UNIVERSITA' DEGLI STUDI DI TRENTO - DIPARTIMENTO DI ECONOMIA

WHY IS TRADE BETWEEN THE EUROPEAN UNION AND THE TRANSITION ECONOMIES VERTICAL?

Hubert Gabrisch
and
Maria Luigia Segnana

Discussion Paper No. 7, 2002

The Discussion Paper series provides a means for circulating preliminary research results by staff of or visitors to the Department. Its purpose is to stimulate discussion prior to the publication of papers.

Requests for copies of Discussion Papers and address changes should be sent to:

Prof. Andrea Leonardi
Dipartimento di Economia
Università degli Studi
Via Inama 5
38100 TRENTO
ITALY

Why is Trade between the European Union and the Transition Economies Vertical ?

Hubert Gabrisch[*] *and Maria Luigia Segnana*[**]

[*] Halle Institute for Economic Research, Kleine Markerstrasse 8, D-06108 Halle

[**] Department of Economics, University of Trento, I-38100 Trento
Correspondence address: gab@iwh-halle.de

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 an 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, Eastern Europe
==========

Introduction*

This paper investigates intra-industry trade (IIT) between the European Union (EU) and countries in transition (TE), the purpose being to find an explanation for the emerging trade pattern between the two regions. We test a model in which intra-industry trade takes place in both vertically and horizontally differentiated products. The distinctive feature of intra-industry trade is product quality. A major challenge faced by the TEs is upgrading quality in order to withstand the competition raised by the superior commodities produced by EU firms. Emerging trade patterns can be best explained in the absence of trade barriers. However, since such a condition is rare, we examine two panels of EU-TE trade, liberalised in one case and non-liberalised in the other The results of such analysis may indicate whether trade liberalisation stimulates upgrading and catching-up or whether some policy support is necessary.

The empirical specification is based on a product-quality cycle (*Flam* and *Helpman*, 1987) that adds income distribution patterns to the usual explanatory country variables, like country size, relative income or wage differences between countries. The empirical analysis concerns the years 1997 and 2000 and four TE countries: the Czech Republic, Hungary, Poland and Slovakia. We further divide trade into two panels. Trade in panel A was completely liberalized in 1993, and trade in the items in panel B gradually underwent liberalisation after 1996.

The paper is organised as follows. *Section Two* provides some stylised facts on intra-industry trade. A significant fraction of EU-TE trade is vertically differentiated, and product flows between both sets of countries show a significant quality cycle. *Section Three* describes the problems of explaining intra-industry trade identified in the relevant literature. We highlight controversial results obtained by the country and industry approaches, arguing that in both cases the main problem is the lack of attention paid either to liberalised/non-liberalised trade flows or to the different components of IIT – horizontal (HIIT) and vertical (VIIT) trade. We utilize a product-quality-cycle model of VIIT consisting of country factors and test it in *Section Four*, finding that relative country differences in GDP per capita, in size and in

* This paper is part of the Research Project "EU Integration and the Prospects for Catch-up Development in CEECs", European Commission, 2001-2004. A first version of this paper was presented at the Universities of Sussex and Trento. We have 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

income inequality exert important and different effects on the shares of vertical and horizontal intra-industry trade. An even clearer result emerges when flows are considered separately, particularly as regards the determinants of VIIT in liberalised trade. *Section Five* concludes, providing some policy implications.

1. Stylised facts on intra-industry trad between EU and TE

The integration of TEs and EU countries has been characterised in the past decade by trade integration and various features of structural change.

In general, the emerging pattern of trade is characterised by:

(1) increased intra-industry trade,
(2) the dominance of vertical trade[1], and
(3) the dominance of quality differences in trade.

Trade liberalisation has exerted a strong influence on the trade pattern. Liberalisation has been concentrated in manufacturing, and trade in some items was completely liberalized at an early stage of integration; for other items, liberalisation has proceeded step by step. By referring to provisions in the European Agreements with the Czech Republic, Hungary, Poland and Slovakia, we identified a set of chapters of the Combined Nomenclature with different degrees of liberalisation between 1993 and 2000. The chapters selected represent about 26 per cent of total trade by the EU with the four TE countries in 1993, and 31 per cent in 2000 (for more details including Table A1, see the Annex).

We found that the share of IIT in trade in all the selected categories of the Combined Nomenclature was between 25 per cent for Poland and 58 per cent for the Czech Republic in 2000 (Table 1), calculated with unadjusted *Grubel-Lloyd* indices. The share increased in all

final draft, to Karin Szalai and Peter Schäfer (both Halle) for preparing the data on income distribution (Karin) and intra-industry trade (Peter). Responsibility for the study, of course, remains ours alone.

[1] See also *Burgstaller* and *Landesmann* (1997), *Aturupane et al.* (1997), *Rosati* (1998), *Gabrisch* and *Werner* (1998), *Thom* (1999), and *Gabrisch* and *Segnana* (2001). For analysis of the different distributive consequences of vertical and horizontal trade see *Facchini* and *Segnana* (2002).

cases with respect to the share in 1993. Balanced trade is, however, a basic assumption of all models that explain IIT. There is a large body of literature which discusses the flaws in the unadjusted Grubel-Lloyd index and suggests various alternatives.[2] In addition to unadjusted indices we used adjusted Grubel-Lloyd indices that corrected for the overall trade imbalances (high EU surplus in our case):

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

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. We found that the shares of IIT were remarkably higher in trade with all four countries compared to the unadjusted shares.

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

Table 1: Grubel-Lloyd indices of intra-industry trade between EU(15) and TE(4), 1993, 1997, and 2000

TE	*year*	*unadjusted*	*adjusted*
	Panel A+B		
Czech Republic	1993	0.383	0.584
	1997	0.521	0.711
	2000	0.583	0.728
Hungary	1993	0.366	0.377
	1997	0.412	0.438
	2000	0.461	0.497
Poland	1993	0.199	0.291
	1997	0.198	0.382
	2000	0.246	0,.357
Slovakia	1993	0.236	0.312
	1997	0.291	0.376
	2000	0.383	0.415
	Panel A		
Czech Republic	1993	0.304	0.823
	1997	0.497	0.848
	2000	0.600	0.846
Hungary	1993	0.408	0.648
	1997	0.539	0.772
	2000	0.550	0.715
Poland	1993	0.238	0.957
	1997	0.172	0.992
	2000	0.241	0.454
Slovakia	1993	0.254	0.890
	1997	0.352	0.875
	2000	0.531	0.758
	Panel B		
Czech Republic	1993	0.506	0.565
	1997	0.563	0.567
	2000	0.551	0.557
Hungary	1993	0.355	0.375
	1997	0.372	0.377
	2000	0.426	0.432
Poland	1993	0.164	0.175
	1997	0.229	0.243
	2000	0.253	0.267
Slovakia	1993	0.221	0.264
	1997	0.230	0.270
	2000	0.226	0.268

Source: Own calculations on EUROSTAT data.
Data for EU(15) 1993 include data for Austria, Sweden and Finland from 1995.

