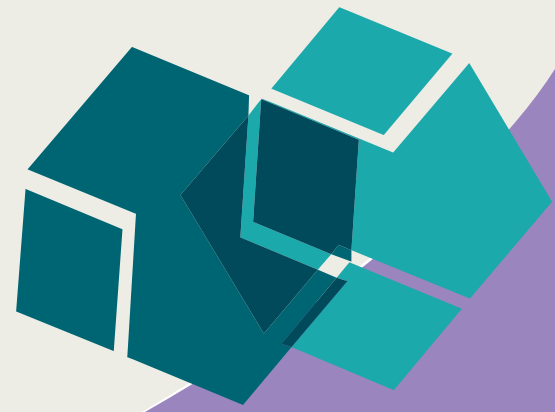




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The Role of Intra-Industry Trade in the Industrial Upgrading of the 10 CEECs New Members of the European Union

Károly Attila Soós

* Institute of Economics, Centre for Economic and Regional Studies, Hungarian Academy of Sciences

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The Role of Intra-Industry Trade in the Industrial Upgrading of the 10 CEECs New Members of the European Union¹

Abstract

In this paper, we analyse the intra-industry trade (IIT) of the ten Central and Eastern European countries (CEECs), members of the EU partly from 2004, partly from 2007, with the 15 “old” member countries of the EU. We use 10 old EU countries’ analogous trade data and trends as a basis of comparison. Besides the (spectacular) growth of IIT, we also examine the trends of strong and not really favourable sectoral concentration of IIT. At the same time, the breakdown of IIT by price-quality segments (i. e., horizontal, low-quality and high-quality vertical IIT) shows a very positive picture, hinting to a very important technological and quality upgrading in the manufacturing industry of CEECs. However, such a conclusion is open to doubts because IIT does not include only the exchange of otherwise similar products of equal or different quality but also back-and-forth transactions in vertically fragmented production chains in the same commodity category. Thus, revealing the actual nature of the contribution to the production of items exported in the framework of IIT requires further research. The latter extends here to an analysis of relative wage levels of workers in industries participating in intra-industry trade, as well as to the examination of the trade of the products of research-intensive (Schumpeter”) industries.

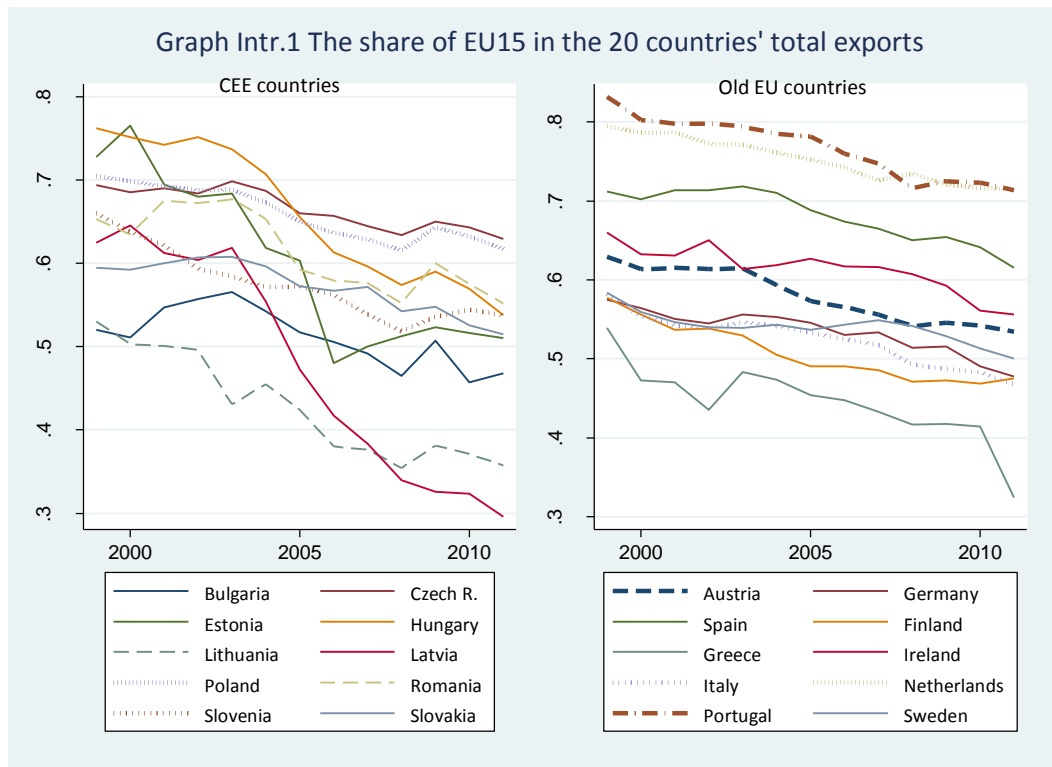
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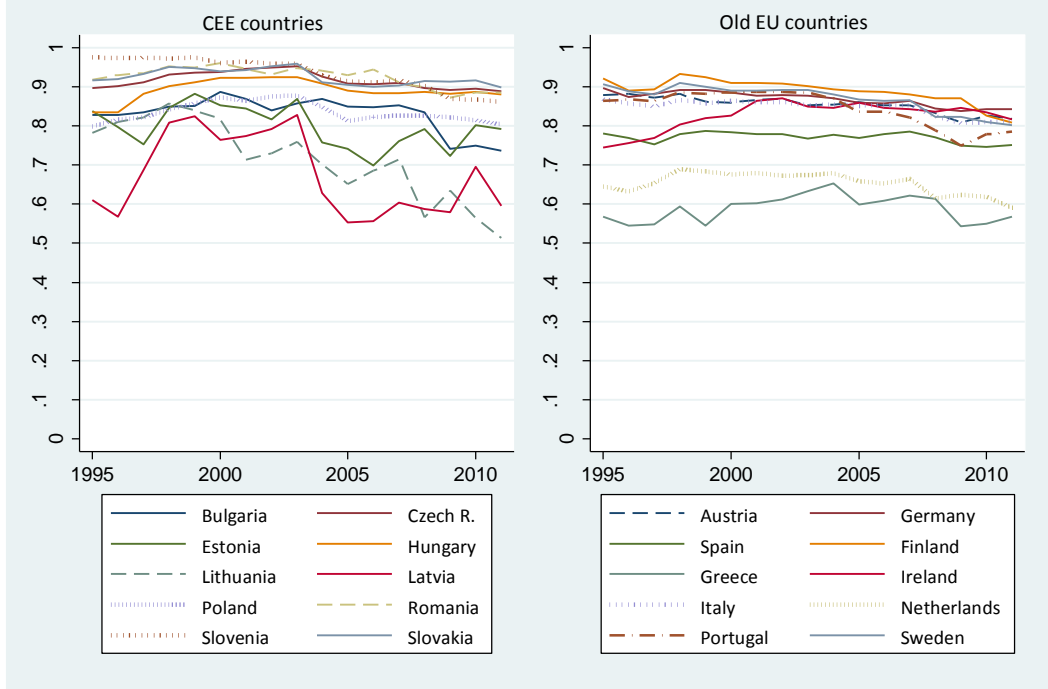
1. Introduction and data

In this paper, we examine the development of intra-industry trade (IIT) between 10 Central and Eastern European countries (CEECs) new members of the European Union (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia) and the 15 „old” EU member countries. The subject of the analysis is restricted to this trade. I. e., the „trade”, and even “total trade” of the CEECs in this paper does not mean anything more than their trade with those 15 countries, except if its wider meaning is explicitly mentioned. As displayed in Graph Intr. 1, the export side of this trade (which has primary importance in our paper) represents 50 percent or more of the total (world) exports for the CEECs, except for Latvia and Lithuania.



A further restriction is that only trade in manufacturing products, i. e., those classified into the Harmonised System's (HS) chapters 28-97 (see their list in Annex 1) is examined. Their share in total exports to EU 15 is shown in Graph Intr. 2. Both restrictions are usually accepted in studies of the IIT of CEECs since they assure a convenient framework for analysing the qualitative upgrading of manufacturing industries in CEECs. (These restrictions exclude – among other things – trade in the products of the food processing industry. More recently, IIT in this field has become the subject of important studies, (e. g. Fertő 2005, Bojnec – Fertő 2006 and Leitão – Faustino 2008). However, because of some sectoral particularities, these analyses separate food trade from the traditional, and in this paper also accepted, area of IIT studies.)

Graph Intr.2 The share of manufacturing products in the exports to EU-15



As a basis of comparison, the IIT of 10 old EU member countries is also analysed in this paper. They are Austria, Finland, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain and Sweden. This list consists of a mix of industrially more and less advanced, smaller and bigger countries. Again, only their trade in HS chapters 28-97 are analysed, and only that with old EU member countries – which for each one of them implies certainly only 14, rather than 15, countries.

Our analysis follows IIT development between 1995 and 2011. The starting year was chosen (instead of any earlier one) on the basis of better availability of data and also taking into consideration the fact that „normal” economic processes (with positive rates of growth, less than running or at least less than Samuelson’s “galloping”, i. e. exceeding annually 20 percent, inflation, etc.) did not arrive to some of the CEECs before that year. In the last years of our sample, the impact of the international financial and economic crisis can be observed.

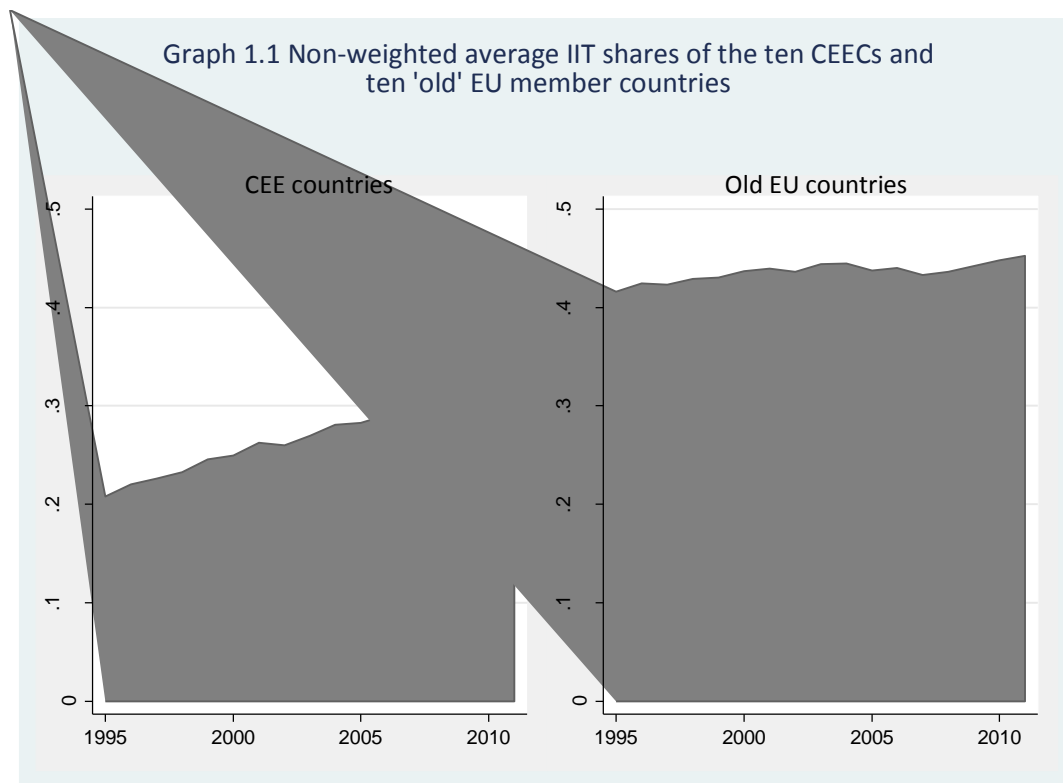
The source of trade data used in the text and in graphs and tables is Eurostat’s Comext database.

In one part of the paper, our analysis is restricted to Hungary. This is not meant to find some particularities of that country. (The exclusion of the other countries would not help the implementation of the latter purpose.) On the contrary, Hungary serves as an example, on the basis of the availability of data (see details in Section 5.2 and Annex 4) that allow some insight into the quality of manpower employed in producing those products exported in the framework of IIT. Unfortunately, similar data for other countries included in our sample are not available.

