Vertical and horizontal patterns of intra-industry trade between EU and candidate countries

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Contents

Abstract

Trade between the European Union (EU) and the Transition Economies (TE) is increasingly characterised by intra-industry trade. The decomposition of intra-industry trade into horizontal and vertical shares reveals predominantly vertical structures with decisively more quality advantages for the EU and less quality advantages for TE countries whenever trade has been liberalised. Empirical research on factors determining this structure in a EU-TE framework lags behind theoretical and empirical research on horizontal and vertical trade in other regions of the world. The main objective of this paper is therefore to contribute to the ongoing debate on EU-TE trade structures by offering an explanation of vertical trade. We utilise a cross-country approach in which relative wage differences, country size and income distribution play a leading role. We find first that relative differences in wages (per capita income) and country size explain intra-industry trade when trade is vertical and completely liberalised, and second that cross-country differences in income distribution play no explanatory role. We conclude that EU firms have been able to increase their product quality and to shift low-quality segments to TE countries. This may suggest a product-quality cycle prevalent in EU-TE trade.

JEL: Classification: F13, F14, F15

Keywords: Intra-Industry Trade, EU candidate countries

Introduction

This study aims to contribute to the analysis of the productivity gap between most EU and candidate countries and of the possible convergence processes.[1] The specific view of the study is from a trade perspective: the objective is to find out whether and how the liberalisation of trade between both sets of countries has set a process of convergence in productivity in motion. The idea behind is that when a small country opens its economy, the foreign sector will become the driving force for structural change in the production and consumption of goods.

With this perspective, we define, in the first section, the various types of trade flows and give an overview on recent theoretical and empirical research. Though trade models, including the model tested in this study, do not include productivity neither as independent nor as dependent variable, there is an intuitive relationship between the various types of trade flows and productivity. In the second section, we provide stylised facts on the emergence of types in trade between EU and candidate countries. This section illustrates that the intra-industry type of trade flows enters the scene, and here, above all, vertical intra-industry trade gains momentum. In addition, we present stylised facts on those trade determinants, which belong to the so-called country-approach in trade models. The third and fourth sections describe and test a country-specific model that explains vertical intra-industry trade as a product-quality cycle between the 'old' EU and the candidate countries. The results can be interpreted in various directions. One of them is of special interest: Although our trade model does not include a productivity variable, we found some evidence for an at least intuitive understanding of the relationship between the emerging type of vertical intra-industry trade and productivity development. The result helps to identify the fields on which an active policy might contribute to the convergence process (section five).

1. An overview on the state of research – theory and empirics

Trade structures are usually identified as of inter-industry or intra-industry type. Inter-industry trade takes place when countries export and import goods of different industries. This type of specialisation can be explained by factor endowment differences between the countries. Empirical research found a robust relationship between GDP per

1 A first version of this paper was presented at the Universities of Sussex and Trento. The study benefited substantially from the comments and suggestions made by participants in the seminars, and by Giovanni Facchini (University of Illinois) on earlier drafts. We gratefully express our thanks to *Lucia Taioli*, *Jozef van Brabant*, and *David Kemme* for providing useful comments and ideas on the final draft, to *Karin Szalai* (Halle) for preparing the data on income distribution and intra-industry trade. Responsibility for the study, of course, remains ours alone.

capita and capital-labour ratios. Countries, unequally endowed with capital and labour tend to have different productivities; for a relatively high (low) capital-labour ratio is tantamount to a high (low) labour productivity. Trade liberalisation would contribute either to a widening productivity gap when the countries differ substantially in factor endowment, or to productivity convergence when they are similar.

The similarity of countries generates a different type of trade flow, that is intra-industry trade (IIT). Intra-industry trade is characterised by the exports and imports of identical industries. There is an abundant literature on the relationship between IIT flows and country and/or industry characteristics. These studies typically construct an index of intra-industry trade and investigate correlates of the index with country or industry determinants. The empirical literature has found more support for country rather than industry factors. While these studies are certainly interesting, their relationship to the theory of international trade is often tenuous and debatable.[2]

An important exception is Helpman (1987), who developed some simple country models of monopolistic competition and tested the hypotheses that the theory "suggests",[3] using OECD data spanning from 1956 to 1981. His first empirical test concerned the volume of trade in a model in which all trade is, by assumption, intra-industry trade. His other tests were based on a model in which some trade is intra-industry and some trade is endowments-based. Helpman's theoretical model implies that intra-industry trade increases with similarity. He found that the theory is supported in that both the volume of trade and the measure of size similarity increased over time together. The selected measure for intra-industry trade was regressed on per capita income differences and the minimum and maximum size of GDP. The sign for the first variable was a negative one, and positive and negative signs for min and max GDP respectively; all as expected. The inclusion of income differences was robust to several theoretical specifications; the min and max GDP variables were less so.[4] His second test separated the GDP size from GDP similarity; results confirmed that both seem to contribute positively to intra-industry trade. Helpman concluded that the theory of monopolistic competition finds some support in the data but there is a lot that needs to be done especially because these results are also compatible with other models.

Hummels and Levinsohn (1995) followed up on Helpman's paper but questioned the apparent empirical success of monopolistic competition models. They used country-pairs instead of the entire OECD, from 1962 to 1983, and instead of estimating each year as a separate regression, they employed standard panel data econometric techniques (fixed and random effects for country pairs). They found support for a negative

2 For a survey, see *Leamer, Levinsohn* (1995).

3 *Helpman* (1987) does not derive a structural equation from the theory.

4 See *Leamer, Levinsohn* p. 1380.

relationship between similarity and trade volumes in both an OECD data set with similar countries and a data set comprising a random selection of developed and less developed countries distributed across the globe. They concluded that perhaps something other than monopolistic competition is generating the empirical success of the estimating equation.

They found in addition that the estimating equation in which the share of intra-industry trade is explained by the differences in the log per capita GDP is less robust to standard panel data estimation. For example, evidence of a negative relationship between GDP per capita differences and IIT shares in OLS regressions turned out to be rather weak. When the explanatory power of their regressions was improved by applying fixed effects, the sign of the coefficient turned positive and remained significant. Hummels and Levinsohn attributed this result to the fact that the fixed effects regressions control for the differences in distance and land endowments, which affect the share of intra-industry trade, finding that the distance effect[5] seems to be much stronger. They concluded in their "in-conclusions" that "we find, at best, very mixed empirical support for the theory. Most of the variation in intra-industry trade is explained by factors idiosyncratic to country pair"[6].

The upshot is that fixed effects estimates drastically change the empirical role of factor and income differences,[7] an effect that emerges clearly even with random effects estimates. The very mixed empirical support for the theory suggests that much intra-industry trade is specific to country-pairs, rather than being explained by factor/income differences.

One of the reasons for mixed empirical support might be that IIT consists of two components, which were identified by empirical research on North-South trade, namely horizontal and vertical trade. While the models of early IIT research (the "first generation") assumed IIT to be characterised by the exchange of varieties of the same quality (= horizontal trade) backed by the same technologies, varieties with different qualities (= vertical trade) were exchanged in North-South trade. In the second generation of IIT literature, it is more or less common that horizontal and vertical IIT need to be explained by different factors. The explanation of IIT by hand of a "horizontal" model might lead to inconclusive results, when IIT is overwhelmingly vertical. For example: Contrary to the horizontal approach to IIT, a positive relationship is expected to exist between vertical IIT and GDP per capita differences, the latter standing for endowment

5 The empirical success of the gravity models is well known.

6 *Hummels, Levinsohn* (1995), p. 828.

7 Recall the long-standing debate on whether per capita income is a proxy for factor endowments or consumer tastes. Empirical literature has interpreted differences in per capita income both as a demand side phenomenon as in *Bergstrand* (1990), and as a proxy for differences in factor composition, in *Helpman* (1987).

differences. Recent tests of high quality VIIT (= vertical IIT) in Intra-EU trade found empirical support for this hypothesis (Díáz Mora 2002).

The relevance of differences in endowment in technology, physical and human capital for the explanation of IIT does not mean that VIIT is a type of inter-industry trade. VIIT models belong to a class of models that combine endowment differences with differences in consumers' preferences. Flam and Helpman (1997) added income distribution among households/consumers to the usual determinants in IIT models. In their model, income inequality explains the different preferences of rich and poor households for high and low quality of goods of the same industry. Other authors introduced transport costs into VIIT models. We dispose now of additional factors for explaining the various types of trade flows.

Though the models do not contain labour productivity neither as a dependent nor as an independent variable, the two types of IIT offer intuitively a strong imagination of productivity developments. If countries were similar in factor endowment, trade liberalisation would trigger horizontal IIT, and with time, a convergence in terms of productivity and income. In a VIIT perspective, the determinants of IIT might contribute to a product-quality cycle in which the firms in "richer" countries shift the production of the good with the lower quality to the "poorer" countries, and expand the production of the higher quality variety at home. If countries were different in factor endowment and household income distribution, trade liberalisation would make productivity gaps stronger or would even widen them by vertical IIT.

The "industry approach" an extensive body of literature on how IIT varies across industries within countries, although empirical results in search of country/industry determinants are not clearly related to the theory. Aturupane et al. (1997) analysed IIT in EU-TE trade, where they found VIIT to account for between 80 per cent and 90 per cent of total IIT. They focussed on industry-specific determinants, among them foreign direct investment, and expected country factors to be particularly important for horizontal IIT (= HIIT). The test results were rather mixed: Only 1 out of 5 tested industry determinants yielded the expected sign for VIIT (foreign direct investment). In two cases, the odd sign was obtained, and in the remaining cases the result was hard to interpret owing to the ambiguity of the expected sign. For HIIT, three (again foreign direct investment) of the five variables showed the expected sign. When country dummies were used,[8] the explanatory power of the regressions increased significantly for HIIT, but only slightly for VIIT. The basic conclusion was that industry specific effects dominate VIIT. When vertical differentiation is empirically important for ITT, the study concluded that country-specific effects become irrelevant and VIIT is explained better by industry determinants than by country ones.

8 But proxies for "country specific factors" are dummies. The use of country dummies is motivated by the absence of reliable data on incomes and endowments for TE countries.

The inclusion of foreign direct investment into the industry approach opens some new perspective on the relation between trade structures and productivity growth. The usual approach to foreign direct investment (FDI) is to assume it as a vehicle to transfer technology to transition economies. An important result of a recent study by Damijan et al. (2001) for a subset of EU candidate countries was that productivity grew significantly faster for those firms that were the object of a FDI in five out of eight countries, however, without intra-sectoral spillover effects on domestic firms. But what about trade? Other empirical investigations seem to confirm the impact of foreign direct investment on the aggregate IIT level. At a 2-digit industry/trade level, recent research found some confirmation of the positive relationship between direct investment and IIT only for some industries and countries: electrical machinery, and other machinery and transport equipment in the cases of Hungary, Poland, and the Czech Republic (Hoekman and Djankov 1996). In Aturupane et al. (from 1997), FDI data on the firm level[9] were 'concorded' to the 3-digit NACE level. The estimates brought the expected positive signs and a high significance of the foreign direct investment variable on both components HIIT and VIIT whereby the explanatory power of the role FDI might play for VIIT seemed to be higher.[10] To bring the puzzle stone in order, we might expect that the role of foreign direct investment for catching-up of productivity seems to be restricted since FDI have a stronger impact on vertical than on horizontal trade, and even if more horizontal, the direct positive effect is associated with the absence of intra-sectoral spillover.

2. Stylised facts of patterns of trade between EU and candidate countries from a country approach

2.1 Trade

In this section, we describe the extent, nature and dynamics of trade between the individual EU countries with 11 candidate countries, the latter including 10 Central and Eastern European countries and Turkey. In addition, we provide stylised facts of endowment and income determinants, taken from the country approach.

There is some recent literature finding that trade between the EU and the candidate countries of Central and Eastern Europe is increasingly intra-industry trade, dominated by vertical intra-industry trade although the studies differ according to the method and

9 Measured as according to the ownership structure of the firm (more than one third of its shares are 'foreign').

10 The results for VIIT depended on the criterion for decomposing VIIT and HIIT. See footnote 18.

scope of calculating the IIT shares.[11] Many studies restrict themselves to unadjusted Grubel-Lloyd indices for the calculation of IIT shares. There is a large body of literature, which discusses the flaws in the unadjusted Grubel-Lloyd index and suggests various alternatives.[12] Because balanced trade is a basic assumption of all models that explain IIT we use in principle adjusted Grubel-Lloyd indices that correct for the overall trade imbalances:

$$GL = \frac{\sum_{i=1}^{n}(X_i + M_i) - \sum_{i=1}^{n}\left|X_i - M_i\right|}{\sum_{i=1}^{n}(X_i + M_i) - \left|\sum_{i=1}^{n} X_i - \sum_{i=1}^{n} M_i\right|} \qquad (1)$$

where *GL* is the adjusted share of intra-industry trade in the total trade of n industries, X_i and M_i are the exports and imports of the individual industry *i*. The second element in the denominator is the factor correcting for the overall trade imbalance. According to equation (1), inter-industry trade is the remainder: *1-GL*.

