International Network for Economic Research

Working Paper 2008.2

Asymmetries in Heterogeneous Integrated Areas:

Evidence from Intra-EU Sectoral Trade

by

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Abstract

This paper estimates gravity models for both directions of trade between the EU-15 and the CEEC-10. The two groups form a heterogeneous integrated area (EU-27) with respect to country size, income levels, relative factor endowments and a different history of economic systems. The estimation was conducted on industries with different degrees of scale economies and factor-intensities in the presence of both spatial (distance and borders) and non-spatial (Eastern enlargements and Euro membership) trade costs. The results highlight the asymmetry in intra-bloc trade when the latter is heterogeneous: country size, income, factor endowments and the various trade barriers or facilitators are found to be significant determinants of intra-EU trade but to an extent that is country and industry-specific. The results also show how this heterogeneity eliminates the equivalence between exports and imports as the dependent variable in gravity models and makes the results sensitive to the definition of the bilateral flows to be estimated.

Keywords: asymmetry, gravity model, trade, EU enlargement

JEL: F14, F15

* The comments of the participants at the 7th European Economics and Finance Society Annual Conference (University of Economics, Prague, Czech Republic), the 9th International Network for Economic Research Annual Conference (Loughborough University, UK) and the Institutions and Policies for the New Europe Conference (Portoroz, Slovenia) on previous versions of the paper are gratefully acknowledged. Thanks are also due to Tomasz Brodzicki, Subrata Ghatak, Henry Overman, José García Solanes and Jan Van Hove for useful suggestions that contributed to the improvement of the paper. The usual disclaimer applies.

1 Introduction

The globalisation phenomenon has been accompanied by a great deal of regionalisation, whereby countries have joined regional trade blocs with varying degrees of heterogeneity. Two of the most important regional trade blocs, the NAFTA in the American continent and the EU in the European continent, integrate countries at different levels of development. In the case of the EU, such heterogeneity has recently increased to a new level following the May 2004 and January 2007 enlargements, as ten of the twelve new members are Central and Eastern European Countries (CEECs)[1] that have been through a deep process of economic transition since the early 1990s. This process included the progressive liberalisation of East-West trade under bilateral free trade agreements - the Europe Agreements - signed between the EU and each of the CEECs. However, such liberalisation did not produce uniform results either at the country or at the industry level. More specifically, not only the CEECs have been trading far more with the richer than with the poorer EU-15, but also the Europe Agreements initially sheltered the so-called sensitive sectors from liberalisation (Baldwin 1994).

The uneven impact of East-West trade liberalisation is very much linked to the different characteristics of the integrating countries and of the industries involved in the liberalisation process. Given those characteristics, trade in heterogeneous industries within a heterogeneous EU-27 can be expected to be determined differently across countries and industries. In fact, the relative role of various determinants of trade, such as size, income and factor endowments, in determining trade patterns has been the subject of debate in the literature (Davis 2000). It is now consensual that, although relative factor endowments are important, country size also plays a role due to the existence of economies of scale in production. Earlier cross-section studies focussing on East-West trade, such as Hamilton and Winters (1992), Havrylyshyn and Pritchett (1991) and Winters and Wang (1992), have concluded that geographical distance was a main determinant of East-West trade. These studies used a simple aggregate gravity model, later improved by using only EU and CEEC data to compute the gravity parameters (Fidrmuc 1998

and Buch and Piazolo 2001), by incorporating the Krugman (1991) assumption that proximity increases trade because it decreases transport costs (Maurel and Cheikbossian 1998) or by considering both geographical and economic distances (Vittas and Mauro 1997). On the other hand, the uneven pace of transition in the new member countries has also determined the extent of trade integration, with those that completed transition sooner also integrating their trade with the EU-15 to a greater extent (Papazoglou et al. 2006). This relationship was strengthened by the complementarity between East-West trade and factor flows (Marques 2008).

Although the literature has realised that various sources of heterogeneity are at play in East-West trade, it has not so far studied explicitly how the various determinants of trade differ with respect to their impact on the two directions of East-West flows, that is, on exports and imports. On the contrary, the gravity model literature on East-West trade flows has used exports and imports more or less equivalently. The aim of this paper is to show that, in a heterogeneous trade bloc such as the EU-27, the various determinants of trade will have an asymmetric impact depending on the direction of the trade flows. This is done by estimating gravity models of export and import flows between the old (EU-15) and the new (CEEC-10) member countries with different size, income levels, factor endowments, spatial and non-spatial trade costs, in industries with different degrees of economies of scale and factor-intensity. The distinction between spatial and non-spatial trade costs is important, as even if non-spatial trade costs can be compressed to zero with full integration, spatial trade costs will persist and give rise to a hub effect.[2] The estimation results are then used to analyse the asymmetric impact of each determinant of trade on bilateral flows between the EU-15 and the CEEC-10. The existence of asymmetry highlights the need to ponder which trade flows are used as dependent variable in the estimation of gravity equations for heterogeneous trade partners, as the results change with the direction of bilateral trade flows between member countries in different stages of development.

The present paper improves on previous gravity studies of East-West trade in several ways. First, the sample period is 1995-2006, comprising both the transition period and the

enforcement of the Europe Agreements. Hence it is a better indicator of normalised trade patterns than the pre-transition, pre-liberalisation data used in most of the earlier studies. Second, the industry-level approach followed here allows the study of how the degree of asymmetry in the direction of flows varies with different factor intensities and degrees of scale economies, which most previous studies conducted at an aggregate level could not do. Third, the use of panel data allows taking into account sources of heterogeneity and idiosyncrasy, producing unbiased results, as shown by Matyas (1997, 1998) and Breuss and Egger (1999). In particular, the use of Panel-Corrected Standard Errors (PCSEs) incorporates the assumption that the disturbances are heteroskedastic (each country has its own variance) and contemporaneously correlated across countries (each pair of countries has their own covariance). This assumption seems to be especially suited for any study involving heterogeneous trading partners.

