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Abstract

The volume and commodity structure of EU trade with the transition countries in central and eastern Europe (CEECs) is estimated on the assumption that it will follow the pattern of trade among market economies. A gravity-type approach at the level of product groups is used, combining geography and factor-proportions theory of international trade. It is shown that there is still considerable potential for a further rise in East-West trade if the CEECs' national product is valued at purchasing power parities, instead of market exchange rates. Considering divergent income levels and distance between East and West, the EU's comparative advantages are in specialised-supplier, scale-intensive and science-based goods, whereas the CEECs' comparative advantages are in labour-intensive and resource-intensive goods. The intersectoral specialisation pattern will become "flatter" and the share of intra-industry trade will grow when the income differentials decrease.

Key words: East-West trade, gravity model, comparative advantages

JEL classification: F10, F17

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1. Introduction

Since the dissolution of the CMEA, trade relations among the former planned economies in central and eastern Europe have largely collapsed while East-West trade has considerably expanded. In particular trade between the countries of the European Union and the ten transition countries, with which the EU has concluded association agreements and which have applied for membership of the Union (CEECs), increased strongly in the nineties. The dynamic expansion of EU trade with central and eastern Europe has taken place against a background of unfavourable income development in the reform countries. At least initially, industrial production declined drastically and GDP suffered a downturn in all the transition economies. Whereas the decline has continued in the Community of Independent States (CIS), most other countries are now growing, some even strongly.

This paper asks whether there is still potential for a further increase of merchandise trade flows between the EU member countries and the CEECs and, if so, what its quantitative dimensions might be. Although the spirit of the paper follows the gravity model, the analysis goes beyond the existing literature in several respects. Firstly, both exports and imports of EU countries are estimated and on these grounds trade balance and patterns of comparative advantage are determined. Secondly, the typical patterns of EU trade are estimated including trade with developing countries, i.e. countries which have a much lower GNP per capita than OECD countries and, in this respect, are more comparable with CEECs. Thirdly, we use purchasing power parities because market exchange rates underestimate the level of the CEECs' GNP and may also underestimate their economic strength in terms of import demand and export supply.

To begin with, the paper presents the theoretical background as well as the data and econometric methods used. The gravity equations are estimated to explain trade flows between the EU and other market economies, for all goods combined and for individual product groups. The equations are then used to calculate 'normal' levels of trade between the EU and the association countries. The results are compared with actual levels and commodity patterns, and projections are presented following a medium scenario of growth in CEECs. The paper concludes that there is considerable room for further expansion and large export surpluses of the EU in East-West trade. Employment losses in import competing industries are therefore more than compensated by additional exports. The comparative advantages of EU countries revealed in actual trade with CEECs are by and large in line with the expected pattern which takes income differentials and distance into account.

2. Theoretical background

After having fallen out of favour for a while, the gravity hypothesis[1] has gained new prominence in the analysis of regionalisation trends in world trade[2] and in estimating the potential for trade with eastern Europe following the political and economic changes in the region.[3] The studies on the perspectives of East-West trade, in general, use trade flows among OECD countries and assume that trade with the transition countries in central and eastern Europe will follow the same pattern. Brenton and Di Mauro (1998) take a different approach in estimating imports for selected product groups of individual major EU countries from a large number of countries, by including developing countries and the transition countries, as well as considering a dummy variable for the former planned economies. All studies are restricted to determine either the exports or the imports. They do not, however, compare the exports and imports in order to determine net exports and to elaborate the pattern of comparative advantages.

Formal theoretical foundations of the gravity approach were provided by Anderson (1979), Bergstrand (1985) and Helpman/Krugman (1985) linking trade flows to exporter and importer incomes multiplicatively. Bergstrand (1989) extended the microeconomic foundations to include exporter and importer per capita incomes, integrating the gravity equation into the factor-proportions theory of trade. Under a number of assumptions, he showed that the gravity equation is the reduced form of a general equilibrium model of bilateral trade among N countries with two differentiated-products industries and two factors of production. As a result the value of bilateral shipments of product group *a* is given by a function taking the form of a "generalized" gravity equation:

$$px_{aij} = c^{\beta_0^a} Y_i^{\beta_1^a} y_i^{\beta_2^a} Y_j^{\beta_3^a} y_j^{\beta_4^a} C_{aij}^{\beta_5^a} T_{aij}^{\beta_6^a} E_{ij}^{\beta_7^a} \pi_i^{\beta_8^a} \pi_j^{\beta_9^a} \qquad (1)$$

Here, px_{aij} is the value of the trade flow in industry a from country i to country j at f.o.b. price. Y_i is i's national output expressed in terms of units of capital and represents the supply capacity of the exporting country. In the typical estimates it is proxied by i's GNP. y_i is i's capital-labour endowment ratio which is proxied by GNP per capita. Y_j and y_j are j's GNP and GNP per capita,

[1] First advanced by Tinbergen (1962) and Linnemann (1966) it proved to be empirically very successful in explaining the regional pattern of aggregated trade in goods.

[2] E.g., Frankel 1993, Saxonhouse 1993, Dhar and Panagariya 1994.

[3] For example, Winters and Wang 1994, Baldwin 1994, Festoc 1995 and Piazolo 1997 consider trade at the aggregate level while Vittas and Mauro 1997, Schumacher 1997a and Fidrmuc 1998 also provide analyses at the level of product groups. The gravity approach has also been applied in the analysis of foreign direct investment (e.g. Brenton, Di Mauro and Lücke 1998) and migration (e.g. Head and Ries 1998).

respectively. The transport costs C_{aij} are proxied by distance between the economic centers of the respective countries in the typical gravity equation, supplemented by a dummy for adjacency. Trade policy measures T_{aij} are in general represented by dummies for the membership in preference zones. The remaining three terms are variables referring to the exchange rate, an overall impact of the price level of exporting country i with regard to all export markets and of the price level in importing country j vis-à-vis all supplier countries.

The coefficients in equation (1) are determined by the parameters of the demand and supply functions. They are negative for transport costs and protectionist measures and positive for GNP in the importing country and, if the elasticity of substitution in consumption exceeds one, for GNP in the exporting country. The impact of the per capita GNP in the importing country is positive for goods which are "luxury" in consumption and negative for goods which are "necessities". The impact of per capita GNP in the exporting country is positive for capital-intensive goods and negative for labour-intensive goods.[4] Thus, the coefficients of per capita GNP can be used to rank the industries (i) by their characteristics in demand, i.e. luxuries versus necessities, and (ii) by their capital intensity in production.

A comparison of the exports and imports in bilateral trade allows us to answer our main question by determining the pattern of comparative advantages in terms of sectoral export/import ratios as a nonlinear function of the income and per capita income of the two countries concerned.[5] The signs of the per capita income elasticities imply that the EU countries' comparative advantages in trade with low income countries should be in goods which are capital intensive in production and necessities in consumption (high export/import ratios). On the other hand, the EU countries should have comparative disadvantages in goods which are labour intensive in production and luxury in consumption (low export/import ratios). We also would expect that those goods have high shares in trade with nearby countries which involve high transport costs or require close producer-user relationships.

