3. THE BALTIC SEA REGION'S ROLE IN TRADE INTEGRATION

Tiiu Paas, Egle Tafenau

Introduction

International trade is the most expedient economic factor in pushing economies into integration. International trade flows are often considered to be indicators of links between the economic centres of the region, thus representing connections between the economic and spatial units. In view of this, the present paper uses the approach based on implementing the law of gravity for the study of international trade flows and effects of regional integration on trade relations. Previous studies have shown that the gravity equation is a successful model for explaining regional trade patterns as it incorporates theoretical and empirical advantages related to modelling them (see Baldwin, 1994; Sen and Smith, 1995; Eichengreen and Irvin, 1998; Feenstra, 1998; Estevadeordal, Frantz and Taylor, 2002).

The paper aims to explore international trade flows of the countries involved in the EU eastward enlargement process, laying emphasis on analyzing the Baltic Sea region's (BSR) role in the EU eastward enlargement process. The effects of regional integration are handled as deviations from the volume of trade predicted by the baseline gravity model, which expresses the impact of traditional gravitational forces like the size of economy, level of economic development, and distance.

One task of the study is to prove the statement that the Baltic Sea region (BSR) countries form a special regional cluster of the countries that are involved in the EU enlargement process. Regional integration supports the development of bilateral trade relations and adjustment with the EU enlargement of the EU15 and the accession countries. In order to prove this statement, also examples of the regional pattern of foreign direct investments (FDI) are presented in the paper.

The fall of the Iron Curtain has remarkably changed the economic and spatial integration of the BSR and has affected both the transitional economies and the industrialized economies of the region (see also Bröcker and Herrmann, 2001; Cornett and Iversen, 1998). The positive integration effect of the countries around the Baltic Sea has been particularly significant in case of the small Baltic economies in transition (Estonia, Latvia and Lithuania). Due to a remarkable amount of FDIs coming from the capital abundant BSR countries to the Baltic States, and due to tight trade relations with the countries of the region, the Baltic States managed comparatively quickly to restructure their economies and to reorient their trade from East to West.

This chapter falls into three parts. Section 1 describes the current trade patterns of the BSR countries, emphasising the role of BSR in the processes of the Baltic States' trade integration. Section 2 views the theoretical foundations of using gravity equations for exploring international trade flows. Section 3 presents the main empirical results obtained by using the gravity approach for exploring the bilateral trade flows of the EU members countries, paying attention to defining the possible regional clusters that influence the bilateral trade relations and to analysing the stability of the gravity equations explaining the behaviour of the bilateral trade flows of the EU countries[1]. The empirical part of the paper

---

[1] EU15 or EU member countries indicate the EU members until May 2004; the countries that joined the EU in May 2004 are called accession countries.

draws mainly on the IMF's trade statistics, and on the data of the World Bank and the Baltic States' statistical offices.

3.1. International trade in the Baltic Sea region

The countries around the Baltic Sea have close trade relations (see Table 1). For example, main trading partners of the region's transitional countries are the region's developed countries. The Nordic countries' most important trading partner is Germany, the biggest economy of the BSR, but the other Nordic countries play an important role as well.

Table 1. International trade of the BSR countries in 2001.

	Export		Import	
Country	Share of BSR	Share of EU	Share of BSR	Share of EU
Denmark	44.1	64.9	45.4	70.1
Estonia	63.6	72.7	65.0	48.5
Finland	36.9	53.2	45.2	53.3
Germany	9.9	55.3	11.9	52.2
Latvia	57.3	61.6	65.5	52.7
Lithuania	56.6	47.8	59.6	44.4
Norway	26.6	77.3	43.9	67.5
Poland	46.9	69.8	45.6	68.8
Russia	25.5	38.7	26.5	40.3
Sweden	31.2	52.1	45.6	67.8

Source: IMF (2002), own calculations.

Trade with the advanced economies of the BSR has helped the transitional economies to adjust to the standards of market economy and restructure their economy. The industrial economies of the region have learned about the problems and processes unfolding in the transitional economies. Therefore, in the EU enlargement process, the countries of the BSR can use their regional trade integration experience in their relations with the rest of the accession or member countries of the EU. Already now the share of the European Union in the foreign trade of the BSR countries is very high, but in the case of the transitional countries it is related with the fact that their main trading partners in the EU are the industrial economies of the BSR.

After the fall of the Iron Curtain, the BSR economies rapidly achieved a high share in the exports and imports of the region's transitional countries (Figures 1 and 2), while the developed countries of the region gained easier access to the former Soviet markets. For eight years the situation remained more or less the same, the most noticeable exception being Estonia for which the importance of the BSR decreased. There are reasons to expect that in time the importance of the BSR for the other transitional countries in the region will start decreasing, too, as they manage to create contacts and thus get a better access also to more far-away markets.