Section 2 presents the gravity model specifications to be estimated and summarises the results of these estimations, discussing the role of various factors in explaining sectoral trade. The main findings can be summarised as follows. First, market size, income and relative factor endowments are all important determinants of both directions of trade but, for the last two, to an extent that differs between the EU-15 and the CEEC-10. Second, distance and borders with non-EU countries are significant barriers to trade between the EU-15 and the CEEC-10, whereas internal EU borders significantly promote it. Third, the Euro membership boosted exports and reduced imports, but EU membership did not help the trade of the new member countries. It is important to note that tariffs had been progressively removed since the early 1990s, so the 2004 effect is mostly about non-tariff barriers, such as technical barriers and standards, which still act as constraints on trade with the new member countries but which they have to incur after EU membership. Finally, the results are generally sector-specific. Section 3 examines the level of asymmetry in the estimation coefficients across exporters and importers and discusses the role of each explanatory variable in giving rise to an asymmetric behaviour. Section 4 concludes.

2 Empirical specifications and results

In the gravity literature, both export and import equations are commonly used. If the exporter and importer coefficients were symmetric, it would be indifferent to consider either trade flow. Otherwise, choosing one over the other may lead to biases in estimates. In order to disentangle the relative impact of country size, income levels and factor endowments of heterogeneous exporters and importers, this paper estimates both the export and the import equations for the case of trade between the EU-15 and the CEEC-10.

The paper's empirical analysis relies on the type of generalised gravity equation proposed by Bergstrand (1989) that integrates in one reduced form equation both increasing returns to scale with monopolistic competition and the factor-proportions theory of trade. Similar efforts have been carried out more recently by Davis (1995) and Davis and Weinstein (1999, 2003), who also show that the gravity equation is compatible with both new trade theory and factor-proportions trade theory. Hence, country size proxied by GDP (*Y*) and factor endowments are both important determinants of trade flows. Given that transition economies are known to have higher levels of human capital than would be expected from their income level, it is important to account for both physical and human capital as factor endowments. In this paper, physical capital per capita and human capital per capita stand for relative factor endowments of physical capital (*k*) and human capital (*hk*) on the exporter's side. Whilst physical capital per capita is measured by GDP per capita, human capital per capita is measured by the fraction of the country's population with tertiary education studies. On the importer's side, the per capita income level (*y*) is taken to represent the average purchasing power in the economy which determines demand patterns. According to the Linder hypothesis (Bergstrand 1990), demand patterns are important in determining bilateral intra-industry trade. Furthermore, in gravity models a number of trade impediments and facilitators need to be taken into account. The most prominent are transport costs which depend on distance (*D*), internal and external EU borders (*B* and *EB* respectively), EU membership (*EU*) and Eurozone (*EMU*) membership.

Accordingly, the log-linear gravity equation specification to be estimated for exports of sector *k* products from country *i* into country *j* in year *t* takes the form:

$$\ln X_{ijt}^{k} = \beta_{0}^{k} + \beta_{1}^{k} \ln Y_{it} + \beta_{2}^{k} \ln k_{it} + \beta_{3}^{k} \ln hk_{it} + \beta_{4}^{k} \ln Y_{jt} + \beta_{5}^{k} \ln y_{jt} + \\ + \beta_{6}^{k} \ln D_{ij} + \beta_{7}^{k} \ln B_{ij} + \beta_{8}^{k} \ln EB_{ij} + \beta_{9}^{k} EU_{ijt} + \beta_{10}^{k} EMU_{ijt} + u_{ijt}^{k} \quad (1)$$

Export flows are expected to be directly related to the market size of the trading partners which measures the importance of increasing returns to scale and monopolistic competition, meaning that more varieties and higher quantities of each one can be produced in larger markets. The impact of factor endowments on exports should follow the prescription of factor-proportions theory: increase (decrease) the exports of sectors relatively intensive in the factor in which a country is relatively abundant (scarce). Moreover, according to the Linder hypothesis, demand patterns change with income levels such that demand for luxury goods increases with income and demand for necessities decreases with income. Finally, exports are expected to be inversely related to physical distance and non-EU borders but positively related to the existence of common internal EU borders and EMU membership. The impact of EU membership in the years 2004-06 should be accounted for, however it only applies to CEEC-8 (Bulgaria and Romania acceded in 2007) and, given that trade liberalisation has been an ongoing process since the early 1990s, it is an empirical question whether there is any significant "2004 effect" for CEEC-8.

The log-linear gravity equation specification to be estimated for imports of sector *k* products into country *i* from country *j* in year *t* is simply the reverse flow to equation (1), with all variables defined as before:

$$\ln M_{ijt}^{k} = \ln X_{jit}^{k} = \beta_{0}^{k} + \beta_{1}^{k} \ln Y_{jt} + \beta_{2}^{k} \ln k_{jt} + \beta_{3}^{k} \ln hk_{jt} + \beta_{4}^{k} \ln Y_{it} + \beta_{5}^{k} \ln y_{it} + \\ + \beta_{6}^{k} \ln D_{ij} + \beta_{7}^{k} \ln B_{ij} + \beta_{8}^{k} \ln EB_{ij} + \beta_{9}^{k} EU_{ijt} + \beta_{10}^{k} EMU_{ijt} + u_{ijt}^{k} \quad (2)$$

From the point of view of trade theory, equations (1) and (2) allow the measurement of three important effects: (i) the size effect given by β_{1}^{k} for the exporter and β_{4}^{k} for the importer;

(ii) the factor endowments effect given by β_2^k for physical capital and by β_3^k for human capital; (iii) the income effect given by β_5^k. Which effect is predominant from an economic point of view is an empirical question.

