Quality product differentiation in CEE-EU intra-industry trade

Anna Maria Ferragina *

Abstract: In this paper we compute price/quality gap indicators to measure vertical intra-iundustry trade (VIIT) in EU markets at 3-digit NACE industry level. These indicators are then used to test some hypotheses relative to the determinants of the quality of trade of Central and Eastern European countries (CEECs). Two underlying models of VIIT are tested: a neo-H-O model (Falvey, 1981; Falvey-Kierzkowski, 1987), based on factor endowment, and an "economic geography" model, based on market size and economic integration (Greenaway-Torstensson, 1997). The explanatory variables (proxies for human capital, physical capital, market size and market integration) affect the dependent variable (unit-value differences) with relevant and significant coefficients. The negative sign for the variable human capital, interacted with the dummy for CEECs, suggests the existence of comparative disadvantages in the high-skill sectors for these countries. Moreover, the lower market size of CEECs could strengthen their disadvantage in high quality segments of production. However, the geographic proximity to the core of Europe and the integration process, which are strongly correlated with high quality trade, could make faster the process of catching up.

Keywords: neo H-O Models of Trade; Quality differentiation; Economic geography; Intra-industry trade; Economic integration;
Jel codes: F110; F120; F140; F150

* Anna Maria Ferragina is a D.Phil. student in economics at the University of Rome III.

Table of Content**

Tables

** ACKNOWLEDGEMENT. These notes represent a report of a research carried out at the University of Sussex, UK, during 1997. Professor Mariano D'Antonio has kindly given me the opportunity to publish the work. I also wish to thank Professor Alasdair Smith for his thoughtful and rigorous supervision. A previous version of the paper has been presented at the Department of Agricultural Economics, Katholieke Univeriteit of Leuven, Belgium, in a session of the seminar cycle of the Policy Research Group, in November 1997. Many thanks are due to all the participants. Especially Prof. Johan Swinnen, director of the PRG, has shown his interest and support for the elaborate through very stimulating discussions. However, the usual disclaimer applies.

Introduction

From 1989, a rapid process of trade liberalisation has occurred between CEECs and EU. Anticipating the adjustment effects of the EU-CEE trade is a reason of major concern, as any economic integration entails costs to specific regions and sectors of the areas involved. On the basis of the most relevant trade theories, different explanations of determinants and gains from trade are possible.

On the ground of a substantial factor endowment differential between East and West, a traditional H-O framework has been proposed as the most appropriate to interpret the effects of trade. It implies that most of the future East-West trade flows should be *inter-industry* trade and as such should produce a quite dramatic reallocation of resources. In other words, the East will specialise in the production of the commodities which intensively use the factor - labour - with which it is relatively well endowed; meanwhile, it would import capital in terms of money, machinery or capital intensive commodities. As a consequence, according to the factor price equalisation and the Stolper-Samuelson theorems, the price of the factor intensively used in the export production will tend to increase relatively to those of other factors: wages and prices for labour intensive goods in the East would rapidly increase, while the return to capital would worse off, because of a decreasing demand for it due to increasing imports of capital goods. Conversely, in the West, wages would reduce and the price for capital increase. Such scenario, providing an alarmist view of the cost of adjustment, has called for enforced protectionism.

However, in the last years a growing share of *intra-industry* trade (IIT since now) has rapidly developed and have suggested another approach. Considering two-way trade as a sign of similar factor endowment between CEECs and EU and emphasising the human capital abundance of the Eastern economies, the conclusion that within few years the CEECs would have been able to export sophisticated goods has been suggested (CEPR, 1992). According to this point of view, not only a rapid process of catching up, but also a full integration with almost neutral effects in terms of income distribution could be envisaged, whose determinants would be product differentiation, scale economies, imperfect competition as according to the most common models of IIT (Krugman's, 1979; 1980).

This paper aims to go beyond the opposition between these two extreme scenarios sketched out and to attempt a deeper investigation on the nature of the actual EU-CEE IIT, by means of a specific attention to quality differentiation in production and vertical IIT. Typically, two-way trade (IIT) is associated with horizontal product differentiation. However, vertical product differentiation is especially relevant between partners with different levels of development. Determinants and adjustment effects of this trade differ substantially from those normally associated with IIT.

These notes are based on the price/quality gap indicators calculated by Landesmann-Burgstaller (1996) to measure vertical product differentiation in EU markets at 3-digit NACE industry level. They have proved to be a key tool to disentangle horizontal and vertical CEE-EU[1] trade (HIIT and VIIT) looking at the ratio between the price at which the CEECs export their goods on EU markets and the average price at which the same goods are imported on the same markets from a range

[1] The CEECs included are: Poland, Czech Republic, Hungary, Yugoslavia/Slovenia, Romania, Bulgaria, Soviet Union/Russia.

of thirty trade partners, including EU members[2]. An high (low) indicator suggests that the productions sold by the CEECs are above (below) the average quality of exports to EU markets, taking prices as a proxy for quality. The general finding is that the countries candidate for accession occupy very low-quality segments of trade with the EU and that in the period 1988-94 they have undergone rather dramatic shifts in relation to other international competitors.

The indicator used provides information not based on the quantity of trade flows, but on their quality. This allows to enlighten the relative productivity and efficiency of CEE exports and to catch the effects of transition on economic performance. The emergence of a clear separation of CEECs into two groups, here called CEECs1 (Hungary, Poland, Czech Republic, Yugoslavia/Slovenia) and CEECs2 (Bulgaria, Romania, Slovakia and Russia), is almost exactly corresponding to the two different groups of countries which, according to the Commission of the EU (Agenda 2000, 1997), should be admitted to the first and the second wave of the pre-accession negotiations[3].

A further development of the analysis has consisted of testing some hypotheses relative to the determinants of the quality of trade in cross-country regressions, taking a sample of trade competitors in EU markets. The hypotheses are those underlying two models of VIIT: the so-called neo-H-O model (Falvey, 1981; Falvey-Kierzkowski, 1987), based on factor endowment, and an "economic geography" model based on market size and economic integration (Greenaway-Torstensson, 1997).

As the explanatory variables used (proxies for human capital, physical capital, market size and a dummy for market integration) seem to affect the dependent variable (unit-value differences) with relevant and significant coefficients, it seems possible to conclude that these variables give rise to specialisation in different segments of the quality spectrum . Therefore, the empirical analysis supports both models. However, the wrong sign for the variable which measures education is obtained when the Eastern European countries are included in the regression. This suggests that educational statistics for these countries overstate the economic value of the education provided.

Many relevant information are drawn from the analysis with respect to CEE specialisation on low-quality exports to EU markets. In particular, the estimates suggest the existence of a process of "crowding out" of the existing human capital due to the transition. This can be explained with the need for inter-sector relocation of labour, retraining and adaptation of non-market labour skills to the needs of the market economy. Therefore, at least in the medium term, the countries considered might have comparative disadvantages in the high-skill sectors, which will be overcome as far as they will be able to convert their human capital.

Moreover, the lower market size of the countries candidate to EU accession could contribute to strengthen the disadvantage in high quality segments of production.

---

[2] In addition to the CEECs, the other competitors (or groups of competitors) considered are: Usa, Japan, Canada, Switzerland, Turkey, EU-North/EFTA countries (Germany, France, Italy, Belgium-Luxembourg, Netherlands, UK, Ireland, Finland, Sweden, Denmark, Austria), EU-South countries (Spain, Greece, Portugal), NIC1 (Taiwan, Hong-Kong, Singapore, Korea), NIC2 (Indonesia, Thailand, Philippines, Malaysia), China, India.

[3] Actually, CEECs1 does not include Estonia, which the Commission considers ready to start negotiations. In the same document, the Commission has expressed the opinion that other five EAs countries are not ready and could start the negotiations as soon as they correct their deficiencies with respect to the Copenhagen criteria (Slovakia on political grounds and Bulgaria, Romania, Latvia and Lithuania on economic grounds). The group CEECs2, while including Romania and Bulgaria, excludes the other three and, in addition, incorporates Soviet Union/Russia, a country which is not included at all among the ones joining the EU together with the South-eastern Europe (Albania, Croatia, Macedonia, Bosnia and new-Yugoslavia) and the former Soviet Union Republics.

In fact, the significance of the variable for market size in the estimates suggests that the liberalisation might be accompanied by increased concentration of high-quality production in large markets. However, the geographic proximity to the core of Europe could counterbalance this force, as soon as the East would catch up with Western levels of per capita income. In this case, in fact, it could benefit from any process of further concentration. Moreover, the integration process itself could make faster the process of catching up in terms of quality of products and of income, providing Eastern producers with a larger market and potential economies to scale.

The adjustment implications stemming from the analysis suggest that, although VIIT will be far less neutral in terms of income distribution effects than HIIT, still the dramatic effects envisaged by the traditional H-O model of IIT, such as the crowding out of entire sectors, are not a realistic perspective. The likely change is a displacement for the Western firms which are specialised in low quality segments of market, with eventual loss of jobs and reductions in wages.

The paper is organised as follows. A first section provides a brief description of the old and new specialisation of the applicant countries by means of a "revealed comparative advantages" analysis (section 1.1.) and of an exam of CEE-EU IIT (section 1.2).

Then, in section 2, the study of the nature of IIT begins. The quality dimension of this kind of trade is researched by means of EU trade data on unit value differences relative to three sectors: food, engineering and textile. A further section (2.3.) questions on the possible implications of the adjustment process in terms of income distribution. Some theoretical models suggested in the literature to deal with quality in international trade - the Falvey's (1981) neo-H-O and the Greenaway-Torstensson (1997) economic geography models - are introduced in section 3.1 and 3.2 respectively. Empirical testing by means of cross-country regressions is dealt with in section 4. Section 5 contains some concluding remarks.

1. Trade composition and trade directions

Observing the massive change in the volume and direction of trade of CEECs occurred after 1989, the first question to rise is how much they must realign their production structures according to comparative advantages. It is difficult to estimate how far the allocation of resources across industries under central planning was from that which would have emerged from market-determined prices.

Furthermore, there is some uncertainty in the estimate of long-term patterns of comparative advantages from actual trade flows. The current structure of production is, in fact, still affected by the legacy of the planned economy which has entailed misallocation of resources and autarky.

However, during the transition process, relevant changes in the trade structure have already occurred in some countries such as Hungary, Poland, the Czech and Slovak Republic (Visegrad group). Besides, it is likely that part of the existing industrial structure inherited from the past in most countries will be the same also in the medium term influencing the future export structure.

The literature has stressed two main stylised facts: firstly, exports from CEECs to Western Europe have grown rapidly; secondly, the composition of these exports has changed relatively little (Halpern, 1995; Drabek and Smith, 1995, Kaminski, Wang and Winters, 1996; World Bank, 1996). It has been claimed that much of the increase in exports to Western markets is simply due to the redirection of goods once sold to Comecon (trade diversion), but the change in the composition of exports

during transition has been quite poor due to the absence of a significant restructuring process. However, it has been observed that the absence of a change in the export composition might also suggest that the initial structure of production may have been appropriate and a need to improve the allocation of resources exists *within* more than *across* industries (Hoekman and Djankov, 1997).

In this section some evidence on the extent of change in export composition is presented.

1.1 The evolution of revealed comparative advantages since 1989

The approach currently used to foresee the change in the export structure is based on the study of the revealed comparative advantage (RCA), following the seminal work of Balassa (1989). To detect the factor content of trade, Neven (1995) has suggested a taxonomy of the sectors of production consisting of grouping the industries into different clusters according to their factor intensities. In other words, the factor intensity of the goods exported is considered an index of the country's relative factor endowment and associated comparative advantage. In particular, four variables are used to organise the industries into clusters: share of wages in value added; investments as a percentage of value added; average compensation per worker; proportion of blue-collar workers in the total number of employees. The advantage of this taxonomy is that it provides a tool to discriminate between labour, physical and human capital intensity across industries. In fact, high average wages together with a high share of labour in value added and a low share of blue-collar workers is associated with industries intensive in human capital (clusters 1 and 2); in contrast, a low average wage, a high share of wages in value added and low percentage of white-collars is considered an index of high labour-intensity (cluster 3); finally, a high level of investment as a percentage of value added is taken as e measure of a high capital-intensity (cluster 4 and 5; tab. 1).

Tab. 1 - Neven's industry clusters by factor intensity

Factor intensity/Sectors	share of white collars	average wage	wage bill/ value added	investment/ value added
1. Very high human capital (chemicals, office machinery)	very high	very high	high	high
2. high human, low physical capital (mechanical, electrical and instrument engineering)	high	high	high	low
3 low human, low physical (footwear and clothing)	low	low	very high	low
4 low human, high physical (motor vehicles, textiles)	low	low	intermediate	high
5 high human, high physical (food processing)	high	high	low	very high

Source: Adapted from Neven (1994), pp. 22-23.

The revealed comparative advantages of a group of CEECs (Poland, former Czechoslovakia, Hungary, former Yugoslavia, Romania, Bulgaria, Soviet Union/CIS)

in the EU markets between 1987 and 1995 have been calculated by Kubielas (1997) using the mentioned Neven's clustering procedure[4] (tab. 2).

Tab. 2 - RCA- Neven Clusters 1988-95

	RCA1		RCA2		RCA3		RCA4		RCA5	
	'88	'95	'88	'95	'88	'95	'88	'95	'88	'95
Poland	-0.81	-0.73	-0.53	-0.53	0.32	0.51	0.02	0.12	0.19	0.04
Czech.	-0.72	-0.65	-0.43	-0.22	0.17	0.38	0.13	0.13	0.15	0.02
Hungary	-0.69	-0.51	-0.45	-0.30	0.38	0.4	0.06	0.13	0.09	-0.4
Yugosl.	-0.62	-0.66	-0.43	-0.19	0.51	0.51	0.05	0.07	0.06	-0.16
Romania	-0.8	-0.9	-0.74	-0.69	0.53	0.7	-0.13	-0.03	-0.29	-0.47
Bulgaria	-0.54	-0.75	-0.39	-0.58	0.07	0.40	-0.12	0.14	0.35	-0.14
SU/ CIS	-0.95	-0.76	-0.85	-0.89	-0.89	-0.47	-0.19	0.04	-0.47	-0.28

Source: Kubielas (1997).