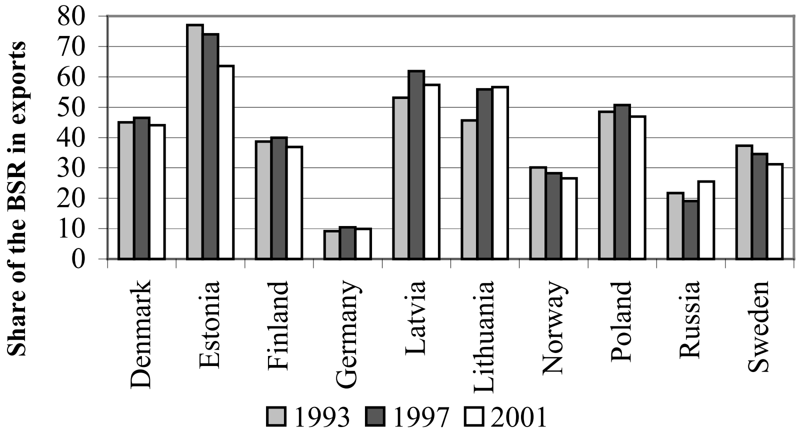

Figure 1. Share (%) of the Baltic Sea region in the exports of the Baltic Sea region countries in 1993–2001.

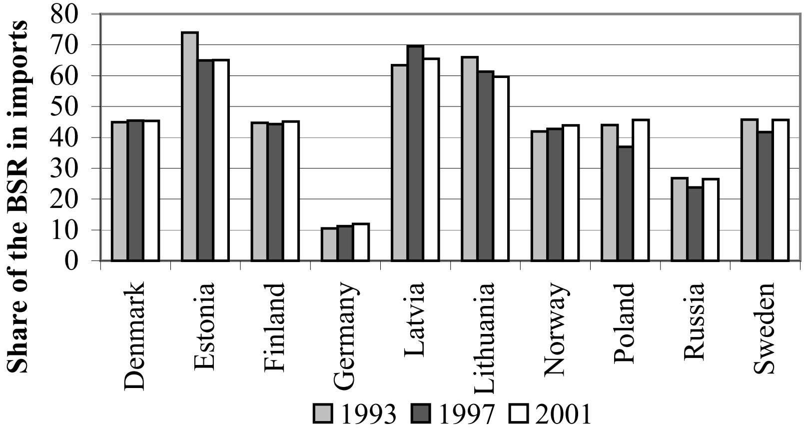

Figure 2. Share (%) of the Baltic Sea region in the imports of the Baltic Sea region countries in 1993–2001.

The importance of the region in the economic development of its transitional countries can also be surmised from the high share of the Baltic Sea region as the source of foreign direct investments (from 60% in Latvia to 82% in Estonia in 2000, see Scannell, Tõnisson and Paas (2003)). Foreign direct investments (FDI) bring up-to-date knowledge and new technologies and have thus helped improve the productivity of enterprises in the transitional countries. As the investors are usually already experienced in selling their goods in the advanced market economies, the enterprises that receive FDIs can use the investor's knowledge and marketing channels for entering the foreign markets. Therefore, FDI flows have also helped to increase trade integration.

3.2. Foundations for using gravity models in exploring international trade flows

3.2.1. Theoretical foundations of the gravity model for analyzing international trade flows

Gravity theory can be viewed as a relational theory, which describes the degree of spatial interaction between two or more points in a manner analogous to physical phenomena. As early as in the middle of the 19th century H. C. Carey (*Principles of Social Science, 1858–1859*) observed the presence of gravitational force in social phenomena, stating that the force was in direct ratio to mass and inverse to distance (Isard, 1960, pp. 498–500).

The gravity model is a mathematical model based on an analogy with Newton's gravitational law and used to account for aggregate human behaviour related to spatial interaction. Newton's law states that the attraction force between two bodies is directly related to their size and inversely related to the distance between them. Thus, the interaction (I_{ij}) between entities i and j is a function f of repulsive forces (R_i) at i and attractive forces (A_j) at j, and an inverse function g of distance (or friction) (D_{ij}) between i and j:

$$(1) \qquad I_{ij} = \frac{f(R_i, A_j)}{g(D_{ij})}.$$

In the gravity equation used for exploring international trade flows the interaction volume (I_{ij}) is represented by the trade flows from the country i to country j. R_i represents factors which are associated with "leaving" i (for instance, the size and development level of the exporting economy). A_j represents attractive factors related to the importing country j (the size and development level of the importing economy). D_{ij} is the distance between the trading countries i and j.

The first gravity models of international trade were developed independently by Jan Tinbergen (1962) and Pentti Pöyhönen

(1963). Initially, the gravity equations lacked a strong theoretical base, but were nevertheless used widely. The intuitive reasons for applying a gravity model for modelling international trade are the following. Firstly, large and wealthy countries also have larger international trade than small countries, as more goods and services are produced and demanded in them. Secondly, the goods produced and exported by more advanced economies often have a higher quality and are thus more expensive. From the side of importers, only rich countries can afford to buy those goods. Thirdly, the main pushing factor in gravity models — the distance between the trading partners — expresses not only transportation costs, but also other possible conditions that may influence bilateral trade (cultural traditions, common or similar language, etc.). It is easier to sell goods at a nearby market, as the neighbours are known better.