Equations (1) and (2) are estimated for bilateral trade flows between the members of the EU-15 and of the CEEC-10. Exports are defined from the EU-15 to the CEEC-10 and imports are defined in the reverse. Hence in equation (1) the exporters are the wealthier EU members and vice-versa for equation (2). Estimations are run for several industries (Chemicals, Machinery, Transport Equipment, Metals, Leather & Footwear, Minerals, Textiles & Clothing and Wood Products) and also for total bilateral exports and imports to establish the average (reference) behaviour. The data appendix describes in detail the data sources, sample and the construction of each variable, specifying also the factor intensities and extent of scale economies in each industry. Estimation of equations (1) and (2) is carried out through the Prais-Winsten regression with country-specific AR(1) terms and correlated Panel Corrected Standard Errors (PCSEs), which assumes that the disturbances are heteroskedastic (each country has its own variance) and contemporaneously correlated across countries (each pair of countries has their own covariance). The full estimation results are shown in Table 1 for exports and in Table 2 for imports.

[Tables 1 and 2 here]

The exports results in Table 1 differ from the imports results in Table 2 in several ways. Hence it is not indifferent to use exports or imports as the dependent variable in gravity equations when the bilateral trading partners are heterogeneous. Market size has a robustly positive impact on trade and the larger EU countries tend to trade more than proportionally to their size. There is a home market effect when trade increases more than proportionally with the home market size. In net terms this is taken as meaning that the size coefficient is larger for the exporter than for the importer (Feenstra 1998). The home market effect is the rule for EU-15

exporters, but for CEEC-10 a home market effect is not found on the whole and it is restricted to only half of the industries.

The income (GDP per capita) coefficient is not significant on average because it follows an industry-specific behaviour. For EU-15 importers it is significantly positive in three industries (Machinery, Textiles & Clothing and Wood Products) and significantly negative in three others (Chemicals, Leather & Footwear and Minerals). For CEEC-10 importers, higher income increases imports in two industries (Chemicals and Metals) and decreases imports in four industries (Leather & Footwear, Machinery, Transport Equipment and Wood Products). So the range of industries which can be considered as luxury goods (increasing with income) or necessities (decreasing with income) does not coincide for the two country groups. This result is in accordance to the idea that vertical intra-industry trade predominates between EU-15 and CEEC-10, which can explain why the same industry can be simultaneously seen as luxury and necessity, depending on the exporter and importer. As a consequence, the two groups can be said to be exporting different quality varieties in different industries.

Countries are expected to be net exporters of the goods which are relatively intensive in the factors they have in relative abundance and net importers otherwise. Overall, the EU-15 exports increase with relative endowments of physical and human capital endowments. At the industry level, this aggregate result is driven by Chemicals and Machinery and also Metals and Transport Equipment in the case of physical capital. The exports of Leather & Footwear actually decrease with capital endowments. The results are more mixed for the CEEC-10, with total exports increasing only with human capital endowments and equal number of industries reacting either positively (Machinery, Textiles & Clothing and Wood Products) or negatively (Chemicals, Leather & Footwear and Minerals) to physical capital endowments. These results are in line with two empirical observations on transition economies: they have relatively high human capital endowments given their income level and they chronically suffer from a problem with outdated capital stock that has been circumvented mostly due to large amounts of FDI.

One of the features of equations (1) and (2) is the distinction between spatial and non-spatial trade barriers. Distance and borders make up spatial barriers whereas the EU and EMU membership dummies form non-spatial trade barriers, or their degree of removal through economic integration. The distance variable is on the whole significantly negative: trade tends to decrease with distance as the latter increases transport costs and, it is also argued, cultural and informational barriers. The coefficients found to be between -0.6 and -2.6 are in line with common results in the literature. The results provide preliminary evidence that distance has a differentiated impact across sectors, although data on sectoral transport costs would be necessary to evaluate the sectoral impact of distance more precisely. Besides the distance effect tends to be higher for the CEEC-10, which is in line with Fratianni and Kang (2006), who found larger distance coefficients in gravity models for less developed countries.

The other component of spatial trade barriers is the existence (or not) of a common border either with the EU-15 or with non-EU countries. There is a large literature on gravity models according to which countries that share a common border trade more. For example, Kandogan (2008) finds that the border effect for CEEC-10 is country and industry-specific but on the whole having good external links benefits trade. In this paper, it is found that on the whole sharing a border with EU-15 countries increases trade in both directions. Sharing a border with non-EU countries decreases overall exports to the EU-15 but it increases imports from the EU-15 in five industries, showing that the CEEC-10 can be a link between the EU-15 and non-members further east. An interesting argument is put forward by Davis (2000) according to which product differentiation tends to reduce the magnitude of the border effect, this being strongest within homogeneous goods categories. It could be argued that the degree of differentiation increases with skill-intensity. However, more research would be necessary on this issue.

The removal of non-spatial trade barriers under economic integration is proxied by EU and Euro zone membership. On the whole, Euro zone membership had a positive impact on exports to the CEEC-10 but not on imports. This could be linked to the initial depreciation of

the Euro, but as it appreciated more recently the result could be overturned. The positive impact of the Euro on exports is in line with Rose (2000), who found a very large, significant and robust trade effect of currency unions. DeGrauwe and Skudelny (2000) provided further evidence on a potential positive impact of the EMU on trade.

Finally, EU membership in 2004 has not had a significant aggregate impact as trade liberalisation had been in course since the early 1990s. The remaining barriers are non-tariff barriers, such as technical barriers and standards, and these are highly industry-specific. In fact, EU membership increased the burden on adhering to standards and this may explain a negative impact of membership on some industries.

3 Asymmetry in exporter and importer coefficients

If the EU-27 was a homogeneous bloc, where member countries had similar characteristics, bilateral net exports would tend to zero independently of differences in the coefficients. That is, bilateral flows would be balanced and intra-EU trade would be symmetric even if the impact of the various determinants of trade differed. However, the EU is highly asymmetric, and so the behaviour of the coefficients is relevant as it indicates which sources of asymmetry are more important in intra-EU trade and in which industries they play a bigger role. In particular, the larger countries and those with higher relative physical and human capital endowments have a double advantage in their foreign trade.

Table 3 summarizes the role of size, factor endowments and income in explaining trade flows in the EU-27. The size effect is consistently positive in all cases, but the contribution of endowments and income is country and industry-specific. Overall, income is not a significant determinant of trade flows in the EU-27, although it matters for six industries in each group (not the same ones however), and whereas in the EU-15 trade flows are influenced by both physical and human capital, for the CEEC-10 the result is restricted to human capital. Also in the case of

factor endowments the industry level response differs across industries and between the EU-15 and the CEEC-10 for each industry.