A specific problem of measuring IIT is the level of desegregation. The scope of intra-industry trade and its main components heavily depends on the level of disaggregating. This phenomenon, broadly discussed in the literature,[13] causes a severe distortion in the comparison of the various studies. It might turn out that, for example, at the 2-digit level of a given trade statistic, IIT is horizontal, but at a 4-digit level becomes vertical. In this study, the indices are calculated for 778 industries throughout SITC-chapters 3 to 8 (manufacturing industries) of Comext Database for the years 1993[14] and 2000. These industries accounted for 82% of aggregate EU trade with the 11 candidate countries in 2000, fairly evenly distributed across EU countries. We selected the 4-digit level; for it corresponds at best to the industry concept, while 2-digit levels stand rather for sectors, and lower levels for products.

Our first finding is that, measured with mean values, trade among EU countries is of the intra-industry type while EU trade with candidate countries is of the inter-industry type even after 7 years of liberalisation (Table 1).[15] While more than 50% (GL > 0.5) of trade among the EU countries was IIT, more than 60% was still inter-industry trade in

11 See also *Burgstaller, Landesmann* (1997); *Aturupane et al.* (1997); *Rosati* (1998); *Gabrisch, Werner* (1998); *Thom* (1999) and *Gabrisch, Segnana* (2001).

12 Various adjustments to trade imbalances have been proposed and criticized by several authors; see for instance *Vona* (1991).

13 See recently *Gullstrand* (2002).

14 Data for Austria, Finland, and Sweden are for 1995.

15 Liberalization started already in 1990. In 1993, the EU started to sign free trade agreements with the transition countries, and liberalization accumulated speed.

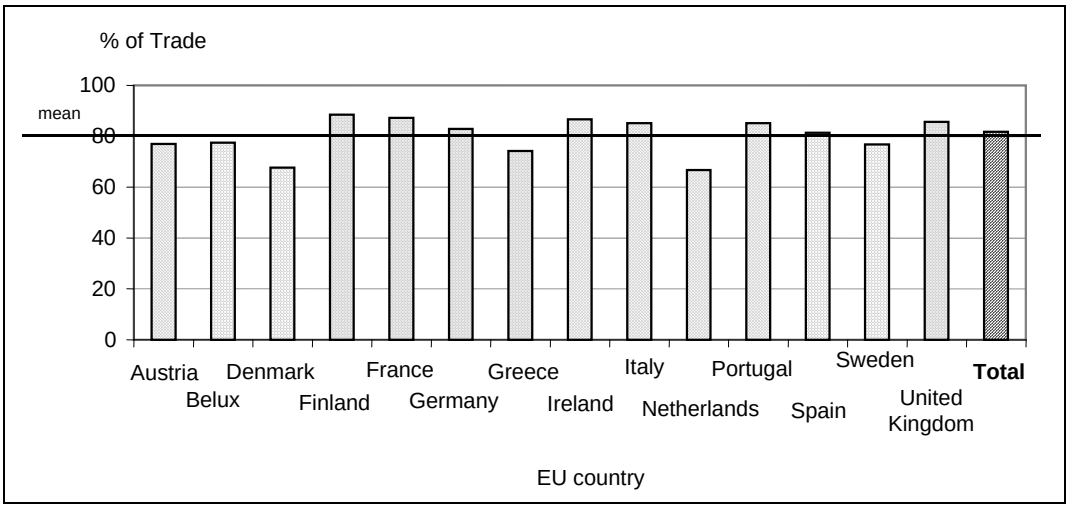
Table 1:
Intra-industry trade indices in Intra-EU trade[a] and EU trade with candidate countries[b] (mean values) 1993 and 2000

GL index	Unadjusted		Adjusted	
Year	1993	2000	1993	2000
Intra-EU	0.558	0.551	0.637	0.649
Trade with candidate countries	0.276	0.350	0.342	0.391

[a] Individual EU countries against all other EU countries. – [b] Total EU with individual candidate countries.

Source: Own calculation based on Eurostat, Comext databank, 2002.

Figure 1:
Share of selected industries in Total Trade Flows between individual EU and aggregate (11) candidate countries, 2000



Source: Own calculation based on Eurostat, Comext databank, 2002. See Table A1.

relations between EU and candidate countries. Trade liberalisation caused the IIT share to increase in trade with candidate countries between 1993 and 2000. Adjusted shares of IIT were remarkably higher than the unadjusted shares in both 1993 and 2000. The difference between both GL-indices is somewhat higher in EU trade with candidate countries due to the larger trade imbalances (high EU surpluses) compared with Intra-EU trade. The adjusted mean of intra-industry trade shares amounted to about 39% of total trade in 2000, after 34% in 1993, demonstrating a decrease of inter-industry trade shares. Nevertheless, a great but declining portion of the productivity gap could still be explained rather by factor endowment differences between EU and candidate countries. The transition from planned to market economy in the candidate countries of Central and Eastern Europe, and the liberalisation of trade between the both regions seems to have contributed to the fall of inter-industry trade; this might partly explain the erosion of the productivity gap in the period considered.

The IIT type of trade was the highest in EU trade with the Czech Republic, Poland, Hungary, and Slovenia, measured with the adjusted GL-index (Table 2). The lowest share was to find in trade with the Baltic countries (Latvia, Estonia, and Lithuania). In three cases – Bulgaria, Estonia, and Hungary – the IIT shares decreased between 1993 and 2000 (shares increased when measured with unadjusted indices, reflecting the relative decline of trade imbalances in trade with the EU).

Table 2:
Intra-industry trade indices in EU trade with candidate countries[a] (mean values) 1993 and 2000

	1993		**2000**	
	unadjusted	Adjusted	Unadjusted	Adjusted
Bulgaria	0.260	0.325	0.274	0.308
Czech Republic	0.480	0.563	0.598	0.637
Estonia	0.211	0.411	0.260	0.267
Hungary	0.406	0.529	0.508	0.509
Latvia	0.109	0.111	0.122	0.124
Lithuania	0.120	0.131	0.182	0.206
Poland	0.323	0.414	0.423	0.551
Romania	0.198	0.243	0.308	0.337
Slovakia	0.334	0.342	0.402	0.418
Slovenia	0.454	0.478	0.511	0.574
Turkey	0.146	0.213	0.262	0.367
Mean	*0.276*	*0.342*	*0.350*	*0.391*

[a] Total EU with individual candidate countries.

Source: Own calculation based on Eurostat, Comext databank, 2002.

The standard procedure for decomposing[16] VIIT and HIIT is to apply unit values (UV). A unit value is defined as turnover in exports or imports in ECU per metric ton. A relative unit value (RUV) outside the range selected – in this case, 15 per cent on either side of unity – qualifies the traded item as belonging to vertical intra-industry trade:[17]

16 Paternity for the procedure can be attributed to *Abd-El-Rahman* (1984). Since *Greenaway, Hine, Milner* (1994), examples of application of this methodology abound.

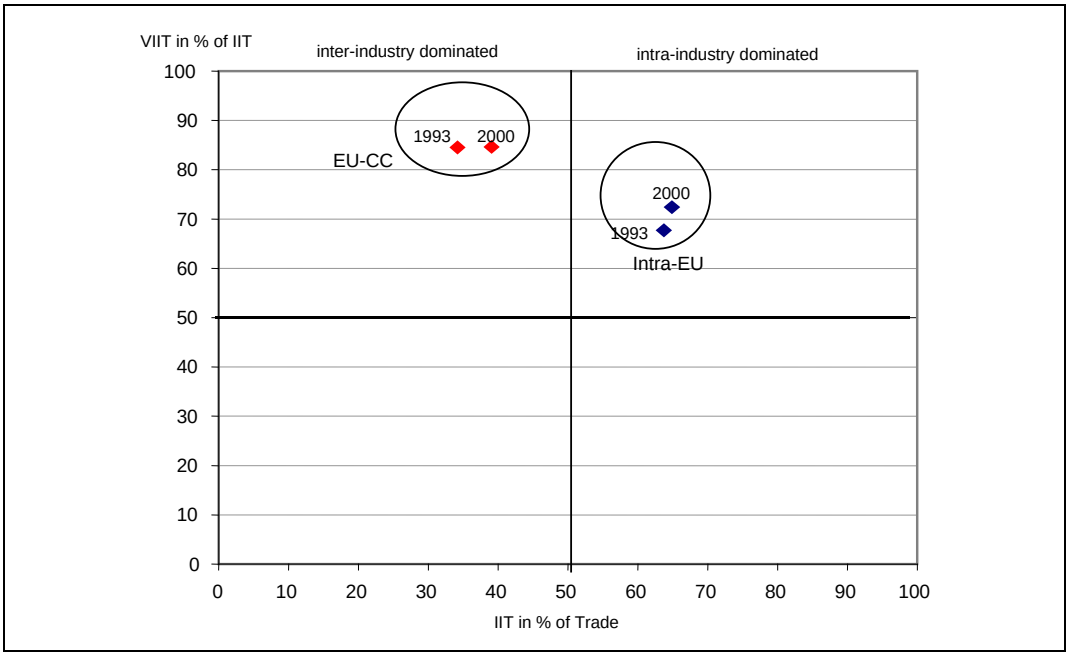
17 Alternatively, a dispersion factor of 25 per cent is used in empirical applications. In *Auturpane et al.* (1997) the shift from the 15 to the 25 per cent specification let the differences in the value of the coefficients of HIIT and VIIT disappear (signs and significances remained unchanged).

$$\text{GLviit, if } 1.15 < \left(RUV_i = \frac{UVX_i}{UVM_i} \right) < 0.85 \qquad (2)$$

where UVX stands for the unit value in exports, and UVM for the unit value in imports of a single item. If RUV > 1.15, the aggregate index is often seen to be 'high-quality VIIT' of the exporting country, assuming that the higher 'price' the export industry may obtain corresponds with a higher quality. If RUV < 0.85, a 'high-quality VIIT' of the importing country is assumed. This assumption is oversimplified, and we will later adjust the procedure in order to reveal a more realistic high-quality VIIT.

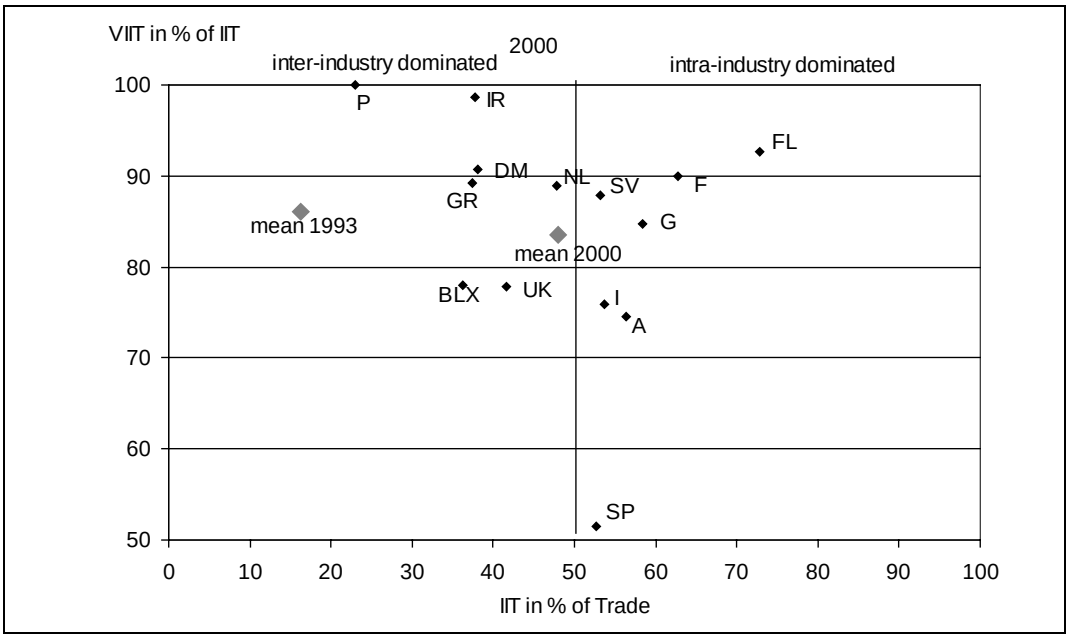
Our second finding is that IIT is overwhelmingly vertical, in trade among EU countries as well as in EU trade with candidate countries. In order to illustrate the types of trade flows more clearly we draw a figure, where the X-axis measures the share of IIT in total trade, and the Y-axis measures the share of VIIT in IIT (Figures 2 and 3). If a country is in the top left quadrant, inter-industry trade is predominant. Horizontal intra-industry trade prevails in low right quadrant. This application confirms the inter-industry structure of aggregate EU trade with individual candidate countries in 1993 and in 2000, and the IIT type of flows in trade among the EU countries. While trade with candidate countries moved towards the IIT type, it remained more or less unchanged in the VIIT quadrant. IIT among EU countries is also vertical, but at a lower level than trade among EU