Next to natural resources, human capital is the decisive factor in determining the sectoral structure of a country's comparative advantage (Wood 1994a and b). This holds particularly for the division of labour between industrial and developing countries, but also for the intersectoral division of labour among industrial countries (e.g. Schumacher 1992). Human-capital endowment is

[4] This strictly holds for two goods; in the multi-industry case "a weak inference of the relative factor intensity of the industry can be made using exporter per capita income coefficient estimates from a gravity equation" (Bergstrand 1989, 146, referring to Deardorff 1982 who provided a "weak" generalisation of the Heckscher-Ohlin theorem by proving that countries tend to export those goods which intensively use their abundant factor).

[5] For details see Schumacher (2000) providing a more detailed theoretical and empirical analysis.

highly correlated with the country's GNP per capita.[6] "Capital" in our context therefore includes tangible and intangible assets.

3. Approach, data and estimation procedure

The gravity equation (1) explains the bilateral exports and imports simultaneously, for trade among a given number of countries. At the level of product groups, an appropriate empirical application including a large number of low income countries is not possible due to limited availability of data. Using only the foreign trade data of OECD countries we have to determine the exports and imports separately, because the number of exporting and importing countries i and j is not the same. Thus, we can take into account the fact that the product groups may not be homogeneous for exports and imports.

On these grounds, we apply equation (1) in logarithmic terms for estimating the 'normal' pattern of exports and imports in good *a* of the EU countries as follows:[7]

$$\ln X_{aij} = C_x^a + \beta_{1x}^a \ln Y_i + \beta_{2x}^a \ln y_i + \beta_{3x}^a \ln Y_j + \beta_{4x}^a \ln y_j + \beta_{5x}^a \ln D_{ij} + \beta_{6x}^a ADJ_{ij} + \beta_{7x}^a EU_{ij} \qquad (2)$$

and

$$\ln M_{aij} = C_m^a + \beta_{1m}^a \ln Y_i + \beta_{2m}^a \ln y_i + \beta_{3m}^a \ln Y_j + \beta_{4m}^a \ln y_j + \beta_{5m}^a \ln D_{ij} + \beta_{6m}^a ADJ_{ij} + \beta_{7m}^a EU_{ij} \qquad (3)$$

where:

X_{aij} Exports of product group a from EU country i to country j (US-$ million)

M_{aij} Imports of product group a of EU country i from country j (US-$ million)

Y_i, Y_j National product of EU country i and of country j, respectively (US-$ million)

y_i, y_j GNP per capita of EU country i and of country j, respectively (US-$)

D_{ij} Distance (in miles) between the economic centres of EU country i and country j

ADJ_{ij} Dummy variable which takes a value of one if both countries i and j share a common land border and zero otherwise.

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[6] E.g., a log-linear regression of the mean years of schooling on per capita GNP gives an R^2 of 0.72 (Schumacher 1997b, 358/9).

[7] We do not include the exchange rate and the two overall price terms because we have not yet found proxies for these "non-traditional" variables which are significant and change the results. Bergstrand (1989) reports similar results.

EU_{ij} Dummy variable which takes a value of one if both countries i and j belong to the EU and zero otherwise.

The subscripts x and m indicate whether the coefficients refer to exports or imports of the EU countries.

Except for the EU countries, the countries considered in the analysis are represented as buyers only in the export equation and as suppliers only in the import equation. The coefficients of the same variable will therefore be different for exports and for imports. The export/import ratios in bilateral trade are determined by subtracting equation (3) from equation (2). The difference for the individual product groups minus the same difference for all manufactures gives the usual indicator of the Revealed Comparative Advantages (RCA) in log-form. Thus, the bilateral pattern of comparative advantages is a function of (per capita) income in the two countries concerned, geographical distance and EU membership.

We estimated the equations for exports and imports, as well as for the sectoral export/import ratios and the relative ratios compared to total manufacturing (RCA values). The regressions were done for trade in all goods combined and for manufactured goods which are broken down into five groups by the main factors believed to affect competitiveness:[8]

- *Resource-intensive goods* subdivided into food, beverages, tobacco and other resource-intensive goods such as wood products, mineral oil products, glass and non-ferrous metals. Food etc. is shown separately because these products are protected by the EU's common agricultural policy.
- *Labour-intensive goods* including, e.g., textiles, wearing apparel, leather products and metal products.
- *Specialised-supplier goods* which cover machinery and electrical goods.
- *Scale-intensive goods* including paper and printing, chemicals, rubber and plastic products, iron and steel and most transport equipment.
- *Science-based goods* such as pharmaceuticals, computers, aircraft and precision engineering goods.

[8] For the exact definition see the Appendix. The sectors are defined in accordance with the International Standard Industrial Classification (ISIC, Rev. 2). For this purpose the OECD foreign trade figures were recoded from the Standard International Trade Classification (SITC, Rev. 3).

The regressions are computed on the basis of the average annual bilateral trade flows for the years 1988 to 1990 between the present EU countries (i = 1, ..., 14)[9] and 70 partner countries (j = 1, ..., 70), including the EU member countries, the other OECD countries and 48 developing countries. The developing countries were selected on the basis of their volume of total trade with OECD countries and whether data for all variables were available. Thus, the coefficients are to represent the average characteristics of EU countries' trade with market economies ranging from high levels of per capita income to very low income levels. Restricting the reference scenario to trade among OECD countries - this is the usual database of most empirical applications of the gravity model at the level of product groups - means that elasticities referring to high income countries are applied to estimate trade with countries at a much lower income level: The CEECs' GNP per capita only achieves the level of middle-income economies, the Czech Republic, Slovenia and Hungary being comparable with upper-middle-income countries such as Mexico, Malaysia or Argentina, Poland with Colombia or Brazil, and the other CEECs with lower-middle-income countries such as Indonesia, Morocco, Peru or Tunisia.

As for the explanatory variables, the data on GNP and GNP per capita was taken from World Bank publications.[10] The absolute values of GNP per capita refer to the USA 1989, whereas the ratios across countries are from 1987. Lagged GNP data is used because income may also depend on foreign trade. The GNP figures are at purchasing power parities (PPPs) as distinct from other studies using data at market exchange rates. At PPPs the differences between high and low income countries are reduced because the ratio of PPP to exchange rate tends to be larger the lower the level of income.[11] Correspondingly, the income elasticities of trade increase. For several CEECs the ratio of PPP to exchange rate is higher than expected from the average relationship. In 1994 and 1995, GNP at PPPs was on average twice as large as at exchange rates in the ten CEECs. Applying exchange rates therefore underestimates the export and import capacity of these countries. The argument is strengthened by the results on a composite indicator of international competitiveness ranking transition countries such as Hungary, Poland, the Czech Republic and the Baltic states higher than the large Latin American countries (Sachs, Zinnes and Eilat 1999). Thus, the economic strength of some CEECs may be even stronger than it is indicated by per capita GNP at PPPs.

[9] Belgium and Luxembourg are taken together.

[10] World Development Indicators. GNP values were calculated by multiplying GNP per capita and population.

[11] An analysis of the reasons goes beyond the scope of this paper. For some hypotheses on the causalities see Podkaminer (1999).