[Table 3 here]

Graphically, symmetric exporter and importer coefficients would lie on a 45 degree line (Figures 1-10). This, however, is not the rule. For total trade flows, size coefficients are nearly symmetric, but symmetry breaks down at the industry level. Country size is relatively more important for the EU-15 countries (country i) as shown by most points in Figures 1 and 2 lying below the 45 degree line. Similarly, the relative capital endowment is more important for the EU-15 but the relative human capital endowment is more important for the CEEC-10 (Figures 3 and 4). For total trade, however, exports of the EU-15 increase with physical capital endowments and those of the CEEC-10 increase with human capital endowments to a similar extent (with the exception of Leather & Footwear which behaves in the opposite way). Hence it could be argued that the EU-15 countries have an advantage in capital-intensive goods and the CEEC-10 countries have an advantage in skill-intensive goods. The impact of income on imports, although symmetric for the total, is also asymmetric at the industry level, with variation from negative to positive indicating the different positioning of the traded goods in the consumption scale (Figure 5).

[Figures 1-10 here]

Regarding the variables impeding or facilitating trade, their impact is also asymmetric (Figures 6-10). The impact of transporting the same sector goods from country i to country j differs from transporting them from country j to country i (Figure 6). On average, it is lower (in absolute terms) for exports from the EU-15 than for those from the CEEC-10. This result could imply that the EU-15 exports products within the same industry that are subject to less costly transport or for which lower production costs make transport costs less important. The impact of internal and external borders is industry-specific, with common internal EU borders benefitting trade in most cases and common external EU borders benefitting the EU-15 more than the CEEC-10 (Figures 7 and 8). This finding reinforces the idea that the CEEC-10 countries provide

a link between the EU-15 and non-member countries further east. The impact of EU accession was nil on average as trade liberalisation had started in the early 1990s with the removal of tariff barriers, but it is industry-specific as these are affected differently by technical barriers and standards (Figure 9). Finally, Euro membership for EU-15 countries had a biased impact in favour of exports but the outcomes are also industry-specific (Figure 10).

4 Conclusions

This paper estimates a sectoral gravity model of trade within a heterogeneous regional trade area, the EU-27, comprised of countries with very different income levels and different economic systems histories. The estimated coefficients are used to draw conclusions on the determinants of bilateral trade patterns among the member countries of the enlarged EU in sectors with different degrees of scale economies and skill-intensities. The bilateral trade flows are defined as exports (or imports) between a higher-income (EU-15) and a lower-income country (CEEC-10). The results reveal important differences between the export and the import equations and across industries. They further show how a high degree of heterogeneity in the sample has implications for the estimation of gravity models of bilateral trade flows. On the whole, sample heterogeneity implies asymmetry in the results.

Market size, income and factor endowments are important determinants of intra-EU trade. Country size increases trade flows more than proportionally and similarly for relative physical capital endowments in the EU-15 countries and for human capital endowments in the CEEC-10 countries. Income, human capital endowments in the EU-15 countries and physical capital endowments in the CEEC-10 countries have a less than proportional effect. The paper's results come as a support of hybrid theories of trade that incorporate elements from both the more traditional trade theory based on factor endowments and the new trade theory based on economies of scale, although highlighting that the relative importance of the theories varies across countries and industries. Furthermore, among the variables that represent impediments or

facilitators of trade, distance decreases trade more than proportionally, whereas borders and integration (EU membership for the CEEC-10 and EMU membership for the EU-15) have a less than proportional effect. Especially in an integrated area, where non-spatial trade barriers are progressively removed, this result indicates that there is still an important role for policies of infrastructure improvement that decrease the market access gap between the EU-15 and the new member countries. Moreover, the distinction between core and periphery in the EU context seems relevant as market size together with transport costs are found to be the most important determinants of intra-EU trade.

The analysis carried out in this paper can be applied to other regional trade blocs, such as NAFTA, CAFTA, MERCOSUR and ASEAN. It is to be expected that the results would be the more asymmetric the greater the development gap among the partner countries. Yet the knowledge of those asymmetries is important to understand the sources of trade imbalance within regional trade blocs.

Endnotes

[1] In this paper the CEECs are the group formed by Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic, Slovenia, Bulgaria and Romania.

[2] The concept of hub effect was introduced by Krugman (1993) in a three country model: a country is said to be a hub if the spatial trade costs between itself and each of the two other countries are lower than the spatial trade costs between the latter two.

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Tables and Figures

Table 1: Regression results for exports from the EU-15 (country *i*) into the new member countries (country *j*) – equation (1)