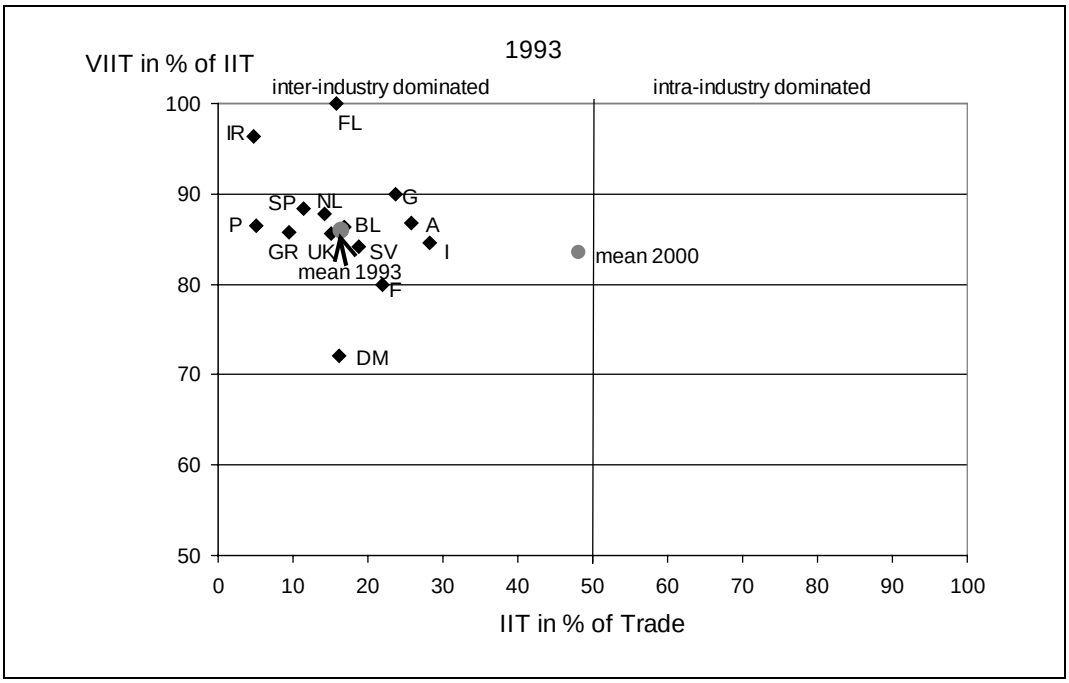
Figure 2:
Types of EU trade flows, 1993 and 2000, adjusted Grubel-Lloyd Indices (mean values)



Source: Own calculation based on Eurostat, Comext databank, 2002. See also Tables A2 and A3.

Figure 3:
Types of EU countries' trade flows with all candidate countries, 1993 and 2000
adjusted Grubel-Lloyd indices





A: Austria; BLX: Belgium & Luxembourg; DM: Denmark; F: France; FL: Finland; G: Germany; GR: Greece; I: Italy; IR: Ireland; NL: Netherlands; P: Portugal ; SP: Spain; SV: Sweden; UK: United Kingdom.

Source: Own calculation based on Eurostat, Comext databank, 2002. See also Table A4.

countries. However, VIIT increased in most cases in the period considered.[18] This seems to be long-term trend, being recently observed by other research (Diaz Mora 2002).

Figures 2 and 3 suggest a kind of 'convergence' between EU and candidate countries, whereby specialisation in the EU countries converges toward higher VIIT shares. This trend can possibly be explained by the ongoing and intensified deepening of the EU including monetary integration, regional policies, and the common agricultural policies, which all mobilises the potential strength of the differences among richer and poorer EU countries (the latter being Greece, Portugal, and Spain). The inclusion of candidate countries into the EU would change the picture of Figures 2 and 3 toward even larger VIIT shares.

Our third finding is more tentative, and concerns the role foreign direct investment might have played for IIT.[19] Based on the aggregate EU trade with individual candidate countries, we found there was only a minor shift from the inter-industry type to the intra-industry type of trade flows, and IIT remained overwhelmingly vertical (Figure 4). The countries which attracted most foreign direct investment per capita in the previous decade (1990 - 2000) were the Czech Republic and Hungary, followed by Estonia, Slovenia and Poland.[20] Foreign direct investment might have contributed to an increase in IIT, illustrated by a rightward shift of the country cluster, but seems not to have prevented an increase in its vertical component in four out of the five mentioned cases.

Our fourth finding is on the quality split between EU and candidate countries. The term 'vertical' implies that one side of each country pair holds a quality advantage. Applying equation (2), we found that the candidate countries held the most quality advantages in vertical trade with the EU in 1993. The relation reversed in 2000: The quality advantage of the EU was near to 66%, while the appropriate share of candidate countries decreased to 34% (Table 3). The distribution among trade with individual candidate countries illustrates Figure 5.

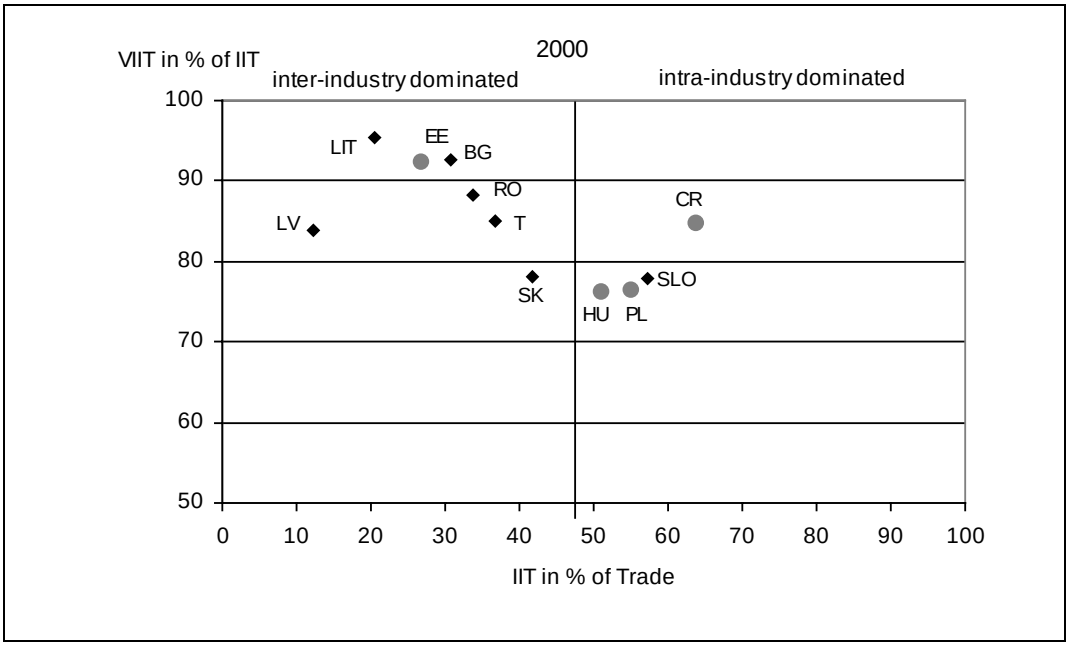
There is a major theoretical and empirical objection that can be made against the simple interpretation of VIIT as expressing only relative quality differences. According to the economic theory of index numbers a relative unit value higher than 1.15 may reflect either a cost disadvantage or a quality advantage of the exports of a country. A simple method for identifying the difference is to relate the RUV with the trade balance of in-

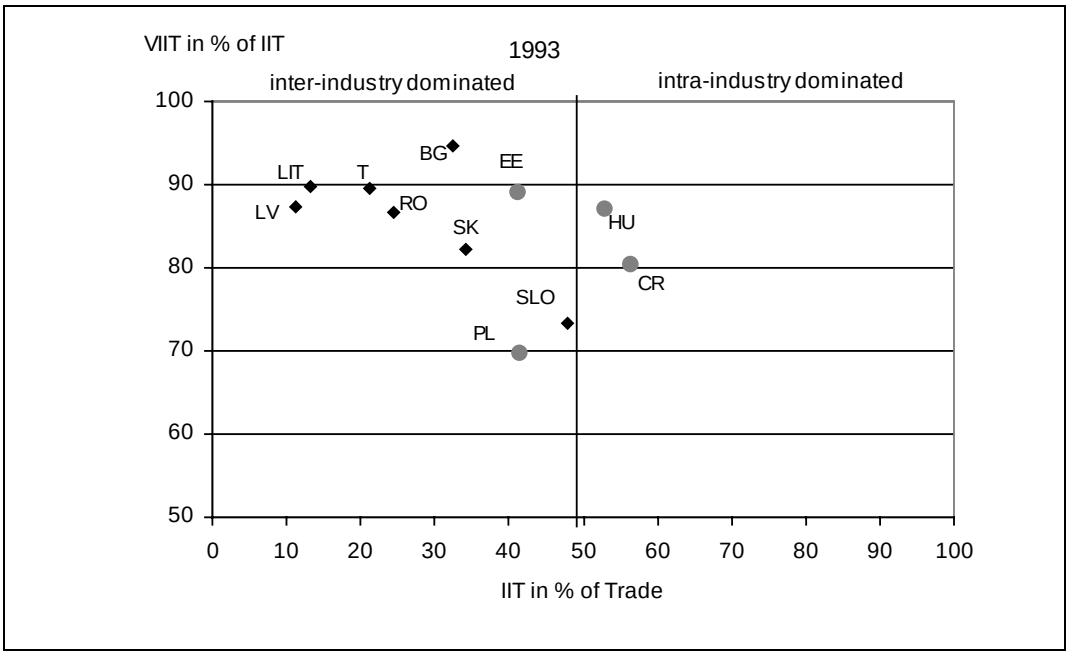
18 The reader should note that this conclusion is based upon a broad panel of 4-digit industries. Trade might be horizontal when a narrower panel will be observed.

19 The reader should take notice that this study is based on the country-approach, while foreign direct investment belong to the industry-approach. Therefore, we resign from explicit foreign direct investment data, and our results are rather preliminary and intuitive.

20 See *UN-ECE* (2002), p. 83.

Figure 4:
Types of aggregate EU trade flows with individual candidate countries, 1993 and 2000
adjusted Grubel-Lloyd indices





BG: Bulgaria; CR: Czech Republic; EE: Estonia; HU: Hungary; LIT: Lithuania; LV: Latvia; PL: Poland; RO: Romania; SK: Slovakia; SLO: Slovenia; T: Turkey.

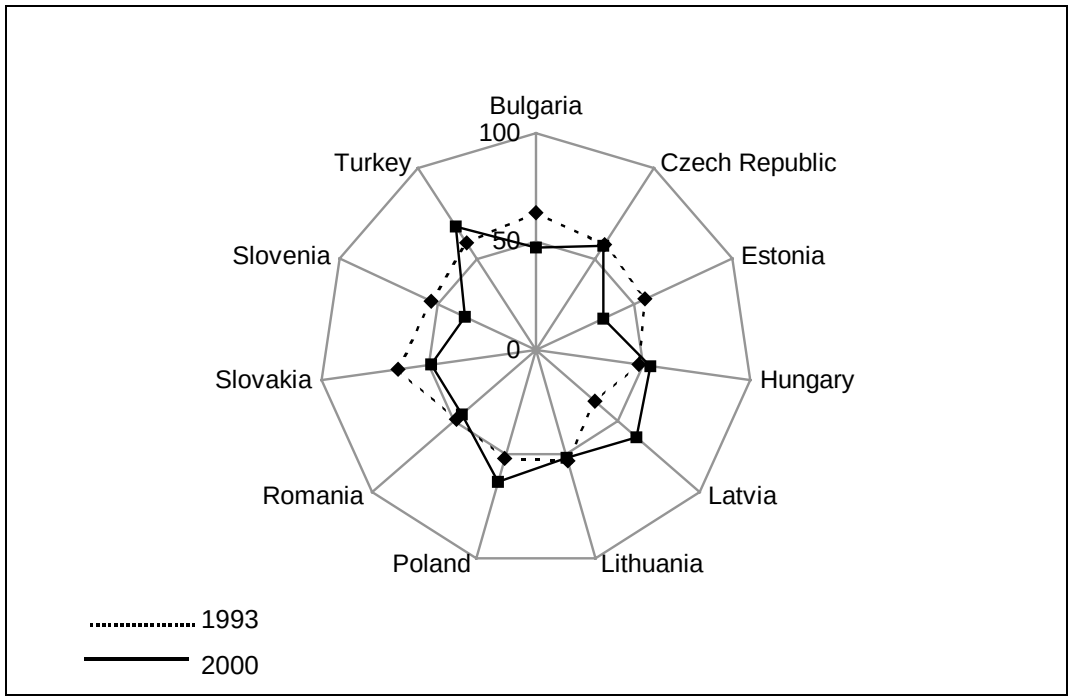
Source: Own calculation based on Eurostat, Comext databank, 2002. See also Table A4.

Table 3:
Mean values of high-quality VIIT[a] in % of total VIIT of EU in trade with individual candidate countries 1993 and 2000

Year	Total VIIT	EU HQ-VIIT		Candidate countries HQ-VIIT	
	Adjusted GL-indices	Adjusted GL-indices	in % of total VIIT	Adjusted GL-indices	in % of total VIIT
1993	0.284	0.136	47.9	0.148	52.1
2000	0.324	0.213	65.7	0.110	34.0

Source: Own calculation based on Eurostat, Comext databank, 2002. See also Table A4.

Figure 5:
High-Quality VIIT[a] in % of total VIIT of EU in trade with individual candidate countries, 1993 and 2000



[a] RUV > 1.15.