The gravity equations composed for exploring international trade flows fit the data remarkably well. Thanks to various modelling refinements and their application in the debates about the theoretical foundations of the gravity equation, this model has demonstrated itself as a serious empirical tool for exploring regional trade patterns. By now, the theoretical considerations for using gravity models for exploring international trade flows have been widely developed (Tinbergen, 1962; Linnemann, 1966; Anderson, 1979; Bergstrand, 1985, 1989 and 1990; Deadorff, 1984, 1995 and 1998; Evenett and Keller, 1998 and 2002; Anderson and Wincoop, 2001; Harrigan, 2001; Hanson and Xiang, 2002). Alan Deardorff found already in 1995 that the gravity model is consistent with a wide range of trade models including also the Heckscher-Ohlin-model, either with frictionless or with impeded trade (Deardorff, 1995). The recent flurry of theoretical work also has led Jeffrey Frankel (1998, p. 2) to say that the gravity equation has "gone from an embarrassment of poverty of theoretical foundations to an embarrassment of riches" (see also Cheng and Wall, 2002, p. 2).

Based on the continuing discussions, it can be summarized that the theoretical foundations of the gravity models are based on

1) microeconomics, 2) regional science and new economic geography, and 3) trade theories (see the list of the respective articles in Paas, 2003a). All these theories explain the existence of trade from different viewpoints and some of them result in models resembling gravity models.

3.2.2. Variables included in the gravity models of international trade

In the basic form of the gravity model, the amount of trade between two countries is assumed to be increasing proportionately to their size as measured by their national income (or GDP), and decreasing proportionately to the cost of transport between them, as measured by the distance between their economic centres. Following the work of Jan Tinbergen (1962), Hans Linnemann (1966) included population as an additional measure of the size of the country and its economy. This model is sometimes called "the augmented gravity model" (Cheng and Wall, 2002). It is also common to specify the augmented gravity model using per capita income (or per capita GDP) instead of the overall national income. Per capita income expresses the level of economic development. Thus, the size of the economy and the level of economic development are the main attractive forces, or pull factors, of bilateral trade flows, while the main push factor is the distance between the trading countries. The distance expresses the impact of transaction costs on the intensity of trade relations. These pull and push factors are the traditional gravitational forces that influence bilateral trade flows.

Gravity models allow for testing the impact of various forms of distance. According to Laaser and Schrader (2002), the distances are measured not only as real geographical distances but also as "virtual distances", which are expressed by tariff- or non-tariff-trade barriers, different languages, diversities in business cultures, traditions and economic systems. Therefore it is understandable that empirical studies unanimously confirm that distance does matter in trade relations of the countries. Even the rapid decline of information and telecommunication costs has not resulted in the "death of distance" (Ghemawat, 2001).

Gravity equations have been widely used for estimating the impact of a variety of policy issues, including regional trading groups, currency unions, political blocks, various trade distortions and agreements, border region activities and historical linkages (Djankov and Freund, 2000; Freund, 1998; Soloaga and Winters, 1999). Owing to comparative advantages, habits, tastes, infrastructure and technology, regions with common borders and/or a similar historical background may be natural trade partners.

Traditionally the gravity models have been estimated on the basis of cross-sectional data and all these considerations and policies are modelled as deviations from the traditional gravitational forces. In the case of regional integration, they are captured by regional dummy variables. Since the middle of the 1990s, cross-sectional gravity models and the inclusion of regional dummy variables to test the importance of trading blocs have been criticized. For example, Mátyás (1997) argues that cross-sectional gravity models testing the importance of trading blocs are misspecified from an econometric point of view: the parameter estimates corresponding to the regional dummy variables might be biased. He proposes using panel data and including country-specific and time effects, using a dummy variable for each home and host country and time period.

In the current chapter, despite the criticism, we will use cross sectional data for estimating the gravity model and analyzing the existence of regional trade clusters. At the moment, the available time series that describe trade integration in the EU eastward enlargement context are too short. If the fixed effects for each country or country-pair are included in a regression, the parameter estimates corresponding to the traditional variables in a gravity equation are not statistically significant. We will use the data of the years 1998–2001 in order to estimate the gravity equations for each year and analyze the dynamics of the parameter estimates. In our opinion, gravity model based estimation provides a useful framework for assessing the impact of regionalism on the level and direction of trade.

