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CONTENTS

Determinants of inward FDI into Visegrad countries: empirical evidence based on panel data for the years 2000–2012[1]

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Abstract: The purpose of this article is to explain which factors are important determinants for allocating FDI in the Visegrad Group countries (the Czech Republic, Hungary, Poland, Slovakia) by investors from the "old" EU member states. The article is divided into three main sections, except for the introduction and the final conclusions. First, we discuss the literature on the determinants of FDI. In Section 2 we introduce the applied research methodology. Finally in (Section 3), we present and discuss the empirical results. We selected 13 variables which were used in the estimation of the panel models, they include core gravity model variables such as the economy size (home and host nominal GDP *per capita*), geographical distance as well as augmented gravity model variables such as access to the sea and/or a common border. We also selected five efficiency-seeking variables (labour productivity, unemployment rate, minimum wage, corporate tax rate, investor protection index) as well as two membership variables (EU, EMU). Adding such variables as "common V4 border", "EMU membership" or "protection index" seems to offer a novel approach. FDI from EU-15 countries are allocated in V4 countries more because of the home and host market potential measured by GDP so they can be classified as pure mark-seeking horizontal FDI. Currently investors from the mature EU-15 countries, whilst allocating FDI in V4 countries rather do not seek efficiency (as before), but the short distance is more important for them (than it used to be before the accession).

Keywords: FDI, V4 countries, gravity model.

JEL codes: C33, F21.

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Introduction

The largest enlargement of the European Union, which took place in 2004, changed dramatically the macroeconomic contours of European economies, especially from the perspective of new member states [Wach and Wojciechowski 2014]. The Visegrad Group countries (V4[4]), including the largest new member state of the European Union (EU), have experienced a lot of changes and challenges, especially in the recent crisis or recession. We decided to select V4 countries as they are relatively rarely investigated in the literature and because these countries are usually reported to be a core comparing target for Poland (as is the country from which we come). What is more EU-15 countries invest the most in terms of relative and absolute investment in the V4 countries compared with the other countries that joined the EU in and after 2004. The availability of data allows the testing and verification of the changes in inward foreign direct investment (FDI) into four Visegrad countries in the years 2000–2012 (13 years). The period is limited by the couple of years before the accession of these countries to the EU and the detailed available data sets from the bottom, and from the top by the available comparable data sets, which made it possible to conduct empirical analyses (we regret not to be able to use newer data).

The purpose of this article is to explain what factors are important determinants in allocating FDI in Visegrad countries by investors from "old" member states of the EU. A gravity model is applied as the main method, using reliable sources of data such as the statistical data of Eurostat, CEPII (The Centre d'Études Prospectives et d'Informations Internationales) and the World Bank (Doing Business database). Instead of a core gravity model we applied an augmented gravity model by adding such variables as "common V4 border", "EMU membership" or "protection index", which seems to offer a novel approach. All calculations and estimations were conducted using Stata®, R-Studio® and JMulti® computer professional software.

1. Determinants of FDI

The literature offers numerous concepts, models and theories explaining the allocation of foreign direct investment (FDI). The most popular classification of these theories divides them into three groups [Kilic, Bayar, and Arica 2014], namely macro-level theories, micro-level theories as well as the development theories, which combine both macro- and micro-aspects. The theoretical concepts are also divided into static (single decision) and dynamic (pro-

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[4] V4 consists of the Czech Republic, Hungary, Poland and Slovakia.

cess) [Trąpczyński 2015]. It is necessary to state that there is no single theory explaining the whole issue. It is worth stressing that various researchers specialize in different aspects of FDI and thus we can better understand the phenomenon [Götz 2016].

Macroeconomic theories treat FDI as a form of capital flow between different economies in the world, trying to explain motivations and determinants of FDI. They include such theories as the capital market theory, the dynamic macroeconomic theory, the exchange rate theory, economic geography, the gravity approach or institutional analysis.