Source: Own calculation based on Eurostat, Comext databank, 2002. See also Table A5.

dividual industries.[21] The idea behind is that when a country obtains a higher price in the exports of a certain industry than in its imports, and when the country's industry re-

21 We follow a proposal of *Aiginger* (1997). A preferable method – estimation of price elasticity – requires long time series. These, however, are not available in trade of EU with candidate countries.

alises a trade deficit, than we may assume a cost disadvantage in this industry. We may expect the cost disadvantage to shrink over time; for the industry will be outcompeted. However, in a comparison of two years, this disadvantage may exist. Only when the industry achieves a trade surplus we may assume that a higher export than import price reports a quality advantage.

Applying this simple method, we found that the EU held a quality advantages in most industries already in 1993, and this advantage increased by 2000 (Table 4). In addition, we found a large portion of the VIIT share, which seems to be linked to cost advantages/disadvantages, for example roughly 44% of total VIIT in 1993. As it was to expect, this share declined by 2000 to about 39% in 2000, mainly to a reduction of the cost disadvantage of candidate countries. To put it differently: Liberalisation eliminates disadvantageous trade over time. The distribution of adjusted high-quality VIIT among individual candidate countries illustrates Figure 6: The size of the quality advantage the candidate countries hold against the EU imploded in the period considered.

Table 4:
Mean values of trade balance related high-quality VIIT[a] in % of total VIIT of EU in trade with individual candidate countries 1993 and 2000

Year	Total VIIT	EU HQ-VIIT *and* trade surplus		Candidate countries HQ-VIIT *and* EU trade deficit	
	Adjusted GL-indices	Adjusted GL-indices	in % of total VIIT	Adjusted GL-indices	in % of total VIIT
1993	0.284	0.084	29.6	0.076	26.8
2000	0.324	0.127	39.2	0.070	21.6

Source: Own calculation based on Eurostat, Comext databank, 2002. See also Table A4.

To sum up, the emerging pattern of trade between the EU and the candidate countries is characterised by:

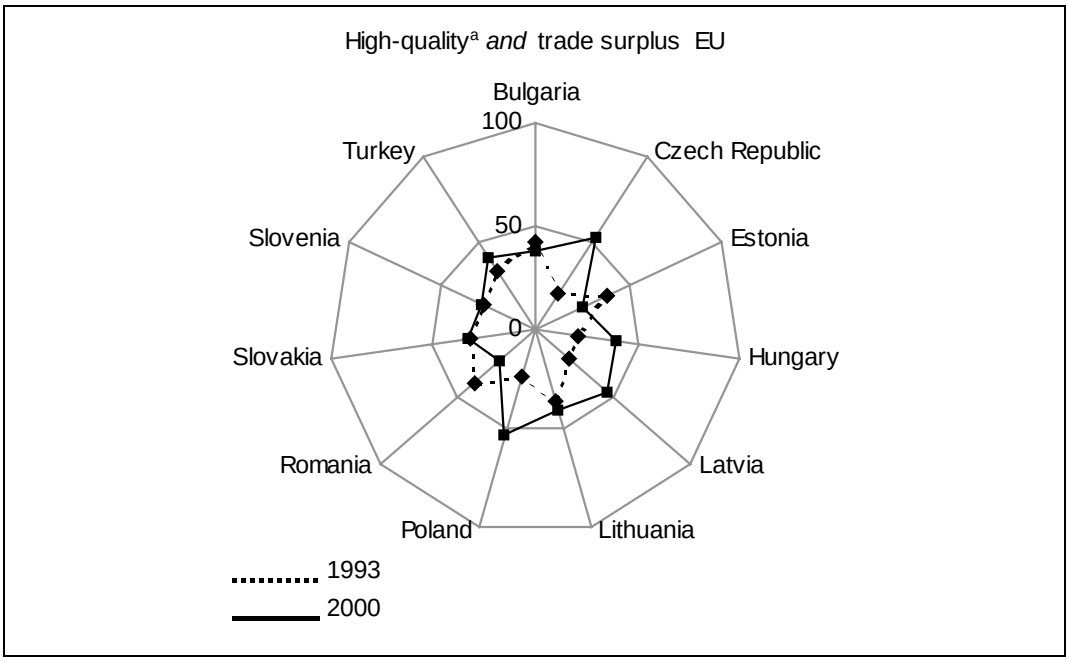
increased intra-industry trade,

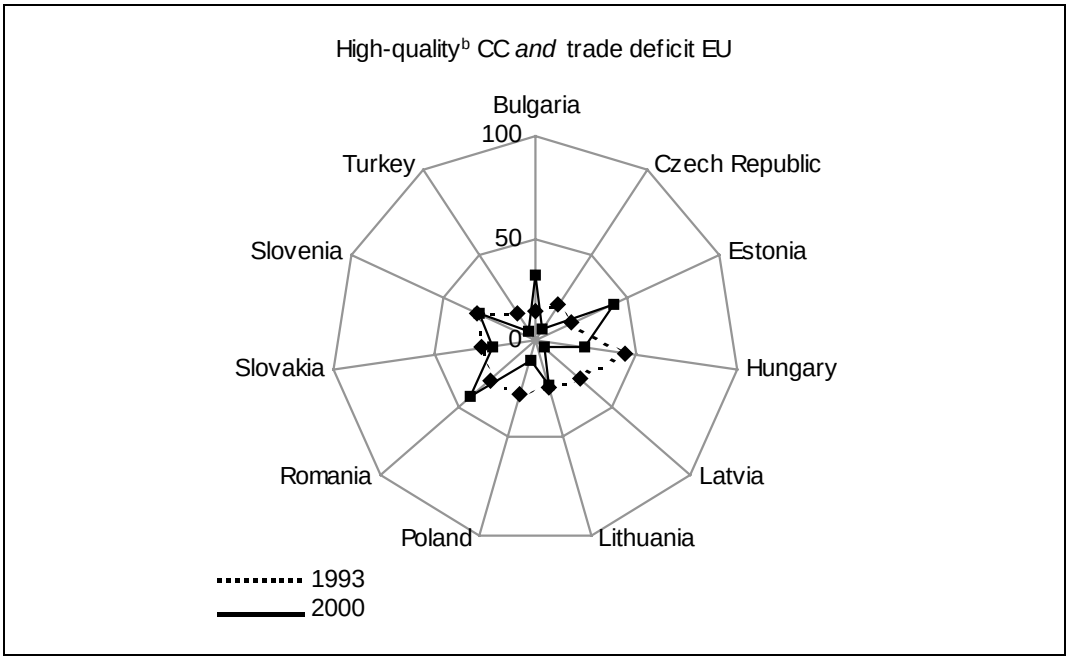
an unchanged dominance of vertical trade between ‘old’ EU countries and candidate countries, which might even increase after accession,

no clear indication that even in the case of relative high foreign direct investment per capita inflows VIIT shares tend to fall, and

a distribution of quality differences in favour of the EU, whereby quality advantages of the candidate countries tended to diminish.

Figure 6:
High-Quality VIIT in % of total VIIT and trade balance position of EU, 1993 and 2000





[a] RUV > 1.15. – [b] RUV < 0.85.

Source: Own calculation based on Eurostat, Comext databank, 2002. See also Table A5.

2.2 Income distribution across and within countries

Income distribution is assumed to have a strong impact on IIT. GDP per capita differences, commonly used in empirical testing, is income distribution *across* countries. Distribution of household income *within* a country is assumed to have an impact on the composition of IIT.

Applying Lorenz curves, GDP per capita distribution is more equal in the present EU than among candidate countries (Figure 7). When GDP per capita differences stand for endowment differences this picture might explain why IIT in Intra-EU trade prevails, but not in EU relationship with candidate countries; for equality in distribution is a driving force for IIT. The distribution patterns changes not very significantly when it is calculated according to current exchange rates or purchasing power parities (PPPs). However, calculated in exchange rate terms, distribution of per capita GDP across both regions became more equal in 2000 than in 1993, and more unequal calculated in purchasing power parity terms (as can be seen from Table 5).

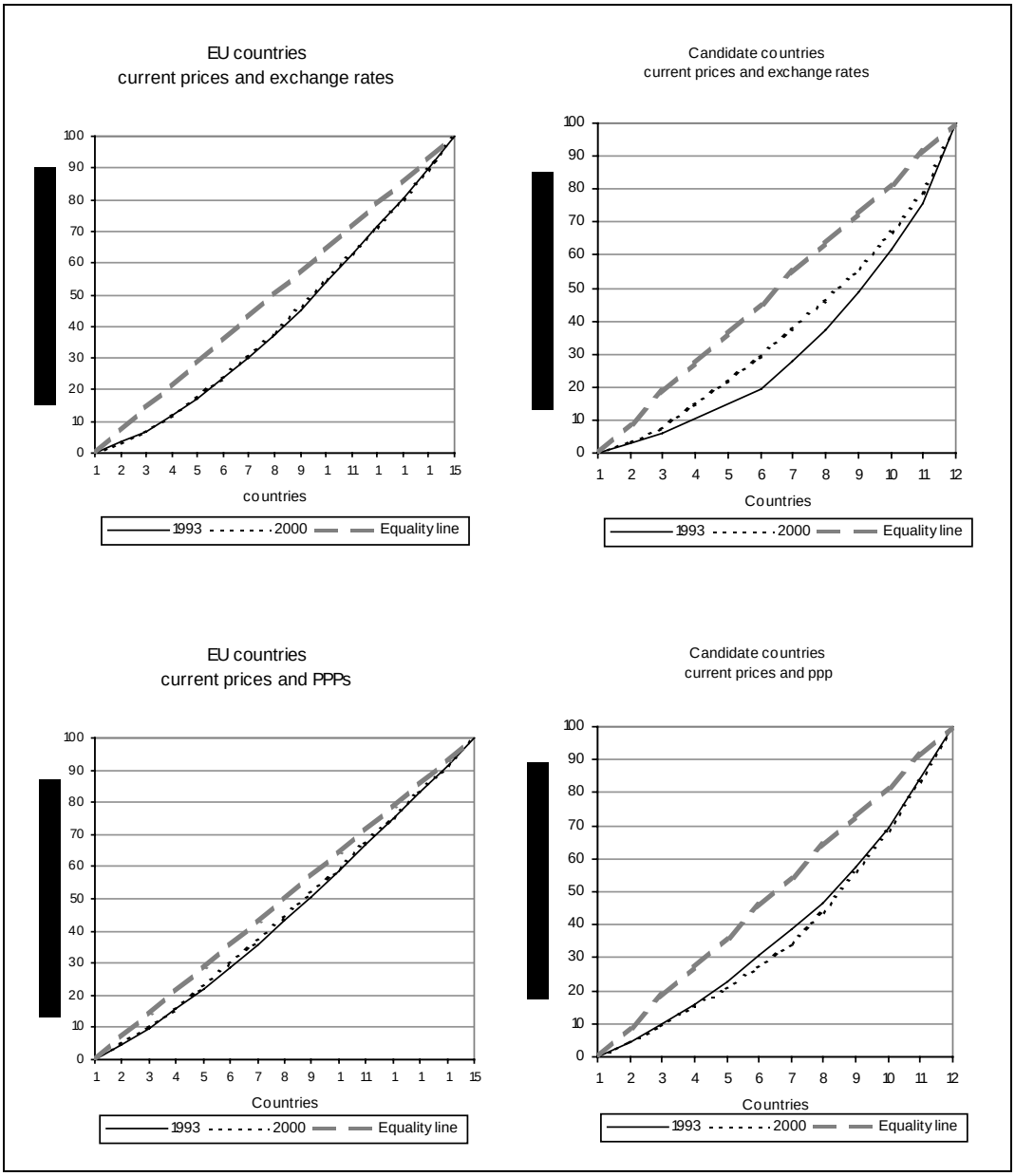
Table 5:
Mean values of GDP per capita in the EU and candidate countries' region, 1993 and 2000

	1993	2000
	According to exchange rates	
EU	18428	20053
Candidate countries	2395	3836
Ratio	7.7	5.2
	According to Purchasing Power Parities	
EU	16942	24741
Candidate countries	6222	8906
Ratio	2.7	2.8

Source: Own calculation based on Tables A6 and A7.

