HWWA HAMBURG

DISCUSSION PAPER

Regional Integration and International Trade in the Context of EU Eastward Enlargement

Tiiu Paas

HWWA DISCUSSION PAPER

218

Hamburgisches Welt-Wirtschafts-Archiv (HWWA)
Hamburg Institute of International Economics
2003
ISSN 1616-4814

Hamburgisches Welt-Wirtschafts-Archiv (HWWA)
Hamburg Institute of International Economics
Neuer Jungfernstieg 21 - 20347 Hamburg, Germany
Telefon: 040/428 34 355
Telefax: 040/428 34 451
e-mail: hwwa@hwwa.de
Internet: http://www.hwwa.de

The HWWA is a member of:

- Wissenschaftsgemeinschaft Gottfried Wilhelm Leibniz (WGL)
- Arbeitsgemeinschaft deutscher wirtschaftswissenschaftlicher Forschungsinstitute (ARGE)
- Association d'Instituts Européens de Conjoncture Economique (AIECE)

HWWA Discussion Paper

Regional Integration and International Trade in the Context of EU Eastward Enlargement

Tiiu Paas*

HWWA Discussion Paper 218
http://www.hwwa.de

Hamburg Institute of International Economics (HWWA)
Neuer Jungfernstieg 21 - 20347 Hamburg, Germany
e-mail: hwwa@hwwa.de

* University of Tartu

An earlier version of this paper was presented at the 1st HWWA Workshop on Current Developments in Regional Research which took place in Hamburg 25-26 November, 2002. The author would like to thank the participants of the workshop for their helpful comments and explicative questions. The author is grateful to master student Eve Tõnisson for her valuable support in collecting data. The usual disclaimer applies.

This discussion paper is assigned to the HWWA's research programme "European Integration and Spatial Development". Tiiu Paas is a research associate of this programme.

Edited by the Department European Integration
Head: Dr. Konrad Lammers

HWWA DISCUSSION PAPER 218
January 2003

Regional Integration and International Trade in the Context of EU Eastward Enlargement

ABSTRACT

The paper aims to explore international trade flows of the countries involved in the EU eastward enlargement processes – the current EU members (EU15) and the candidate countries (CC12). The empirical results of the study allow us to conclude that the behaviour of bilateral trade flows within the countries involved in EU eastward enlargement accords to the normal rules of gravitation, having statistically significant spatial biases caused by the trade relations, between the Baltic Sea Region (BSR) countries (the BSR bias), the border countries (the border bias) and the EU member and candidate countries (the East-West bias). The East-West trade relations are still rather weakly developed and there is a statistically significant difference in international trade patterns between the two groups – the current EU members and the applicant countries. The lessons of the Baltic Sea Region in integrating countries with different economic and political backgrounds and developing bilateral trade relations are valuable in supporting EU eastward enlargement and the reintegration of new member countries into Europe.

JEL-Classification: F15, C5, R15
Keywords: EU enlargement, the Baltic Sea Region, integration, international trade, gravity models

Tiiu Paas
University of Tartu
Faculty of Economics and Business Administration
Narva Rd. 4, Tartu, Estonia 51009
Phone: 3727 376 340
Fax: 3727 376 312
E-mail: tpaas@ut.ee

1. INTRODUCTION

The eastward enlargement of the EU poses a major challenge for both the current member countries (EU15) and the candidate countries (CC12) who have to integrate their national economies with rather different structures. The applicant countries have to combine the transition processes with simultaneous adjustment to the requirements of accession. Coping with these tasks is certainly not easy. The transition from a command to market economy is a special case of economic, social and political development of the countries, and each accession country's economic structures and institutions have to be gradually brought in line with the requirements of full EU membership. For most candidate countries accession to the EU means reintegration into Europe.

According to Andreas Cornett (2002), the process of reintegration into the European economic and political system has two interrelated aspects, namely, internal domestic transformation and external relationship with the regional and global economic system. Both these aspects largely determine the economic growth and international economic relations of the countries and are crucial for the estimation of the future economic parameters.

The paper focuses on the external aspects of the reintegration process in the context of EU eastward enlargement. The external aspects of reintegration have at least two main factors that bring about a new division of labour in Europe: these are international trade (export and import flows) and foreign direct investments (FDI). These two groups of factors are also the main indicators which characterize economic openness and the level of international integration.

The most expedient economic factor in pushing economies into integration is international trade. Significant changes in regional trade patterns have prompted economists to pay more attention to the development of theoretical considerations and empirical approaches which would enable them to explore international trade flows and the role played by regional integration in the development of bilateral trade relations between countries. International trade flows are often considered to be indicators of links between the economic centres of the region, thus representing links between the economic and spatial concepts. Therefore the approach based on implementing the law of gravity for the study of international trade flows has been widely used in recent years. The previous studies have shown that the gravity equation is the most successful model for explaining regional trade patterns, which incorporates theoretical and empirical advantages related to it (see Baldwin 1994; Eichengreen and Irvin, 1998; Feenstra, 1998; Estevadeordal, Frantz and Taylor, 2002).

The paper aims to explore bilateral trade flows between the countries that are involved in the EU eastward enlargement process, the current EU members and the candidate countries, using a gravity model based approach. In some sense this paper represents development of

the main issues presented in the author's previous HWWA discussion paper (the Discussion Paper No 180) about exploring the possibilities of using the knowledge resulting from the law of gravity as a universal law of nature for analyzing the integration processes unfolding in the Baltic Sea region (BSR) countries in the field of international trade (Paas, 2002).

This paper focuses on studying bilateral trade flows in the context of EU eastward enlargement using a gravity model based approach and laying emphasis on the BSR as a regional cluster of the countries that are involved in this enlargement process. The Baltic Sea Region (Denmark, Germany, Sweden, Finland, Norway, Poland, Estonia, Latvia, Lithuania and Russia) has become one of the most competitive economic regions in Europe due to its favourable location between East and West and the dynamic interdependence between transition and integration (see also World Competitiveness Yearbook, 2002).

The fall of the iron curtain has remarkably changed the spatial structure of the BSR and has affected both the transition economies and the industrialized economies of the region (see also Bröcker and Herrmann (eds.), 2001; Cornett and Iversen, 1998). The positive integration effect of the countries around the Baltic Sea has been particularly significant in the case of the small Baltic economies in transition (Estonia, Latvia and Lithuania). Needless to say that the Baltic States are the only former Soviet republics among the EU accession countries.

The main body of the paper falls into three parts. Section II views shortly the role of the BSR in the export and import flows of EU15 and CC12. Section III presents the main empirical results obtained by using the gravity approach for exploring the bilateral trade flows of the current EU members and the candidate countries, paying attention to defining the possible regional clusters that influence the bilateral trade relations and to analyzing the stability of the gravity equations explaining the behaviour of the bilateral trade flows of EU15 and CC12. In Section IV the bilateral trade flows within the BSR countries are analyzed, emphasizing the role of the BSR in the Baltic transition and integration processes. The empirical part of the paper draws mainly on the IMF's trade statistics, and the data of the World Bank and the Baltic States' statistical offices.