The distance D_{ij} between the countries i and j was calculated as the shortest line between their economic centres EC_i and EC_j by latitudinal and longitudinal position[12]. The EU dummy in the regressions refers to the EU membership by 1990, i.e. before the enlargement by Austria, Sweden and Finland.

There are three possible methods to account for zero trade flows for estimating the equations in a log-linear form. This problem occurs if the analyses include developing countries or are disaggregated by product groups. The first method is using OLS by simply discarding the observations with zero trade flows. This causes a selection bias in the regression. Secondly, one can substitute the zero trade flows by small values which is the usual method. The third method is to use a Tobit estimator which explicitly takes account of the censoring. Because the results of the second and third method are very similar,[13] we decided to take OLS on the log-linear form adding a small value to the trade flows. [14]

Another problem is that estimating the product groups separately can give inconsistent results, i.e. the sum of the estimated trade flows at the level of product groups need not add up to the amount estimated at the aggregate level. The divergence for the export estimates is very small, while the sum of estimated imports in the various product groups is smaller than the overall estimate. We therefore calculated commodity patterns from the estimated flows of East West trade at the level of product groups and applied them to the estimated overall value of exports or imports, respectively, in order to determine absolute values.

4. Regression results: Volume and comparative advantage in bilateral trade of EU countries

The complete results of the regressions describing the EU countries' bilateral exports and imports are presented in Table A.1 in the Appendix. The explanatory power of the approach is

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[12] The formulae are:

$\cos D_{ij} = \sin \varphi_i \cdot \sin \varphi_j + \cos \varphi_i \cdot \cos \varphi_j \cdot \cos (\lambda_j - \lambda_i)$

$D_{ij} = \arccos (\cos D_{ij}) \cdot 3962.07$ miles

for $EC_i = (\varphi_i; \lambda_i)$ and $EC_j = (\varphi_j; \lambda_j)$

with φ = latitude, λ = longitude. In principle, the national capitals were taken as the economic centre except for Canada (Montreal), the United States (Kansas City as a geographical compromise between the centres of the East and West Coasts), Australia (Sydney), West Germany (Frankfurt/Main), Brazil (Rio de Janeiro), Pakistan (Karachi), and India (Bombay).

[13] See Baldwin 1994, 85 and Wang and Winters 1991, 119, confirmed by own calculations.

[14] 0.001 US-$ million. This is the smallest figure recorded in international trade statistics.

fairly extensive and, by and large, the results show the typical pattern of gravity-type estimations with regard to sign and significance of the coefficients. The higher the national product of countries and the smaller the geographical distance between them, the greater the merchandise flows are between the two. Membership of the EU in general has a positive impact on exports and imports. The impact of a common border too, is mostly positive as might be expected; it is, however, less significant than in other studies.

The values of the coefficients, however, can differ widely for the various product groups compared to manufactures as a whole. The impact of GNP, distance and the dummy variables on the commodity pattern of bilateral trade flows can be assessed by the figures in Tables 1 to 3. Coefficients in Table 1 which lie above the value for total manufacturing identify product groups that increase their share in manufacturing exports or imports, respectively, with increasing value of the independent variable and *vice versa*. A positive value in Table 2 indicates an increasing export/import ratio with higher values of the respective variable. A negative value indicates the opposite. A positive value in Table 3 indicates an increasing comparative advantage (or decreasing disadvantage) of the product groups alongside the respective variable, negative values indicate a decreasing comparative advantage (or increasing disadvantage). The indicator simply shows whether the sectoral export/import ratio is growing faster or slower than the ratio for total manufactures for higher values of the respective variable.

According to the elasticity of exports with respect to *GNP per capita in the EU countries* (β_{2x}^{a}) the richer member countries tend to export relatively more specialised-supplier, science-based and scale-intensive goods and less food, other resource-intensive and labour-intensive goods (see Table 1). On the import side (β_{2m}^{a}) the share of labour-intensive, specialised-supplier, science-based and "other" resource intensive goods increases with increasing GNP per capita, while the share of food and scale-intensive goods decreases. Taking both sides together, the pattern of comparative advantages *c.p.* shifts from labour-intensive goods, food and other resource-intensive goods to specialised-supplier, scale-intensive and science-based goods with higher per capita income of the EU country (see Tables 2 and 3).

Table 1

Elasticities of EU trade with respect to GNP per capita, distance and EU membership

Product groups	GNP per capita													
	in EU countries				in partner countries				Distance				EU membership			
	Exports β^a_{2x}		Imports β^a_{2m}		Exports β^a_{4x}		Imports β^a_{4m}		Exports β^a_{5x}		Imports β^a_{5m}		Exports β^a_{7x}		Imports β^a_{7m}	
All products	2.15	**	0.37		0.59	**	0.62	**	-0.79	**	-0.59	**	0.48	*	0.48	**
Manufacturing	2.18	**	0.37		0.60	**	0.81	**	-0.79	**	-0.63	**	0.45	**	0.79	**
Resource intensive	0.79	**	0.22		0.65	**	0.57	**	-0.97	**	-0.55	**	0.46	**	1.21	**
Food, beverages, tobacco	0.88	**	0.01		0.73	**	0.49	**	-0.79	**	-0.01		1.28	**	2.71	**
Resource intensive excl. food	1.04	**	0.65		0.82	**	0.70	**	-1.16	**	-1.08	**	-0.07		0.34	
Labour intensive	1.50	**	1.40	**	0.97	**	0.73	**	-0.99	**	-0.20	*	0.55	**	1.73	**
Specialised supplier	4.47	**	0.86	*	0.55	**	1.81	**	-0.71	**	-0.84	**	0.42	*	1.01	**
Scale intensive	3.14	**	0.38		0.51	**	1.58	**	-0.86	**	-0.98	**	0.40	**	0.77	**
Science based	3.68	**	0.85	*	0.72	**	1.93	**	-0.70	**	-0.43	**	0.67	**	1.51	**

Note: ** indicates significance at 99 % level, * indicates significance at 95 % level.

Source: Own calculations, for method see text.

Table 2

Impact on the export / import ratio

Product groups	GNP				GNP per capita				Distance		EU membership	
	EU country		Partner country		EU country		Partner country					
	$\beta^a_{1x} - \beta^a_{1m}$		$\beta^a_{3x} - \beta^a_{3m}$		$\beta^a_{2x} - \beta^a_{2m}$		$\beta^a_{4x} - \beta^a_{4m}$		$\beta^a_{5x} - \beta^a_{5m}$		$\beta^a_{7x} - \beta^a_{7m}$	
Manufacturing	-0.31	**	-0.26	**	1.81	**	-0.21	**	-0.16	*	-0.33	
Resource intensive	-0.51	**	-0.12	*	0.58		0.08		-0.42	**	-0.75	**
Food, beverages, tobacco	-0.39	**	-0.38	**	0.86	*	0.24	*	-0.78	**	-1.44	**
Resource intensive excl. food	-0.12		-0.24	**	0.40		0.12		-0.08		-0.41	
Labour intensive	0.20	*	-0.60	**	0.10		0.24	*	-0.79	**	-1.18	**
Specialised supplier	-0.22	**	-0.53	**	3.62	**	-1.27	**	0.13		-0.59	*
Scale intensive	-0.31	**	-0.61	**	2.76	**	-1.07	**	0.12		-0.37	
Science based	-0.32	**	-0.50	**	2.83	**	-1.21	**	-0.27	*	-0.83	**

Note: ** indicates significance at 99 % level, * indicates significance at 95 % level.