2. The quantitative development of intra-industry trade

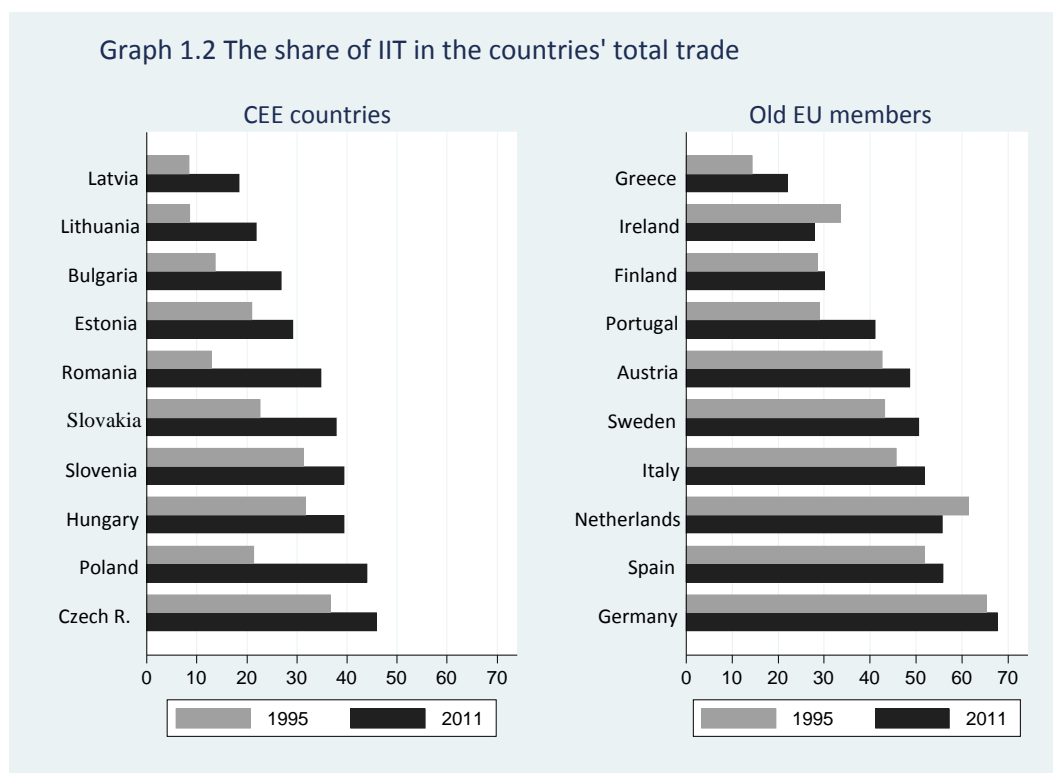
Having a look at Graph 1.1 convinces the reader that over the last one and half decade the growth of IIT of CEECs has been rather significant: at the end of the period observed, the (non-weighted)

average share of IIT in these countries' trade was close to the analogous average share achieved by the 10 old EU member countries at the beginning of the period. What does this mean?



IIT usually is considered trade between industrially advanced countries. Already the classical literature of this trade underlined the fundamental role played by the level of manufacturing and general economic development in the advancement of a country's IIT with others (Balassa – Bauwens 1987). However later, with the emergence of the distinction between horizontal and vertical IIT, the theoretical framework for a subordinated, low-tech role of “developing” countries in IIT was created (e. g. Greenaway – Hine 1991). Then, lots of studies described the trade of “emerging” countries (e. g. Clark – Stanley 1999) with developed ones on this basis, and some authors found that this framework holds for CEECs, too. (e. g. Aturupane et al. 1999). Others, rather than finding such actual development, forecast it as the (unfortunately) likely future of the manufacturing sector of the CEECs, (Gabrisch – Werner 1998). We will see below that these pessimistic views – and some more complicated but no less pessimistic notions – are at least exaggerations. The positions of CEECs in the IIT “sector” of international trade do include but are certainly not restricted to low-tech servicing of more advanced western European countries' high-tech manufacturing activities. High-tech is gaining ground in these countries.

Another issue is raised by the visible deceleration of the growth of the share of IIT in the total trade of the CEECs. The deceleration began in 2009, it may be related to the international financial and economic crisis. However, this deceleration does not amount to a reduction, does not have any visible impact on the composition of IIT by its different kinds (see below), and could only be analysed for two years, which would not be sufficient for drawing any serious conclusions.



Graph 1.2 displays the growth of the ten CEECs' and the ten old EU member countries' IIT share in their trade between 1995 and 2011. Countries that had a high IIT share in 1995 – thus primarily the advanced industrial countries of the old EU – mostly have slow growth. In the Netherlands' case the growth is negative. However, such a saturation effect (which is not unknown in the literature, (e. g. Glejser 1983) also appears already at some CEECs (Slovenia, the Czech Republic and Hungary). Besides the latter, looking at both the levels achieved in 2011 and the progress observable between 1995 and 2011, we can notice the obvious presence of the impact of factors lengthily discussed in the literature, whose analysis we do not repeat here, we only recall its main conclusions.

Geographical closeness and common border (contiguity) are positive factors of IIT. This is recognised by all authors, even though it is explained in various ways. According to Balassa (1986), "it can be assumed that the availability of information decreases, and its costs increase, with distance", whereas Venables – Rice – Stewart (2003) find that distance increases differences in country characteristics, and the latter are responsible for smaller IIT shares in trade between countries farther from each other. Romania's, Bulgaria's and the Baltic countries' relatively large distance from such industrial "superpowers" like Germany and northern Italy certainly reduces their IIT levels as compared to Slovenia, the Czech Republic, Hungary and Poland. Our own multiple regression analysis also supports the importance of this impact (Fertő – Soós 2008).

Further many times proven and non-debated factors positively influencing IIT are country sizes, usually measured in GDP. The sum of two countries' GDP has a positive; the difference between the two GDPs has a negative impact. Our research could only rather poorly serve for verifying this relationship since in our approach one of the partners are always the same or almost the same (14 or 15) old EU member countries.

Yet another factor influencing IIT is foreign direct investment (FDI), but this relationship is a complex one. Horizontal or market-seeking FDI is basically an alternative to exports, thus it tends to reduce trade and also IIT (even though it may entail exports of component parts, which moderates the negative impact). According to Markusen – Maskus (2002), most FDI falls into this, trade- and IIT-reducing category. However, other researchers (e. g. Greenaway et al. 1998, Yeaple 2003 and Hanson et al. 2005) have found a domination of vertical (comparative advantages-based or efficiency-seeking) FDI. Efficiency-seeking is mostly the basis on which international production networks are built. The production process is fragmented across countries' borders; in this process FDI and IIT go hand in hand². This kind of positive role of FDI in the development of IIT between the CEECs and the EU was stressed already by Lemoine (1997). In our multiple regression analysis (Fertő – Soós 2008), we have demonstrated the important positive role played in the development of IIT by this factor in these countries. In relative terms (per capita, per GDP) Estonia, the Czech Republic and Hungary have been the largest recipients of FDI (WIIW 2012), and this is obviously part of the explanation of their high levels of IIT, as reflected in Graph 2. (Estonia's performance in this field has to be compared, rather than to Central European countries, to its Baltic neighbours Latvia and Lithuania, which – see above – share with it a relatively unfavourable geographical position, far from Europe's large manufacturing powerhouses.)

In the particular case of CEE countries (and, obviously, other former communist countries), the progress towards a market economy system also has to (positively) influence the development of IIT. In the former non-market economic system, IIT was far from unknown but its ways of functioning were clumsy, strongly limiting its development (Drabek – Greenaway 1984; also see our analysis of the Hungarian automotive industry's case in the 1970s: Bauer – Soós 1979). The importance of this reform factor is underlined in Fidrmuc (2001) as the individual “countries' structural reform performance”, and it is included (proxied with the European Bank for Reconstruction and Development's “transition indicators”) in our multiple regression analysis of IIT of CEECs (Fertő – Soós 2008). There we found – and probably would find also on the basis of more recent data – that this factor is most favourable for Hungary, the Czech Republic and Estonia³.

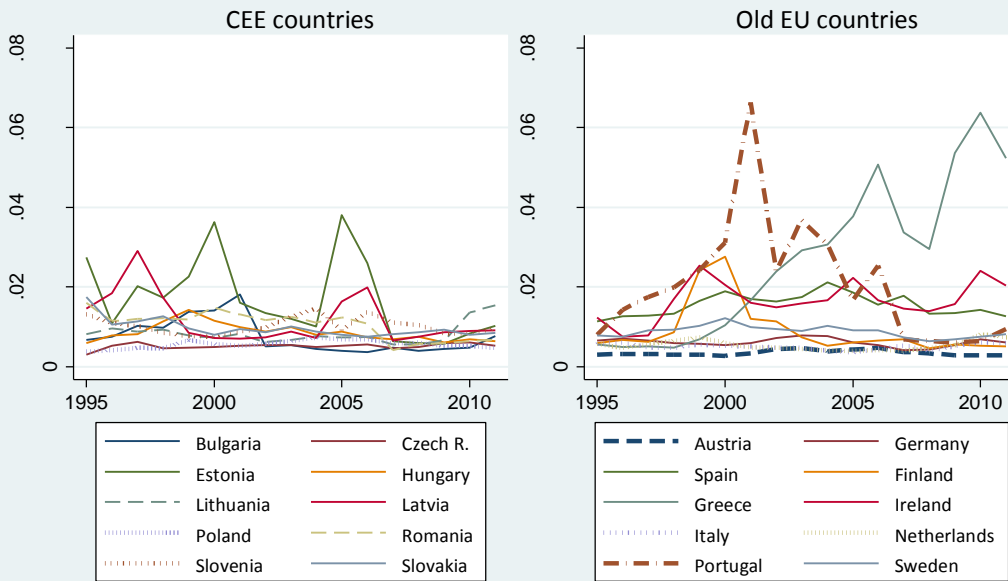
3. Concentration of IIT – measured by products and by sectors

The level of concentration of the IIT of CEECs has not been studied in the literature. In itself, this concentration might not be a phenomenon worth the attention of economists (and actors of economic policy). Except if IIT has an important and further increasing share in the trade of one or several countries. This is what we can observe at several countries (the Czech Republic, Poland, Hungary, Slovakia), and this has implications for the concentration of their exports in general, which is already worth our attention. We measure concentration with Herfindahl indexes.

² The literature on the development of international production networks is huge, (e. g. Sun – Zhang 2009 and Bair (ed.) 2009). For a recent review of the literature see Chen (2012).

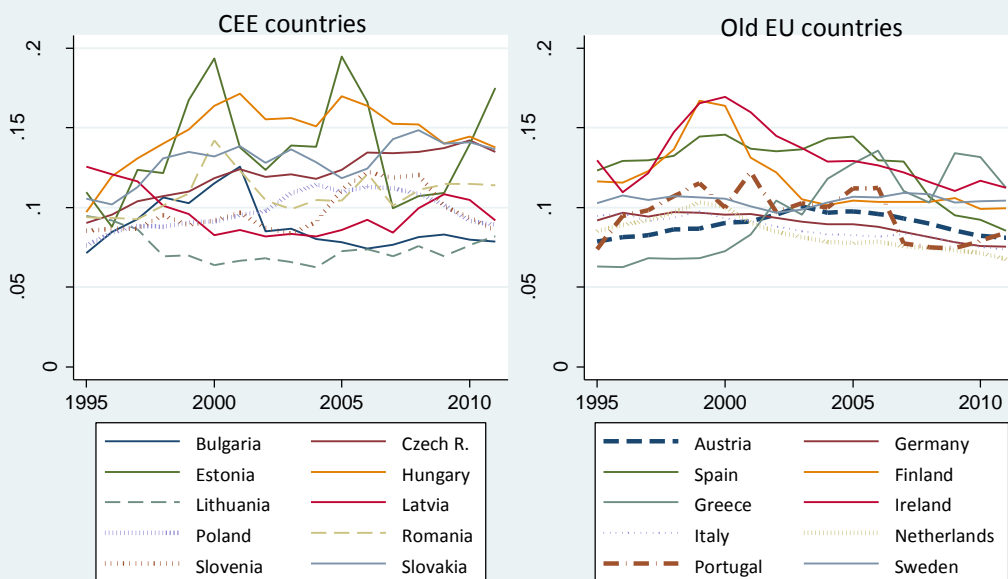
³ Cf. EBRD 2012. The Czech Republic is considered graduated from transition. From 2008 on, no transition indicators have been calculated for this country.

Graph 2.1 Concentration of IIT measured at product (CN 8 digit) level(Herfindahl indexes)

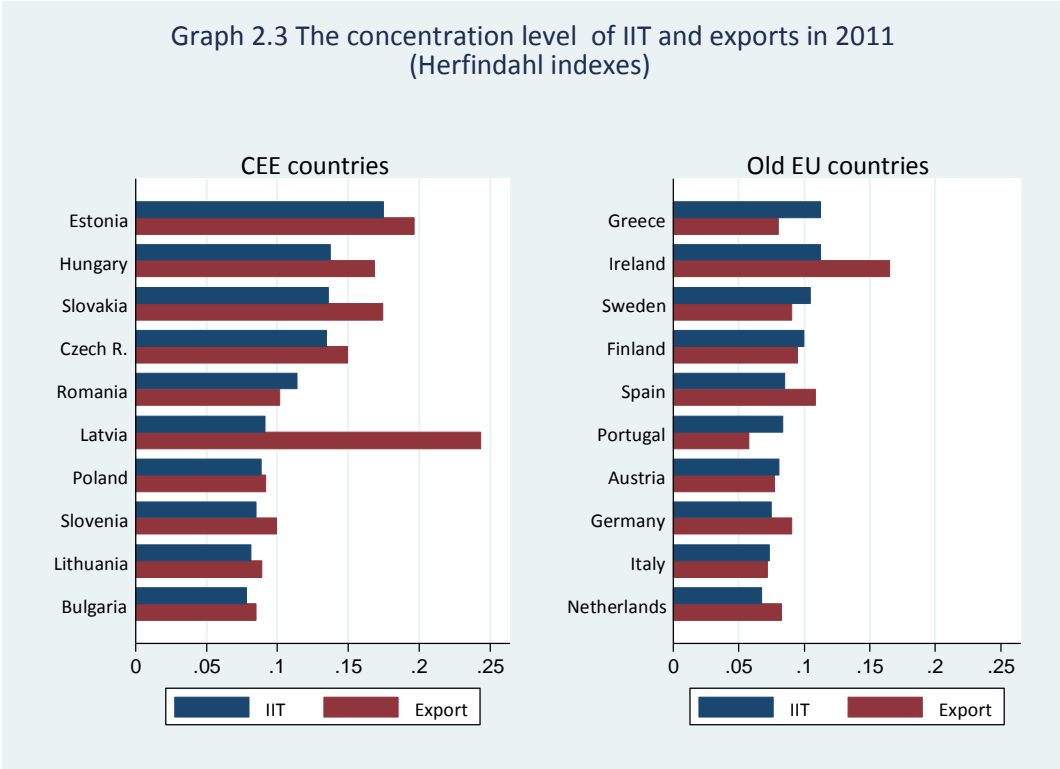


In Graph 2.1, we present the concentration of IIT of CEECs and old EU countries. Here we measure concentration at the product level (Combined Nomenclature – CN – 8 digit). This graph does not suggest any peculiarity for the CEECs. But the latter does not hold for the concentration of IIT measured at a higher level of aggregation – HS 2 digit chapters –, as the reader can see in Graph 2.2.