Over time, adjusted Grubel-Lloyd indices show a significant increase of IIT in EU trade with all four TE countries compared with the unadjusted indices. This highly dynamic change prompts the question as to which factors determine it. An initial answer is that it may be caused by a combination of trade liberalisation (due to the trade agreements since 1992) with comparative advantages, both of which are possibly reflected in the high EU surplus in the period under consideration. Since the difference between liberalised and non-liberalised trade was most pronounced in the period 1993-2000, we split our data set into two panels: panel A comprised all items whose trade was completely liberalised between EU and TE in 1993. The adjustment period lasted seven years. Panel A typically included industries which are particularly attractive to foreign direct investors. Panel B consisted of selected items whose trade started to be liberalised in 1996. The adjustment period for firms was shorter than in panel A, and the still existing trade barriers should have had an impact on the trade pattern. Panel B included mainly textiles and clothing. In some of these industries, outward processing trade (OPT) might have had an influence on trade flows. The distinction between OPT and FDI is important insofar as both strategies at the firm level influence the emergence of trade structures in different ways: as is well known, investments create new production, while OPT utilises existing production.

Assuming that the EU has a pronounced comparative advantage in liberalised commodities, we would expect larger imbalances in panel A than in panel B and, consequently, higher IIT shares. The data confirmed this expectation. IIT shares were significantly greater in panel A than in panel B. The gap between the unadjusted and the adjusted shares was far larger in panel A than in panel B, and the increase in adjusted shares also turned out to be somewhat weaker in B than in A. Thus, the first conclusion is this: When trade is liberalised and when one side has a comparative advantage, this advantage exerts a more pronounced impact on IIT than it does

under less liberalised conditions. Which kind of advantage this might be will show the decomposition between horizontal and vertical trade structures.

The standard procedure for decomposing[3] 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:

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

where UVX stands for the unit value in exports, and UVM for the unit value in imports of a single item.[4]

This application to the Grubel-Lloyd indices showed a clear VIIT dominated trade structure (Table 2). VIIT accounted for between 84% (EU-Hungary) and 90% per cent (EU-Slovakia) of trade in 2000. An advantage in quality for the EU compared with the TE is particularly evident in liberalised trade. The shares of VIIT in panel A were much greater than in panel B. IIT in panel A was almost completely vertical in EU trade with all four countries – a feature that prompts questions concerning the usual assessment of FDI and its effect on this kind of trade. Hungary attracted the highest FDI per capita among TE countries. It is often assumed that FDI in particular promotes IIT, and thus also raises the technological level of production, increasing productivity and income. However, although FDI certainly contributes to technological upgrading, the link between this effect and catching-up in income terms cannot be taken as certain when FDI establishes or hardens VIIT structures.

---

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

[4] We can define RUV as a, where $a \in]1-\alpha, 1+\alpha[$; more rigorous ranges are also applied when $a \in \left]\frac{1}{1+\alpha}, 1+\alpha\right[$; the vertical can be considered superior vertical if $a \in [1+\alpha, +\infty[$, or inferior vertical if $a \in \left[0, \frac{1}{1+\alpha}\right]$; the parameter α is a dispersion factor, arbitrarily fixed, in general assumed equal to 0.15 or alternatively α=0.25

Table 2: Shares of vertical intra-industry trade between EU(15) and TE(4), 1993, 1997, and 2000; % of total intra-industry trade, adjusted Grubel-Lloyd indices

	Year	A+B	A	B
Czech Republic	1993	83.5	97.6	70.2
	1997	83.5	95.2	65.2
	2000	84.1	90.3	70.7
Hungary	1993	79.8	99.9	74.2
	1997	82.0	99.7	74.1
	2000	83.6	98.2	76.4
Poland	1993	88.0	95.8	78.1
	1997	77.1	96.3	59.1
	2000	87.3	91.1	81.3
Slovakia	1993	78.3	95.9	60.7
	1997	75.9	90.4	53.6
	2000	90.4	96.0	76.5

Source: Own calculations on EUROSTAT data.

Data for EU(15) 1993 include data for Austria, Sweden and Finland from 1995.

The basic assumption is that prices (unit values) are quality indicators of goods. There are objections that can be made against the simple interpretation of VIIT as expressing only relative quality differences. The economic theory of index numbers

develops the conditions under which a unit value index reflects a change in the quality vector of a bundle of commodities when prices are fixed. When prices are not fixed, both quality and cost may have changed. A unit value higher than 1.15 may reflect an export price higher than the import price because of either a cost disadvantage or a quality advantage of the EU. Each scenario is rooted in a completely different world: perfect or imperfect competition.

One procedure with which to roughly identify the appropriate advantage in traded items is to link the individual relative unit values (RUVs) with the quantities traded, that is, the trade balance of the items (*Aiginger,* 1997).[5] We can identify four cases or examples important for our selection procedure:

(1) If the RUVs > 1.15, the gap reflects a quality advantage for the EU, and the EU should achieve a trade surplus (despite higher prices). Otherwise, the gap reflects a cost disadvantage of the EU which is hard to reconcile with an export surplus. Hence, if RUV>1.15, we assume that the EU exports are of higher quality than imports of the same item. Intra-industry trade is governed by quality and technology. We can thus formulate the remaining cases:

(2) If the RUV< 0.85 and the EU has recorded a deficit in trade, the TE is assumed to have a quality advantage. In this case, the EU exports goods of lower quality than that of imported goods. Again, intra-industry trade is governed by quality and technology.

(3) If the RUV>1.15 and the EU has recorded a deficit, the TE is assumed to have a cost advantage. Intra-industry trade is determined by factor endowment and other cost specific factors.

(4) If the RUV<0.85 and the EU has recorded a surplus, the EU is assumed to have a cost advantage.

We applied this method to the adjusted indices and found that almost all VIIT trade is linked with a quality advantage of the EU in panel A (Table 3). While a quality advantage of the TE could be identified for 1993, we found that it disappeared by 1997 and 2000. Although the quality advantage of the EU tended to decline, the four

countries could not take advantage of this feature. The loss of quality advantage by the EU and both of the TEs turned into appropriate gains of cost advantage. The picture is somewhat different in panel B. First, the quality advantage of the EU was not as great as in panel A. Second, it seems to have increased after 1997, when liberalisation gained momentum.

[5] A preferable method – estimation of price elasticity – requires time series. These, however, are not available

Table 3: The distribution of quality-based VIIT between EU and TEs (adjusted G-L indices)

		EU	TE
		Panel A+B	
Czech Republic	1993	0.328	0.027
	1997	0.583	0.001
	2000	0.435	0.018
Hungary	1993	0.084	0.114
	1997	0.143	0.131
	2000	0.142	0.114
Poland	1993	0.148	0.043
	1997	0.206	0.027
	2000	0.169	0.039
Slovak Republic	1993	0.193	0.019
	1997	0.191	0.018
	2000	0.251	0.010
		Panel A	
Czech Republic	1993	0.655	0.013
	1997	0.583	0.001
	2000	0.568	0.006
Hungary	1993	0.258	0.000
	1997	0.558	0.000
	2000	0.271	0.000
Poland	1993	0.625	0.000
	1997	0.924	0.002
	2000	0.279	0.058
Slovak Republic	1993	0.748	0.063
	1997	0.584	0.000
	2000	0.560	0.007
		Panel B	
Czech Republic	1993	0.195	0.042
	1997	0.201	0.026
	2000	0.244	0.034
Hungary	1993	0.065	0.145
	1997	0.056	0.164
	2000	0.103	0.148
Poland	1993	0.057	0.058
	1997	0.041	0.032
	2000	0.067	0.021
Slovak Republic	1993	0.105	0.014
	1997	0.071	0.033
	2000	0.075	0..,016

Source: Own calculations on EUROSTAT data.
Data for EU(15) 1993 include data for Austria, Sweden and Finland from 1995.