2. EU EASTWARD ENLARGEMENT AND THE ROLE OF THE BALTIC SEA REGION IN INTERNATIONAL TRADE FLOWS

2.1. EU eastward enlargement and reintegration

The EU candidate countries (CC12) of the next rounds of enlargement (eastward enlargement) form two groups: 1) the Luxembourg group of candidate countries (formed in 1997): Poland, the Czech Republic, Hungary, Estonia, Slovenia, Cyprus, and 2) the Helsinki group of candidate

countries (formed in 1999): Latvia, Lithuania, Bulgaria, Romania, Slovakia and Malta. According to the recent negotiations, the first round of eastward enlargement in 2004 involves ten candidate countries out of twelve. Bulgaria and Romania will have a chance to join during the next round of enlargement.

The majority of the candidate countries (excluding Malta and Cyprus) are post-socialist countries and former members of the Soviet-led Council for Mutual Economic Assistance (CMEA), while three of them, the Baltic States of Estonia, Latvia and Lithuania are former republics of the Soviet Union. Due to their historical background, the European post-socialist countries have some experience of developing under market economy conditions. Thanks to the experience they gained in the framework of the CMEA, these countries are also familiar with the main principles of integration. The traditional principles of integration in the former CMEA were based on the exploitation of scale economies in the competitive sectors of the countries involved, according to common plans within the framework of the socialist division of labour (see also Robson, 1987; Artis and Lee (eds), 1997). Hence, for most of the candidate countries accession to the EU means reintegration into Europe. The reintegration processes have also altered the spatial dimensions.

In the development of the spatial processes and reintegration of the post-socialist countries into Europe a remarkable role belongs to the countries around the Baltic Sea. The Baltic Sea region is a non-homogenous region. It consists of two groups of countries; on the one hand, there are the industrialized countries Finland, Sweden, Denmark, Norway and Germany, and on the other, the transitional countries Estonia, Latvia, Lithuania, Poland and Russia. On the basis of their relationship with the European Union, the BSR countries can be divided into three groups. All the transitional countries except for Russia belong to eastward enlargement, while all the industrialized countries except for Norway already belong to the EU. The third group is thus made up by the EU-associated industrialized Norway and the non-associated transitional Russia.

After the fall of the iron curtain the Baltic Sea region became an integral part of Europe's spatial development. Subsequently, significant changes have been taking place in this region, affecting the political landscape and economic system of Northern Europe. The adjustment processes with accompanying changes in the economic and political development of Northern Europe are also supported by the EU. Namely, the Northern Dimension programme of the EU is aimed at promoting regional co-operation between the EU member states, candidate states and non-EU-member states. The Northern Dimension activities take place within the framework of the existing contractual relations and regional organizations, including the Nordic Council, the Barents Euro-Arctic Council and the Barents Regional Council.

2.2. International trade flows of the Baltic Sea region countries

The BSR countries' role in trade relations between EU15 and the candidate countries is remarkable. Unquestionably, the share of the BSR countries' export and import flows in the trade flows of the EU and candidate countries varies greatly, depending on their population numbers, location, level of infrastructure and also various factors that are not always directly measurable.

Tables 1 and 2 show the data about the share of the BSR in the export and import flows of EU15 and CC12 .

The range of variability according to the population numbers within EU15 is 81.9 million (the smallest EU member country is Luxembourg and the biggest is Germany). According to the BSR share in the trade flows of the current EU member countries, this range is 40.4% in imports (differences between Ireland and Finland) and 34.6% in exports (differences between Germany and Denmark). Among four EU member states (Austria, Denmark, Finland and Sweden) more than one third of the export and import flows belongs to the BSR. The population numbers of these four countries are below the EU average.

Table 1. The share of the BSR in the trade flows of the EU member countries in 2000

Country	Size of population (Mil)	Import (share, %)	Export (share, %)
Austria	8.1	49.3	38.8
Belgium	10.3	22.3	21.5
Denmark	5.3	46.0	44.2
Finland	5.2	51.4	37.1
France	59.0	23.2	18.4
Germany	82.3	11.4	9.6
Greece	10.6	22.9	19.6
Ireland	3.8	10.9	15.6
Italy	57.8	25.0	20.4
Luxembourg	0.4	24.9	29.3
Netherlands	16.0	24.2	33.9
Portugal	10.2	19.3	22.8
Spain	39.3	20.3	16.4
Sweden	8.9	42.9	32.6
United Kingdom	59.9	22.7	18.5

Source: Author's calculation based the data of IMF and Statistical Office of Estonia (IMF, *Direction of Trade Statistics Yearbook*, 2001; Estonia and European Union, Statistical Office of Estonia, 2002)

Table 2. The share of the BSR in the trade flows of the EU candidate countries in 2000

Country	Population (millions)	Import (share, %)	Export (share,%)
Bulgaria	8.0	41.5	13.2
Czech Republic	10.3	51.4	50.5
Cyprus	0.8	14.5	13.0
Estonia	1.4	64.4	74.8
Hungary	10.0	32.3	43.3
Latvia	2.4	65.0	54.9
Lithuania	3.7	60.2	55.9
Malta	0.4	9.9	11.0
Poland	38.6	41.2	47.6
Romania	22.4	29.9	23.3
Slovak Republic	5.4	52.0	36.1
Slovenia	2.0	25.9	34.4

Source: Author's calculations based on the data of the IMF and the Central Statistical Bureau of Latvia (IMF, *Direction of Trade Statistics Yearbook*, 2001; Foreign Trade. Estonia, Latvia, Lithuania, Central Statistical Bureau of Latvia, 2001)

The bivariate correlation coefficients indicating the linear relationship between the population numbers of the EU member countries and the share of BSR in their export and import flows are respectively –441 (statistically significant at α=0.1) and –0.639 (statistically significant at α=0.01). Thus the role of the BSR in developing bilateral trade relations is more remarkable in the case of small than large EU member states. The significance of regional integration is particularly evident for the EU member countries from the BSR and also for Germany's neighbouring Austria.

The role of the BSR is also visible in the development of bilateral trade relations between the candidate countries from the BSR (Poland, Estonia, Latvia and Lithuania) and the Czech Republic, the candidate country having close neighbourhood with Germany. The range of variability of the BSR's share in the import and export of the candidate countries' trade flows is even higher than this range is in the case of the EU member states. The range indicator is 55.1% for the import and 63.8% for the export flows (differences between Malta and Estonia).

The role of the BSR is most remarkable for the three Baltic States, transitional countries with small open economies (Table 3). The main trading partners for the Baltic States are capital-abundant countries around the Baltic Sea, such as Germany, Sweden and Finland (see also Figure 1).

Table 3. The Baltic States' exports and imports by groups of countries in 2000 (share, %)

The group of countries	Estonia		Latvia		Lithuania	
	Export	**Import**	**Export**	**Import**	**Export**	**Import**
BSR	74.8	64.4	54.9	65.0	55.9	60.2
EU	68.5	56.1	50.9	38.0	47.9	43.3
CIS	9.6	17.8	21.9	39.1	16.3	31.7
EFTA	3,2	2.0	2.6	1.6	2.5	1.8

Source: Foreign Trade 2000, Estonia, Latvia, Lithuania, Statistical bulletin, Central statistical Bureau of Latvia, Riga, 2001

In the import flows of Latvia and Lithuania the dominating role still belongs to Russia. The share of the CIS (Commonwealth of Independent States) countries in Latvian and Lithuanian trade flows is also rather significant, while in the case of Estonia this share is considerably smaller.