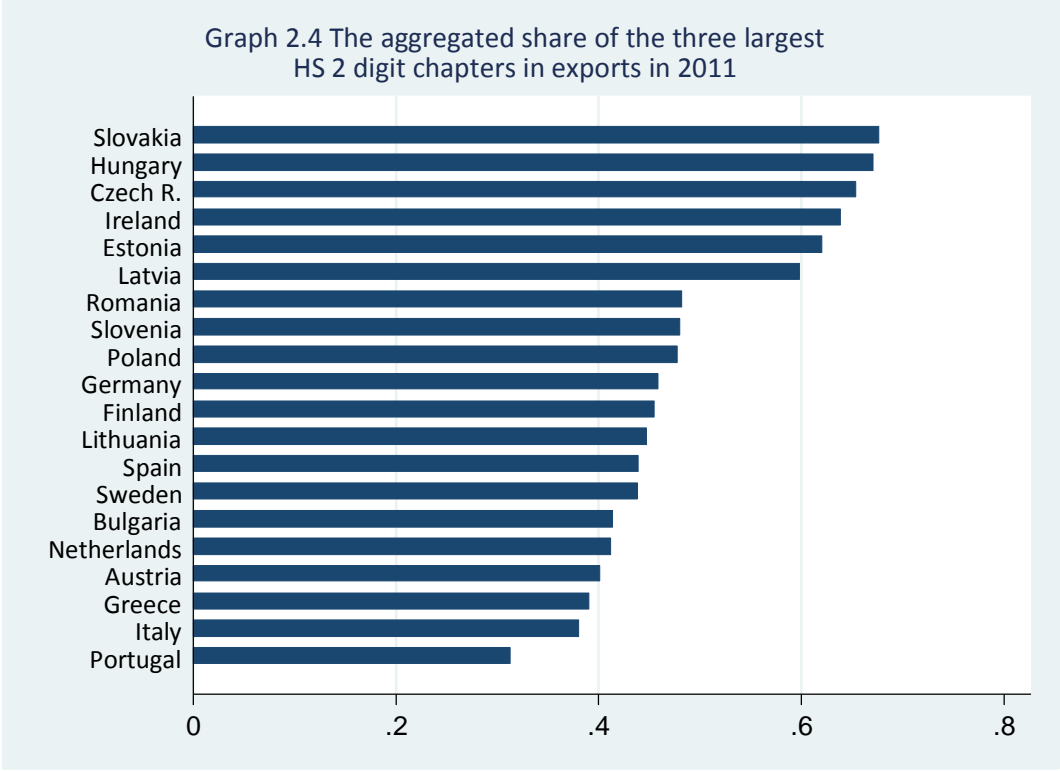
Graph 2.2. Concentration of IIT measured at HS 2 digit level (Herfindahl indexes)



What we can observe in Graph 2.2 is that those old EU countries that had high IIT concentration at the HS2 digit level around the year 2000 (Ireland, Finland and Spain) had diminishing concentration levels over the last decade. The only old EU country (of the 10 in our sample) having high (and strongly fluctuating) IIT concentration level in the last years is Greece (whose economy is very strongly services-oriented, with a relatively weak manufacturing sector). On the other hand, among CEECs not only Estonia has high (and fluctuating) level of IIT concentration (which in a very small country is little surprise), but also Hungary, Slovakia and the Czech Republic and what is more, with Hungary's exception in the last few years, the concentration level follows a rising, rather than declining, trend.

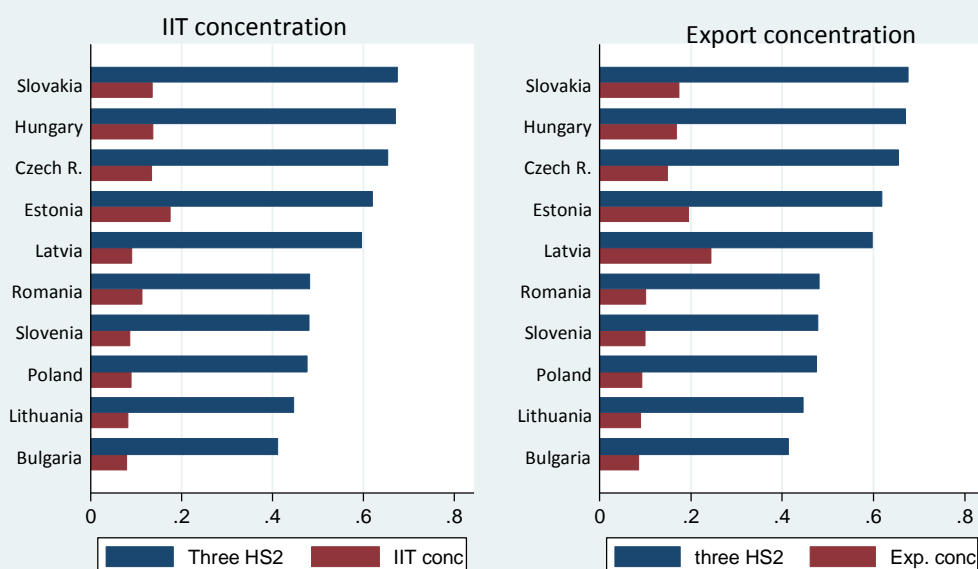


And export concentration – also measured in HS 2 digit chapters – as displayed in Graph 2.3 together with IIT concentration, shows basically similar picture to the latter. In the graph, the relationship is shown only for the year 2011. Omitting Ireland and Latvia, visibly outliers, we can demonstrate the validity of the relationship between the two kinds of concentration with a panel estimation for the whole period. Taking into consideration the visibly bigger positive impact of IIT concentration on export concentration at CEE countries (left panel in Graph 5), we also use another, cross effect-type independent variable: $cee\ dummy * IIT\ concentration$. Both independent variables' coefficients are positive (0.60 and 0.24 respectively), both are highly significant, and the estimation explains 52 percent of the standard deviation of the concentration level of exports. (Details of the estimation are described in Annex 2.)



Looking at the share of the three largest IIT chapters in the exports of our 20 countries (Graph 2.4), we can see that this indicator is outstandingly high for Slovakia, Hungary and the Czech Republic. They are followed by Ireland but the next five are again CEECs. Only two of the 10 CEECs, Lithuania and Bulgaria, are “laggards” according to this indicator. And Graph 2.5 demonstrates (with Latvia as an outlier) the positive relationship between three various concentration indicators: Herfindahl indexes of IIT and exports (measured at HS 2 digit level) and the share of the three largest HS 2 digit chapters in total exports.

Graph 2.5 The three largest HS 2 digit export chapters and the concentration (Herfindahl indexes) of IIT and exports



We can also examine which HS 2 digit chapters are the ones giving very high shares of total exports (and at the same time also dominating IIT) for more than two thirds of the CEECs.

Table 2.1 The five largest Harmonised System 2 digit chapters, ranked by size, of the IIT of CEE countries in 1995 and 2011

Country	ranking in 1995					ranking in 2011				
	1	2	3	4	5	1	2	3	4	5
Bulgaria	84	61	62	85	64	85	84	30	87	61
Czech R.	84	85	87	73	39	84	85	87	39	73
Estonia	84	62	85	94	73	85	84	87	39	73
Hungary	85	84	87	39	73	85	84	87	39	90
Lithuania	61	62	94	85	51	39	85	87	84	30
Latvia	62	94	61	85	84	87	84	73	85	39
Poland	84	85	87	73	39	87	84	85	39	73
Romania	85	84	61	62	64	85	87	84	30	73
Slovenia	87	84	85	94	39	87	84	85	39	30
Slovakia	87	85	84	39	94	87	84	85	39	73

As the reader can see in Table 2.1, in 2011 three HS2 sectors – 84 (non-electrical machinery), 85 (electrical machinery) and 87 (products of automotive industry) – were among the first (largest) five for all CEECs, whereas in 1995 yet at least one of the three was missing from the first five at half of the countries. And in 2011 already these three chapters were the three largest for all countries, with the exception of Bulgaria, Latvia and Lithuania (but two of the three are among the first three even in the case of these – as we can see in Graph 2.4, low-IIT – countries). The situation is crystal-clear:

these three chapters dominate the CEECs' IIT. And they also dominate these countries' exports, as it is visible in Table 2.2.

Table 2.2 The five largest Harmonised System 2 digit chapters, ranked by size, of the exports of CEE countries in 1995 and 2011

Country	ranking in 1995					ranking in 2011				
	1	2	3	4	5	1	2	3	4	5
Bulgaria	72	62	74	31	84	74	85	84	62	61
Czech R.	84	85	87	72	73	84	85	87	73	72
Estonia	44	62	84	72	85	85	44	94	84	87
Hungary	84	85	62	87	39	85	84	87	90	39
Lithuania	44	62	31	72	85	39	94	31	44	62
Latvia	44	72	62	74	61	44	87	72	84	73
Poland	62	94	87	85	44	84	87	85	94	39
Romania	62	72	64	94	76	85	87	84	62	94
Slovenia	87	84	85	62	94	87	85	84	72	94
Slovakia	72	87	62	85	84	87	85	84	72	40

In 2011, at six of the ten old EU members also these three HS 2 digit chapters were the largest ones but, with Germany's exception, they were much less dominant than at the CEECs (this can be seen in Graph 2.4). And four countries had other chapters among their largest three: organic chemicals (Ireland and the Netherlands), pharmaceutical products (Greece and Ireland), paper and iron and steel (Finland), aluminium products (Greece).

We have to underline that the observed high sectoral concentration of IIT and of exports at most CEECs is not a favourable phenomenon. The most obvious case in this respect is Slovakia's strong specialisation on automotive industry. As the European Automobile Manufacturers' Association's Slovakia Country Profile (at <http://www.acea.be>) states, this country is the largest per capita car producer in the world. The Slovak economy is strongly exposed to the car industry's international fluctuations. The automotive industry accounted for 17% of this country's total GDP in 2010, the vast majority of which was destined for export, cf. Automotive (2012). In Slovakia the decline of manufacturing production in 2009 was „led unsurprisingly by the car industry, which had previously been the growth motor.“, cf. Hugh (2009).

Slovakia's, as well as Hungary's and the Czech Republic's exposure to international fluctuations is aggravated by the fact that all the three HS 2 digit chapters, which dominate their IIT and exports, are parts of the engineering sector, serving mostly for investments (consumer, business and public investments). Thus, demand for them fluctuates with bigger amplitudes than e. g. demand for pharmaceutical products.

Diagnose should be followed by ideas for therapy. What can easily be told on the latter account is that hindering the diversification of the economic structure in any way – e. g. by the preferential treatment of “productive” investments against the service sector – is harmful and should be avoided. On the other hand however, we certainly cannot recommend any restriction of further investments in the engineering sector of any CEECs' economies. Promoting investments in other sectors is desirable but direct ways towards this objective (investment subsidies and the like) may entail more

harm than good. Stimulating research and innovation in non-engineering high-tech industries (chemistry, pharmaceuticals, biotechnology etc.) might be useful, as well as strengthening vocational training in those fields. Such measures may promote FDI, IIT and thus exports in non-engineering sectors. Other related issues (policies aiming at strengthening small and medium-sized enterprises, etc.) may also be relevant but are far from our subject here.

4. Horizontal and vertical – high-quality vertical and low-quality vertical – intra-industry trade

The development of IIT between CEECs and the EU of that time was visible already in the early 1990s (important figures on this development were published in Gács 1994). The question most frequently asked with respect to intra-industry trade between the CEECs and the old EU member countries is whether with such trade CEECs achieve high manufacturing quality standards or they only become suppliers of low-quality goods to Western European consumers and/or sites of unskilled/low-skilled work phases of international production networks. As we mentioned above, the theoretical literature on IIT attributed theoretically the second, subordinated role to less developed countries. Lots of researchers feared that within IIT, the manufacturing sector of the CEECs would receive such a role (Gabrisch – Werner 1998). Some analyses found developments that seemed to confirm these fears (e. g. Aturupane et al. 1999).