3.3. Estimating the gravity equation

3.3.1 Specification of the gravity equation and data for estimating it

The basic gravity equation consists of the main pull and push factors (gravitational forces) influencing bilateral trade flows. As explained above, the main pull factors for developing bilateral trade flows are the size of economy and the level of economic development of the trading partners. In our specification, the size of a particular economy is expressed by the population and the level of economic development by the per capita GDP. The main push factor is the distance between the trading countries. Thus, the basic specification for estimating the international trade flows of the EU member countries is as follows:

$$\begin{aligned} \ln Y_{ij} &= \beta_0 + \beta_1 \ln(POP)_i + \beta_2 \ln(POP)_j + \beta_3 \ln(GDPpc)_i \\ &\quad + \beta_4 (GDPpc)_j + \beta_5 \ln(DIST)_{ij} + u_{ij} \end{aligned}, \qquad (2)$$

where

Y_{ij} — export from country i to country j (or import from country i to country j);

$(POP)_i$ and $(POP)_j$ — populations of the exporting (i) and importing (j) countries, respectively (or home (i) and host (j) countries);

$(GDPpc)_i$ and $(GDPpc)_j$ — gross domestic product per capita of the exporting (i) and importing (j) countries, respectively;

$(DIST)_{ij}$ — the distance in kilometres between the countries i and j (the flight distance between the capitals of the countries);

$\beta_0, \beta_1, ..., \beta_5$ — parameters of the model;

u_{ij} — error term.

Several authors have discussed whether GDP should be measured in terms of purchasing power parity (GDP(PPP)) or the market exchange rate (GDP(MER)) for estimating the gravity equations (see Gros and Consiarz, 1996; Baldwin, 1994 and 1997; Cornett and Iversen, 1998; Iversen, 1998). Gros and Consiarz (1996, p. 715) do not recommend using PPP-converted GDP for estimating gravity equations, arguing that the estimates of a country's trade potential should be made on the basis of the international value of goods and services it produces, not how well off its inhabitants are. Iversen (1998, p. 273) suggests that the proper measure of the transition economies' incomes (GDP(MER) or GDP(PPP)) lies somewhere between the two approaches, and therefore it is impossible to settle this matter on a purely theoretical basis. Previous results of modelling bilateral trade flows between the countries of the Baltic Sea region using the data of the year 1998 show that statistical estimates are best in the equations with GDP(PPP) (Paas, 2001).

Our sample consists of the 25 EU member countries. The list of the countries is presented in Appendix 1 and the data sources and definitions in Appendix 2. The gravity equations are estimated separately for each year between 1998 and 2001.

For analyzing the existence of trade clusters among the countries involved in the EU enlargement process, dummy variables for three regions and their interaction terms with distance are added into the basic gravity equation (2). The choice of trading clusters is based on the geographical proximity of the countries. Additionally, as the EU enlargement processes are of interest, the regions were chosen so that each region includes both some EU members and some accession countries. Three regions were formed:

- Baltic Sea region — includes Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland and Sweden (*D_BSR*);

- Central Europe — Austria, the Czech Republic, Germany, Hungary, Poland, the Slovak Republic and Slovenia (*D_CE*);
- Mediterranean region — Cyprus, France, Greece, Italy, Malta and Spain (*D_MEDIT*).

Our previous empirical studies have confirmed the importance of historical trade linkages in EU enlargement processes. The East-West trade relations are still less developed than the West-West trade relations. The East-West trade flows are on average only about 0.7 times as large as the other trade flows of the countries involved in the EU eastward process (under the *ceteribus paribus* conditions) (Paas, 2003, p. 19). But we suppose that regional integration supports the development of East-West trade.

Thus, we test whether the international trade flows are on average different in the three regions, after controlling for the traditional gravitational forces, and whether the distance plays a different role in the regions, representing their cultural heterogeneity and existence of region-specific trading barriers. This is done by adding regional dummy variables into the regression, both independently and interactively with the distance (Model 1 and Model 2). In addition to the regional dummies, a dummy variable for trade flows between the countries sharing a common border (*D_BORD*) is included as neighbours are natural trade partners.

3.3.2. Estimation results

The estimation results are presented in Tables 2 and 3.

The traditional gravitational forces are significantly related to the foreign trade flows of the countries in the sample. As expected, trade is more intensive between large and affluent countries than between small and poor ones. The trade flows between distant countries are smaller than between countries locating close to one another.

Table 2. Estimation results of the international trade flows (Model 1).

Variable	1998	1999	2000	2001
Constant	–35.41*** (1.840)	–34.82*** (1.806)	–32.97*** (1.751)	–31.29*** (1.802)
$\ln(POP)_i$	0.974*** (0.026)	1.001*** (0.029)	0.961*** (0.029)	0.980*** (0.027)
$\ln(POP)_j$	0.871*** (0.030)	0.905*** (0.028)	0.901*** (0.029)	0.885*** (0.026)
$\ln(GDPpc)_i$	1.915*** (0.096)	1.748*** (0.095)	1.652*** (0.091)	1.545*** (0.093)
$\ln(GDPpc)_j$	1.331*** (0.093)	1.311*** (0.091)	1.263*** (0.086)	1.236*** (0.090)
$\ln(DIST)_{ij}$	–0.865*** (0.081)	–0.872*** (0.080)	–0.852*** (0.080)	–0.915*** (0.079)
D_BORD_{ij}	0.518*** (0.162)	0.486*** (0.163)	0.503*** (0.150)	0.443*** (0.128)
D_BSR_{ij}	0.990*** (0.151)	0.981*** (0.156)	0.947*** (0.148)	0.858*** (0.146)
D_CE_{ij}	0.173 (0.177)	0.171 (0.183)	0.168 (0.165)	0.270* (0.143)
D_MEDIT_{ij}	–0.107 (0.129)	–0.050 (0.120)	0.015 (0.127)	0.166 (0.133)
N	587	587	587	587
R^2	0.883	0.880	0.878	0.884
$Adj.\ R^2$	0.881	0.878	0.876	0.882
p	0.000	0.000	0.000	0.000