As far as the high-technology sectors (1 and 2) are concerned, all the countries show strong comparative disadvantages, although slight improvements with respect to 1988 can be observed for the Visegrad group. Conversely, in the labour-intensive sector 3, all the countries, except for the Soviet Union, show comparative advantages. They have also experienced positive changes over the period considered.

In physical capital intensive industries (sector 4), the initial specialisation is confirmed for Poland, ex-Czechoslovakia, Hungary and Yugoslavia. The others (Romania, Bulgaria and Soviet Union), which had negative imbalances in 1988, show a growing specialisation with the emergence of positive comparative advantage in 1995.

Finally, food processing (sector 5) has reshaped its position with a sizeable reduction of the advantage over time and even in most cases the emergence of a net trade imbalance.

The performances of all the CEECs are the weakest in the capital and technology intensive productions suggesting a low R&D and skilled labour endowment. This applies also to the most advanced group of countries (Ceecs1). However, the Visegrad countries also show a relevant specialisation in capital intensive activities (steel, plastics, textile, printing, motor vehicles), although they tend to specialise ever more in labour-intensive ones (footwear, clothing, leather, wood products). In other words, the present pattern of CEE exports reflects both the legacy of past industrial policies (emphasis on capital-intensive sectors and natural resources) and the characteristics of the transition period where plummeting wages have boosted labour-intensive exports.

On the whole, trade between industries reveals the absence of dramatic changes. However, it is possible to observe that the labour intensive sector is dominant and has been improving its position steadily, peaking in 1993; the trade balance of sectors 4 has been fluctuating around zero throughout the period; the human capital intensive sectors (1 and 2) have maintained highly negative ratios. Thus, the change seems to be mainly concentrated on low human-capital intensity sectors, while the physical capital intensity sectors maintain their traditional role thanks to past trade links and to the

[4] There are many variants for measuring RCAs. Some of them rely on both import and export data, others only on exports, because import figures may be distorted by restrictive trade. In the following, the indicator of revealed comparative advantages in exports to the European Union is adjusted for total trade imbalances and is calculated by considering the difference between export and import shares (x/X - m/M) for the specific industry at the Nace 3-digit level of aggregation. Export/import shares are the ratio between the exports/imports at the industry level and the aggregate export/import flows. The indices are calculated on Comext database.

increasing mobility of the factor (Kubielas, 1997). The maintenance of most of the past specialisation might suggest that under central planning the production criteria were at least partially based on natural resources or factor intensity (Buckwell, 1997).

Food processing is the only sector in which most of the countries are experiencing a dramatic decline of their comparative advantages, in spite of a quite strong initial specialisation[5].

In Neven (1995), the same index is calculated using data for 1991-92. A comparison has been carried out to assess the comparative advantages of each European Community member and the EU-12 as a whole, with respect to the Eastern countries as a bloc[6]. Positive trade imbalances have been observed for North-European countries in industry groups 1 and 2, intensive in technology and human capital. The South-European countries have large and positive imbalances in industries with a low capital intensity combined with an high labour content (groups 2 and 3). Both North and South of Europe register large net imports in industries intensive in capital and labour (group 4).

Neven's analysis suggests that the increasing specialisation of CEECs in labour intensive sectors is likely to face problems of market access. In fact, it seems that candidate countries may specialise further in industries intensive in labour and capital (steel, motor vehicles, textile, rubber, plastics, wood transformation and printing), where they have a comparative advantage with respect to North and South-Europe and easily enter their markets. Conversely, their exports to the Northern European markets of goods intensive in labour, using relatively low capital (clothing, furniture, leather, agricultural equipment) are likely to face a strong competition from South-Europe.

On a policy ground, similar, but not completely correct considerations have fed the hostile attitude which has been shown by some of the European Community members against the complete relaxing of trade barriers with the associated countries (Rollo J. & Smith A., 1993). In fact, as well known, substantial protection for agriculture and the "sensitive" sectors, such as textiles, food processing, metals, chemicals, has been a typical feature of the Europe Agreements signed in 1992. Also the Interim Agreements, operating a free trade area for many industrial products in 1995, has maintained relevant tariff and quantitative restrictions in high labour and capital intensive sectors. Only very recently, the trend towards a full integration is gradually taking place.

On a theoretical ground, the revealed comparative advantage approach proves that the H-O-S model is a relevant source of explanation of the developing patterns of a relevant component of trade. In case of the inter-industry kind of trade, the goods exchanged embody different factor intensities and the specialisation mirrors the different factor endowment between Eastern and Western economies. In particular Eastern specialisation is consistent with the H-O predictions for an economy with relatively abundant and inexpensive labour. The exception represented by the high share of exports of goods belonging to sectors which are physical-capital as well as labour intensive can be explained in terms of historical conditions. In other words, through the transition period, there has been a remarkable tendency to trade labour in exchange for human capital while keeping constant the level of physical-capital intensity of exports.

However, as already predicted in CEPR (1990, p. 20), relevant objections to the application of a traditional H-O approach to the analysis of CEE-EU trade rises from the fact that a large share of trade is registered "within" rather than "between"

---

[5] For a recent sector specific analysis of the food sector, see Macours K. and J.F.M. Swinnen (1997);

[6] Here the countries considered are Hungary, Poland, Romania, former Czechoslovakia and the CIS.

industries, a paradox difficult to reconcile with the traditional factor proportion theories[7].

1.2 - The role of IIT and its components

The growing share of IIT has been one of the main features of the process of EU-CEE economic integration. Using the Grubel-Lloyd index to measure it at the 3-digit NACE classification, it emerges that the shares of IIT of Poland, CSFR and Hungary are higher than those of some NICs and steadily increasing from 1988 to 1993 (tab. 2).

Tab. 3 - Intra-industry trade with the EU (1988-1993)

	1988	1989	1990	1991	1992	1993
POLAND	0.38	0.42	0.39	0.40	0.42	0.45
CSFR	0.46	0.46	0.47	0.50	0.53	0.59
HUNGARY	0.48	0.49	0.50	0.52	0.52	0.55
SINGAPORE	0.38	0.38	0.40	0.41	0.39	0.36
SOUTH KORE	0.27	0.28	0.30	0.29	0.34	0.34
TAIWAN	0.32	0.35	0.38	0.38	0.37	0.37

Source: Dràbek & Smith, CEPR, 1995, p. 28, COMEXT data.

This data would suggest that a trade closer to West-West rather than to North-South trade is developing between EU and the CEECs. Nonetheless, the Grubel-Lloyd figures must be interpreted cautiously. First objection could be that 3-digit is a too low level of desegregation which implies that heterogeneous goods are classified together. However, Landesmann-Burgstaller (1996) find a relevant IIT share even at 8-digit industry level. A more funded reason for caution is that the Grubel-Lloyd is ineffective to check whether trade taking place within a sector is between goods embodying the same level of technology and know-how. The figures actually conceal real differences in the nature and quality of the products traded. Most IIT entails trade between low-skill and high-skill products. Such vertical IIT may be more important than exchanges of similar, but differentiated goods driven by economies to scale and demand for variety as according to the textbook explanation of IIT (Krugman P. & Obstfeld M., 1994).

As observed by Hoekman-Djankov (1997), especially in the early stages of transition, the factors determining IIT are quite numerous. First of all, Eastern European firms are strongly dependent on imports of inputs from the West in order to acquire know-how and technologies. There are many ways of doing it: much of the imports may occur within inward FDI or by joint ventures relationships. Moreover, a great role is played by outward processing trade (OPT) or subcontracting arrangements. Indeed, the relevant growth of IIT in textiles and clothing is related to OPT thanks to the special provisions contained in the Europe Agreements, i.e. zero or negligible tariffs.

However, not all trade in similar goods generated by transfer of technology can be strictly defined as IIT, as much of it is likely to disappear at a very detailed statistic level due to the fact that no real two-way trade of intermediate inputs and capital goods is observed. Therefore, in this work, VIIT is not defined as exchange of goods according to the fragmentation of the production process by stages of production (two-ways trade in goods that make up an industry's production chain), which is the

[7] The factor proportion approach assumes that each industry has a given factor-intensity and, therefore, trade determined by factor endowment differentials between partners may only happen between goods belonging to different industries.

definition usually adopted in industrial economics. The definition of VIIT most common in the trade literature has rather been followed. It incorporates bilateral exchanges of similar goods where the unit values ratios of exports to imports are below or above particular threshold values. Conversely, HIIT applies to bilateral trade flows of goods falling in the same classification whose unit value ratios are between the threshold values (Greenaway, Hine and Milner 1995).

The existence of VIIT has crucial implications in terms of determinants of trade and adjustment effects on producers and consumers. Especially the effects on income distribution seem less easy to predict. In general, there are arguments in favour of an ease of adjustment connected with an increase in IIT (Balassa, 1966). However, in case of VIIT, capital-labour ratios and skill requirements may alter during the process of trade liberalisation because product and factor mixes change. In fact, some studies have shown that variability in capital-labour ratios may be even greater "within" than "between" industries (Greenaway-Milner, 1986). Hence, the issue of the adjustment is crucially reliant on whether horizontal or vertical IIT is developed.

2 - Quality product differentiation in CEE-EU trade

The aim of this section is to investigate the actual nature of two-way trade in differentiated products between the CEECs and the EU. The price/quality gaps of export sales to the EU, as computed by Landesmann-Burgstaller (1996), is the tool used to distinguish between high and low quality trade and to attempt two types of investigation.

The first one consists of assessing the relative position of the CEECs with respect to other competitors and with respect to each other on EU markets in three sectors characterised by different factor intensity (engineering, food and textile). In addition, OLS estimates of price/quality gaps upon country dummies are presented for 1988 and 1994 and the shifts of the coefficients are compared to assess whether a process of catching up has been occurring.

2.1 - The price-quality gap indicator to disentangle vertical and horizontal IIT

Landesmann-Burgstaller (1996) provide relevant information regarding the price and quality position of the Eastern European producers in EU markets based on the calculation of a price/quality gap index of IIT, PG_{jh}. This equals the sum of the ratios between the prices at which the *n* items *i*, belonging to the same industry, *I(h)*, are exported to EU markets, and the average price of the same item in total EU imports, $p_{EU,i}$ weighted by the share of the same product item in total country *c*'s exports to the EU, $sx_{j,i}$ (Tab. A.1):

$$PG_{jh} = \Sigma\left(\frac{p_{j,i}}{p_{EU,i}}\right) * sx_{j,i} \quad i \in I(h); \quad \Sigma sx_{ji} = 1 \qquad [1]$$

This index is exposed to some criticisms. First of all, the assumption that quality is reflected in prices and that price gaps are a measure of quality gaps is somehow reductive. However, such an assumption is largely found in the trade literature (Torstensson, 1991; Abd-al-Rahman, 1991; Greenaway-Hine-Milner, 1994; 1995). It

has been shown by Stiglitz (1987) that, assuming perfect information, a variety sold at a higher price must be of higher quality than a variety sold more cheaply[8].

Secondly, the effect of the level and the fluctuations of the exchange rate could produce a biased index. Landesmann-Burgstaller (1996) have found that "while upward movements in the exchange rate relative to the PPP rate relate in the general sample positively with upward movements in the price/quality position of exporters, such a relationship cannot be found with respect to CEE exporters" (p. 10). Thus, in the case of the CEECs the index does not exhibit a strong correlation with the dramatic exchange rate fluctuations registered[9].

Finally, tariffs and non-tariff barriers could be hidden behind prices, giving a misleading measure of quality. For example, the free access to the market for EU member countries is partially responsible for a lower average export price with respect to non-EU members at a similar level of development (market integration effect). The exports of the CEECs to the EU market has continued to be affected by serious restrictions over the period considered so that the trade barriers are quite a serious distortion of the analysis.

Nevertheless, [1] is able to provides a new insight into EU-CEE trade and measures changes in performance. It can be used to disentangle the presence of V- and HIIT, applying to it the criterion suggested by Abd-el-Rahman, (1991) and refined by Greenawy-Hine-Milner (1994, 1995), for a slightly different index, based on a ratio between unit value of exports (UV_{ij}^{x}) and unit value of imports (UV_{ij}^{m}) of a given good i by a given country j, i.e. $\frac{UV_{ij}^{x}}{UV_{ij}^{m}}$. The price/quality gap indicator is based, in fact, on a similar comparison between the unit value of exports to EU and the average price of EU imports for each 8-digit product in a given industry. Now, considering $p_{EU,i}$ as a proxy for UV_{ij}^{m}, the mentioned criterion consists of setting a threshold value for detecting HIIT. It means that if:

$$1-\alpha \le PG_{jh} \le 1+\alpha \qquad [2a]$$

there is HIIT. Conversely, if

$$PG_{jh} < 1-\alpha \quad \text{or} \quad PG_{jh} > 1+\alpha \qquad [2b]$$

there is VIIT, choosing an appropriate value (0.25) for the wedge α.

2.2 - Evidence on quality position of Eastern European producers on EU markets

---

[8] However, in presence of asymmetric information and transaction costs prices are only imperfect measures of quality. Nevertheless, they provide the most accessible source of information about consumer assessments of the qualitative characteristics of the products. Another criticism is that the measure adopted, prices per kg, implies that unit values depend on the heaviness of the good considered. Unfortunately, unit values per item are only available for a limited range of products.

