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FDI Determinants in the European Union: Empirical Application

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Abstract

The purpose of this paper is to verify and estimate, besides gravity factors, the individual country specific determinants in influencing FDI inflows to the selected countries. More than standard factors, we revile additional factors, which could explain the investment in the EU. In this context, we take into account the neighboring effects as an important motive for FDI inflows last time. Our findings verify that efficiency-seeking and more complex form of the FDI determinants is more pronounced strategy now in the new EU member states than market-seeking FDI that is more relevant for the whole EU. Moreover, in addition to the existing literature, we argue that a variation in FDI determined by the EU-2004 enlargement started earlier than official date and remains its impact. Supposedly, a significant surrounding market potential could be for the new EU member states an evidence of the complex vertical FDI determinant today.

Keywords: foreign direct investment, the new EU member states, country-specific determinants of FDI, panel data, fixed effects, neighboring effects.

JEL classification: F21; F23; O52.

1. INTRODUCTION

Recently decrease FDI to developing economies is partly offset by increase in the new EU member countries. Estimating various determinants of FDI in the European Union (EU), and in the new EU member states particular, are more necessary today than they have ever been. In 2004 year Poland, Hungary, the Czech Republic, and other seven Central and East European countries joined the EU. In this context, the EU enlargement, more than other determinants, affects nature and dynamic of FDI across EU countries.

The European Union for a long time has played a major role as both the source and destination of FDI flows in the world. On average, according OECD, between 2000 and 2008, EU countries attracted more than 43% and direct almost 50% of all FDI, while other advanced economies attracted 23.8%. Despite the financial crisis and emergence of new Asian FDI destinations, the share of EU FDI inflows is stable and accounts for 27% of

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global FDI in 2017. And the developed EU counties continue to be the main FDI source for the new EU member states.

While a majority of literature about the FDI determinants in the new EU member states more focused on the investment flows from outside Europe, our aim is to verify and combine potential extra- and, more importantly, intra-EU sources and motives for FDI activity in this region. The main reason for this is that the new EU member states characterized by the concentration of their FDI inflows from few large investors within the EU. Based on OECD data, we calculated that until recently the share of intra-EU investment to the new EU member states has exceeded 85%. The leading invest partners are Germany, France, Austria, Netherlands and Luxembourg.

Despite the FDI determinants studies are considered to be well established, almost always new emerging FDI motives require to re-estimate and improve existing results. Most papers from this research area based on the gravity model and focused on the country-pair bilateral characteristics. It provides unbiased and consistent results but not reveals individual differences across host and home countries that may affect FDI activity. In this context, beside the gravity determinants, we take into account the neighboring effects as an important motive for FDI inflows last time in the new EU member states.

Empirical analysis based on the theoretical explanation of the determinants FDI activity and emergence of MNEs. In addition to the existing literature, we compare the determinants of FDI activity in the EU-10 countries with determinants in the whole EU-28 countries over 2002-2017 periods.

This paper is structured as follows. In Section 2, we review the most popular theories of FDI and provide the summary of the empirical literature on FDI determinants. In Section 3, we describe the stages of data collecting and empirical specification. In Section 4 with panel data analysis we estimate country-specific FDI determinants and report results, and Section 5 includes conclusions.

2. LITERATURE REVIEW

A vast FDI literature presents different approaches with a variety of determinants of FDI activity. Over time, various theories proclaim a number of factors that could explain FDI flows into country, involving the characteristics of both macro and micro environment (Dunning and Lundan, 2008; Sahiti *et al.*, 2018). However, there is no general agreement about the main FDI determinants and a single universal analytical approach. Here we provide a review of empirical studies in an attempt to systemize the most cited papers and distinguish the robust factors affect FDI distribution in the EU, and particular, in the new EU members.