We may draw two preliminary conclusions:

(1) VIIT structures are a prevalent feature in all trade, be it liberalised or non-liberalised, but VIIT achieves significantly higher shares in liberalised trade.

VIIT structures are dominated by quality advantages of the EU, which increased in liberalised trade over time. The disappearance of the TEs' quality advantage in panel A in favour of cost advantages is evidence of a quality-based product cycle. In this cycle, the EU specialises in production at the high-quality end, and the TE at the low-quality end, of the continuum of differentiated goods.

3. A review of IIT models and test results

3.1 Country and industry determinants

There is an abundant literature on the relationship between trade flows and country and/or industry characteristics. The theoretical perspective behind these links is often discussed as well as their empirical implementation. These studies typically construct an index of intra-industry trade and investigate correlates of the index with country and/or industry determinants. While these studies are certainly interesting, their relationship to the theory of international trade is often tenuous and debatable.[6] An important exception is *Helpman* (1987), who developed some simple models of monopolistic competition and tested some hypotheses directly motivated by the theory. The empirical literature has focused on "testing" all or a subset of the industry and country determinants of IIT predicted by theory, finding more empirical support for country rather than industry factors.

The "country approach" focuses on how country characteristics explain IIT (*Helpman*, 1987; *Hummels and Levinsohn*, 1995). Assuming all intra-industry trade to be horizontally differentiated, a negative relationship is expected to exist between IIT and GDP per capita differences. A positive relationship is expected between IIT and the minimum size of GDP in a pair of countries involved in trade, and a negative

[6] For a survey, see *Leamer* and *Levinsohn* (1995)

relationship is expected with the maximum size of GDP in a pair of countries. Helpman found that the data bear out these predictions.

Hummels and *Levinsohn* questioned the apparent empirical success of these models. Their estimated regression for basic comparison with *Helpman's* results was the following:

$$s_{jk} = \beta_0 + \beta_1 \ln\left|\frac{GDP^j}{L^j} - \frac{GDP^k}{L^k}\right| + \beta_2 \min\left(\ln GDP^j, \ln GDP^k\right) + \\ + \beta_3 \max\left(\ln GDP^j, \ln GDP^k\right) + \varepsilon_{jk}, \qquad (3)$$

where s is the Grubel-Lloyd index for the bilateral trade of a country pair, j and k, *with* $\beta_1<0$, $\beta_2>0$, *and* $\beta_3<0$. They found rather weak evidence of a negative relationship between GDP per capita differences and IIT shares in OLS regressions. When the explanatory power of their regressions was improved by applying fixed effects, the sign of β_1 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[7] seems to be much stronger. They concluded in their "in-conclusions" that "we find, at best, very mixed empirical support for the theory. Contrary to factor differences explaining the share of intra-industry trade, much of intra-industry trade appears to be specific to the country-pair"[8].

The upshot is that fixed effects estimates drastically change the empirical role of factor and income differences,[9] 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.

[7] The empirical success of the gravity models is well known.
[8] *Hummels* and *Levinsohn*, op.cit. p. 828.

The "industry approach" constitutes a further 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 VIIT accounts for between 80 per cent and 90 per cent of total IIT, focusing on industry-specific determinants and expecting country factors to be particularly important for HIIT. This was, however, not the case. Only 1 out of 5 tested industry determinants yielded the expected sign for VIIT. 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 of the five variables showed the expected sign. When country dummies were used,[10] the explanatory power of the regressions increased significantly for HIIT, but only slightly for VIIT. The basic conclusion is that industry specific effects dominate VIIT. When vertical differentiation is empirically important for ITT, country-specific effects become irrelevant and VIIT is explained better by industry determinants than by country ones.

We are now left with two problems: the first has to do with the obvious fact that VIIT and HIIT are determined by different factors. What happens when the "country approach" takes account of the stylised facts on intra-industry trade: that is, the relative importance of VIIT in TE-EU (liberalised) trade ? *Hummels* and *Levinsohn* argued that the weak significance of the GDP per capita variable without fixed effects and the change of the sign with fixed effects should be explained by country-pair specifics. However, the result may also be consistent with models of intra-industry trade in vertically differentiated products. The fixed effects may control for differences across countries when it is VIIT, not HIIT, that matters.

[9] 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).
[10] 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 second problem is linked with the identification of additional changeable country factors (instead of 'unknown' fixed effects) and with their explicit testing (instead of implicit testing via country dummies) in order to find a better explanation of trade flow variations whenever HIIT and VIIT are identified. The model of vertically differentiated intra-industry trade developed by *Flam* and *Helpman* (1987) for a North-South context also offers an interesting theoretical perspective on EU-TE trade by including income distribution in the pool of country factors. A brief outline will illustrate the structure of the model.

3.2 A model with income distribution

The model explains the demand for different varieties of the same good as being due to indivisibilities in consumption and variations in income across countries. The less advanced country, say, the TE, 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 TE -- 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 Graph 1). The reason why the EU does not produce the entire range of the differentiated product is the possible comparative advantage of the TE in producing part of the low quality variety. The problem is identifying 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 TE. 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 q_d. Consumers/households with higher incomes purchase high-quality varieties g_h, and those with lower incomes purchase low-quality ones q_l. 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 $\omega=w/w^*$ 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

$$S = \frac{\alpha+\gamma}{\alpha+\gamma^*}\frac{wL}{w^*L^*}\frac{F(h_d)}{1-F^*(h_d^*)}, \qquad (4)$$

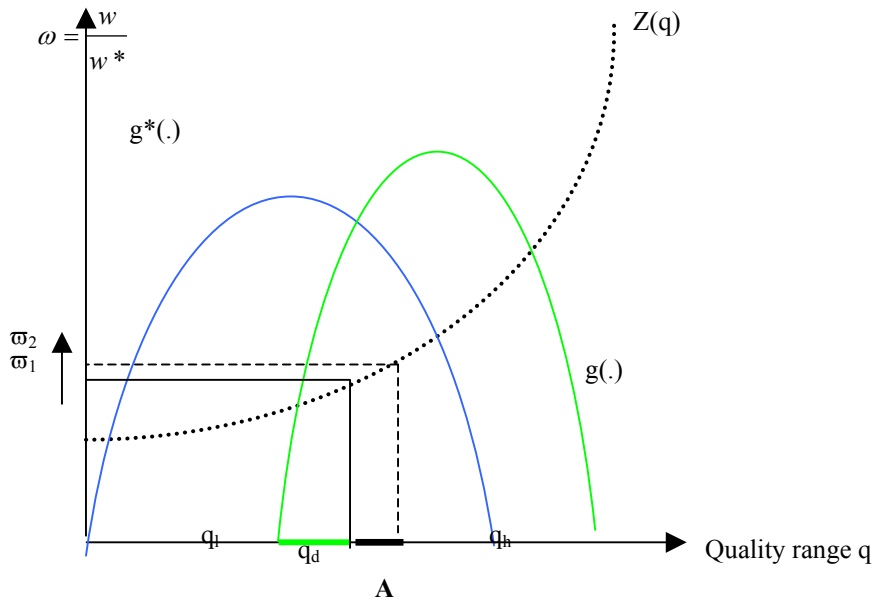
where α is a parameter for consumer preferences (equal in both countries) and γ, γ* describe the comparative advantage in the unit labour input functions. $F(\cdot)$ and $F^*(\cdot)$ are the cumulative distribution function in the EU and in the TE up to the consumer with the dividing income level, which 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 TE households 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.[11]

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

[11] The ratio between both shares yields the parameter term in expression (4).

households. As shown by Graph 1, with density functions g for EU and g^* for TE, for an arbitrary relative wage ω, the TE country exports the quality variety between q_l and q_d, whereas the EU country produces and exports the quality variety between q_d and q_h. Expression (4) 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 1: The quality split



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.