[9] It is not completely clear which role has been played by the dramatic devaluation happened during the first years of the transition process: the relative stability of the index could be seen as a sign of recovery, since the gap is expected to increase, as a consequence of a monetary devaluation. However, it has also been observed that, in case of appreciation, which after the initial devaluation many countries have experienced, the stability of the price gap is evidence of low market power of the Eastern producers on EU market

A look at the qualitative patterns of the EU-CEE trade may solve the apparent paradox of growing levels of IIT in spite of the slow pace of the industrial restructuring observed.

Pooling the data regarding three sectors, a substantial price gap emerges between the Eastern European exports to EU and those of five other groups of competitors (NICs, EU-South, EU-North, Japan, USA; see Tab. A.2 for the definitions). The index for CEECs1 and for CEECs2 is heavily concentrated on values lower than 0.75, which may be considered the wedge to discriminate between HIIT and VIIT (tab. 4). The hypotheses proposed by some contributions on the role and the features of the IIT emerged in the last years are confirmed: the CEECs have been developing a kind of trade with the countries of the European Community ever more relevant in terms of volumes, but quite poor in terms of quality (Smith-Drabek, 1995).

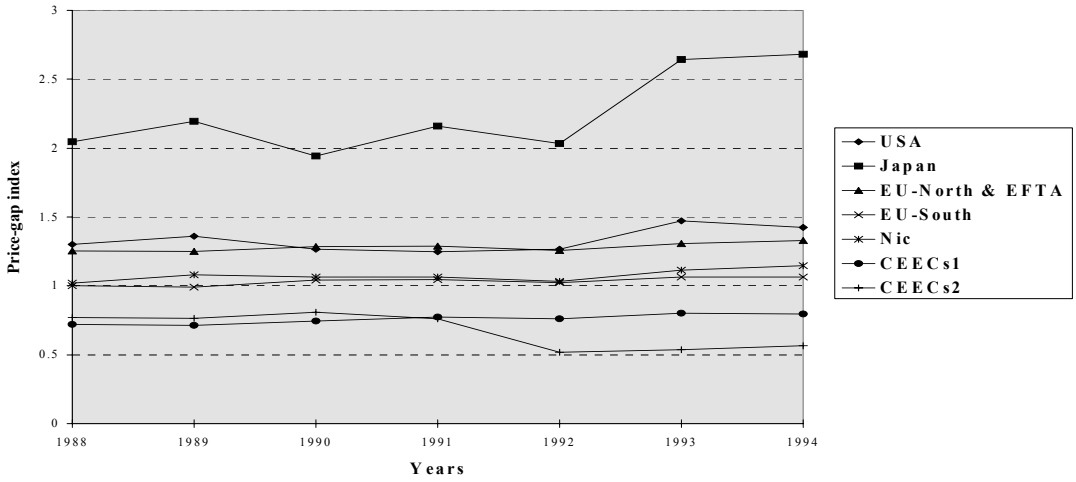
Tab. 4 - Horizontal and vertical IIT for countries and groups of Central and Eastern European countries (1988-1994)

	Engineering		Food		Textile	
	1988	1994	1988	1994	1988	1994
CEECs1	V	V	H	V	V/H	H
CEECs2	V	V	H	V	V	V
Hung	V	H	H	H	H	H
Pol	V	V	H	H	V	H
CSFR	V	V	H	V	V	H/V
Bulg	V	V	V(+)	V(-)	V	H/V
Rom	V	V	H	V	V	V
Yug	V	V	H	V	H	V(+)
SU	V	V	H	V	H	V/H

Note: H=HIIT in case of a price gap index, PG, such that 0.75<PG<1.25.V=VIIT in all the other cases, with V(-) such that PG<0.75 and V(+) such that PG>1.25. Where not specified, V=V(-).

The gap registered between the CEECs and the groups of the NICs and EU-South equals 0.25 on average over the period considered. It rises to 0.5 circa when the comparison is with the EU-North & EFTA and the USA. Considering that the observed prices of the CEECs include tariff and non-tariff barriers, the gap with EU members can be even bigger than estimated (chart 1).

Chart 1 - Price-quality gaps in three selected groups of industries relative to different countries and groups of countries (1988-1994)

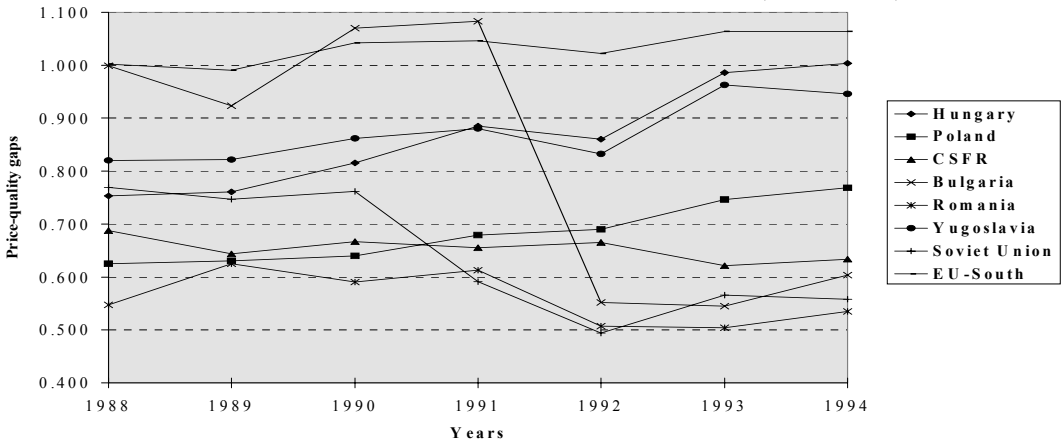


Relevant information on the emergence of a strong bifurcation between two groups of economies, CEECs1 and CEECs2, have emerged over the period 1988-1994:

the Western CEECs (CEECS 1 in the chart) show a slow and weak tendency to a closure of the gap, whereas the Eastern CEECs (CEECS2) seem to experience a dramatic collapse of their quality positions, starting from 1990 (chart 1).

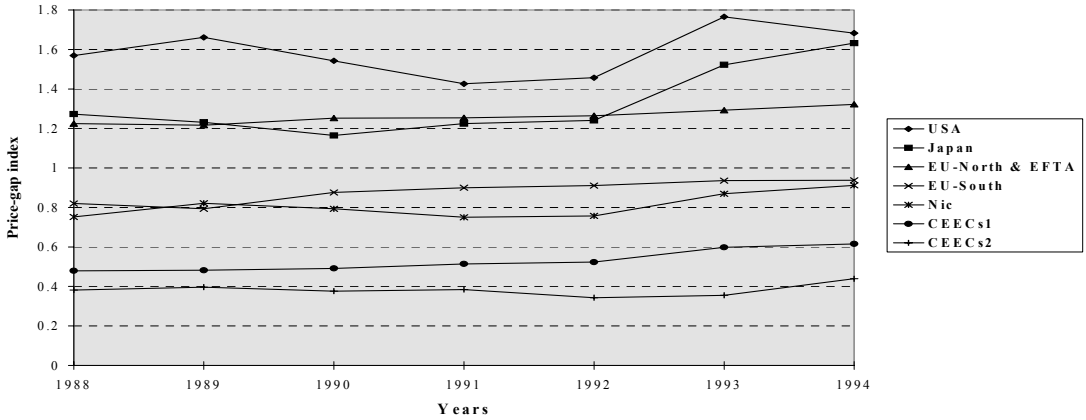
Chart 2, which goes in more detail taking into account each Eastern economy, shows that quite a complex process of re-positioning among the CEECs is taking place. Some countries, such as Hungary and the former Yugoslavia, seem to have almost completely filled the gap with the EU-Southern countries, reaching a level of HIIT in the sectors concerned. Other countries, such as Poland, have improved their position, although their trade is still of a vertical kind. The former CSFR and Romania are quite stationary, with a value slightly higher than 0.6 and equal to 0.55, respectively. Other countries, such as the former Soviet Union and Bulgaria, have seen reduced the average quality level of their productions from 1988 to 1994 with an increase of the price-gap by almost 0.22 and 0.4 points, respectively. In the case of Bulgaria, the reduction implies a shift from HIIT to VIIT.

Chart 2 - Average price-quality gaps for three selected groups of industries, for each of the CEECs and EU-South (1988-1994)



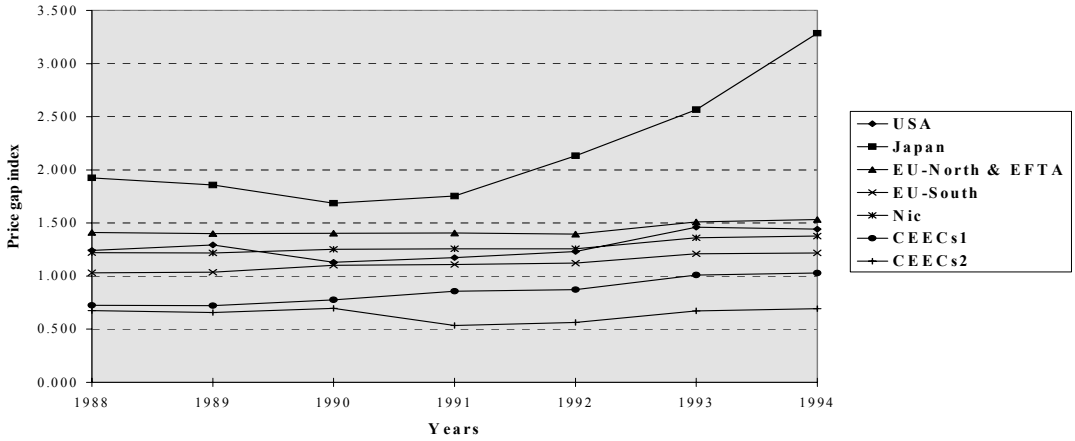
Restricting the analysis to each sector, it has to be observed that the under-representation of the CEECs in high-quality segments of EU imports is especially evident in the engineering industries while it is less pronounced in the food and textiles (charts 3-4-5). In the engineering, the average price-gaps of CEECs1 and CEECs2 over the period considered are 0.5 and 0.4 circa respectively. A slight improvement is observed in the last two years for both groups, but the emergence of a bifurcation between CEECs1 and CEECs2 is quite remarkable in these branches (chart 3).

Chart 3 - Price-quality gaps in the engineering industry relative to different countries and groups of countries (1988-1994)



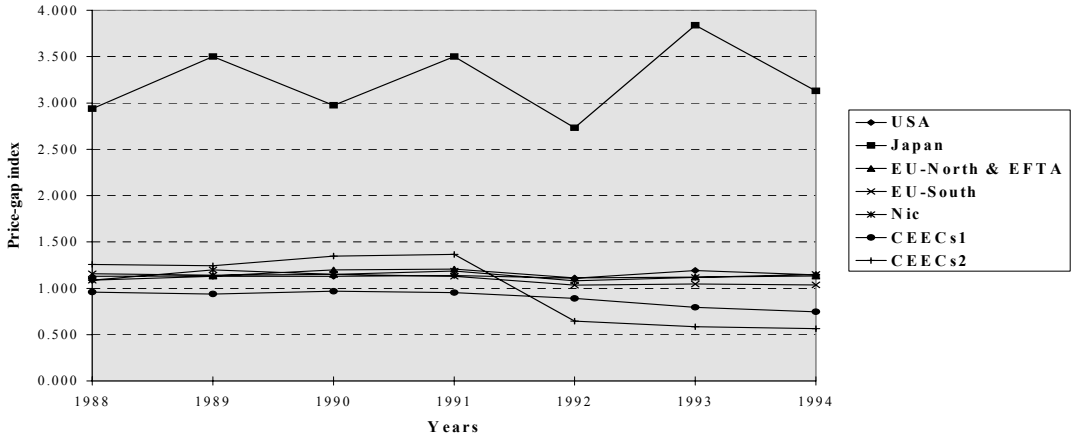
Regarding textile, it has to be noted the clear reduction in the gap for the CEECs1 which move from a position of vertical (0.75) to one of horizontal (1.1) trade on EU markets. Conversely, the CEECs2 persist at a level of 0.7 circa, which is on the edge of VIIT. Because of the different speed of change of the two groups, the gap between them increases continuously over the period, passing from 0.1 points in 1988 to 0.4 circa in 1994 (chart 4).

Chart 4 - Price-quality gaps in the textile, clothing and footwear industries for countries and groups of countries (1988-1994)



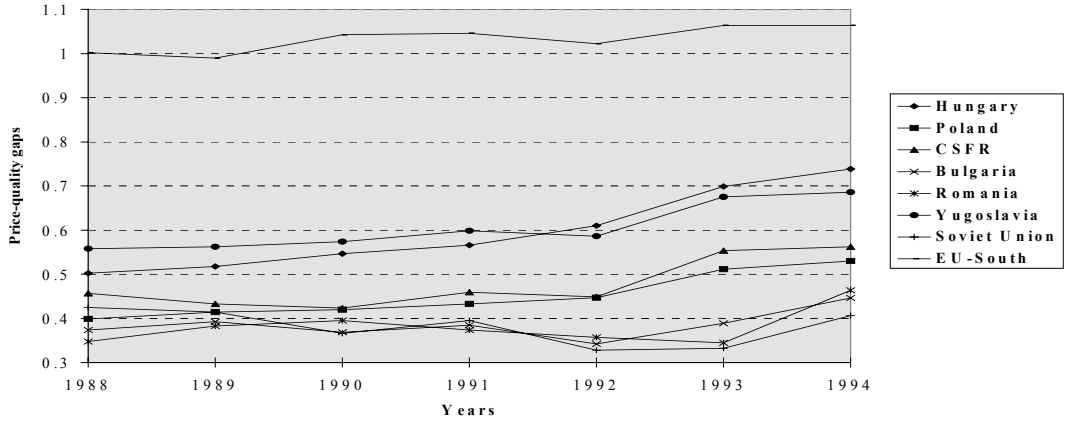
In the food sector, a remarkable decline is registered for CEECs2 which loose their initial high price position, moving from HIIT to VIIT, mainly because of the dramatic fall down of the index for Bulgaria. A less relevant reduction in the indices is instead registered for CEECs1(chart 5). In spite of a quite bad performance, the CEECs in 1994 still hold an average quality position in a market which is not very much differentiated across countries.

