NACE 51), Other Supporting and Auxiliary Transport Activities (NACE 63), Pulp, Paper, Paper, Printing and Publishing (NACE 21t22) and Renting of M&Eq and Other Business Activities (NACE 71t74)), all industries experienced an increase in the degree of vertical specialisation between 1995 and 2007 (Panel A in Figure 4). Moreover, it highlights that vertical specialisation intensified the most in the manufacturing sector, and that within the manufacturing sector, it intensified the most in the high-tech sector: with almost 30 percentage points, vertical specialisation increased the most in the Electrical and optical equipment industry (NACE 30t33) followed by the Transport equipment industry (NACE 34t35) with an almost 22 percentage points increase in vertical specialisation. Similarly, impressive increases in the degree of vertical specialisation of over 10 percentage points are observable in the Leather, leather and footwear industry (NACE 19), the Coke, refined petroleum and nuclear fuel industry (NACE 23), the

Machinery industry (NACE 29), the Textiles and textile products industry (NACE 17t18) and the Wood and products of wood and cork industry (NACE 20).

With an overall increase of 16 percentage points between 1995 and 2007, the Czech Republic (from initially 30% to 46% in 2007), Slovakia (from initially 32% to 48% in 2007) and Poland (from initially 17% to 33% in 2007) all experienced similarly impressive increases in vertical specialisation. Panel B in Figure 4 refers to the Czech Republic and highlights that in contrast to Hungary a substantial number of (predominantly service sector) industries experienced losses in vertical specialisation of between around 6 percentage points (in the Post and telecommunications industry (NACE 64)) and 0.1 percentage points (in the Food, beverages and tobacco industry (NACE 15t16)). However, again, vertical specialisation intensified the most in the manufacturing sector. More specifically, vertical specialisation increased the most in the Coke, refined petroleum and nuclear fuel sector (NACE 23) by around 23 percentage points, followed by two high-tech industries: the Electrical and optical equipment by around 22 percentage points and the Machinery industry (NACE 29) by around 17 percentage points. Non-negligible increases in the degree of vertical specialisation of between 11 and 15 percentage points are also observable for the Manufacturing and recycling industry (NACE 36t37), the Transport equipment industry (NACE 34t35), the Basic metal and fabricated metal industry (NACE 27t28), the Leather, leather and footwear industry (NACE 19) and the Water transport industry (NACE 61).

Panel C in Figure 4 depicts industry-level dynamics of vertical specialisation for Slovakia. It highlights that, similar to the Czech experience, a non-negligible number of industries experienced a loss in the degree of vertical specialisation. The most dramatic decrease in vertical specialisation of around 34 percentage points experienced the Air transport industry (NACE 62). In contrast, the main drivers behind the observable increase in vertical specialisation at the level of the total economy stems from the manufacturing sector. Here, the Leather, leather and footwear industry (NACE 19) experienced the strongest increase in vertical specialisation by around 28 percentage points (from initially 23% in 1995 to 51% in 2007), followed by the Coke, refined petroleum and nuclear fuel industry (NACE 23), the Electrical and optical equipment industry (NACE 30t33) and the Machinery industry (NACE 29) with around 20 percentage points.

Industry-level dynamics of vertical specialisation for Poland are depicted in Panel D of Figure 4. It shows that, in contrast to Hungary, the Czech Republic or Slovakia, all industries experienced an increase in vertical specialisation between 1995 and 2007. Moreover, vertical specialisation increased the most in the manufacturing sector. The most pronounced increases in vertical specialisation of 21 percentage points occurred in the Basic metal and fabricated metal industry (NACE 27t28), followed by the Chemicals and chemical products industry (NACE 24), the Transport equipment industry (NACE 34t35) and the Electrical and optical equipment industry (NACE 30t33) with around 20 percentage points.

Finally, Panel E of Figure 4 depicts industry-level dynamics of vertical specialisation in Bulgaria whose degree of vertical specialisation increased by around 12 percentage points between 1995 and 2007. It stresses that between 1995 and 2007, only three industries experienced decreases in the degree of vertical specialisation which were, however, of very small extent only. Again, the observed overall increase in vertical specialisation is predominantly a phenomenon driven by the intensification of vertical specialisation in the manufacturing sector. Within the manufacturing sector, high-tech industries again experienced the strongest increases in the degree of vertical specialisation. Specifically, between 1995 and 2007, vertical specialisation increased the most in the Machinery industry (NACE 29) by around 25 percentage points and the Transport equipment industry (NACE 34t35) by around 20 percentage points. This is followed by the Manufacturing and recycling industry (NACE 36t37) and the Basic metal and fabricated metal industry (NACE 27t28), which experienced increases in vertical specialisation of around 20 percentage points.

Figure 4 / The degree of vertical specialisation among selected new Member States: 1995 versus 2007

Panel A: Hungary – Total economy

Panel B: Czech Republic – Total economy

Panel C: Slovakia – Total economy

Panel D: Poland – Total economy

Panel E: Bulgaria – Total economy
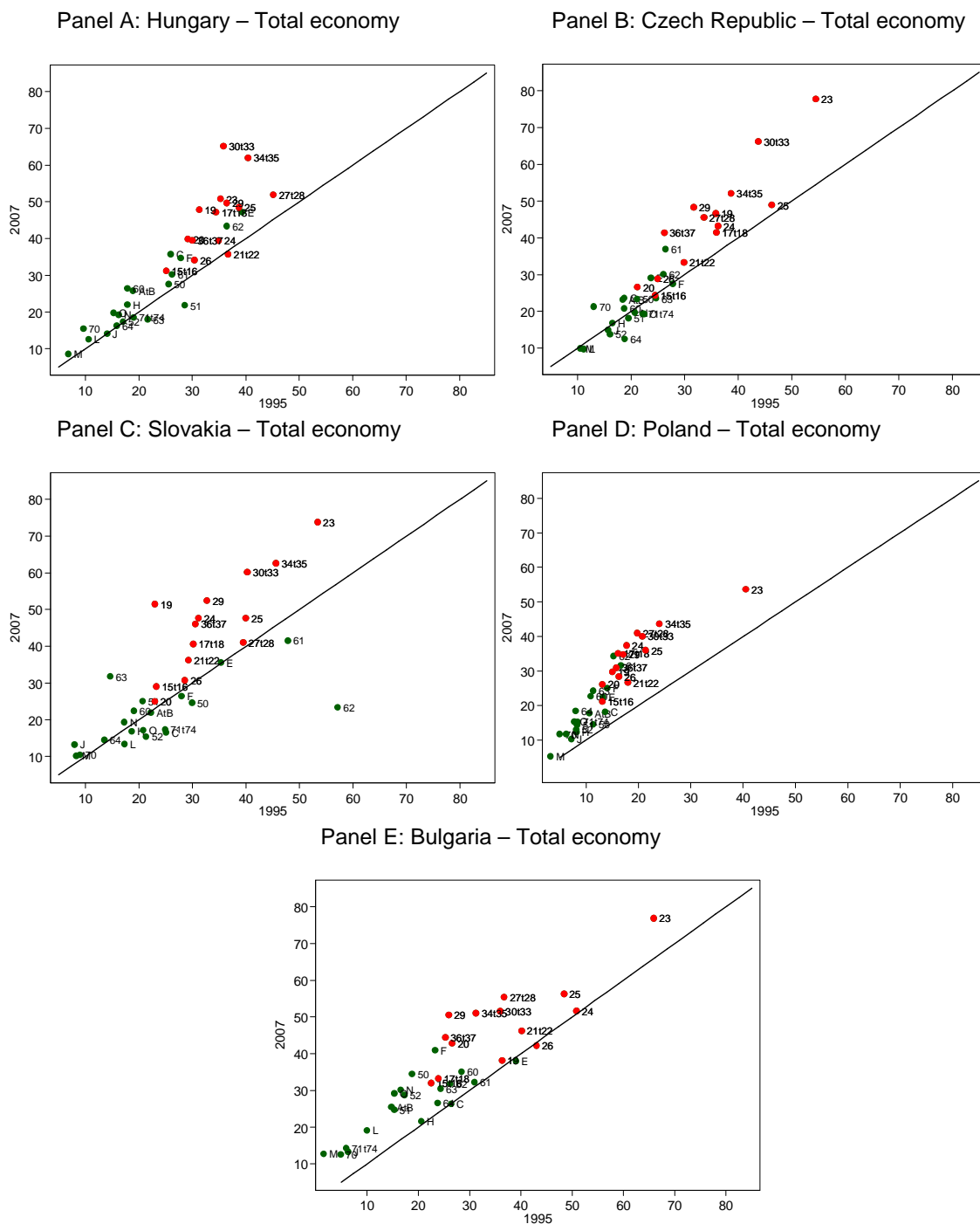
Source: WIOD, own calculations.