Distribution of household income is assumed to explain the demand of households for different qualities of goods of the same industry. If income distribution were completely equal (Gini coefficient = 0; or distribution following the equality line in the Lorenz framework), households were indifferent against quality. Their decision would be ruled by differences in prices, tastes, colours, package etc. Lorenz curves, drawn with data from the World Bank Development Report 2001, reveal that income distribution in the candidate deviate from the distribution patterns of the EU (Figure 8). The Gini coefficient illustrates that mean distribution was somewhat more equal in candidate countries than in EU countries (Table 6). The standard deviation from the mean value is more pronounced in candidate countries. However, this comparison should be viewed with certain caution: first, the country data care from different years (for example, Austria

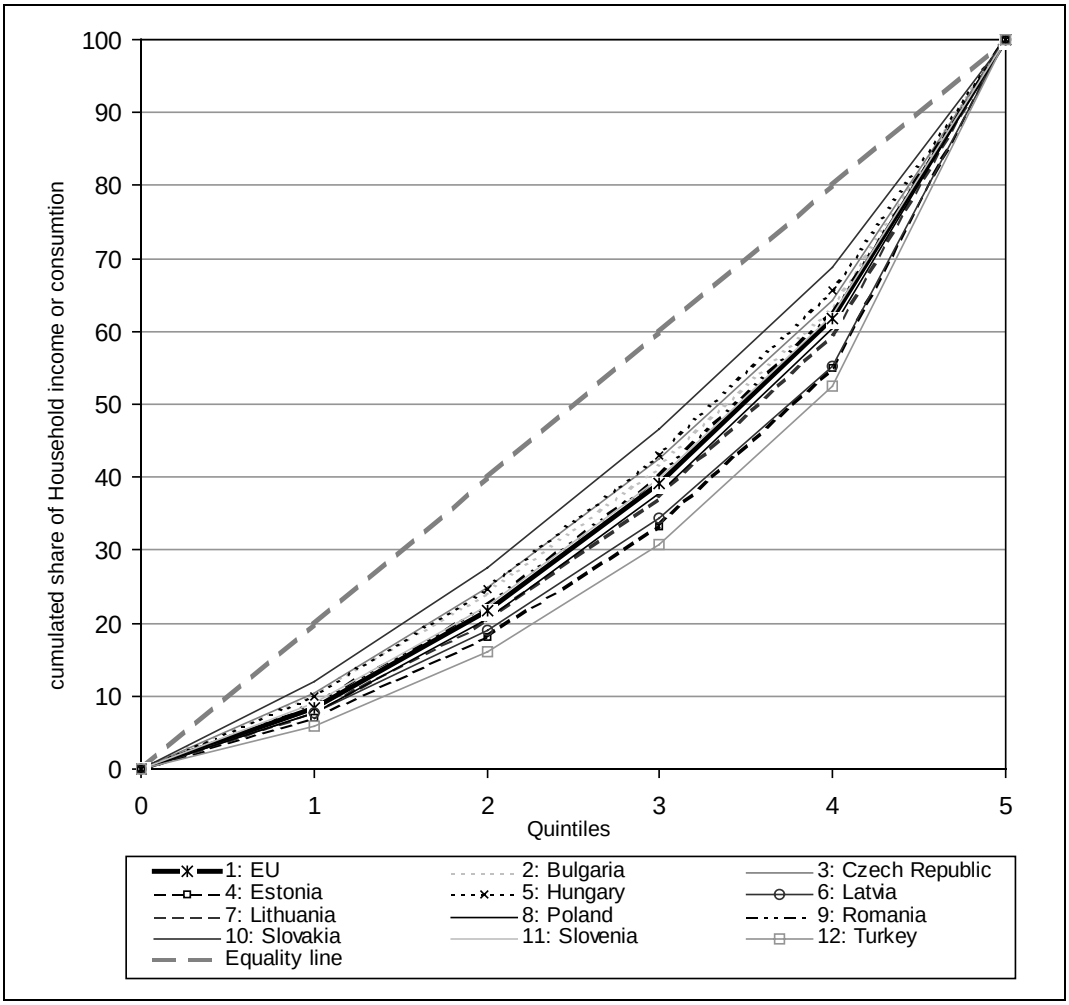
Figure 7:
Lorenz curves of GDP per capita distribution among EU and candidate countries, 1993 and 2000



Note: Cumulated share of income in relation of the sum of GDP per capita of all countries; see Tables A6 and A7. A *Lorenz curve* below the 45° line reflects an unequal income distribution. A downward shift of the curve reports more inequality.

Sources: OECD max data; WIIW (Bulgaria, Romania, and Slovenia for GDP in PPS) and HWWA (Baltic countries for GDP in PPS); national sources.

Figure 8:
Distribution of household income in the EU (mean values) and candidate countries, various years
- Lorenz curves -



Source: World Bank 2001; Table A8.

1987, and Estonia 1998). Second, data for some countries (Hungary, Lithuania, Poland, and Turkey) report households' expenditure and not income.[22] Third, data might not be harmonized (World Bank data on high-income economies – EU countries – are taken from Luxembourg Income Study database, data on candidate countries stem from government statistical agencies).

22 Average income based estimates of Gini coefficient were up to 6.6. percentage points higher than those based on expenditure (see *Atkinson, Brandolini* 2001).

Table 6:
Income distribution in EU and candidate countries

	Gini	Percentage share of income or consumption				
		Lowest 20%	Second 20%	Third 20%	Fourth 20%	Highest 20%
EU countries						
Mean	29.7	8.4	13.3	17.4	22.7	38.3
St.Dev.	4.4	1.2	1.2	0.8	0.3	3.3
Candidate countries						
Mean	28.2	8.1	13.1	16.9	22.1	39.8
St. Dev.	5.9	1.7	1.6	1.2	0.6	4.1

Source: World Bank 2001.

With reference to the LIS database, we are able to observe changes in income distribution over time for some candidate countries (Czech Republic, Hungary and Poland) compared with the EU (Figure 9). The distribution of household incomes changed in the transition period towards higher inequality compared to the EU. In an IIT model with income distribution this change would contribute to more vertical IIT.

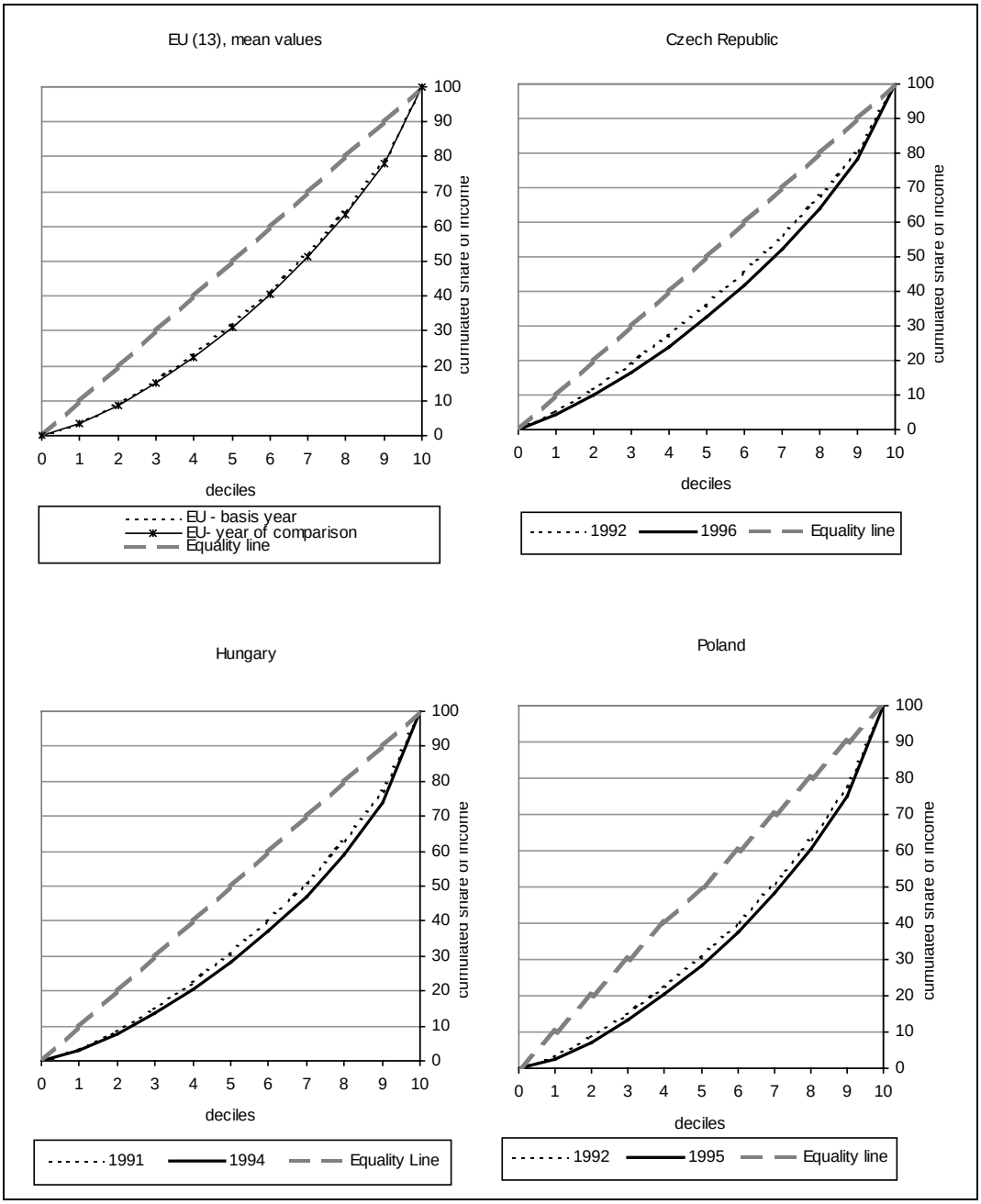
3. A model with income distribution

In this chapter we will present a model that brings vertical intra-industry trade in accordance with the stylised facts. We follow Flam and Helpman (1987) who showed that with differences in technology and population (income distribution across countries) and inequality in household incomes, a product-quality cycle with high vertical intra-industry trade can be set in motion. This model provides even a 'feeling' on the role foreign direct investment might play in this cycle.

The model assumes that the less advanced country, say, the candidate country, produces a homogenous good and the low-quality variety of the differentiated product, while the developed country, the EU in this case, produces the high-quality variety. On the production side, both countries have the same unit labour requirements to produce the homogeneous good but different unit labour requirements to produce one unit of the differentiated good with quality level q. Labour input requirements – a(q) for the EU and a*(q) for the candidate country – are positive and convex in the quality level. Their ratio $Z = a^*(q)/a(q)$ is assumed to increase in q since the EU has an absolute advantage in producing all quality levels (see Figure 1). The reason why the EU does not produce the entire range of the differentiated product is the possible comparative advantage of the

candidate country in producing part of the low quality variety. The problem is identify

Figure 9:
Changes in household income distribution in EU, Czech Republic, Hungary and Poland



ing the split between the two regions of the 'chain' of comparative advantages defined by quality levels with a continuum of varieties q of the differentiated commodity. The model provides a solution based on changes in the relative wage (due to productivity and quality changes), on population growth, and on changes in income distribution.

The demand for a specific variety is associated with different income levels of consumers. Those with higher effective labour endowments earn higher incomes and demand higher quality varieties of the differentiated good. It is possible to describe the distribution of income across households by density functions g for the EU, and g* for the candidate country. These functions also denote the density of the distribution of effective labour endowments across households.

There is a dividing income level at which consumers are indifferent towards a marginal change of quality, but respond to changes in the relative price of varieties. These consumers demand a quality qd. Consumers/households with higher incomes purchase high-quality varieties gh, and those with lower incomes purchase low-quality ones ql. Assuming a balanced trade, the model can be solved for the dividing income class. The dividing income class determines not only the split in the demand for quality in both countries, but also the relative wage per effective labour unit ω=w/w* and a pattern of specialisation typical for Ricardian models with a continuum of goods.

The explicit expression for the share of VIIT in total trade according to Flam and Helpman is

$$S = \frac{\alpha+\gamma}{\alpha+\gamma^*}\frac{wL}{w^*L^*}\frac{F(h_d)}{1-F^*(h_d^*)} \qquad (3)$$

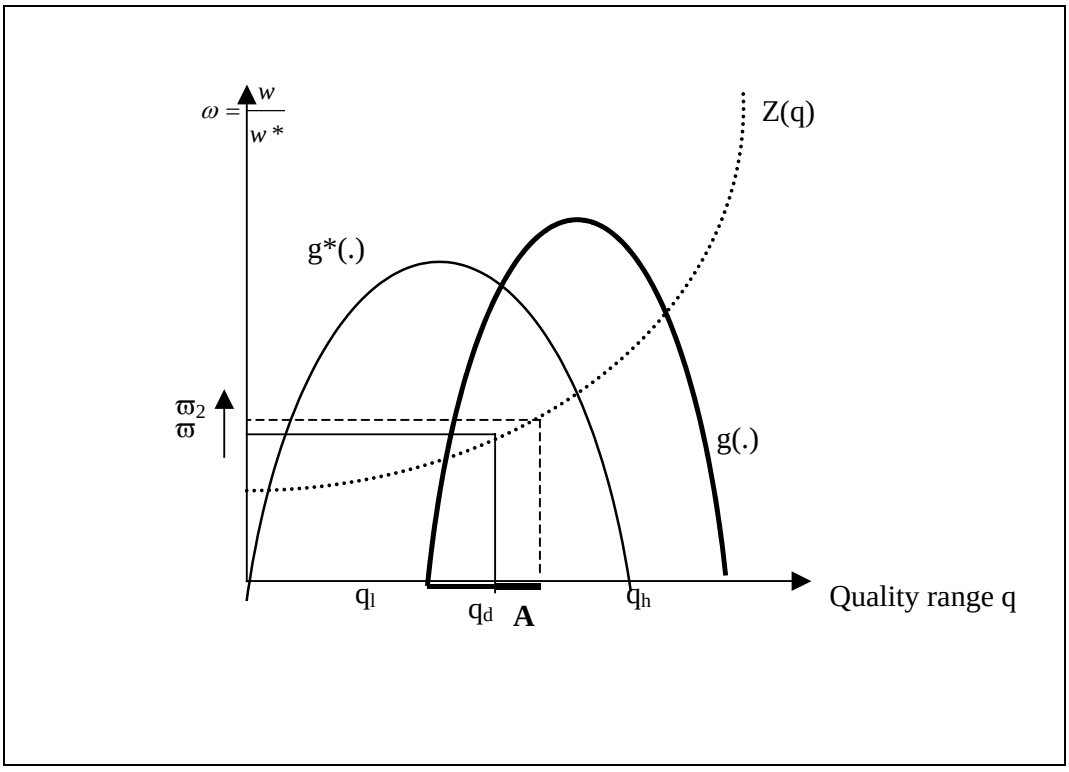
where α is a parameter for consumer preferences (equal in both countries) and γ, γ* describe the comparative advantage in the unit labour input functions. F(.) and F*(.) are the cumulative distribution function in the EU and in the candidate country up to the consumer with the dividing income level, which is in the interval $h, h^* = \left[0,...h, h_d^*,...1\right]$. The wage rate and the labour supply are defined by w and w*, and L and L*, respectively. All EU households in the interval $h = \left[1, h_d\right]$ spend a share $\frac{\alpha}{\alpha+\gamma^*}$ of their income wL on the imported low-quality variety. All households in candidate countries in the interval $h^* = \left[h_d^*,1\right]$ spend a share $\frac{\alpha}{\alpha+\gamma}$ of their income w*L* on the high-quality variety produced in the EU country.[23]