Most of the earliest empirical FDI studies, based on the relevant neoclassical theory, treat capital flows as a trade and did not identify the firm as a subject of FDI activity. In the late 1970s authors, starting from the Dunning's eclectic paradigm, have been estimated also variables might influence a firm FDI decision choice. When New Trade Theory (NTT) embraced industrial organizations with international trade theory, in addition to the analysis of firm's variables, the country's factors, such as market size, openness, labor force, became central. Yet the MNEs were generally missing, in spite of characteristics of the general-equilibrium models (Markusen, 2000; Cieslik, 2015).

In the earlier empirical papers, the determinants of the FDI flows are often explained with aggregate data in gravity type models. In this context, the correlation between the host

country market size and FDI is the most tested hypothesis. The positive effects of market size with regards to FDI inflow is confirmed by numerous studies of various economies regardless of their size. In contrast, Smarzynska and Wei (2000), and Asiedu (2002, 2006) achieved inconclusive results with estimation of market size and growth. NTT allows modeling horizontal (market-seeking) FDI determinants and vertical (efficiency-seeking) FDI motives.

The main issue of the horizontal model is that firms invest in the foreign market if the benefits of producing abroad outweigh the loss of economies of scale from producing only at home. Consequently, horizontal FDI occurs mostly between developed countries with similar factor endowments and market size. The first models of a vertically-integrated multinational enterprise were developed by Helpman (2006) and later extended by Markusen (2000). Vertical integrated MNCs split up the production process across the different location where the inputs are relatively cheaper.

For a long time horizontal and vertical FDI models have treated as two different strands in the literature. In the end of the 1990s, the next step in the development of the FDI theory has been done by Markusen (2002) who combine the horizontal and vertical approaches into a hybrid framework which called the Knowledge Capital Model (KC). In order to develop this model, some authors (Baltagi *et al.*, 2007) have relaxed the two-country assumption and take third-country effects into consideration for analysis of the FDI decisions of MNEs.

The liberalization and opening of the economies of Central and East European countries to MNCs and FDI activity in the early 1990s stimulated interest in studying determinants of FDI into those countries. Initially, empirical studies for those countries were presented by cross-country analysis and were conducted treating whole region jointly (Smarzynska and Wei, 2000) and later the authors with the panel data analysis prove that not only official EU date, but even announcements about EU Accession have an impact on FDI for the future members (Bevan *et al.*, 2004; Wach and Wojciechowski, 2016).

3. DATA AND EMPIRICAL SPECIFICATION

To obtain various comparable estimates over the period of 2002-2017, we collect data for the general sample of EU-28 countries as well as for subsample of EU-10 countries, and for several smaller subsamples, according to the purpose. The subsample of EU-10 countries is presented by Cyprus, the Czech Republic, Estonia, Latvia, Lithuania, Hungary, Malta, Poland, Slovakia, and Slovenia. The intuition behind this is to verify, whether the same factors affect FDI in the new EU member countries as well as across the whole European Union, and then estimate the country-specific FDI determinants.

More important, it allows explaining the differences in FDI distribution over time and among countries that recently became the EU members and predict the FDI incentives accounting for the neighboring effects driven by WBC (Albania, Bosnia and Herzegovina, Kosovo, the Republic of North Macedonia, Montenegro, and Serbia). Namely, based on the modern literature (Nwaogu and Ryan, 2014), we can assume that FDI to the EU positively linked with a market potential of the neighboring region, here, the Western Balkan Countries.

Our study based on the secondary transparent data collected from the World Bank Indicator databank and OECD statistic. Due to the fact, that the single FDI dataset for the new EU member states is nonexistent, we separately bring together data scattered data from the national banks and agencies of the host countries. Maximum number of observations is 28*16=448 for EU-28, and 10*16=160 for EU-10, respectively.

The main problem with FDI data for the econometric estimation is disinvestment which arises last time. FDI flows with negative values can be estimated as neither PPML nor negative binomial models or OLS. Until now this problem in the literature is not addressed, and most often negative values of FDI are excluded from the sample. Sometimes the authors treat them as zero (Bruno *et al.*, 2017).