4. Analysis of the effects of trade

Next, the analysis aims to shed light on how ongoing trade expansion and internationalisation is related to the performance of countries and industries, where performance is captured in terms of output, value-added, employment and labour productivity growth. Methodologically, a standard growth regression approach is used, extended by indicators of trade expansion and specialisation to reflect the importance of growing trade and increased internationalisation and fragmentation of production observable in recent decades.

The following specification will be used:

$$\text{GR\_I}_{it} = \alpha_i + \beta_1 \text{GR\_TFP}_{it} + \beta_2 \text{Log\_VAph}_{it} + \beta_3 \text{GR\_K}_{it} + \beta_4 (\text{GR\_EMPHS}_{it} - \text{GR\_EMP}_{it}) + \beta_5 \text{GR\_X}_{it} + \beta_6 \text{VSP}_{ijt} + \beta_7 (\text{GR\_X}_{it} * \text{VSP}_{it}) + \epsilon_{it}, \tag{1}$$

where GR_I_{it} refers to the growth rate of either gross output, value-added, employment or labour productivity (either based on gross output or value-added) of country i at time t. GR_TFP_{it} is the growth rate of total factor productivity of country i at time t. In principle, an industry's growth performance should be positively related to its (total factor) productivity growth[5]. In contrast, as a proxy for technical change, TFP growth may, at least temporarily, be obstructive to employment growth since technical change may be labour-saving in nature. Log_VAph_{it} refers to the log of value-added per hour worked and captures the effect of catching-up of lagging economies. Hence, a negative effect points to a process of catching-up among lagging economies (i.e. convergence), while a positive effect points to a process of divergence as initial laggards keep falling behind even further (i.e. divergence). Moreover, GR_K_{it} is the growth rate of capital of country i at time t, while $(\text{GR\_EMPHS}_{it} - \text{GR\_EMP}_{it})$ is the deviation of employment growth of high-skilled employees from overall employment growth. Generally, since increases in either capital or (high-skilled) labour endowments are considered to be conducive to growth, both capital and human capital accumulation are expected to be positively associated with growth of either gross output or value-added. In contrast, the effect of capital accumulation on employment growth is ambiguous: it may be positive in case of prevailing capital-labour complementarities but may also be negative if capital accumulation is of a labour-saving nature. Finally, the role of trade expansion and increased trade integration is captured by i) GR_X_{it} as the growth rate of exports of country i at time t and by ii) VSP_{it} as an indicator of vertical specialisation, captured in terms of the foreign value-added content of country i at time t. In principle, export growth is expected to positively impact on growth while the effect of vertical specialisation is ambiguous, a priory: on the one hand, more intense vertical specialisation may be associated with lower growth since industries which source more intensely from abroad also tend to use foreign resources more intensely than domestic ones. On the other hand, industries that are characterised by more intense vertical specialisation may exploit gains from specialisation and gains from more efficiently sourcing intermediate factors which, in turn, are expected to boost growth. Finally, there is reason to believe that the effects of both export growth and vertical specialisation on a country's performance are not independent of each other but that a higher degree of

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[5]   To avoid the effect of outliers, implausibly large values which appeared in some cases for small industries were excluded from the analysis.

vertical specialisation, if accompanied by higher export growth, results in higher growth and vice versa. This is captured by the interaction term ($\mathrm{GR\_X_{it}} * \mathrm{VSP_{it}}$) whose effect is expected to be positive. Finally, ϵ_{it} is the error term.

Data stem from the WIOD Database for the period from 1996 to 2007. Again, results are presented for three country groups: the group of EU Member States as a whole and, to shed light on potential similarities and differences across country groups, for the group of new Member States and the group of EU-15 countries separately.

The analysis is pursued in a step-wise procedure. First, section 4.1 presents and discusses results for the country level. In a second step, section 4.2 looks at the industry level to explicitly account for the strong heterogeneity across industries, which tends to get blurred and watered down in the process of aggregation.

4.1. COUNTRY-LEVEL ANALYSIS

Results of the country-level analysis are reported in Table 5, Table 6 and Table 7. More specifically, Table 5 reports results for the total economy, Table 6 and Table 7 present results for the manufacturing sector and the high-tech sector, respectively. All regressions include country fixed effects.

As for the role of internationalisation, the two indicators capturing aspects of trade internationalisation and integration (i.e. export growth and vertical specialisation) were centred to facilitate interpretation. Generally, in line with previous empirical evidence outlined above, there is relatively consistent evidence that export growth tends to spur overall performance, at least for the new Member States and the overall EU. In particular, for a new Member State with average vertical specialisation, higher export growth is associated with higher output, employment and labour productivity growth. Individual effects, however, differ across country groups or industry groups considered. However, some uniform patterns emerge: generally, if significant, the gross output effect always greatly exceeds the value-added effect and, new Member States profit the most from export expansions in terms of income growth, employment generation or labour productivity improvements.

Likewise, in line with previous empirical results, for a country characterised by average export growth, higher vertical specialisation appears to significantly improve overall performance. However, specific effects differ across country and industry groups. In particular, except for the high-tech sector, the group of EU-15 countries profits most comprehensively from an increase in vertical specialisation and experiences improvements in output, employment and labour productivity growth (gross output based only). In contrast, gains from enhanced vertical specialisation of new Member States are confined to gross output and (gross output based) labour productivity growth. However, the high-tech sector in the new Member States profits most comprehensively from more pronounced vertical specialisation since output, employment and (gross output based) labour productivity expand in conjunction with higher degrees of vertical specialisation. However, the general absence of a significant effect of vertical specialisation on value-added growth in all three industry groups in new Member States seems to suggest that new Member States are strongly involved in assembly activities which fail to generate high levels of value-added. Finally, results highlight that export growth and the degree of vertical specialisation are not independent of each other but tend to reinforce each other. In particular, the

effects of export growth on macroeconomic performance tend to be even higher if vertical specialisation is high. And while such reinforcing effects are absent for the economy as a whole, they tend to be more systematic in the manufacturing sector and the high-tech sector, though major differences across the two country groups are obvious, particularly for the high-tech sector.

With respect to the other control variables, the results highlight that irrespective of the country group or industry group considered, TFP growth is always positively associated with (gross output or value-added) growth. Moreover, the effect on gross output growth always exceeds the effect on value-added growth. In contrast, the effects of TFP growth on employment growth are more diverse and strongly depend on the industry group or country group considered. For instance, for the total economy, a negative relationship emerges between TFP growth and employment growth for all country groups considered which points to TFP growth to be labour-saving in nature. In the manufacturing sector, a negative effect is observable for the overall EU and the group of new Member States, while no significant effect exists for the group of EU-15 countries. In contrast, no significant relationship is found in the high-tech sector for the group of new Member States, while, on the contrary, TFP growth tends to foster employment in high-tech sectors of the group of EU-15 countries and the overall EU.

In addition, results point to a process of catching-up among countries, particularly among EU-15 countries. By contrast, only scarce and weak evidence of catching-up emerges for the group of new Member States.

Moreover, there is evidence that the effects of factor accumulation are relatively uniform across country groups or industry groups considered. Specifically, physical capital accumulation tends to be positively associated with gross output or value-added growth. In addition, a somewhat similar picture emerges for labour productivity growth: capital accumulation tends to be positively associated with labour productivity growth in all industry groups. However, the group of EU-15 countries does not experience any significant labour-productivity effect, irrespective of industry group considered. Moreover, capital-labour complementarities are confined to the group of EU-15 states for the manufacturing sector and the high-tech sector but appear to be entirely irrelevant for the new Member States.

