WIFO
ÖSTERREICHISCHES INSTITUT
FÜR WIRTSCHAFTSFORSCHUNG

WORKING PAPERS

Openness to Trade, Migration and Foreign Direct Investments of the EU

Stanislav Cernosa

401/2011

Openness to Trade, Migration and Foreign Direct Investments of the EU

Stanislav Cernosa

WIFO Working Papers, No. 401
September 2011

E-mail address: cernosa@aristej.si
2011/233/W/0

Medieninhaber (Verleger), Hersteller: Österreichisches Institut für Wirtschaftsforschung • 1030 Wien, Arsenal, Objekt 20 • Tel. (43 1) 798 26 01-0 • Fax (43 1) 798 93 86 • http://www.wifo.ac.at/ • Verlags- und Herstellungsort: Wien

Kostenloser Download: http://www.wifo.ac.at/wwa/pubid/42674

Openness to Trade, Migration and Foreign Direct Investments of the EU

Stanislav Cernosa*

Abstract

This paper analyses openness to trade, migration and foreign direct investment (FDI) using panel data. The focus is on the relationship between fifteen European Union member states (EU15) as destination countries, and 71 trading partner countries which send migrants and receive FDI outflows, where only those predictions which are based on demographic trends of the partner countries and their geographical locations are introduced in the extended gravity model. The results confirm that a unified model successfully explains differences in openness to trade, migration and FDI between the EU15 and the twelve new EU members, candidate countries, and developing countries.

Key Words: International trade, migration, foreign direct investments, and gravity model.
JEL Code: F14, F21, F22

Introduction

Openness to trade, migration and foreign direct investment (FDI) is closely associated with economic globalization. The literature on the economic effects of globalization is focused on the openness to trade and aggregate growth. Frankel and Romer's (1999) theoretical model is used primarily to measure the link between openness to trade and economic growth. The same or similar model specification is applied by Ondrich et al. (2006), Badinger (2007), Nenna and Ricchi (2007), Buch and Monti (2008), Buch and Toubal (2009), and Felbermayr et al. (2010). Finally, Ortega and Peri (2011) consider openness to trade and immigration by adopting the gravity based approach of Frankel and Romer in order to estimate the effects of trade and immigration on income.

The central aim of this paper is to estimate the openness to trade, migration flows and FDI using the extended Frankel and Romer model. This analysis introduces unbalanced panel data of the fifteen core European members (EU15)[1] as trading partners, destination countries, and investors in relationship with 71 other countries[2] from 1996 to 2006, where Ireland is excluded from further research for methodological reasons. According to OECD data this country mainly identifies migrant flows from the United Kingdom and United States and reports completely asymmetric migration flows.[3] For instance, Brakman et al. (2010) pointed out that an important methodological problem with the analysis of trade flows or similar analysis is the occurrence of zero flows, which can be caused by rounding errors, missing observations or truly zero flows. As suggested by Bergeijk and Brakman (2010), the two standard approaches[4] of handling zero values are introduced, and the OLS methodology as the preferable estimation method is implemented in this analysis.

Thus the proper handling of large numbers of zeroes in migration statistics and especially FDI statistics represents the essence of this analysis. A further contribution to the literature is the adopted and extended Frankel and Romer model. The extended model is related to the Frankel and Romer framework, but at the same time differs in a few important aspects. As mentioned elsewhere, the cited authors estimate the effects of trade openness on GDP per capita income

* Aristej Research Group, Aristej Publishing House Maribor, Slovenia. E-mail: cernosa@aristej.si .

[1] These states are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Luxemburg, Netherlands, Portugal, Spain, Sweden, and United Kingdom.

[2] The following bilateral relationships are analysed: EU15 with Developing countries, EU15 with the twelve new EU members, and EU15 with Candidate Countries.

[3] Ireland was also excluded due to data asymmetries in Warin and Blakely (2009).

[4] The first standard approach is used by Afman and Maurel (2010), while the second is implemented by Rose and Spiegel (2010).

at the aggregate level, while this paper primarily estimates the effects of explicitly exogenous variables on openness to trade, immigration, and FDI.

This paper includes for the first time openness to FDI in an empirical framework in addition to previously included openness to trade and immigration. The prediction is that a country's exposure to international trade, migration flows, and FDI spreads knowledge, stimulates competition and selects more productive firms. It is also predicted that openness to trade, immigration and FDI between two partner countries is a function of two kinds of external factors: the partner country's geographical location and the size of the potential partner. The great circle distance, common language, and landlocked position are included as time-invariant geographic variables, while the potential partner characteristics are determined purely by population as a measure of the size potential.

The results confirm that the population of the partner countries, landlocked position, distance, and common language are relevant determinants which explain openness to trade, immigration and FDI most significantly. This paper is structured in the following way: Section Two presents the theoretical framework. Section Three presents the data and methodology, while Section Four presents the regression results. The final section provides concluding remarks.

2. Theoretical framework

2.1. Frankel and Romer (1999) model

The theoretical framework introduced is based on Frankel and Romer's (1999) model, which includes openness to trade. Ortega and Peri (2011) contributed to the literature on the aggregate economic effects of openness with the inclusion of openness to immigration in addition to trade openness in Frankel and Romer's model. While economic development is a cause as well as a consequence of immigration, trade and foreign direct investment, this paper extends the model by including openness to FDI in the empirical framework. The supposition is that countries differ in their geographic location and their size, and that each country is continuously exposed to foreign goods, immigration and capital flows. This framework can be described with a few equations.