Dependent variable: $\ln(IMPORT)_{ij}$. White heteroskedasticity consistent standard errors of the estimates in parentheses.
*** — significant at 0.01 level, ** — significant at 0.05 level, * — significant at 0.1 level.
The list of variables is presented in Appendix 2.
Source: own calculations.

For the years under observation (1998–2001), the results are rather stable, but in some cases it is possible to point out certain tendencies in the parameter estimates. On the one hand, there is a fall in the influence of the wealth (the level of development) of the countries. It indicates that trade is getting more and more intensive everywhere, offering possibilities to profit from it both to rich and poor countries. This result is influenced also by the fact that during the period restrictions on the (transitional) accession countries' trade with EU have decreased.

On the other hand, as the parameter estimate for the distance between the countries has increased in absolute terms, it seems that the restrictions imposed by distance are still important and their importance is not vanishing despite strong trade integration of the EU member and accession countries. Of course it has to be kept in mind that the dynamics was observed only during 4 years and on the basis of these data no conclusions can be drawn about long-run processes.

From the dummy variables included in the model in order to control for the regional cooperation possibly resulting in more intensive trade linkages, the following can be concluded. First, to start with the closest neighbours, trade with countries with which a dry land border is shared is more intensive than with other countries. The statistically significant coefficient of the border dummy of the estimated gravity equation-2001 is 0.443. It indicates that bilateral trade flows between the border countries are 1.6 times larger than trade flows between the other countries (*ceteris paribus*). This indicates the importance of cross-border cooperation.

Second, from the regional trade clusters it is possible to distinguish only the Baltic Sea region cluster on the basis of estimation results presented in Table 2. The Baltic Sea region countries' bilateral trade flows are on average 2.4 times larger than those outside the region after controlling for the size of economy, the level of economic development, distance and other dummies.

The intensiveness of trade between the Central European and Mediterranean countries does not differ from the intensiveness of other trade relationships, though in both cases the parameter estimate has risen during the period under observation. In the case of the Baltic Sea region, the estimate is decreasing, probably mainly because of the fact that the transitional economies have managed to enter also more distant markets.

This result raises the question about why one area is distinguishable while the others are not. For example, some trading clusters might be distinguishable and some others not because of different trading barriers (trading costs) in different regions. In order to receive some hint, the interaction variables of the dummy variables and distance were switched into the model (Table 3). Now also the Mediterranean region is distinguishable as a trading cluster (but the trading bias is still larger in the case of the Baltic Sea Region), while the trade flows between the Central European countries seem to be lower than in other cases, ceteris paribus. It seems that Central Europe has not been as successful in integrating the transitional economies as the Baltic Sea region. Another important change in model 2 compared to the initial model is the considerable rise in the values of the parameter estimates corresponding to the dummy variables of the Baltic Sea region and neighbouring countries.

At the same time, the parameter estimates of the interaction variables are negative for the trade flows between the bordering, BSR and Mediterranean countries and positive in the case of the Central European countries. Therefore, it seems that in the case of the Baltic Sea and Mediterranean area there are additional costs associated with trading, probably deriving from the fact that nowadays sea separates rather than connects countries. While in the past sea transport was maybe the easiest way of transporting goods, in today's world land transport tends to be preferred: it is easier to move from one country to another by land than by crossing a sea. Another reason could be cultural diversity (several very different languages, etc.) in the regions.

Table 3. Estimation results of the international trade flows (Model 2).