Furthermore, the negative FDI flows have real economic meaning, and, consequently, cannot be eliminated without losing consistency. For our study, we also cannot set negatives to zero because it means that the investment relationships between host and origin countries do not exist. Unlike true zero investment, we suggest to transform negative FDI flows into 1 USD. While it is indeed a strong assumption, we provide estimates for both the traditional eliminating and the transforming negatives models into 1 USD.

Based on the literature review, we create a set of potential determinants for undertaking FDI in the selected countries, according to the main related multinationals strategies (Dunning and Lundan, 2008; Markusen, 2013): market access (horizontal FDI) or efficiency-seeking (vertical FDI), and both of them (knowledge capital (KC) model). Supposedly, the impact of explanatory variables on FDI is determined by the purpose of the multinationals activity. Namely, foreign firms that are market-seeking intend to come to the bigger and richer markets, while for the efficiency-seeking firms labor costs and qualification, infrastructure, policy, regional agreements, and tax are more important. With KC model, FDI activity could be explained by differences in the market size and production cost.

For a deeper understanding of the measures and factors which could encourage investment into the EU and the new EU member states specifically, we try to find the appropriate estimators for our model. For this, our analysis for each sample includes several stages. In the first step, for EU-28 as well as for EU-10 countries, we perform the most popular pool OLS model, which cannot be accepted as a benchmark, as noted earlier, but it is necessary for comparing the results.

Then, in order to address the endogeneity problem, a number of instrumental variables are included in the regressions (2SLS model). In the next step, accounting for the Haussmann test, we rely on the fixed- or random effects model. But, since the dependent variable (FDI inflows) is estimated also in the log-linear form, the heteroscedasticity could remain. In contrast, we measure FDI inflows in levels and employ the Pseudo Poisson Maximum Likelihood (PPML) estimator. To provide robustness we cluster the regression. For the overdispersion reason (Cieślik, 2017), we also run the negative binominal model (NB).

Generally, to find unbiased estimates and mitigate heterogeneity across countries, we use the panel data approach with different specifications. For this, our baseline equation takes the following functional form:

$$lnFDI_{i,t} = \beta_0 + \beta_1 lnGDP_{i,t} + \beta_2 lnGDPP_{i,t} + \beta_3 LForce_{i,t} + \beta_4 lnHigher_{i,t} + \beta_5 Infrastr_{i,t} + \beta_6 lnTax_{i,t} + \beta_7 WBCGDP_{i,t} + \beta_8 ICTI_{i,t} + \beta_9 EU\_memb_{i,t} + \beta_{10} NaturResour_{i,t} + \beta_{11} Openness_{i,t} + \beta_{12} HTln_{i,t} + \beta_{13} Wage_{i,t} + Ui + \varepsilon_{i,t},$$

where $lnFDI_{i,t}$ is the logarithm of FDI inflows to the country i at time t. β_0 is a constant term, Ui are individual (random/fixed) effects, and $\varepsilon_{i,t}$ is error term, which determines whether appear fixed or random effects. The whole set of the explanatory variables and their expected effects on FDI, is presented in Table no. 1.