However, more optimistic views also emerged rather early. E. g., according to Winters, – Wang (1994, p. 133), on the basis of certain indicators of education, “The clear indication is that Hungary is likely to be a significant exporter of engineering goods. It appears to have the labour force skills important to both high- and mid-tech exports.” Halpern (1995) mentioned signs of good technological capabilities of some of the countries, and wrote that with the necessary investments, including foreign direct investments, CEECs „will be able to expand intra-industry trade with the West based on product differentiation rather than relying on relatively low labour cost as in the more recent past.” (P. 83.) One strand of pessimistic forecasts considered the human capital endowments of CEECs irrelevant, at least for the medium term. According to this view, the CEECs seemed destined to have a comparative disadvantage in the high-skill sectors simply because their markets were small, and high-quality production tended to move towards countries having large markets (Ferragina – Pastore 2005) . (Let me remark: this approach, based on economic geography theory, concerns only the production of final products, and it is irrelevant for the production and trade of intermediates, on which the IIT of CEECs is largely built.)

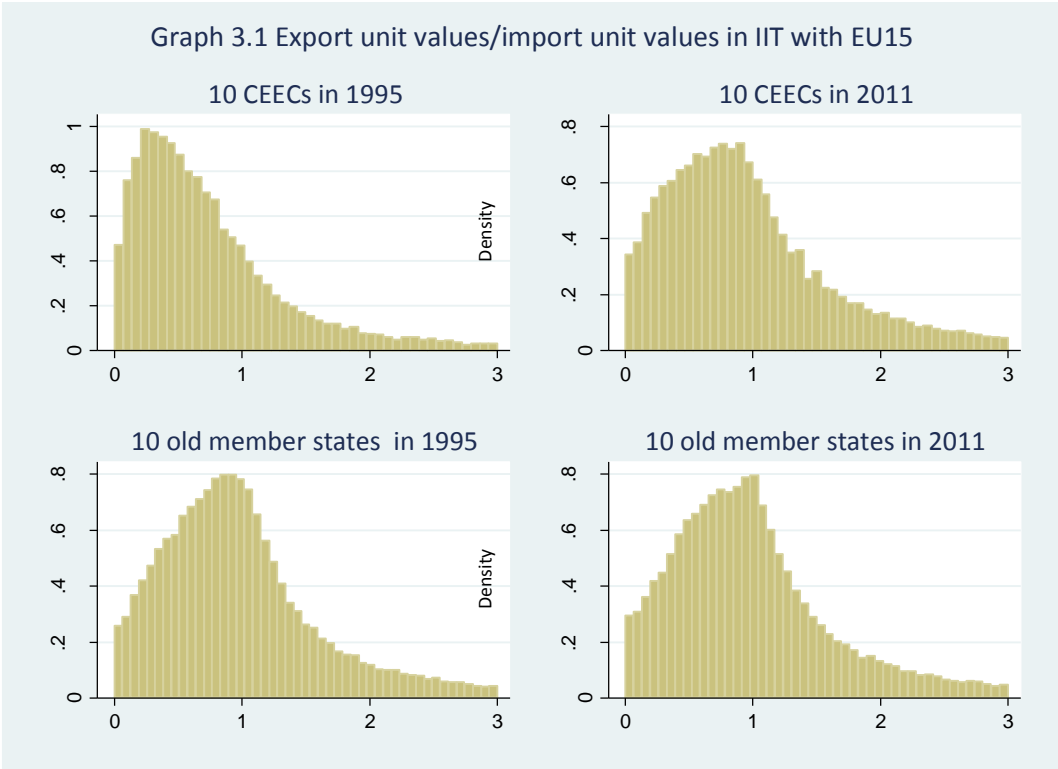
WOLFMAYR-SCHNITZER (1998) saw reasons for optimism in the development of IIT itself, stating that the latter

„is a phenomenon mainly observed in trade among industrialised countries with similar demand and supply characteristics. For this reason, ... an increase in the share of IIT in two-way trade of the CEECs and the OECD may be associated with the decrease in the developmental and technological gap between the countries of the two regions...”. (P. 81.)

Let me remark here: our own research has found that IIT’s development necessarily remains rather limited between countries whose manufacturing industries are at strongly different levels of development (Fertő – Soós 2012).

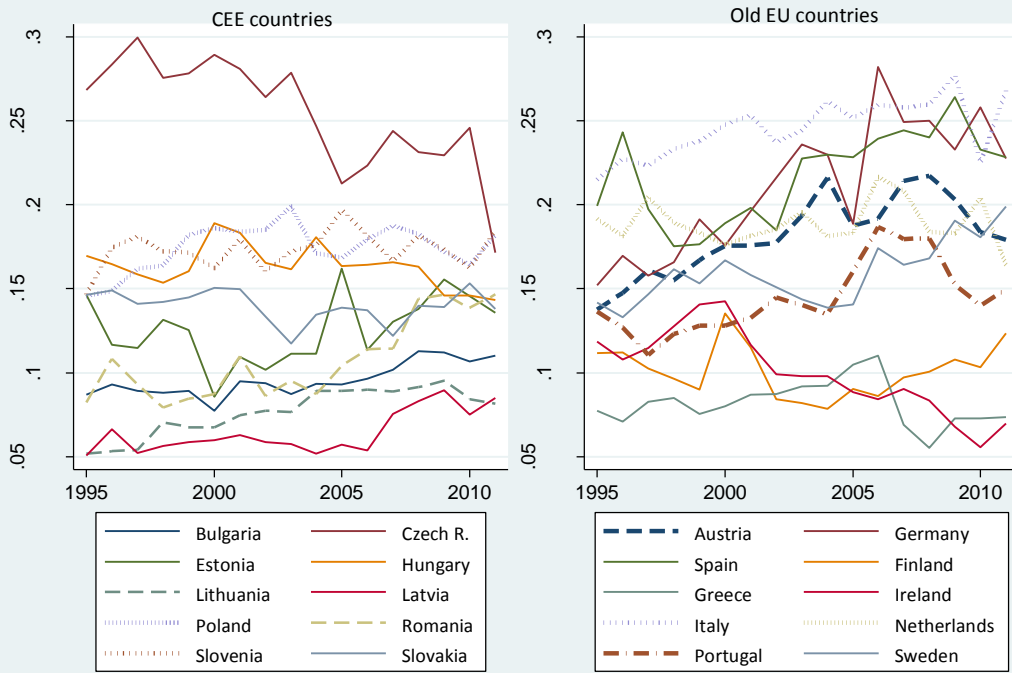
The distinction between horizontal and vertical IIT is the usual starting-point of attempts to clarify whether and to what extent IIT means an upgrading of emerging market countries’ – among them

CEECs – manufacturing industries. Upgrading means improving quality of products (of course, upgrading might also mean higher productivity, more environmentally friendly technologies, etc. but these dimensions of industrial development are not related to IIT.) And economists relate product quality and the improvement (upgrading) of product quality to unit values (Greenaway et al. 1994 and 1995). This measurement of product quality is not perfect but it is the best simple and available solution. Horizontal IIT means that part of total IIT (IIT in those sectors) where the unit value (value/weight) of the two-way trade flows is roughly similar. Roughly similar mostly (including in this paper) means differences less than 15 per cent. I. e., IIT is horizontal if the unit value of exports is between 85 and 115 per cent of the unit value of imports, and it is vertical otherwise. In the vertical case, one side’s product is cheaper, meaning lower quality. In some first papers on IIT between CEECs and old EU member countries, it was taken for granted that the CEECs were on the latter side, i. e., they had low-quality – LQ – vertical IIT whenever IIT between them and industrially more advanced countries was vertical (e. g. Aturupane et al. 1999). That was not quite true even then (Soós 2000). And CEECs’ relative export unit values (export unit values/import unit values) have improved very significantly over the last one decade and a half, as we show it in Graph 3.1. The mode of these relative values had been about one quarter; it improved to almost one. And the right tail of its distribution thickened importantly.

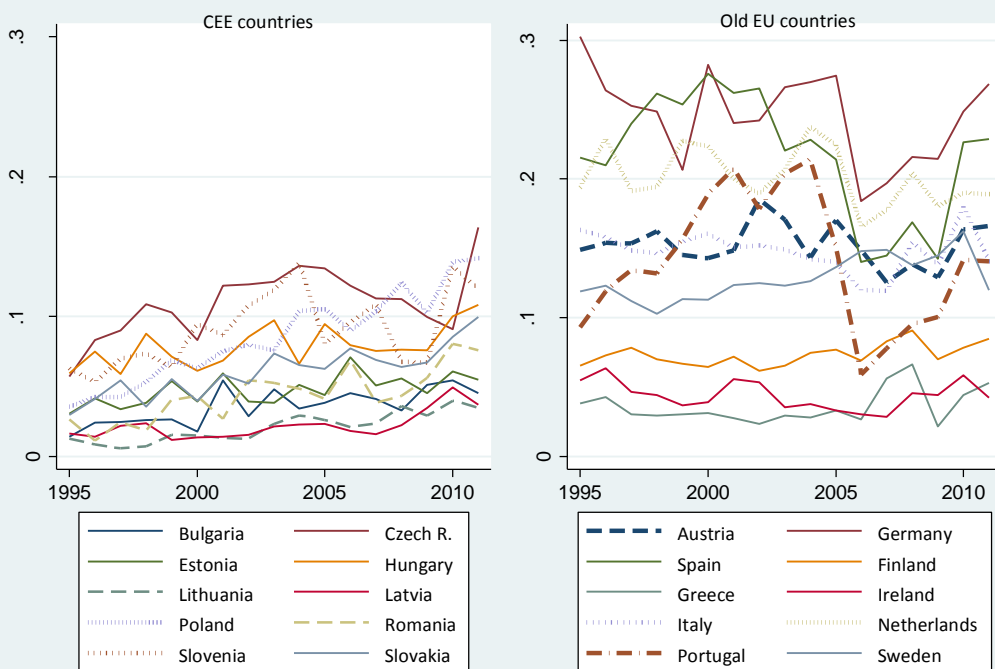


This increase of CEECs’ relative export unit values is reflected in the diminishing share of LQ vertical IIT in their trade with EU 15 that we can observe at half of the CEE countries in Graph 3.2. At the same time Bulgaria, Latvia, Lithuania and Poland recorded growth in this share (the first three from rather low starting levels) between 1995 and 2011, and Estonia had stagnation. Such growth or stagnation is little reason for shame. As we can see in the right panel of the graph, also Austria, and even Germany and Sweden, had increasing share of LQ vertical IIT. Of course, stagnating and even slowly declining shares hide growing absolute figures with increasing total trade.

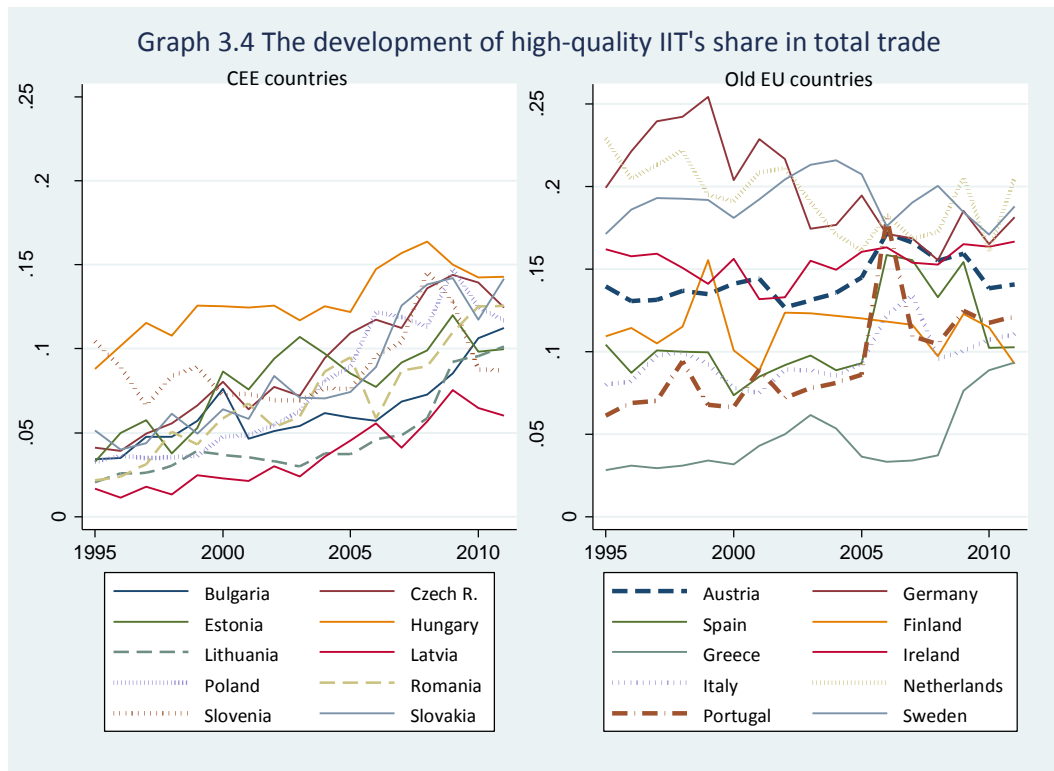
Graph 3.2 The development of low-quality vertical IIT's share in total trade



Graph 3.3 The development of horizontal IIT's share in total trade



Horizontal IIT's share in total trade displays upward trend for all CEECs, and HQ vertical IIT's increasing share at this country group is even more obvious – faster – as we can see in Graphs 3.3 and 3.4, respectively.