Chart 5 - Price-quality gaps for food, drink and tobacco industries relative to different countries and groups of countries (1988-1994)



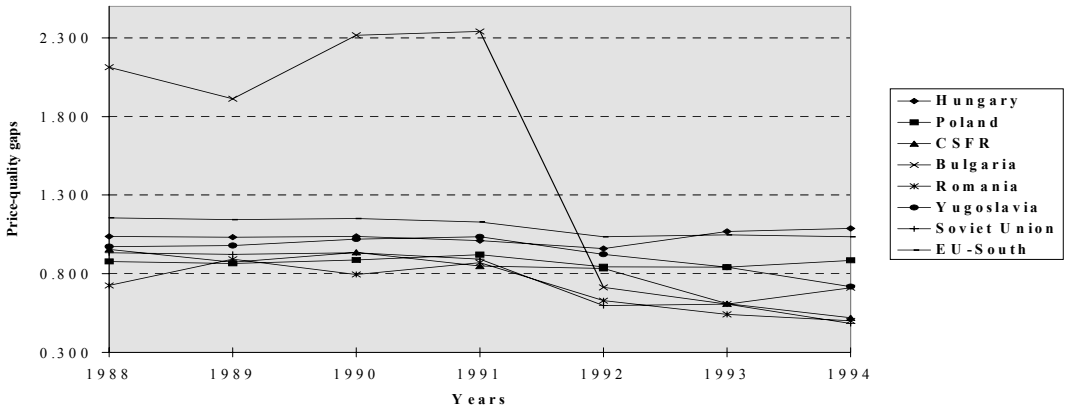
When the specific position of single Eastern European countries is considered, further differentiation emerges (charts 6,7,8 and tab. 4.4). In the engineering industry, Hungary and Yugoslavia appear to be close to cover the quality gap with EU in 1994. Conversely, Poland and Yugoslavia are quite far from developing HIIT with EU in this industry, albeit the gap is continuously reducing. Quite worse is the position of all the other CEECs.

Chart 6 - Average price-quality gaps in the engineering industries, for each of the CEECs (1988-94)



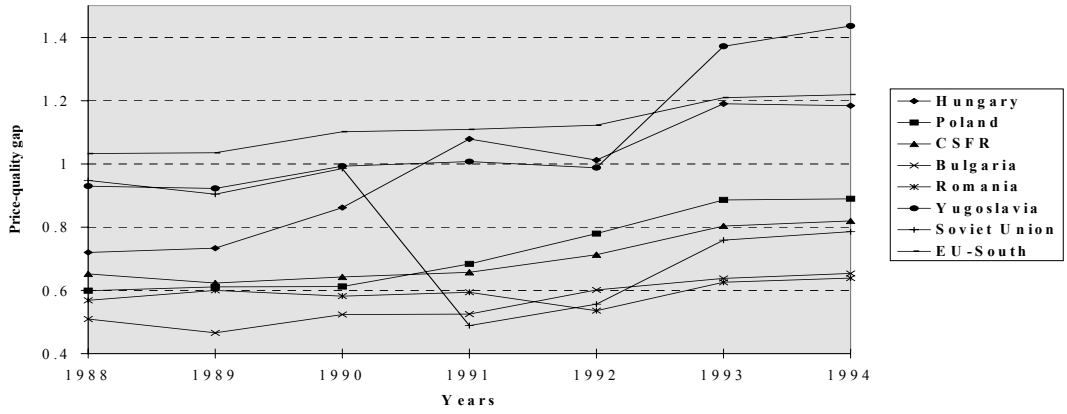
In the food industries, the position in 1988 and the evolution of the single countries is quite homogenous: most of the CEECs have experimented a worsening of their performance, leading to a quite relevant increase in the price gap, exceptional in the case of Bulgaria (chart 7).

Chart 7 - Average price-quality gaps in the food industries, for each of the CEECs (1988-94)



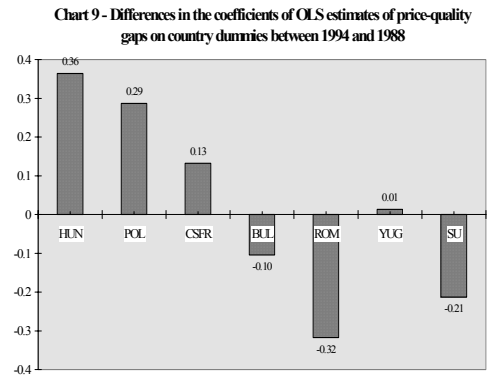
The textile industries provide a different picture from the previous two sectors, with the price gap indicators of almost all the countries moving upward, in many cases involving a transition from V- to HIIT. The negative exceptions are represented by Romania and the ex-Soviet Union.

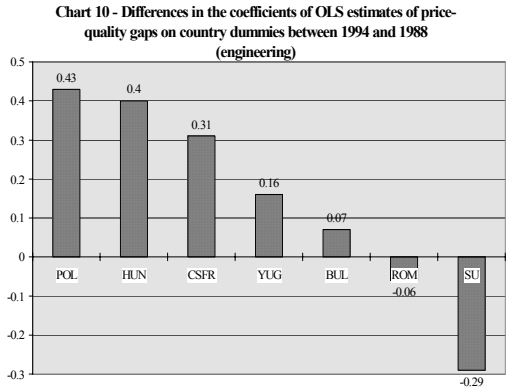
Chart 8 - Average price-quality gaps in the textile industries, for each of the CEECs (1988-94)

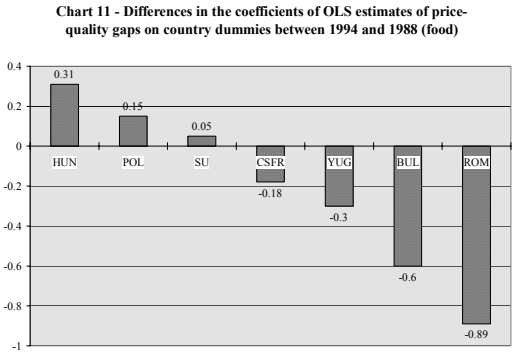


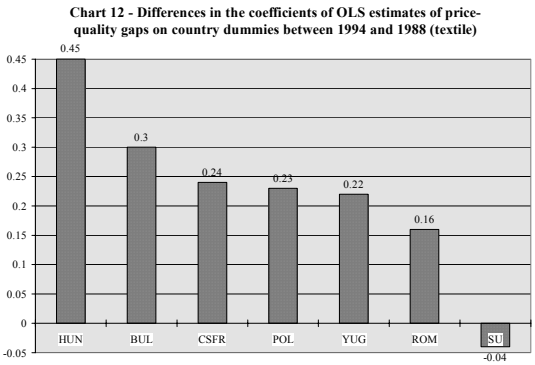
A further way to represent the changes occurred between 1988 and 1994 is by regressing the variable price gap upon country dummies. The coefficients provide a

measure of the positive or negative shift of each country with respect to the mean of the dependent variable which is equal to 1 in Landesmann's tables. The coefficients are highly significant except for some countries. The insignificance is mainly due to an insignificant difference from the mean value of the dependent variable. The coefficients for all CEECs are negative, highly significant and lower than for the other competitors in the sample, confirming that the quality of their products is lower than EU average import price and than that of the other EU trade partners. Comparing the coefficients in 1988 and 1994, it seems clear that a sharp differentiation has emerged in 1994 with respect to 1988: the shift in the coefficients of the dummies from 1988 to 1994 reveals an improvement (lower negative coefficients) for CEECs1 and a deterioration for CEECs2. Hungary is the country with the most relevant positive shift, followed by Poland and the Czech and Slovak Republics. Yugoslavia also shows a slightly positive value. Conversely, the former Soviet Union, Bulgaria and Romania register a negative shift (chart 9-12).









To sum up some of the main findings of the previous analysis, it should be noted that, above all, VIIT with the EU appears dominant not only for CEECs2, but also for CEECs1, with the only exception of the textile (tab. 4). Moreover, some changes have been detected in an apparently static framework. In the food sector, quality is declining from levels associated to HIIT to levels associated to VIIT. In the engineering sector, a trend towards upward changes is not uniform, but relates to many countries, albeit it is still far from HIIT, with the exception of Hungary. Finally, in the textile, a clear process of catching up seems to involve all the CEECs. It is evident that, while some transition economies were more successfully integrating into European markets, others were not.

The strong degree of differentiation between CEECs1 and 2 has been associated with many factors: differences in initial economic conditions inherited from the communism, starting levels of inflation, geographical location, different ease of access to EU markets, different therapy of reform and exchange rate policy pursued. All these

factors have played some role[10], but the last two factors have been especially emphasised in the literature. It has been argued, and shown, that liberalisation of foreign trade has failed to increase Eastern competitiveness in all those cases in which no coherent programme of stabilisation was implemented, which means domestic prices decontrolled, administrative controls removed, inflation tackled (Kaminski, Wang, Winters, 1996).

Furthermore, the CEECs have followed two different approaches to exchange rate management. In Hungary, the former Czechoslovakia and Poland, large initial devaluation has been combined with a subsequent policy of fixed nominal exchange rates. Anyway, only the Czech Republic has maintained a stable nominal exchange rate and, at the same time, kept inflation under control, thanks to an initial low inflation. In Poland, the initial revaluation has given strong incentives to domestic firms, but, eventually, subsequent inflation leading to real appreciation has partially eroded them. The target for Poland and Hungary has rather consisted of monitoring the real exchange rate. All the other CEECs have experienced a continuous fall in their nominal exchange rate to cope with high level of inflation (Halpern-Wyplosz, 1995; Kaminski, Wang, Winters, 1996, p. 432; and for the case of agriculture, Bojnec, Münch and Swinnen, 1997).

Previous studies making a comparison between EU-CEE imports and exports at an aggregate level had found unit values ratios lower than 1 and rapidly decreasing from 1988 (Smith-Drabek, 1995). The increasing price-gaps were explained in terms of the following factors. Firstly, a fall in prices due to increased quantities sold in EU markets (terms of trade effect) was considered. Secondly, a decline in export demand due to the fact that EU markets have not been able to compensate for the loss of the huge demand coming from the former CMEA. Thirdly, a fall in the quality of Eastern exports to EU, as goods once destined to CMEA are now sold on European markets. The third factor is the most interesting as it supports the thesis that reorientation has mainly consisted of maintaining the old specialisation and composition of trade simply changing the direction ("distressed trade"). It means that the CEECs have conquered a position on EU markets only by means of facing lower prices and in order to sell those commodities which no longer could be sold in the former Comecon. This would suggest that trade liberalisation has been carried out without a systematic and structural industrial restructuring policy (Smith & Drabek, 1995; Faini and Portes, 1995).

The main findings obtained by the analysis of the price gaps calculated for each of the CEECs and for all the industries in the sample pooled together seem consistent with this conclusion (tab. 2). Nevertheless, an analysis per sector shows that behind an apparent static performance, which also the revealed comparative advantage analysis seems to suggest (section 1.1), there are countries and sectors experiencing a process of catching up and others regressing. Some sector specific factors, hence, have also to be considered[11].

---

[10] A more detailed analysis may be found in Kaminski, Wang, Winters (1996) p. 427.

[11] There is evidence in the literature of the negative effects played by the EAs tariff and non-tariff barriers especially relative to the "sensitive" sectors. It is likely that their role has been particularly negative for the food sector where FDI and OPT have not been able to play a compensating role, being quite low in terms of percentage (5% for Poland according to Naujoks-Schmidt, 1994). Conversely, in the textile, the role of foreign investors could have been relevant in crowding out the expected negative effects of protection. FDI could have also affected the good performance of the engineering sector.

2.3. Adjustment implications of IIT

It has been asserted that radical trade liberalisation with CEECs would entail significant costs for the EU economies. Alarmist predictions have been made, such as: 1) the possibility of steady trade imbalances for member states due to a faster growth of imports than exports to the associated ones; 2) an eventual growing competition on domestic markets to be faced by producers operating in specific weaker regions or sectors, such as the so-called "sensitive" sectors; 3) a displacement of EU members exports in third markets because of CEE competition.

The first macro-economic prediction is based on the untrue assumption that the former communist countries maintain a slower pace of growth than Western economies. Conversely, from 1994, most of the CEECs have registered a quite high growth rate with consequent trade imbalances. Points two and three are the usual implications of the traditional H-O approach and deserve a special attention as far as policy choices are concerned. So far, it has been shown that a substantial share of EU-CEE trade is of intra-industry kind.

It seems crucial here to consider that the adjustment costs generally associated with intra-industry specialisation are much less disruptive than those induced by inter-industry trade. The most followed argumentation is that, since in the former case factor input ratios in export and import sectors exhibit greater similarity than in the latter, the factor price differential should be narrower and, as a result, the adjustment to trade opening should be less dramatic. The reason for this would be that, if factor intensities between sectors are similar, we should expect labour to transfer from one sector to another with relative ease. In fact, the skills acquired working in the import substitute sector can be re-deployed in the export sector with minimal retraining costs. To follow the conclusion of Krugman (1981), every country gains from trade, paying much lower employment and redistribution costs than those associated with the inter-industry trade, provided that the countries have similar capital-labour ratios and skill levels, and that trade happens within productions with strong economies to scale and high product differentiation.