Table no. 1 - Potential determinant variables of FDI inflows

Explanatory variables	Description	Expected Effect
lnGDP	The country-specific nominal GDP, (million US. dollars) lnGDP = logarithm (GDP). World Bank Data	+
lnGDPP	GDP per capita based on purchasing power parity (million U.S. dollars). World Bank Data lnGDPP = logarithm (GDPP)	+/-
LForce	Labor force comprises people ages 15 and older who supply labor for the production of goods and services during the year, (million people). World Bank Data	+
lnHigher	Population with tertiary education includes people having completed the highest level of education, (% in same age group). OECD Data	+/-
Infrastr	Index of the country capacity to efficiently move goods and connect producers and consumers with international markets; calculated by author based on the Logistics Performance Indicators from the new World Bank survey	+
lnTax	Standard statutory corporate tax rate (%) of the host country. OECD Corporate Tax Statistics Database lnTax = logarithm (Corporate Tax Rate)	-
lnWBCGDP	The average level of the Western Balkan Countries GDP, (million US. dollars). World Bank Data lnWBCGDP = logarithm (WBCGDP)	+/-
lnICT	Information and communication technology goods imports, including computer and communications equipmentand electronic components, (million U.S. dollars). lnICT = logarithm (ICT). World Bank Data	+
EU_memb	Dummy variable, that takes a value of 1 if the host country in the EU, and zero otherwise	+
NaturResour	Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents, (% of GDP).World Bank Data	+/-
Openness	Trade openness is the sum of exports and imports of goods and services as a share of gross domestic product, (% of GDP); calculated by author based on the World Bank Data. Openness = ((Export + Import)/GDP)*100%	+
HTln	High-technology products with R&D intensity from abroad, (million U.S. dollars). World Bank Data HTln = logarithm (High-technology exports of R&D)	-/+
Wage	The country-specific average wages are obtained by dividing the total wage bill by the average number of employees, (US dollars). OECD Data	-

Source: essential aggregate variables are presented from the official datasets (2002-2017); resulting variables calculated by author.

Following the idea that the importance of the determinants depends on the purpose of the FDI, and based on the latest literature, we can suppose, in the absence of large natural resources and without breakthrough technologies in the selected countries, two main FDI motivation strategies of the foreign investors dominate: access the new available markets and reducing production cost to produce more efficiently. KC model consolidates both horizontal and vertical FDI reasons. Consequently, two main groups of FDI determinants become crucial: variables indicated the economic size and market potential of the country, and variables characterized factor endowments.

Generally, higher economic growth indicates a larger market and more promising prospects for FDI. Thus, the coefficient of the *GDP variable* is expected to be positive. To measure the growth of the factor endowments is often used *GDP per capita*, that could turn negative, then horizontal FDI prevail, and a positive sign of the variable suggests the vertical FDI (Bergstrand and Egger, 2007; Cieślik, 2017). *Labor force*, as a measure of working age population, is positively associated with FDI, while a share of the people with *thirty and higher education* implies improving skills, in turn, would result in gross wages, that negatively linked with FDI. Similarly, larger *labor cost* makes the cost of production higher, hence, causes less FDI.

Just opposite, lower *corporate taxation* and regional integration (*EU membership*) are often found to stimulate FDI, particularly vertical FDI (Bevan *et al.*, 2004), through lower investment cost as well as via greater quality of institutions (Cardamone and Scoppola, 2012). However, since foreign investors in our case are mostly from EU countries, the impact of EU membership within the EU-28 sample, probably, will be ambiguous. Related to *infrastructure, high technology, and communication services* in the host country, the well-established facility provides a great platform for investment. So we expected a positive effect of infrastructure facility on FDI. Due to the fact that our selected countries are not natural resources abundant, the negative relation between cross-border investment and *natural resources* is possible.

Trade openness generally is expected to be positive and significant FDI determinant due to the fact that trade complements rather than substitutes FDI (Helpman, 2006), and multinationals intend to invest to the host country with which they are familiar via export. However, trade and FDI could be substitutes in the case of horizontal FDI (Markusen, 2013). Recent papers formalize coexistence trade and FDI as well as vertical and horizontal FDI determinants under KC model. Thereby, the impact of trade openness could be ambiguous in relation to horizontal FDI and is positively associated with vertical FDI (Bergstrand and Egger, 2007). In this context, including the effects of third-country strengthens the coexistence trade and horizontal multinationals. One reason for this is that foreign affiliates obtain the opportunity to relocate production to the near countries with lower labor costs. Thus, surrounded market potential and *economic growth of WBC* become important.