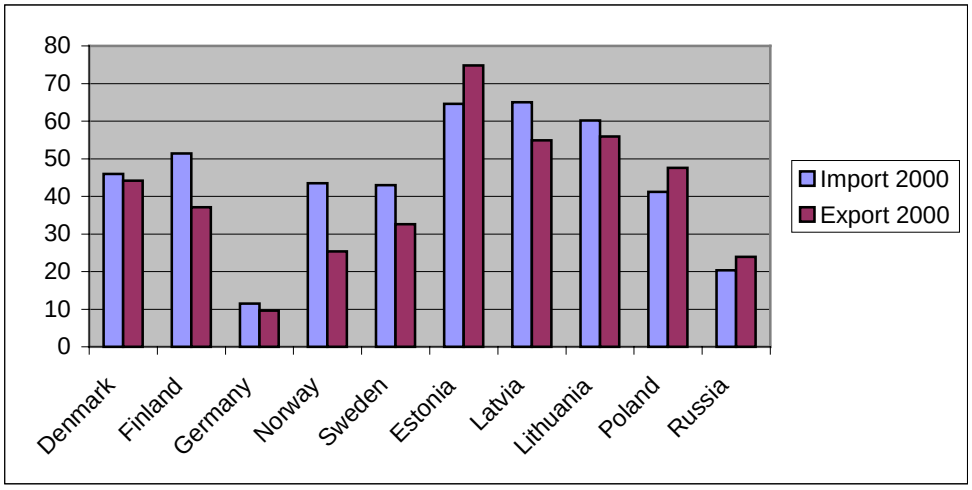

Figure 1. The BSR share in export and import of the countries around the Baltic Sea in 2000 (%)

The BSR's role is noteworthy also for Norway and Russia. About one quarter of Norwegian exports go to the BSR countries and more than forty percent of imports come from this region. Russian import and export flows from and to the BSR countries form more than one fifth of the respective trade flows of the country.

3. BEHAVIOUR OF INTERNATIONAL TRADE FLOWS IN THE CONTEXT OF EU ENLARGEMENT

3.1. Some theoretical considerations of using gravity models for studying EU enlargement processes

In order to explore bilateral trade flows of the countries involved in the EU eastward enlargement processes a gravity model based approach is used. Starting in the 1860s when H. Carey first applied Newtonian physics to the study of human behaviour, the gravity law based approach has been widely used in the social sciences. Thus, a gravity model is a mathematical model based on analogy with Newton' gravitational law which has been used to account for aggregate human behaviour related to spatial interaction (see Send and Smith, 1995). Gravity model based studies have achieved empirical success in explaining various types of inter-regional and international flows, including labour migration, commuting, customers and international trade.

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, interaction (I_{ij}) between entities i and j is a function of repulsive forces (R_i) at i and attractive forces (A_j) at j, and an inverse function of distance (or friction) (D_{ij}) between i and j:

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

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 the country j. R_i is a parameter representing factors which are associated with "leaving" i, for instance, the population numbers and/or the GDP of the exporting country i. A_j is a parameter representing attractive factors related to the importing country j. In the case of bilateral trade relations the export of the country i equals the import of the country j. D_{ij} is the distance between the trading countries i and j.

The gravity model of international trade was developed independently by Jan Tinbergen (1962) and Pentti Pöyhönen (1963). In this basic form of the gravity model, the amount of trade between two countries is assumed to be increasing in their sizes, as measured by their national incomes, and decreasing in the cost of transport between them, as measured the distance between their economic centres. Following this work, Hans Linnemann (1966) included population as an additional measure of country's size. This model is sometimes called "the augmented gravity model" (Cheng and Howard, 2002). It is also common to specify the augmented gravity model using per capita income (or per capita GDP). The population expresses the size of a country as well as the size of its economy. Per capita

income expresses the level of economic development. Thus, the size of economy and level of economic development are the main attractive forces or pull factors of bilateral trade flows. The main push factor is the distance between the trading partner's countries.

The theoretical considerations for using gravity models to explore international trade flows have been widely discussed and 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; Cheng and Wall, 2002).

The use of gravity equations is widespread despite of the fact that they have, until recently, tended to lack strong theoretical bases. Thanks to various modelling refinements and their application to debates about theoretical foundation of the gravity equation, this model has established itself as a serious empirical tool for exploring regional trade patterns. Evenett and Keller (2002), among with Deardorff (1998), evaluate the usefulness of gravity models also in testing alternative theoretical models of trade. The recent flurry of theoretical work 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). Needless to remember that the gravity equations built for exploring international trade flows fit the data remarkably well.

Despite continuing discussions and some uncertainty about the foundations of the gravity model, one can summarize that the theoretical considerations of the gravity models base on 1) microeconomic foundations, 2) trade theories and 3) new economic geography. These theoretical foundations are also acceptable when exploring the changes in international trade patterns during the transition and European integration processes laying emphasis on possible regional clusters of countries within the common Europe.

The gravity model has been used widely as a baseline model 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 also historical linkages. Owing to comparative advantages, habits, tastes, infrastructure and technology, regions with common border and/or similar historical background may be natural trade partners. Borders often tend to be formed around populations that are relatively homogenous, have similar tastes and habits, common historical background, and in which the regional economies are linked. The associated regions may create common rules to protect themselves from external shocks.

Growing empirical literature finds that historical linkages are important determinants of international trade flows (Frankel, Stein and Wei, 1995; Frankel, 1977; Eichengreen and Inrwin, 1998). Lagged bilateral trade flows are significant in determining current trade in a

large cross-section of countries, after controlling for income and distance. This means that past trade linkages adjust slowly to new conditions. The current EU members have already created a well-integrated market among themselves and they are maintaining stronger trade links with each other than with the countries that will join later. This fact must also be taken into consideration when analysing EU eastward enlargement processes.

In the gravity models, all these considerations and policies are modelled as deviations from the volume of trade predicted by the baseline gravity model (which expresses the impact of traditional gravitational forces), and, in the case of regional integration, they are captured by dummy variables.

3.2. Gravity equation and data

The basic gravity equation estimated in the paper consists of the main pull and push factors (gravitational forces) influencing bilateral trade flows:

$$lnY_{ij}=B_0+B_1ln(POP)_i+B_2ln(POP)_j+B_3ln(GDPpc)_i+B_4(GDPPpc)_j+B_5ln(DISTANCE)_{ij}+u_{ij} \quad (2),$$

where

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

$(POP)_i$ 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;

$(DISTANCE)_{ij}$ – the distance in kilometers between the countries i and j (the flight distance between the capitals of the countries);

u_{ij} – error term.

It is predictable that the main pull factors for developing bilateral trade flows are the size of economy and the level of economic development of the trading partners. The size of economy is expressed by the population numbers and the level of economic development by the GDP per capita. The main push factor is the distance between the trading countries, which expresses not only transportation costs but also other possible conditions that may influence their bilateral trade relations (cultural traditions, common or similar language, etc).