Microeconomic theories are developed from the point of view of multinational enterprises (MNEs). These theories try to explain why multinational companies choose FDI rather than other entry modes such as exporting or licensing. They also concern how transnational corporations are able to organize the flow of production factors and the implement benefits of imperfect competition whilst allocating FDI. They include, amongst others, the firm specific advantage theory, the oligopolistic markets theory, the theory of internalisation, or eclectic theory. Development theories (mixed theories) of FDI include the product life cycle theory created by Vernon, Japanese FDI theories introduced by Ozawa or the five stage theory of Dunning.

Two the most popular research problems about FDI include determinants and motives for FDI as well as the impact of FDI on the host economy [Wach and Wojciechowski 2014; Pawłowska and Wojciechowski 2015; Marona and Bieniek 2013]. To large extent the above mentioned theories are still the theoretical foundations for present-day empirical analyses, so it seems to be reasonable to identify the main determinants of the allocation of FDI from the perspective of the most commonly applied and cited theories.

The capital market theory postulates that FDI is determined by interest rates. The theory of portfolio capital transfers has become a sort of introduction to the consideration of the factors of FDI and their location. The basic premise of making FDI and portfolio investment in the country is the expectation for a higher rate of return than in the home country and that the expected rate of profit should compensate the costs and risks associated with taking business overseas and the foreign currency risk. Some deficiencies of this concept were raised by many scholars, the first of whom was Hymer [1960|1976], who was not satisfied with the lack of other factors explaining the location. Caves [1996: 21] proves that an international difference in expected returns is not sufficient to induce FDI, which are caused by other motives. Thus, the portfolio theory, like other theories, can only partially explain FDI.

Dynamic macroeconomic FDI theory states that flows of FDI are due to changes in the macroeconomic environment. The exchange rate theory of FDI links FDI with the exchange rates and FDI is perceived as a way of exchange rate reduction [Cushman 1985]. The economic geography theory of FDI searches for success factors in attracting FDI by a given region or city in which inter-

nationally successful industries operate [Porter 1990]. The gravity approach towards FDI [Isard 1954] explores the allocation of FDI through the study of geographic, economic or cultural distance (proximity vs. distance), and this concept will be applied in the empirical part of this article. The institutional theory of FDI focuses on the impact of institutional framework on the flows of FDI [Wilhelms and Witter 1998]. For empirical purposes we decided to apply the "investment protection index" as one of the most important elements of the institutional environment.

Dunning [1980; 1988] in his eclectic theory combines three basic concepts, namely the theory of monopolistic advantages, the internalisation theory and the theory of location factors. Thus the eclectic theory of production is defined as the OLI paradigm (ownership-location-internalisation). Due to its complex nature the OLI paradigm is often considered the general theory of FDI, which makes it possible to answer the fundamental questions regarding FDI. Dunning singled out four main types of FDI investors, namely (i) resource seekers, (ii) market seekers, (iii) efficiency seekers and (iv) strategic asset or strategic capabilities seekers [Dunning 1988]. Shepotylo [2012] notices that recent FDI-theory focuses on four different motives for FDI location, namely (i) market-seeking FDI considered as purely horizontal FDI, (ii) efficiency-seeking FDI considered as purely vertical FDI, (iii) complex vertical FDI and (iv) export-platform FDI. In the empirical part of this paper the two main categories will be applied, namely marketing-seeking and efficiency-seeking.

Most of the factors mentioned in the literature and determinants of FDI have been empirically tested, nevertheless most of the empirical investigations focus only on a few factors selected by the researchers. This made it very difficult to operationalize such analyses which at the same time were not comprehensive (Table 1).

The list of potential determinants is impressive. Amongst the most popular determinants are market size, infrastructure as well as tariffs and taxes [Leibrecht and Riedl 2010]. As we believe that infrastructure is more or less similar in all V4 countries we will attempt to empirically verify the market size and taxation as determinants of FDI allocation. Other factors also determine FDI, however, they are less frequently investigated, amongst them being governance [Bellos and Subasat 2011] or corruption [Bellos & Subasat 2013]. Thus using a well-known protection index prepared by the World Bank will enable us to present a new aspect into researching FDI in V4 countries. Based on the gravity model, Nakamura, Olsson, and Lönnborg [2012], proved that in the countries of the Baltic Sea Region (8 countries) such factors as trade volume, the size of home and host economies and the location of investing countries are important for understanding foreign direct investment activity. We believe that V4 countries are somehow similar to the countries of the Baltic Sea Region, so it will be good to apply these factors (market size, location variables) in other empirical considerations.