Interestingly, the effects of human capital accumulation (defined as the deviation of growth of high-educated workers from total employment growth) crucially depend on the industry group considered. In particular, for the economy as a whole, human capital accumulation is positively associated with growth (in either gross output or value-added) or labour productivity (based on gross output), at least for the overall EU or the group of EU-15 states. On the contrary, no significant income or productivity effects are observable for the group of new Member States though. However, once smaller, more coherent and more technology-intensive industry groups are considered, effects seem to fade away and are finally almost absent altogether in the high-tech sector.

Table 5 / Country-level regression results for the total economy: EU, EU-15 and EU-12, 1996-2007

Variables	EU					EU-12 only					EU-15 only				
	(1) Gross output	(2) Value Added	(3) Employ-ment	(4) LP (GO-based)	(5) LP (VA-based)	(1) Gross output	(2) Value Added	(3) Employ-ment	(4) LP (GO-based)	(5) LP (VA-based)	(1) Gross output	(2) Value Added	(3) Employ-ment	(4) LP (GO-based)	(5) LP (VA-based)
TFP growth	1.031***	0.535***	-0.681***			0.942***	0.478***	-0.858***			1.130***	0.637***	-0.229***		
	(5.80)	(12.44)	(9.25)			(3.77)	(7.96)	(7.65)			(4.16)	(10.72)	(2.97)		
Log value-added per hour worked	-0.032***	-0.006	0.007	-0.032**	-0.007	-0.025*	0.006	0.019	-0.038*	-0.008	-0.072***	-0.058***	-0.040***	-0.038**	-0.025**
	(3.15)	(1.08)	(0.78)	(2.46)	(0.66)	(1.76)	(0.81)	(1.37)	(1.79)	(0.43)	(3.90)	(7.07)	(3.79)	(2.03)	(2.21)
Growth rate of capital	0.955***	0.618***	-0.064	0.761***	0.369*	0.876***	0.526***	-0.367	0.942**	0.533	0.637**	0.398***	0.214	0.276	-0.041
	(5.27)	(6.47)	(-0.39)	(3.25)	(1.93)	(3.31)	(3.71)	(1.39)	(2.40)	(1.60)	(2.36)	(3.29)	(1.37)	(1.01)	(0.24)
Growth rate of high educated workers (as deviation from total empl. growth)	0.130***	0.042***	-0.085***	0.089**	-0.009	0.100	-0.023	-0.115*	0.073	-0.054	0.146***	0.064***	-0.033*	0.091***	-0.011
	(4.56)	(2.78)	(3.31)	(2.54)	(-0.32)	(1.49)	(0.64)	(1.73)	(0.75)	(0.65)	(5.09)	(4.80)	(1.93)	(3.59)	(0.72)
Export growth	0.022	0.021**	0.044**	-0.007	-0.010	0.081**	0.048***	0.099***	-0.004	-0.035	-0.036	0.016	0.004	-0.021	0.024
	(1.09)	(1.99)	(2.49)	(0.28)	(0.49)	(2.51)	(2.80)	(3.09)	(0.09)	(0.87)	(1.45)	(1.46)	(0.31)	(0.86)	(1.54)
Vertical specialisation	0.284***	0.052	0.086	0.289***	0.082	0.257**	0.015	0.061	0.384**	0.149	0.398***	0.203***	0.160***	0.232**	0.081
	(3.81)	(1.31)	(1.27)	(3.00)	(1.04)	(2.15)	(0.23)	(0.51)	(2.17)	(0.99)	(4.15)	(4.74)	(2.89)	(2.36)	(1.36)
Exp.Growth*Vertical specialisation	0.002	0.001	0.002	-0.002	-0.003	0.002	-0.001	-0.001	-0.003	-0.007	-0.002	0.001	0.000	-0.002	0.001
	(1.16)	(1.08)	(1.18)	(0.69)	(1.44)	(0.62)	(0.50)	(0.26)	(0.60)	(1.52)	(0.93)	(0.72)	(0.11)	(0.92)	(0.69)
Constant	11.777***	3.408**	0.251	11.425**	3.967	9.932***	1.078	-1.083	12.434**	4.638	27.485**	22.638**	15.654**	15.127**	11.240**
	(3.73)	(2.06)	(0.09)	(2.79)	(1.19)	(2.64)	(0.54)	(0.29)	(2.22)	(0.97)	(4.14)	(7.64)	(4.07)	(2.24)	(2.72)
No of Observations	292	292	292	292	292	127	127	127	127	127	165	165	165	165	165
R²	0.266	0.458	0.283	0.080	0.027	0.342	0.532	0.411	0.084	0.062	0.302	0.564	0.170	0.135	0.042
F-Test	13.37	31.15	14.54	3.755	1.21	8.003	17.53	10.76	1.668	1.211	8.844	26.43	4.197	3.737	1.055

Note: All regressions include country fixed effects. *** p<0.01, ** p<0.05, * p<0.1. t-statistics in parentheses.

Table 6 / Country-level regression results for the manufacturing sector only: EU, EU-15 and EU-12, 1996-2007

Variables	EU (1) Gross output	EU (2) Value Added	EU (3) Employ-ment	EU (4) LP (GO-based)	EU (5) LP (VA-based)	EU-12 only (1) Gross output	EU-12 only (2) Value added	EU-12 only (3) Employ-ment	EU-12 only (4) LP (GO-based)	EU-12 only (5) LP (VA-based)	EU-15 only (1) Gross output	EU-15 only (2) Value added	EU-15 only (3) Employ-ment	EU-15 only (4) LP (GO-based)	EU-15 only (5) LP (VA-based)
TFP growth	1.707***	0.792***	-0.427***			1.649***	0.671***	-0.616***			1.751***	1.078***	0.015		
	(6.97)	(18.75)	(6.07)			(4.18)	(9.87)	(5.21)			(6.17)	(30.12)	(0.41)		
Log value-added per hour worked	-0.028***	-0.002	-0.004	-0.028***	-0.005	-0.027***	-0.001	-0.002	-0.030***	-0.005	-0.049***	-0.015***	-0.021***	-0.035***	-0.012
	(4.92)	(1.01)	(1.21)	(4.16)	(1.10)	(3.34)	(0.20)	(0.29)	(3.05)	(0.84)	(4.30)	(4.89)	(6.40)	(2.93)	(1.42)
Growth rate of capital	0.314***	0.129***	0.027	0.301***	0.114***	0.317***	0.107***	-0.026	0.351***	0.141**	0.116	0.116***	0.057**	0.068	0.042
	(5.95)	(6.30)	(0.80)	(4.83)	(2.81)	(3.74)	(3.24)	(0.45)	(3.45)	(2.13)	(1.50)	(5.43)	(2.50)	(0.81)	(0.74)
Growth rate of high educated workers (as deviation from total empl. growth)	0.012	0.003	-0.010	0.026**	0.020**	0.012	0.004	-0.008	0.036	0.029**	0.001	0.006*	-0.007**	-0.002	0.000
	(1.04)	(0.78)	(1.35)	(1.99)	(2.31)	(0.67)	(0.56)	(0.61)	(1.65)	(2.03)	(0.10)	(1.78)	(1.98)	(0.16)	(0.04)
Export growth	0.045***	0.009**	0.020***	0.039***	0.006	0.075***	0.016**	0.037***	0.063***	0.004	0.004	0.007**	0.009**	0.006	0.014
	(4.10)	(2.23)	(2.78)	(3.04)	(0.69)	(4.46)	(2.46)	(3.26)	(3.15)	(0.31)	(0.29)	(2.02)	(2.35)	(0.40)	(1.50)
Vertical specialisation	0.185***	0.017	0.033	0.176***	0.015	0.205***	0.030	0.048	0.212**	0.039	0.223***	0.045***	0.078***	0.153***	-0.002
	(4.47)	(1.03)	(1.22)	(3.61)	(0.48)	(2.91)	(1.10)	(0.99)	(2.50)	(0.71)	(4.46)	(3.27)	(5.33)	(2.85)	(0.07)
Exp.Growth*Vertical specialisation	0.004***	0.001*	0.002**	0.004***	0.001	0.003*	0.001	0.001	0.005**	0.002	0.002	0.000	0.001*	0.001	0.000
	(3.72)	(1.72)	(2.56)	(3.51)	(1.28)	(1.67)	(0.73)	(1.07)	(2.32)	(1.47)	(1.31)	(1.20)	(1.69)	(0.73)	(0.17)
Constant	9.506***	0.849	1.680	9.746***	2.144	8.647***	0.595	1.332	9.332***	2.067	18.454***	5.637***	7.710***	14.059***	5.016
	(5.13)	(1.18)	(1.40)	(4.47)	(1.51)	(3.76)	(0.66)	(0.84)	(3.38)	(1.16)	(4.36)	(4.76)	(6.14)	(3.12)	(1.64)
No of Observations	286	286	286	286	286	127	127	127	127	127	159	159	159	159	159
R²	0.434	0.660	0.167	0.233	0.067	0.464	0.604	0.247	0.279	0.098	0.378	0.892	0.377	0.096	0.048
F-test	27.62	69.85	7.209	12.79	3.01	13.37	23.54	5.055	7.019	1.966	11.9	162.2	11.86	2.453	1.152

Note: All regressions include country fixed effects. *** p<0.01, ** p<0.05, * p<0.1. t-statistics in parentheses.