If the economic outcome for country i in year t is presented with y_{it}, then the country's economic outcome is a log-linear function of its accumulated exposure to international trade (T_{it}), migration flows (M_{it}) and foreign direct investments (FDI_{it}). Since countries differ in their size, the control for size differences S_{it} is introduced into the model specification. The prediction is that the larger countries are more diversified in terms of ideas, skills, and factors of production, which increases the frequency of productive interactions. In this way the quality of economic interactions is related to the country's accumulated openness to trade, immigration, and FDI. This economic outcome is presented by following specification:

(1). $$\ln y_{it} = \alpha_{yt}^{'} + \beta_y T_{it} + \gamma_y M_{it} + \varphi_y FDI_{it} + \delta_y S_i + \varepsilon_{it}^{'} \ ,$$

,

where y_{it} is the economic outcome of interest for country i in year t, T_{it} is a measure of the accumulated openness to foreign goods (such as the stock of imported capital or ideas relative to the destination country's GDP), M_{it} is a measure of the accumulated openness to foreign individuals (such as the stock of immigrant population relative to the destination country's population), FDI_{it} is a measure of the accumulated openness to foreign direct investments (such as the stock imported capital or ideas relative to the destination country's GDP), S_i is a country's size measure, the term $\alpha_{yt}^{'}$ captures the other systematic determinants of theoutcome variables, and $\varepsilon_{it}^{'}$ is a mean zero random variable accounting for random shocks to $\ln y_{it}$. In time-differences the equation (1) is rewritten as follows:

(2). $$\Delta \ln y_{it} = \alpha_{yt} + \beta_y \tau_{it} + \gamma_y m_{it} + \varphi_y f_{it} + \varepsilon_{it} \ ,$$,

where τ_{it}, m_{it} and f_{it} are flow measures of openness to international trade, international migration, and FDI, respectively. Openness to international trade is defined as the sum of exports plus imports relative to the destination country's GDP, openness to immigration is defined as the inflow of new immigrants in the observed year relative to the destination cuntry's population at the beginning of the same year, and openness to FDI is measured as the destination country's FDI outflows weighted by the destination country's total GDP in the observed year. Thus these measures of openness expressed relative to the size of the country (in terms of population or output) are introduced as proxies for exposure to foreign goods, foreign individuals and FDI. The countries that receive positive shocks to their per capita

income may increase their international trade flows, may attract more immigrant population, and may also increase the FDI outflows.

This paper presupposes that each country's openness is a function of two kinds of external factors: the country's geographic location and the size of its potential (trade, migration, and FDI) partners. In this way this paper introduces time-invariant geographic variables such as for instance bilateral distance, landlocked position, and common language as a measures of the partner country's geographic location, and introduces population size of the sending country as a measure of trade potential, migration potential, and FDI potential. The present empirical framework is formed similarly to the successfully implemented gravity equation in the international trade, migration, and FDI literature (Anderson and van Wincoop 2003; Bergstrand and Egger 2007; Grogger and Hanson 2008), where the present empirical framework differs in one important point: This paper omits all information regarding the destination country *i*. In this paper it is assumed that openness to trade flows and FDI flows between country *i* and *j* is expressed by:

(3). $$\ln \chi_{ijt} = a^{\chi} + b_1^{\chi} \ln P_{jt} + b_2^{\chi} \ln(Dist)_{ij} + b_3^{\chi} ComLang_{ij} + b_4^{\chi} Landlock_j + e_t^{\chi},$$

where, , χ_{ijt} stands either as a dependent variable for trade (defined as the proportion between exports plus imports relative to the destination country's GDP) or as a dependent variable for FDI (defined as the FDI outflows relative to the destination country's GDP), a^{χ} is the intercept, P_{jt} is the population of the sending country (or country of origin), *Dist* is bilateral distance, $ComLang_{ij}$ is an indicator for common language, $Landlock_{ij}$ is an indicator of the partner country's landlocked geographical position, and e_t^{χ} is a zero-mean error term. Similarly it is assumed that openness to migration between country *i* to country *j* is expressed:

(4). $$\ln m_{ijt} = a^{m} + b_1^{m} \ln P_{jt} + b_2^{m} \ln(Dist)_{ij} + b_3^{m} ComLang_{ij} + b_4^{m} Landlock_j + e_t^{m}$$

where the dependent variable m_{ijt} is the log of the migration flow from country *j* to country *i* relative to the destination country's population, a^m is the intercept, and e_t^m is a zero-mean error term. All other right-hand variables are the same as in equation (3). Since the

explanatory variables are completely identical in equations (3) and (4), the weights of coefficients will clearly define the roles of each particular variable included in the model.