	Chemicals	*Leather & footwear*	*Machinery*	*Metals*	*Minerals*	*Textiles & clothing*	*Transport Equipment*	*Wood Products*	*Total*
Y_{it}	1.177***	1.630***	0.913***	1.302***	1.639***	1.513***	1.977***	1.098***	0.947***
	(0.032)	(0.086)	(0.062)	(0.076)	(0.073)	(0.040)	(0.067)	(0.123)	(0.037)
Y_{jt}	0.973***	0.774***	1.067***	1.070***	0.958***	1.006***	0.823***	0.893***	0.950***
	(0.058)	(0.089)	(0.065)	(0.077)	(0.067)	(0.100)	(0.082)	(0.076)	(0.029)
k_{it}	2.235***	-2.061***	3.648***	1.017***	-0.103	0.290	1.515***	0.611	1.594***
	(0.231)	(0.403)	(0.266)	(0.391)	(0.541)	(0.406)	(0.378)	(0.530)	(0.179)
hk_{it}	0.245**	0.382**	0.269**	0.261	0.003	0.119	0.030	0.139	0.223**
	(0.117)	(0.172)	(0.120)	(0.167)	(0.114)	(0.192)	(0.158)	(0.133)	(0.104)
y_{jt}	1.346***	-3.183***	-1.469***	0.715**	-0.544	-0.558	-2.169***	-2.447***	-0.010
	(0.288)	(0.358)	(0.480)	(0.351)	(0.646)	(0.426)	(0.434)	(0.419)	(0.248)
D_{ij}	-0.971***	-2.611***	-0.600***	-1.480***	-1.883***	-1.365***	-2.278***	-1.809***	-0.913***
	(0.125)	(0.192)	(0.209)	(0.212)	(0.186)	(0.293)	(0.179)	(0.167)	(0.097)
B_{ij}	0.446***	-0.688*	0.798*	0.534**	0.001	0.475*	-0.410	0.071	0.560***
	(0.150)	(0.358)	(0.432)	(0.239)	(0.199)	(0.250)	(0.260)	(0.251)	(0.130)
EB_{ij}	0.081	0.429***	-0.301**	0.265*	0.589***	0.795***	0.924***	0.108	0.172
	(0.084)	(0.163)	(0.128)	(0.139)	(0.178)	(0.175)	(0.233)	(0.236)	(0.107)
EU_{ijt}	-0.182**	0.178	-0.161**	0.033	-0.062	-0.104	0.162	-0.068	-0.065
	(0.071)	(0.122)	(0.074)	(0.119)	(0.103)	(0.121)	(0.109)	(0.109)	(0.070)
EMU_{ijt}	1.135***	-0.419	0.759***	0.614***	0.636***	0.433*	0.081	-0.104	0.616***
	(0.100)	(0.304)	(0.066)	(0.121)	(0.142)	(0.234)	(0.110)	(0.249)	(0.052)
Cons	-59.752***	-4.341	-63.441***	-48.845***	-37.669***	-42.439***	-51.437***	-24.566***	-40.935***
	(3.629)	(6.246)	(4.522)	(6.090)	(4.697)	(8.089)	(5.238)	(6.346)	(3.161)
Obs	1624	1544	1622	1623	1598	1623	1571	1601	1624
R^2	0.9925	0.9494	0.9838	0.9778	0.9725	0.9712	0.9639	0.9572	0.9971
Chi^2	5909.95***	1601.81***	2516.62***	23038.87***	4224.78***	3946.21***	7538.15***	5608.22***	11845.78***

*Note: All regressions carried out using Prais-Winsten Regression with Panel-specific AR(1) and Correlated Panels Corrected Standard Errors. Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.*

Table 2: Regression results for imports into the EU-15 (country *i*) from the new member countries (country *j*) – equation (2)

	Chemicals	*Leather & footwear*	*Machinery*	*Metals*	*Minerals*	*Textiles& clothing*	*Transport Equipment*	*Wood Products*	*Total*
Y_{jt}	1.461***	1.239***	1.061***	1.359***	0.745***	1.284***	1.415***	1.257***	1.009***
	(0.090)	(0.115)	(0.075)	(0.113)	(0.096)	(0.063)	(0.086)	(0.090)	(0.035)
Y_{it}	1.304***	1.039***	1.845***	1.907***	1.403***	0.886***	1.862***	1.222***	1.096***
	(0.075)	(0.136)	(0.115)	(0.167)	(0.081)	(0.087)	(0.130)	(0.130)	(0.062)
y_{it}	-0.960*	-0.815**	1.529***	-0.113	-0.577*	1.083***	-0.221	2.370***	0.225
	(0.575)	(0.347)	(0.375)	(0.575)	(0.303)	(0.208)	(0.522)	(0.395)	(0.157)
k_{jt}	-0.051	-0.276*	1.052***	-0.330	-0.199*	-0.658***	1.175***	0.245*	-0.052
	(0.176)	(0.160)	(0.201)	(0.301)	(0.120)	(0.232)	(0.152)	(0.138)	(0.063)
hk_{jt}	1.879***	-0.753	0.537	1.783***	0.803	0.179	0.258	2.811***	1.626***
	(0.685)	(0.867)	(0.362)	(0.606)	(0.492)	(0.533)	(0.406)	(0.704)	(0.178)
D_{ij}	-2.107***	-1.557***	-1.224***	-2.229***	-2.060***	-1.544***	-2.304***	-1.364***	-1.213***
	(0.359)	(0.407)	(0.225)	(0.295)	(0.143)	(0.141)	(0.242)	(0.168)	(0.113)
B_{ij}	-0.634	1.084**	0.547	-0.606	-0.052	0.364	-0.501	0.949***	0.436**
	(0.479)	(0.527)	(0.417)	(0.396)	(0.272)	(0.257)	(0.468)	(0.265)	(0.200)
EB_{ij}	-0.319	0.587**	0.117	-0.151	-0.922***	0.170	-0.487**	0.370*	-0.239*
	(0.213)	(0.258)	(0.227)	(0.240)	(0.239)	(0.218)	(0.241)	(0.221)	(0.139)
EU_{ijt}	-0.041	-0.541***	-0.201**	0.132	-0.163**	-0.277***	0.077	-0.294***	0.002
	(0.138)	(0.140)	(0.078)	(0.128)	(0.069)	(0.073)	(0.117)	(0.082)	(0.058)
EMU_{ijt}	-0.028	-0.453**	0.013	-0.103	-0.385**	0.089	0.001	-0.189	-0.015
	(0.180)	(0.194)	(0.190)	(0.201)	(0.174)	(0.110)	(0.175)	(0.134)	(0.089)
Cons	-34.243***	-21.182***	-72.948***	-50.813***	-18.276***	-34.409***	-58.897***	-70.941***	-31.549***
	(6.281)	(7.387)	(6.350)	(7.580)	(5.160)	(3.784)	(5.929)	(6.343)	(3.089)
Obs	1588	1518	1619	1596	1545	1613	1552	1611	1624
R^2	0.9547	0.9094	0.9718	0.9443	0.9543	0.9721	0.9353	0.9596	0.9943
Chi^2	2786.95***	3951.45***	2821.56***	2295.62***	8324.86***	8507.69***	7612.29***	1121.97***	11397.85***

*Note: All regressions carried out using Prais-Winsten Regression with Panel-specific AR(1) and Correlated Panels Corrected Standard Errors. Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.*