Some scholars have argued that the East-West trade pattern might be similar to the two-ways West-West one and interest high technology more than labour-intensive goods. The production processes and markets of the former are subject to economies to scale, imperfect competition and product differentiation. The underlying assumption is that human capital abundance is a key factor in determining comparative advantages of Eastern European countries (CEPR, ed., 1990, p. 7).

However, the empirical evidence has clearly shown the presence of VIIT which calls for other interpretative schemes. Following recent studies which have questioned the explanation of IIT based on monopolistic competition models (Hummels-Levinsohn, 1995; Torstensson, 1996a, 1996b). A feature of the most recent literature on IIT is the higher sensitivity of the analyses to the existence of VIIT and to its specific determinants and adjustment implications.

Two relevant studies have contributed to form a new approach: Greenaway-Hine-Milner (1994; 1995), moving from the finding that a large part of UK IIT is caused by vertical rather than horizontal product differentiation, have estimated determinants of HIIT and VIIT separately and tested the relevance of country-specific factors in explaining the relative importance of the two types of trade. Their main results are as follow: firstly, the determinants of VIIT and HIIT differ quite substantially; secondly, the results are generally more supportive and robust in models using VIIT as dependent variable.

Other applied studies have, in fact, proposed a revival of the traditional factor proportion theories adapted to take into account the quality of the goods traded. It is assumed that quality differences among products within an industry depend on supply side variables and can be mainly due to different factor intensities and to the degree to which scale economies are relevant in the production. Quality of products is nothing else, but a way to measure factor proportion relevance in IIT (Torstensson, 1996a, 1996b).

This leads to consider the topic of adjustment under a new perspective. The specialisation in vertically differentiated productions provides a situation in which the capital-labour ratio alters during the process of trade liberalisation. As a result, also skill requirements may alter. In fact, in many developed market economies a fundamental contrast is usually observed between the skill inputs in low-quality imports and high-quality exports.

The conclusion is not straightforward. On the one hand, in fact, VIIT is less neutral in terms of income distribution effects than HIIT; on the other hand, the dramatic effects envisaged by the traditional H-O model, such as the crowding out of entire sectors, is not a likely perspective. The adjustment implicit in a vertical kind of trade is based on income distribution between firms within a sector and not between sectors. In particular, increased competitiveness and displacement are possible for the Western firms which are specialised in low quality segments of the market. At most, also backward regions in a country may be affected for the same reason.

Furthermore, it might be argued that increasing trade with the CEECs might benefit EU producers in two ways: above all, exploiting new market opportunities for those goods where industrial countries have a true comparative advantage, such as high-quality goods; secondly, favouring the opportunity of transferring highly labour-intensive operations to CEE in such a way to improve the capacity of EU producers of facing the competitive pressure from developing countries. Indeed, much of the CEE exports of "sensitive" goods already involve mainly OPT, a relevant opportunity for EU producers to face the competitive pressure from developing countries (Faini-Portes, 1995).

Previous analyses have come to the conclusion that the process should imply quite small distribution effects phased out in a long period. (Rollo and Smith, 1992; Hamilton and Winters, 1992).

3 - Determinants of quality differentiated trade

In section 2.2, evidence has been found of the fact that even trade within industries between CEECs and EU reflects the factor endowment of the CEECs and their comparative advantage in sectors which exploit the higher labour and natural resource endowment. This observation has lead to an econometric investigation on the determinants of vertically differentiated trade in the EU markets.

The approach followed differs from the common econometric analysis of IIT which focuses on factors such as scale economies and product differentiation within monopolistic competition models of IIT. As already observed, recent empirical works have cast some doubts on the empirical validity of these models due to the fact that they mainly emphasise the role of horizontal differentiation (Torstensson, 1996; Hummels-Levinsohn, 1995). As a results, trade within industries which is not dependent on these variables, but rather on vertical product differentiation, as it is the

case for the CEECs, cannot be explained by means of such empirical models[12]. It is evident, in fact, that whilst HIIT is explained mainly by the so-called "new theories of trade", VIIT is related much more to the traditional theories of comparative advantages. This implies to leave the assumption of identical factor intensities and scale economies in the production of all the commodities, typical of some models of monopolistic competition, in order to investigate the possible existence of fundamental differences among products within an industry, for instance in the characteristics of the supply side. The main differences lead to two crucial variables: factor-intensity and scale economies.

The empirical analysis has concentrated on two streams of literature which focus on the way in which different qualities of the same good can generate international trade. The first model is the so-called neo-H-O model (Falvey, 1981; Falvey and Kierzkowski, 1987). A further model tested (Greenaway-Torstensson, 1997) explains trade in quality differentiated goods as a linear function of lowering trade costs and of market size differentials between trade partners[13]. The analysis has consisted of testing by cross-country regressions the relation between factor endowment and market size (independent variables) and industry-level price gaps between trade partner (dependent variable).

This approach can provide us with an explanation of the substantial gap between the average import price on EU markets (calculated as average of the import price of goods exported by European and non European producers) and the price at which the CEECs are able to sell their production to Europe.

3.1. - Neo-Hecksher Ohlin models

Models of VIIT date from three fundamental contributions: Falvey (1981), Falvey-Kierzkowski (1987) and Shaked-Sutton (1984). They have gained the label of neo-Heckscher-Ohlin models. In the first two papers, VIIT is modelled as a difference in quality between similar products within a perfect competitive market. It is shown that VIIT can be explained in terms of factor endowment: relatively capital abundant countries specialise and export high-quality manufactures, whilst labour abundant countries specialise in low quality manufactures. Given the relevance that this form of trade seems to play in East-West trade, the formal model will be briefly analysed and its main conclusions sketched.

---

[12] As already observed in the previous section, two findings of the applied literature have played quite a disruptive role toward the past empirical analyses of IIT and have justified a simplification of the econometric testing in favour of core models as well as experiment models not based on monopolistic competition. The first reason is that the monopolistic competition models perform quite poorly in empirical analyses. Especially the industry determinants of IIT have been found sensitive to various econometric problems (Torstensson , 1996). The second relevant reason is that according to the evidence contained in the estimates provided by Greenaway, Hine and Milner (1994, 1995) the most relevant share of total IIT is not horizontal but vertical IIT .

[13] In opposition, more complex "economic geography" models of IIT (Krugman-Venables, 1990 and 1995; Markusen-Venables, 1996; Puga-Venables, 1997) show the existence of a non monotone relation between the size of the export country and the entity of the VIIT as trade costs reduce.

3.1.1. - The large number case of VIIT

In Falvey (1981), it is assumed that capital intensity is increasing in quality of vertically differentiated products. According to this analysis, VIIT is similar to the trade based on the H-O approach: relatively capital abundant countries specialise and export high-quality manufactures, whilst labour abundant countries specialise in low quality manufactures. The paper develops a model of trade within an industry considering only two basic departures from the standard H-O framework: firstly, one of the two factors used is industry-specific (capital); secondly, an industry can produce a range, instead of a single homogeneous output. The advantage of this approach is that not only the source, but also the corresponding pattern of IIT is explained, unlike the modelling of IIT based on economies of scale and monopolistic competition.

The industry is assumed to possess a given stock of capital (K) and to hire labour at a given wage rate (W) with which it can produce a continuum of products of different qualities which are indexed by a. Each quality is assumed to be related to a given level of the capital-labour ratio used in its production. Thus, the production of a unit of quality a requires one unit of the industry's capital stock and one unit of labour. Thus, higher quality products need more capital-intensive techniques of production and have higher prices. This is a simplification, since all the other factors from which quality may possibly depend, such as the size of the domestic market, the degree of opening up of the economy, the tradition of a country in a given sector of the industry, are not considered. Another restrictive hypothesis is that the input-output ratios are supposed to be internationally identical for any given quality. This reflects the fact that quality is expressed completely through prices and that only one technology is available to produce at a given standard.

In each of the countries considered, home, H, and foreign, F, the industry has a given capital stock (K and K^* respectively) and given wage rates (W and W^*) and rental (R and R^*) on quality-specific capital. Each industry is assumed to be perfectly competitive and F is assumed to have a lower wage rate (this implies different factor endowment). The cost of producing a unit of quality a, for a given return to capital in H and F (R and R^*), is given respectively by:

$$\pi(\alpha) = W + \alpha R$$
$$\pi^*(\alpha) = W^* + \alpha R^* \qquad [1.2]$$

Given that $W^*<W$, if also $R^*<R$, the foreign country will have an absolute advantage and be able to produce all the qualities. In this case, no IIT is possible. However, since IIT exists, must be $R^*>R$. The developed hypotheses let to explain the existence of IIT when labour costs are lower in one country than in the other because of different factor endowment.

Since p(a) and $p^*(a)$ are assumed to be continuous in a, for any given $R^*>R$, some marginal quality a_1 such that $p(a_1) = p^*(a_1)$ exists and is given by:

$$\alpha_1 = \frac{W - W^*}{R^* - R} \qquad [3]$$

For the other qualities:

$$\pi(\alpha) - \pi^*(\alpha) = \left(\frac{W - W^*}{\alpha_1}\right)(\alpha_1 - \alpha) \qquad [4]$$

given that $W-W^*>0$, the sign of $p(a)-p^*(a)$ will be negative, implying a comparative advantage, if $a_1-a<0$. This outcome implies that the country with an higher wage, H, has a comparative cost advantage (lower costs, $p(a)-p^*(a)<0$) in those qualities which are superior to the marginal quality, i.e. which require more capital

intensive techniques than the marginal quality (a_1<a), whereas it has a comparative disadvantage in the lower qualities (a_1>a). It follows that the relatively labour scarce country exports the relatively capital intensive qualities, as the H-O theory predicts.

The described model satisfies the purpose of explaining international trade in differentiated products, without involving imperfect competition, economies to scale or consumer taste differences. In this extremely simplified context, markets are considered perfectly competitive. It is evident that the crucial assumption is that the two countries have different factor endowment. In fact, if $W-W^*=0$, it follows that $p(a)-p^*(a)=0$ and that $R=R^*$ which corresponds to the case of indeterminate patterns of trade and is the conclusion reached by Krugman (1979), assuming identical factor endowment between countries.

Despite all the limitations, the realism of this model is quite high as vertical differentiation is a widespread form of differentiation and the relative capital intensity seems its predominant reason. Even in those productions in which higher quality does not follow from higher physical capital intensity (think of hand-made clothing) there are ways to lead again trade to a neo-H-O framework, introducing the distinction between skilled and unskilled labour or, in other words, the role of human capital accumulation.

3.2. Economic Geography approach

Further relevant developments in the analysis of IIT have occurred departing from the first generation of monopolistic competition models on the basis of a re-consideration of trade costs and specialisation.

A basic version of such models, based on Helpman-Krugman (1985), is introduced here, as it may provide a new explanation of VIIT, alternative to that of the neo-H-O approach. In such model, two countries, A and B, have access to identical technologies. There is only one factor, labour, which is industry-specific. These assumptions are made to separate the effects on trade of market size and trade costs from those of technology or factor endowment differences. The goods produced are of two types. The first homogeneous type is produced under constant returns to scale; the market for it is supposed to be perfectly competitive and operating under free trade conditions. The other type is a differentiated good, produced under increasing returns to scale, monopolistic competition and high trade costs.

In Greenaway-Torstensson (1997), a reinterpretation has been done with respect to the quality dimension of the good traded, in order to explain VIIT. The goods considered are respectively low and high quality varieties. Moreover, there is a positive relation between quality and scale economies, since high quality varieties need higher investment in fixed costs (especially due to product development) and are subject to lower elasticity of substitution.

The individuals try to maximise the following sub-utility function which refers to the industry x, characterised by j=1,…, n varieties:

$$U_x = \left(\Sigma h_j^{\varepsilon}\right)^{\alpha} l^{1-\alpha} \qquad [5]$$

where $\varepsilon = 1 - \frac{1}{\sigma}$ is the elasticity of substitution (0<e <1); α and 1- α are respectively the share of spending on the differentiated good, h, and on the low-quality variety (or homogeneous good in the original model), l; l is the consumption of the

only low-quality good and h_j is the consumption of the j varieties of the high quality (or differentiated) good, h. Because of the costs affecting trade in high-quality varieties, of each exported unit, only a portion $1/\tau$ (with $\tau > 1$) is received by the importer (hypothesis of *iceberg* transport technology).