2.2. The Gravity Approach

This paper introduces the gravity model mentioned elsewhere as a particular type of specification inspired by Newton's law of gravity. In its basic form, the gravity model states that trade between two countries is a positive function of their GDP as a proxy variable for their respective supply (conditions in the source country) and demand (conditions in the host country), and a negative function of the distance between two countries as a proxy variable for transportation costs:

(5.) $$T_{ij} = \frac{GDP_i^{\alpha} GDP_j^{\beta}}{D_{ij}^{\theta}} \ .$$

This specification is most often estimated in log-linear form. The equation, first introduced by Tinbergen (1962), explains bilateral trade by means of economic size and distance: the larger the two countries, the larger the trade flows; the greater the distance between two countries, the smaller the bilateral trade. Despite its popularity during the early days of its introduction, the lack of a theoretical foundation gave the gravity model a somewhat dubious reputation among academics. Anderson (1979) and Bergstrand (1985, 1989) provided the first micro-economic foundation of the gravity model, while Anderson and van Wincoop (2003) extended previous work and introduced a method which is based on a complicated price index (called multilateral resistance terms) and which is a well-known reference for subsequent theoretical work using the gravity equation.

Van Bergeijk and Brakman's book (2010) resumes the theoretical work on the gravity equation and answers a number of questions regarding the gravity equation, such as for instance: how to deal with the multilateral resistance terms, how to deal with the large numbers of zeroes in (trade, migration and FDI) statistics, and what is the appropriate level of (dis)aggregation for the gravity model. The first chapter of the cited work presents the methodology, the second chapter presents a few different concepts for measuring distance as a proxy variable for transportation and other freight costs between two countries, and the last chapter provides a large sample of the empirical applications.

3. Data and Methodology

The estimations of the gravity model for trade flows, migration flows or FDI flows are not without problems: an important issue is how to handle zero values. The Eurostat trade data (in euros) introduced are almost perfectly covered by values on exports and imports. This trade data basis is generally without zero values or missing values for a sample of more than six thousand observations.[5] But the introduced OECD data on migration flows and especially OECD data on FDI flows (in US dollars) have many zero values or missing observations.

Since the percentage of FDI observations with zeroes is quite high, this constitutes a problem because of the preferred log-linearized gravity specification which is undefined for observations with zero flows. Thus instead of zeroes we add 1 to all FDI outflows from the EU country *i* to partner country *j* aiming to overcome the zero problem in log specification.[6] This procedure represents the standard approach of handling zeroes as suggested by Brakman et al., Santos Silva and Tenreyro (2006), Baldwin and Harrigan(2007), and Rose and Spiegel (2010).

This paper introduces the alternative standard approach of handling zeroes in migration data, first implemented by Linnermann (1966). The same procedure is also used in Santos Silva and Tenreyro (2006) and Afman and Maurel (2010). This procedure mainly discards the zeroes by truncating the data sample, and applies OLS estimation. The problem is that estimating strictly positive observations may sometimes lead to a selection bias. The sample selection bias problem can be handled by means of sample selection corrections. For instance, Helpman et al. (2008) implemented a theoretical model rationalizing the zero trade flows. They proposed an estimation of the gravity model with correction for the probability of countries to trade, and applied the new two-step estimation technique similarly to sample selection models used in labour economics.

[5] For instance, the former Serbia and Montenegro is a relatively rare exception.
[6] The fact of the matter is that foreign direct investment from a sending country *j* to a destination country *i* are either insignificant or hard to obtain for most of the 71 partner countries which send migrants to EU15. The relatively rare exceptions are the advanced countries, and some Central and Eastern European countries.

Table 1: The core EU members as destination countries

EU member	Country Pairs	Observations
Austria	14	154
Belgium	33	363
Denmark	32	352
Finland	18	198
France	47	517
Germany	76	836
Greece	28	308
Italy	63	693
Luxemburg	14	154
Nederland	67	737
Portugal	18	198
Spain	69	759
Sweden	49	539
Great Britain	33	363
Total	561	6171

Source: OECD International Migration data

But implementation of the suggested approach is comprehensive and hardly applicable in present analysis. While zero values are discarded, and the data truncated as suggested according to Linnermann's procedure, this paper uses the OLS estimation method as preferable. The assumption in this analysis is that selection bias is of the second order. Table 1 shows the number of country pairs and the total number of observations included, and confirms that Ireland, which reports extremely asymmetric migration flows, is excluded from further research. Similarly, the United Kingdom immigration data only reports immigrant flows of the larger cohorts of immigrants.

In this way Belgium has the same number of country pairs and the same number of observations as the larger United Kingdom. But generally the introduced OECD data sample on migration ensures relatively consistent international comparisons. For instance, Austria and Luxemburg as the only core EU15 landlocked states have the smallest number of country pairs (14), and also the smallest number of observations (154) in comparison with the other EU15 member states.

The data on migration flows are an unbalanced panel beginning in 1996 and ending in 2006. These data measure the yearly inflows of migrants, and yearly stocks of immigrants. The stocks of immigrants are introduced aiming to ensure the robustness of the analysis. As mentioned elsewhere, the data on migration are sourced from the OECD International Migration database. The basic sample of data includes only migration inflows with positive values from 5874 observations, and excludes all zero immigrant flows. The final version of immigration data also includes a limited number of flows with interpolated observations. This procedure is applied to 297 observations when a data point for bilateral migration flow was missing and data for both the previous and following year are available.[7]

Data for population and purchasing power parity gross domestic product are taken from the Penn World Table (PWT 7.0) website (http://pwt.econ.upenn.edu/php_site/pwt_index.php). Data for distances and common language are taken from the CEPII website (www.cepii.fr). Distance is measured in kilometres between the partner countries' capital cities. The EU15 partner countries are considered to be landlocked when they are without direct access to the sea and therefore shipping trade.[8] These data are from CIA World Factbook 2008.