It is interesting to have a look at the right panel of Graph 3.4. In the changes of the share of horizontal IIT we cannot see any general pattern at old EU member countries but here, at HQ vertical IIT, a certain convergence can be observed. Those countries that had a high share of such IIT in the first years of the period observed display a somewhat decreasing trend, whereas countries weaker in the late 1990s in HQ vertical IIT have increasing shares later. The centre of the interval, in which the convergence process stands in 2011, is somewhat below 0.15, meaning a 13 to 14 percent share of HQ vertical IIT in total trade. As we can see in the same graph's left panel, the four "Visegrád" countries (the Czech Republic, Hungary, Poland and Slovakia) have reached this level in the last years of the period observed. Thus can we conclude that the analysis of IIT suggests that the process of technological upgrading of these CEECs has reached the level characterising the advanced industrial countries of Western Europe?

Such a conclusion would not be well-founded. Intra-industry trade – indeed the functioning of international production networks – is a rather complex mechanism. In the IIT in the field of manufacturing between Japan and other East and South-East Asian countries, and even between Japan and CEE countries (Faustino 2009) a similar ostensible upgrading was observed by researchers, and more thorough analyses led to the conclusion that the explanation behind it is not some outstandingly high technological level achieved by those countries. The logic of international production networks is different from that. As Ando (2006, p. 276) states,

“vertical IIT cannot be fully explained by the hypothesis of the ‘quality ladder’; rather vertical IIT reflects not only intra-industry trade of quality-differentiated commodities, but also back-and-forth transactions in vertically fragmented production chains in the same commodity category.”

Taking an imaginary extreme (European) example, a product assembled in Hungary by semi-skilled workers from high-tech component parts produced in Germany will normally have higher unit value than those component parts, with which it may be classified into one and the same CN eight-digit

category. Then the related (inter-country but often intra-firm) trade will be IIT – either horizontal or HQ vertical for Hungary and conversely, LQ vertical for Germany. And behind it there is hardly any outstanding Hungarian technological upgrading, since the work is done by semi-skilled workers in Hungary.

And what if we restrict our interest to the trade of such products whose production cannot be separated from their research and development?

5. Exports and imports of “Schumpeter mobile and immobile” industries

Manufacturing products whose production is research- and development-intensive are sometimes called Schumpeter goods and the industries producing them Schumpeter industries (Dettmer et al. 2011). This may reflect a rather particular interpretation of Schumpeter’s growth and innovation theory but let me avoid the creation of a new terminology here. An important distinction within this category is the one between Schumpeter mobile and immobile industries. Mobile ones are those industries (and their products), which allow the geographic separation of research and production. Conversely, the fabrication of immobile products requires the presence of research personnel and activities at the site of production. The distinction was established by Klodt 1987 and 1989, who polled a series of large industrial companies on the details of their cross-border activities. He examined the share of foreign-affiliate sales in total sales as compared to the export-sales ratio of the parent company. Industries with higher shares are mobile, those yielding lower shares are immobile industries. The classification of Schumpeter industries (SITC 2 digit product groups) into mobile and immobile ones can be found in Annex 3.

The trade of Schumpeter mobile and immobile industries can be considered a particular kind of intra-industry trade, where “industry” means research-intensive manufacturing activities, mobile and immobile in the sense described above, rather than industries or products classified on other, more usual bases basically related to the use of the products.

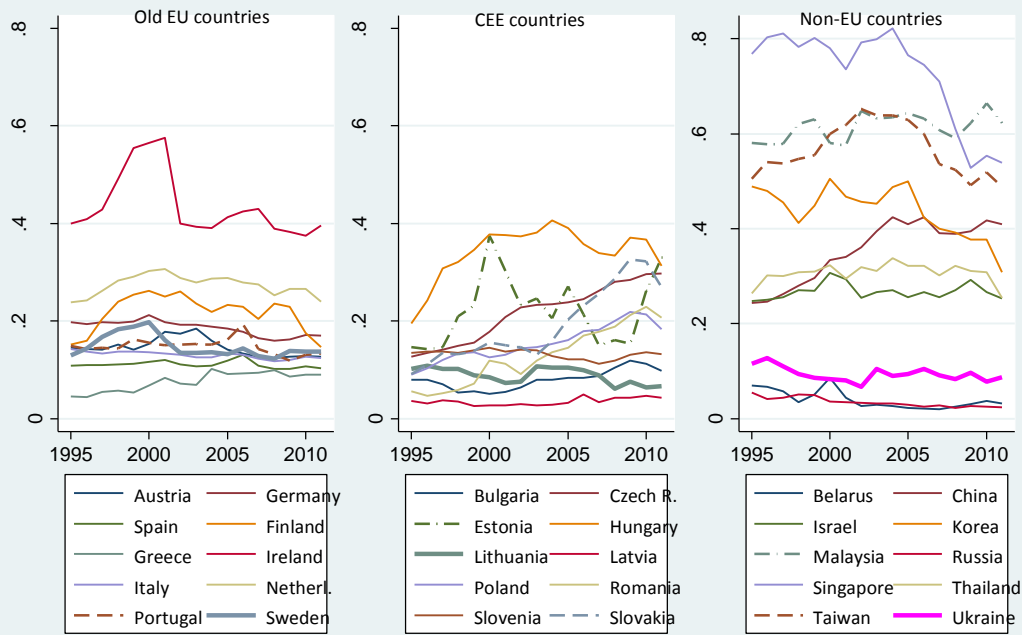
Europe’s (the EU 15’s) trade with China of mobile and immobile products is analysed by Dettmer et al 2011. Not surprisingly, they find that the position of the EU in the trade of Schumpeter industry products was strong in 1999 and remained so in 2008, and the

“EU has especially strengthened its competitiveness in industries of the immobile type (...). Products of mobile Schumpeter industries are subject to increasing Chinese comparative advantages.” (p. 56.)

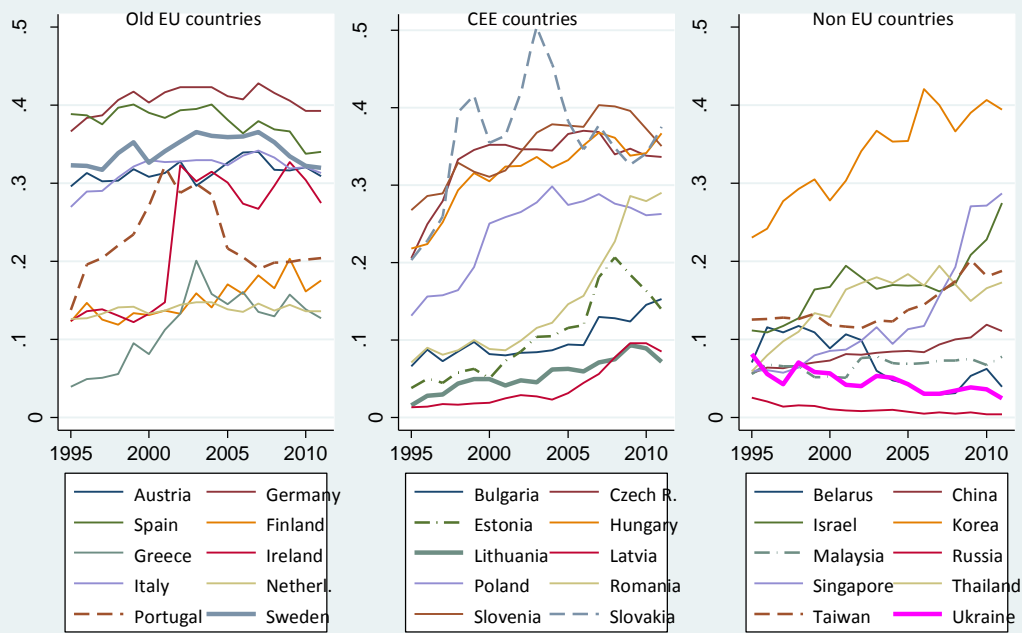
Schumpeter products’ trade also plays an important role in CEECs’ international trade, including in their trade with EU15, being worth our attention. Here, our analysis will differ in two important respects from the approach followed in other paragraphs of this paper. First, beyond our usual 10 CEECs and 10 old EU member countries we have included 10 non-EU member countries from Europe and Asia: Belarus, China, Israel, Korea (South), Malaysia, Russia, Singapore, Taiwan, Thailand and Ukraine. Second, following Dettmer et al. 2011, we calculate the indicator using “total commodity exports (imports)” to EU15, i. e. not, as elsewhere in this paper, exports and imports of manufacturing goods, in the denominators.

First let us have a short look on Schumpeter mobile and immobile products’ export shares (Graphs 4.1 and 4.2).

Graph 4.1. The share of Schumpeter mobile exports in total commodity exports to EU15



Graph 4.2 The share of Schumpeter immobile products in total commodity exports to EU15



Visibly, the range of CEECs' Schumpeter mobile export shares is similar to that of old EU member countries, meaning mostly rather low shares as compared to the corresponding export shares of most non-EU countries. However, in the case of Schumpeter immobile exports, the picture is rather different. Here, all CEECs display improving performance over the observed period, among them the immobile export share of four countries – the Czech Republic, Hungary, Slovakia and Slovenia – and

at the end of that period reaches the level achieved by the technologically most advanced old EU member countries.

Beyond absolute export shares, more important is export performance compared to the import of similar products, which shows comparative advantages. Our “revealed comparative advantage” indicator is the usual Balassa indicator, the natural logarithm of the ratio of the share of mobile or immobile products in exports and the same share in imports (Balassa 1965). With this indicator, the no-advantage-no-disadvantage line in our graphs 4.3 and 4.4 (revealed comparative advantages of 30 countries in their trade with EU 15 in the trade of Schumpeter mobile and immobile products, respectively) is at value zero. Above the zero line, the country has comparative advantage, below it it has comparative disadvantage vis-à-vis EU15. In the notes to the graphs we give the exact definition of the indicator displayed.

The reader can see that old EU member countries (Graph 4.3, left panel) are all rather close to the “neutral” no-advantage-no-disadvantage line in the trade of mobile Schumpeter products. Particularly close are to it Germany and Portugal. Below the line is, displaying some comparative disadvantage, the no less strange pair of Sweden and Greece. However, these and other differences and “pairs” observable among these countries do not reveal any real regularity; the basic fact remains that all these countries are close to the “neutral” line. This is what distinguishes them from the other two country groups whose dispersion around the no-advantage-no-disadvantage line is wider. Five of the six countries displaying significant comparative disadvantage are former Soviet republics with low-middle income levels: Belarus, Ukraine and Russia among non-EU countries (right panel) and Latvia and Lithuania (plus Bulgaria) among CEECs (central panel), all largely raw material (and partly energy) exporters. The other non-EU countries are above the “neutral” line (Korea, Singapore, Taiwan and increasingly also China), or above but close to it (Israel, Malaysia, Thailand). Seven CEECs’ positions are below or above but close to the “neutral” line, just like those of old EU member countries.