Assuming that the EU country improves productivity 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 TE country, will decline. For EU producers, it becomes profitable to abandon the lower section of the quality range and shift it to the TE country, where cheap labour is available. As can be seen in Graph 1, the range of q_h, produced in the EU, has narrowed; and for q_l, produced in the TE, 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 TE country. A quality-based product cycle emerges that finds expression in an increasing share of VIIT in total trade. In equation (4), 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 TE county, but this productivity level is considerably below the productivity level of the high-quality range in 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 TE 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 TE, 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 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 TE. 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 TE. With a new dividing income class, $F(h_d)$ would increase. The same would happen in the TE 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 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 TE country. The productivity gap in both cases is 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 TE.

Expression (4) may be a good candidate for disentangling different determinants of both HIIT and VIIT in the EU-TE context, where the EU stands for a region of more developed countries and the TE 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 the distance in 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 model), but they obtained ambiguous results for the size variable (as a proxy for labour supply).

4. The results

The empirical form of equation (4) is

$$\ln s_{EU,TE} = \beta_0 + \beta_1 \ln\left|\frac{GDP^{EU}}{C^{EU}} - \frac{GDP^{TE}}{C^{TE}}\right| + \beta_2 \min\left(\ln GDP^{EU}, \ln GDP^{TE}\right) + \\ + \beta_3 \max\left(\ln GDP^{EU}, \ln GDP^{TE}\right) + \beta_4 \ln ID + \varepsilon_{EU,TE}, \quad (5)$$

where $s_{EU,TE}$ is the share of intra-industry trade between a single EU country and a single TE country in trade. The share of intra-industry trade is calculated for the years 1997 and 2000 as total IIT, HIIT and VIIT for each panel A and B and for the entire panel (A+B).[12] 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 TE country, and max(lnGDP) for the EU country.[13] We abbreviate the former as *MINGDP*, and the latter as *MAXGDP*. All GDP data are in US dollar terms based on 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.

There is no income distribution variable in *Hummels* and *Levinsohn*, but there is a specification with fixed effects. In *Durkin* and *Krygier*, income distribution, though differently calculated, 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. 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 TE countries and of the household class with lowest incomes in EU countries – there would thus be no overlapping income class. This was actually found in the EU-TE relationship, even in terms of PPS. To capture, first, differences in income distribution between EU and TE countries, and avoiding exchange rate problems,

[12] We regressed the total VIIT data of Table 2 to the determinants and neglected our calculated quality based VIIT data in Table 3. The latter provides only a rough idea of the quality advantage of the EU. Methodological problems prevented us from using them in regressions.

[13] Durkin and 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 TE 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.

and (second) changes in domestic income distribution[14], we calculated decile ratios for each country, and relative decile ratios for each country pair (see tables A2 and A3 in the Annex); mean values report a strong drift to inequality in TE compared to EU countries (see figure A1 in the Annex). Data were taken from Luxembourg Income Studies (LIS) with the exception of Slovakia, for which country data were taken from official statistics. In all cases, data include two years of comparison, not necessarily matching 1993, 1997 or 2000. This may be an additional source of distortions in estimations. Among all data the income distribution data set is the weakest one, although this a problem general to empirical research including income distribution data (see also *Atkinson* and *Brandolini*, 2001).

From the theoretical perspective identified for HIIT and VIIT, 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[15]

(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 ($\beta_3 > 0$; $\beta_2 < 0$)

Equation (5) was estimated using OLS for years 1997 and 2000, including and excluding fixed effects.

In the first stage, we estimated a set of equations and compared the results with those that *Hummels* and *Levinsohn* obtained for total IIT excluding income distribution (Table 4). Testing unadjusted Grubel-Lloyd indices, we obtained the expected signs for VIIT in the entire panel (A+B) for RELGDP (column 3). The explanatory power of the model (adj. R^2 = 0.74) was high. For HIIT (column 2), the wrong signs appeared. MINGDP remained insignificant. We concluded that the model explains rather VIIT, accounting for the largest share of intra-industry trade, and less HIIT

[14] For a very useful comparison among transition countries see Milanovic (1998,1999)

[15] 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).

Hummels and Levinsohn obtained a positive sign for the coefficient of the relative difference variable 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: neither in panel (A+B) nor in panel A and panel B, with and without fixed effects, did the sign of the RELGDP variable change from positive to 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.[16]

However, from the theoretical perspective, it is well known that adjusted Grubel-Lloyd indices should be preferred in estimations. When we tested the entire panel with adjusted indices (columns 10-18), we again obtained the same signs of coefficients in both, including and excluding fixed effects but in this case the model's former explanatory power diminished considerably, probably because of multicollinearity.

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

Table 4: Regression results
Years 1997 and 2000; 12 EU countries and 4 TE countries