[7] Ortega and Peri (2011) used a similar procedure.
[8] Afghanistan, Armenia, Azerbaijan, Belarus, Czech Republic, Ethiopia, Hungary, Kazakhstan, Macedonia, Moldova, Serbia, Slovakia, Switzerland, Uzbekistan (and Austria and Luxemburg for intra EU27 migration).

Table 2: Descriptive statistics presented by country of origin

World	*ln* TRD	*ln* MIG	*ln* FDI	*ln* pops.	Comm. lang.	Landlocked	*ln* dist.
Mean	-3.113	-5.547	-20.947	16.928	0.087	0.139	7.849
Median	-3.022	-5.662	-21.421	16.965	0.000	0.000	7.825
Maximum	1.828	2.275	-11.420	20.825	1.000	1.000	9.781
Minimum	-1.499	-8.850	-25.288	12.848	0.000	0.000	4.088
Observations	6171	6171	6171	6171	6171	6171	6171
Developing Countries	*ln* TRD	*ln* MIG	*ln* FDI	*ln* pops.	Comm. lang.	Landlocked	*ln* dist.
Mean	-3.996	-5.904	-22.026	22.794	0.090	0.089	8.501
Median	-3.866	-5.977	-23.245	17.405	0.000	0.000	8.629
Maximum	0.931	-0.113	-14.109	15.480	1.000	1.000	9.440
Minimum	-1.499	-8.850	-25.288	12.887	0.000	0.000	6.389
Observations	3069	3069	3069	3069	3069	3069	3069
NEU12	*ln* TRD	*ln* MIG	*ln* FDI	*ln* pops.	Comm. lang.	Landlocked	*ln* dist.
Mean	-3.213	-5.696	-20.872	15.808	0.013	0.289	6.964
Median	-3.106	-5.836	-20.599	15.903	0.000	0.000	7.057
Maximum	0.594	-0.257	-14.761	17.471	1.000	1.000	8.098
Minimum	-8.522	-8.732	-25.288	12.848	0.000	0.000	4.088
Observations	836	836	836	836	836	836	836
Candidate countries	*ln* TRD	*ln* MIG	*ln* FDI	*ln* pops.	Comm. lang.	Landlocked	*ln* dist.
Mean	-4.280	-5.195	-22.085	16.065	0.024	0.319	7.109
Median	-3.876	-5.262	-23.270	15.319	0.000	0.000	7.226
Maximum	-0.219	-0.685	-16.122	18.116	1.000	1.000	7.916
Minimum	-8.782	-8.669	-25.288	14.494	0.000	0.000	5.438
Observations	451	451	451	451	451	451	451

Notes: TRD – bilateral trade defined as the sum of exports plus imports relative to the destination country's GDP; MIG – migration inflow relative to destination country's population; FDI – foreign direct investment relative to destination country's GDP; pops – sending country's population; Comm. lang. – binary variable for official common language; Landlocked – binary variable for sending country's landlocked geographical position; and dist. – great circle distance between partner countries' capital cities.

This paper alternatively tests contiguity and colonial ties as explanatory variables. While both variables are highly correlated with great circle distance as an explanatory variable for transportation costs, both tested variables are excluded from further research. Nevertheless, Bosker and Garretsen (2010) suggest that inclusion of proxy variables such as great circle distance, border and language variables, and geographical features such as having direct access to the sea should be preferred. Appendix 1 shows the list of countries. Table 2 reports some descriptive statistics for the following bilateral relationships: EU15 with all countries[9] (World), EU15 with Developing countries (Developing countries), EU15 with the NEU12 (NEU12), and EU15 with Candidate Countries (Candidate Countries).

[9] This sample of countries includes also intra EU15 bilateral trade, immigration flows and FDI flows.

4. Results of the analysis

As described in the previous section, trade data have mainly positive values, while data on immigration flows and especially data on FDI flows have a lot of non-positive values. This problem is solved by implementation of the standard approaches of handling with zeroes. The next problem which is solved is comparability of the regression coefficients for the introduced measures of the openness to trade, immigration, and FDI. In order to obtain comparable regression coefficients which have the same magnitude, the openness to trade is defined as the sum of exports plus imports relative to the destination country's GDP, openness to immigration is defined as the inflow of new immigrants relative to the destination country's population, and openness to FDI is measured as the destination country's FDI outflows weighted by the destination country's GDP in the observed year.

The gravity model is used to estimate equations (3) and (4). The time effects or fixed effects are not included in order to use variation in openness to trade, immigration, and FDI which arise purely from the partner country's demographics (population), bilateral geographic variables (distance, and landlocked position), and linguistic proximity (common language). Additional explanatory variables, such as for instance the sending country's share of young people, and measures of economic size and performance of partner country, are not included in the model. These variables may increase the goodness of fit of the model estimated, but at the same time reduce the credibility of the basic suppositions and empirical framework.

Table 3 reports the results of the estimations for the largest sample (World) in the first three columns 1, 2, and 3. The specification that estimates openness to trade, immigration and FDI in these columns is completely identical. The most interesting result is that each column shows different overall explanatory power of the model (R-squared), and that these results are comparable with Ortega and Peri's (2011) analysis.[10] For instance, Ortega and Peri (2011) reported relatively higher R-squared for trade openness (0.45) in comparison with openness to immigration (0.20), and at the same time reveal the highest values of coefficients for distance (-1.43) when trade openness was estimated.