4. COUNTRY-SPECIFIC ANALYSIS AND EMPIRICAL RESULTS

To investigate the described relationships and empirically validate FDI determinants, we use a number of possible estimators and variations of the sample. We start from the analysis of the whole EU-28 sample. Our results are reported in Table no. 2.

As seen from column (1) of Table no. 2, the coefficients of *GDP, trade openness, information and communication technologies* in the selected countries are positive and statistically significant as expected, while the coefficient of the *tax rate* is predictably negative. It confirms that these variables are relevant determinants of FDI inflows to the EU. But the coefficient r2, which is 0.27, indicates that the regression fits only with 27% for the explanation the variation in the dependent. Moreover, as already noted, pool OLS results are severely biased as the error term could be correlated with, for instance, GDP. To address the endogeneity problem, we apply the instrumental variable regression (column 2).

In terms of results, the 2SLS analysis seems more robust to the control variables and their magnitude but assumes that there are no differences among countries. However, as

noted in the previous part of the study, along with the bilateral FDI determinants, unique national characteristics also determine FDI substantially. To distinguish country-specific effects, firstly, we assume that individual effects vary across countries and are constant over time. From this, we estimate the Random effects (RE) model (column 3). The consistency of the model is suggested by R^2: more than 71% of FDI changeability between countries in the EU-28 sample is explained by the variation in the explanatory variables.

Table no. 2 – Panel estimation the determinants of FDI in the EU-28 countries

Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Estimator	**OLS**	**2SLS**	**RE**	**FE**	**NB**	**PPML**
Dep.variable	lnFDI				FDI	
lnGDP	1.4139	1.4019	1.5264	1.4092	1.5182	1.9421
	(0.3847)**	(0.2743)**	(0.3672)**	(0.9940)	(0.2644)**	(0.3344)**
lnGDPP	-1.1402	-1.1294	-1.7272	-3.2058	-0.7481	-1.6639
	(0.8660)	(0.6354)+	(0.7925)*	(1.4098)*	(0.6277)	(0.6077)**
LForce	0.0221	0.0227	0.0172	0.2428	0.0145	0.0631
	(0.0270)	(0.0203)	(0.0306)	(0.2745)	(0.0183)	(0.0171)**
lnHigher	-0.2906	-0.2912	-0.5103	-0.8842	-0.4792	-0.5623
	(0.4261)	(0.3239)	(0.3670)	(0.4537)+	(0.2359)*	(0.2872)+
Infrastr	0.0028	0.0027	0.0063	0.0076	0.0062	0.0154
	(0.0096)	(0.0096)	(0.0098)	(0.0107)	(0.0062)	(0.0062)*
lnTax	-0.5079	-0.6085	-0.4899	-0.3625	-0.2394	-0.6515
	(0.7724)+	(0.5642)**	(0.5569)**	(0.6011)*	(0.4392)	(0.3419)+
lnWBCGDP	0.3372	0.3374	0.3491	0.3643	0.2959	0.3038
	(0.2485)	(0.2406)	(0.2328)	(0.2385)	(0.0847)	(0.1469)
lnICT	0.6808	0.6764	0.4308	-0.1112	0.7752	0.5257
	(0.3476)+	(0.3295)*	(0.4413)	(0.7349)	(0.3514)*	(0.1751)**
EU_memb	-0.0957	-0.0943	0.1859	0.5805	-0.1244	-0.1847
	(0.4992)	(0.4888)	(0.5103)	(0.6328)	(0.2794)	(0.4798)
NaturResour	0.1650	0.1659	0.0103	-0.1745	-0.2348	0.1423
	(0.3142)	(0.2492)	(0.3182)	(0.4755)	(0.2239)	(0.2232)
Openness	0.1190	0.1189	0.2201	0.3243	0.3162	0.4199
	(0.0046)**	(0.0034)**	(0.0047)**	(0.0095)*	(0.0048)**	(0.0037)**
HTln	-0.2547	-0.2506	-0.2593	-0.2403	-0.4405	-0.1811
	(0.1689)	(0.1399)+	(0.1979)	(0.4257)	(0.1507)**	(0.1325)*
Wage	-0.0081	-0.0084	0.0097	0.1077	0.0204	0.0058
	(0.0244)	(0.0214)	(0.0300)	(0.0740)	(0.0210)	(0.0218)
_cons	10.5739	10.5685	14.4086	21.1217	3.7064	6.8000
	(7.6486)	(6.2170)+	(7.1448)*	(10.5843)*	(6.3543)	(5.4834)
Ln alpha _cons					0.5246	
					(0.1411)**	
N	448	448	448	448	448	448
r2	0.2694	0.2694		0.0679		0.6635
R^2: within			0.0570	0.0679		
between			0.7135	0.5274		
Overall			0.2652	0.1944		