Several authors have discussed how to use the GDP data for estimating gravity equations; whether to use GDP(PPP) (PPP – Purchasing Parity Power) or GDP(MER) (MER – Market Exchange Rate) (see also Gros and Consiarz, 1996; Baldwin 1994 and 1997; Cornett and

Iversen 1998; Iversen, 1998). Gros and Consiarz do not recommend one to use PPP-converted GDP for estimating gravity equations. Instead, 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 (Gros and Consiarz, 1996, pp. 715). Iversen argues that the proper measure of the transition economies' incomes (GDP(MER) or (GDP(PPP) lies somewhere between the two approaches, and it is impossible to settle this matter on a purely theoretical basis (Iversen, 1998, p. 273).). Previous results of modelling bilateral trade flows between the countries of the Baltic Sea Region using the data of the year 1998 show that the statistical estimations are the best in the equations with GDP(PPP) (Paas, 2001 and 2002).

In addition to the traditional gravitational forces influencing bilateral trade flows there are also some factors that create resistance to trade and affect the degree of trade intensity, for instance, various regional agreements and institutions that support trade relations. Also the historical background of the trading partners leaves, through their historical ties, an imprint on their current trade relations. These factors can be included into gravity equations by means of dummy variables.

The gravity equation with dummies:

$$lnY_{ij}=B_0+B_1ln(POP)_i+B_2ln(POP)_j+B_3ln(GDPpc)_i+B_4(GDPpc)_j+B_5ln(DISTANCE)_{ij}+$$

$$+DUMMIES+u_{ij} \qquad (3)$$

Analyzing the bilateral trade flows between the countries involved in EU eastward enlargement (EU15 and CC12) and in order to test the evidence of possible regional clusters and/or other conditions influencing bilateral trade relations, the following dummies were used in gravity equation (3):

DUMMY 1 – designating that the trade partners are the Baltic Sea region countries (Denmark, Finland, Germany, Sweden, Poland, Estonia, Latvia and Lithuania);

DUMMY 2 – designating that the trade partners have a common border (land border);

DUMMY 3 – designating the East-West trade relations (the trade flows occur between the EU (Western partner) and the candidate (Eastern partner) countries);

DUMMY 4 – designating that the trade partners are the Nordic countries (Denmark, Finland and Sweden);

DUMMY 5 – designating that the trade partners are the Visegrad countries (the Czech Republic, Hungary, Slovakia and Slovenia);

DUMMY 6 – designating that the trade partners are the CEFTA countries (the Czech Republic, Bulgaria, Hungary, Romania, Slovakia and Slovenia).

Gravity equations (2) and (3) are estimated, using data of the year 2000:

1) Export and import data of the IMF on EU15 and CC12 (IMF, Direction of Trade Statistics Yearbook 2001; Foreign Trade. Estonia, Latvia, Lithuania, Central Statistical Bureau of Latvia, 2001);

2) Population and GDP (PPP) data of the World Bank http://www.worldbank.org/data/databytopic/GDP.html;

3) A matrix of distances between the capitals of the countries *(*www.indo.com/distance*).*

3.3. The empirical results

The estimation results[1] of the basic gravity equation (2) without dummies allow us to conclude that the behaviour of bilateral trade flows in the countries involved in EU enlargement (EU15 +CC12) is in accordance with the normal gravitational rules aiming to link economic and spatial concepts (Table 4).

Table 4. Estimators of the gravity equation (2) for EU15+CC12 (Model 1)

Variables	**Coefficients**	**Standard error**	***t*-statistic**	**Significance (*p*)**
Constant	–28.749	1.168	–24.621	0.000
$Ln(GDPpc)_i$	1.625	0.068	24.051	0.000
$Ln\ (GDPpc)_j$	1.006	0.061	17.352	0.000
$Ln(POP)_i$	0.963	0.025	38.203	0.000
$Ln(POP)_j$	0.932	0.025	36.832	0.000
Ln (DISTANCE)	–1.199	0.056	–21.476	0.000

R^2= 0.864; $\overline{R}^2 = 0.863$; *F=875,674; p=0.000; N=702*

In order to test whether the increase in R^2 owing to the inclusion of dummies in the gravity model is statistically significant or not, the *F*-test was used. Testing this by means of the *F*-test is exactly the same as testing whether the coefficients for the dummies are equal to zero

[1] For estimating the gravity equations, the statistical package Eviews is used in the paper. All estimators are the White heteroskedasticity-consistent covariance estimators. All model specifications and the estimators results are resumed in the appendix 1 and the explanation of variables included in the gravity equations are presented in the appendix 2.

(hypothesis H_0) or not. The estimated equation (2) is treated as a restricted equation and the estimated equation (3) as an unrestricted equation.

According to the test results, the estimated equation (3) was statistically better than equation (2), which was estimated without dummies. Hence, including dummies into the gravity equation will statistically significantly improve the explanatory power of the estimated model. Based on the comparison results of two model specifications – Model 2 with six dummies: (BSR, Border, East-West; Nordic, Visegrad and CEFTA) and Model 3 with three dummies (BSR, Border and East-West) – we can conclude that the improvement of the explanatory power of the estimated equation (3) with 6 dummies was statistically insignificant (see Table 5 and Appendixes 1 and 2).

Table 5. Estimators of the gravity equation (3) for EU15+CC12 (Model 3)

Variables	**Coefficients**	**Standard error**	***t*-statistic**	**Significance (*p*)**
Constant	–30.679	1.186	–25.865	0.000
$Ln(GDPpc)_I$	1.613	0.065	24.637	0.000
$Ln\ (GDPpc)_j$	1.053	0.059	17.721	0.000
$Ln(POP)_i$	0.972	0.024	40.103	0.000
$Ln(POP)_j$	0.943	0.024	38.788	0.000
Ln (DISTANCE)	–1.199	0.056	–21.476	0.000
Dummy 1 (BSR)	0.924	0.137	6.766	0.000
Dummy 2 (Border)	0.446	0.144	3.087	0.002
Dummy 4 (East-West)	–0.351	0.072	–4.877	0.000

R^2= 0.877; $\overline{R}^2 = 0.876$; *F=613.552; p=0.000; N=702*

The statistically significant coefficient of the Baltic Sea region dummy (Dummy 1) is 0.924. This suggests that the Baltic Sea Region countries' bilateral trade flows are on average 2.5 times larger than trade flows outside the region after controlling for size of economy, the level of economic development, distance and other dummies.

The coefficient of the border dummy (Dummy 2) is also statistically significant and it indicates that bilateral trade flows between the border countries are 1.5 times larger than trade flows between other countries (*ceteris paribus*).

The statistically significant coefficient of the East-West dummy is negative, which suggests that East-West trade flows are on average only about 0.7 times as large as other trade flows are under the *ceteris paribus* conditions. Thus, the biggest is the BSR bias.

Until now the effect of regional dummies was assumed to be constant, irrespective of the partner countries' population numbers and their level of economic development. But it is assumable, for example, that the BSR countries are developing international trade relations differently, depending on their population numbers and/or the level of economic development. It is possible to allow for such differences by interacting each of these explanatory variables with dummies. The coefficients for the interaction variables measure to what extent the bilateral trade flows' dependence on the trade partner countries' size and level of development is different depending on the dummies.

Including interactions for the exporting (i) and importing (j) countries' population numbers ($ln(POP)_i$ and $ln(POP)_j$), and the level of economic development ($ln(GDPpc)_i$ and ($ln(GDPpc)_j$), and for all three dummies (the BSR, the Border and the East-West dummies) (Model 4) yielded the results presented in Table 6.