Table 7 / Country-level regression results for the high-tech sector only: EU, EU-15 and EU-12, 1996-2007

Variables	EU					EU-12 only					EU-15 only				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	Gross output	Value Added	Employ-ment	LP (GO-based)	LP (VA-based)	Gross output	Value added	Employ-ment	LP (GO-based)	LP (VA-based)	Gross output	Value added	Employ-ment	LP (GO-based)	LP (VA-based)
TFP growth	3.649***	1.084***	0.048*			3.298***	1.067***	0.018			2.761***	1.103***	0.096***		
	(12.30)	(44.14)	(1.81)			(6.12)	(22.45)	(0.38)			(10.75)	(43.10)	(3.67)		
Log value-added per hour worked	-0.006**	0.001**	0.001**	-0.009***	-0.001	-0.003	0.002*	0.001	-0.003	0.001	-0.007	-0.002**	-0.001	-0.005	0.000
	(2.43)	(2.30)	(2.04)	(2.62)	(0.83)	(0.82)	(1.98)	(1.59)	(0.74)	(0.33)	(1.55)	(2.11)	(1.26)	(0.84)	(0.04)
Growth rate of capital	0.080***	0.045***	0.008**	0.062***	0.029***	0.083***	0.043***	0.001	0.080***	0.040***	0.064***	0.044***	0.028***	0.022	-0.002
	(5.29)	(15.59)	(2.60)	(3.27)	(3.26)	(3.91)	(9.98)	(0.29)	(3.26)	(3.54)	(2.83)	(8.66)	(5.34)	(0.75)	(0.09)
Growth rate of high educated workers (as deviation from total empl. growth)	0.007	0.001	0.000	0.009	0.003	0.002	0.000	-0.001	0.008	0.005	0.004	0.003**	0.001	-0.004	-0.004
	(1.10)	(1.10)	(0.15)	(1.08)	(0.83)	(0.21)	(0.07)	(0.56)	(0.62)	(0.82)	(0.63)	(2.07)	(0.59)	(0.43)	(0.65)
Export growth	0.010***	0.000	0.001***	0.014***	0.003***	0.019***	0.000	0.001	0.029***	0.009***	0.002	0.000	0.000	0.002	0.001
	(6.06)	(1.15)	(3.65)	(7.27)	(3.82)	(3.70)	(0.46)	(1.08)	(5.45)	(3.63)	(1.50)	(0.53)	(1.17)	(1.48)	(0.80)
Vertical specialisation	0.104***	0.004	0.013***	0.151***	0.037***	0.104***	0.008	0.025***	0.104**	0.006	0.026	0.002	0.005	0.033	0.012
	(6.05)	(1.14)	(3.69)	(7.26)	(3.81)	(2.72)	(1.06)	(3.15)	(2.34)	(0.29)	(1.50)	(0.52)	(1.18)	(1.48)	(0.81)
Exp.Growth*Vertical specialisation	0.001***	0.000	0.000***	0.001***	0.000***	0.003***	0.000	0.000	0.004***	0.001***	0.000	0.000	0.000	0.000	0.000
	(6.05)	(1.11)	(3.66)	(7.26)	(3.81)	(5.22)	(0.87)	(1.52)	(7.33)	(4.43)	(1.50)	(0.51)	(1.17)	(1.48)	(0.81)
Constant	2.744***	-0.489***	-0.374*	4.277***	0.921	1.407	-0.638**	-0.418	1.835	0.016	2.708	0.706*	0.384	2.476	0.529
	(2.84)	(2.64)	(1.87)	(3.51)	(1.60)	(1.05)	(2.34)	(1.49)	(1.18)	(0.02)	(1.56)	(1.81)	(0.96)	(1.11)	(0.36)
No of Observations	229	229	229	229	229	95	95	95	95	95	134	134	134	134	134
R²	0.588	0.926	0.193	0.248	0.119	0.697	0.923	0.303	0.541	0.350	0.542	0.945	0.349	0.038	0.011
F-Test	40.02	350.1	6.697	10.86	4.42	25.34	132.4	4.771	15.33	7.002	18.93	276.2	8.572	0.753	0.215

Note: All regressions include country fixed effects. *** p<0.01, ** p<0.05, * p<0.1. t-statistics in parentheses.

4.2 INDUSTRY-LEVEL ANALYSIS

The analysis is also conducted for the industry level. While Table 8 reports results for the total economy, Table 9 and Table 10 present results for the manufacturing sector and the high-tech sector, respectively. All regressions include country-industry fixed effects.

As for the role of internationalisation, the two indicators capturing aspects of internationalisation were again centred to facilitate interpretation. The results point to a uniform picture for export growth. Irrespective of industry aggregate or country group considered, the coefficient for the growth rate of exports is always positive and significant which suggests that, at the average level of vertical specialisation, industries with a stronger exposure to and presence in foreign markets tend to grow faster, generate more employment and tend to become more productive too. However, the size of individual effects differs across country and industry groups. For instance, the effect on gross output always exceeds the effect on value-added. In addition, effects tend to become stronger as more cohesive and technology intensive industry groups are considered. In particular, effects tend to be comparatively weakest in the total economy but strongest in the high-tech sector. Finally, compared to the group of EU-15 countries, industries in the new Member States profit the most from an expansion of export activities.

In contrast, a more diverse picture emerges for vertical specialisation. Specifically, with very few exceptions only, higher vertical specialisation of industries with average export growth has no significant employment effect. A positive employment-effect is only observable in the manufacturing and high-tech sectors of EU-15 industries. Moreover, for industries with average export growth rates, an increase in vertical specialisation is associated with an expansion of gross output and an increase in labour productivity (gross output based). In contrast, the responses of both value-added and labour productivity growth (value-added based) are more diverse. For instance, industries in new Member States consistently suffer losses in value-added growth as their level of vertical specialisation increases. Moreover, the magnitude of the loss is strongest in the high-tech sector. On the contrary, industries in the group of EU-15 countries only suffer significant losses in value-added growth at the level of the total economy but tend to experience increases in value-added growth in manufacturing and, more strongly, in the high-tech sector. This negative value-added growth effect of vertical specialisation observable in new Member States reconfirms above finding that industries in NMS tend to predominantly specialise in assembly activities which yield very little value-added only while the positive value-added growth effect of vertical specialisation in industries in the group of EU-15 countries highlights their stronger specialisation in high value-added yielding production activities. Furthermore, labour productivity effects (value-added based) tend to be rather scarce and limited: industries in the group of EU-15 countries experience losses in value-added based labour productivity as their degree of vertical specialisation increases. These losses are strongest in the high-tech sector. However, results for the interaction term suggest that while industries with higher vertical specialisation may lose in terms of value-added based growth or labour productivity, higher average export growth helps to more than compensate for these losses.

With respect to TFP growth, results point to strong similarities: irrespective of industry group (i.e. total economy, manufacturing sector or high-tech sector) or country group (all EU countries, EU-12 or EU-15) considered, growth (either in terms of value-added or gross output) is always positively associated with total factor productivity (TFP) growth. Moreover, in line with above results, effects are always stronger

for the group of EU-15 countries. In contrast, across all industry and country groups considered, employment and TFP growth rates are always negatively related which suggests that, on average, technical change tends to be labour-saving in nature. The labour-saving effect of TFP-growth is relatively stronger for new Member States though.