	Dependent								
	Unadjusted Grubel-Lloyd								
	Panel A + B			Panel A			Panel B		
	IIT	HIIT	VIIT	IIT	HIIT	VIIT	IIT	HIIT	VIIT
	1	2	3	4	5	6	7	8	9
Independents	Including Ffixed effects								
lnMAXGDP	0.195***	1.003***	0.193***	0.203***	1.131***	0.200***	0.299***	1.041***	0.312***
lnMINGDP	0.837	-1.970	0.753	0.571	-2.770	0.629	0.772	8.569**	0.262
lnRELGDP	0.832***	2.410**	0.854***	0.762**	1.073	0.836***	1.390***	2.565**	1.337***
CR-C	-20.976	-19.758	-20.856	-17.479	-0.581	-18.855	-27.439	-135.830	-21.786
HU-C	-21.427	-20.017	-20.856	-17.917	-2641	-19.321	-27.602	-135.367	-21.935
PL-C	-22.605	-17.673	-21.971	-18.991	2.549	-20.496	-28.517	-145.430	-22.333
SL-C	-20.991	-22.502	-20.537	-17.602	-4.448	-18.976	-28.155	-128.913	-23.194
corr. R2	0.670	0.160	0.740	0.510	0.079	0.548	0.374	0.172	0.322
	Excluding fixed effects								
Constante	-11.637***	-42.430***	-12.199***	-8.633**	-37.819**	-9.537**	-20.567***	-44.828***	-20.101***
lnMAXGDP	0.239***	0.940***	0.238***	0.239***	1.075***	0.239***	0.316***	1.141***	0.307***
lnMINGDP	-0.106	0.303	-0.106	-0.275**	0.773*	-0.284**	0.155	0.242	0.194
lnRELGDP	0.809***	2.273**	0.850***	0.699*	0.967	0.789**	1.315***	2.309*	1.212***
corr. R2	0.510	0.170	0.570	0.390	0.054	0.407	0.271	0.135	0.166
Observations	96	96	96	96	96	96	96	96	96
	Adjusted Grubel-Lloyd								
	Panel A + B			Panel A			Panel B		
	IIT	HIIT	VIIT	IIT	HIIT	VIIT	IIT	HIIT	VIIT
	10	11	12	13	14	15	16	17	18
Independents	Including fixed effects								
lnMAXGDP	0.151***	1.000***	0.102	0.173***	1.353***	0.170***	0.109	0.915***	0.116
lnMINGDP	-1.090	-4.305	-0.741	-0.779	-4.785	-0.711	0.248	0.9121**	-0.205
lnRELGDP	0.460**	2.261**	0.324	0.463*	1.273	0.516*	0.967***	2.263*	0.972***
CR-C	4.558	7.446	2.654	1.10	16.98	-0.17	-14.75	-137.03	-10.20
HU-C	3.879	6.668	2.737	0.94	14.63	-0.37	-15.08	-136.52	-10.51
PL-C	5.442	12.421	3.684	1.94	22.96	0.53	-15.26	-147.12	-10.25
SL-C	2.822	2.374	1.22	-0.02	11.09	-1.28	-15.85	-129.39	-11.94
corr. R2	0.16	0.16	0.13	0.06	0.16	0.05	0.24	0.14	0.25
	Excluding fixed effects								
Constante	-8.615***	-44.660***	-7.431**	-8.167***	-47.418***	-8.444***	-13.144***	-40.719***	-13.183***
lnMAXGDP	0.125**	0.925***	0.083	0.158**	1.294***	0.153**	0.115	1.027***	0.105
lnMINGDP	0.172*	0.660**	0.242*	0.143	1.225**	0.126	0.141	0.215	0.170
lnRELGDP	0.405	2.165**	0.292	0.402	1.227	0447*	0.879***	2.097	0.843**
corr. R2	0.05	0.16	0.11	0.06	0.13	0.04	0.19	0.11	0.12
Observations	96	96	96	96	96	96	96	96	96

Significance levels: * 10 %, ** 5 %, *** 1 %.

In the second stage, the equations included the income distribution variable. We omit results on the entire panel and focus on IIT and VIIT in Panel A and B (Table 5).

The regressions again yielded the expected signs for *RELGDP, MAXGDP* and *ID* in the case of the unadjusted index. *MINGDP* turned out to have a positive sign instead of the expected negative one; however, the variable was insignificant. *RELGDP* and *MAXGDP* were significant, but not so income distribution. In panel B we found only *RELGDP* to be significant. The estimation for panel B yielded similar results as for panel A, but only RELGDP was significant. In addition, the explanatory power of the model was weaker.

The test with adjusted Grubel-Lloyd indices not only decreased the R^2 as in Table 4 but changed the sign of the income distribution variable. The inclusion of income distribution did not affect the sign and the significance of *RELGDP* and *MAXGDP* in panel A. We conclude that income distribution does not add greatly to the explanation of VIIT, but neither does it reduce the explanatory power of the other variables.

Table 5: Regression results when income distribution is included.
Years 1997 and 2000; 12 EU countries and 4 TE countries; fixed effects

	Dependent							
	Adjusted Grubel-Lloyd				Unadjusted Grubel-Lloyd			
	Panel A		Panel B		Panel A		Panel B	
	IIT	VIIT	IIT	VIIT	IIT	VIIT	IIT	VIIT
Indep.	1	2	3	4	5	6	7	8
MAXGDP	0.138**	0.137**	0.128	0.129	0.207**	0.203**	0.314***	0.321***
MINGDP	-0.470	-0.387	0.116	-0.287	0.544	0.609	0.652	0.204
RELGDP	0.732***	0.751***	0.924***	0.957** *	0.745**	0.822**	1.334***	1.327***
ID	-0.711***	-0.781***	0.137	0.071	0.046	0.032	0.138	0.052
CR-C	-4.69	-5.83	-13.12	-9.32	-17.511	-18.516	-25.740	-21.161
HU-C	-4.43	-5.56	-13.53	-9.67	-18.559	-19.003	-25.991	-21.345
PL-C	-3.72	-4.97	-13.58	-9.32	-17.187	-20.157	-26.781	-21.653
SL-C	-5.62	-6.75	-14.32	-11.12	-17.045	-18.652	-26.550	-22.617
corr. R2	0.22	0.27	0.19	0.2	0.51	0.54	0.36	0.30
Observ.	96	96	96	96	96	96	96	96

Significance levels: 10%,*5%,*1%.**

Some conclusions can now be drawn:

1). The expected opposite relationship between horizontal or vertical trade and RELGDP is confirmed for vertical trade. The results for horizontal trade are ambiguous because of the marginal role of this component in EU-TE trade.

2). Confirmation is provided for the positive impact on VIIT whenever the developed country/region is significantly larger than the less advanced country. We offer two explanations for this. The first relates to severe defects in the data base: income distribution data belong rather to the category of 'soft' data, and international comparisons may be highly distorted as a result. The second explanation concerns the question of which sign can really be expected in the concrete EU-TE framework. Assume two countries which differ remarkably in size. Greater inequality in the smaller country may only marginally affect prices in the larger country. In this case, according to (4) the share of VIIT would shrink rather than increase.

3). The major role of income distribution in explaining VIIT is not confirmed.

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. Hence, 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.

Finally, we could not confirm the positive impact of income (re-)distribution on vertical intra-industry trade that *Durkin* and *Krygier* found in their study. This may be either the result of a weak database or a country size effect not captured in the model. In the latter case, the model used is better suited to pairs of countries of similar size.

What we did find was that after a seven–year-long period of trade liberalisation, the division of labour between the EU and the TEs 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 two factors: first, the increasing or at least stagnating per capita income differences between EU and TE countries; second, the increasing or almost stagnating size (demand) differences between them. These two 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 TE 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 TE countries, or TE firms may decide to undertake (domestic) investment in those qualities. Hence, the answer to our initial question of whether TE firms can withstand competition on quality in the enlarged Union is 'no' – at least as regards the past few years.

However, a product-cycle kind of trade[17] 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 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.

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, and Bernard Hoeckman (1999) "Horizontal and Vertical Intra-Industry trade between Eastern Europe and the European Union." *Weltwirtschfliches Archiv* 135, 1: 62-81

[17] For an analysis of the product cycle in the perspective of North-South trade see Chun-Zhu (2000)

Atkinson, Anthony B., and 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, and 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.

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., and 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.

EUROSTAT, *Intra-and extra-EU* trade. Luxembourg: European Communities, 2001.

Facchini Giovanni, and 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 Europea*, Bologna: Il Mulino, 2002, 129-156

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

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

Gabrisch, Hubert, and 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, and 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.

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

Hummels, David, and 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., and 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.

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.