Table 1. A Review of the selected empirical research results on FDI determinants

Determinants	Effects		
	Significant positive	Significant negative	Insignificant
Macroeconomic stability (including economic growth)	Duran (1999); Dassgupta and Ratha (2000); Vijayakumar, Sridharan and Rao (2010)		
Market size (GDP *per capita*)	Lankes and Venables, (1996); Sahoo (2006); Schneider and Frey (1985); Tsai (1994); Lipsey (1999)	Edwards (1990); Jaspersen, Aylward and Knox (2000)	Asiedu (2002); Wei (2000); Loree and Guisinger (1995)
Infrastructure facilities and quality	Kumar (1994); Loree and Guisinger (1995); Leibrecht and Riedl (2010)		
Institutions and its quality (including corruption)		Wei (2000) – corruption	Wheeler and Mody (1992)
Labour costs	Wheeler and Mody (1992); Kumar (1994); Sahoo (2006); Leibrecht and Riedl (2010)	Schneider and Frey (1985)	Tsai (1994); Loree and Guisinger (1995); Lipsey (1999)
Trade Openness (trade effects)	Edwards (1990); Gastanaga *et al.* (1998); Hausmann and Fernandez-Arias (2000)		
Trade protection (tariffs and non-tariffs)	Grubert and Mutti (1991); Kogut and Chang (1996)		

Taxes and tariffs	Loree and Guisinger (1995); Wei (2000); Gastanaga et al. (1998); Leibrecht and Riedl (2010)	Wheeler and Mody (1992); Lipsey (1999)
Political instability	Schneider and Frey (1985); Edwards (1990)	Hausmann and Fernandez-Arias (2000); Loree and Guisinger (1995); Jasperen et al. (2000)
Gross capital formation	Vijayakumar, Sridharan and Rao (2010)	Lipsey (2000); Krkoska (2001)
Currency valuation (exchange rate effects)	Vijayakumar, Sridharan and Rao (2010); Blonigen (1997)	
Firm characteristics (*including* firm-specific assets)	Kogut and Chang (1991); Blonigen (1997)	

Source: Own compilation based on: Vijayakumar, Sridharan, and Rao [2010: 5–6]; Blonigen [2005: 383–403] and Asiedu [2002: 110].

Based on the analysis of literature, we believe that most important – in case of V4 countries – are market-seeking (e.g. market size) as well as efficiency-seeking (including labour costs, taxes, institutional environment) factors.

2. Research methodology

2.1. Hypotheses building

The objective of this article is to evaluate determinants of the general FDI stock to Visegrad countries (V4) from the old EU member states (EU-15).

As Vijayakumar, Sridharan and Rao [2010] noted, many researchers proved that there is a positive role of the market size measured by (GDP *per capita* in attracting FDI, nevertheless some authors conclude the opposite. Estrin and Uvalic [(2013] found that levels of FDI to Balkan transition economies can be explained by three categories of factors including: the size of the domestic economy in terms of GDP *per capita*, their distance from the investing economies of Western Europe and their remoteness from the EU and other major trading blocks. Empirical analyses were conducted in various parts of the world, mainly in emerging markets. Thus, it seems interesting to verify the following hypothesis in the realities of four Visegrad countries:

H1: *FDI allocated in V4 countries from EU-15 countries arise mainly because of the home and host market potential measured by GDP so they can be classified as pure market-seeking horizontal FDI.*