Figure 1: Exporter size coefficients for country *i* (Y_{it}, eq1) and for country *j* (Y_{jt}, eq2)

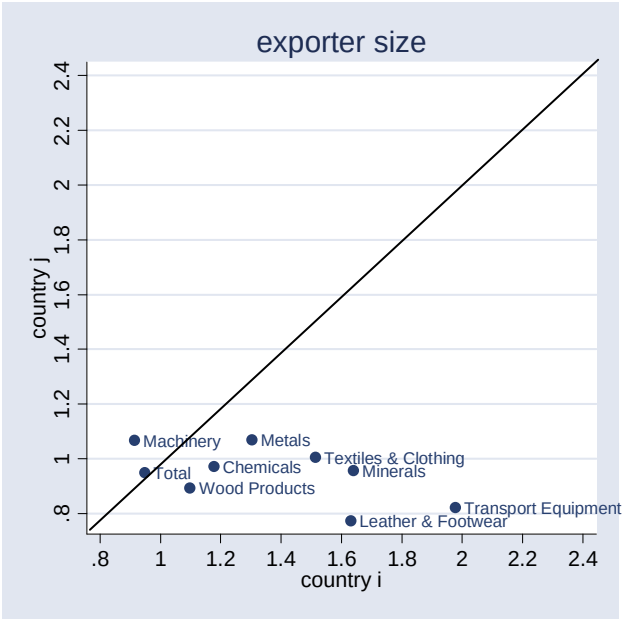

Figure 2: Importer size coefficients for country *i* (Y_{it}, eq2) and for country *j* (Y_{jt}, eq1)

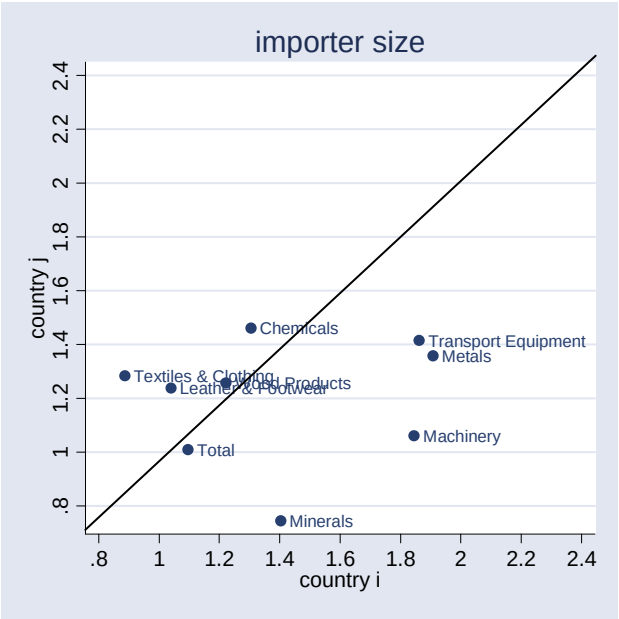

Figure 3: Relative capital endowment coefficients for country *i* (k_{it}) and for country *j* (k_{jt})

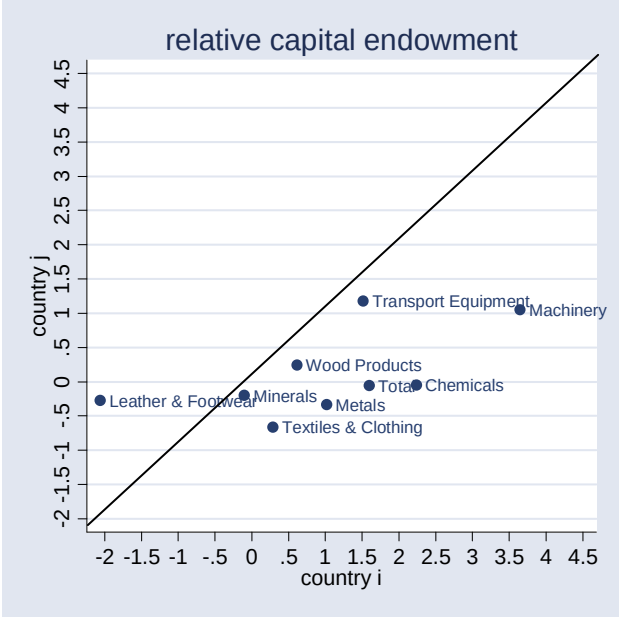

Figure 4: Relative human capital endowment coefficients for country *i* (hk_{it}) and for country *j* (hk_{jt})

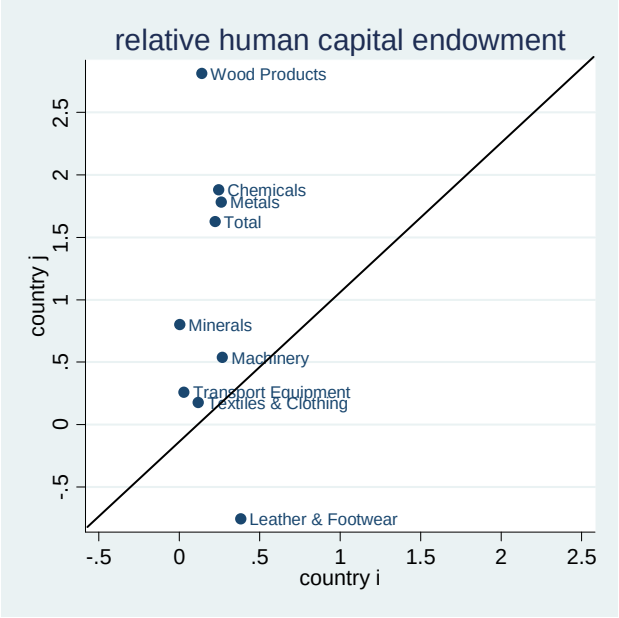

Figure 5: Income coefficients for country *i* (y_{it}) and for country *j* (y_{jt})