[10] It should be noted that the study cited introduces a different sample of countries (thirty OECD destination countries), and tests two empirical specifications (openness to trade and migration).

The results of estimations for the trade equation in column 1 imply the highest coefficients on distance as a proxy variable for transportation and other freight costs, similar to the study previously cited, while common language and population of the sending country have different weights of coefficients and are consequently differently ordered. The cited analysis also shows the highest values of coefficients for common language (1.64), followed by distance (-0.60) and sending country population (0.58) when openness to immigration is estimated. Table 3 shows similar results in columns 2 and 3 when openness to immigration and FDI are estimated as dependent variables. The variables for common language, distance and sending country's population are ranked one after another as reported by Ortega and Peri.

Table 3: Regression results for the two largest samples of countries

	Relationship					
	World			Developing countries		
	1	2	3	1	2	3
Specification	*ln TRD*	*ln MIG*	*ln FDI*	*ln TRD*	*ln MIG*	*ln FDI*
ln population origin	0.640	0.374	0.593	0.002	0.001	0.001
	(0.02)***	(0.01)***	(0.03)***	(0.00)***	(0.00)***	(0.00)***
Common language	0.908	0.943	0.959	0.692	1.045	1.113
	(0.08)***	(0.06)***	(0.13)***	(0.12)***	(0.09)***	(0.14)***
Landlocked	-0.802	-0.413	0.058	-2.195	-0.228	-1.102
	(0.07)***	(0.05)***	(0.11)	(0.12)***	(0.09)**	(0.14)***
ln distance	-1.006	-0.659	-0.850	-0.089	-0.240	-0.608
	(0.02)***	(0.02)***	(0.04)***	(0.05)*	(0.04)***	(0.06)***
Constant	-6.016	-6.734	24.405	3.181	-3.956	27.259
	(0.31)***	(0.22)***	(0.46)***	(0.45)***	(0.34)***	(0.54)***
Observations	6171	6171	6171	3069	3069	3069
R-squared	0.29	0.25	0.12	0.12	0.06	0.08

*Notes: Standard errors are shown in the parentheses; *; **: *** - statistically significant at the 10, 5 and 1 per cent level, respectively; TRD –bilateral trade defined as the sum of exports plus imports relative to destination country's GDP; MIG –migration inflow relative to destination country's population; FDI –foreign direct investments relative to destination country's GDP.*

As noted, this paper introduced the binary variable of the partner country's landlocked geographical position[11], which has only rarely been introduced in empirical analysis and which is differently ranked in columns 1, 2, and 3. This variable reveals the second highest weight in column 1 for openness to trade, significant weight in column 2 for openness to immigration, and finally completely insignificant weight in column 3 for openness to FDI

[11] The expected sign of this dummy variable is negative.

flows. In this way the order of significance for the landlocked position's variable is somehow in accordance with the R-squared in these three columns.

As shown in Table 3, the same model specification is also implemented on the sample of developing countries. The introduced variable for landlocked position reveals the highest values of the coefficients in column 1, where results of estimation for openness to trade are presented. Distance as an introduced proxy variable for transportation and other freight costs simultaneously reveals the lowest weights of coefficients. This finding confirms the relevance of direct access to the sea for developing countries: shipping still represents the most efficient means of transport for different kinds of goods between the more developed core EU members and developing countries.

The next interesting result is that the binary variable for common language is ranked in the second position by weights of coefficients when trade is estimated in column 1, or is ranked in the first position when results of estimations for openness to migration and FDI as dependent variables are presented in columns 2 and 3. Although the variable for a partner country's population is statistically significant, this variable reveals the lowest values of the coefficients in all three columns. In this way the developing country's population is not a relevant deterministic factor, while common language, the partner country's landlocked position and geographical location are the most important deterministic factors which explain openness to trade, immigration and FDI flows for the observed sample of developing countries.

Table 4 shows results of estimations for the NEU12 countries. Column 1 reveals similar results for trade as a dependent variable as shown for the largest sample of countries in Table 3. The explanatory variables for distance and common language reveal the highest weights of coefficients and are ranked one after another, while variables for the partner country's population and landlocked position are ranked differently. More precisely, the population of the NEU12 partner countries is a significant determent, while a landlocked position is a completely insignificant deterministic factor for openness to trade.

Generally, the overall explanatory power of the model is similar in all three columns. Distance has the highest value of coefficients in column 1 for openness to trade, and has the highest value even when migration inflows and FDI flows are estimated as dependent variables in columns 2 and 3. These results confirm that migrants from the NEU12 members

are primarily orientated to neighbouring core EU members, that FDI outflows from core EU members are primarily turned towards neighbouring NEU12 members, and that trade between the EU15 and the NEU12 is likewise orientated to the neighbouring countries. At the same time these results confirm that trade flows, migration flows and FDI flows are complements in the relationship between EU15 and NEU12.