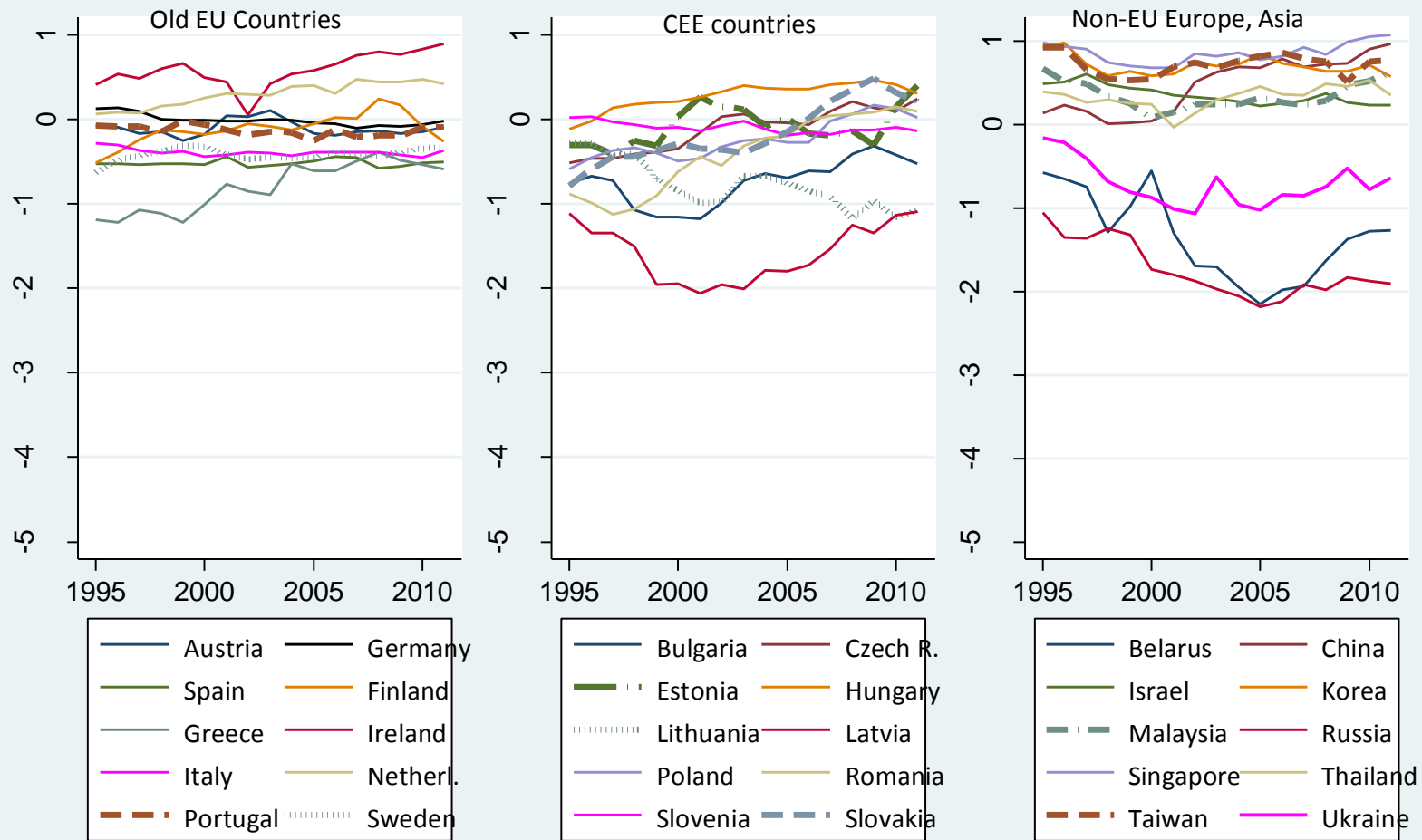
Turning now to revealed comparative advantages in the trade of Schumpeter immobile products (Graph 4.4), we can observe that only four old EU member countries (left panel) are relatively far below the “neutral” line: Finland, Greece, the Netherlands and Portugal. Others are closely around or (Germany and, increasingly, Ireland) distinctly above the line, displaying comparative advantages in this important and delicate field. At the same time, all non-EU countries (right panel) are below the “neutral” line, in most cases (with South Korea’s, Israel’s and, towards the end of the period observed, Singapore’s exception) rather far below it. In the CEE group (central panel), we can observe two important phenomena. On the one hand, six of the ten countries (the Czech Republic, Hungary, Poland, Slovakia, Slovenia and, towards the end of the period, Estonia) clog together around the “neutral” line. Thus they show a picture similar to the old EU member countries’ group, even though they are in a somewhat lower lane. On the other hand, with positively sloped lines, all CEECs have improving revealed comparative advantages (or diminishing comparative disadvantages) in their trade of Schumpeter immobile products. Similar positive trends appear at some countries of the old EU group. (With the already achieved high levels – saturation – the “headroom” might be rather small for most of these countries; but Finland, Greece, Ireland and Portugal, which have more “headroom”, do display improvement.) At non-EU countries, improvements are mostly not visible (but notice Israel, Korea and Singapore).

In interpreting the results received for the revealed comparative advantages in the trade of Schumpeter immobile products, we have to take into consideration the possible (and, as we will see, possibly multiple) role of the geographical distance factor. Six Central European countries (the Czech Republic, Estonia, Hungary, Poland, Slovakia and Slovenia), i. e., all those having good performance (some comparative advantage or only a small disadvantage) in this trade, are very close to EU 15, with Estonia's exception closer to EU 15's densely inhabited central areas than any member of our non-EU country group. Smaller distance means smaller transportation costs, always implying an advantage in trade, but here we are discussing such trade in which transportation costs have rather limited importance. Schumpeter immobile products tend to have high unit values, their prices can support transportation costs more easily than prices of most other products. Nevertheless, even though the importance of transport cost differences between the Central European countries and Korea, Taiwan, etc. is limited, those differences might yield better comparative advantage positions in the trade of Schumpeter immobile products to the six Central European countries than to those Asian ones. However, then the lower transport costs should similarly yield better positions to the former than to the latter in the trade of Schumpeter mobile products, which, as we have seen, is not the case.

Thus, having arrived to the statement that the six Central European countries display better revealed comparative advantage positions (small advantages or only very small disadvantages) in the trade of Schumpeter immobile goods than in the trade of Schumpeter mobile goods, can we state that this reflects an outstanding level of upgrading of the Central European countries? Well, not really. The trouble is that geographical distance of Central European countries from the EU 15, or more exactly from two of its important technological and manufacturing areas (Northern Italy and Southern Germany) is so small that it might be rather irrelevant from the point of view of the "non-distant-location-requirement" of the production of Schumpeter immobile products. I. e., whereas research and development of such products cannot be thousands of kilometres away from their fabrication, distances of some hundreds of kilometres might not be a problem. Research and development can be in Bavaria or Piedmont; the production unit in Hungary or the Czech Republic will only be some hours of car driving away, i. e., not really distant. And let us note: even within-country allocations show some trends towards further reducing this distance.⁴

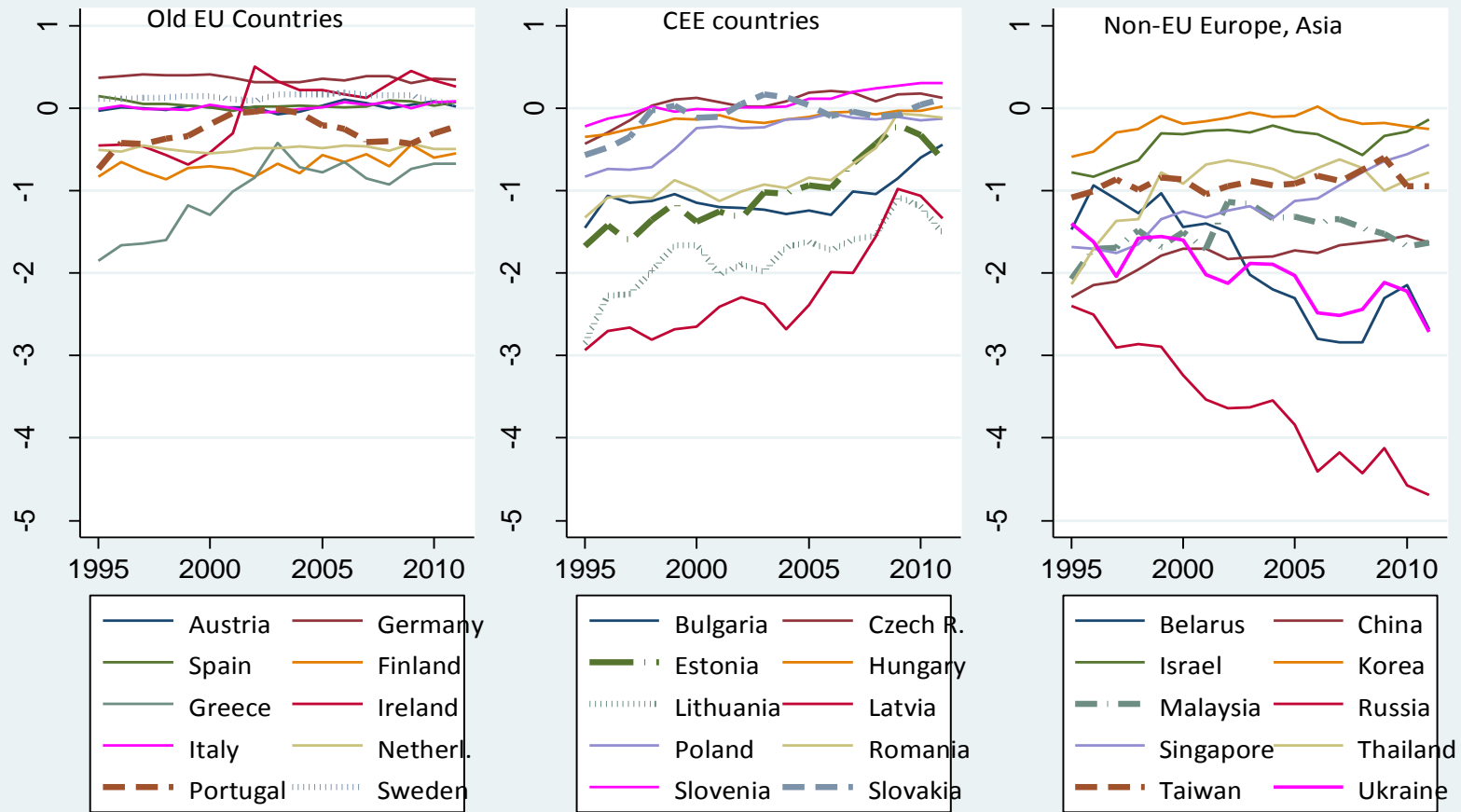
⁴ Trends towards allocating foreign investment enterprises close to the Western border can be observed in Hungary (Fazekas 2003). (But let me note: this source does not specifically treat Schumpeter immobile industries.)

Graph 4.3 Revealed comparative advantage/disadvantage in the trade of 'mobile' Schumpeter (research-intensive) manufacturing products



Note: calculated as $\ln\left(\frac{\text{exports of 'mobile' products}/\text{total commodity exports}}{\text{imports of 'mobile' products}/\text{total commodity imports}}\right)$

Graph 4.4 Revealed comparative advantage/disadvantage in the trade of 'immobile' Schumpeter (research-intensive) manufacturing products



Note: calculated as $\ln[(\text{exports of 'immobile' products} / \text{total commodity exports}) / (\text{imports of 'immobile' products} / \text{total commodity imports})]$

6. Behind trade: upward pull or downward push impact of IIT on skill levels in CEECs?

6.1 The issue in the literature

Our finding of rather favourable positions of CEECs – and particularly of the Czech Republic, Hungary, Poland, Slovakia and Slovenia, the five Central European countries – confirms other researchers' similar results in their in horizontal and HQ vertical IIT and even in the trade of Schumpeter immobile products (e. g. Palazuelos-Martinez 2007) but our difficulty remains basically the same that we faced with the observation of hints to upgrading in the increase of the share of horizontal and high-quality vertical IIT of these countries. Namely, these research results do not answer the question of what role the workers of these countries play in the production of those goods.

Egger – Stehrer (2001) found that in the Czech Republic, Hungary and Poland in 1993-1999 the increase of intermediate exports to and imports from the that time EU – i. e., the bulk of IIT – had a negative impact on the skill premium, obviously meaning that IIT-related manufacturing activities at that time were not skill intensive . Some authors find that the outsourcing of labour intensive phases of production to CEECs was predominant not only at the beginning of the transition but even in the early 2000's (e. g., in Poland's case according to Ulff-Moller Nielsen – Pawlik 2008). At the same time, quite a few papers have found that skilled labour and research intensive exports of Central European countries have been increasing. However, in relation with findings of the latter kind the question remains: what particular kind of work is being done on those products in these countries? What is the place of these countries in the value chains producing those research intensive products? With the increase of foreign direct investments in CEE countries, IIT is increasingly related to such investments (cf. supra). Taking into consideration observations (e. g. Alfaro – Charlton 2009), according to which companies functioning in high-tech industries often tend to restrict their overseas investments to high-tech activities (and to purchase low-tech inputs from alien companies), we can guess that real upgrading, i. e. more or less increase of the share of skilled work is going on. Marin 2004 finds obvious signs of outsourcing skill intensive activities and even research by Austrian and German companies to their subsidiaries in CEECs. Her results show that the outsourced activities are more skill intensive than those remaining in the companies' home countries. The research of Lorentowicz et al. (2005) leads to the conclusion that

“with the new international division of labour emerging in Europe Austria, the high income country, is specializing in the low skill intensive part of the value chain and Poland, the low income country, is specializing in the high skill part”, p. 1.

The authors also show that, as a result of such trends, the skill premium in incomes has been increasing in Poland and decreasing in Austria. In Hungary, a particularly high growth of the skill premium could be observed after 1995 (Kézdi 2002). The latter author (in line with trends observed by Feenstra and Hanson 1997 in other emerging countries) has also found positive relationship between foreign ownership and demand for skilled labour. Given the important role of foreign investment enterprises in Hungarian IIT, we have to guess an also positive relationship between increasing IIT and increasing demand for skilled labour.

6.2 Upward pull or downward push impact of IIT on skill levels in CEECs? Some calculations

This review of the literature suggests that, particularly directly before and since EU accession, i. e., in the 2000's, and more strongly in Central Europe (the Czech Republic, Hungary, Poland, Slovakia and Slovenia) than in the Baltics (Estonia, Latvia and Lithuania) or in the two Eastern European EU member countries (Bulgaria and Romania), IIT basically entailed a positive bias towards the employment of skilled labour. Available statistical data yield us some possibility to examine this trend, unfortunately, only for Hungary.