Annex: Trade and income distribution data and methods

(1) Trade

Panel A includes all four-digit CN categories of manufactured goods from CN chapters 30, 33-38, 84, 86, and 88-90 whose trade was almost completely liberalised immediately after the European Agreements with the EU came into effect. We found 100 4-digit items for the Czech Republic, only 29 items for Hungary, 81 items for Poland, and 100 items for Slovakia. Trade between the EU and Hungary is somewhat different concerning panel A. When the interim agreement came into force, customs duties of the Union were not abolished, but instead reduced to two-thirds of the basic rate on 1 March 1992, and to one-third on 1 January 1993. Tariffs were abolished from 1994 onwards. Hungary followed the course taken by the other three countries with a one-year delay – which may be responsible for some differences in price-quality gaps and in IIT and VIIT indices.

Panel B includes 137 four-digit items from CN chapters 50-63: mainly textiles and clothing. Trade in these items was initially not liberalised (with few exceptions). It was planned iberalisation would be completed six years after the agreement came into effect in March 1992, and therefore by the end of 1998. Of course, each panels may include some items which belong to the other one, or even to neither of them.

Panel B data also include subcontracting or outward processing trade (OPT). The share of OPT in total EU imports in textiles and clothing was 29 per cent in 1996 (*Pellegrin*, 1998). The share in German imports from the four TE countries in chapters 62 and 63 (clothing) was 75 per cent for both the Czech and Slovak Republics, 85 per cent for Hungary, and 90 per cent for Poland in 1996 (*Möbius*, 1998). OPT played an insigificant role in most of the other chapters, particularly 80 to 90. In these 'industries', foreign direct investment seemed to have a more influential role for trade structures than OPT.

Table A1: EU trade with TE 4. Some basic data

EU	1993	1997	2000
	Total trade in mn Ecu		
Exports	22255	59404	87280
Imports	17540	41649	73394
Balance	4715	17755	13886
Turnover	39795	101053	160674
	Trade in Panel A+B in mn Ecu		
Exports	6425	11829	30869
Imports	3709	5832	19554
Balance	2716	5997	11315
Turnover	10134	17661	50423
	Trade in in Panel A+B % of total trade		
Exports	28.9	19.9	35.4
Imports	21.1	14.0	26.6
Turnover	25.5	17.5	31.4

Source: Own calculation on EUROSTAT data.

(2) Income distribution

Table A2: Decile ratios and relative decile ratios for the base year ("1993")

Base year		Czech Republic	Hungary	Poland	Slovak Republic
EU	Decile ratios of countries	3.80	6.76	6.94	3.44
		Relative decile ratios of country pairs			
Austria	4.61	0.83	1.47	1.50	0.75
Belgium	4.25	0.90	1.59	1.63	0.81
Denmark	5.22	0.73	1.30	1.33	0.66
Finland	4.19	0.91	1.62	1.66	0.82
France	7.60	0.50	0.89	0.91	0.45
Germany	5.28	0.72	1.28	1.31	0.65
Ireland	8.59	0.44	0.79	0.81	0.40
Italy	6.53	0.58	1.04	1.06	0.53
Netherlands	6.38	0.60	1.06	1.09	0.54
Sweden	5.11	0.74	1.32	1.36	0.67
Spain	8.75	0.43	0.77	0.79	0.39
UK	9.04	0.42	0.75	0.77	0.38
means	*6.29*	*0.65*	*1.16*	*1.19*	*0.59*

Note: For decile ratios, income shares of 10^{th} over 1^{st} deciles in individual countries.
Source: Own calculations on LIS data (except Slovakia); Slovakia: Statistical Office of the Slovak Republic, 1999.

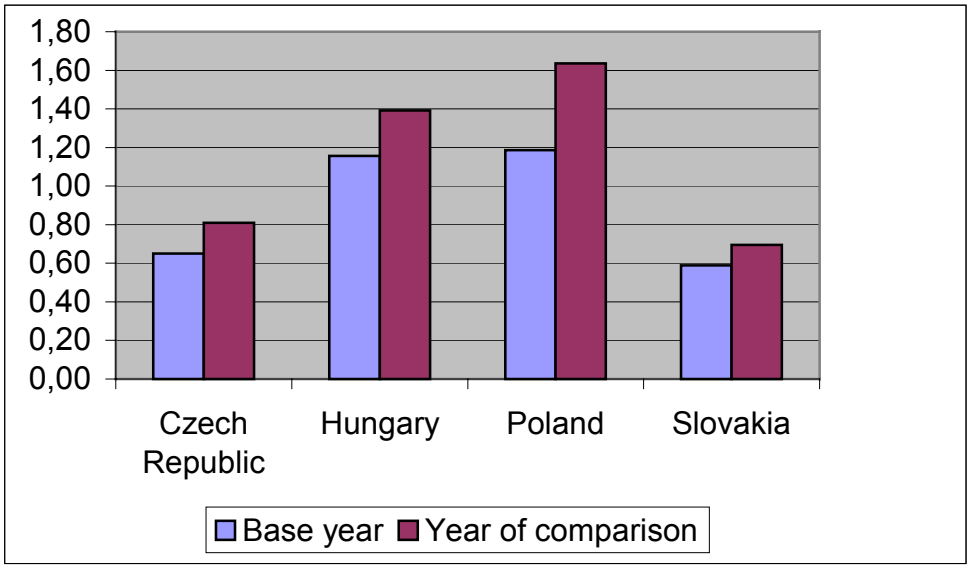
Table A3: Decile ratios and relative decile ratios for the year of comparison ("1997")

Year of comparison	*TE*	Czech Republic	Hungary	Poland	Slovak Republic
EU	Decile ratios of countries	5.21	8.97	10.54	4.48
		Relative decile ratios of country pairs			
Austria	7.36	0.71	1.22	1.43	0.61
Belgium	5.70	0.91	1.57	1.85	0.79
Denmark	4.43	1.18	2.02	2.38	1.01
Finland	4.43	1.18	2.02	2.38	1.01
France	6.53	0.80	1.37	1.61	0.69
Germany	6.03	0.87	1.49	1.75	0.74
Ireland	8.59	0.61	1.04	1.23	0.52
Italy	11.59	0.45	0.77	0.91	0.39
Netherlands	6.42	0.81	1.40	1.64	0.70
Sweden	5.25	0.99	1.71	2.01	0.85
Spain	7.61	0.68	1.18	1.38	0.59
UK	10.00	0.52	0.90	1.05	0.45
Mean	*6.99*	*0.81*	*1.39*	*1.64*	*0.70*

Source: Own calculations on LIS data (except Slovakia); Slovakia: Statistical Office of the Slovak Republic, 1999.

Note: For decile ratios, income shares of 10^{th} over 1^{st} deciles in individual countries.

Figure A1: Relative decile ratios (means of TE countries over EU-13 countries)[a]



[a] Excluding Greece and Ireland
Source: Own calculations on LIS data.

1989. 1. *Knowledge and Prediction of Economic Behaviour: Towards A Constructivist Approach.* by Roberto Tamborini.

1989. 2. *Export Stabilization and Optimal Currency Baskets: the Case of Latin American Countries.* by Renzo G.Avesani Giampiero M. Gallo and Peter Pauly.

1989. 3. *Quali garanzie per i sottoscrittori di titoli di Stato?* Una *rilettura del rapporto della Commissione Economica dell'Assemblea Costituente* di Franco Spinelli e Danilo Vismara.
(*What Guarantees to the Treasury Bill Holders? The Report of the Assemblea Costituente Economic Commission Reconsidered* by Franco Spinelli and Danilo Vismara.)