Source: Own calculations, for method see text.

Table 3

Impact on the relative export / import ratio (manufacturing = 1)

- ln RCA, manufacturing = 0 -

Product groups	GNP				GNP per capita				Distance		EU membership	
	EU country		Partner country		EU country		Partner country					
Manufacturing	0.00		0.00		0.00		0.00		0.00		0.00	
Resource intensive	-0.20	**	0.14	**	-1.23	**	0.29	**	-0.26	**	-0.42	*
Food, beverages, tobacco	-0.08		-0.12		-0.95	*	0.45	**	-0.62	**	-1.11	**
Resource intensive excl. food	0.19	*	0.02		-1.41	**	0.33	**	0.08		-0.08	
Labour intensive	0.51	**	-0.34	**	-1.71	**	0.45	**	-0.63	**	-0.85	**
Specialised supplier	0.09		-0.27	**	1.81	**	-1.06	**	0.29	**	-0.26	
Scale intensive	0.00		-0.35	**	0.95	**	-0.86	**	0.28	**	-0.04	
Science based	-0.01		-0.24	**	1.02	**	-1.00	**	-0.11		-0.50	

Note: ** indicates significance at 99 % level, * indicates significance at 95 % level.

Source: Own calculations, for method see text.

The elasticities of exports and imports with respect to *GNP per capita in their partner countries* may be interpreted similarly. Taking exports and imports together again, the pattern of comparative advantages of the EU country *c.p.* shifts from labour-intensive goods, food and other resource-intensive goods to specialised-supplier, science-based and scale-intensive goods with lower per capita income of the partner country. The direction of shifts arising from lower per capita income in a partner country and from higher per capita income in an EU country is the same.

There are no negative elasticities with respect to *per capita income in the supplier country* (β_2^a) and (β_{4m}^a) as expected for labour-intensive goods. As compared to total manufactures or all goods combined we can, however, identify two groups of sectors, (i) specialised-supplier, science-based and scale-intensive goods with a high elasticity and, therefore, tending to be (human-)capital intensive in production, and (ii) labour-intensive and resource-intensive goods with a low elasticity and, therefore, tending to be labour-intensive in production. With respect to the *per capita income of the importing country* (β_{2m}^a) and (β_4^a) too, we do not find negative elasticities as expected for "necessities". Here, labour-intensive goods have the highest elasticity and may be identified to be "luxury", while food and scale-intensive goods tend to be necessities for EU countries (lowest values of β_{2m}^a) and scale-intensive and specialised-supplier goods tend to be necessities for partner countries (lowest values of β_{4x}^a).

The volume and pattern of trade also depends on *distance* (β_{5x}^a and β_5^a). In general, exports are more sensitive than imports to distance, i.e., exports concentrate more on nearby countries while imports are taken from further afield as well. The lower distance elasticity of imports can partly be explained by the c.i.f. valuation which tends to increase the value of shipments in line with distance. On the export and import side, resource-intensive and scale-intensive products show above-average distance elasticities which my be due to relatively high transportation costs and/or close producer-user relationships providing some "natural" protection. The same is true for exports of labour-intensive goods and imports of specialised-supplier products. On the other hand, exports of specialised-supplier and science-based goods as well as imports of food, labour-intensive and science-based products depend much less on distance. Here, transport costs and producer-user relations seem to be less important.

The effect of *EU membership* (β_{7x}^a) and (β_7^a) too, varies considerably from product group to product group. Membership is an additional advantage for manufactured imports and for exports in most product groups. The greatest effect is on imports of food and labour-intensive goods

which are most strongly affected by EU protection, by tariffs as well as non-tariff barriers (see Möbius and Schumacher 1995). In total, the regression results show an EU-specific increase in imports and exports of some 60 %, for manufactures EU membership may increase imports by some 120 % and exports by some 60 %. The effect on total trade and the pattern by product groups seem to be meaningful, while the absolute values of coefficients in the individual product groups seem to be exaggerated. One reason may be the correlation between EU membership and distance.[15]

Summarising the net impact of the various variables on the commodity structure in bilateral trade of manufactures in terms of the RCA indicator the following conclusions can be drawn:

- The comparative advantages of EU countries in specialised-supplier, science-based and scale-intensive goods are higher the higher the per capita income of the EU country and the lower the per capita income of the partner country. This is in line with the (neo-) factor-proportions theories of trade because these product groups are (human-) capital intensive and the endowment with (human-) capital increases with per capita income.
- Distance has a negative impact on the comparative advantages of EU countries in food and labour-intensive goods. The reason may be that in these product groups EU exports have higher transport costs and/or require closer producer-user relationships than EU imports. For specialised-supplier and scale-intensive goods the opposite holds. Here EU exports are less sensitive to distance than imports and therefore EU comparative advantages increase in trade with more distant countries.
- EU membership of a partner country mostly decreases the comparative advantages of the EU country in food and labour-intensive products where EU protection is highest.

5. Room for growth in EU trade with CEECs

Calculation of trade flows between the EU countries and the CEECs using the regression results provides information about the trade potential on the assumption that the exchange of goods with the transition countries develops in accordance with the rules for trade between market economies. The two decisive variables for estimating potential trade between EU countries and CEECs are national product and distance. Information on the national product of central and eastern

[15] Recalculating the regressions without the EU dummy gives considerably higher (negative) values for the elasticities of imports with respect to distance. The ranking of product groups according to distance elasticity remains unchanged, however.

European countries is, however, less reliable in a number of cases. There is little experience with the national accounting system on the Western model, and the unofficial economy not recorded by such statistics is relatively large. Since exchange rates and purchasing power parities differ widely, the choice of conversion factor results in very different uniform-currency values. Furthermore, expectations diverge regarding the growth that can be achieved by the transition economies in the coming years.

Table 4

Population and GNP per capita in CEECs, 1994

Country	Population in millions	GNP per capita in US-$	
		Exchange rates	Purchasing power parities[1)]
Poland	38.5	2410	5285
Czech Republic	10.3	3200	9833
Slovak Republic	5.3	2950 [2)]	6534
Hungary	10.3	3840	6565
Romania	22.7	1270	4108
Bulgaria	8.4	1250	4705
Estonia	1.5	2820	4296
Latvia	2.5	2320	3579
Lithuania	3.7	1350	4090
Slovenia	2.0	7040	11305

[1)] Extrapolated from 1996 per capita GNP at PPPs from World Development Report 1998/99 by using real growth rates from national sources.- [2)] 1995.

Sources: World Development Reports, various issues; own calculations.