The literature presents two opposite attitudes towards the role of the territorial distance whilst doing business across borders [Wach 2015]. The role of the distance is still being explored in many countries and by many researchers. Cairncross [2001] notices that nowadays geographical distance seems to be out of place in the age of global markets ("death of distance"), but Ellis [2007] highlights that the empirical evidence suggests otherwise ("distance still matters"). This issue has been recently researched by numerous economists, geographers and especially by international business researchers [Clark, Dollar, and Micco 2004; Ghemawat 2001; Frankel & Rose 2002]. This is why we decided to check the role of distance for the allocation of FDI in Visegrad countries by formulating the following hypothesis:

H2: *Whilst allocating FDI in V4 countries shorter distance plays a more important role for investors from the mature EU-15 countries than efficiency-seeking.*

2.2. The gravity model and its variables

We analysed the determinants of inward FDI into V4 countries from old EU member states (bi-directionally) using the gravity panel data approach [Baltagi 2005]. It is a commonly used tool whilst investigating trade and FDI, and as other numerous researchers, we decided to apply this tool [e.g. Folfas

2011; Leibrecht and Riedl 2010]. The study was designed to explore the determinants of FDI. The gravity model appears as an adaptation of the law of universal gravitation for socio-economic phenomena like trade [Zysk and Śmiech 2014], inward FDI and migrations. Initially the concept of the gravity model of international trade [Linneman 1966] was proposed independently by Tinbergen [1962] and Poyhonen [1963]. This formula (1) sought to explain the bilateral flows amongst countries taking into account the size of countries and the limiting factor in trade, which reflected the costs of movement between two countries:

$$X_{ij} = K \frac{Y_i^a \cdot Y_j^b}{D_{ij}^c}. \tag{1}$$

This proxy of resistance factor was the geographical distance [Błaszczuk 1974: 1095–1104; Anderson 1979: 106–116]. The model in linearised form is as follows (2):

$$\ln X_{ij} = \ln K + a \ln Y_1 + b \ln Y_2 - \beta_3 \ln D_{ij}, \tag{2}$$

where:

Y_{ij} – the volume of trade between countries i and j,
Y_i, Y_j – the size of the economy of the country i and j, expressed by GDP, GDP *per capita*, the size of the market, population size, etc.,
D – distance, transportation costs,
K – factor proportionality.

According to the original formula (2) trade is proportional to the size of these countries (in terms of GDP or other variable imaging market size) in *ceteris paribus* terms and the volume decreases with increasing an distance between two countries, which generates additional costs that reduce the attractiveness of trade. We will apply the formula to FDI (instead of trade). However there are many variables which embody economic measures of the locations (e.g. gross national product, gross domestic product and population, gross domestic product *per capita* or endowment of production factors – in absolute values or *per capita*).

In our models, we selected 13 variables which were used in the estimation of panel models (Table 2). Firstly *FDIstock$_{ij,t}$* was made the dependent variable in the model explaining the determinants of gravity flow of FDI into V4 countries.

The **core gravity model** only takes into account the size of economies measured by home and host GDP (GDP *per capita*) and the geographical distance that is the proxy of transport costs and other barriers. However it is debatable which measure of GDP (in current prices, in constant prices or in purchasing power parity) is the most adequate for gravity models [Folfas 2011], nevertheless we decided to use GDP *per capita*.