Variable	1998	1999	2000	2001
Constant	–37.84*** (1.91)	–37.19*** (1.87)	–34.94*** (1.82)	–33.15*** (1.96)
$\ln(POP)_i$	0.984*** (0.026)	1.012*** (0.029)	0.970*** (0.029)	0.988*** (0.027)
$\ln(POP)_j$	0.881*** (0.030)	0.916*** (0.028)	0.910*** (0.029)	0.893*** (0.026)
$\ln(GDPpc)_i$	1.973*** (0.095)	1.801*** (0.094)	1.697*** (0.090)	1.589*** (0.094)
$\ln(GDPpc)_j$	1.388*** (0.092)	1.364*** (0.090)	1.307*** (0.085)	1.280*** (0.091)
$\ln(DIST)_{ij}$	–0.726*** (0.090)	–0.737*** (0.090)	–0.744*** (0.088)	–0.811*** (0.087)
D_BORD_{ij}	3.551** (1.438)	3.436** (1.408)	3.195** (1.313)	2.950** (1.222)
D_BSR_{ij}	6.721*** (1.581)	6.755*** (1.615)	6.309*** (1.413)	5.335*** (1.269)
D_CE_{ij}	–4.642*** (1.591)	–4.315*** (1.576)	–4.419*** (1.511)	–3.952** (1.535)
D_MEDIT_{ij}	4.821*** (1.756)	4.246*** (1.638)	2.886* (1.551)	3.820** (1.706)
$D\_BORD_{ij}*\ln(DIST)_{ij}$	–0.500** (0.223)	–0.487** (0.218)	–0.442** (0.204)	–0.412** (0.190)
$D\_BSR_{ij}*\ln(DIST)_{ij}$	–0.887*** (0.235)	–0.894*** (0.242)	–0.834*** (0.210)	–0.694*** (0.186)
$D\_CE_{ij}*\ln(DIST)_{ij}$	0.820*** (0.252)	0.765*** (0.249)	0.776*** (0.238)	0.716*** (0.245)
$D\_MEDIT_{ij}*\ln(DIST)_{ij}$	–0.671*** (0.243)	–0.585** (0.228)	–0.390* (0.215)	–0.497** (0.234)
N	587	587	587	587
R^2	0.888	0.885	0.883	0.888
Adj. R^2	0.886	0.883	0.880	0.885
p	0.000	0.000	0.000	0.000

Dependent variable: $\ln(IMPORT)_{ij}$.
White heteroskedasticity consistent standard errors of the estimates in parentheses.
*** — significant at 0.01 level, ** — significant at 0.05 level, * — significant at 0.1 level.
The list of variables is presented in Appendix 2.
Source: own calculations.

Thus, initially the Mediterranean trade cluster was not distinguishable (in the regressions presented in Table 2), as the dummy variable controlled also for the transaction costs associated with the distance between the trading partners. Similarly, the smaller than average trade intensiveness between the Central European countries was hidden behind the fact that the trading costs are lower in that area.

For the neighbouring countries, the distance has also a stronger impact on the trade flows than in the other cases. The reason for this result could be that when the economic and cultural centres (which often coincide with the capital cities) are far apart, the cultural and economic barriers to trade with the other countries are not much stronger than in the case of trading with the neighbour.

Looking at the dynamics, it is observed that the dummy variables for the regions are decreasing and also the effect of distance between the countries in the regional groups has somewhat diminished.

It is possible to conclude that the Baltic Sea region's trading cluster is clearly distinguishable. Earlier on the existence of the BSR cluster has been detected by means of gravity models, for example, by Paas (2001, 2003) when analyzing trade flows and by Scannell, Tõnisson and Paas (2003) when analyzing foreign direct investments. The latter concluded that the BSR capital plays an important role in the transition processes of the Baltic States (Estonia, Latvia and Lithuania) as a majority of the foreign direct investments comes from the BSR's industrialized countries. Thus, the influence of the close economic linkages and regional cooperation on the development of the BSR's transitional economies cannot be underestimated, as also shown in the current paper.

Conclusions

One of the most important results of economic cooperation of the countries is international trade. The intensiveness of international trade relations depends on several issues, such as the size and level of development of the partner economies, transportation costs, the geographical and cultural distance between the trading partners. As countries belonging into the same geographical region often share history and have cultural connections, the trade between them is more intensive than their trade with other countries. It has to be noted, though, that in some regions these effects are stronger than in some other regions.

A suitable approach for testing the existence of regional trading clusters is using gravity models. This approach has been popular in describing international trade flows for more than thirty years. In the last decade, gravity models have also been used for modelling foreign direct investments. Though initially gravity models did not have strong theoretical foundations, to-date several theories have been built to explain the remarkably good empirical performance of gravity models for exploring bilateral trade flows.

Our estimation results support the existence of traditional gravitational forces: the larger and wealthier the countries, the more intensive is trade between them, and trade flows are smaller in the case of distant countries than in the case of those located close by. We estimated the gravity models for four years, 1998–2001 and analyzed the trade flows of EU member countries. We found that the influence of the wealth of the countries has decreased during the period under observation, indicating that both rich and poor countries can win from trade. Of course, it has to be noted that the time period is too short to draw strong conclusions about dynamics.

Our main purpose was to test the existence of regional trading clusters. Three regions — the Baltic Sea region, the Mediterranean area, and Central Europe — were formed so that they included both some old and new members of the EU. We concluded that the Baltic Sea region and the Mediterranean area are trading clusters (the trade linkages are the strongest in the Baltic Sea region), whereas the Central European countries have relatively weaker trade relations (and thus, this region has been less successful in integrating the transitional economies into the European economic system). But it appeared on the basis of interaction variables of dummies for the trading clusters and distances between the trading countries that in the Baltic Sea region and the Mediterranean area distance had a stronger negative influence on the trade flows than in other cases, and in the Central Europe distance played a less important role. The main reason for this could be that in today's world it is easier to cover the same distance by land than by sea.