First, let us specify our question. Of course, the best thing would be to know exactly, workers with what skills work in IIT-related manufacturing. The usual formulation of the question – upgrading – suggests comparative measurement: do workers participating in the production of the products traded in IIT have higher or lower skill levels than their counterparts have in advanced Western European countries? However, we have two problems with this question. One is the obvious difficulty of giving any exact answer to it: that would require tremendous work. The other problem is that we can often guess an approximate answer. If the counterpart is Sweden then the skill advantage is probably on that side; if it is Portugal then the opposite is much more likely. An alternative question might be the impact of IIT on the demand for workers' skill. Does this demand pull the skill level of CEEC workers upwards, or rather, does it push that level downwards? With IIT being a dynamically increasing part of trade and thus manufacturing activities related to it having an important impact on the demand for workers, this question seems to be an important one.

Important, even though the reader might say, and not without some reason, that we ask this specific question because this is the one to which we can give some tentative answer.

For the tentative answer we can use two datasets. One (let us call it foreign trade–balance sheet database) is built on merging foreign trade statistical data with the balance sheet data of Hungarian companies applying double-entry accounting. The number of firms included in the database in 1995-2003 was between 62000 and 131000, fluctuating because of changing legal obligations of the companies to keep double-entry accounting. Thus the database does not include all Hungarian exports, and data are also missing from it partly with the purpose of protecting business secrets (some companies' data could easily reveal their identities), and partly because of inaccuracies. Export data in the database are given in a conveniently disaggregated form (by partner countries in HS 6 digit). We can summarise the export, workers' earnings and headcount data by HS 6 digit exports (several companies may export the same product). The export data received are largely different from those published by Eurostat. We stick to Eurostat data, which practically means that the enterprise data of the foreign trade–balance sheet database become data representing industrial sectors exporting various HS 6 digit products. And we take the quantities of those exports (and of course also of imports) from the Eurostat Comext database. In other words, we calculate IIT data at CN 8 digit from the Eurostat data; we aggregate the latter to HS 6 digit, and connect them with the earnings and headcount data of the foreign trade–balance sheet database. (One unfortunate consequence of our procedure is that companies exporting various HS 6 digit items appear, with their earnings and headcount data, in several export rows.) See some more details of the database in Annex 4.

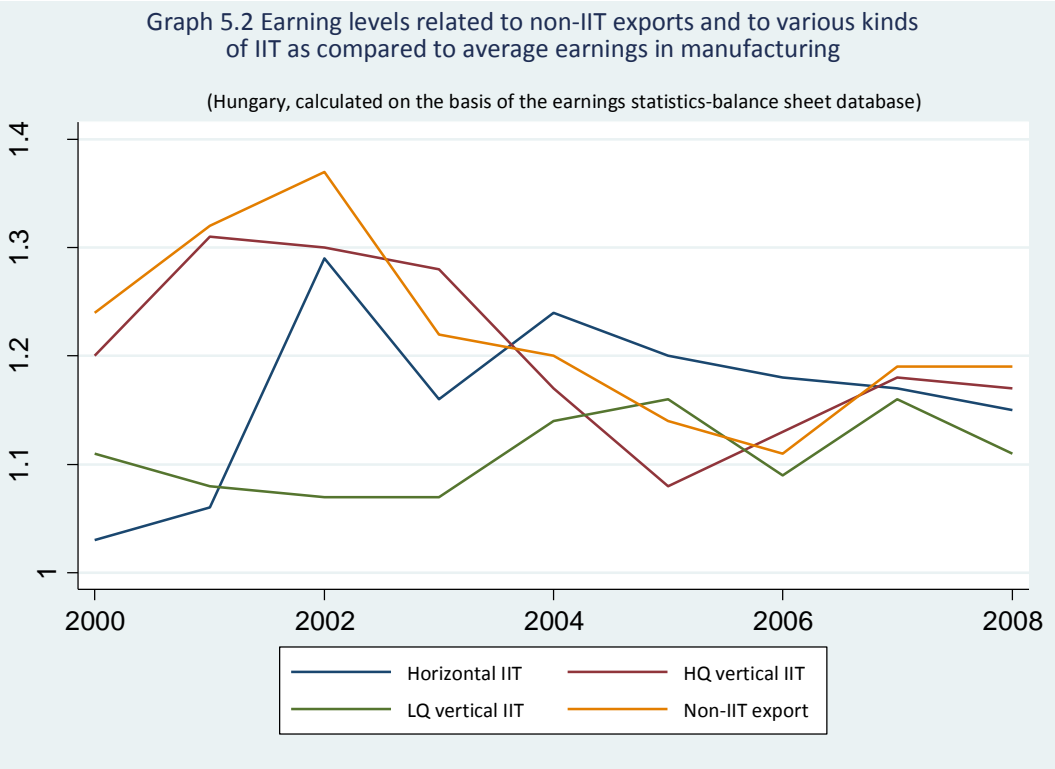
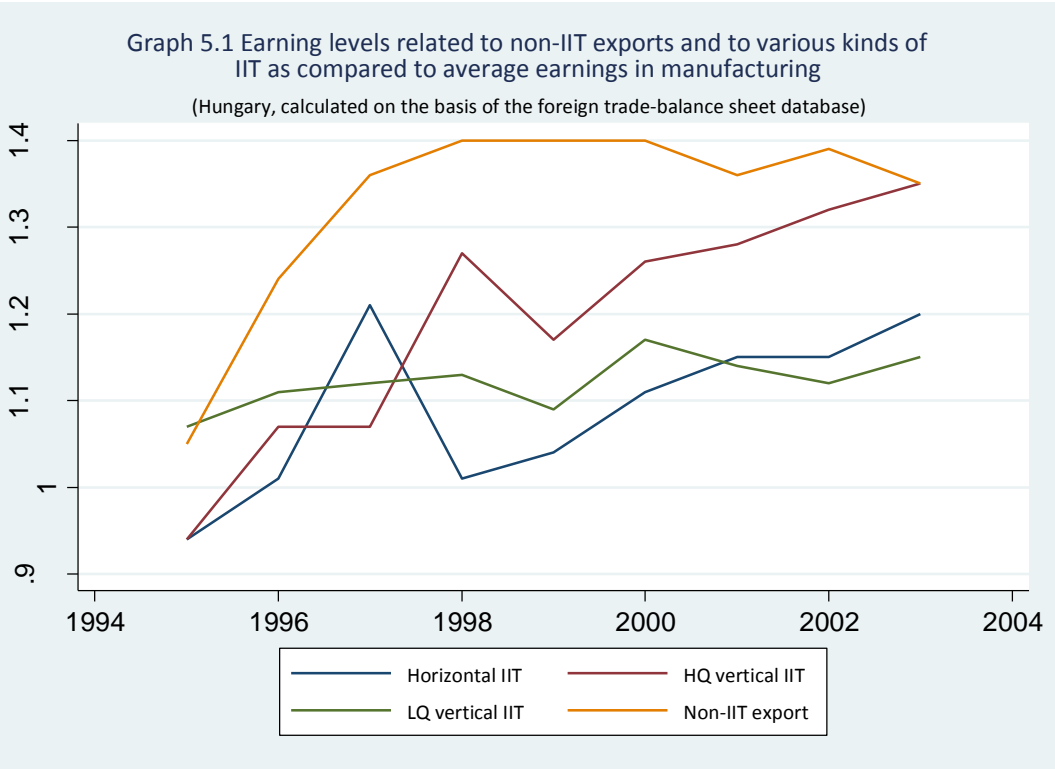
Thus we arrive to such a database, from which, even though with the compromises described, we can calculate average earning levels related to exports and to various kinds of IIT in HS 6 digit disaggregation, and we compare them to average earnings of workers in manufacturing. In the calculation we weight the earning levels exporting companies' workers with the absolute values of IIT's various kinds and non-IIT exports (export – IIT), as calculated from Eurostat data. (Because IIT and within it horizontal, etc. IIT are measured at CN 8 digit level, with the aggregation to HS 6 digit we often receive IIT of various kinds (horizontal, LQ and HQ vertical) within one product category.) And this disaggregation even allows the examination of earning levels in relation with Schumpeter mobile and immobile classification.

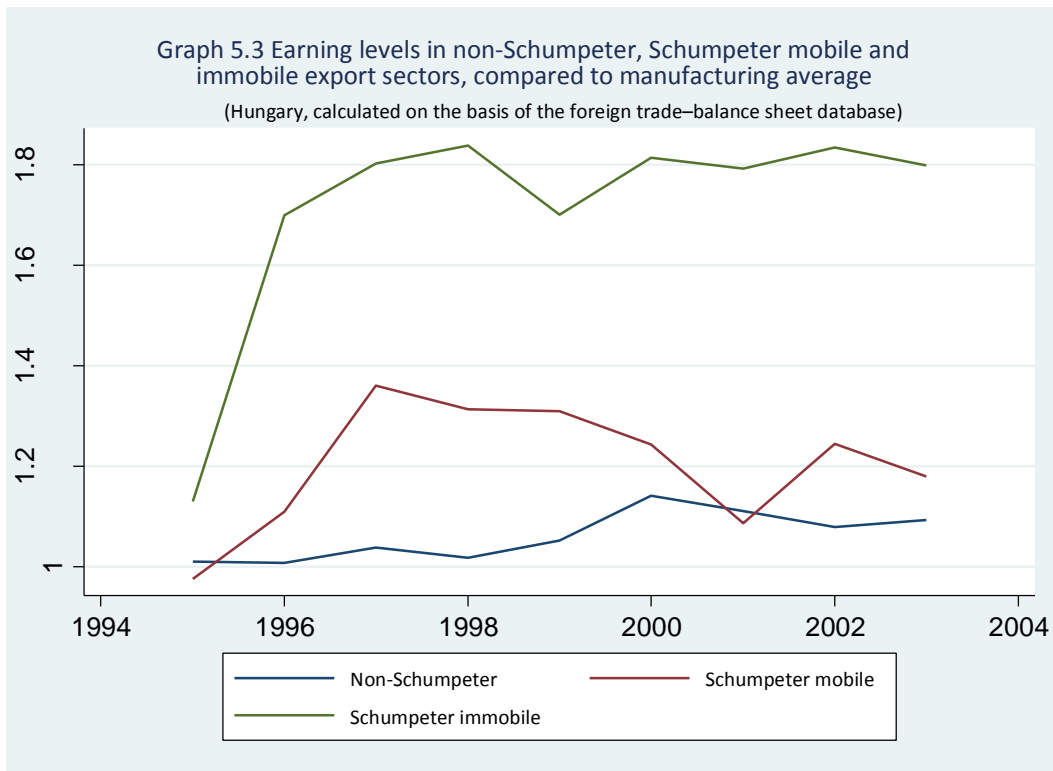
The other dataset (let us call it earnings statistics–balance sheet database), available for the years 2000 to 2008, is based on “earnings statistics”, a monthly poll of 120000 to 185000 wage earners. I. e., in this case the unit of observation is not the company but still these data are also merged with the balance sheet data of the companies. The weakness of this database from our point of view is that the sectoral breakdown of the companies is restricted to NACE 4 digit categories. With correspondence tables, our CN (HS) data, using the mediation of the CPA classification, can be translated to NACE, and the analysis of relative earning levels of IIT's various kind can be performed. The procedure is the same as the one described above, i. e., average earnings related to horizontal IIT are calculated by weighting earnings with the absolute values of horizontal IIT, etc. The unfortunate thing here is that NACE 4 digit is not a sufficient level of disaggregation for the distinction of Schumpeter mobile and immobile products (or, with more exact wording, the sectors producing those products).

The average values of earnings compared to manufacturing average, related to various kinds of IIT, are displayed in Graphs 5.1 and 5.2, calculated from the foreign trade–balance sheet database and from the earnings statistics–balance sheet database, respectively. In the years 2000 to 2003, the periods examined overlap, opening some possibility for cross-checking the calculations. The one based on the earnings statistics–balance sheet database almost always yields somewhat lower figures but the differences – except in 2002 for horizontal IIT – remain on tolerable levels (the ratios of the two sets of results are displayed in Graph Annex1 that the reader can find in Annex 5).

As we see in Graph 5.1, earning levels related to all categories of IIT as well as to non-IIT exports were rather low in 1995 but – particularly at HQ vertical IIT and non-IIT exports – increased rather fast in the following years. At the beginning of the 2000's, in parallel with huge increase of the quantities traded in all categories, the growth of relative earnings turned into some reduction at all of them, except at LQ vertical IIT, where it moved somewhat upwards from its rather low level (Graph 5.2). The relative levels have also converged, and have seemed to stabilise between 110 and 120 percent of average earnings in manufacturing; at LQ vertical IIT it has remained lower. There are no data on the share of manufacturing workers working for exports to the EU or for exports in general. In the years observed, the share of export sales in total sales of Hungarian manufacturing industries were between 60 and 66 percent. Supposing that in average work for non-EU 15 exports paid about the same level as exports into EU15 and half of all manufacturing workers worked for exports, 10 to 20 percent deviation upwards from the overall average amounts to 20 to 40 percent upward deviation from the earnings of those working for the home market. In most years, earnings related to non-IIT exports and HQ vertical IIT were highest. These results suggest that horizontal and

HQ vertical IIT, as well as non-IIT exports have an upward pulling effect, and even LQ vertical IIT does not have a downward pushing effect, on the skill level of manufacturing industry workers in Hungary.