Finally, both countries have some production in the industries of low quality varieties. This means that wage rates are equalised across countries. This assumption is a way to exclude that wage differentials and factor endowments can affect trade and obtain that only the relative market size plays a role in driving the patterns of trade·

Suppose n domestic and n^* foreign firms. The price to consumers of an imported variety will be $p\tau$. From the solution of the consumer's maximization problem, the demand for a domestic high-quality product can be divided into demand of domestic residents, D, and of foreign residents, D^*:

$$D = \left[\frac{p^{-\sigma}}{(np)^{1-\sigma} + n^*(p\tau)^{1-\sigma}}\right]\alpha\omega L$$
$$D^* = \left[\frac{(pt)^{-\sigma}}{(np)^{1-\sigma} + n^*(p\tau)^{1-\sigma}}\right]\alpha\omega L^* \qquad [6]$$

where the home and foreign country's incomes are wL and wL^* respectively. In each country, the gross output of the differentiated high-quality varieties of the industry X is given by:

$$X = nx = n\left(D + D^*\right) = \left[\frac{(np)^{-\sigma}}{(np)^{1-\sigma} + n^*(p\tau)^{1-\sigma}}\right]\alpha\omega L + \left[\frac{n(p\tau)^{-\sigma}}{n(p\tau)^{1-\sigma} + n^* p^{1-\sigma}}\right]\alpha\omega L^*$$
$$X^* = n^* x = n^*\left(D^* + D\right) = \left[\frac{n^*(p\tau)^{-\sigma}}{(np)^{1-\sigma} + n^*(p\tau)^{1-\sigma}}\right]\alpha\omega L\tau + \left[\frac{n^*(p)^{-\sigma}}{n(p\tau)^{1-\sigma} + n^* p^{1-\sigma}}\right] \qquad [7]$$

to simplify the notation, let be w = p = 1 and $\tau^{1-\sigma} = r$. The equations become:

$$\frac{x}{\alpha} = \left(\frac{1}{n + n^*\rho}\right)L + \left(\frac{\rho}{n\rho + n^*}\right)L^*$$
$$\frac{x^*}{\alpha} = \left(\frac{\rho}{n + n^*\rho}\right)L + \left(\frac{1}{n\rho + n^*}\right)L^* \qquad [8]$$

These are two equations in n and n^*. If both n and n^* are positive, they can be solved to get:

$$n = \left[\frac{\alpha}{(1-\rho)x}\right]\left(1 - \rho L^*\right)$$
$$n^* = \left[\frac{\alpha}{(1-\rho)x}\right]\left(L^* - \rho\right) \qquad [9]$$

Thus, it is possible to determine trade patterns of products within industries, by means of the ratio $\frac{n}{n^* L^*}$. Country A income is supposed to equal one and country B income to equal L^*. If $\frac{n}{n^* L^*} > 1$, country A is a net exporter of the high quality

product. But, $\frac{n}{n^* L^*} = \frac{\left(1-\rho L^*\right)}{L^*\left(L^*-\rho\right)}$, then $\frac{\left(1-\rho L^*\right)}{L^*\left(L^*-\rho\right)} > 1$ if $\left(1-\rho L^*\right) > L^*\left(L^*-\rho\right)$, which happens when $1-L^{*2} > 0$, hence when $L^* < 1$. In other words, if country A is bigger than country B, it will be net exporter of high quality products.

Three important implications derive from this result:

1) net exports of high-quality varieties from the larger country are proportional to the relevance of scale economies and to the difference in country size;

2) "if transport costs are low […] even small differences in country size will lead the differentiated product industry to concentrate in the larger country" (Krugman-Helpman, 1985, p. 208).

3) as trade costs fall, the production of high-quality goods becomes increasingly concentrated in the large country; in other words, net specialisation will increase. This implies that trade will increasingly take place in different qualities which correspond to an increase in VIIT, with respect to HIIT.

The novelty of the approach of economic geography consists of the predictions it allows regarding the net trade pattern and the equilibrium factor prices. In particular, countries with a large domestic market will end up exporting scale-intensive products and may benefit of higher factor rewards.

In Krugman (1991) and Krugman-Venables (1995) a probable non-linear relationship between IIT and trade costs has been enlightened. In particular, they show that reductions in trade costs may increase concentration of production and lead to a decreased share of IIT only in some intervals of trade costs, while in others the process can be reverted. The problem with these models is that they do not provide hypotheses easy to test, as in the case of the [5]-[9].

Regarding CEE-EU trade, the implicit assumption of such an approach is that an increasing concentration of the productions caused by the integration process may imply the prospective for the CEECs of specialising in low-quality productions.

4. Empirical evidence

The two models presented above have been tested by means of OLS regressions and Probit estimates. The following specification has been used for the OLS estimates:

$$PGAP_{jh} = \beta_1 * HIGH_j^{\beta_2} * GDPW_j^{\beta_3} * TGDP_j^{\beta_4} * EU^{\beta_5} \qquad [10]$$

where j is the country and h the industry; $PGAP_{jh}$ is the industry-level (weighted) price/quality gap indicator; *HIGH* is a proxy for human capital endowment; *GDPW* (real GDP per worker) is a proxy for capital and labour endowment in country j; *TGDP* is the total real GDP and is used as a proxy for the market size of the country; *EU* is a dummy for market integration, taking values of one for all the countries belonging to the EU-EFTA and of zero in all the other cases.

After a log-transformation, [10] becomes:

$$LPGAP_{jh} = L\beta_1 + \beta_2 LHIGH_j + \beta_3 LGDPW_j + \beta_4 LTGDP_j + \beta_5 EU \qquad [11]$$

Positive coefficients for the variables which represent physical and human capital endowment (*RGDPW* and *HIGH*) provide support for the factor proportions models (Falvey, 1981; and Falvey-Kierzkowski, 1987).

The sign of the coefficient for the variable which represents market size (*TOTGDP*) is also expected to be positive (Helpman-Krugman, 1985; Greenaway-Torstensson, 1997). This would confirm that market access measured by the dimension of the home market is positively correlated with the development of quality differentiated trade, since scale economies are an important factor of vertical differentiation across products within an industry. The explanation for this is that high-quality varieties have to face higher fixed costs and have a low elasticity of substitution (one of the assumptions of the monopolistic models is that there is a positive relation between the elasticity of substitution and the presence of scale economies in the production). Previous analyses have already shown that VIIT is positively influenced by an high degree of scale economies and by the presence in the market of a small number of firms (Shaked A. & Sutton J., 1984).

An EU dummy has been used to verify whether there is an impact of participation in EU-EFTA regional trading arrangements on the quality standard of the goods exported. A similar variable has been found to significantly and positively affect the share of intra-industry on total trade by Balassa-Bawens (1987). In Greenaway-Torstensson (1997), a similar variable was found not significant using prices as dependent variable. 5

Actually, in the case of price/quality gaps, the sign of the variable is difficult to forecast on an *a priori* ground, although some relevant factors may play a role in favour of a positive sign. In fact, following Puga-Venables (1997), it can be argued that member countries of the EU-EFTA may increase their production and net exports in the IRS-industries, with an higher level of price/quality on average. In addition, the integration process among countries with highly concentrated and differentiated productions may produce a relevant pro-competitive effect, increasing the competition for an higher average level of quality. It has to be observed, however, that the estimated sign of the coefficient will depend on the chosen sample of countries, because other variables may play a relevant role: for instance, if the presence of countries with an higher level of capital endowment or a bigger internal market is dominant, it is also possible that the sign is negative.

4.1. Estimation Results

a) OLS pooled regressions:

The data relative to three-digit Nace industries (tab. A.3) have been pooled together. Different regressions have been run based on different country samples: the complete sample, a sub-sample excluding the CEECs, a sub-sample taking only the CEECs (Tab. 5). The model as a whole is well-defined with an R^2-statistics satisfactory for cross-country estimates. Moreover, all of the coefficient estimates are statistically significant and the signs generally consistent.

Tab. 5 - OLS estimates of price gaps in export sales to EU, for food/drink/tobacco, textile/clothing/footwear, engineering industries pooled together (1988 and 1994, all set of countries and selections of countries)

OLS[1]	Dependent variable[2, 3]

Independent variables	$LPGAP_{jh}^{88}$ (1)	$LPGAP_{jh}^{88}$ (2)	$LPGAP_{jh}^{94}$ (3)	$LPGAP_{jh}^{94}$ (4)	$LPGAP_{jh}^{94}$ (5)
CONSTANT	-3.84 (0.00)***	-2.93 (0.00)***	-9.54 (0.00)***	-2.7 (0.00)***	-9.74 (0.00)***
LHIGH	-0.06 (0.01)***	0.07 (0.00)***	-0.22 (0.00)***	0.16 (0.00)***	-2.37 (0.00)***
LGDPPW	0.26 (0.00)***	0.35 (0.00)***	0.69 (0.00)***	0.21 (0.00)***	1.82 (0.00)***
LTOTGDP	0.06 (0.00)***	-0.02 (0.00)***	0.15 (0.00)***	0.02 (0.06)*	-0.13 (0.00)***
LHIGH*EU	0.11 (0.00)***				
EU		-0.15 (0.00)***	0.21 (0.02)**		
R^2- adj	0.25	0.12	0.23	0.14	0.13
F-stat	112.42 (0.00)***	34.6 (0.00)***	91.54 (0.00)***	54.69 (0.000)***	13.62 (0.00)***
Included observations[4]	1360	1017	1236	1033	283

[1] White heteroskedasticity-consistent variance and covariance.

[2] (1): estimates for 1988, including all the countries;
(2): estimates for 1988, excluding the CEECs;
(3): estimates for 1994, including all the countries;
(4): estimates for 1994, excluding the CEECs.%

[3] Significance levels: *** is 1%, ** is 5%, * is 10%. The values between brackets are probabilities.

[4] The observations excluded represent no-trade, for which no price-quality gap can be calculated, or outliers.

An exception is represented by the estimates which include the CEECs (columns 1 and 3) where the sign for human capital is negative. However when the CEECs are excluded from the sample (columns 2 and 4) the expected highly significant positive sign for human capital appears. It has been argued that the negative unexpected sign is due to the inclusion of the data relative to the CEECs. It is well known that data regarding human capital in former communist countries is over-estimated, due to many factors. Moreover, as observed, the international measurement are not very sensitive to the quality of education and, thus, qualification differentials across countries are hidden behind the statistics.

GDPW is a significant regressor for the quality of traded products, thus confirming the assumptions of the neo-H-O-S model regarding trade quality patterns: the abundance of physical capital increases the quality of exports.

Moreover, the significant positive sign of *TOTGDP* seems to verify a simplified economic geography model of market access. In other words, it seems correct to argue that the expansion of intra-industry trade is in the direction of a concentration of high-quality varieties in ore developed countries and conversely a specialisation of the less developed ones in the production of low-quality varieties. This means a concentration of IRS-industries in the former and the tendency for VIIT to increase at the expenses of HIIT.

The dummy for EU-EFTA integration, is not significant in columns 4-5. In column 1, it has been used as a multiplicative dummy to check whether regional

integration could change the coefficient of human capital. The sign is positive when the CEECs are included and negative otherwise: this is probably due to the fact that the sample of countries becomes biased towards high levels of price/quality when the CEECs are excluded. The interpretation of the positive sign, however, is not straightforward. It is possible that the EU membership increases the level of quality of the products traded, in other words, the causality would be in the sense that the higher the level of integration, the higher that of quality. But on the other hand, the dummy could simply catch the obvious fact that the EU countries have reached a quite similar level of development.

.

b) OLS sectoral regression

Estimates have also been run for each sector based on the fact that industry specific dummies have been found highly significant suggesting the presence of shifts in the coefficients. Hence model [11] has been tested for each sector, for all the countries (tab. 6) and excluding the CEECs (tab. 7). The results confirm the previous analysis. *GDPW* and *TOTGDP* perform quite well in almost all the regressions. Re5garding human capital, the coefficient presents a negative sign when the CEECs are included and positive when they are excluded. Moreover, the coefficient is also not significant in some years and for some sectors (columns 1,2,4 in tab. 6; and 3 in tab. 7). Again the reason could be found in the presence of the CEECs in the sample: some of these countries, such as Bulgaria, present values of the price/quality gap higher than many other competitors in 1988, but lower in 1994 (charts 3,7,11).

Tab. 6 - OLS estimates of price gaps in export sales to EU, for 3-digit NACE industries (1988 and 1994; food/drink/tobacco, textile/clothing/footwear, engineering)

OLS[1]	Dependent variable[3]					
Independent variables[2]	$LPGAP^{88}_{jeng}$	$LPGAP^{88}_{jfood}$	$LPGAP^{88}_{jtex}$	$LPGAP^{94}_{jeng}$	$LPGAP^{94}_{jfood}$	$LPGAP^{94}_{jtext}$
	(1)	(2)	(3)	(4)	(5)	(6)
CONSTANT	-6.49 (0.00)***	-2.30 (0.00)***	-3.41 (0.00)***	-8.97 (0.00)***	-13.16 (0.00)***	-3.2 (0.00)***
LHIGH	-0.03 (0.55)	0.071 (0.21)	-0.12 (0.08)*	-0.15 (0.11)	-0.38 (0.00)***	-0.06 (0.00)***
LGDPPW	0.46 (0.00)***	0.08 (0.22)	0.29 (0.00)***	0.57 (0.00)***	1.06 (0.00)***	0.2 (0.00)**
LTOTGDP	0.09 (0.00)***	0.073 (0.00)***	0.04 (0.11)	0.18 (0.00)***	0.16 (0.00)***	0.07 (0.00)***
EU	0.35 (0.00)***	0.13 (0.09)*	0.23 (0.01)***	0.23 (0.03)**	0.15 (0.42)	0.27 (0.00)***
R^2- adj	0.38	0.07	0.26	0.29	0.25	0.14
F-stat	88.56 (0.00)***	9.59 (0.00)***	23.38 (0.00)***	54.64 (0.00)***	41.50 (0.00)***	10.38 (0.00)***

Included observations[4]	564	487	257	520	482	234

1 White heteroskedasticity-consistent variance and covariance

2 Significance levels: *** is 1%, ** is 5%, * is 10%. The values between brackets are probabilities.

3 $LPGAP^{88}_{jeng}$= engineering industry (1988); $LPGAP^{88}_{jfood}$= food/drink/tobacco industry (1988); $LPGAP^{88}_{jtext}$ = textile/clothing/footwear (1988); $LPGAP^{94}_{jeng}$= engineering industry (1994); $LPGAP^{94}_{jfood}$= food/drink/tobacco industry (1994); $LPGAP^{94}_{jtext}$ = textile/clothing/footwear (1994);

4 The observations excluded represent no-trade, for which no price-quality gap can be calculated, or outliers.

The results for the food industry are quite contrasting: in fact, human and physical capital endowment are insignificant in 1988, significant and negative in 1994. The food industry appears to be a "problematic" sector, since even the variable for capital endowment is often not significant. Actually, this sector should be considered a special case, given the role that variables not included in the model, such as natural resources, play in it. Indeed, the R^2 is generally lower in the food sector.