Table 4: Regression results for the NEU12 and Candidate countries

	Relationship					
	NEU12			Candidate countries		
	1	2	3	1	2	3
Specification	*ln TRD*	*ln MIG*	*ln FDI*	*ln TRD*	*ln MIG*	*ln FDI*
ln population origin	0.581	0.727	0.909	1,283	0,670	0,807
	(0.04)***	(0.04)***	(0.07)***	(0.06)***	(0,06)***	(0,08)***
Common language	0.831	0.153	0.708			
	(0.41)**	(0.39)	(0.66)			
Landlocked	0.352	-0.840	0.868	0,700	0,835	-0,147
	(0.10)***	(0.10)***	(0.17)***	(0,19)***	(0,21)***	(0,28),
ln distance	-1.076	-0.864	-1.180	-1,34	-1,569	-0,574
	(0.06)***	(0.06)***	(0.10)***	(0,12)***	(0,13)***	(0,17)***
Constant	-5.022	10.939	27.279	15,549	-4,947	-30,955
	(0.72)***	(0.68)***	(1.18)***	(1,03)***	(1,08)***	(1,45)***
Observations	836	836	836	451	451	451
R-squared	0.37	0.39	0.30	0,54	0,30	0,22

Notes: *See Table 2*

It is also shown that a common language is a significant factor only in column 1, and completely insignificant in columns 2 and 3. For instance, Huber and Nowotny (2008) found that a common language is a more significant deterministic factor in comparison with distance when individual level data on migration and commuting plans in regions of the Czech Republic, Hungary and Slovakia bordering on Austria were implemented. But Nowotny (2011) found that a common official language highly increases the attractiveness of a particular region for migrants to the EU15, while the attractiveness of a region decreases with distance from the sending country, which indicates that distance as a proxy variable for migration costs is a significant deterministic factor in the location decision of migrants.[12]

[12] In both cases a different model specification is introduced in order to analyse the regional migration flows.

Table 4 shows that distance as a proxy variable for transportation costs (or migration costs) is not the only significant variable in this relationship. For example, a second important obstacle which limits the migration flows to the core EU states is a landlocked position[13] of the NEU12 countries, while a third important factor is the sending country's population, which by definition shows migration potential. The relatively high weights of coefficients on the last proxy variable clearly show that the migration potential of the NEU12 is large.[14]

Similarly, FDI outflows from the core EU states to the NEU12 in column 3 are also significantly determined by the partner country's population. These results simply confirm that FDI outflows from the EU15 are directed towards Poland, the Czech Republic and Hungary as the largest NEU12 countries measured by population, which enable large scale production and have relatively large market potential in the long-term period. And not surprisingly, common language variable in columns 2 and 3 is an insignificant factor in this relationship.[15]

Table 4 also reports results of estimations for the EU Candidate countries, where all three columns reveal completely different R-squared for bilateral trade, migration flows, and FDI flows as dependent variables. These results give the highest importance to bilateral trade openness. Trade flows in column 1 are defined by three factors with different weights of coefficients: the distance, candidate country's population, and their landlocked position. As shown, distance and population prevailingly determine bilateral trade openness. Openness to migration of the Candidate countries is also defined by two factors: distance as a measure for migration costs which displays the highest values of the coefficients, and highly positive values of coefficients on population as a measure for migration potential.

The FDI outflows from the core EU countries to the candidate countries are significantly defined by two factors, where population of the Candidate countries as a measure for FDI absorption potential overweighs distance. According to these results the FDI outflows from the core EU countries are firstly directed towards Turkey as the largest country and then orientated to the Balkan states (Serbia and Montenegro, Croatia, Bosnia and Herzegovina, and Macedonia), while geographical distance as the second most important factor completely re-

[13] For instance, the Czech Republic, Slovakia and Hungary are landlocked countries.
[14] This assertion is also confirmed by R-squared in column 2.
[15] For instance, the CEE countries have different official languages, their own culture, but at the same time the same or similar religion as the core EU members.

oriented the FDI outflows from the EU15 towards the nearest Balkan states. Therefore the size potential and geographical location are those variables which generally determine openness to trade, immigration and FDI of the candidate countries.

Robustness check

This paper tests the openness to immigration where the stock of the immigrant population relative to the destination country's population is introduced as a dependent variable. The only problem was that the stock of immigrants residing in the destination country is exogenous than endogenous. In this way it is assumed that the stocks of immigrants residing in the destination country in a given year represent the net flow of immigrants over time, and that the stocks of immigrant population are "weakly" exogenous.[16] Testing showed that the alternative variable for openness to immigration reveals similar results to those presented in Tables 3 and 4.

This paper additionally estimates the openness to trade, immigration and FDI by using pooled OLS methodology.[17] The first problem is that the pooled OLS method is inconsistent and biased when regressors are correlated with the unit effects. The tests show that regressors are not correlated with the unit effects and that the pooled OLS methodology is consistent and unbiased as an alternative methodology. Therefore the pooled OLS method reveals similar weights on coefficients and entirely the same order of explanatory variables as presented in Table 3 and 4.

This paper also tests the effects of exogenous variables on the openness to trade, immigration and FDI for the sample of EU15, and enlarged sample of EU27 countries (see Appendix 2). The thesis that openness to trade, immigration and FDI of the core EU members prevailingly influence the intra EU27 relationship is tested. This assumption generally holds true when the openness to trade, migration flows is estimated in columns 1 and 2.[18] Similar results are also shown when the observed period from 2004 to 2006 is introduced.[19] But how do we explain

[16] This supposition is also introduced by Warin and Blakely, 2009.
[17] Frankel and Romer (1999) tested the gravity model using pooled data.
[18] For instance, columns 1 and 2 reveal a similar order and weights of explanatory variables.
[19] Remember that the observed period of the present paper is from 1996 to 2006, and that the EU was enlarged in 2004 and 2007 by twelve new EU members.

the different order and weights of the explanatory variables in column 3 when FDI is estimated as a dependent variable for the sample of the EU27?