Source: Authors' calculations with Stata 15.0

*Notes: Standard errors in parentheses: + p< 0.10, * p< .05, ** p< .01.*

Columns (1) and (3) show, that OLS and RE results are similar. In addition, we run the Breusch-Pagan test (chi2=600.5, p-value=0.00), from which we choose RE as an appropriate method for comparison with the Fixed effects (FE) model (column 4), where only 7% of FDI changeability in each country is explained by changeability of explanatory variables. Moreover, the results of the modified Wald test indicate the presence of heteroscedasticity. In order to obtain the efficient estimator, we compare RE and FE by the Hausman test (chi2=8.09; p-value=0.342), which rejects the validity of FE.

After these estimation experiments, it is observed that for the whole group of EU-28 countries both RE and FE are consistent, but RE is efficient. However, estimates obtained using log-linearized models (columns (1)-(4)) are probably biased due to the problem of heterogeneity and omitted zero values (Santos Silva and Tenreyro, 2006), that might distort the interpretation the impacts of the explanatory variables on FDI inflows. Despite this fact, most previous studies have employed these specifications, thus we take RE as a preferable model (grey colored column) for the logged FDI inflow.

Following the recent empirical papers, PPML and NB are more robust to the different patterns of heterogeneity. Due to the fact that NB (column 5) and PPML (column 6) are related to the same Poisson family estimators, and taking into account for the explanatory power (R^2), our preferable model for FDI in levels is PPML. Indeed, as seen from column (6) of Table no. 2, almost 70% of all variables (*lnGDP, lnGDPP, LForce, lnHigher, infrastr, lnICT, lnTax, Openness,* and *HTln*) are statistically significant, and mostly have expected signs. At the same time, the impact of these variables on FDI is not straightforward.

While the coefficient of economic growth *(lnGDP)* in both RE and PPML models indicate that foreign investors are high positively sensitive to economic size and market potential, the coefficient of relative factor endowments *(lnGDPP)* is significant but negative, and the share of population with tertiary education (*lnHigher)* is negative (PPML) and even non-significant (RE).

However, despite the mixed results, our estimates are in line with the existing literature (Bevan *et al.*, 2004; Cieślik, 2017). Namely, the horizontal FDI motives predict that the bigger market size attracts more FDI inflows, and the activity of the multinational in the country would increase with decreasing differences in relative factor endowments. In PPML, as 1% increase in *GDP* leads to increase FDI inflows, an average, by 0.019 mln US$, while as 1% decrease in *GDPP* causes 0.017 mln US$ increase in FDI flows. Hence, the market access motive for whole EU-28 sample is more important.

At the same time, according to another approach (Bruno *et al.*, 2017), the variable *lnGDPP* implies not only the development level but also labor cost, and consequently, if labor cost is the main component, a negative influence of the variable suggests a vertical FDI model. In support of this claim, the variable *HTln* shows the importance of high-tech services from abroad. It suggests the KC assumption about pure vertical FDI model, where the creation of knowledge-based assets is geographically separated from production and supplied to foreign subsidiaries (Cieślik, 2017). Since the headquarters of the main investors and exporters for the selected countries are also in the EU, the negative sign of the coefficient *HTln* is possible. Furthermore, the ongoing process of the convergence between the EU member states yields the positive results in the tax policy *(lnTax)* and infrastructure (*Infrastr, lnITC*). These facts are pro vertical FDI.