Table 2. List of variables used in the study

Type of variable	Variable	Expected impact	Description	Unit	Source (data code)
Dependent variable	$FDIstock_{ij,t}$		stock FDI in i-V4' country from j-EU-15 country in t-period	million EUR	EUROSTAT (bop_fdi_pos)
Core gravity model variables (including market-seeking)	$GDPhost_{i,t}$	(+)	nominal GDP *per capita* in i-V4' country in t-period (host GDP)	EUR	EUROSTAT (nama_aux_gph)
	$GDPhome_{j,t}$	(+)	nominal GDP *per capita* in j-extra-V4' country within EU-27 in t-period (home GDP)	EUR	EUROSTAT (nama_aux_gph)
	$DIST_{ij}$	(–)	geographical distance between capitals of i-V4' country and j-extra V4 country within EU-27	km	CEPII database
Location variables	$BORD_{ij}$	(+)	common border between i-V4' country and j-extra V4 country	dummy	CEPII database
	SEA_{ij}	(+)	access to the Baltic Sea	dummy	CEPII database
Efficiency-seeking	$LABPRODhost_{j,t}$	(+/–)	real labour productivity per hour worked EUR in j-partner in t-period	EUR/h	EUROSTAT (nama_aux_lp)
	$UNEMPhost\ j,t$	(+/–)	annual average total unemployment rate based on monthly seasonally adjusted data in j-host in t-period	%	EUROSTAT (une_rt_m)
	$MinWAGEhost_{j,t}$	(–)	minimum wage in j-host country in t-period	EUR	EUROSTAT (earn_mw_cur)
	$2TaxEUhost\ i,t$	(–)	Corporate total tax rate in i-V4' country	%	Doing Business Reports
	$PROTECT_{j,t}$	(+)	Strength of investor protection index	(0–10)	Doing Business Reports
Membership	$EU_{ij,t}$	(+)	binary variable: 1 if i-V4' country and j-extra V4 country in t-period were both in EU, 0 others	dummy	CEPII database
	$EMU_{ij,t}$	(+)	binary variable: 1 if i-V4' country and j-extra V4 country in t-period were both in EMU, 0 others	dummy	CEPII database

Source: Own study based on Eurostat, CEPII, Doing Business reports of the WB.

Gravity models are used in various social sciences to predict and describe certain behaviours that are similar to gravitational interaction as described in Isaac Newton's law of gravity. The theoretical support of the research in this field was originally very poor, however several theoretical developments have appeared in support of the gravity model. Anderson [1979] made the first formal attempt to derive the gravity equation from a model that assumed product differentiation. The gravity model is a major simplification when it comes to dealing with the variables positively affecting the volume of trade (GDP) and negative (distance). Most authors use the gravity model with an additional vector of explanatory variables. They are described by examining the significance of the relationship and direction as well as the impact of the variable on the phenomenon being discussed. The model can be augmented by other quantitative and qualitative variables, which can make it appear that countries seemingly similar in terms of GDP *per capita* or neighbouring states [Suder and Sohn 2012] trade less than others. However it is not a denial of the gravity model because it is like any other kind of simplification and refers to the general correctness [Brun et al. 2005]. Larger economies as host countries may be associated with higher FDI due to larger potential demand and lower costs due to the economies of scale. Resmini [2000] analysing manufacturing FDI, finds that countries in the region of CEE with larger populations attract more FDI, Bevan and Estrin [2004] show similar results. The success of gravity models in international economics relies on their widespread use due to the high quality of the results and their relative ease of interpretation. However the structure of the gravity FDI models is associated with some additional difficulties: the values of bilateral FDI flows are only available for selected countries in most developed countries, some flows of FDI are associated with individual events (e.g. large M&A) causing abrupt changes in their values [Folfas 2011].

Gravity models have been increasingly popular in trade literature for analysing the driving forces of FDI. Brainard [1997] by applying the gravity model to analyse MNEs uses affiliate sales to proxy FDI rather than applying actual FDI, which is a reasonable way to capture actual MNE activity, because it measures the value of this activity.

Gravity models are a widely used tool in the literature of international economics to explain country-(sectoral)-level of trade and FDI flows. Against the background of its increased popularity and data availability a range of commonly made econometric mistakes have recently been discussed in literature, mostly pertaining to the (omitted) characteristics of countries or country pairs in gravity models. Some authors show that there is indeed a problem with the non-stationarity of variables commonly used in gravity equations [Zwinkels and Beugelsdijk 2010].