This paper repeats the estimation by an additionally introduced methodology, a different measure introduced,[20] and a different observed period in an attempt to answer this question. But neither the new observed period nor different estimation methodology change significantly the results of estimations for foreign direct investments as a dependent variable. The fact is that foreign direct investments inside the core European Union are completely asymmetric,[21] and the most intensive capital flows are revealed between the largest countries.

Similarly, the FDI outflows from EU15 to the NEU12 are primarily directed towards the largest NEU12 countries measured by population, and are secondarily directed to the less distant partner countries.[22] In any case, the problem is that the capital flows between the core EU members and the NEU12 are predominately one-way, and that such a pattern of capital investments influences the openness to FDI for the sample of the EU12, and finally also the intra EU27 members' openness as shown in Appendix 2.

Concluding remarks

The aim of this paper was to estimate the effects of the explicitly exogenous variables on openness to trade, migration and foreign direct investment by using panel data of the fifteen core EU members. In this way the Frankel and Romer (1999) theoretical model was extended by including openness to FDI in the empirical framework in addition to openness to trade and migration flows. The assumption was that a country's openness is a function of two kinds of external factors. The first factor is the partner country's geographic location as determined by distance, landlocked position and common language, while the second external factor introduced was the partner country's population.

This paper for the first time estimated the openness to trade, migration flows and foreign direct investments using the unified empirical framework in the relationship between EU15 and 71 trading partner countries, migrants sending countries, and foreign direct investment

[20] For instance, we test FDI as a dependent variable instead of FDI related to the home country's GDP.
[21] For instance, the Netherlands invests a similar amount in USD from 1996 to 2006 in four completely different partner countries measured by size potential: Belgium, France, Italy, and Luxemburg.
[22] See the results of the estimation in Table 4 for the NEU12 countries.

receiving countries. Generally, the EU15 revealed the highest openness to migration and trade, the NEU12 showed the highest level of openness to foreign direct investments and trade, and revealed relatively high migration potential in the relationship with EU15, while the Candidate countries surprisingly showed the highest level of openness to trade, a relatively high level of openness to FDI, and relatively high migration potential in the bilateral relationship with EU15.

The developing countries as the largest sample of 48 countries showed a significant level of openness to trade, FDI and migration in bilateral relationship with the EU15. Bilateral trade is primarily influenced by the landlocked position and common language of the partner country, while the openness to FDI and migration are influenced by common language, the country's landlocked position and distance. Therefore developing countries with direct access to the sea and shipping trade have a clear advantage in comparison with landlocked countries. These results clearly confirm that the developing partner country's geographic location prevailingly defined the country's openness in comparison with the partner country's population as the second external factor implemented.

Literature

Anderson, J. E. (1979). Theoretical foundation for the gravity equation, *American Economic Review*, 69, 106-16.

Anderson, J. E. and van Wincoop E. (2003). Gravity with gravitas: A solution to the border puzzle, *American Economic Review*, 93, 170-192.

Afman, E. R. and Maurel M. (2010). Diplomatic relation and trade reorientation in transition countries. In Bergeijk Peter A.G. van and Brakman Steven (eds.) *The gravity model in International trade.* New York, Cambridge University Press, pp. 278-295.

Badinger, Herald (2007). Market size, trade, competition and productivity: Evidence from OECD manufacturing industries, *Applied Economics*, Taylor and Francis Journals, vol. 39, 2143-2157.

Baldwin, R. and Harrigan J. (2007). Zeroes, quality and spaces: Trade theory and trade evidence, *NBER Working Paper* No. 13214, Cambridge MA.

Bergeijk, Peter A.G van and Brakman Steven (2010). *The gravity model in International trade.* New York, Cambridge University Press.

Bergstrand, J. H. (1985). The gravity equation in international trade, Some microeconomic foundations and empirical evidence, *Review of Economics and Statistics*, 67, 474-81.

Bergstrand, J. H. (1989). The generalized gravity equation, monopolistic competition, and empirical evidence, *Review of Economics and Statistics*, 71, 143.53.

Bergstrand, J. H and Egger P. (2007). A knowledge-and-physical-capital model of international trade flows, Foreign direct investment, and multinational enterprises, *Journal of International Economics,* 73(2), 278-308.

Bosker, E. M. and Garretsen H. (2010). Trade costs, markets access, and economic geography. In Bergeijk Peter A.G. van and Brakman Steven (eds.) *The gravity model in International trade.* New York*,* Cambridge University Press.

Brakman*,* S. Garita, G., Garretsen H., and van Marrewijk C. (2010). Economic and financial integration and the rise of cross-border M&As. In Bergeijk Peter A.G. van and Brakman Steven (eds.) *The gravity model in International trade.* New York*,* Cambridge University Press.

.

Buch, Claudia M. and Monti Paola (2008). Openness and income disparities: Does trade explain the "mezzogiorno" effect?, *IAW Discussion Paper 41*, ISSN: 1617-5654.