1989. 4. *L'intervento pubblico nell'economia della "Venezia Tridentina" durante l'immediato dopoguerra* di Angelo Moioli.
(*The Public Intervention in "Venezia Tridentina" Economy in the First War Aftermath* by Angelo Moioli.)

1989. 5. *L'economia lombarda verso la maturità dell'equilibrio agricolo-commerciale durante l'età delle riforme* di Angelo Moioli.
(*The Lombard Economy Towards the Agriculture-Trade Equilibrium in the Reform Age* by Angelo Moioli.)

1989. 6. *L'identificazione delle allocazioni dei fattori produttivi con il duale.* di Quirino Paris e di Luciano Pilati.
(*Identification of Factor Allocations Through the Dual Approach* by Quirino Paris and Luciano Pilati.)

1990. 1. *Le scelte organizzative e localizzative dell'amministrazione postale: un modello intrpretativo.*di Gianfranco Cerea.
(*The Post Service's Organizational and Locational Choices: An Interpretative Model* by Gianfranco Cerea.)

1990. 2. *Towards a Consistent Characterization of the Financial Economy*. by Roberto Tamborini.

1990. 3. *Nuova macroeconomia classica ed equilibrio economico generale: considerazioni sulla pretesa matrice walrasiana della N.M.C.* di Giuseppe Chirichiello.
(*New Classical Macroeconomics and General Equilibrium: Some Notes on the Alleged Walrasian Matrix of the N.C.M.*by Giuseppe Chirichiello.)

1990. 4. *Exchange Rate Changes and Price Determination in Polypolistic Markets.* by Roberto Tamborini.

1990. 5. *Congestione urbana e politiche del traffico. Un'analisi economica* di Giuseppe Folloni e Gianluigi Gorla.
(*Urban Congestion and Traffic Policy. An Economic Analysis* by Giuseppe Folloni and Gianluigi Gorla.)

1990. 6. *Il ruolo della qualità nella domanda di servizi pubblici. Un metodo di analisi empirica* di Luigi Mittone.
(*The Role of Quality in the Demand for Public Services. A Methodology for Empirical Analysis* by Luigi Mittone.)

1991. 1. *Consumer Behaviour under Conditions of Incomplete Information on Quality: a Note* by Pilati Luciano and Giuseppe Ricci.

1991. 2. *Current Account and Budget Deficit in an Interdependent World* by Luigi Bosco.

1991. 3. *Scelte di consumo, qualità incerta e razionalità limitata* di Luigi Mittone e Roberto Tamborini.
(*Consumer Choice, Unknown Quality and Bounded Rationality* by Luigi Mittone and Roberto Tamborini.)

1991. 4. *Jumping in the Band: Undeclared Intervention Thresholds in a Target Zone* by Renzo G. Avesani and Giampiero M. Gallo.

1991. 5 *The World Tranfer Problem. Capital Flows and the Adjustment of Payments* by Roberto Tamborini.

1992.1 *Can People Learn Rational Expectations? An Ecological Approach* by Pier Luigi Sacco.

1992.2 *On Cash Dividends as a Social Institution* by Luca Beltrametti.

1992.3 *Politica tariffaria e politica informativa nell'offerta di servizi pubblici* di Luigi Mittone
(*Pricing and Information Policy in the Supply of Public Services* by Luigi Mittone.)

1992.4 *Technological Change, Technological Systems, Factors of Production* by Gilberto Antonelli and Giovanni Pegoretti.

1992.5 *Note in tema di progresso tecnico* di Geremia Gios e Claudio Miglierina.
(*Notes on Technical Progress,* by Geremia Gios and Claudio Miglierina).

1992.6 *Deflation in Input Output Tables* by Giuseppe Folloni and Claudio Miglierina.

1992.7 *Riduzione della complessità decisionale: politiche normative e produzione di informazione* di Luigi Mittone
(*Reduction in decision complexity: normative policies and information production* by Luigi Mittone)

1992.8 *Single Market Emu and Widening. Responses to Three Institutional Shocks in the European Community by* Pier Carlo Padoan and Marcello Pericoli

1993.1 *La tutela dei soggetti "privi di mezzi": Criteri e procedure per la valutazione della condizione economica* di Gianfranco Cerea
(*Public policies for the poor: criteria and procedures for a novel means test* by Gianfranco Cerea)

1993.2 *La tutela dei soggetti "privi di mezzi": un modello matematico per la rappresentazione della condizione economica* di Wolfgang J. Irler
(*Public policies for the poor: a mathematical model for a novel means test* by Wolfgang J.Irler)

1993.3 *Quasi-markets and Uncertainty: the Case of General Proctice Service* by Luigi Mittone

1993.4 *Aggregation of Individual Demand Functions and Convergence to Walrasian Equilibria* by Dario Paternoster

1993.5 *A Learning Experiment with Classifier System: the Determinants of the Dollar-Mark Exchange Rate* by Luca Beltrametti, Luigi Marengo and Roberto Tamborini

1993.6 *Alcune considerazioni sui paesi a sviluppo recente* di Silvio Goglio
(*Latecomer Countries: Evidence and Comments* by Silvio Goglio)

1993.7 *Italia ed Europa: note sulla crisi dello SME* di Luigi Bosco
(*Italy and Europe: Notes on the Crisis of the EMS* by Luigi Bosco)

1993.8 *Un contributo all'analisi del mutamento strutturale nei modelli input-output* di Gabriella Berloffa
(*Measuring Structural Change in Input-Output Models: a Contribution* by Gabriella Berloffa)

1993.9 *On Competing Theories of Economic Growth: a Cross-country Evidence* by Maurizio Pugno

1993.10 *Le obbligazioni comunali* di Carlo Buratti (*Municipal Bonds* by Carlo Buratti)

1993.11 *Due saggi sull'organizzazione e il finanziamento della scuola statale* di Carlo Buratti
(*Two Essays on the Organization and Financing of Italian State Schools* by Carlo Buratti

1994.1 *Un'interpretazione della crescita regionale: leaders, attività indotte e conseguenze di policy* di Giuseppe Folloni e Silvio Giove.
(*A Hypothesis about regional Growth: Leaders, induced Activities and Policy* by Giuseppe Folloni and Silvio Giove).

1994.2 *Tax evasion and moral constraints: some experimental evidence* by Luigi Bosco and Luigi Mittone.

1995.1 *A Kaldorian Model of Economic Growth with Shortage of Labour and Innovations* by Maurizio Pugno.

1995.2 *A che punto è la storia d'impresa? Una riflessione storiografica e due ricerche sul campo* a cura di Luigi Trezzi.

1995.3 *Il futuro dell'impresa cooperativa: tra sistemi, reti ed ibridazioni* di Luciano Pilati.
(*The future of the cooperative enterprise: among systems, networks and hybridisation* by Luciano Pilati).

1995.4 *Sulla possibile indeterminatezza di un sistema pensionistico in perfetto equilibrio finanziario* di Luca Beltrametti e Luigi Bonatti.
(*On the indeterminacy of a perfectly balanced social security system* by Luca Beltrametti and Luigi Bonatti).