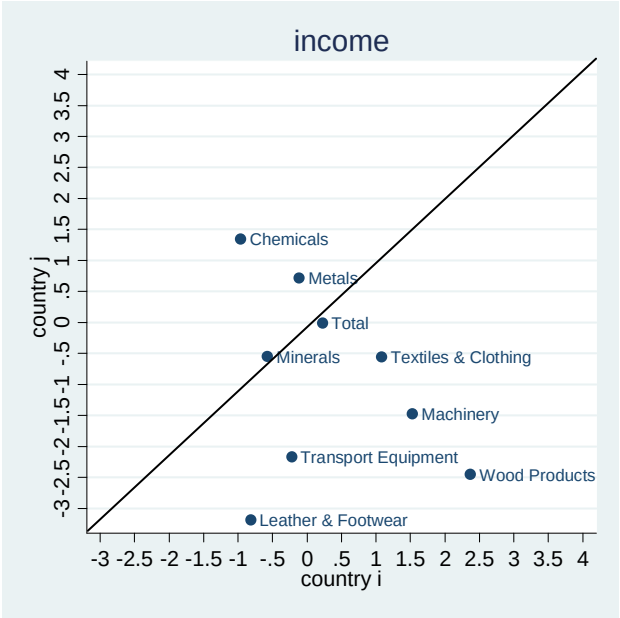

Figure 6: Distance coefficients for exports of country *i* (D_{ij}, eq1) and of country *j* (D_{ij}, eq2)

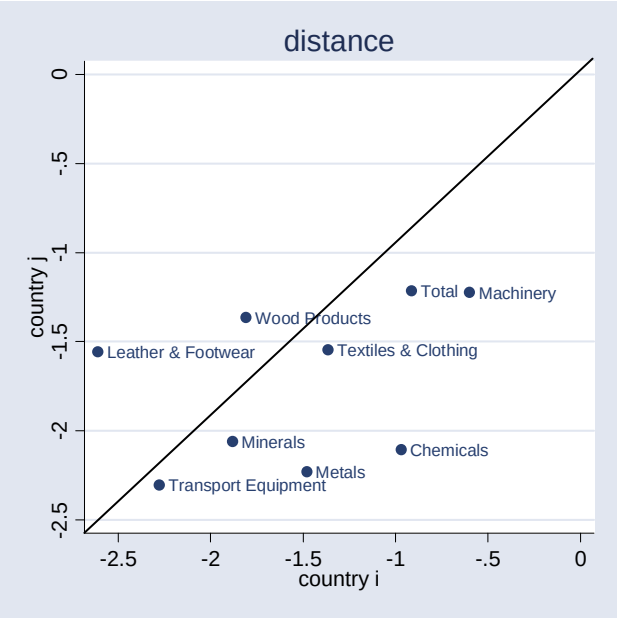

Figure 7: Border coefficients for exports of country *i* (B_{ij}, eq1) and of country *j* (B_{ij}, eq2)

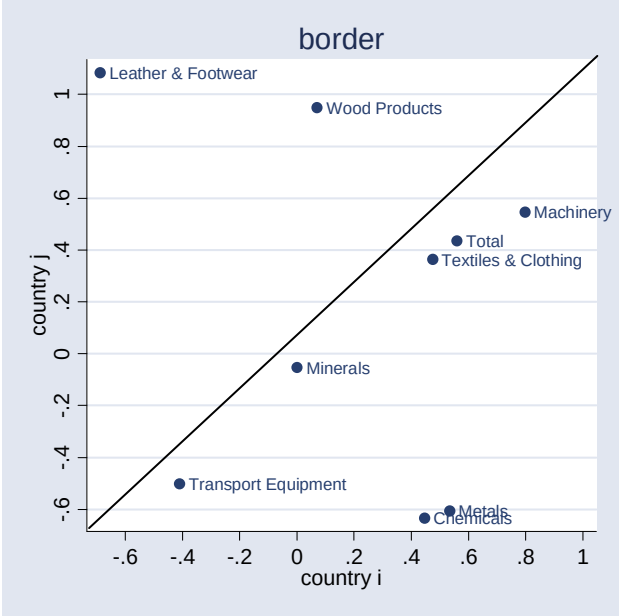

Figure 8: External border coefficients for exports of country *i* (EB_{ij}, eq1) and of country *j* (EB_{ij}, eq2)

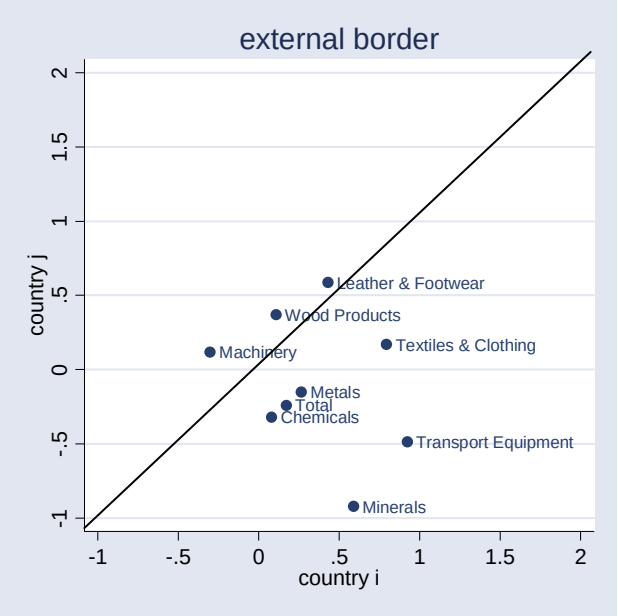

Figure 9: EU membership coefficients for exports of country *i* (EU_{ij}, eq1) and of country *j* (EU_{ij}, eq2)