Moreover, the accumulation of factors like physical capital or human capital gives rise to interesting and diverse patterns. As expected, for both the total economy (Table 8) and the manufacturing sector (Table 9) alike, capital accumulation is positively related to both growth (either in terms of value-added or gross output) and labour productivity growth (either in terms of value-added or gross output). However, for the high-tech sector (Table 10), positive effects of capital accumulation only emerge for gross output or value-added growth while labour productivity growth appears to be unrelated to capital accumulation. Moreover, a more diverse picture emerges for the relationship between capital and employment growth. In both, the total economy and the manufacturing sector, the negative relationship between capital accumulation and employment growth observable for the overall EU as well as for the group of new Member States highlights that capital and labour tend to be substitutes. In contrast, however, the positive relationship between capital and labour for the group of EU-15 countries emphasises that capital and labour are complements and therefore modified jointly. As for the high-tech sector, capital accumulation and employment growth are unrelated except for the group of EU-15 countries which is again an indication of non-negligible capital-labour complementarities.

In contrast, the effects of human capital accumulation (defined as the deviation of growth of high-educated workers from total employment growth) on industry-level performance are rather limited. Specifically, for the total economy and partly also for the manufacturing sector, higher human capital accumulation is associated with higher gross output or value-added growth, irrespective of country group considered. However, somewhat surprisingly, no labour-productivity effects emerge. Moreover, human capital accumulation is even less relevant in the high-tech sector: except for a positive relationship between value-added growth and human capital accumulation for the group of EU-15 countries, no effects surface, either for value-added or gross output growth or for labour productivity growth.

Table 8 / Industry-level regression results for all industries: EU, EU-15 and EU-12, 1996-2007

Variables	EU					EU-12 only					EU-15 only				
	(1) Gross output	(2) Value Added	(3) Employ-ment	(4) LP (GO-based)	(5) LP (VA-based)	(1) Gross output	(2) Value added	(3) Employ-ment	(4) LP (GO-based)	(5) LP (VA-based)	(1) Gross output	(2) Value added	(3) Employ-ment	(4) LP (GO-based)	(5) LP (VA-based)
TFP growth	0.552***	0.522***	-0.708***			0.443***	0.440***	-0.862***			0.914***	0.828***	-0.134***		
	(30.78)	(86.36)	(62.07)			(17.41)	(48.56)	(47.73)			(32.80)	(118.42)	(14.89)		
Log value-added per hour worked	0.004	0.016***	0.023***	0.006	0.025***	0.010**	0.020***	0.030***	0.009	0.025***	-0.068***	-0.007*	-0.030***	-0.033***	0.024***
	(1.52)	(6.64)	(5.17)	(1.10)	(4.21)	(2.57)	(6.02)	(4.49)	(0.95)	(2.76)	(9.67)	(1.71)	(5.77)	(3.96)	(2.87)
Growth rate of capital	0.182***	0.342***	-0.066***	0.042	0.135***	0.150***	0.296***	-0.159***	0.073	0.170***	0.219***	0.447***	0.143***	-0.017	0.081***
	(12.73)	(29.72)	(3.02)	(1.45)	(4.69)	(6.41)	(14.87)	(4.02)	(1.35)	(3.14)	(13.41)	(46.46)	(11.58)	(0.85)	(4.10)
Growth rate of high educated workers (as deviation from total empl. growth)	0.030***	0.043***	-0.057***	0.002	-0.008	0.050***	0.036***	-0.033	0.002	-0.029	0.037***	0.071***	-0.016***	0.002	-0.002
	(6.12)	(10.92)	(7.78)	(0.24)	(0.80)	(3.92)	(3.29)	(-1.50)	(0.07)	(0.96)	(8.88)	(29.39)	(5.25)	(0.32)	(0.38)
Export growth	0.093***	0.062***	0.092***	0.063***	0.054***	0.138***	0.097***	0.147***	0.079***	0.063***	0.053***	0.020***	0.026***	0.056***	0.048***
	(15.67)	(13.05)	(10.28)	(5.30)	(4.53)	(13.35)	(11.05)	(8.34)	(3.30)	(2.64)	(8.45)	(5.39)	(5.37)	(7.41)	(6.20)
Vertical specialisation	0.255***	-0.204***	-0.156***	0.265***	-0.211***	0.340***	-0.236***	-0.115	0.391***	-0.176	0.348***	-0.064***	0.000	0.218***	-0.235***
	(7.96)	(7.93)	(3.22)	(4.10)	(3.25)	(6.24)	(5.08)	(1.24)	(3.08)	(1.38)	(9.48)	(2.98)	(0.00)	(4.97)	(5.27)
Exp.Growth*Vertical specialisation	0.005***	0.002***	0.003***	0.004***	0.003***	0.006***	0.003***	0.002*	0.007***	0.005***	0.003***	0.001***	0.001***	0.002***	0.002***
	(11.63)	(7.31)	(4.19)	(5.56)	(3.96)	(7.69)	(4.63)	(1.83)	(3.88)	(2.88)	(6.55)	(3.67)	(3.60)	(4.65)	(3.17)
											26.615**		10.949**	14.808**	
Constant	1.401	-3.955***	-5.719***	0.730	-6.259***	1.140	-3.493***	-4.956***	0.755	-4.914**	*	2.649*	*	*	-7.124**
	(1.52)	(5.35)	(4.10)	(0.39)	(3.36)	(1.15)	(4.13)	(2.94)	(0.33)	(2.13)	(10.48)	(1.78)	(5.72)	(4.85)	(2.30)
No of Observations	9,733	9,736	9,736	9,736	9,736	4,168	4,168	4,168	4,168	4,168	5,565	5,568	5,568	5,568	5,568
R²	0.165	0.497	0.307	0.012	0.010	0.173	0.437	0.380	0.013	0.010	0.223	0.751	0.089	0.021	0.018
F-Test	248.7	1245	557.3	17.53	14.36	111.8	416.4	329	8.314	6.14	207.5	2182	70.89	18.22	15.16

Note: All regressions include country-industry fixed effects. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. t-statistics in parentheses.

Table 9 / Industry-level regression results for manufacturing only: EU, EU-15 and EU-12, 1996-2007

	EU					EU-12 only					EU-15 only				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Variables	Gross output	Value Added	Employ-ment	LP (VA-based)	LP (GO-based)	Gross output	Value added	Employ-ment	LP (VA-based)	LP (GO-based)	Gross output	Value added	Employ-ment	LP (VA-based)	LP (GO-based)
TFP growth	0.386***	0.430***	-0.777***			0.264***	0.324***	-0.929***			1.057***	0.909***	-0.097***		
	(12.31)	(46.95)	(54.54)			(6.16)	(24.32)	(43.60)			(18.29)	(98.35)	(7.31)		
Log value-added per hour worked	0.004	0.024***	0.030***	0.004	0.035***	0.010	0.033***	0.041***	0.002	0.032**	-0.101***	-0.037***	-0.066***	-0.023	0.043***
	(0.67)	(5.95)	(4.71)	(0.40)	(3.77)	(1.44)	(5.78)	(4.52)	(0.11)	(2.24)	(7.61)	(6.18)	(7.55)	(1.57)	(2.96)
Growth rate of capital	0.304***	0.349***	-0.076**	0.192***	0.166***	0.292***	0.325***	-0.154**	0.265**	0.253**	0.294***	0.450***	0.116***	0.082**	0.062*
	(10.01)	(15.03)	(2.10)	(3.50)	(3.12)	(5.66)	(7.90)	(2.34)	(2.47)	(2.43)	(8.88)	(29.42)	(5.29)	(2.21)	(1.70)
Growth rate of high educated workers (as deviation from total empl. growth)	0.051***	0.017	-0.063***	0.053*	0.002	0.077***	0.014	-0.067*	0.075	0.001	0.022	0.045***	-0.028***	0.026	0.005
	(3.23)	(1.39)	(3.36)	(1.87)	(0.07)	(2.81)	(0.62)	(1.93)	(1.32)	(0.02)	(1.35)	(6.08)	(2.64)	(1.41)	(0.28)
Export growth	0.147***	0.089***	0.123***	0.116***	0.088***	0.199***	0.131***	0.179***	0.143***	0.103**	0.115***	0.031***	0.051***	0.099***	0.068***
	(11.49)	(9.08)	(8.09)	(5.04)	(3.93)	(9.95)	(8.23)	(7.03)	(3.45)	(2.56)	(7.42)	(4.32)	(5.02)	(5.70)	(4.00)
Vertical specialisation	0.205***	-0.219***	-0.104*	0.201**	-0.249***	0.265***	-0.295***	-0.039	0.302*	-0.250	0.392***	0.082***	0.112***	0.168**	-0.223***
	(3.97)	(5.56)	(1.71)	(2.16)	(2.75)	(3.07)	(4.27)	(0.35)	(1.69)	(1.43)	(6.53)	(2.99)	(2.83)	(2.49)	(3.38)
Exp.Growth*Vertical specialisation	0.004***	0.002***	0.002**	0.003*	0.002	0.006***	0.004***	0.003*	0.005	0.003	0.000	0.000	0.000	0.000	0.000
	(4.23)	(3.31)	(2.05)	(1.65)	(1.04)	(3.82)	(2.92)	(1.71)	(1.57)	(1.13)	(0.13)	(1.03)	(0.46)	(0.25)	(0.34)
Constant	1.028	-6.786***	-8.255***	2.058	-8.275***	0.597	-6.689***	-7.724***	3.031	-5.479	38.037***	13.122**	22.892**	11.724**	12.874**
	(0.61)	(5.32)	(4.16)	(0.68)	(2.82)	(0.33)	(4.67)	(3.38)	(0.81)	(1.52)	(7.88)	(5.95)	(7.21)	(2.16)	(2.42)
No of Observations	4,208	4,208	4,208	4,208	4,208	1,786	1,786	1,786	1,786	1,786	2,422	2,422	2,422	2,422	2,422
R²	0.131	0.418	0.439	0.019	0.014	0.151	0.354	0.543	0.021	0.015	0.192	0.821	0.078	0.026	0.018
F-Test	82.07	392.7	428	12.44	8.909	41.02	126.4	273.2	5.842	4.073	75.01	1449	26.64	9.659	6.74