The analysis includes a number of other variables that could potentially affect the decisions regarding the selection of the country to undertake FDI (**augmented gravity model**). Additionally we decided to take into account oth-

er variables expressing the geography [Wojciechowski and Lubacha-Sember 2014] (location), that is the access to the sea [Wojciechowski 2013], and a common border with V4 countries [Fitzsimons, Hogan, and Neary 2013; Felipe and Kumar 2010; Kepaptsoglou, Karlaftis, and Tramboulas 2010]. Martinez-Zarzoso and Nowak-Lehman [2002] applied the augmented gravity model to assess Mercosur-EU trade, and the trade potential following the agreements that were reached between both trade blocks. Based on the sample of 20 countries and utilizing panel econometric models containing various relevant variables, captured time invariant country-specific effects and dynamic relations. Using such variables as infrastructure quality, income differences and exchange rates as proxies, allowed the explanation of determinants of bilateral trade flows more precisely than utilising a simple core gravity model. Krisjansdottir [2005] using an augmented gravity model investigates low FDI in Iceland which can be explained by its geographical location together with market size factors. The results obtained indicate that distance negatively affects FDI as well as the fact that FDI appears to be driven more by the effects of wealth rather than the effects of market size.

The gravity model provides a framework for further in-depth analysis of the use of variables and relationships [Bengoa, Sanchez-Robles, and Shachmurove 2015].

Foreign investors are expected to pay attention to the level of labour productivity, unemployment rate and wages (minimal wage) in the host country [Szczepkowska and Wojciechowski 2002]. Corporate tax rates in the host and home countries seem to be not without significance [Egger and Pfaffermayr 2004; Milner, Reed, and Talernsgiri 2004; Folfas 2012]. V4 countries are still often classified as emerging markets [Kowalski et al. 2006], thus there is a fear that foreign investors are willing to undertake FDI in countries with a higher level of investor protection [Bevan and Estrin 2004]. For this purpose we use the *Protect* index proposed in the reports of Doing Business prepared by the World Bank (measuring investor protection on the scale of 1–10). At the same time the effects of participation in the EU, and especially in the EMU, play a very important role whilst attracting FDI in V4 [Brenton, Mauro, and Lucke 1999].

2.3. Data

In this paper we analysed the stock inward FDI into the Visegrad countries from EU-15 countries in the years 2000–2012. FDI can be researched in two ways – as inflows and outflows – as well as outward and inward stocks. We selected stock inward data in order to reduce missing data due to the minus flows logarithm and this solution is also widely applied in much empirical research [e.g. Bellos and Subasat 2011; Nakamura, Olsson, and Lönnborg 2012; Goh, Wong, and Tham 2013; Zwinkels and Beugelsdijk 2010]. Subasat and Bellos [2013: 116] in their gravity model analysis "use FDI stocks because stocks are

more stable than flows" as they underline. It is debatable which measure of GDP (in current prices, in constant prices or in purchasing power parity) is the most adequate for gravity models [Folfas 2011: 6–10], nevertheless we decided to use GDP *per capita*.

It might be interesting to answer the question, which part of FDI from the particular EU-15 countries is "intercepted" by V4 countries. The calculations led us to some regularities. Only the more interesting results are discussed in here (Figure). In the years 2000–2012 there was a permanent decrease in the percentage of Austrian investment in V4. A similar situation occurred in the case of Italy and the UK. The opposite trend was observed in the case of Sweden and Finland. Analysing the structure and dynamics of FDI (Figure), the largest investments in V4 come from Austria, France, the Netherlands as well as Germany and Luxembourg (the growth rate of stock FDI of Luxembourg in V4 reached 51% annually in the examined period).
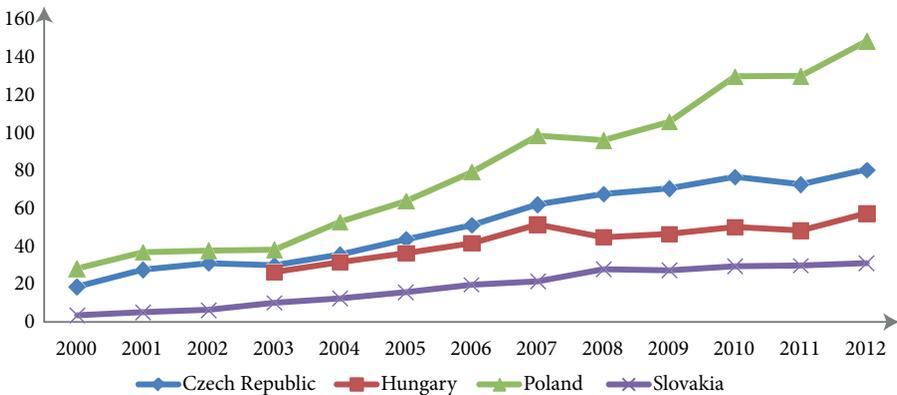
Value of accumulated FDI from the EU-15 into V4 from particular V4 countries [mld EUR]
Source: Own compilation based on EUROSTAT (bop_fdi_pos) NACE Rev. 1.1 and NACE Rev.2