Tab. 7 - OLS etimates of price gaps in export sales to EU, for 3-digit NACE industries (1988 and 1994; excluding the CEECs; food/drink/tobacco, textile/clothing/footwear, engineering)

OLS[1]	Dependent variable[3]					
Indep. Variables[2]	$LPGAP^{88}_{jeng}$	$LPGAP^{88}_{jfood}$	$LPGAP^{88}_{jtex}$	$LPGAP^{94}_{jeng}$	$LPGAP^{94}_{jfood}$	$LPGAP^{94}_{jtext}$
CONSTANT	-2.53 (0.00)***	-0.82 (0.11)	-1.17 (0.01)***	-2.6 (0.00)***	-0.83 (0.06)*	-1.85 (0.01)***
LHIGH	0.18 (0.00)***	0.15 (0.00)***	0.03 (0.49)	0.27 (0.00)***	0.12 (0.00)***	0.13 (0.03)**
LGDPPW	0.32 (0.00)***	0.00 (0.98)	0.18 (0.00)***	0.28 (0.00)***	0.14 (0.00)***	0.16 (0.01)***
LTOTGDP	-0.04 (0.00)***	0.03 (0.01)***	-0.02 (0.11)	-0.03 (0.04)**	-0.02 (0.05)**	0.01 (0.56)
EU	-0.12 (0.02)**			-0.11 (0.02)**	-0.16 (0.02)**	
R^2- adj	0.32	0.05	0.17	0.35	0.04	0.12
F-stat	51.64 (0.00)***	8.16 (0.00)***	13.9 (0.00)***	59.33 (0.00)***	5.92 (0.00)***	10.37 (0.00)***
Included observations[4]	431	384	193	520	482	234

[1] White heteroskedasticity-consistent variance and covariance

[2] Significance levels: *** is 1%, ** is 5%, * is 10%. The values between brackets are probabilities.

[3] $LPGAP^{88}_{jeng}$= engineering industry (1988); $LPGAP^{88}_{jfood}$= food/drink/tobacco industry (1988); $LPGAP^{88}_{jtext}$ = textile/clothing/footwear (1988); $LPGAP^{94}_{jeng}$= engineering industry (1994); $LPGAP^{94}_{jfood}$= food/drink/tobacco industry (1994); $LPGAP^{94}_{jtext}$ = textile/clothing/footwear (1994);

[4] The observations excluded represent no-trade, for which no price-quality gap can be calculated, or outliers.

c) Probit Estimates

A further exercise has consisted of an attempt to use the same model by Probit estimates. The price/quality gap index has been transformed from a continuous (PGAP) to a dichotomous variable (PGAPH), posing equal to one (HIIT) all the values included in a range of 0.75 - 1.25 and equal to zero (VIIT) all the values higher than 1.25 or lower than 0.75. Log-linear estimation may generate predicted values for the dependent variable outside the field of variation of the dependent variable. To avoid this problem a normal distribution and a non-linear estimator has been chosen (Maddala, 1983; Pindick-Rubelfeld, 1991).

The mean of PGAPH (0.48 in 1988 and 1994) gives a rough measure of the share of HIIT in the sample. The shares are different in each sector, taking values of 0.40 and 0.39 for engineering, 0.54 and 0.60 for food and 0.52 and 0.44 for textile, in 1988 and 1994, respectively. These figures confirm the dominance of VIIT in the engineering and of HIIT in the food and textile.

A similar estimation method has been applied to the share of IIT by Balassa-Bauwens (1987) and Greenaway-Milner-Elliot (1997). However, a relevant difference here is that the dependent variable may give three different outcomes. As a consequence, the absolute values of the distance from the mean of the variable have been adopted as regressors (LHIGHA, LGDPWA, LTOTGDPA).

Due to the doubt regarding this kind of estimates only the results relative to 1994 and to all the countries have been included (tab. 8). The results are not completely satisfactory. Apart for the engineering sector which as usual gets better results, the coefficients appear with the right sign but are often not significant. In addition, the pseudo-R^2 is very low as often happens in ths kind of estimate.

Tab. 4.13 - Probit estimates of Price gaps in export sales to EU, for food/drink/tobacco,textile/clothing/footwear, engineering industries together, 1988 and 1994, all the countries

Probit	Dependent variable[1, 2, 4]			
Independent var.	$PGAPH^{94}_{jh}$ (1)	$PGAPH^{94}_{jeng}$ (2)	$PGAPH^{94}_{jfood}$ (3)	$PGAPH^{94}_{jtex}$ (4)
CONSTANT	0.66 (0.48)	2.51 (0.09)*	-0.00 (0.99)	2.21 (0.33)
LHIGHA[3]	-0.10 (0.02)**	-0.12 (0.07)*	-0.06 (0.46)	-0.00 (0.99)
LGDPPWA[3]	0.07 (0.06)*	0.01 (0.91)	0.08 (0.25)	0.23 (0.03)**
LTOTGDPA[3]	-0.08 (0.05)**	-0.16 (0.02)**	0.06 (0.48)	-0.24 (0.03)**
EU	0.72 (0.00)***	0.88 (0.00)***	0.89 (0.00)***	-0.16 (0.52)
Pseudo-R^2	0.08	0.13	0.11	0.10
Included observations[5]	1366	581	391	258

[1] (1): estimates for 1994, including all the countries and sectors;
(2): estimates for 1994, including all the countries and for engineering;
(3): estimates for 1994, including all the countries and for food;
(4): estimates for 1994, including all the countries and for textile.

[2] Significance levels: *** is 1%, ** is 5%, * is 10%. The values between brackets are probabilities.

[3] LHIGHA, LGDPWA and LTOTGDPA represent the absolute values of the distance from the mean of LHIGH, LGDPW and LTOTGDP.

[4] PGAPH is a dichotomous variable for HIIT, assuming a value of 1 in case the price/quality index assumes values from 0.75 to 1.25 and 0 otherwise. $PGAPH^{94}_{jh}$ = all the sectors (1994); $PGAPH^{94}_{jeng}$ = engineering industry (1994); $PGAPH^{94}_{jfood}$ = food/drink/tobacco industry (1994); $PGAPH^{94}_{jtex}$ = textile/clothing/footwear (1994).

[5] The observations excluded represent no-trade, for which no price-quality gap can be calculated, or outliers.

4.2. Implications

The theoretical contributions to the analysis of quality in trade examined (neo-H-O and "economic geography" model) in previous sections suggest two main observations: 1) physical capital and human capital are the determinants of a country specialisation in high or low-skill trade (Falvey, 1981: Falvey-Kierzkowsky, 1987; Torstensson, 1991; 1996; Greenaway-Torstensson, 1997); 2) as trade cost reduces, high-tech products, which are the result of differentiated and increasing-return-to-scale processes, tend to concentrate where the market access is easier, i.e. in the most developed areas which give rise to a polarised core/periphery structure of trade with an increasing role of VIIT (Greenaway-Torstensson, 1997)

These theories have been tested by means of cross-country regressions. Quality gap indices have been regressed upon proxy variables for physical and human capital endowment and for market size. All the variables have been found highly significant, providing evidence in favour of the neo-H-O and "economic geography" explanations of trade.

The results suggest that the factor endowment of a country is a significant explanatory variable of the quality of trade and, in particular, that human capital, a factor not considered in the basic neo-H-O model, is a highly significant variable.

Beside the fact that they confirm previous theoretical and empirical studies, the results obtained have crucial implications for EU-CEE integration, confirming that an assessment of the factor endowment of these countries can be determinant to predict their future specialisation, although difficult to operate.

Two main hypotheses have been made to describe factor endowment of Eastern European countries. The first one stresses the relative scarcity of capital and abundance of natural resources and labour. Conversely, the second emphasises the abundance of highly qualified human capital, considered the crucial resource for the future performance of Eastern countries.

Indeed, the present stock of capital is difficult to assess as, through the past decades, these countries have maintained very high investment rates, thus appearing to be well endowed with capital. Nonetheless, much of the capital stock is of little or no value and a big process of depreciation is occurring.

Other studies have stressed the abundance of highly qualified and skilled labour force, i.e. human capital, predicting a comparative advantage in high-tech industries and other skilled labour intensive sophisticated goods which would lead to mainly develop IIT with Northern Europe, without involving a serious threat to the more labour-intensive productions of the Southern regions (Cepr, 1990, p. 3; Hamilton C. B. & Winters L. A., 1992, p. 95-103; Winters and Wang, 1994). These conclusions have been drawn considering different human capital statistics, such as the share of the labour force engaged in R&D related activities, the average level of educational qualification, the percentage of workers employed in professional occupation, the share of GDP devoted to education. These indices are, on average, for the Eastern countries quite higher than the corresponding values in the lower income economies.

For some countries, such as Hungary and Czechoslovakia, the data is well above that for Southern Europe. In 1990, educational attainment, as measured by the average years of schooling, was identical to the average level for the OECD countries and quite far from that of the developing countries traditionally specialised in low-skilled trade (Barro-Lee, 1996). However, some statistics (Rollo-Stern, 1992; Halpern, 1994) show a different picture: for instance, computer literacy in the CEECs is among the least developed; moreover, secondary and tertiary education enrolment ratios are not comparable to those of the most advanced European countries (only one OECD country, Turkey, has a tertiary enrolment ratio lower than Hungary).

Over all the estimates, the performance of human capital has been problematic with respect to the CEECs: interestingly, a measure of schooling gives the wrong sign when the CEECs are included in the regression.

This can be explained considering that the variable for human capital endowment presents two serious limits: firstly, it does not consider the quality of education; secondly, it does not make any distinction between different types of education, whereas it would be important, for instance, to assess the importance of education in science and engineering, as well as management. Such limits are particularly relevant in the case of the CEECs, since, in these countries, the average level of education competes with that of the most advanced countries (chart 13), but the statistics conceal information about the quality of the education system. Moreover, this seems to be also a proof of the difficulty of measuring the quality of human capital and making international comparisons, because of a very low sensitivity of current measures of human capital to the quality of education and to qualification differentials across countries. A better measure of human capital would represent an important improvement for cross-country regressions, especially if able to take quality into consideration and focus on the kind of education of different groups of workers, which is of major importance in manufacturing production.

The regressions reveal that the CEECs occupy the lowest quality segments of the European market, despite the fact that the CEECs show levels of education attainment comparable to the standard of the most advanced countries within the sample considered. Of course, this casts a shadow on the statistics on human capital and let argue that, for most of the CEECs, the educational statistics overstate the economic value of the education provided. The apparently high qualification level in Eastern Europe is the reflex of the great effort to guarantee the population with an even free and widespread access to the education. At the same time the concentration of the planners on scarcely competitive and innovative productive strategies has yield a system of skills unable to compete with the Western standard.

Such findings suggest the existence of a process of human capital deterioration due to the adjustment which these countries have to face in terms of inter-sector relocation of labour and adaptation of non-market labour skills to the needs of the market economy. This is a very sensitive issue on which the industrial and trade policies are in fact trying to intervene. However, at least in the medium term, the CEECs will have a comparative disadvantage in the high-skill sectors.

The second result provided by the econometric analysis concerns the relevance of market size for the localisation of high-quality productions. The implication for the CEECs may be that the accession to EU would potentially lead to further specialisation in low quality production. In fact, we have found that while belonging to a preferential trade agreement is not clearly able to affect positively the quality level of a country export, conversely, market size seems to be highly correlated with an higher quality of exports at least within a certain range of reduction in trade costs. Therefore,

liberalisation would be accompanied by increased concentration of high-quality production in large markets. The relation between concentration and liberalisation is anyway a rather uncertain field of analysis and the result achieved is therefore considered as rather uncertain in view of the recent finding of the "economic geography" literature which show the tendency of liberalisation to be accompanied first by an increased concentration in large markets and then again by a decrease in concentration for level of trade costs sufficiently low (at the extreme location of production is evenly spread when there are no costs to trading). This literature anyway goes beyond the object of the analysis performed (Krugman-Venables, 1990; 1995; Puga-Venables, 1997).

However, it is important to consider that CEECs are much closer to the "core" of Europe than many EU full members. As the average income of some of the CEECs is likely to catch up quite soon with Western levels, it is possible to say that further concentration of activity might benefit CEECs and anticipate an Eastward movement of the economic centre of Europe.

5. Conclusions

This work is aimed at describing the driving forces and the adjustment effects of East-West European trade. The first step has consisted of a short review of the main conclusions achieved on the ground of an H-O analysis, which has been quite central in the literature on integration so far. In this specific context, the revealed comparative advantages approach shows that the H-O-S model is a relevant source of explanation of the inter-industry component of the developing patterns of trade: the goods exchanged embody different factor intensities and the specialisation mirrors different factor endowment between Eastern and Western economies. In particular, Eastern specialisation is consistent with the H-O predictions for an economy with relatively abundant and inexpensive labour. The exception represented by the high share of exports of goods belonging to sectors which are physical-capital as well as labour intensive can be explained in terms of historical conditions. The conclusion of previous works is that there has been a remarkable tendency to trade labour in exchange for human capital, while keeping constant the level of physical-capital intensity of exported goods over the transition period.

However, as already shown in CEPR (1990, p. 20), relevant objections to the application of a traditional H-O approach to the analysis of CEE-EU trade rises from the fact that a large share of trade is registered "within" rather than "between" industries, a paradox which appears difficult to reconcile with the traditional factor proportion theories.