Note: All regressions include country-industry fixed effects. *** p<0.01, ** p<0.05, * p<0.1. t-statistics in parentheses.

Table 10 / Industry-level regression results for the high-tech sector only: EU, EU-15 and EU-12, 1996-2007

Variables	EU (1) Gross output	EU (2) Value added	EU (3) Employment	EU (4) LP (VA-based)	EU (5) LP (GO-based)	EU-12 only (1) Gross output	EU-12 only (2) Value added	EU-12 only (3) Employment	EU-12 only (4) LP (VA-based)	EU-12 only (5) LP (GO-based)	EU-15 only (1) Gross output	EU-15 only (2) Value added	EU-15 only (3) Employment	EU-15 only (4) LP (VA-based)	EU-15 only (5) LP (GO-based)
TFP growth	1.172***	0.432***	-0.258***			0.916***	0.314***	-0.307***			1.803***	0.934***	-0.077***		
	(11.92)	(18.96)	(11.81)			(5.74)	(9.08)	(8.77)			(15.32)	(48.80)	(3.05)		
Log value-added per hour worked	0.003	0.055***	0.019**	0.010	0.056***	0.020	0.075***	0.031**	0.011	0.060***	-0.113***	-0.050***	-0.086***	-0.030	0.031
	(0.28)	(5.99)	(2.17)	(0.71)	(4.51)	(1.17)	(5.66)	(2.29)	(0.53)	(3.29)	(5.09)	(4.53)	(5.93)	(1.14)	(1.16)
Growth rate of capital	0.337***	0.292***	0.047	0.078	0.001	0.260**	0.278***	0.001	0.065	0.037	0.428***	0.435***	0.109***	0.064	-0.029
	(6.29)	(6.75)	(1.13)	(1.23)	(0.02)	(2.45)	(3.28)	(0.01)	(0.50)	(0.33)	(8.92)	(18.53)	(3.50)	(1.17)	(0.53)
Growth rate of high educated workers (as deviation from total empl. growth)	0.056	0.050*	0.014	0.003	-0.002	0.090	0.075	0.061	-0.024	-0.030	0.014	0.047***	-0.030	0.017	0.021
	(1.63)	(1.78)	(0.54)	(0.08)	(0.06)	(1.37)	(1.43)	(1.17)	(0.30)	(0.42)	(0.44)	(3.05)	(1.46)	(0.44)	(0.56)
Export growth	0.142***	0.103***	0.062***	0.154***	0.111***	0.193***	0.167***	0.090***	0.175***	0.133***	0.144***	0.048***	0.068***	0.125***	0.069**
	(5.79)	(5.24)	(3.31)	(5.29)	(4.15)	(4.65)	(5.14)	(2.75)	(3.51)	(3.01)	(5.68)	(3.81)	(4.12)	(4.10)	(2.24)
Vertical specialisation	0.297***	-0.505***	0.070	0.377***	-0.266**	0.307*	-0.694***	0.077	0.536**	-0.296	0.570***	0.218***	0.330***	0.112	-0.236*
	(2.96)	(6.17)	(0.89)	(3.11)	(2.40)	(1.81)	(5.06)	(0.55)	(2.58)	(1.61)	(5.18)	(4.04)	(4.59)	(0.85)	(1.76)
Exp.Growth*Vertical specialisation	0.010***	0.006***	0.005***	0.001	-0.003	0.011***	0.008***	0.007***	-0.003	-0.005	0.010***	0.000	0.001	0.007***	-0.002
	(5.26)	(3.94)	(3.56)	(0.56)	(1.34)	(3.06)	(3.05)	(2.68)	(0.72)	(1.37)	(4.15)	(0.28)	(0.44)	(2.62)	(-0.89)
Constant	2.114	-15.480***	-5.447*	2.562	-12.694***	0.350	-15.908***	-6.430*	5.222	-8.524*	-42.784***	-18.120***	-31.351***	15.322	-7.171
	(0.58)	(5.31)	(1.95)	(0.59)	(3.19)	(0.08)	(4.77)	(1.91)	(1.02)	(1.87)	(5.29)	(4.54)	(5.93)	(1.57)	(0.73)
No of Observations	882	882	882	882	882	359	359	359	359	359	523	523	523	523	523
R²	0.286	0.399	0.191	0.072	0.051	0.262	0.367	0.250	0.091	0.071	0.437	0.843	0.158	0.066	0.022
F-Test	45.37	75.22	26.76	10.23	7.15	16.03	26.19	15.07	5.316	4.045	52.18	361.7	12.66	5.515	1.762

Note: All regressions include country-industry fixed effects. *** p<0.01, ** p<0.05, * p<0.1. t-statistics in parentheses.

5. Summary and conclusion

As a result of dramatically expanding trade volumes and swiftly advancing global fragmentation of production processes, the global trade landscape has transformed fundamentally and opened up new opportunities for many economies. In this respect, it has become a major political concern whether well-designed economic policies, which promote participation in global markets and in globally fragmented production chains, help foster economic development, spur employment and accelerate catching up.

Against this backdrop, the analysis determines whether new opportunities arising from the more recent changes in the global trade landscape have actually translated into real gains. It uses the World Input-Output Database (WIOD) from 1995 to 2007 and identifies whether recent trade-related changes have helped stimulate growth in output, value-added, employment and labour productivity among EU countries. To explicitly account for their different historical experiences with trade integration, the new Member States are analysed separately from the group of EU-15 countries.

The descriptive analysis of changes in the degree of trade integration highlights that between 1995 and 2007, vertical specialisation (defined as the foreign value-added content of exports) intensified in all EU member countries - but the UK – and that it intensified the most in the new Member States, with Hungary, the Czech Republic, Slovakia, Poland and Bulgaria experiencing the most pronounced increases of between 12 and 19 percentage points. From an industry-level perspective, the high-tech sector lies at the very core of increases in vertical specialisation of these new Member States. By contrast, vertical specialisation increased more moderately in the group of EU-15 countries, by 11 percentage points at most, and was strongest in Finland, Greece, Austria, Germany and Denmark.