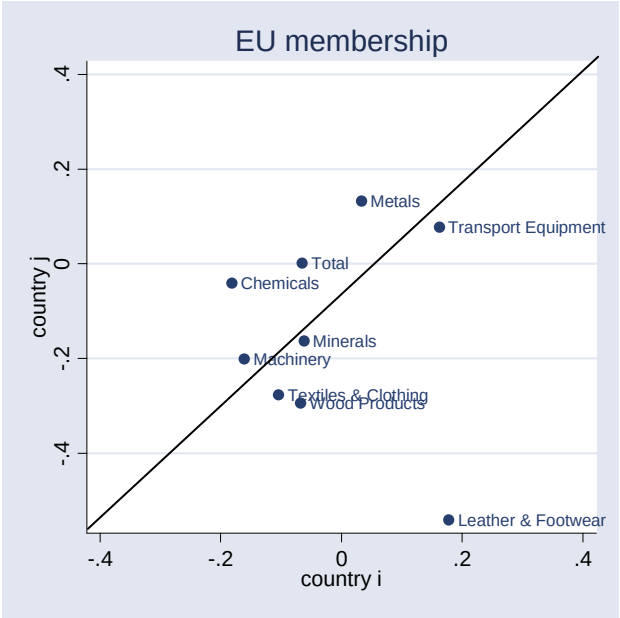

Figure 10: EMU membership coefficients for exports of country *i* (EMU_{ij}, eq1) and of country *j* (EMU_{ij}, eq2)

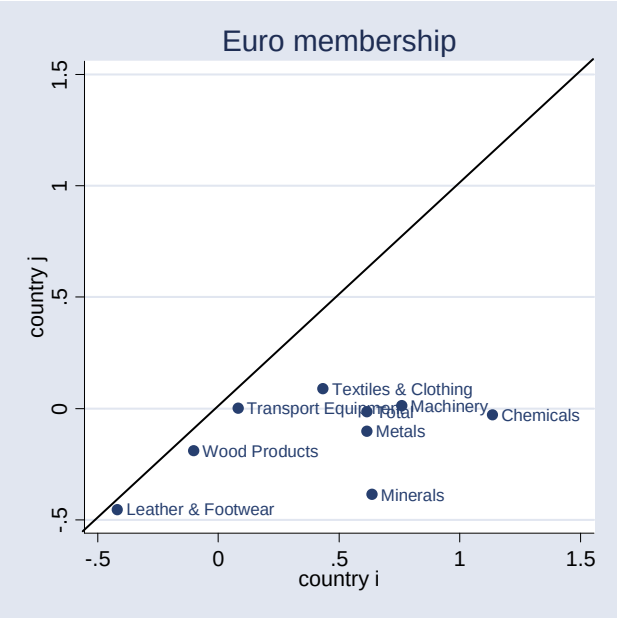

Table 3: Contribution of different theories of trade within the EU-27

	Chemicals	*Leather & footwear*	*Machinery*	*Metals*	*Minerals*	*Textiles & clothing*	*Transport Equipment*	*Wood Products*	*Total*
				EU-15					
(i) size effect	+	+	+	+	+	+	+	+	+
(ii) factor endowments effect (physical capital)	+	-	+	+	0	0	+	0	+
(ii) factor endowments effect (human capital)	+	+	+	0	0	0	0	0	+
(iii) income effect	-	-	+	0	-	+	0	+	0
				CEEC-10					
(i) size effect	+	+	+	+	+	+	+	+	+
(ii) factor endowments effect (physical capital)	0	-	+	0	-	-	+	+	0
(ii) factor endowments effect (human capital)	+	0	0	+	0	0	0	+	+
(iii) income effect	+	-	-	+	0	0	-	-	0

Data Appendix

Data is taken for trade flows between the EU-15 and the ten new member countries in the 1995-2006 period for the following aggregates of SITC Rev. 2 sectors: chemicals (5), leather products (61, 85), machinery (71-77), metals (67-69), minerals (66), textiles and clothing (65, 84), transport equipment (78, 79), wood products (63, 82) and total flows. Data on trade flows (value of exports and imports in Euros) was provided by the Eurostat COMEXT database. Data on population and GDP (given in Euros at constant prices) was taken from the Eurostat national statistics. Human capital is measured by the share of people with tertiary education studies in total population. This figure was obtained from the Barro-Lee dataset for 1995 and to this initial stock the yearly number of enrolments in tertiary education was added to obtain a time series for this variable. The enrolment data was taken from the UNESCO Education Statistics. Distance data was taken from CEPII and is measured in km between the partner countries' economic centres. These correspond to the capital city except for Germany (Hamburg is the city used). Countries are considered to share a common border when they share a land border or there is a thin body of water separating them (case of Finland and Estonia). The external border dummy takes the value of one when a country shares borders with non-EU countries (Finland and all the new member countries except the Czech Republic). The first Eastern enlargement took place in 2004 (during the sample period) and it is accounted for by means of a dummy variable taking a value of one after 2004 for the countries acceding in that year. Finally, the dummy for Eurozone membership takes the value one after 1998 for the Eurozone countries.

European averages of factor value added shares (Baldwin et al. 2000)

Sector	Unskilled labour ($1-\alpha-\mu$)	Skilled labour (α)	Capital (μ)	Implied HK/L	Implied K/L
Machinery	**0.478**	**0.313**	**0.210**	**0.655**	**0.439**
Chemicals	**0.438**	**0.278**	**0.285**	**0.635**	**0.651**
Transport equipment	**0.540**	**0.268**	**0.198**	**0.496**	**0.367**
Wood products	**0.530**	**0.245**	**0.228**	**0.462**	**0.430**
Other manufacturing	**0.553**	**0.240**	**0.205**	**0.434**	**0.371**
Metals	**0.565**	**0.233**	**0.203**	**0.412**	**0.359**
Minerals	**0.455**	**0.195**	**0.353**	**0.429**	**0.776**
Food products	**0.450**	**0.185**	**0.365**	**0.411**	**0.811**
Textiles	**0.595**	**0.175**	**0.235**	**0.294**	**0.395**
Leather products	**0.603**	**0.175**	**0.225**	**0.290**	**0.373**

European averages of economies of scale in manufacturing (Henriksen et al. 2001)

Sector	Internal economies of scale	External economies of scale (within country and cluster)
Textiles & Footwear	1.131	-0.044
Machinery & Electronics	1.007	0.047
Transport Equipment	1.214	-0.089