Table 6. Estimators of the gravity equation (3) for EU15+CC12 (Model 4)

Variables	Coefficients	Standard error	*t*-statistic	Significance (*p*)
Constant	-34.152	1.270	-26.888	0.000
$LN(POP)_j$	0.911	0.030	30.497	0.000
$LN(POP)_i$	0.035	0.030	34.527	0.000
$LN(GDPpc)_i$	2.245	0.106	21.109	0.000
$LN(GDPpc)_j$	0.647	0.086	7.539	0.000
LNDIST	-0.829	0.071	-11.729	0.000
BSR (Dummy 1)	15.312	3.422	4.474	0.000
BORDER (Dummy 2)	5.594	2.924	1.913	0.056
EASTWEST (Dummy 3)	-2.793	3.189	-0.876	0.381
$BSR*ln(POP)_i$	-0.568	0.101	-5.625	0.000
$BORDER * ln(POP)_i$	-0.010	0.085	-0.119	0.906
$EASTWEST*ln(POP)_i$	-0.020	0.050	-0.402	0.688
$EASTWEST*ln(POP)_j$	0.143	0.051	2.787	0.005
$BSR*ln(POP)_j$	-0.528	0.101	-5.226	0.000
$BORDER*ln(POP)_j$	-0.104	0.085	-1.225	0.221
$EASTWEST*ln(GDPpc)_j$	-0.613	0.175	-3.511	0.000
$EASTWEST*(GDPpc)_i$	0.666	0.163	4.092	0.000

*BORDER*ln(GDPpc)$_j$*	0.227	0.265	0.856	0.392
*BORDER*ln(GDPpc)$_i$*	-0.549	0.267	-2.058	0.040
*BSR*ln(GDPpc)$_i$*	0.142	0.225	0.631	0.528
*BSR*ln(GDPpc)$_j$*	0.176	0.225	0.783	0.434

R^2=0.895; $\overline{R}^2$ *=0.892; N=702; p=0.00*

The results indicate that in the case of the BSR, the influence of the population numbers is negative for both the exporting as well as the importing countries. The influence of per capita GDP is statistically insignificant. In the case of the East-West trade relations, the level of economic development and the export flows of the countries are related positively, while the per capita GDP and import flows are related negatively at the level of significance of 0.01.

To test the joint hypothesis that each of the twelve coefficients of the variables interacted with dummies is zero, the *F*-test using the determination coefficients of unrestricted and restricted equations (respectively $R^2_{UR}=0.876$ and $R^2_R=0.895$) was computed. The testing results indicate that specification of the gravity equation with interaction variables has a statistically significant improvement over specification only with the statistically significant dummies (Model 3, see Table 5) and also over specification without the dummies (Model 1, see Table 4).

3.4. Some empirical evidences of modelling bilateral trade flows within EU15 and CC12

The sample of data characterizing bilateral trade flows of the countries that are involved in the EU eastward enlargement processes comprises the datasets of two groups of countries, EU15 and CC12. In order to test the assumption that the trade flows of the two groups of countries behave in a similar fashion, Chow test statistics was used. This allowed us to compare the regression coefficients´ stability of the estimated gravity equations (3).

The estimation results allow us to conclude that the assumption about the occurrence of behavioural differences between the bilateral trade flows of EU15 and CC12 can be accepted. We reject the hypothesis about the stability of the estimated gravity equations' parameters (the gravity equations for a) EU15+CC12, b) EU15, and for c) CC12).

In order to compute Chow statistics, separate gravity equations were also estimated for EU15 (Model 5) and CC12 (Model 6) (Tables 7 and 8).

In the case of trade relations of the current EU member states, the level of economic development expressed by per capita GDP of the exporting country has the most significant positive impact on bilateral trade flows. We can see that 1% increase in the exporting country

per capita GDP, the bilateral trade flows on average increase by about 1.6% on the ceteris paribus conditions. In the case of importing country the respective coefficient of elasticity is only about 0.3 % (table 7).

Table 7. Estimators of the gravity equation (3) for EU15 (Model 5)

Variables	**Coefficients**	**Standard error**	***t*-statistic**	**Significance (*p*)**
Constant	–22.824	6.318	–3.612	0.000
$Ln(GDPpc)_i$	1.633	0.299	5.452	0.000
$Ln\ (GDPpc)_j$	0.316	0.299	1.055	0.000
$Ln(POP)_i$	0.972	0.047	20.822	0.000
$Ln(POP)_j$	0.909	0.047	19.457	0.000
Ln (DISTANCE)	–0.925	0.115	–8.054	0.000
BSR dummy	0.572	0.210	2.729	0.007
Border dummy	0.387	0.163	2.369	0.019

R^2= 0.879; $\overline{R}^2$ *=0.875*; *F=209.237; p=0.000; N=210*

Table 8. Estimators of the gravity equation (3) for CC12 (Model 6)

Variables	**Coefficients**	**Standard error**	***t*-statistic**	**Significance (*p*)**
Constant	–11.515	6.197	–1.858	0.066
$Ln(GDPpc)_i$	1.424	0.305	4.665	0.000
$Ln\ (GDPpc)_j$	0.665	0.267	2.493	0.014
$Ln(POP)_i$	0.723	0.098	7.383	0.000
$Ln(POP)_j$	0.529	0.097	5.481	0.000
Ln (DISTANCE)	–1.512	0.253	–5.984	0.000
BSR dummy	0.777	0.407	1.910	0.059
Border dummy	0.689	0. 373	1.844	0.068

R^2= 0.745; $\overline{R}^2$ *=0.730*; *F=49.605; p=0.000; N=132*

Distance has the most significant impact on bilateral trade flows of the candidate countries (CC12), and this impact is as expected negative. The impact of the trading partners' countries size and level of economic development is positive. The respective elasticity coefficients are about 1.4 in the case of exporting countries and about 0.7 of importing countries' per capita GDP (table 8).

Comparing modelling results presented in the tables 7 and 8, it is possible to summarize that the negative impact of distance on bilateral trade flows is more significant in the case of the candidate than the EU current member countries. The size of trading partner's countries' population has almost the same impact on bilateral trade flows in the case of both exporting and importing EU15 countries (the respective coefficients of elasticity are 0.97 and 0.91). The elasticity coefficients of CC12 trade flows regarding exporting and importing countries' size are different: respectively 0.72 and 53 (table 8).

The EU15 countries have statistically significant (α=0.05) BSR and border countries' biases (respectively about 1.8 and 1.5). In the case of CC12 countries the BSR and border countries' dummies are statistically significant only at the level of significance 0.1. The evidence of cross-border trade relations and Baltic Sea regional cooperation is stronger in the current EU members than the candidate countries.

4. REGIONAL INTEGRATION WITHIN THE BALTIC SEA REGION

4.1. Modelling bilateral trade flows between the Baltic Sea region countries

The gravity equations estimated in the previous section of the paper allowed us to conclude that there is a regional cluster of the BSR countries that support development of bilateral trade flows between the countries involved in the EU eastward enlargement processes. In this part of the paper we will test the assumption that the BSR also consists of regional clusters that support developing bilateral trade relations within the region. We assume that there are regional clusters of the Baltic (Estonia, Latvia, Lithuania) and Nordic (Finland, Sweden, Denmark, Norway) countries, which also have an institutional umbrella that supports the integration processes between these countries: the agreement "5+3" (NB8) promoting co-operation between the Nordic and the Baltic countries.