2.4. Periods for modelling

In order to indicate which factors and how they determine the inward FDI to the countries of the Visegrad Group from the EU-15 in the years 2000–2012, as many as 11 different models were estimated (Table 3), based on the gravity model approach. To illustrate the impact of the accession to the European Union we decided to investigate three periods. Basically these models cover the whole period of 2000–2012 (models 1–7) examined. Additionally we decided to check whether the analysed period experienced the change of the impact taking into account the pre-accession period (2000–2003 – models 8–9), and the post-accession period (2004–2012 – models 10–11). The core and augmented gravity models were estimated for these sub-periods.

3. Results and discussion

In comparing model 1 and model 2 we can see that only the addition of variables such as SEA_j and $EMU_{ij,\,t}$, helps to improve the quality of explanations for $lnFDIstock_{ij,\,t}$. According to model 2 the bigger the home economy and the smaller the geographic distance between two countries was, the more this country invested in the host country (Table 3). This is coherent with the theoretical assumptions of the gravity model theory. Attempts to estimate augmented models using other estimators (RE, FE, between-group, GEE – i.e. models 3–7) met difficulties in the form of a permanent inability to take into account the time-invariant variables (model 5), and the ineffectiveness of the estimation (based on results of diagnostic tests). Basically these models indicate the positive importance of the participation of Slovakia in the euro area in the context of accumulation of FDI. By analysing the statistical data after 2008 the high growth of inward FDI stock into Slovakia can be noticed (introducing the euro in Slovakia took place on 1 January 2009). The results of the estimation of models 3–7 usually show the importance of the size of the home economy and less frequently of the host economy (as three out of four V4 countries are small economies). What is more, time models confirm the negative impact of geographical distance on the accumulation of FDI.

Comparing the core gravity models 9 and 11 covering the periods 2000–2003 and 2004–2012, we claim that in the pre-accession period the distance factor was statistically significant discouraging inward FDI. In the post-accession period this parameter (ln DIST) is also negative but statistically insignificant. Which is undoubtedly important, in the years 2000–2003 the market size of the host economy seemed to have no meaning in the context of investing in each country, but in the post-accession period the wealth of the host economy expressed by $GDPh_{j,\,t}$ seems to be crucial in the case of selecting a country in which to invest.

Comparing the augmented gravity models 8 and 10 for the years 2000–2003 and 2004–2012 we find as in models 9 and 11) the decreasing importance of geographical distance (Table 3). Taking into consideration the parameter SEA*j*, which *de facto* means the location advantage of Poland over the rest of V4 countries, this factor does not have the same importance as before. Furthermore the participation in the EMU in the case of Slovakia contributed to the acceleration of inward FDI, which is consistent with previous calculations.

Table 3. The estimated models of inward stock FDI from EU-15 to V4 countries in the years 2000–2012