The income of the consumers/households, which are indifferent towards quality, is the product of the wage ratio and the amount of effective labour offered by these house-

23 The ratio between both shares yields the parameter term in expression (3).

holds. As shown by Figure 10, with density functions g for EU and g* for candidate countries, for an arbitrary relative wage ω, the candidate country exports the quality variety between ql and qd, whereas the EU country produces and exports the quality variety between qd and qh. Expression (3) describes how changes in the relative wage level, the labour supply, and the dividing income class influence the share of (vertical) intra-industry trade in total trade. The most interesting determinants are the changes in the relative wage and in income distribution.

Figure 10:
The quality split



Assuming that the EU country improves technology, or increases physical capital and human capital in its high-quality goods industry, the prices of all qualities in the range q_d and q_h will fall. With increasing demand for these qualities, demand for labour will increase, and so will the EU wage rate w and the relative wage rate ω with labour supply given. The demand for the low quality range, produced in the candidate country, will decline. For EU producers, it becomes profitable to abandon the lower section of the quality range and shift it to the candidate country, where cheap labour is available. As can be seen in Figure 10, the range of q_h, produced in the EU, has narrowed; and for q_l, produced in the candidate country, it has broadened. On the demand side, the income of households up to the dividing income increases due to the higher wage rate. These

households start to consume in addition precisely a variety of the differentiated good that was formerly produced in the EU and has been shifted to the candidate country. A quality-based product cycle emerges that finds expression in an increasing share of VIIT in total trade. In equation (3), the numerator increases due to the wage increase. The wage rate of the TE country w^* may have increased (and so the denominator), but it has done so less than in the EU country. The shift of the lower-quality section of the differentiated good from the EU country has added some higher productivity level to the quality-range in the candidate country, but this productivity level is considerably below the productivity level of the high-quality range in the EU country.

When productivity and ω increase, the bold section A on the quality range will shift from the EU to the TE country. With a given income distribution (density functions), a given labour supply, and dividing income, this additional part will be produced and exported by the TE country, and consumed by the EU country.

Flam and Helpman show that some of the factors, which affect the relative wage, ω may exert indirect effects on *S* via a change in the dividing income level. In the case considered here, the falling price for the high-quality version would induce households with the dividing income and indifferent to quality to demand the higher quality. The dividing household income h_d would fall, and so would $F(h_d)$ with the effect of reducing VIIT. The same might happen in the candidate country, only that $1-F^*(h_d)$ would increase, and so too would total trade (in the denominator). This is, however, an effect that cannot compensate completely for its cause.

Let us now assume that, in the candidate country, income distribution becomes more unequal, to the detriment of the poorer households, and demand for imported goods increases. Consumers in both countries now face a higher price level for $q_{h.}$. EU $_{\text{households}}$ with the dividing income would react to higher prices for q_h and shift their demand to q_l, which is produced in the candidate country. The price for the lower quality variety would increase, and EU producers would find it profitable to shift production of the lower-section of the high-quality range to the candidate country. With a new dividing income class, $F(h_d)$ would increase. The same would happen in the candidate country because some of the consumers with the dividing income would shift their demand to the low quality product. Again, the dividing income increases, and $F^*(h_d^*)$ would follow suit. According to (4), the share of VIIT in total trade would turn out to be higher.

In the former case, the cause of all changes was an improvement in technology, physical and human capital, increasing the comparative advantage of the EU country. The intermediate result was an increase in productivity that may give rise to a change in the dividing income class. In the latter case, the cause was income redistribution, and the effect was the increase in productivity. In both cases demonstrated, we find a product cycle based upon a shift of the lower end of the quality range in the EU country to the upper end of the quality range in the candidate country. The productivity gap in both cases was not closed. Flam and Helpman also show that the productivity increase in the

poorer country needs to be decisively higher than in the rich country if it is to compensate for the comparative advantage in producing higher quality. Only then does the share of VIIT fall (and the share of HIIT increase). The model explains why this higher productivity increase cannot be achieved simply by shifting the lower end of the EU quality range to the candidate country (through foreign direct investment, for example).

Expression (3) may be a good candidate for disentangling different determinants of both HIIT and VIIT in the context of EU-candidate countries, where the EU stands for a region of more developed countries and the candidate countries for a region of less developed ones. The model predicts that the volume and share of VIIT between two countries will be positively related to the difference in their wage rates and to domestic income distribution. *Durkin* and *Krygier* (2000) tested the model for US-OECD trade. They found the expected signs and significant coefficients for GDP per capita (as a proxy for the relative wage rate), income distribution, and distance (a variable not included in the basic model), but they obtained ambiguous results for the size variable (as a proxy for labour supply).

4. Estimations and results

The empirical form of equation (4) is

$$\ln s_{EU,TE} = \beta_0 + \beta_1 \ln\left|\frac{GDP^{EU}}{C^{EU}} - \frac{GDP^{TE}}{C^{TE}}\right| + \beta_2 \min\left(\ln GDP^{EU}, \ln GDP^{TE}\right) + \\ + \beta_3 \max\left(\ln GDP^{EU}, \ln GDP^{TE}\right) + \beta_4 \ln ID + \beta_5 \ln D + \varepsilon_{EU,TE} \qquad (4)$$

where $s_{EU,TE}$ is the share of intra-industry trade between a single EU country and a single candidate country in trade. The bilateral shares (14x11 = 154 observations) of intra-industry trade are calculated for the year 2000 as total IIT, HIIT and VIIT according to adjusted Grubel-Lloyd indices. We use GDP per capita $\left|\frac{GDP^{EU}}{C^{EU}} - \frac{GDP^{TE}}{C^{TE}}\right|$ as a proxy for the average wage (henceforth *RELGDP*); this variable reports changes in the relative difference between each pair of countries.

The next variable is a proxy for size. In most, but not all, cases min(lnGDP) stands for the candidate country, and max(lnGDP) for the EU country.[24] We abbreviate the former as *MINGDP*, and the latter as *MAXGDP*. All GDP data are in US dollar terms based on

[24] *Durkin*, *Krygier* in their study on US-OECD trade rephrased max and min values into GDP(US) and GDP(OECD) because the GDP of the US exceeded that of each OECD country. In our case, the GDP of some candidate countries exceeded that of some EU countries, for example in the Polish-Greek case, and the min value is the Greek one while the max value is the Polish one.

the average exchange rate. GDP and population data were taken from OECD (2001). *ID* represents differences in income distribution between each pair of countries, and changes approximate shifts in the dividing income level. *D* is a distance variable we use in addition to the basic model. The inclusion of distance enlarges the model by transport costs and brings it closer to gravitation models in international trade.

From the theoretical perspective identified for HIIT and VIIT in equation (4), we expected the signs of the coefficients to be as follows:

(1) an opposite relationship for HIIT ($\beta_1 < 0$) and VIIT ($\beta_1 > 0$) if per capita GDP (*RELGDP*) and capital-labour ratios were correlated[25]

(2) a major role by income distribution in explaining VIIT ($\beta_4 > 0$), whereas it would have no role in the case of HIIT, and

(3) a positive impact on VIIT if the developed country/region was significantly larger than the less advanced country ($\beta_3 > 0$; $\beta_2 < 0$)

(4) a negative impact on HIIT and VIIT if the distance between two countries is large ($\beta_5 < 0$).

Equation (4) was estimated using OLS for 2000 data. We tested two models. In the first stage (model 1), we estimated a set of equations excluding income distribution and distance, and compared the results with those that Hummels and Levinsohn obtained for total IIT with the same specifications. Hummels and Levinsohn obtained a positive sign for the coefficient of the relative difference variable (RELGDP in our case) in explaining IIT with fixed effects regressions, and a negative sign without fixed effects. They concluded that their mixed empirical results stand for country-pair specific effects (for example distance) in explaining IIT, and not for factor endowment differences. Our estimations did not yield mixed results (Table 7, upper panel). With (columns 5 and 6) and without fixed effects, the sign of the RELGDP variable did not change from positive into negative. We found empirical support for a positive relationship between relative GDP per capita and VIIT, and therefore for the factor endowment explanation of VIIT.[26] However, although VIIT regressions with fixed effects yield good results (including the increase of the explanatory power compared to regressions without fixed effects), the equal direction of all signs and significance of the independent variables is somewhat unsatisfactory.

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25 Consider the long-standing debate on whether per capita income is a proxy for factor endowments or consumer tastes. The empirical literature has interpreted differences in per capita income both as a demand side phenomenon, as in *Bergstrand* (1990), and as a proxy for differences in factor composition, as in *Helpman* (1987).

26 For recent results see *Díaz Mora* (2002), who finds evidence that factor endowment and technology differences in intra-EU trade are the driving force for (high quality) VIIT.

In the second stage (model 2), we followed Durkin and Krygier. Income distribution within two trading countries plays an important role, and there are spatial distances plus fixed effects in addition. Durkin and Krygier constructed the income distribution value by cumulating household deciles in a US-OECD framework along the x-axis of the Lorenz curve setting. They set the income of the lowest US quintile in purchasing power parity (PPS) as the overlapping income class, assuming that household quintiles above this class demand higher quality and households below it demand lower quality. We followed their approach by calculating the ratio of the share of the lowest quintile in a EU country to the share of the highest quintile in the candidate country (but in US dollar exchange rate terms). Data were taken from the World Bank (World Development Report 2001). The main problem with this and similar approaches is a severe distortion caused by a possible gap between the average income of the household class with highest incomes in candidate countries and of the household class with lowest incomes in EU countries – there would be no overlapping income class. This was actually found in the EU-candidate countries relationship, even in terms of PPS. With the usual statistical flaws and drawbacks in addition (no match with the year 2000, mixed data for income and expenditure, no standardization in the national household surveys), the income distribution dataset is the weakest one among all datasets, and a good candidate for distortions in estimates.

Testing adjusted Grubel-Lloyd indices without fixed effects, we obtained the expected signs for vertical trade (VIIT) for the independent variables (Table 7, lower panel, column 6) except MINGDP, and the variables were highly significant. For horizontal trade (HIIT) we obtained the wrong sign for RELGDP (column 5): instead a '-' we obtained a '+'. We concluded that the model explains rather VIIT, accounting for the largest share of intra-industry trade, and less HIIT. The equations include the income distribution variable according to the overlapping concept (based on quintiles) and a distance variable. For income distribution we calculated the ratio between the share of the lowest quintile in a EU country and the share of the highest quintile in a candidate country (see Table A8). The distance variable measures the distance between the capitals of each country pair in kilometres (see Table A9). Three results are striking compared with model 1:

- First, the explanatory power of the model increased significantly by the inclusion of two new variables that explain IIT when it is mainly vertical; adjusted R^2 are at about 0.65 for VIIT (0.55 in model 1 with fixed effects).

- Second, RELGDP bears the expected positive sign in VIIT estimations with high significance. The variable turned out to be insignificant in HIIT estimations, although in estimation without fixed effects the correct sign (a minus) emerged.

- The distance variable yielded the expected sign in all estimations underpinning that with increasing distance intra-industry trade tends to decrease whatever the component is.

In all estimations including or excluding income distribution and distance, the coefficient to MINGDP yielded the "wrong" sign.