Thus, the regional dummies placed into gravity equation (3) are the following:

- *DUMMY 1 (Baltic Dummy)*– designating that the trade partners are the countries of the Baltic States Region;
- *DUMMY 2 (Nordic (BSR) Dummy)* – designating that the trade partners are the Nordic countries.

The gravitation equation is estimated using data of ten BSR countries (including also Norway and Russia) in the year 2000. The estimation results support the assumption that the gravity equation with the regional dummies explains the regional trade pattern of the BSR countries statistically better than the equation without the regional dummies (R^2_R=0.805 and R^2_{UR}=0. 860; F=15.9, k=8; m=2; n=90).

The estimation results of equation (3) for the BSR countries are presented in Table 9 (Model 7).

The test results correspond to the statement that the BSR trade flows behave in accordance with the rules of gravitation. The regional trade pattern of the BSR countries is influenced by the trade relations within the regional clusters, i.e. the Nordic and the Baltic cluster. The Baltic cluster has the biggest bias (about 5.4 versus Nordic bias about 2).

Table 9. Estimators of the gravity equation (3) for the BSR (Model 7)

Variables	**Coefficients**	**Standard error**	***t*-statistic**	**Significance (*p*)**
Constant	–10.136	1.856	–5.462	0.066
$Ln(GDPpc)_i$	0.702	0.072	9.777	0.000
$Ln\ (GDPpc)_j$	0.757	0.072	10.570	0.014
$Ln(POP)_i$	0.860	0.054	15.789	0.000
$Ln(POP)_j$	0.706	0.055	12.911	0.000
Ln (DISTANCE)	–1.282	0.155	–8.267	0.000
Baltic dummy	1.684	0.337	4.998	0.000
Nordic (BSR) dummy	0.684	0. 262	2.613	0.011

R^2= 0.860; $\overline{R}^2$ =848; F=7.232; p=0.000; N=90

The integration processes within the BSR have also supported the region's industrialized countries, helping them adjust to the radical changes that followed the break-up of the iron curtain. The industrialized countries gained a wealth of experience in how to penetrate new markets and how to develop economic co-operation with Russia and other post-socialist countries.

4.2. Reintegration processes of the Baltic States

The Baltic States' regional trade pattern has changed significantly during the last decade. At the beginning of the 1990s they had active trade relations with the former Soviet republics and the countries that belong to the Commonwealth of Independent States (CIS). For instance, in 1993 the CIS countries accounted for about 30% of the Estonian and a bit less than a half of the Latvian and Lithuanian international trade volumes. The subsequent market integration broadened their networks of partnering, advancing trade relations between the Baltic States themselves, with the other BSR countries, and also with the EU.

Furtherance of the Baltic States' new trade networks is duly supported by developments in their policies and institutions:

- The Baltic Assembly, a structure for co-operation among the three parliaments, maintains relations with international and regional organizations, notably the Nordic Council.
- The Baltic Council of Ministers (BCM), the "5+3" (NB8) promotes co-operation between the Nordic and Baltic Countries.
- The Council of the Baltic Sea States (CBSS) intensifies co-operation and co-ordination among the Baltic Sea States.

Analyzing integration in international trade, it is possible to conclude that the reintegration processes in the context of EU eastward enlargement have been most remarkable in the case of the Baltic States. It is difficult to overestimate the role of the BSR in this reintegration process. Due to the remarkable amount of FDIs coming from the capital-abundant BSR countries (see Appendix 3) to the Baltic States and due to close trade relations within the countries of the region, the Baltic States succeeded comparatively quickly to restructure their economies and to reorient their FSU- and CIS-based trade relations to those with the EU.

5. CONCLUDING REMARKS

The main feature characterizing the European Union's eastward enlargement processes is integration of national economies with different historical backgrounds and structures. For most candidate countries accession to the EU means reintegration into Europe – this also alters the pertaining spatial dimensions. In order to establish links between the economic and spatial concepts of integration and to explore the regional trade patterns of the countries involved in EU eastward enlargement a gravity model based approach was used in the paper.

Despite the continuing discussions about the foundations of the gravity equation, we can summarize that the theoretical considerations which are mostly based on microeconomic foundations, trade theories and new economic geography are also applicable when analysing possible consequences of regional integration in the context of EU eastward enlargement. The regional integration effects as the deviations from the volume of trade predicted by the baseline gravity model, which expresses the impact of traditional gravitational forces like size of economy, level of economic development and distance, are captured by dummy variables.

The behaviour of bilateral trade flows between the countries involved in the EU eastward enlargement (EU15 and CC12) as well as the EU current member countries (the West-West trade relations) and the candidate countries (the East-East trade relations) is in accordance with the rules of gravitation having statistically significant spatial biases. The East-East trade relations are less developed than the West-West relations.

The East-West trade relations are still rather weakly developed. The East-West trade flows are on average only about 0.7 times as large as other trade flows under the ceteris paribus conditions. There is a behavioural difference in bilateral trade flows between the two groups of countries involved in the EU eastward enlargement process. The modelling results allow us to prove the preposition that the current EU members have already created a well-integrated market among themselves and they are maintaining stronger trade links with each other than with the candidate countries despite of good potential and possibilities for expanding their markets. Lagged bilateral trade flows are still significant in determining current trade. Past trade linkages adjust slowly to the new conditions of the EU eastward enlargement.

The modelling results also indicate that the cross border trade relations and the trade relations between the BSR countries support bilateral trade flows in both groups of countries, the EU15 and CC12. The BSR bias is the biggest. The Baltic Sea region countries' bilateral trade flows are among the countries involved in the EU eastward enlargement on average 2.5 times larger than trade flows outside the region after controlling for size of economy, the level of economic development, distance and other dummies. The evidence of cross-border trade relations and Baltic Sea regional cooperation is stronger in the current EU members than the candidate countries.

The countries around the Baltic Sea benefit from the integration due to the synergetic effect of non-homogenous entities – the countries on different economic levels and with different historical ties. The integration processes within the BSR have been of particular importance for the Baltic States, pushing these small countries into quick restructuring of their economies and supporting these processes by foreign direct investments from the capital-abundant countries of the region.

The Baltic States provide an interesting case for generalizing transition, EU eastward enlargement and regional integration processes and for developing a new field of economics – the economics of transition and integration. In real terms the influence of the Baltic economies on EU eastward enlargement cannot be significant as the Baltic markets are very small in comparison with the markets of the current EU member states as well as the other candidate countries. The population of the Baltic States is only about 2 % of that of EU15 and about 7 % of CC.

The optimal speed of the transition and integration processes is a disputable question. Is the conversion in accordance with the expectations or is it proceeding more slowly and at a lower level than expected? From the point of view of the transitional countries, the transformation processes have often been even quicker than expected, placing the population under serious pressure. The absorptive power of people is limited. The majority of the population in the transitional countries cannot adjust quicker with such rapid changes and the natural consequences are structural unemployment, lack of properly qualified labour force and social problems that are sometimes difficult to solve by rather poor countries.

The integration within the BSR has played a significant role in supporting the adjustment processes of the transitional countries of the region and in making the economies of these countries competitive to follow the requirements of EU enlargement processes. The future of the BSR countries' integration will be an interesting field to study that ensues from the real processes of EU eastward enlargement.