And for Schumpeter industries, earnings data show a rather impressive picture, see Graph 16. Schumpeter mobile exporting industries pay somewhat higher earnings than do (as compared to the general average, better paying) export industries in general. Schumpeter immobile industries pay even much more; earnings here, after a sharp increase in the mid-1990s, exceed by approximately 80 percent the manufacturing average. We can safely exclude the possibility that Hungary’s Schumpeter immobile exports reflect mostly unskilled and/or low-skilled labour’s contribution to the production of such products.

It is rather unfortunate that we do not have the necessary data for similar analysis concerning other Central European countries. Finding large deviations in them from the Hungarian trends – i. e., finding significantly different actual workers’ earnings patterns behind similarly changing IIT and Schumpeter industry trade data – would be rather surprising. And we have to suppose that the positive developments observed in Baltic and East European new EU member states also hide more or less similar tendencies. Of course, supposing all this is much less than having material evidence.

7. Conclusions

- a. The intra-industry trade (IIT) of the ten Central and Eastern European countries (CEECs), members of the EU with the 15 “old” member countries of the EU increases fast. In 2011 IIT’s average share in total trade has almost reached the similar indicator of 1995 of a “control group” of old EU member countries. The share of IIT in the trade of some countries reaches the one usual at advanced West European countries.
- b. CEECs’ sectoral concentration of IIT, and consequently the sectoral concentration of exports, particularly in the case of Central Europe (the four “Visegrad” countries and Slovenia), is higher than the similar concentration in old EU member countries. And the dominating sectors produce mostly investment goods. The unfavourable consequence of this situation is

strong exposure to international economic fluctuations. Diversification should be promoted, but certainly not with negative measures concerning the dominating sectors. Rather, the development of other sectors might be encouraged, and ideas on the preferential treatment of “productive” activities vis-à-vis the service sector should be forgotten.

- c. Low-quality vertical IIT is important for all CEECs, but it is no less important for the most developed Western European countries. At the same time, horizontal and high-quality vertical IIT strengthens in the whole region, and in some Central European countries it has reached levels usual at advanced old EU member countries. This, however, is not a hard evidence of a high level of industrial upgrading and maturity since vertical IIT cannot be fully explained by the hypothesis of the “quality ladder”. Vertical IIT does not include only intra-industry trade of quality-differentiated commodities, but also back-and-forth transactions in vertically fragmented production chains in the same commodity category. Thus, revealing the actual nature of the contribution to the fabrication of items exported in the framework of IIT requires further research.
- d. This further research takes two directions. The first one, in Section 4, deals with “intra-industry trade” understood in an unorthodox way. Namely, we examine the trade between the CEECs and the old EU of research and development intensive (Schumpeter) products, among them separately the trade of so-called Schumpeter immobile products, whose production cannot be geographically separated from the related research and development. We find that in the export of such products all CEECs display improving performance over the observed period, and the immobile export share of four countries – the Czech Republic, Hungary, Slovakia and Slovenia – and at the end of that period reaches the level achieved by the technologically most advanced old EU member countries. Even more importantly, the balances of this specific trade of the less advanced CEECs tend to be rather good; those of Central European countries are more favourable than those of Asian “tigers”, and close to the best Western European levels. However, even this, ostensibly extremely encouraging observation might be misleading. Namely, the distance of Central European countries from the EU 15, or more exactly from two of its important technological and manufacturing areas (Northern Italy and Southern Germany) is so small that it might be rather irrelevant from the point of view of the “non-distant-location-requirement” of the production of Schumpeter immobile products. I. e., whereas research and development of such products cannot be thousands of kilometres away from their fabrication, distances of some hundreds of kilometres might not be a problem.
- e. Thus, another direction of further research of the hints to industrial upgrading of CEECs is followed, but because of the limited availability of data, only with respect to Hungary. We formulate the “upgrading” question in this form: what is the impact of IIT on the demand for workers’ skills? Does this demand pull the skill level of Hungarian workers upwards, or rather, does it push that level downwards? With IIT being a dynamically increasing part of trade and thus manufacturing activities related to it having an important impact on the demand for workers, this question seems to be an important one. Our calculations – to our knowledge the first such calculations in the intra-industry trade literature – show that workers’ earnings in the sectors producing products traded in low-quality IIT are not lower, whereas in production related to the other segments of IIT and in the production of non-IIT

exports those earnings are higher than in the average of manufacturing industries. And earnings in the production of Schumpeter immobile goods are particularly high. All this implies a favourable answer to our question: intra-industry trade (and also non-IIT export) has a pulling up, rather than pushing down effect on wage, and with that, presumably also on skill levels. It would be surprising if other CEECs' similar IIT and Schumpeter product trade data hid some different trends in workers' earnings.

- f. With an upward pull impact on earnings and skills, intra-industry trade plays a positive role in the cohesion process of the CEECs.

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Annexes

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Annex 1

The list of “processing industries” chapters of the “Harmonised System” nomenclature of trade

CODES LABELS (WITH ABBREVIATIONS)

28	INORGANIC CHEMICALS
29	ORGANIC CHEMICALS
30	PHARMACEUTICAL PRODUCTS
31	FERTILISERS
32	TANNING OR DYEING EXTRACTS
33	ESSENTIAL OILS AND RESINOIDS
34	SOAP, ORGANIC SURFACE-ACTIVE AGENTS, WASHING PREPARATIONS, ETC.
35	ALBUMINOIDAL SUBSTANCES
36	EXPLOSIVES
37	PHOTOGRAPHIC OR CINEMATOGRAPHIC GOODS
38	MISCELLANEOUS CHEMICAL PRODUCTS
39	PLASTICS AND ARTICLES THEREOF
40	RUBBER AND ARTICLES THEREOF
41	RAW HIDES AND SKINS (OTHER THAN FURSKINS) AND LEATHER
42	ARTICLES OF LEATHER
43	FURSKINS AND ARTIFICIAL FUR
44	WOOD AND ARTICLES OF WOOD
45	CORK AND ARTICLES OF CORK
46	MANUFACTURES OF STRAW, OF ESPARTO OR OF OTHER PLAITING MATERIALS
47	PULP OF WOOD OR OF OTHER FIBROUS CELLULOSIC MATERIAL
48	PAPER AND PAPERBOARD
49	PRINTED BOOKS, NEWSPAPERS, PICTURES AND OTHER PRODUCTS OF THE PRINTING I
50	SILK
51	WOOL, FINE OR COARSE ANIMAL HAIR
52	COTTON
53	OTHER VEGETABLE TEXTILE FIBRES
54	STRIP AND THE LIKE OF MAN-MADE TEXTILE MATERIALS
55	MAN-MADE STAPLE FIBRES
56	WADDING, FELT AND NONWOVENS
57	CARPETS AND OTHER TEXTILE FLOOR COVERINGS
58	SPECIAL WOVEN FABRICS
59	IMPREGNATED, COATED, COVERED OR LAMINATED TEXTILE FABRICS
60	KNITTED OR CROCHETED FABRICS
61	ARTICLES OF APPAREL AND CLOTHING ACCESSORIES, KNITTED OR CROCHETED
62	ARTICLES OF APPAREL AND CLOTHING ACCESSORIES, NOT KNITTED OR CROCHETED
63	OTHER MADE-UP TEXTILE ARTICLES
64	FOOTWEAR, GAITERS AND THE LIKE
65	HEADGEAR AND PARTS THEREOF
66	UMBRELLAS, SUN UMBRELLAS, WALKING-STICKS, SEAT-STICKS, WHIPS, ETC.
67	PREPARED FEATHERS AND DOWN AND ARTICLES MADE OF FEATHERS OR OF DOWN
68	ARTICLES OF STONE, PLASTER, CEMENT, ASBESTOS, MICA OR SIMILAR MATERIALS
69	CERAMIC PRODUCTS
70	GLASS AND GLASSWARE

CODES LABELS (WITH ABBREVIATIONS)

71	NATURAL OR CULTURED PEARLS, PRECIOUS OR SEMI-PR. STONES, PR. METALS, ETC.
72	IRON AND STEEL
73	ARTICLES OF IRON OR STEEL
74	COPPER AND ARTICLES THEREOF
75	NICKEL AND ARTICLES THEREOF
76	ALUMINIUM AND ARTICLES THEREOF
78	LEAD AND ARTICLES THEREOF
79	ZINC AND ARTICLES THEREOF
80	TIN AND ARTICLES THEREOF
81	OTHER BASE METALS
82	TOOLS, IMPLEMENTS, CUTLERY, SPOONS AND FORKS, OF BASE METAL
83	MISCELLANEOUS ARTICLES OF BASE METAL
84	NUCLEAR REACTORS, BOILERS, MACHINERY AND MECHANICAL APPLIANCES
85	ELECTRICAL MACHINERY AND EQUIPMENT AND PARTS THEREOF
86	RAILWAY OR TRAMWAY LOCOMOTIVES, ROLLING-STOCK AND PARTS THEREOF
87	VEHICLES OTHER THAN RAILWAY OR TRAMWAY ROLLING-STOCK, AND PARTS ETC.
88	AIRCRAFT, SPACECRAFT, AND PARTS THEREOF
89	SHIPS, BOATS AND FLOATING STRUCTURES
90	OPTICAL, PHOTOGRAPHIC, CINEMATOGRAPHIC, MEASURING, ETC. INSTRUMENTS
91	CLOCKS AND WATCHES AND PARTS THEREOF
92	MUSICAL INSTRUMENTS
93	ARMS AND AMMUNITION
94	FURNITURE
95	TOYS, GAMES AND SPORTS REQUISITES
96	MISCELLANEOUS MANUFACTURED ARTICLES
97	WORKS OF ART, COLLECTORS' PIECES AND ANTIQUES

Panel random-effects regression of export concentration on IIT concentration and on the “cross-effect” *cee dummy*IIT concentration*

```
xtreg expconc iit_conc CEEdummy*iitconc if country!="LV" & country!="IE", re
```

```
iit_conc          0.60***
```

```
CEEdummy*iitconc 0.24***
```

```
_cons            0.03***
```

```
r2_w  0.36
```

```
r2_b  0.59
```

```
r2_o  0.52
```

```
chi2  196.01
```

```
rho   0.41
```

```
sigma_u  0.01
```

```
sigma_e  0.02
```

```
N       306
```

```
N_g     18
```

```
g_avg  17.00
```

legend: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

(*xttest0* does not reject random effects; *hausman* and *suest* tests not applicable.)

Schumpeter mobile and immobile product categories in Standard SITC Rev. 4, 2 digit chapters

CODES LABELS***SCHUMPETER MOBILE***

- 51 CHEMICAL MATERIALS AND PRODUCTS, N.E.S.
- 52 ELECTRICAL MACHINERY, APPARATUS AND APP
- 58 INORGANIC CHEMICALS
- 59 MACHINERY SPECIALIZED FOR PARTICULAR IN
- 75 OTHER TRANSPORT EQUIPMENT
- 76 PLASTICS IN NON-PRIMARY FORMS
- 77 POWER-GENERATING MACHINERY AND EQUIPMEN

SCHUMPETER IMMOBILE

- 54 GENERAL INDUSTRIAL MACHINERY AND EQUIPM
- 71 MEDICINAL AND PHARMACEUTICAL PRODUCTS
- 72 METALWORKING MACHINERY
- 73 OFFICE MACHINES AND AUTOMATIC DATA-PROC
- 74 ORGANIC CHEMICALS
- 78 PROFESSIONAL, SCIENTIFIC AND CONTROLLING INSTRUMENTS
- 79 ROAD VEHICLES
- 87 TELECOMMUNICATIONS AND SOUND-RECORDING EQUIPMENT

Source: Dettmer et al (2011).

Annex 4

The databases

The utilisation of the databases described here is discussed in paragraph 5.2.

The *foreign trade–balance sheet database* is a combination of Hungarian foreign trade statistical data with the balance sheet data of Hungarian companies applying double-entry accounting. The number of firms included in the database in 1995-2003 was the following:

Year	No. of comp.	Year	No. of comp.
1995	90416	2000	62262
1996	105718	2001	63358
1997	120203	2002	66096
1998	130865	2003	66562
1999	134582		

The explanation of the fluctuation is the changing legal obligation of the companies to keep double-entry accounting. Thus the database does not include all Hungarian exports. And even more export data are missing from it, partly with the purpose of protecting business secrets (some companies' data could easily reveal their identities), and partly because of inaccuracies. The database includes export data of the companies, in HS 6 digit. It contains a wide range of data characterising the companies but we use only the wages, salaries and other payments to employees and the average headcount data and two kinds of identification data: year and 6 digit HS code of goods exported by the companies.

The *earnings statistics–balance sheet database*, available for the years 2000 to 2008, is based on "earnings statistics", a monthly poll of 120000 to 185000 wage earners. The representativeness of the sample is assured by weighting. Albeit in this case the unit of observation is not the company but still these data are also merged with the balance sheet data of the companies. This database does not include any foreign trade data but it identifies the sectoral affiliation of the companies in NACE 4 digits. Besides identifying figures (year and NACE 4 digit code) we use the earnings and the weight data of the database. With correspondence tables, our CN (HS) data, using the mediation of the CPA classification, can be translated to NACE, and the analysis of relative earning levels of IIT's various kind can be performed. Here, in a similar way to the case of the foreign trade–balance sheet database discussed above, the earnings data of the companies' employees become representative data of incomes earned in the corresponding NACE sectors of the economy.

Ratios of the wage levels estimated from the two databases