In line with the availability of statistics we proceeded as follows: To begin with we calculated potential bilateral trade flows between the EU countries and the CEECs, in total and by product groups, for the 1994 levels of GNP per capita at purchasing power parities. The increase in total trade of the EU countries in 1994 as compared to the 1988-90 average levels is represented by the (higher) 1994 GNP figures for the EU countries.[16] The data on GNP per capita for the CEECs were taken from the World Development Report 1998/99; they refer to 1996 and were extrapolated to 1994 levels using real growth rates from national statistics (see Table 4). Compared with data published earlier, the figures for Slovakia and Slovenia have been revised up-

[16] The 1994 figures for Germany relate to Germany as a whole while the data for 1988-90 in the regressions only covers West Germany.

wards considerably. They are, however, lower than most recent Eurostat data. Here, only aggregated results of 1994 trade estimates are presented. Secondly, the overall results were updated to 1997 taking account of GNP growth in CEECs and EU countries. Finally, the effects of further GNP growth were estimated according to the income elasticities of trade and following a medium growth scenario in CEECs until 2020 with 1997 as base year.

Table 5

Estimates of EU trade with CEECs, 1994

	Estimated values 1994 in US-$ billion			Ratio of actual to estimated value 1994	
	Exports	Imports	Exports minus imports	Exports	Imports
	EU countries with CEEC-10				
Austria	14.8	4.5	10.3	0.4	0.8
Belgium/Lux	5.8	2.0	3.8	0.3	0.7
Denmark	3.3	1.0	2.3	0.3	1.0
Finland	1.5	0.6	0.9	1.3	1.3
France	18.8	11.7	7.1	0.2	0.3
Germany	52.0	37.3	14.7	0.4	0.6
Greece	0.8	0.8	0.0	0.8	0.8
Ireland	0.4	0.2	0.2	0.4	0.6
Italy	20.3	13.3	7.0	0.4	0.4
Netherlands	5.8	2.7	3.1	0.4	0.8
Portugal	0.5	0.5	0.0	0.1	0.2
Spain	3.0	3.2	-0.2	0.3	0.2
Sweden	2.9	1.3	1.6	0.4	0.7
United Kingdom	13.3	9.7	3.6	0.2	0.3
EU -15	143.4	88.9	54.5	0.4	0.5
	EU-15 with individual CEECs				
Poland	30.7	23.6	7.2	0.5	0.5
Czech Republic	45.5	28.8	16.7	0.3	0.4
Slovak Republic	13.6	6.2	7.4	0.2	0.4
Hungary	16.6	9.4	7.2	0.6	0.7
Romania	9.8	6.6	3.2	0.3	0.5
Bulgaria	6.4	3.8	2.6	0.3	0.4
Estonia	1.7	0.7	1.0	0.6	0.6
Latvia	1.9	0.9	1.0	0.4	0.9
Lithuania	3.0	1.5	1.5	0.3	0.5
Slovenia	14.2	7.4	6.8	0.4	0.6

Source: Own calculations; for method see text.

On the assumptions described above and aggregated over all EU countries and CEECs, the *'normal' 1994 level* of exports by the EU-15 to the CEEC-10 can be estimated at about US-$ 143 billion while potential imports amount to some US-$ 89 billion (see Table 5). This gives an EU export surplus of some US-$ 50 billion which is six times the actual 1994 surplus or twice the actual 1997 surplus. Although the absolute amount may be exaggerated, the estimated figure clearly indicates that a larger export surplus of the EU and thus higher net capital exports to the CEECs can be expected.

In total trade with CEECs, the actual EU exports in 1994 were some 40 % and actual imports about 50 % of the estimated levels. The ratios of actual to estimated value (utilisation rate) for individual EU countries, however, differ widely. They indicate that the unused potential for trade with the CEEC-10 was highest for Portugal, Great Britain and France, whereas it was rather low for Greece and for imports by Austria, the Netherlands, Belgium and Sweden. The actual trade of Finland, as well as imports by Denmark had already reached or exceeded the estimated potential level. Utilisation rates also differ from country to country among CEECs. E.g., the Slovak Republic is estimated to have the highest potential for greater trade with the EU, followed by trade with the Czech Republic and Bulgaria, as well as exports to Romania and Lithuania. On the other hand, the unused potential for trade with Estonia and Hungary was rather low. Imports from Latvia had by and large reached the estimated level.

Meanwhile, the growth of EU trade with CEECs has exploited part of the potential calculated for 1994. There is, however, still considerable room for expansion. In East-West *trade in 1997*, exports reached some 50 % and imports about 60 % of the usual levels of trade between market economies (taking into account the growth of GNP in recent years).[17] These conclusions are confirmed by results from regressions on the 1995 trade of EU countries including trade with CEECs. They show a significant negative impact of membership in the (former) CMEA and indicate that EU trade with the CEECs is at only about 40 % to 50 % of the normal level.

Earlier studies too, concluded that East-West trade was lagging far behind what was to be expected under ‘normal’ market conditions. Major studies suggested that, e.g., EU exports to the CEEC-6 should be 5.1 times (Winters and Wang 1994), 3.9 times (Collins and Rodrik 1991) or 2.6 times (Baldwin 1994) the actual volume at the beginning of the transition process.[18] Our re-

[17] The estimated aggregate trade flows were updated to 1997 by applying the GNP elasticities to real growth in the CEECs and unity elasticities to real growth in the EU countries (see below the same methodology to project trade flows according to a scenario of growth in CEECs).

[18] Quoted from the comparative calculation by Cazes, Coquet and Lerais 1996, 7.

sults show that considerable growth in EU trade with CEECs still can be expected merely from catching up with usual levels. This result is in contrast to the more recent findings of Schumacher (1997a), Gros and Gonciarz (1995) and Brenton and Di Mauro (1998) who conclude that any potential in East-West trade is already exhausted if the CEECs' national product is converted by current exchange rates.

Trade will further increase as GNP grows in the CEECs and the EU. Following a *medium growth scenario*, by the year 2015 GNP per capita in CEECs would be 2.3 times the 1994 level, raising the CEEC per capita income from 31 % of the EU level in 1997 to 44 % in 2015.[19] Growth in Slovenia and the Czech Republic would be lower, while the economies in the three Baltic states and Romania would grow more quickly. Doubling the GNP per capita in CEECs means that Slovenia and the Czech Republic would achieve the 1994 level of countries such as Portugal, Spain, Ireland or Israel, i.e., today's lowest levels of high-income countries, the level in Poland, Slovakia and Hungary would compare with the 1994 level in Greece or South Korea, and the other CEECs would be at the 1994 level of the Czech Republic or upper-middle-income countries such as Mexico, Malaysia or Argentina.

The effect on EU trade of higher GNP in CEECs can be calculated from the income elasticities of the regressions, which cover a very broad range of income levels in partner countries including 1994 levels of CEECs as well as much higher values. The exact growth factors (in logarithmic form) of EU exports and imports arising from growth of total and per capita GNP in CEECs as compared to 1994 are given by

$$\Delta \ln X_{ij} = \ln X_{ij}^{t} - \ln X_{ij}^{1994} = \beta_{3x} \ln g_3^t + \beta_{4x} \ln g_4^t \qquad (4)$$

and

$$\Delta \ln M_{ij} = \ln M_{ij}^{t} - \ln M_{ij}^{1994} = \beta_{3m} \ln g_3^t + \beta_{4m} \ln g_4^t \qquad (5)$$

Here, g_3^t and g_4^t are the growth factors of GNP and GNP per capita in CEECs in year t (1994 = 1). Doubling the PPP-GNP in CEECs at constant population increases EU exports to CEECs by 130 % $(\beta_{3x} + \beta_{4x} = 1.30)$ and EU imports from CEECs by 146 % $(\beta_{3m} + \beta_{4m} = 1.46)$.