REFERENCES

Anderson, James E. "A Theoretical Foundation for the Gravity Equation", *American Economic Review,* Vol. 69 (1), pp. 106-116, 1979

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

Artis, Mike, Norman Lee (eds) "The Economics of the European Union. Policy and Analysis" (second edition), Oxford University Press, New York, 1997

Baldwin, Richard E. "The Potential for Trade between Countries of EFTA and Central and Eastern Europe", *Occasional Paper,* No. 44, European Free Trade Association, Geneva, 1993

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

Baldwin, Richard E. "Comment on Gros and Gonciards", *European Journal of Political Economy*, Vol. 13, pp. 187-188, 1997

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

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

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

Bröcker, Johannes, Herrmann, Hajo "Spatial Change and Interregional Flows in the Integrating Europe" - Essays in Honor of Karin Peschel, Contributions to Economics, Psychica Verlag, Heidelberg, New York, 2001

Cheng I-Hui, Wall, Howard J. "Controlling for Heteogeneity in Gravity Models of Trade", *Federal Reserve Bank of St. Louis Working Paper*, No. 1999-010C, St. Louis, 33 p., 2002

Cornett, Andreas P. "Integration and Reintegration in the Baltic Sea Region: A Tentative Assessment", Papers of the 7th Nordic-Baltic Conference in Regional Science, Ystad, Sweden, 2002

Cornett Andreas P., Iversen, Soren 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 Alan V. “Testing Trade Theories and Predicting Trade Flows”, *Handbook of International Economics,* Vol. 1, Amsterdam: North-Holland, 1984

Deadorff Alan 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 Alan 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, pp. 7-31, 1998

Estevadeordal Antoni, Frantz Brian, Taylor Alan M. “The Rise and Fall of World Trade, 1870–1939”, *NBER Working Paper,* No. 9318, Cambridge Mass.: National Bureau of Economic Research, 33 p., 2002

Eichengreen Barry, Irwin Douglas “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, pp. 33-64, 1998

Estonia and European Union, Statistical Office of Estonia, Tallinn, 2000

Evenett Simon J., Keller Wolfgang “On Theories Explaining the Success of the Gravity Equation”, *NBER Working Paper*, No. W6529, Cambridge Mass.: National Bureau of Economic Research, 1998

Evenett Simon J., Keller Wolfgang “On Theories Explaining the Success of the Gravity Equation”, *Journal of Political Economy*, 110, pp. 281-316, 2002

Frankel Jeffrey, Stein Ernesto, Wei Shang-jin “Trading Blocks and the Americas: The Natural, the Unnatural, and the Super-natural”, *Journal of Development Economics*, Vol. 47, pp. 61-95, 1995

Frankel Jeffrey “Regional Trading Blocks”, Institute for International Economics, Washington DC, 1997

Frankel Jeffrey (ed) “The Regionalization of the World Economy”, The University of Chicago Press, Chicago, London, 1998

Feenstra, Robert C. "Integration of Trade and Disintegration of Production in the Global Economy", *Journal of Economic Perspectives,* XII, pp. 31-50, 1998

Foreign Trade 2000. Estonia, Latvia, Lithuania. Statistical bulletin, Riga, 2001

Gros Daniel, Gonciarz Andrzej "A Note on the Trade Potential of Central and Eastern Europe", *European Journal of Political Economy*, Vol. 12, pp. 709-721, 1996

Hanson, Gordon H., Chong Xiang "The Home Market Effect and Bilateral Trade Patterns", *NBER Working Papers*, No. W9076, Cambridge Mass.: National Bureau of Economic Research, July, 2002

Harrigan, James "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

International Monetary Fund, *Direction of Trade Statistics Yearbook*, 1999, 2000 and 2001

Iversen, Soren 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, pp. 257-280, 1998

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

Paas, Tiiu "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, pp. 607-618, 2001

Paas, Tiiu "Gravity Approach for Exploring Baltic Sea Regional Integration in the Field of International Trade", *HWWA Discussion Paper*, No. 180, Hamburg: Hamburg Institute of International Economics, 2002

Poyhönen, Pentty "Tentative Model for the Volume of Trade between Countries", *Weltwirtschaftliches Archiv*, 90, pp. 91-113, 1963

Robson, Peter "The Economics of International Integration" (third edition), Allan & Unwin, London, 1997

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

Tinbergen, Jan "Shaping the World Economy", New York: Twentieth Century Fund, 1962

World Competitiveness Yearbook, Methodology, International Institute for Management Development, Lausanne, Switzerland, 2002

World Development Indicators, CD-ROM, World Bank, 2000
http://www.worldbank.org/data/databytopic/GDP.html

Appendix 1

The specifications and estimators of the gravity equations based on data of the countries involved into EU eastward enlargement (data of 2000)

Variables	EU15+CC12 Model 1	EU15+CC12 Model 2	EU15+CC12 Model 3	EU15+CC12 Model 4	EU15 Model 5	EU12 Model 6	BSR Model 7
Constant	–28.749 (0.000)	–29.799 (0.000)	-30.679 (0.000)	–34.152 (0.000)	–22.824 (0.000)	–11.515 (0.000)	–10.136 (0.000)
$Ln(GDPpc)_i$ *(p)*	1.625 (0.000)	1.573 (0.000)	1.613 (0.000)	2.245 (0.000)	1.633 (0.000)	1.424 (0.000)	0.702 (0.000)
$Ln\ (GDPpc)_j$ *(p)*	1.006 (0.000)	1.023 (0.000)	1.053 (0.000)	0.647 (0.000)	0.316 (0.000)	0.662 (0.014)	0.757 (0.014)
$Ln(POP)_i$ *(p)*	0.963 (0.000)	0.974 (0.000)	0.972 (0.000)	1.035 (0.000)	0.972 (0.000)	0.723 (0.000)	0.860 (0.000)
$Ln(POP)_j$ *(p)*	0.932 (0.000)	0.945 (0.000)	0.943 (0.000)	0.911 (0.000)	0.909 (0.000)	0.529 (0.000)	0.706 (0.000)
Ln (DIST) *(p)*	–1.199 (0.000)	-0.966 (0.000)	–1.199 (0.000)	–0.829 (0.000)	–0.925	–1.512 (0.000)	–1.282 (0.000)
BSR *(p)*	–	0.827 (0.000)	0.924 (0.000)	15.312 (0.000)	0.572 (0.007)	0.777 (0.059)	–
Border *(p)*	–	0.438 (0.003)	0.446 (0.002)	5.594 (0.056)	0.378 (0.019)	0.689 (0.068)	–
East-West *(p)*	–	–0.372 (0.000)	–0.351 (0.000)	–2.793 (0.381)	–	–	–
Nordic *(p)*	–	0.478 (0.226)	–	–	–	–	–
Visegrad *(p)*	–	–0.065 (0.788)	–	–	–	–	–