Variables/Periods	2000–2012							2000–2003		2004–2012	
Dependent variable: lnFDIstock$_{i,t}$	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
Estimation type	H-T augmented gravity model	H-T core gravity model	GLS random effects	Between regression (regression on group means)	Fixed effects within regression	Random-effects ML regression	GEE population-averaged model	H-T augmented gravity model	H-T core gravity model	H-T augmented gravity model	H-T core gravity model
lnGDPp$_{i,t}$	**3.095**	**1.442**	**3.626**	**6.453**	0.783	**3.374**	**3.170**	**4.049**	**2.204**	**4.038**	**2.093**
lnGDPh$_{t}$	1.020	**2.235**	–0.654	–14.506	**2.234**	–0.322	–0.069	1.010	–0.099	–0.021	**2.227**
lnDIST$_{ij}$	**–1.756**	**–1.456**	**–1.520**	**–1.512**	•	**–1.527**	**–1.534**	**–2.110**	**–2.013**	–1.489	–1.175
BORD$_{ij}$	0.036	•	•	•	•	•	1.015	–0.457	•	0.385	•
LABPRODhost$_{i,t}$	0.143	•	•	0.055	**0.008**	0.058	**0.623**	0.053	•	0.051	•
UNEMP1host$_{i,t}$	–0.023	•	–0.029	–0.449	0.005	–0.025	–0.022	–0.099	•	0.004	•
MinWAGEhost$_{i,t}$	–0.001	•	0.005	0.023	–0.003	0.004	0.004	–0.003	•	0.005	•
SEAj	**3.133**	•	•	•	•	•	0.435	**3.893**	•	**2.610**	•
TaxEUhost$_{i,t}$	–0.053	•	–0.072	0.489	0.004	–0.064	–0.058	–0.164	•	–0.023	•
PROTECT$_{i,t}$	0.033	•	0.063	**0.044**	0.028	**0.034**	0.014	–0.018	•	0.015	•
EU$_{ij,t}$	0.647	•	0.047	–0.203	0.032	0.041	0.037	•	•	•	•
EMU$_{ij,t}$	**1.738**	•	**1.626**	–8.832	**1.671**	**1.643**	**1.654**	•	•	**1.416**	•
const	–22.453	–18.916	**–14.909**	72.823	–22.040	–15.188	–15.278	–25.930	–2.426	–26.638	–27.520
Wald chi2	124.960	150.430	117.490	5.360	12.470	105.480	124.580	29.230	14.550	63.610	56.230
Prob >chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.000	0.000
sigma u	3.107	3.275	2.716		3.622	2.975		3.657	3.562	3.006	
sigma e	1.629	1.585	1.642		1.642	1.639		1.048	1.010	1.740	
rho	0.784	0.810	0.732		0.829	0.767		0.924	0.926	0.749	

Bolded values relevant to 0.05 significance level.

Source: own calculations in STATA v. 12.

Conclusions

Hypothesis H1 was tested partially positive. The more affluent the host V4 country is as measured by GDP, the more inward FDI it receives from the EU-15. In the period investigated, the size of FDI, in contrast to the inflow pace, corresponded more closely to the size of the GDP of the destination country (revealing the market absorption potential). The highest growth rate of FDI was recorded in Poland – a country with the lowest nominal GDP *per capita* since 2003.

The analysis of efficiency parameters has not reaffirmed the importance of the selected factors at the assumed level of significance. In a few cases, the empirical results confirm the impact of labour productivity of the host country (pull factor) and the taxation in the home country (push factor).

The empirical results also partially support the hypothesis H2. A trend towards investment in neighbouring countries is noticed mainly in the pre-accession period, what is more in the post-accession period the proximity effect looses its importance.

Efficiency-seeking was not the dominant factor for inward FDI. Such factors as (i) the level of minimum wages, (ii) unemployment rate, or (iii) corporate income taxation in host countries did not constitute a significant determinant of inward FDI. Foreign investors paid more attention to (i) labour productivity and (ii) the degree of investor protection. At the same time, in case of Slovakia, the adoption of the euro (reduced risk) was a factor attracting FDI.

As in all research that which we conduced has its limitations. We used a relatively small sample (the number of analysed periods was only 13 years). What is more we did not consider to which industries the capital was directed as we used a high level of aggregated data. Future analyses should try to eliminate these limitations. Taking into account the fact that heterogeneity is accounted for correctly, gravity models can greatly overestimate the effects of integration on the trade [Cheng and Wall 2004] so too the FDI volume presumably.

Based on the results, the following suggestions for further research can be pointed out:
1. An evaluation of the robustness of the results by the means of another set of variables (we checked the robustness of time only).
2. Disaggregation of data including research on the level of industries.
3. Checking whether positive effects of inward FDI exceeded the negative effects for the countries analysed.

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