As mentioned earlier, the Baltic Sea region is a region where trade flows between the region's countries were, according to the estimations of the gravity equation-2001, on average 2.4 times larger than the trade flows outside the region after controlling for the size of economy, the level of economic development, the distance and the other dummies. In 1998, this bias was 2.7. Some decrease is probably due to the fact that the transitional economies of the region have managed to enter also more distant markets.

The mere shares of the Baltic Sea region in the exports and imports of the region's countries give evidence of high trade integration. The region plays an especially important role in the development of its transitional countries and not only in trade relations: the region's developed economies are also the main countries of origin of foreign direct investments to the Baltic States.

The estimation results also confirm the significance of cross-border cooperation between the EU-25 countries (the bias is around 1.6). As neighbouring countries are natural trading partners, the trade flows between them are larger than those with third countries.

References

Anderson, J. E. A Theoretical Foundation for the Gravity Equation. — American Economic Review, 1979, Vol. 69 (1), pp. 106–116.

Anderson, J. E., van Wincoop, E. Gravity with Gravitas: A Solution to the Border Puzzle, NBER Working Paper, No 8079, Cambridge Mass.: National Bureau of Economic Research, 2001.

Baldwin, R. E. Towards an Integrated Europe. Centre for Economic Policy Research, 1994.

Baldwin, R. E. Comment on Gros and Gonciards. — European Journal of Political Economy, 1997, Vol. 13, pp. 187–188.

Bergstrand, J. H. The Generalized Gravity Equation, Monopolistic Competition, and the Factor-Proportions Theory in International Trade. — Review of Economics and Statistics, 1989, Vol. 71, pp. 143–153.

Bergstrand, J. H. The Gravity Equation in International Trade — Some Microeconomic Foundations and Empirical Evidence. — Review of Economics and Statistics, 1985, Vol. 67, pp. 474-481.

Bergstrand, J. H. The Hecksher-Ohlin-Samuelson Model, the Linder Hypothesis, and the Determinants of Bilateral Intra-Industry Trade. — The Economic Journal, 1990, Vol. 100, pp. 1216–1229.

Bröcker, J., Herrmann, H. Spatial Change and Interregional Flows in the Integrating Europe — Essays in Honor Karin Peschel, Contributions to Economics, Psychica Verlag, Heidelberg, New York, 2001.

Cheng, I-H., Wall, H. J. Controlling for Heteogeneity in Gravity Models of Trade. Federal Reserve Bank of St. Louis Working Paper, No 1999–010C, St. Louis, 2002, 33 pp.

Cornett, A. P., Iversen, S. P. The Baltic State in an European and Baltic Perspective: Trade and Transition in the Baltic Rim. Materials of the Conference "Global-Local Interplay in the Baltic Sea Region", Pärnu, Estonia October 1–4, 1998.

Deadorff, A. V. Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World? NBER Working Paper, No 5377, Cambridge Mass.: National Bureau of Economic Research, 1995.

Deadorff, A. V. Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World. In: J.A. Frankel (ed.) The Regionalization of the World Economy, The University of Chicago Press, Chicago, London, 1998, pp. 7–31.

Deadorff, A. V. Testing Trade Theories and Predicting Trade Flows. Handbook of International Economics, 1984, Volume 1, Amsterdam: North-Holland.

Djankov, S., Freund, C. Disintegration and Trade Flows: Evidence from the Former Soviet Union. CEPR Working Paper, August 2000.

Eichengreen, B., Irwin, D. The Role of History in Bilateral Trade Flows. In: J. Frankel (ed.) The Regionalization of the World Economy, The University of Chicago Press, Chicago, London, 1998, pp. 33–64.

Estevadeordal, A., Frantz, B., Taylor, A. M. The Rise and Fall of World Trade, 1870–1939. NBER Working Paper No. 9318, Cambridge Mass.: National Bureau of Economic Research, 2002, 33 pp.

Evenett, S. J., Keller, W. On Theories Explaining the Success of the Gravity Equation. NBER Working Paper, No. W6529, Cambridge Mass.: National Bureau of Economic Research, 1998.

Evenett, S. J., Keller, W. On Theories Explaining the Success of the Gravity Equation. — Journal of Political Economy, 2002, 110, pp. 281–316.

Feenstra, R. C. Integration of Trade and Disintegration of Production in the Global Economy. — Journal of Economic Perspectives, 1998, Vol. 12, No. 4, pp. 31–50.

Frankel, J. (ed). The Regionalization of the World Economy, The University of Chicago Press, Chicago, London, 1998.

Freund, C. L. Regionalism and Permanent Diversion. — International Finance Discussion Papers, Number 602, January 1998

Ghemawat, P. Distance Still Matters. The Hard Reality of Global Expansion. Economics, Vol. 47, No 1, 2001, pp. 137–147.