The econometric analysis, which was pursued for the country and the industry level alike, points to the following impacts of trade and production integration. In particular, results from the country-level analysis demonstrate that export growth tends to stimulate overall performance. This is particularly true for the new Member States, which profit the most in terms of stronger income growth, higher employment generation and more pronounced labour productivity improvements. By contrast, the group of EU-15 countries benefits very little and only in terms of value-added and employment growth in the manufacturing sector. Similarly, in line with previous empirical evidence, higher vertical specialisation is found to also significantly improve overall performance. However, in contrast to the new Member States, EU-15 countries are the major beneficiaries and experience improvements in output, employment and labour productivity growth (gross output based) alike. In addition, the lack of any significant value-added effects for new Member States indicates that new Member States appear to specialise in the particularly low value-added yielding assembly stage of the global production chain while EU-15 countries are located higher up the value chain. The analysis also demonstrates that high-tech sectors in the EU-15 countries fail to profit from either trade expansion or higher vertical specialisation.

The results also indicate that export growth and the degree of vertical specialisation tend to reinforce each other, i.e. the effects of export growth on macroeconomic performance tend to be even higher if vertical specialisation is high, which is particularly the case in the manufacturing sector and the high-tech

sector, though major differences across the two country groups are obvious, particularly for the high-tech sector.

The results of the industry-level analysis consistently demonstrate that export growth is beneficial to industrial performance: industries with a stronger and growing presence in foreign markets tend to grow faster, generate more employment and are likely to be more productive as well. These performance-enhancing effects are strongest in the high-tech sector and, compared to the group of EU-15 countries, most beneficial to industries in the new Member States. By contrast, a higher degree of vertical specialisation not necessarily translates into better performance of industries. Specifically, while industries with average export growth rates tend to experience a boost in gross output and (gross output based) labour productivity as their degree of vertical specialisation increases, there is hardly any evidence of a significant employment effect. Moreover, results also highlight that the effects on value-added growth are mixed and the consequence of differences in prevailing production activities. For instance, industries in new Member States consistently suffer losses in value-added growth as their level of vertical specialisation increases. However, as a result of higher vertical specialisation, industries in the group of EU-15 countries experience strong value-added growth, particularly in the manufacturing sector, but more so in the high-tech sector. These diverging patterns suggest that industries in new Member States tend to predominantly specialise in assembly activities, which yield less value-added, while industries in the group of EU-15 countries more strongly specialise in high value-added yielding production activities. At the industry level, results for the interaction term suggest that while industries with higher vertical specialisation may lose in terms of value-added growth or labour productivity, higher average export growth helps to more than compensate for these losses, suggesting an overall positive effect of production integration on growth.

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Appendix

7.1 DESCRIPTIVE TABLES

Table 11 / Descriptive statistics for the EU: industry level, total economy

Variable	Obs	Mean	Std.Dev	Min	Max
Gross output growth	9736	3.73	10.17	-82.12	243.72
Value-added growth	9736	2.87	10.70	-271.97	39.91
Employment growth	9736	0.70	16.43	-100.00	1004.00
Labour productivity growth (GO-based)	9736	3.03	18.18	-993.69	270.17
Labour productivity growth (VA-based)	9736	2.17	18.28	-997.21	110.08
TFP growth	9736	0.41	13.01	-545.71	220.77
Log value-added per hour worked	9736	315.53	82.11	107.56	474.80
Growth rate of capital	9736	4.42	8.01	-75.79	188.67
Growth rate of high educated workers	9736	4.07	19.20	-96.18	1261.75
Export growth	9736	0.00	16.78	-58.42	41.57
Vertical specialisation	9736	0.00	13.57	-24.56	67.89
Exp.Growth*Vertical specialisation	9736	14.36	248.62	-2644.64	2430.03

Table 12 / Descriptive statistics for the new Member States: industry level, total economy

Variable	Obs	Mean	Std.Dev	Min	Max
Gross output growth	4168	4.66	12.75	-82.12	243.72
Value-added growth	4168	3.57	13.50	-271.97	39.91
Employment growth	4168	1.22	24.16	-73.32	1004.00
Labour productivity growth (GO-based)	4168	3.43	26.09	-993.69	270.17
Labour productivity growth (VA-based)	4168	2.35	26.21	-997.21	96.16
TFP growth	4168	0.39	17.43	-545.71	220.77
Log value-added per hour worked	4168	252.47	82.59	107.56	474.80
Growth rate of capital	4168	5.72	9.40	-75.79	188.67
Growth rate of high educated workers	4168	3.18	14.11	-67.24	135.74
Export growth	4168	0.00	18.61	-60.13	39.84
Vertical specialisation	4168	0.00	13.45	-24.51	64.89
Exp.Growth*Vertical specialisation	4168	11.67	263.80	-2599.77	1254.66

Table 13 / Descriptive statistics for the EU-15: industry level, total economy

Variable	Obs	Mean	Std.Dev	Min	Max
Gross output growth	5568	3.04	7.61	-73.03	150.43
Value-added growth	5568	2.35	7.94	-91.12	39.59
Employment growth	5568	0.31	5.92	-100.00	100.22
Labour productivity growth (GO-based)	5568	2.73	8.25	-82.60	150.43
Labour productivity growth (VA-based)	5568	2.04	8.38	-87.02	110.08
TFP growth	5568	0.42	8.27	-150.91	64.05
Log value-added per hour worked	5568	362.73	38.46	246.63	444.62
Growth rate of capital	5568	3.45	6.63	-54.47	143.91
Growth rate of high educated workers	5568	4.74	22.24	-96.18	1261.75
Export growth	5568	0.00	15.15	-57.14	42.85
Vertical specialisation	5568	0.00	13.22	-22.32	61.96
Exp.Growth*Vertical specialisation	5568	9.66	227.54	-2023.95	2600.79

Table 14 / Descriptive statistics for the EU: industry level, manufacturing

Variable	Obs	Mean	Std.Dev.	Min	Max
Gross output growth	4208	3.61	11.88	-82.12	243.72
Value-added growth	4208	2.83	11.42	-91.12	39.70
Employment growth	4208	-0.58	16.84	-100.00	894.30
Labour productivity growth (GO-based)	4208	4.18	19.24	-886.90	270.17
Labour productivity growth (VA-based)	4208	3.40	18.72	-884.86	110.08
TFP growth	4208	1.58	14.47	-545.71	220.77
Log value-added per hour worked	4208	316.06	81.81	107.56	474.80
Growth rate of capital	4208	3.44	6.88	-75.79	112.17
Growth rate of high educated workers	4208	3.99	10.71	-50.29	114.60
Export growth	4208	0.00	15.08	-56.97	41.45
Vertical specialisation	4208	0.00	12.32	-23.50	58.73
Exp.Growth*Vertical specialisation	4208	23.82	217.80	-2237.63	2055.86

Table 15 / Descriptive statistics for the new Member States: industry level, manufacturing

Variable	Obs	Mean	Std.Dev.	Min	Max
Gross output growth	1786	5.02	15.08	-82.12	243.72
Value-added growth	1786	3.94	14.26	-90.27	39.70
Employment growth	1786	-0.02	24.80	-66.77	894.30
Labour productivity growth (GO-based)	1786	5.04	27.53	-886.90	270.17
Labour productivity growth (VA-based)	1786	3.97	26.73	-884.86	91.95
TFP growth	1786	1.86	19.97	-545.71	220.77
Log value-added per hour worked	1786	252.86	82.82	107.56	474.80
Growth rate of capital	1786	5.05	8.01	-75.79	79.36
Growth rate of high educated workers	1786	3.09	11.93	-50.29	114.60
Export growth	1786	0.00	17.99	-59.51	38.91
Vertical specialisation	1786	0.00	11.18	-25.48	54.67
Exp.Growth*Vertical specialisation	1786	9.55	228.11	-2191.74	1482.02

Table 16 / Descriptive statistics for the EU-15: industry level, manufacturing

Variable	Obs	Mean	Std.Dev.	Min	Max
Gross output growth	2422	2.56	8.65	-73.03	150.43
Value-added growth	2422	2.00	8.66	-91.12	39.59
Employment growth	2422	-0.98	6.26	-100.00	52.11
Labour productivity growth (GO-based)	2422	3.55	9.14	-57.64	150.43
Labour productivity growth (VA-based)	2422	2.99	9.04	-87.02	110.08
TFP growth	2422	1.37	8.36	-88.67	40.20
Log value-added per hour worked	2422	362.67	38.12	246.63	444.62
Growth rate of capital	2422	2.25	5.61	-41.18	112.17
Growth rate of high educated workers	2422	4.66	9.66	-28.22	68.59
Export growth	2422	0.00	12.17	-52.75	42.89
Vertical specialisation	2422	0.00	12.26	-20.51	53.54
Exp.Growth*Vertical specialisation	2422	21.19	205.87	-1716.38	2277.71