Table 7:
Results of OLS

	Dependent variables (logs); adjusted IIT shares					
	With fixed effects[a]			Without fixed effects		
	1	2	3	4	5	6
Independents (logs)	IIT	HIIT	VIIT	IIT	HIIT	VIIT
	Model 1: excluding domestic income distribution and distance					
CONSTANT	---	---	---	-11.886***	-17.638***	-11.460***
MAXGDP	0.386***	0.257***	0.215***	0.275***	0.435***	0.235***
MINGDP	2.257***	0.951***	0.633**	0.309***	0.696***	0.263***
RELGDP	0.176	0.444***	0.470***	0.368***	0.082	0.409***
Adjusted R^2	0.38	0.51	0.55	0.25	0.35	0.22
	Model 2: including domestic income distribution and distance					
CONSTANT	-	-	-	-6.682***	-8.417***	-6.286***
MAXGDP	0.298***	0.458***	0.247***	0.331***	0.522***	0.290***
MINGDP	0.776**	1.735**	0.470*	0.363***	0.763***	0.312***
RELGDP	0.283***	0.004	0.343***	0.135	-0.280	0.185**
D	-0.225***	-0.810***	-0.209**	-0.290***	-0.665***	-0.285***
ID	0.838**	0.122**	0.818**	1.387***	1.721***	1.414***
Adjusted R^2	0.59	0.42	0.65	0.49	0.48	0.65

IIT: Intra-Industry Trade; HIIT: Horizontal IIT; VIIT: Vertical IIT.

MAXGDP: maximum size of GDP of a country pair; MINGDP: minimum size of GDP of a country pair; RELGDP: relative size of country measured in GDP per capita; D: Distance in kilometres; ID: Income Distribution (household income). All variables in logs.

5. Concluding remarks

This study has found no confirmation for Hummels and Levinsohn's conclusion that intra-industry trade is decisively determined by country-pair specifics. When their model was tested with EU-TE data, the shift from regressions including and excluding fixed effects did not produce a change in the sign of any coefficient, particularly of the coefficient to the relative income per capita variable. This prompts us to conclude that the

probability of a sign change may depend on the character of intra-industry trade. The probability may be small when IIT is overwhelmingly vertical, as it was in the case that we analysed.

We also found that country determinants matter in explaining vertical intra-industry trade, although we did not test explicitly for industry specific factors. Nevertheless, the conclusion reached by Aturupane et al. strikes us as somewhat 'inconclusive'. The use of explicit country determinants is always preferable to the use of country dummies.

What we did find in addition was that after a seven-year-long period of trade liberalisation, the division of labour between the EU and the candidate countries reflects a respective specialisation in low and high quality goods with dominant quality advantages for the EU firms. Our analysis indicates that this situation is due to three factors: first, the per capita income differences between EU and candidate countries; second, the size (demand) differences between them; and third, the different inequalities in income distribution among households. These three types of difference may have given rise to a product-quality cycle in which firms find it profitable to produce the low end of the quality spectrum in candidate countries, and the high end of the spectrum in a EU country.

It is not important where the firms are located: EU firms may shift the production of a certain lower quality via foreign direct investment to candidate countries, or firms in candidate countries may decide to undertake (domestic) investment in those qualities. It is a striking aspect of this observation, that foreign direct investment in candidate countries seems to have had an almost negligible impact on change toward horizontal trade structures. This should trigger off a more moderate view on the role of foreign direct investment, which is too often seen overly optimistic to contribute to catching-up in terms of quality and technology whenever trade has been liberalised.

However, a product-cycle kind of trade[27] is not in itself a process that leads TE countries into a technology trap. The product-cycle includes the transfer of technology, capital and human capital, and helps upgrade quality in the host country. These opportunities offered by the product-cycle need only to be exploited. Economic policy can mobilise resources to support catching-up in quality, productivity and per capital income. Such policy should concentrate on improving the domestic absorptive capacity of local firms in TE countries so that they can move upwards along the quality spectrum. It should also enhance domestic factors like R&D intensity, and investment in capital stock and human capital so that technology can be mobilised. Last but not least, a convergence toward the "European Social Model" could support convergence of income distribution patterns. The dividing income class would shift toward the households with lower incomes in candidate countries. This would make the countries more attractive for high-quality production.

27 For an analysis of the product cycle in the perspective of North-South trade see *Chun-Zhu* (2000).

References

Abd-El-Rahman, Kamal: Firms' Competitive and National Comparative Advantage as Joint Determinants of Trade Composition. Weltwirtschafliches Archiv, 127, 1: 83-97, 1984.

Aturupane, Chonira, Simeon Djankov; Bernard Hoeckman (1999): Horizontal and Vertical Intra-Industry trade between Eastern Europe and the European Union. Weltwirtschfliches Archiv 135, 1: 62-81.

Atkinson, Anthony B.; Andrea Brandolini: Promise and Pitfalls in the Use of 'Secondary' Data-Sets: Income Inequality in OECD Countries as a Case Study. Journal of Economic Literature, XXXIX, 3: 771-800, Sept. 2001.

Bergstrand Jeffrey H.: The Heckscher-Ohlin-Samuelson model, the Linder Hypothesis and the Determinants of Bilateral Intraindustry trade. Economic Journal, 100, 1216-1229, Dec. 1990.

Burgstaller, Johann; Michael Landesmann: Vertical product differentiation in EU markets: the relative position of east European producers. Research Reports No 234. Vienna, WIIW 1997.

Chun Zhu, Susan: Product Cycles and Skill Upgrading: An Empirical Assessment. Toronto, mimeo, Dec. 2000.

Damijan, J. Pl.; B. Majcen; M. Rojec; M. Knell: The role of FDI, R&D accumulation and trade in transferring technology to transition countries: Evidence from firms panel data for eight transition countries. Working paper 10. University of Ljubljana, 2001.

Díaz Mora, Carmen: The Role of Comparative Advantage in Trade within Industries: A Panel Data Approach for the European Union. Weltwirtschaftliches Archiv, 138, 2: 291-317, 2002.

Durkin John T.; Markus Krygier: Differences in GDP per capita and the Share of Intraindustry Trade: The Role of Vertically Differentiated Trade. Review of International Economics, 8, 4: 760-774, Nov. 2000.

Edward, Ch.: Potential Trade in Southeast Europe: A Gravity Model Approach. WIIW Working Paper No 21. Wiener Institut für Internationale Wirtschaftsvergleiche, 2002.

EUROSTAT: Comext database. Intra- and extra-EU trade. Luxembourg, European Communities, 2002.

Facchini Giovanni; Maria L. Segnana: Integrazione Europea e commercio internazionale. Quali aspetti distributivi? in: Farina Francesco and Roberto Tamborini (eds), Da nazioni a regioni. Mutamenti strutturali ed istituzionali dopo l'ingresso nell'Unione Monetaria Europe. Bologna, Il Mulino, 2002, 129-156.

Flam, Harry; Elhanan Helpman: Vertical Product Differentiation and North-South Trade. American Economic Review, 76, 5: 810-822, Dec. 1998.

Gabrisch, Hubert; Klaus Werner: Advantages and drawbacks of EU membership – the structural dimension. Comparative Economic Studies, XXX, 3: 79-103, Fall 1998.

Gabrisch, Hubert; Maria L. Segnana: Trade Structure and Trade liberalization: The emerging pattern between the EU and Transition countries. MOCT-MOST, 11, 1: 27-44, 2001.

Greenaway, David; Robert Hine; Cris Milner: Country Specific Factors and the Patterns of Horizontal and Vertical Intra-industry trade in the UK. Weltwirtschafliches Archiv, 130, 1: 77-99, 1994.

Gullstrand, Joakim: Does the Measurement of Intra-Industry Trade Matter? Weltwirtschaftliches Archiv, 138, 2: 317-40, 2002.

Helpman, Elhanan: Imperfect Competition and International Trade: Evidence from Fourteen Industrial Countries. Journal of the Japanese and International Economies, 1, 62-81, 1987.

Hoekman, Bernard; Simeon Djankov: Intra-Industry trade, foreign direct investment and the reorientation of East European exports. CEPR Discussion Paper Series, No. 1377. Centre for Economic Policy Research, 1996.

Hummels, David; James Levinsohn: Monopolistic competition and international trade: reconsidering the evidence. Quarterly Journal of Economics, 110, 799-836, August 1995.

Instituto Nacional De Estatística – Direcção Regional De Lisboa E Vale Do Tejo. Unpublished series, data available on request, 2001.

Leamer, Edward E.; James Levinsohn: International Trade Theory: The Evidence, in: Gene Grossman, and Kenneth Rogoff (eds), Handbook of International Economics, Vol. III, pp. 1339-94. Amsterdam, Elsevier, Science B.V., 1995

LIS (Luxemburg Income Studies): Unpublished series, data available on request, 2001.

Milanovic, Branko: Explaining the Increase in Inequality During the Transition. Economics of Transition, 7, 2:299-341, 1999.

Milanovic Branko (1998): Income, Inequality and Poverty during the Transition from Planned to Market Economy. The World Bank, Regional and Sectoral Studies

Milanovic Branko (1999): Explaining the increase in inequality during transition. Economics of Transition, Vol. 7, No. 2 pp. 299-341.

Möbius, Uta: Passive Lohnveredelung in Mittel- und Osteuropa für Deutschland und die übrige EU.(reverse direction of quotation marks), in: Transformation, No. 8, pp. 47-57. Leipzig: Zentrum für Internationale Wirtschaftsbeziehungen der Universität Leipzig, 1998.

OECD: OECD Statistical Compendium. edition 01#2001 (maxdata). 2001.

Pellegrin, Julie: Between Dependency and Globalisation: Towards a New Division of Labour in an Enlarged Europe. WWDP No. 23/1998. Chemnitz-Zwickau: Technische Universität Chemnitz-Zwickau, 1998.

Rosati, Dariusz: Emerging Trade Patterns of Transition Countries: Some Observations from the Analysis of 'Unit Values'. MOCT-MOST, 8, 2: 51-67, Jan. 1998.

Statistical Office of the Slovak Republic: Statistical Yearbook of the Slovak Republic. Bratislava: 1999.

Thom, Rodney: The Structure of EC-CEE Intraindustry trade." Working Paper No. 1. Dublin: Centre for Economic Research, Jan. 1999.

UN-ECE: Economic Survey of Europe. United Nations – Economic Commission for Europe, No 2, 2002.

Vona, Stefano: On the Measurement of Intra-Industry Trade: Some Further Thoughts. Weltwirtschaftliches Archiv, 127, 4: 678-700, 1991.

WIIW (Wiener Institut für Internationale Wirtschaftsvergleiche): Countries in Transition 2001. WIIW Handbook of Statistics. Vienna: WIIW 2001.

World Bank: World Development Report 2001. Washington, DC. 2001.

Annex of Tables

Table A1:
Trade turnover (exports + imports) of individual EU countries with candidate countries 2000

	Total trade	**Trade in selected industries**	
	mn ECU	mn ECU	in % of total trade
Austria	19619	15102	77.0
Belux	11305	8761	77.5
Denmark	4308	2915	67.7
Finland	62890	5568	88.5
France	22769	19864	87.2
Germany	107086	88750	82.9
Greece	3486	2590	74.3
Ireland	2339	2028	86.7
Italy	32359	27566	85.2
Netherlands	14380	9598	66.7
Portugal	1175	1001	85.2
Spain	8278	6740	81.4
Sweden	8673	6653	76.7
United Kingdom	17954	15378	85.7
Total	*260021*	*212515*	*81.7*
Mean	----	----	80.2

Source: Own calculation based on Eurostat, Comext databank, 2002.

Table A2:
Grubel-Lloyd indices: Intra-EU trade 1993 and 2000

1993	Unadjusted indices			Adjusted indices		
EU country against all others	IIT	HIIT	VIIT	IIT	HIIT	VIIT
Austria	0.582	0.182	0.400	0.700	0.219	0.481
Belgium & Luxembourg	0.663	0.327	0.336	0.750	0.370	0.380
Denmark	0.572	0.159	0.413	0.673	0.187	0.486
Finland	0.372	0.088	0.284	0.440	0.104	0.336
France	0.786	0.451	0.334	0.834	0.479	0.355
Germany	0.719	0.356	0.362	0.817	0.405	0.412
Greece	0.181	0.027	0.155	0.405	0.059	0.345
Ireland	0.448	0.057	0.391	0.495	0.063	0.432
Italy	0.543	0.144	0.398	0.613	0.163	0.450
Netherlands	0.711	0.329	0.382	0.741	0.343	0.398
Portugal	0.339	0.111	0.228	0.395	0.130	0.265
Spain	0.620	0.153	0.466	0.695	0.172	0.523
Sweden	0.570	0.166	0.404	0.602	0.175	0.426
United Kingdom	0.700	0.184	0.516	0.764	0.201	0.563
Mean	*0.558*	*0.195*	*0.362*	*0.637*	*0.219*	*0.418*

2000	Unadjusted indices			Adjusted indices		
EU country against all others	IIT	HIIT	VIIT	IIT	HIIT	VIIT
Austria	0.655	0.158	0.496	0.731	0.177	0.554
Belgium & Luxembourg	0.716	0.344	0.371	0.799	0.384	0.415
Denmark	0.609	0.003	0.606	0.738	0.004	0.734
Finland	0.328	0.080	0.248	0.395	0.097	0.298
France	0.801	0.445	0.356	0.844	0.469	0.375
Germany	0.714	0.377	0.336	0.864	0.457	0.407
Greece	0.185	0.008	0.178	0.512	0.021	0.490
Ireland	0.486	0.037	0.449	0.572	0.044	0.528
Italy	0.585	0.209	0.376	0.596	0.213	0.383
Netherlands	0.664	0.280	0.384	0.790	0.333	0.457
Portugal	0.482	0.102	0.380	0.569	0.120	0.449
Spain	0.651	0.170	0.480	0.772	0.202	0.570
Sweden	0.579	0.217	0.362	0.624	0.234	0.390
United Kingdom	0.261	0.015	0.246	0.276	0.016	0.260
Mean	*0.551*	*0.175*	*0.376*	*0.649*	*0.198*	*0.451*

Source: Own calculation based on Eurostat, Comext databank, 2002.