Buch, Claudia M. and Toubal, Farid (2009). Openness and growth: The long shadow of the Berlin Wall, *Journal of Macroeconomics*, Elsevier, vol. 31(3), 409-422.

Felbermayr, Gabriel J., Hiller Sanne, and Sala Davide (2010). Does immigration boost per capita income?, *Economics Letters*, Elsevier, vol. 107(2), 177-179.

Frankel, Jeffrey A. and Romer David (1999). Does trade cause Growth?, *American Economic Review*, 89(3), 379-399.

Grogger, Jeffrey and Hanson, H. Gordon (2008). Income maximization and the selection of sorting of international migrants, *NBER Working Paper No. 13821*.

Helpman, E., Melitz M. and Rubenstein Y. (2008). Estimating trade flows: Trading partners and trading volumes, *Quarterly Journal of Economics*, 123, 441-87.

Huber, Peter and Nowotny Klaus (2008). Moving across borders: Who is wiling to Migrate or to commute?, *WIFO Working papers*, No. 322, Vienna.

Linnermann, H. (1966). *An economic analysis of international trade flows*. Amsterdam, Nord Holland.

Nenna Manuela and Ricchi Ottavio (2007). The Role of Trade Openness and Institutional Quality in the Productivity Performance of Central and Eastern European Accession Countries, *Rivista di Politica Economica*, SIPI Spa, vol. 97(4), 219-50.

Nowotny, Klaus (2011). Welfare magnets, taxation and the location decisions of migrants to the EU, WIFO Working Papers, No. 393, Vienna.

Ondrich Jan, Richardson J. David and Zhang Shuo (2006). A further investigation of the link between trade and income. *International Economic Journal*, Korean International Economic Association, vol. 20(1), 19-36.

Ortega Francesc and Peri Giovanni (2011). The aggregate Effects of trade and migration: Evidence from OECD countries. *Queens College and CUNY and IZA Discussion Paper* No. 5604.

Rose, A. K. and Spiegel M. M. (2010). International environment arrangements and international trade. In Bergeijk Peter A.G van, and Brakman Steven (eds.) *The gravity model in International trade.* New York*,* Cambridge University Press.

Santos Silva, J. and Tenreyro, S. (2006). The log of gravity, *The Review of Economics and Statistics*, 88(4), 641-58.

Tinbergen, J. (1962). *Shaping the world economy: Suggestions for an international economic policy*. New York, Twentieth Century Fund.

Warin, Thierry and Blakely, Andrew (2009). Choice or mimetism in the decision to migrate? A European Illustration, *Scientific Series, 2009s-38*, ISSN 1198-8177.

Appendix 1: List of the countries

EU15 states: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Luxemburg, Netherlands, Portugal, Spain, Sweden, and United Kingdom.

NEU12 countries: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia, Slovakia, Malta, and Cyprus.

EU Candidate countries: Bosnia and Herzegovina, Croatia, Macedonia, Serbia and Montenegro, and Turkey.

Developing countries: Afghanistan, Albania, Algeria, Argentina, Armenia, Azerbaijan, Bangladesh, Byelorussia, Brazil, Cameroon, Cape Verde, China, Colombia, Congo Republic, Congo Democratic Republic, Cuba, Ecuador, Egypt, Ethiopia, Georgia, Ghana, India, Indonesia, Iran, Iraq, Kazakhstan, Kenya, Korea, Lebanon, Libya, Malaysia, Mexico, Moldova, Morocco, Nigeria, Pakistan, Philippines, Russian Federation, South Africa, Sri Lanka, Sudan, Syria, Thailand, Tanzania, Tunisia, Ukraine, Uzbekistan, and Vietnam.

Other countries: Australia, Canada, Japan, Norway, Switzerland, and United States.

Appendix 2: Regression results for EU15 members and EU27

	Relationship					
	EU15			EU27		
	1	2	3	1	2	3
Specification	*ln TRD*	*ln MIG*	*ln FDI*	*ln TRD*	*ln MIG*	*ln FDI*
ln population origin	0.690	0.397	0.364	0.799	0.575	0.756
	(0.04)***	(0.03)***	(0.08)***	(0.02)***	(0.02)***	(0.05)***
Common language	-0.288	1.473	-1.936	0.236	1.132	-0.861
	(0.14)**	(0.14)***	(0.32)***	(0.13)*	(0.11)***	(0.25)***
Landlocked	0.315	-1.463	0.923	-0.011	-0.861	0.728
	(0.16)**	(0.12)***	(0.36)***	(0.09)	(0.07)***	(0.17)***
ln distance	-0.920	-0.519	-1.368	-1.002	-0.688	-1.205
	(0.06)***	(0.06)***	(0.14)***	(0.05)***	(0.04)***	(0.09)***
Constant	-6.488	-7.860	-15.527	-8.218	-9.730	-23.850
	(0.79)***	(0.68)***	(1.76)***	(0.55)***	(0.46)***	(1.06)***
Observations	1265	1265	1265	2101	2101	2101
R-squared	0.36	0.44	0.08	0.43	0.45	0.16

*Notes: Standard errors are shown in the parentheses; *; **: *** - statistically significant at the 10, 5 and 1 per cent level, respectively; TRD – is bilateral trade defined as the sum of exports plus imports relative to destination country's GDP; MIG – Is migration inflow relative to destination country's population; FDI – are foreign direct investments relative to destination country's GDP.*