The investigation of this work on CEE-EU IIT has been able to show the fallacy of such an assessment through a careful consideration of the role of comparative advantages in IIT giving specific attention to a quite neglected issue, quality product differentiation and VIIT. Disentangling horizontal and vertical components of IIT has proved to reveal deep differences in the determinants of different kinds of two-way trade and, thus, to substantially improve the estimates of the labour market impact of trade. The relevance of such an approach is, in fact, emphasised by the presence in the literature of totally different models to describe IIT based on quality differentiation with respect to models of HIIT. The role of human capital endowment, physical capital with respect to labour endowment, market size and market integration has emerged from cross-country regressions on unit value differences in EU trade data.

The main conclusion of the enquiry has been that factor endowment matters when we consider VIIT. The enormous implications of EU-CEE integration for the labour markets of the two areas involved are evident and should be object of further research.

Another issue enlightened by the results obtained refers to the role of human capital endowment in the next future of Eastern countries. At the beginning of the process of transition, human capital was considered the key resource for a rapid catching up due to high quality and relative abundance inherited by the communist era. Relevant empirical evidence has been found of the importance of the relationship between human capital endowment and specialisation in different parts of the quality spectrum, but unfortunately no evidence has been found of the economic value of the great stock of human capital registered in the Eastern economies. Human capital appears negatively correlated with quality in the Eastern economies which let suppose that educational statistics overstate the economic value of the education provided in the CEECs.

In this sector, a fundamental process of retraining and conversion is, in fact, already occurring. If human capital will benefit of the critical mass of investments that it needs, it could become the strategic resource able to produce an acceleration of the catching up as prospected by CEPR (1990).

Appendix

Tab. A.1 - Variable definition and data sources

Variable definition	Data sources
a) Dependent Variable:	Landesmann tables (1994)
PG_{jh} = industry-level (weighted) price/quality gap indicator $= \Sigma\left(\frac{p_{j,i}}{p_{EU,i}}\right) * sx_{j,i} \quad i \in I(h); \quad \Sigma sx_{ji} = 1$ where j = country, h = industry, i = item belonging to the set of all the 8-digit items in NACE industry h, I (h); pji = price (per kg) at which country j sells exports of the item i on EU markets; $p_{eu,i}$ = average price of item i in total EU imports; sx_{ji} = share of product item i in country c's exports to the EU;	Construction of the index: 1) product prices (values per Kg) are calculated at the detailed product level (8 - digit Nace) across a set of countries competing in EU markets; 2) then, these prices are divided by the average price for the same product in total EU imports; 3) the price gaps for the individual products are then aggregated to construct a price/quality gap indicator at industry level. Each price gap is weighted considering which share, s, a particular commodity represents of a given country's exports to the EU markets. 4) the weighted price/quality gap measures have been scaled so that they take the value of 1.0 for total EU imports: values below 1.0 mean sales of products by a specific country on EU markets at prices below the average of total EU imports the opposite for value higher than 1;
b) Independent variables:	
GDPW= real GDP per worker (current international prices). Proxy for capital endowment (capital/labour ratio)	RGDPPW in Penn World Tables (Mark5), Summers and Heston database, 1991

RGDPC = real GDP per capita (current international prices);	CGDP in Penn World Tables (Mark5)
TGDP= total real GDP = (CGDP)*POP Proxy for market size;	Product of CGDP times POP in the Penn World Tables (Mark5)
HIGH = HIGHC25, since this measure performed better than others Proxy for human capital endowment	HIGHC25 = percentage of population over 25 which has completed high school education; TYR = average years of schooling in the total population SECC25 = percentage of population over 25 which has completed secondary education. Barro and Lee data (1996).
R&D = ratio of R&D personnel to economically active population (per thousand)	Unesco, Yearbook, 1991 and OECD (STI database), OECD Leading Indicators
PCAP = capital stock per worker (1985 international prices) as a measure of physical capital endowment	Penn World Tables (KAPW, Summers and Heston database, 1991). It equals the depreciated sum of the cumulated gross domestic investment.
OPEN = Openess (exports + import)/ CGDP	Penn World Tables (Summers and Heston database, 1991).
EU = dummy for market integration taking values of 1 for all the countries belonging to EC-EFTA and values of 0 for the others countries;	UK, Germany, France, Italy, Belgium/Luxemburg, Netherlands, Spain, Portugal, Greece, Ireland, Austria, Switzerland, Sweden, Finland, Denmark.

Tab. A.2 - List of the abbreviations used for countries and groups of countries

Abbreviation	Countries	Abbreviation	Countries
USA	United States of America	TUR	Turkey
JAP	Japan	HUN	Hungary
CAN	Canada	POL	Poland
GER	Germany	CSFR	Czech (and Slovak in 1994) Republic
FRA	France	BUL	Bulgaria
BEL	Belgium/Luxemburg	ROM	Romania
NETH	Netherlands	YUG	Yugoslavia
ITA	Italy	SU	Soviet Union / Russia
UK	United Kingdom	NIC1	Taiwan, Hong Kong, Singapore, Korea
AUS	Austria	NIC2	Indonesia,Thailand,Philippines,Malaysia
SWIT	Switerland	IND	India
IRE	Ireland	CHI	China
FIN	Finland	EU-SOUTH	Spain, Greece, Portugal
SWE	Sweden	EU-NORTH AND EFTA	GER, FRA, BEL, NETH, ITA, UK, AUS, SWIT, IRE, FIN, SWE, DEN
DEN	Denmark	CEECS1	HUN, POL, YUG, CSFR
SPA	Spain	CEECS2	SU, ROM, BUL
PORT	Portugal	NIC	NIC1, NIC2
GRE	Greece		

Tab. A.3 - List of three-digit NACE engineering; food, drink and tobacco; textile, clothing and footwear

Sector	Definition	Sector	Definition
321	Agricultural machinery; tractors	415	Processing of fish
322	Machine-tools for working metal	416	Grain milling
323	Textile machinery and accessories	417	Spaghetti, Macaroni
324	Machinery for the food, chemical industries	418	Starch products
325	Plant for mines, iron and steel industry foundries	419	Bread and flower
326	Transmission equipment for motive power	420	Sugar
327	Other machinery and equipment for specific branches	421	Cocoa and chocolate
328	Other machinery and equipment	422	Animal and poultry foods
330	Office machinery and data processing	423	Other food products
341	Insulated wires and cables	424	Distilling of alcohol
342	Electrical machinery	425	Wine of grapes
343	Batteries and accumulators	426	Cider and other beverage
344	Telecommunication equipment, electro-medical equipment	427	Brewing and malting
345	Radio & television receiving sets	428	Soft drinks
346	Domestic electric appliances	429	Tobacco
347	Electric lighting equipment	436	Knitting
371	Precision instruments	438	Carpets, linoleum and other floor coverings
372	Medical and surgic5l equipment	439	Textile industries
373	Optical instruments and fotografic equipment	441	Tanning of leather
374	Clocks and watches	442	Products from leather
411	Vegetable and animal oils	451	Mass produced footwear
412	Meet	453	Clothing
413	Dairy products	455	Household textiles
414	Processing of fruit and vegetables	456	Furs

References

Abd-el-Rahman, K (1991), "Firms Competitive and National Comparatiive Advantages as Joint Determinants of Trade Composition", *Weltwrischaftliches Archiv*, Vol. 127, 83-97.

Balassa B. (1966), "Tariff Reductions and Trade in Manufactures among Industrial Countries", *American Economic Review*, 56, 466-73.

Balassa B. (1989), *Comparative Advantage, Trade Policy and Economic Development*, Harvester Weathsheaf, London.

Bojnec Š., W. Münch and J.F.M. Swinnen, "Exchange Rates and the Measurement of Agricultural Price Distortions in CEECs and of CEEC-EU Accession Costs", Policy Research Group, Working Paper, June, n. 10.

Buckwell, A. (1997) "Economic transition in Central and Eastern Europe and the former Soviet Union: Implications for international trade", Wye Colllege, University of London, typescript.

CEPR (1992), *Is Bigger Better? The Economics of EC Enlargement*, Monitoring European Integration, n° 3, Annual Report.

CEPR (ed., 1990), *Monitoring European Integration. The Impact of Eastern Europe*, London.

Commission of the European Communities (1997), *Agenda 2000*, (III vols.: *I. For a Stronger and Wider Union; II. The Challenge of Enlargement; III. The Opinion of the European Commission on the Applications for Accession*), Brussels.

Faini R. & Portes R. (ed., 1995), *European Union Trade with Eastern Europe*: *Adjustment and Opportunities*, CEPR, London.

Falvey, R. & Kierzkowski, H. (1985) "Product Quality, Intra-Industry Trade and Im(pefect) Competition", in *Protection and Competition in International Trade* (ed. H. Kierzkowski), Oxford, Blackwell.

Falvey, R. (1981) "Commercial Policy and Intra-Industry Trade", *Journal of International Economics*, vol. 11, 495-511.

Fontagne' L. & M. Freudenberg (1997), "Intra-industry Trade: Methodological Issues Reconsidered", CEPII, Document de Travail, n. 1.

Greenaway D., Hine, R.C. and Milner, C.R. (1994) "Country-Specific Factors and the Pattern of Horizontal and Vertical Intra-Industry Trade in the UK", *Welwirtschaftliches Archiv,* vol. 130, 77-100.

Greenaway D., Hine, R.C. and Milner, C.R. (1995) "Vertical and Horizontal Intra-Industry Trade: A Cross Industry Analysis for the United Kingdom", *The Economic Journal*, nov 1995, vol. 105, n°433, 1505-1518.

Greenaway, D., and C.R. Milner (1986), *The Economics of Intra-Indutry Trade*, Oxford, Blackwell.

Greenway, D. and J. Torstensson (1997), "Economic Geography, Comparative Advantage and Trade within Industries: Evidence from the OECD", CEPR/NBER Conference, 23-25 May 1997, Paris.

Halpern L. (1994), "Comparative Advantage and Likely Trade Pattern of the CEECs", *CEPR*, Discussion Paper n° 1003.

Hamilton C. B. & Winters L. A. (1992), "Opening Up International Trade with Eastern Europe", *Economic Policy*, April.

Helpman, E. and P.R. Krugman (1985), *Market Structure and Foreign Trade*: *Increasing Returns, Imperfect Competition and the International Economy,* Wheatsheaf.

Hoekman B. and Djankov S. (1997), "Determinants of the Export Structure of Countries in Central and Eastern Europe", *The World Bank Economic Review*, vol.11, n. 3.

Hummels, D. and Levinshon, J. (1995), "Monopolistic Competition and International Trade: Reconsidering the Evidence", *Quarterly Journal of Economics*, vol. 110, 799-836.

Kaminski, B. Wang Z.K. and Winters L.A. (1996), "Exports Performance in Transition Economies", *Economic Policy*, October.

Krugman P. & Obstfeld M. (1994), International Economics. Theory and policy, Harper Collins, New York.

Krugman, P. & A.J. Venables (1995), "Globaliztion and the Inequality of Nations", *The Quarterly Journal of Economics*, Vol. 110, n. 4.

Krugman, P. (1979) "Increasing Returns, Monopolistic Competition and International Trade", *Journal of International Economics*, vol. 9, 469-479.

Krugman, P. (1980), "Scale Economies, Product Differentiation and the Pattern of Trade", *American Economic Review*, vol. 70, 950-959.

Krugman, P. (1991),"Increasing returns and economic geography", *Journal of Political Economy*, vol. 99, n° 3, 483-499.

Kubielas S. (1997), "The Technology factor in the Pattern of Globalisation of the Polish Economy", mimeo.

Landesmann M. & J. Burgstaller (1996), "Vertical Product Differentiation in EU Markets: the Relarive Position of East European Producers", *WIIW*, Wien.

Macours K. & J.F.M. Swinnen (1997), "Causes of Output Decline in Economic Transition: the Case of Central and Eastern European Agriculture", Policy Research Group, Working Paper, June, n. 11.

Maddala G. (1983), *Limited and Qualitative Dependent Variables*, Cambridge University Press.

Naujoks P. & Schmidt K.D. (1994), "Outward Processing in Eastern European Transition Countries", Kiel Working Paper, 631, Institut fur Wltwirtschaft.

Neven D. (1995), "Trade Liberalization with Eastern Nations: How Sensitive?", in Faini R. & Portes R. (ed.), *cit.*

Pindick R. & Rubenfeld D. (1991), *Econometric Models & Economic Forecast*, McGraw-Hill.

Rollo J. & Smith A. (1993), "The political Economy of Eastern European trade with the European Community: why so sensitive?", *Economic Policy*, April.

Shaked A. & Sutton J. (1984), "Natural Oligopolies and International Trade", in Kierzkowski H. (ed.), *Monopolistic Competition and International Trade*, Oxford University Press.

Smith M. A. M. and Z. Dràbek (1995), "Trade Performance and Trade Policy in Central and Eastern Europe", CEPR, Discussion Paper n. 1182.

Stiglitz J.E., "The Causes and Consequences of the Dependence of Quality on Price", *The Journal of Economic Literature*, vol. 25, 1-48.

Torstensson, J. (1996a), "Can factor proportion explain vertical intra-industry trade?", *Applied Economic Letters*, 3, 307 - 9.

Torstensson, J. (1996b), "Determinants of intra-industry trade: a sensitivity analysis", *Oxford Bullettin of Economics and Statistics*, 58, 3.

Torstensson, J. (1991) "Quality differentiation and factor proportions in international trade: an empirical test of the Swedish Case", *Weltwrischaftliches Archiv ,* vol. 127.

World Bank (1996) World Development Report 1996: from Plan to Market, New York, Oxford University Press.