Table 17 / Descriptive statistics for the EU: industry level, high-tech sector

Variable	Obs	Mean	Std.Dev.	Min	Max
Gross output growth	882	6.17	12.04	-43.10	108.11
Value-added growth	882	5.33	11.09	-55.06	39.70
Employment growth	882	0.10	8.56	-58.97	53.08
Labour productivity growth (GO-based)	882	6.07	12.31	-47.70	90.20
Labour productivity growth (VA-based)	882	5.23	11.44	-50.39	72.26
TFP growth	882	3.62	13.13	-45.58	220.77
Log value-added per hour worked	882	318.51	81.57	107.56	474.80
Growth rate of capital	882	4.70	7.77	-12.52	112.17
Growth rate of high educated workers	882	4.04	9.92	-31.01	64.94
Export growth	882	0.00	15.70	-54.57	39.68
Vertical specialisation	882	0.00	11.32	-21.35	37.68
Exp.Growth*Vertical specialisation	882	19.54	185.98	-1460.85	835.98

Table 18 / Descriptive statistics for the new Member States: industry level, high-tech sector

Variable	Obs	Mean	Std.Dev.	Min	Max
Gross output growth	359	8.41	15.67	-43.10	108.11
Value-added growth	359	6.79	14.08	-55.06	39.70
Employment growth	359	0.14	12.23	-58.97	53.08
Labour productivity growth (GO-based)	359	8.27	16.69	-47.70	90.20
Labour productivity growth (VA-based)	359	6.65	14.96	-50.39	72.26
TFP growth	359	4.82	18.03	-45.58	220.77
Log value-added per hour worked	359	252.80	83.63	107.56	474.80
Growth rate of capital	359	6.86	8.48	-7.49	65.37
Growth rate of high educated workers	359	3.45	11.15	-31.01	54.61
Export growth	359	0.00	19.42	-58.46	35.79
Vertical specialisation	359	0.00	11.49	-23.89	32.70
Exp.Growth*Vertical specialisation	359	9.36	223.75	-1367.35	640.31

Table 19 / Descriptive statistics for the EU-15: industry level, high-tech sector

Variable	Obs	Mean	Std.Dev.	Min	Max
Gross output growth	523	4.63	8.38	-26.94	41.52
Value-added growth	523	4.33	8.31	-22.51	39.59
Employment growth	523	0.07	4.58	-16.00	25.00
Labour productivity growth (GO-based)	523	4.56	7.70	-23.49	32.75
Labour productivity growth (VA-based)	523	4.26	8.06	-34.79	41.49
TFP growth	523	2.80	8.15	-38.08	40.20
Log value-added per hour worked	523	363.61	37.75	246.63	444.62
Growth rate of capital	523	3.23	6.86	-12.52	112.17
Growth rate of high educated workers	523	4.44	8.97	-21.11	64.94
Export growth	523	0.00	11.82	-50.75	41.31
Vertical specialisation	523	0.00	9.85	-17.93	27.78
Exp.Growth*Vertical specialisation	523	4.11	124.01	-587.16	780.17

7.2 CORRELATION TABLES

Table 20 / Correlation matrix for the EU: industry level, total economy

	gTFP	LnVAphw	gCAP	gHC	gEXP	VS	gEXP*VS
gTFP	1						
LnVAphw	0.024	1					
gCAP	-0.111	-0.163	1				
gHC	-0.122	0.079	-0.031	1			
gEXP	0.082	-0.048	0.113	0.037	1		
VS	0.016	-0.040	-0.013	0.019	0.063	1	
gEXP*VS	0.046	-0.004	0.042	0.023	0.019	0.067	1

Table 21 / Correlation matrix for the new Member States: industry level, total economy

	gTFP	LnVAphw	gCAP	gHC	gEXP	VS	gEXP*VS
gTFP	1						
LnVAphw	0.035	1					
gCAP	-0.079	-0.092	1				
gHC	-0.042	0.156	-0.032	1			
gEXP	0.094	0.004	0.121	0.093	1		
VS	0.026	0.052	-0.062	0.024	0.047	1	
gEXP*VS	0.054	-0.004	0.061	0.026	0.006	0.001	1

Table 22 / Correlation matrix for the EU-15: industry level, total economy

	gTFP	LnVAphw	gCAP	gHC	gEXP	VS	gEXP*VS
gTFP	1						
LnVAphw	0.020	1					
gCAP	-0.192	-0.106	1				
gHC	-0.248	0.010	-0.025	1			
gEXP	0.067	0.037	0.078	0.014	1		
VS	0.005	0.249	-0.020	0.030	0.048	1	
gEXP*VS	0.011	0.029	0.004	0.017	-0.046	0.122	1

Table 23 / Correlation matrix for the EU: industry level, manufacturing

	gTFP	LnVAphw	gCAP	gHC	gEXP	VS	gEXP*VS
gTFP	1						
LnVAphw	0.003	1					
gCAP	-0.050	-0.214	1				
gHC	-0.028	0.101	-0.008	1			
gEXP	0.103	-0.081	0.182	0.104	1		
VS	-0.025	-0.087	0.142	-0.023	0.128	1	
gEXP*VS	0.033	-0.023	0.095	0.073	0.288	0.032	1

Table 24 / Correlation matrix for the new Member States: industry level, manufacturing

	gTFP	LnVAphw	gCAP	gHC	gEXP	VS	gEXP*VS
gTFP	1						
LnVAphw	0.002	1					
gCAP	-0.017	-0.103	1				
gHC	-0.012	0.137	0.019	1			
gEXP	0.116	-0.005	0.232	0.134	1		
VS	-0.022	0.067	0.044	-0.002	0.048	1	
gEXP*VS	0.043	-0.047	0.079	0.030	0.104	-0.101	1

Table 25 / Correlation matrix for the EU-15: industry level, manufacturing

	gTFP	LnVAphw	gCAP	gHC	gEXP	VS	gEXP*VS
gTFP	1						
LnVAphw	0.081	1					
gCAP	-0.154	-0.130	1				
gHC	-0.063	-0.052	-0.010	1			
gEXP	0.073	0.079	0.043	0.093	1		
VS	-0.054	0.281	0.141	-0.003	0.142	1	
gEXP*VS	-0.039	-0.016	0.059	0.090	0.335	0.174	1

Table 26 / Correlation matrix for the EU: industry level, high-tech sector

	gTFP	LnVAphw	gCAP	gHC	gEXP	VS	gEXP*VS
gTFP	1						
LnVAphw	-0.024	1					
gCAP	-0.152	-0.203	1				
gHC	-0.028	0.077	-0.030	1			
gEXP	0.122	-0.113	0.122	0.107	1		
VS	0.036	-0.127	0.294	-0.013	0.110	1	
gEXP*VS	-0.039	-0.041	0.084	0.027	0.249	-0.010	1

Table 27 / Correlation matrix for the new Member States: industry level, high-tech sector

	gTFP	LnVAphw	gCAP	gHC	gEXP	VS	gEXP*VS
gTFP	1						
LnVAphw	0.030	1					
gCAP	-0.145	-0.079	1				
gHC	-0.011	0.145	0.002	1			
gEXP	0.115	0.017	0.092	0.140	1		
VS	0.052	0.131	0.284	0.030	0.042	1	
gEXP*VS	-0.105	-0.035	0.034	-0.047	0.035	-0.096	1

Table 28 / Correlation matrix for the EU-12: industry level, high-tech sector

	gTFP	LnVAphw	gCAP	gHC	gEXP	VS	gEXP*VS
gTFP	1						
LnVAphw	0.054	1					
gCAP	-0.250	-0.056	1				
gHC	-0.050	-0.093	-0.041	1			
gEXP	0.098	0.075	0.063	0.095	1		
VS	-0.066	0.257	0.182	-0.019	0.035	1	
gEXP*VS	-0.034	0.006	0.073	0.078	0.175	-0.024	1

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