Gros, D., Gonciarz, A. A Note on the Trade Potential of Central and Eastern Europe. — European Journal of Political Economy, 1996, Vol. 12, pp. 709–721.

Hanson, G. H., Chong, X. The Home Market Effect and Bilateral Trade Patterns. NBER Working Papers, No w9076, Cambridge Mass.: National Bureau of Economic Research, July 2002.

Harrigan, J. Specialization and the Volume of Trade: Do the Data Obey the Laws? NBER Working Paper, No 8675, Cambridge Mass.: National Bureau of Economic Research, 2001.

How Far is It? www.indo.com/distance.

IMF. Direction of Trade Statistics Quarterly. September 2002.

IMF. Direction of Trade Statistics Yearbook 2001.

Isard, W. Methods of Regional Analysis: An Introduction to Regional Science, New York, NY: John Wiley and Sons, 1960.

Iversen, S. P. The Czech Republic's Reintegration in The European Division of Labour. A Gravity Model Analysis. Proceedings of the Conference "Business and Economic Development in Central and

Eastern Europe: Implications for Economic Integration into Wider Europe, Brno, 1998, pp. 257–280.

Laaser, C.-F., Schrader, K. European Integration and Changing Trade Patterns. The Case of the Baltic States. Kiel Working Paper, No. 1088, Kiel Institute of World Economics, 2002, 55 pp.

Linnemann, H. An Econometric Study of International Trade Flows, Amsterdam: North-Holland Publishing Company, 1966.

Mátyás, L. Proper Econometric Specification of the Gravity Model. — The World Economy, 1997, Vol. 20, No. 3, pp. 363–368.

Paas, T. EU Eastward Enlargement and the Baltic Sea Region Role in Trade Integration. In: Essays in Estonian Transformation Economics. Ed. by Ülo Ennuste and Lisa Wider. Estonian Institute of Economics at Tallinn Technical University, 2003a, pp. 149–181.

Paas, T. Modeling International Trade Flows of the Baltic Sea Region Countries. Global Business & Economics Review — Anthology 2001, Selected Papers of Business and Economics Society International, Worcester, USA, 2001, pp. 607–618.

Paas, T. Regional Integration and International Trade in the Context of EU Eastward Enlargement. HWWA Discussion Paper, No 218, Hamburg: Hamburg Institute of International Economics, 2003b.

Pöyhönen, P. Tentative Model for the Volume of Trade between Countries. Weltwirtschaftlishes Archiv, 1963, 90, pp. 91–113.

Scannell, N. J., Tõnisson, E., Paas, T. Foreign Direct Investments and its Relationship with International Trade in the Baltic States during Transition. — Journal of Global Business, Vol. 14, No. 26, 2003, pp. 35–49.

Sen, A., Smith, T. E. Gravity Models of Spatial Interaction Behaviour. Springer Verlag, 1995.

Soloaga, I., Winters, A. How Has Regionalism in the 1990s Affected Trade? — World Bank Working Papers, No. 2156, 1999.

Tinbergen, J. Shaping the World Economy. New York: Twentieth Century Fund, 1962.

World Bank. http://www.worldbank.org/data/databytopic/GDP.html.

Appendix 1. The countries included in the sample

The EU member countries (EU15): Austria, Belgium, Denmark, Finland, France, Germany, Great Britain, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden.

The EU accession countries: Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, the Slovak Republic, Slovenia.

The following country-pairs are excluded due to data limitations:

Exporting country	**Importing country**
Cyprus	Latvia
Cyprus	Lithuania
Cyprus	Luxembourg
Estonia	Luxembourg
Latvia	Luxembourg
Latvia	Malta
Lithuania	Luxembourg
Lithuania	Malta
Malta	Czech Republic
Malta	Latvia
Malta	Lithuania
Malta	Luxembourg
Slovak Republic	Malta

Appendix 2. The variables and sources of data used in the estimation of the gravity equations

$\ln(IMPORT)_{ij}$	import from country *i* to country *j* (export and import data of IMF)
$\ln(POP)_i$	population of the exporting country (World Bank)
$\ln(POP)_j$	population of the importing country (World Bank)
$\ln(GDPpc)_i$	gross domestic product per capita of the exporting country in the terms of purchasing power parity (World Bank)
$\ln(GDPpc)_j$	gross domestic product per capita of the importing country in the terms of purchasing power parity (World Bank)
$\ln(DIST)_{ij}$	flight distance between the capitals of the trading partners (How Far is It?)
D_BORD_{ij}	=1, if the trading partners share a dry land border, =0 otherwise
D_BSR_{ij}	=1, if both of the trading partners are from the Baltic Sea region (Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland and Sweden), =0 otherwise
D_CE_{ij}	=1, if both of the trading partners are Central European countries (Austria, the Czech Republic, Germany, Hungary, Poland, the Slovak Republic and Slovenia), =0 otherwise
D_MEDIT_{ij}	=1, if both of the trading partners are Mediterranean countries (Cyprus, France, Greece, Italy, Malta and Spain), =0 otherwise