[19] For details on the growth scenario see Brücker et al. (1999).

The increase is somewhat smaller because the population is expected to shrink and, therefore, GNP will grow more slowly than GNP per capita. A World Bank scenario of population growth suggests that the population in the CEEC-10 in 2015 may be 3 % smaller (World Development Report 1998/99).

The medium scenario of growth in CEECs implies a 2 % annual growth of GNP per capita in EU countries. The impact on EU trade cannot be derived in the same way from the regressions because they only represent differences between EU countries' trade due to different income levels; they do not describe changes over time. For the growth scenario we therefore assume that the elasticities of EU exports and imports with respect to EU income are unity. This adds another 54 % to East-West trade by the year 2015, reflecting a 54 % increase in GNP per capita and a population assumed to remain constant in the EU as a whole. According to the World Bank projections cited above, the population in several countries is expected to grow (Ireland, Finland, France, Netherlands) compensating expected losses in other countries (Italy, Spain, Portugal, Germany).

Table 6

EU trade with CEECs: Estimated and projected flows, 1994 to 2020

Year	Trade between EU-15 and CEEC-10				
	Exports		Imports		Exports minus imports
	in US-$ billion	1994 estimate = 1	in US-$ billion	1994 estimate = 1	in US-$ billion
1994	143.4	1.00	88.9	1.00	54.5
1997	178.2	1.24	112.3	1.26	65.9
2000	217.2	1.51	139.1	1.56	78.1
2005	291.2	2.03	191.2	2.15	100.0
2010	378.1	2.64	254.2	2.86	123.9
2015	482.7	3.37	332.0	3.73	150.7
2020	605.7	4.22	426.0	4.79	179.8

Source: Own calculations; for method see text.

The projections of EU trade with CEECs over the next 20 to 25 years derived from the medium growth scenario are shown in Table 6. They are calculated by equations (4) and (5), adding the

effect arising from GNP growth in EU countries (assuming $\beta + \beta_2 = 1$ for exports and imports). On these assumptions, EU exports to the CEEC-10 by 2015 will be 3.4 times the 'normal' level of 1994, with EU imports 3.7 times as high. The projected EU export surplus will be 2.8 times the 'normal' 1994 figure, i.e., it will grow somewhat more quickly than GNP in the CEECs and less quickly than trade.

For Germany, trade with central and eastern Europe can gain new impetus as East Germany catches up with the West in economic capacity. In order to simulate the impact of such a change, another estimate of German trade with the CEECs did not use geographical distances from Frankfurt/Main, but from Berlin. This predicts a further increase in German trade with Poland and the Baltic states (of some 25 % for exports and almost 20 % for imports).

6. Commodity patterns and structural trends

For individual product groups, sectoral elasticities with respect to distance and income can be brought in to identify the sectors that profit in foreign trade from geographical proximity, and to show the direction in which comparative advantage changes with increasing per capita income in CEECs. The results permit conclusions about the impact of GNP and distance on the sectoral specialisation pattern in trade between EU countries and CEECs and likely structural trends. The analysis concentrates on the division of labour within manufacturing industry. The coefficients compiled in Tables 1 to 3 will be used firstly to explain the 'normal' commodity pattern of East-West trade which can be compared with the actual pattern, and secondly to evaluate the changes arising from growth in CEECs and accession to the EU.

The sectoral pattern of trade between western and eastern Europe is characterised by relatively small distances, especially for member states on the eastern margin of the EU, and by low income and pay levels in CEECs. Which product groups benefit can be deduced from export and import elasticities with reference to distance and income. The greater the absolute figure for (negative) distance elasticities, the greater the flows between nearby countries (β_{5x}^{a} for exports and β_{5m}^{a} for imports). Furthermore, the EU industries that are likely to be particularly successful exporters are those that show low elasticities with regard to GNP per capita in the importing country (β_{4x}^{a} for exports). Conversely, the CEECs will gain particularly large shares in imports of the European Union in product groups that show low elasticities with regard to the supplier country's per capita GNP (β_{4m}^{a} for imports).

The regression results show that short distances favour EU exports and imports of resource-intensive and scale-intensive products, as well as exports of labour-intensive goods and imports of specialised-supplier products. This should have the strongest impact on trade between Austria and Slovakia, Hungary, the Czech Republic and Slovenia, or between Finland and Estonia, where distances are shortest and it is least important for trade between Portugal and the Baltic states where distances are greatest. Low income levels in CEECs favour EU exports of specialised-supplier and scale-intensive goods and imports of labour-intensive and resource-intensive products. This structural effect increases with per capita income in the EU country. The effect, therefore, should be strongest in trade between high-income EU countries and Latvia or Lithuania, where the divergence of per capita income is largest, and it should be smallest in trade between Greece or Portugal and Slovenia or the Czech Republic, where the income differential is lowest.

Distance and income differentials have the opposite effect on East-West trade in most sectors, and a cumulative effect only in a few cases. Both short distances and the low income levels in CEECs favour EU exports of scale-intensive goods and imports of resource-intensive goods, and they have a negative impact on the share of science-based goods in exports and imports. Considering exports and imports together, the net effect on EU comparative advantage arising from both short distances and low income in CEECs is positive only in science-based goods (Table 3). In specialised-supplier and scale-intensive goods, the low income in CEECs has a positive effect on EU's comparative advantage whereas the short distances have a negative impact. On the other hand, the RCA values in labour-intensive goods, food and other resource-intensive goods are decreased by the low income level in CEECs and increased by short distances.

Table 7 summarises the actual and estimated commodity structures and specialisation patterns in terms of RCA values as well as net exports for trade between the EU-15 and the CEEC-10, reflecting the combined effect of distance and GNP. The figures indicate that the shares of resource-intensive and scale-intensive products in exports and imports should be larger than the actual figures in 1994. On the other hand, the share of labour-intensive goods in exports and even more so in imports was actually much higher than estimated. A large part of the difference may be due to imports after outward processing, which are recorded at gross values including the value of materials supplied by the EU, and which play a very important role in East-West trade, especially for the clothing trade with Germany. According to the sign of the RCA values the actual comparative advantages are consistent with the expected pattern, except for food. In food the

EU countries have revealed comparative advantages in trade with CEECs whereas disadvantages should be expected.

Table 7
Specialisation patterns in EU trade of manufactures with CEECs, 1994

Product groups	Actual trade				Estimated trade				Ratio of actual values to estimated values	
	Exports in %	Imports in %	RCA[1)]	Net exports in US-$ billion	Exports in %	Imports in %	RCA[1)]	Net exports in US-$ billion	Exports	Imports
Manufacturing	100	100	0	9.7	100	100	0	64.2	0.4	0.5
Resource intensive	14	27	-69	-4.2	12	42	-120	-14.1	0.4	0.3
Food, beverages, tobacco	7	5	25	1.3	3	4	-46	0.5	0.9	0.7
Resource intensive excl. food	7	22	-116	-5.4	10	37	-134	-14.6	0.2	0.3
Labour intensive	19	30	-43	-2.4	12	13	-6	7.2	0.6	1.3
Specialised supplier	27	15	61	7.6	29	12	91	31.5	0.3	0.7
Scale intensive	32	26	19	5.3	40	31	26	32.7	0.3	0.5
Science based	8	2	146	3.3	7	3	72	6.9	0.4	0.3
for information: All products	.	.	.	8.1	.	.	.	54.5	0.4	0.5

[1)] ln * 100.