Table A3:
Grubel-Lloyd indices: Extra-EU trade 1993 and 2000

1993	Unadjusted indices			Adjusted indices		
Candidate country with all EU countries	IIT	HIIT	VIIT	IIT	HIIT	VIIT
Bulgaria	0.260	0.014	0.246	0.325	0.018	0.307
Czech Republic	0.480	0.094	0.386	0.563	0.110	0.452
Estonia	0.211	0.023	0.188	0.411	0.045	0.366
Hungary	0.406	0.052	0.353	0.529	0.068	0.461
Latvia	0.109	0.014	0.095	0.111	0.014	0.097
Lithuania	0.120	0.012	0.107	0.131	0.013	0.118
Poland	0.323	0.098	0.225	0.414	0.125	0.288
Romania	0.198	0.026	0.172	0.243	0.032	0.211
Slovakia	0.334	0.059	0.274	0.342	0.061	0.281
Slovenia	0.454	0.121	0.333	0.478	0.127	0.351
Turkey	0.146	0.015	0.131	0.213	0.022	0.191
Mean	*0.276*	*0.048*	*0.228*	*0.342*	*0.058*	*0.284*

2000	Unadjusted indices			Adjusted indices		
Candidate country with all EU countries	IIT	HIIT	VIIT	IIT	HIIT	VIIT
Bulgaria	0.274	0.020	0.254	0.308	0.022	0.285
Czech Republic	0.598	0.091	0.507	0.637	0.097	0.540
Estonia	0.260	0.020	0.240	0.267	0.020	0.247
Hungary	0.508	0.120	0.387	0.509	0.121	0.389
Latvia	0.122	0.020	0.102	0.124	0.020	0.104
Lithuania	0.182	0.008	0.174	0.206	0.009	0.196
Poland	0.423	0.100	0.323	0.551	0.130	0.421
Romania	0.308	0.036	0.272	0.337	0.040	0.297
Slovakia	0.402	0.088	0.314	0.418	0.092	0.326
Slovenia	0.511	0.113	0.398	0.574	0.127	0.446
Turkey	0.262	0.039	0.223	0.367	0.055	0.312
Mean	*0.350*	*0.060*	*0.290*	*0.391*	*0.067*	*0.324*

Source: Own calculation based on Eurostat, Comext databank, 2002.

Table A4:
Grubel-Lloyd indices: Extra-EU trade: EU countries with all candidate countries 1993 and 2000

1993	Unadjusted indices			Adjusted indices		
	IIT	HIIT	VIIT	IIT	HIIT	VIIT
Austria	0.179	0.025	0.154	0.258	0.034	0.224
Belgium + Luxembourg	0.120	0.015	0.105	0.169	0.023	0.146
Denmark	0.127	0.032	0.095	0.162	0.045	0.117
Finland	0.083	0.000	0.083	0.157	0.000	0.157
France	0.175	0.034	0.141	0.220	0.044	0.176
Germany	0.206	0.021	0.185	0.237	0.024	0.213
Greece	0.065	0.008	0.057	0.095	0.014	0.082
Ireland	0.022	0.001	0.021	0.047	0.002	0.045
Italy	0.210	0.032	0.178	0.283	0.044	0.239
Netherlands	0.120	0.015	0.105	0.142	0.017	0.125
Portugal	0.036	0.005	0.031	0.050	0.007	0.044
Spain	0.079	0.008	0.071	0.113	0.013	0.100
Sweden	0.132	0.021	0.111	0.188	0.030	0.158
United Kingdom	0.126	0.019	0.107	0.152	0.022	0.130
Mean	*0.120*	*0.017*	*0.103*	*0.162*	*0.023*	*0.140*

2000	Unadjusted indices			Adjusted indices		
	IIT	HIIT	VIIT	IIT	HIIT	VIIT
Austria	0.537	0.137	0.401	0.563	0.143	0.420
Belgium + Luxembourg	0.296	0.065	0.231	0.363	0.080	0.283
Denmark	0.361	0.033	0.327	0.381	0.035	0.346
Finland	0.414	0.030	0.384	0.728	0.053	0.676
France	0.500	0.050	0.450	0.628	0.063	0.564
Germany	0.548	0.084	0.464	0.584	0.089	0.495
Greece	0.324	0.035	0.289	0.374	0.040	0.334
Ireland	0.250	0.004	0.246	0.377	0.005	0.371
Italy	0.441	0.106	0.335	0.537	0.129	0.408
Netherlands	0.426	0.047	0.378	0.478	0.053	0.425
Portugal	0.230	0.230	0.230	0.230	0.230	0.230
Spain	0.381	0.185	0.196	0.528	0.256	0.271
Sweden	0.418	0.051	0.367	0.532	0.065	0.467
United	0.403	0.089	0.314	0.417	0.092	0.324

Kingdom						
Mean	*0.395*	*0.082*	*0.329*	*0.480*	*0.095*	*0.401*

Source: Own calculation based on Eurostat, Comext databank, 2002.

Table A5:
Grubel-Lloyd indices: Extra-EU trade: High-quality (HQ-)VIIT 1993 and 2000

1993	1.15<RUV < 0.85	1.15 < RUV			0.85 > RUV		
	VIIT	'HQ'-VIIT EU	with EU trade surplus	with EU trade deficit	'HQ'-VIIT CC	with EU trade deficit	with EU trade surplus
Bulgaria	0.307	0.199	0.131	0.068	0.108	0.045	0.063
Czech Republic	0.452	0.189	0.095	0.094	0.263	0.096	0.167
Estonia	0.366	0.228	0.139	0.089	0.138	0.074	0.064
Hungary	0.461	0.132	0.094	0.038	0.329	0.201	0.128
Latvia	0.097	0.056	0.021	0.035	0.041	0.027	0.014
Lithuania	0.118	0.069	0.042	0.027	0.049	0.029	0.020
Poland	0.288	0.127	0.068	0.058	0.162	0.080	0.082
Romania	0.211	0.129	0.082	0.046	0.082	0.062	0.020
Slovakia	0.281	0.114	0.088	0.026	0.167	0.075	0.093
Slovenia	0.351	0.145	0.094	0.051	0.206	0.113	0.093
Turkey	0.191	0.114	0.065	0.049	0.077	0.030	0.047
Mean	*0.284*	*0.136*	*0.084*	*0.053*	*0.148*	*0.076*	*0.072*

2000	1.15<RUV < 0.85	1.15 < RUV			0.85 > RUV		
	VIIT	'HQ'-VIIT EU	with EU trade surplus	with EU trade deficit	'HQ'-VIIT CC	with EU trade deficit	with EU trade surplus
Bulgaria	0.285	0.167	0.108	0.059	0.118	0.091	0.027
Czech Republic	0.540	0.481	0.285	0.196	0.059	0.035	0.023
Estonia	0.247	0.116	0.061	0.055	0.130	0.107	0.024
Hungary	0.389	0.239	0.153	0.086	0.150	0.096	0.054
Latvia	0.104	0.081	0.047	0.034	0.023	0.006	0.016
Lithuania	0.196	0.129	0.079	0.050	0.067	0.045	0.022
Poland	0.421	0.333	0.223	0.111	0.087	0.044	0.044
Romania	0.297	0.107	0.069	0.038	0.190	0.125	0.065
Slovakia	0.326	0.207	0.108	0.100	0.119	0.067	0.052
Slovenia	0.446	0.276	0.130	0.146	0.171	0.139	0.031
Turkey	0.312	0.212	0.129	0.082	0.100	0.018	0.082
Mean	*0.324*	*0.213*	*0.127*	*0.087*	*0.110*	*0.070*	*0.040*

Source: Own calculation based on Eurostat, Comext databank, 2002.

Table A6:
GDP per capita in US dollar according to current prices and current exchange rates, 1993 and 2000

1993		2000	
EU countries			
Portugal	8735	Greece	8868
Greece	9009	Portugal	10622
Spain	12792	Spain	14221
Ireland	14074	United Kingdom	16158
United Kingdom	16556	Finland	16670
Finland	17015	Italy	18620
Italy	17413	France	21545
Netherlands	21275	Germany	22713
Sweden	22067	Belgium+Luxembourg	23150
France	22204	Austria	23288
Belgium + Luxembourg	22759	Netherlands	23292
Austria	23237	Ireland	25232
Germany	24106	Sweden	25844
Denmark	26749	Denmark	30525
Candidate countries			
Lithuania	795	Bulgaria	1542
Latvia	835	Romania	1635
Estonia	1081	Turkey	3061
Romania	1158	Lithuania	3061
Bulgaria	1276	Latvia	3065
Poland	2236	Estonia	3503
Slovakia	2385	Slovakia	3573
Turkey	3032	Poland	4083
Czech Republic	3388	Hungary	4619
Hungary	3789	Czech Republic	4945
Slovenia	6366	Slovenia	9112

Source: OECD, Maxdata; national sources.

Table A7:
GDP per capita in US dollar according to current prices and current Purchasing Power parities, 1993 and 2000

1993		2000	
EU countries			
Greece	11196	Greece	16836
Portugal	12004	Portugal	18034
Spain	13918	Spain	20372
Ireland	14550	United Kingdom	24452
Finland	15969	France	24709
United Kingdom	17319	Sweden	24873
Sweden	17468	Italy	25182
Italy	17865	Finland	25276
Netherlands	18515	Germany	25895
Germany	18953	Belgium + Luxembourg	27000
France	19133	Austria	27027
Austria	19496	Netherlands	27937
Denmark	19753	Ireland	29256
Belgium + Luxembourg	21043	Denmark	29531
Candidate countries			
Latvia	3070	Latvia	4309
Estonia	3785	Lithuania	5108
Lithuania	4049	Estonia	5465
Bulgaria	4810	Bulgaria	5610
Romania	5230	Romania	6250
Poland	5343	Turkey	6589
Turkey	5562	Poland	9586
Slovakia	7381	Slovakia	11646
Hungary	8053	Hungary	12440
Czech Republic	10435	Czech Republic	14282
Slovenia	10720	Slovenia	16680

Source: OECD max data; WIIW; own calculation (Baltic countries).

Table A8:
Distribution of income or consumption

EU country	Survey year	Gini	Percentage share of income or consumption				
			Lowest 20 %	Second 20 %	Third 20 %	Fourth 20 %	Highest 20 %
Austria	1987	23.1	10.4	14.8	18.5	22.9	33.3
Belgium	1992	25.0	9.5	14.6	18.4	23.0	34.5
Denmark	1992	24.7	9.6	14.9	18.3	22.7	34.5
Finland	1991	25.6	10.	14.2	17.6	22.3	35.8
France	1995	32.7	7.2	12.6	17.2	22.8	40.2
Germany	1994	30.0	8.2	13.2	17.5	22.7	38.5
Greece	1993	32.7	7.5	12.4	16.9	22.8	40.3
Ireland	1987	35.9	6.7	11.6	16.4	22.4	42.9
Italy	1995	27.3	8.7	14.0	18.1	22.9	36.3
Luxembourg	1994	26.9	9.4	13.8	17.7	22.6	36.5
Netherland	1994	32.6	7.3	12.7	17.2	22.8	40.1
Portugal	1994-95	35.6	7.3	11.6	15.9	21.8	43.4
Spain	1990	32.5	7.5	12.6	17.0	22.6	40.3
Sweden	1992	25.0	9.6	14.5	18.1	23.2	34.5
UK	1991	36.1	6.6	11.5	16.3	22.7	43.0
	Mean	**29.7**	**8.4**	**13.3**	**17.4**	**22.7**	**38.3**
	St.Dev.	4.4	1.2	1.2	0.8	0.3	3.3
Bulgaria	1997	26.4	10.1	13.9	17.4	21.9	36.8
Czech R.	1996	25.4	10.3	14.5	17.7	21.7	35.9
Estonia	1998	37.6	7.0	11.0	15.3	21.6	45.1
Hungary	1998	24.4	10.0	14.7	18.3	22.7	34.4
Latvia	1998	32.4	7.6	11.4	15.3	20.8	45.0
Lithuania	1996	32.4	7.8	12.6	16.8	22.4	40.3
Poland	1998	31.6	7.8	12.8	17.1	22.6	39.7
Romania	1994	28.2	8.9	13.6	17.6	22.6	37.3
Slovakia	1992	19.5	11.9	15.8	18.8	22.2	37.7
Slovenia	1998	28.4	9.1	13.4	17.3	22.5	37.7
Turkey	1994	41.5	5.8	10.2	14.8	21.6	47.7
	Mean	**28.2**	**8.1**	**13.1**	**16.9**	**22.1**	**39.8**
	St. Dev.	5.9	1.7	1.6	1.2	0.6	4.1

Source: World Bank 2001, World Development Indicators.