CEFTA *(p)*	–	–0.207 (0.224)	–	–	–	–	–
Baltic *(p)*	–	–	–	–	–	–	1.684 (0.059)
Nordic *(BSR)* *(p)*	–	–	–	–	–	–	0.684 (0.011)
*BSR** $ln(POP)_i$ *(p)*	–	–	–	-0.568 (0.000)	–	–	–
*BORDER ** $ln(POP)_i$ *(p)*	–	–	–	–0.010 (0.906)	–	–	–
*EASTWEST** $ln(POP)_i$ *(p)*	–	–	–	-0.020 (0.688)	–	–	–
*EASTWEST** $ln(POP)_j$ *(p)*	–	–	–	0.143 (0.005)	–	–	–
*BSR** $ln(POP)_j$ *(p)*	–	–	–	-0.528 (0.000)	–	–	
*BORDER** $ln(POP)_j$ *(p)*	–	–	–	-0.104 (0.221)	–	–	
*EASTWEST** $ln(GDPpc)_j$ *(p)*	–	–	–	-0.613 (0.000)	–	–	
*EASTWEST** $(GDPpc)_i$ *(p)*	–	–	–	0.666 (0.000)	–	–	
*BORDER** $ln(GDPpc)_j$ *(p)*	–	–	–	0.227 (0.392)	–	–	
*BORDER** $ln(GDPpc)_i$ *(p)*	–	–	–	-0.549 (0.040)	–	–	

BSR ln(GDPpc)$_i$ (p)*	–	–	–	0.142 (0.528)	–	–	
BSR ln(GDPpc)$_j$ (p)*	–	–	–	0.176 (0.434)	–	–	
N	702	702	702	702	210	132	90
R^2	0.864	0.878	0.877	0.895	0.879	0.745	0.860
$\overline{R}^2$	0.863	0.876	0.876	0.892	0.875	0.730	0.848
P	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Model 1. The gravity equation includes basic variables that characterize the size of economy and level of economic development as pull factors and distance between the trading partners as a push factor which influence bilateral trade flows (basic variables).

Model 2. The gravity equation includes basic variables and dummies that characterize possible influence of regional clusters on bilateral trade flows (BSR countries, Nordic countries, Border countries, Visegrad countries, CEFTA countries, East-West trade flows)

Model 3. The gravity equation includes basic variables and statistically significant dummies that characterize possible influence of regional clusters on bilateral trade flows (BSR, Border, East-West).

Model4. The gravity equation includes basic variables, statistically significant dummies and interaction variables.

Model 5. The gravity equation estimated for EU15.

Model 6. The gravity equation estimated for CC12.

Model 7. The gravity equation estimated for the BSR countries (Denmark, Finland, Germany, Estonia, Latvia, Lithuania, Poland, Russia, Sweden).

Appendix 2

Variables of the gravity models specifications presented in the appendix 1.

Variables	Explanations
$(GDPpc)_i$	Per capita GDP (PPP) of exporting (home) country.
$(GDPpc)_j$	Per capita GDP (PPP) of importing (hoste) country.
$(POP)_i$	Population of exporting (home) country.
$(POP)_j$	Population of importing (host) country.
(DIST)	Distance between the home (*i*) and host (*j*) countries.
BSR	Baltic Sea region dummy (=1, if trading partners' countries are the BSR countries; =0, if other trade relations). The Baltic Sea region countries are: Denmark, Finland, Estonia, Germany, Latvia, Lithuania, Poland, Sweden.
Border	Border countries dummy (=1, if trading partners´ countries have common border; =0, if other countries).
East-West	East-West dummy (=1, if trade flows are between the EU15 and CC12 countries).
Nordic	Nordic countries dummy (=1, if trading partners' countries are Nordic countries; =0, if other trade relations). Nordic countries are: Denmark, Finland, Sweden.
Visegrad	Visegrad countries dummy (=1, if trading partners' countries are Visegrad countries; =0, if other trade relations). Visegrad countries are: Czech Republic, Hungary, Slovakia, Slovenia.
CEFTA	CEFTA countries dummy (=1, if trading partners' countries are the CEFTA countries; =0, if other trade relations). CEFTA countries are: Czech Republic, Hungary, Slovakia, Slovenia, Bulgaria, Romania

Baltic	Baltic States dummy (=1, if trading partners' countries are the Baltic States (Estonia, Latvia, Lithuania); =0, if other trade relations).
Nordic(BSR)	Nordic (BSR) dummy (=1, if trading partners' countries are the Nordic countries from the BSR (Denmark, Finland, Norway, Sweden); =0, if other trade relations).
$BSR*ln(POP)_i$	Interactions: BSR dummy and exporting (home) country's size of population.
$BORDER * ln(POP)_i$	Interactions: Border dummy and exporting (home) country's size of population.
$EASTWEST*ln(POP)_i$	Interactions: East-West dummy and exporting (home) country's size of population.
$EASTWEST*ln(POP)_j$	Interactions: East-West dummy and importing (host) country's size of population.
$BSR*ln(POP)_j$	Interactions: BSR dummy and importing (host) country's size of population.
$BORDER*ln(POP)_j$	Interactions: Border dummy and importing (host) country's size of population.
$EASTWEST*ln(GDPpc)_j$	Interactions: East-West dummy and importing (host) country's per capita GDP (PPP).
$EASTWEST*(GDPpc)_i$	Interactions: East-West dummy and exporting (home) country's per capita GDP (PPP).
$BORDER*ln(GDPpc)_j$	Interactions: Border dummy and importing (host) country's per capita GDP(PPP).
$BORDER*ln(GDPpc)_i$	Interactions: Border dummy and exporting (home) country's per capita GDP(PPP).
$BSR*ln(GDPpc)_j$	Interactions: BSR dummy and importing (host) country's per capita GDP(PPP).
$BSR*ln(GDPpc)_i$	Interactions: Border dummy and exporting (home) country's per capita GDP(PPP).

Appendix 3.

Inward FDI stocks in the Baltic States in 1998-2000

Table 10. Inward FDI stocks in Estonia by home country, 1998-2000, (share, %)

		31 Dec. 1998		31 Dec. 1999		31Dec. 2000
1.	Sweden	32,45	Sweden	40,58	Sweden	39,75
2.	Finland	26,97	Finland	30,04	Finland	29,94
3.	Denmark	5,80	Denmark	4,08	USA	4,56
4.	United Kingdom	4,06	USA	3,94	Norway	4,29
5.	USA	3,88	Norra	3,49	Denmark	4,07

Source: Bank of Estonia

Table 11. Inward FDI stocks in Latvia by home country in 1998-2000, (share, %)

		31Dec. 1998		31Dec. 1999		31Dec. 2000
1.	Denmark	15,15	Denmark	14,31	Denmark	14,00
2.	USA	10,67	USA	10,30	Germany	12,72
3.	Russia	8,61	Germany	8,79	Sweden	10,19
4.	Germany	8,57	Sweden	8,58	USA	9,31
5.	UK	7,54	UK	7,69	Russia	7,28

Source: Bank of Latvia, author's calculations.

Table 12. Inward FDI stocks in Lithuania by home country in 1998-2000, (share, %)

		31Dec.1998		31Dec. 1999		31Dec. 2000
1.	USA	18,67	Sweden	17,50	Denmark	18,25
2.	Sweden	16,86	USA	13,37	Sweden	17,33
3.	Finland	10,67	Finland	10,57	USA	9,83
4.	Germany	8,16	Denmark	9,71	Germany	7,38
5.	UK	6,77	Germany	7,66	UK	6,68

Source: Bank of Lithuania, author's calculations.