Sources: DIW Foreign Trade Data; own calculations, for method see text.

Table 8
Elasticity of EU trade in manufactures with respect to GNP in partner countries[1)]

Product groups	Exports $\beta^a_{3x} + \beta^a_{4x}$	Imports $\beta^a_{3m} + \beta^a_{4m}$	Ratio of exports to imports $\beta^a_{3x} + \beta^a_{4x} - (\beta^a_{3m} + \beta^a_{4m})$
Manufacturing	1.29	1.76	-0.47
Resource intensive	1.32	1.36	-0.04
Food, beverages, tobacco	1.31	1.45	-0.13
Resource intensive excl. food	1.59	1.71	-0.12
Labour intensive	1.61	1.97	-0.36
Specialised supplier	1.29	3.08	-1.79
Scale intensive	1.26	2.95	-1.69
Science based	1.47	3.18	-1.71

[1)] At constant population.

Source: Own calculations, for method see text.

All in all, the estimates at the level of product groups suggest that the largest unused potential for EU exports is in “other” resource-intensive, specialised-supplier and scale-intensive products, and for EU imports in “other” resource-intensive and science-based products. In these categories the ratios of actual values to estimated values are smallest. Actual exports and/or imports in other product groups too, are below the ‘normal’ levels except for imports of labour-intensive products, which already exceed the estimate. The estimated export surplus in scale-intensive and specialised-supplier products is much higher than the actual level, and labour-intensive goods could also achieve a surplus, except in trade with Poland and Romania. Only in “other” resource-intensive goods is a negative balance much larger than the actual one likely to occur. These re-

sults suggest that only in resource-intensive EU industries is the attainment of 'normal' levels in East-West trade likely to have a considerable negative impact on production and employment; in other sectors, also in labour-intensive industries, it should have a positive effect. By and large, this is true for all EU countries; only the estimates for Portugal and Ireland indicate an additional trade deficit in labour-intensive goods.

Growth in CEECs has an impact on the structure of trade according to the divergent sectoral elasticities with respect to GNP and GNP per capita (see Table 8). At constant population, i.e., according to $\beta_3^a + \beta_4^a$, GNP growth in CEECs will induce

- increasing shares of "other" resource-intensive, labour-intensive and science-based goods in EU exports,
- increasing shares of specialised-supplier, scale-intensive and science-based goods in EU imports,
- decreasing export/import ratios in total and in all products groups, EU imports growing more quickly than EU exports. The divergence is largest in specialised-supplier, scale-intensive and science-based goods, where imports may grow twice as fast as exports.

Thus, the trade deficit in resource-intensive goods will grow and the (estimated) trade surplus in labour-intensive goods will decrease. In specialised-supplier, scale-intensive and science-based goods, intra-industry trade will increase, reducing the comparative advantage of EU countries in these product groups.

In sum, the figures seem to show that EU trade with low income countries is dominated by intersectoral division of labour, the EU exporting mainly specialised-supplier, scale-intensive and science-based goods, and importing mainly labour-intensive and resource-intensive goods. The higher the income level of the partner country is, the more this pattern of specialisation is replaced by intrasectoral division of labour, because specialised-supplier, scale-intensive and science-based goods increase their share in EU imports, and labour-intensive and resource-intensive goods increase their share in EU exports.

EU membership of the CEECs can be expected to increase import competition in manufacturing, in particular in food and labour-intensive goods (see Tables 2 and 3). In quantifying the effect it

must be repeated that it is difficult to disentangle the impact of EU membership and the impact of distance.[20]

7. Summary and Conclusions

European Union trade with central and eastern Europe, especially with countries closest to the EU borders and most advanced in the transformation process, has developed with particular dynamism in recent years. Whether the central and eastern European region will again achieve its pre-World War I market share will depend essentially on the extent to which it is able to catch up in income.

The analysis of potential trade between western and eastern Europe has proceeded on the assumption that bilateral trade flows between market economies - in aggregate and at the sectoral level - can be primarily explained in terms of GNP, distance, and (human-)capital endowment, measured indirectly by per capita income. The empirical findings of this and other studies show that this approach is very successful in explaining bilateral trade. At the level of individual industries the approach is adequate for identifying product groups that are mainly traded between nearby countries and for indicating the direction in which a country's comparative advantage and disadvantage change when per capita income increases.

The empirical analysis at the aggregate level shows that

- in 1997, actual EU trade with CEECs reached only about 50 % of exports and some 60 % of imports to be expected from 'normal' trade relations among market economies, indicating that there is still considerable potential for a further rise in EU trade with central and eastern Europe on condition that the transformation process in the CEECs continues;
- the increase of East-West trade will be accelerated by further GNP growth;
- further export surpluses for the EU in trade with CEECs are likely, which would be further increased by accession to the Union.

From the disaggregated analysis one may conclude that the commodity structure of East-West trade in manufactures depends mainly on distance and divergent income levels, which have the opposite impact in most sectors and the same impact only in a few cases. The relatively short distances favour intra-industry trade of transport-cost-intensive goods, i.e., exports and imports

[20] Recalculating the 'normal' commodity pattern of East-West trade from regressions which exclude the EU dummy already gives a larger share of labour-intensive goods in EU imports from CEECs.

of resource-intensive and scale-intensive products, as well as EU exports of labour-intensive goods and imports of specialised-supplier goods. From these results one may conclude that the CEECs have a far better chance than more distant countries when it comes to supplying basic materials, to processing consumer goods for EU domestic accounts, or to international specialisation within capital goods industries. On the other hand, the large income differentials imply a high volume of inter-industry trade, with the EU countries concentrating on supplying specialised-supplier, scale-intensive and science-based products and the CEECs concentrating on resource-intensive and labour-intensive products. By and large, the comparative advantages revealed in actual trade between the EU and CEECs are in line with the expected pattern. In absolute values actual trade lags behind 'normal' levels, particularly in resource-intensive and scale-intensive products.

In the longer term and in line with GNP growth in CEECs, the intra-industrial division of labour between the EU and the CEECs will increase, imports from CEECs growing most strongly in specialised-supplier, scale-intensive and science-based goods. The growth scenario of medium convergence indicates, however, that this will be a very long-term process.

The intensification of East-West trade is an employment programme for the EU countries which still face high unemployment. Increased exports can be expected for all industries. Only resource-intensive goods will face a higher trade deficit than presently, whereas the other product groups will have an export surplus. According to our model calculations this is also true for labour-intensive products. The production of food and labour-intensive goods could be negatively affected, however, by increased import competition from EU membership of the CEECs.

The extent of structural changes in EU countries arising from trade with CEECs cannot be concluded, however, from the analysis presented here. It would be considerably underestimated because the analysis does not take account of the vertical division of labour within industries. In trade between countries at different levels of per capita income the high income country tends to export the human-capital intensive high quality segments and to import the labour-intensive low quality segments also within product groups. Future research, therefore, should provide analysis at the level of more narrowly defined product groups and consider the specific kind of intra-industry division of labour in trade between countries at different levels of per capita income.