1995.5 *Two Goodwinian Models of Economic Growth for East Asian NICs* by Maurizio Pugno.

1995.6 *Increasing Returns and Externalities: Introducing Spatial Diffusion into Krugman's Economic Geography* by Giuseppe Folloni and Gianluigi Gorla.
1995.7 *Benefit of Economic Policy Cooperation in a Model with Current Account Dynamics and Budget Deficit* by Luigi Bosco.

1995.8 *Coalition and Cooperation in Interdependent Economies* by Luigi Bosco.

1995.9 *La finanza pubblica italiana e l'ingresso nell'unione monetaria europea* di Ferdinando Targetti.
(*Italian Public Finance and the Entry in the EMU* by Ferdinando Targetti)

1996.1 *Employment, Growth and Income Inequality: some open Questions* by Annamaria Simonazzi and Paola Villa.

1996.2 *Keynes' Idea of Uncertainty: a Proposal for its Quantification* by Guido Fioretti.

1996.3 *The Persistence of a "Low-Skill, Bad-Job Trap" in a Dynamic Model of a Dual Labor Market* by Luigi Bonatti.

1996.4 *Lebanon: from Development to Civil War* by Silvio Goglio.

1996.5 *A Mediterranean Perspective on the Break-Down of the Relationship between Participation and Fertility* by Francesca Bettio and Paola Villa.

1996.6 *Is there any persistence in innovative activities?* by Elena Cefis.

1997.1 *Imprenditorialità nelle alpi fra età moderna e contemporanea* a cura di Luigi Trezzi.

1997.2 *Il costo del denaro è uno strumento anti-inflazionistico?* di Roberto Tamborini.
(*Is the Interest Rate an Anti-Inflationary Tool?* by Roberto Tamborini).

1997.3 *A Stability Pact for the EMU?* by Roberto Tamborini.

1997.4 *Mr Keynes and the Moderns* by Axel Leijonhufvud.

1997.5 *The Wicksellian Heritage* by Axel Leijonhufvud.

1997.6 *On pension policies in open economies* by Luca Beltrametti and Luigi Bonatti.

1997.7 *The Multi-Stakeholders Versus the Nonprofit Organisation* by Carlo Borzaga and Luigi Mittone.

1997.8 *How can the Choice of a Tme-Consistent Monetary Policy have Systematic Real Effects?* by Luigi Bonatti.

1997.9 *Negative Externalities as the Cause of Growth in a Neoclassical Model* by Stefano Bartolini and Luigi Bonatti.

1997.10 *Externalities and Growth in an Evolutionary Game* by Angelo Antoci and Stefano Bartolini.

1997.11 *An Investigation into the New Keynesian Macroeconomics of Imperfect Capital Markets* by Roberto Tamborini.

1998.1 *Assessing Accuracy in Transition Probability Matrices* by Elena Cefis and Giuseppe Espa.

1998.2 *Microfoundations: Adaptative or Optimizing?* by Axel Leijonhufvud.

1998.3 *Clower's intellectual voyage: the 'Ariadne's thread' of continuity through changes* by Elisabetta De Antoni.

1998.4 *The Persistence of Innovative Activities. A Cross-Countries and Cross-Sectors Comparative Analysis* by Elena Cefis and Luigi Orsenigo

1998.5 *Growth as a Coordination Failure* by Stefano Bartolini and Luigi Bonatti

1998.6 *Monetary Theory and Central Banking* by Axel Leijonhufvud

1998.7 *Monetary policy, credit and aggregate supply: the evidence from Italy* by Riccardo Fiorentini and Roberto Tamborini

1998.8 *Stability and multiple equilibria in a model of talent, rent seeking, and growth* by Maurizio Pugno

1998.9 *Two types of crisis* by Axel Leijonhufvud

1998.10 *Trade and labour markets: vertical and regional differentiation in Italy* by Giuseppe Celi e Maria Luigia Segnana

1998.11 *Utilizzo della rete neurale nella costruzione di un trading system* by Giulio Pettenuzzo

1998.12 *The impact of social security tax on the size of the informal economy* by Luigi Bonatti

1999.1 *L'economia della montagna interna italiana: un approccio storiografico,* a cura di Andrea Leonardi e Andrea Bonoldi.

1999.2 *Unemployment risk, labour force participation and savings*, by Gabriella Berloffa e Peter Simmons

1999.3 *Economia sommersa, disoccupazione e crescita*, by Maurizio Pugno

1999.4 *The nationalisation of the British Railways in Uruguay,* by Giorgio Fodor

1999.5 *Elements for the history of the standard commodity,* by Giorgio Fodor

1999.6 *Financial Market Imperfections, Heterogeneity and growth,* by Edoardo Gaffeo

1999.7 *Growth, real interest, employment and wage determination,* by Luigi Bonatti

2000.1 *A two-sector model of the effects of wage compression on unemployment and industry distribution of employment*, by Luigi Bonatti

2000.2 *From Kuwait to Kosovo: What have we learned? Reflections on globalization and peace,* by Roberto Tamborini

2000.3 *Metodo e valutazione in economia. Dall'apriorismo a Friedman ,* by Matteo Motterlini

2000.4 *Under tertiarisation and unemployment.* by Maurizio Pugno

2001.1 *Growth and Monetary Rules in a Model with Competitive Labor Markets,* by Luigi Bonatti.

2001.2 *Profit Versus Non-Profit Firms in the Service Sector: an Analysis of the Employment and Welfare Implications,* by Luigi Bonatti, Carlo Borzaga and Luigi Mittone.

2001.3 *Statistical Economic Approach to Mixed Stock-Flows Dynamic Models in Macroeconomics,* by Bernardo Maggi and Giuseppe Espa.

2001.4 *The monetary transmission mechanism in Italy: The credit channel and a missing ring,* by Riccardo Fiorentini and Roberto Tamborini.

2001.5 *Vat evasion: an experimental approach,* by Luigi Mittone

2001.6 *Decomposability and Modularity of Economic Interactions,* by Luigi Marengo, Corrado Pasquali and Marco Valente.

2001.7 *Unbalanced Growth and Women's Homework,* by Maurizio Pugno

2002.1 *The Underground Economy and the Underdevelopment Trap,* by Maria Rosaria Carillo and Maurizio Pugno.

2002.2 *Interregional Income Redistribution and Convergence in a Model with Perfect Capital Mobility and Unionized Labor Markets,* by Luigi Bonatti.

2002.3 *Firms' bankruptcy and turnover in a macroeconomy,* by Marco Bee, Giuseppe Espa and Roberto Tamborini.

2002.4 *One "monetary giant" with many "fiscal dwarfs": the efficiency of macroeconomic stabilization policies in the European Monetary Union,* by Roberto Tamborini.

2002.5 *The Boom that never was? Latin American Loans in London 1822-1825,* by Giorgio Fodor.

2002.6 *L'economia senza banditore di Axel Leijonhufvud: le 'forze oscure del tempo e dell'ignoranza' e la complessità del coordinamento,* by Elisabetta De Antoni.

2002.7 *Why is Trade between the European Union and the Transition Economies Vertical?,* by Hubert Gabrisch and Maria Luigia Segnana.

PUBBLICAZIONE REGISTRATA PRESSO IL TRIBUNALE DI TRENTO