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Appendix

Definition of product groups[1)]

Product groups	International Standard Industrial Classification (ISIC Rev. 2)
Resource intensive (access to natural resources)	31, 33, 353/4, 36, 372
Food, beverages and tobacco	31
Other resource intensive	33, 353/4, 36, 372
Labour intensive (labour costs)	32, 381, 39
Specialised supplier (differentiated products)	382 excluding 3825, 383
Scale intensive (length of production runs)	34, 351, 352 excluding 3522, 355, 356, 371, 384 excluding 3845
Science based (rapid application of scientific advance)	3522, 3825, 3845, 385

1) By main factors affecting competitiveness according to OECD, Industrial Policy in OECD Countries: Annual Review 1993, Paris 1993, 84.

Table A.1

Regression results for trade of EU countries with 70 countries by product groups

- Exports -

Product groups	Yi $ß^a_{1x}$		yi $ß^a_{2x}$		Yj $ß^a_{3x}$		yj $ß^a_{4x}$		Dij $ß^a_{5x}$		ADJij $ß^a_{6x}$		EUij $ß^a_{7x}$		constant		adjusted R^2	standard error	degrees of freedom
All products	0.85	**	2.15	**	0.71	**	0.59	**	-0.79	**	0.48	*	0.48	**	-32.05	**	0.83	1.00	958
	(25.7)		(14.2)		(27.8)		(14.9)		(-17.1)		(2.4)		(3.8)		(-22.0)				
Manufacturing	0.85	**	2.18	**	0.69	**	0.60	**	-0.79	**	0.49	*	0.45	**	-32.36	**	0.82	1.02	958
	(25.3)		(14.1)		(26.7)		(14.8)		(-16.9)		(2.4)		(3.5)		(-21.8)				
Resource intensive	0.80	**	0.79	**	0.67	**	0.65	**	-0.97	**	0.49		0.46	**	-19.18	**	0.73	1.33	958
	(18.1)		(3.9)		(19.7)		(12.3)		(-15.8)		(1.8)		(2.7)		(-9.9)				
Food, beverages, tobacco	0.84	**	0.88	**	0.58	**	0.73	**	-0.79	**	0.45		1.28	**	-23.82	**	0.58	1.88	958
	(13.4)		(3.1)		(12.1)		(9.7)		(-9.1)		(1.2)		(5.4)		(-8.7)				
Resource intensive excl.food	1.25	**	1.04	**	0.76	**	0.82	**	-1.16	**	0.51		-0.07		-30.41	**	0.75	1.53	958
	(24.7)		(4.5)		(19.5)		(13.5)		(-16.4)		(1.7)		-(0.4)		(-13.6)				
Labour intensive	1.27	**	1.50	**	0.64	**	0.97	**	-0.99	**	0.30		0.55	**	-34.63	**	0.76	1.49	958
	(25.6)		(6.6)		(16.8)		(16.3)		(-14.4)		(1.0)		(2.9)		(-15.9)				
Specialised supplier	0.97	**	4.47	**	0.74	**	0.55	**	-0.71	**	0.46		0.42	*	-58.11	**	0.76	1.41	958
	(20.7)		(20.8)		(20.4)		(9.7)		(-10.9)		(1.6)		(2.4)		(-28.2)				
Scale intensive	0.96	**	3.14	**	0.75	**	0.51	**	-0.86	**	0.55	*	0.40	**	-43.47	**	0.79	1.23	958
	(23.5)		(16.8)		(23.9)		(10.4)		(-15.2)		(2.2)		(2.6)		(-24.2)				
Science based	0.94	**	3.68	**	0.75	**	0.72	**	-0.70	**	0.24		0.67	**	-52.99	**	0.68	1.73	958
	(16.4)		(14.0)		(17.0)		(10.4)		(-8.8)		(0.7)		(3.0)		(-21.0)				

Note: t-values in parentheses, ** indicates significance at 99 % level, * indicates significance at 95 % level.

Source: Own calculations, for method see text.

Table A.1 continued

Regression results for trade of EU countries with 70 countries by product groups

- Imports -

Product groups	Yi ß a 1m		yi ß a 2m		Yj ß a 3m		yj ß a 4m		Dij ß a 5m		ADJij ß a 6m		EUij ß a 7m		constant		adjusted R^2	standard error	degrees of freedom
All products	1.12	**	0.37		0.84	**	0.62	**	-0.59	**	0.69	*	0.48	**	-21.75	**	0.73	1.40	958
	(24.3)		(1.7)		(23.5)		(11.1)		(-9.2)		(2.5)		(2.7)		(-10.7)				
Manufacturing	1.16	**	0.37		0.95	**	0.81	**	-0.63	**	0.73	*	0.79	**	-25.64	**	0.71	1.64	958
	(21.2)		(1.5)		(22.7)		(12.4)		(-8.3)		(2.2)		(3.8)		(-10.7)				
Resource intensive	1.31	**	0.22		0.79	**	0.57	**	-0.55	**	0.94	*	1.21	**	-24.27	**	0.59	2.02	958
	(19.5)		(0.7)		(15.3)		(7.1)		(-5.9)		(2.3)		(4.7)		(-8.2)				
Food, beverages, tobacco	1.23	**	0.01		0.96	**	0.49	**	-0.01		1.74	**	2.71	**	-29.62	**	0.53	2.40	958
	(15.4)		(0.0)		(15.6)		(5.1)		(-0.1)		(3.6)		(8.9)		(-8.4)				
Resource intensive excl.food	1.37	**	0.65		1.00	**	0.70	**	-1.08	**	0.52		0.34		-30.85	**	0.59	2.37	958
	(17.5)		(1.8)		(16.5)		(7.4)		(-9.9)		(1.1)		(1.1)		(-8.9)				
Labour intensive	1.07	**	1.40	**	1.24	**	0.73	**	-0.20	*	1.40	**	1.73	**	-42.82	**	0.58	2.42	958
	(13.3)		(3.8)		(20.0)		(7.5)		(-2.0)		(2.9)		(5.7)		(-12.1)				
Specialised supplier	1.19	**	0.86	*	1.27	**	1.81	**	-0.84	**	0.67		1.01	**	-44.83	**	0.72	2.34	958
	(15.3)		(2.4)		(21.1)		(19.4)		(-7.7)		(1.4)		(3.4)		(-13.1)				
Scale intensive	1.27	**	0.38		1.37	**	1.58	**	-0.98	**	0.45		0.77	**	-38.43	**	0.73	2.26	958
	(17.0)		(1.1)		(23.6)		(17.5)		(-9.4)		(1.0)		(2.7)		(-11.6)				
Science based	1.26	**	0.85	*	1.25	**	1.93	**	-0.43	**	0.82		1.51	**	-50.57		0.68	2.55	958
	(14.9)		(2.2)		(19.3)		(19.0)		(-3.7)		(1.6)		(4.7)		(-13.6)				

Note: t-values in parentheses, ** indicates significance at 99 % level, * indicates significance at 95 % level.

Source: Own calculations, for method see text.