To confront, the positive and significant variable *Openness* and non-significant variables *Wage, EU_memb, NaturResour* in both preferable models, and *LForce* in RE, as

well as significant but with negative coefficient variable *lnHigher* cannot suggest a pure vertical FDI strategy for this sample. In addition, the neighboring effect from WBC, is not significant. Hence, our findings confirm that both horizontal and vertical FDI are likely to appear in the EU that is in line with the literature (Bevan *et al.*, 2004; Welfens and Baier, 2018). However, horizontal FDI dominate, since multinational activity is concentrated among countries with similar size and relative endowments (Markusen, 2002).

Table no. 3 – Panel estimation the determinants of FDI in the EU-10 countries

Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Estimator	**OLS**	**2SLS**	**RE**	**FE**	**NB**	**PPML**
Dep.variable	lnFDI				FDI	
lnGDP	0.4387	0.4367	0.4387	-0.9010	0.7326	0.7715
	(0.2965)	(0.4235)	(0.4176)	(1.6611)	(0.2503)**	(0.2846)
lnGDPP	-1.0031	-1.0027	-1.0031	-1.0763	0.1188	0.0458
	(1.0697)	(1.0053)	(1.0052)	(2.0598)	(0.7904)	(0.8406)*
LForce	0.1534	0.1537	0.1534	-0.9976	0.1433	0.1422
	(0.0711)+	(0.0973)	(0.0965)	(1.5307)	(0.0697)*	(0.0594)*
lnHigher	-1.3183	-1.3187	-1.3183	-1.8047	-0.4815	-0.5912
	(0.3191)**	(0.4983)**	(0.4982)**	(0.6815)**	(0.3300)	(0.3016)*
Infrastr	0.0089	0.0089	0.0089	0.0096	0.0013	0.0013
	(0.0120)	(0.0130)	(0.0130)	(0.0140)	(0.0066)	(0.0093)+
lnTax	-0.3230	-0.4030	-0.6530	-0.9777	0.2751	-0.0940
	(0.8373)	(0.7062)+	(0.7062)+	(0.7618)	(0.4501) +	(0.4879)
lnWBCGDP	1.1113	1.1114	1.1113	1.0923	0.6196	0.4640
	(0.3921)*	(0.3696)**	(0.3696)**	(0.3828)**	(0.1636)**	(0.1401)**
lnICT	0.4462	0.4458	0.4462	-0.0755	1.4205	1.6933
	(0.2729)	(0.4920)	(0.4917)	(0.9128)	(0.3538)**	(0.4997)**
EU_memb	0.6762	0.6768	0.6762	1.2949	0.7486	1.5044
	(0.8138)	(0.6975)	(0.6970)	(0.8543)	(0.3694)*	(0.4250)**
NaturResour	0.0752	0.0740	0.0752	0.0485	-0.4325	-0.2433
	(0.5160)	(0.5707)	(0.5689)	(0.7671)	(0.3815)	(0.4501)
Openness	0.0097	0.0097	0.0097	0.0096	0.0044	0.0048
	(0.0032)*	(0.0060)	(0.0060)	(0.0135)*	(0.0035)	(0.0031)*
HTln	-0.1315	-0.1310	-0.1315	-0.0739	-0.6395	-0.7039
	(0.1041)	(0.1776)	(0.1768)	(0.5692)	(0.1142)*	(0.1043)*
Wage	0.0195	0.0196	0.0195	-0.1720	0.0717	-0.1056
	(0.0463)	(0.0648)	(0.0647)	(0.1096)*	(0.0599)	(0.0475)*
_cons	15.5693	15.5720	15.5693	21.2415	1.2263	0.3078
	(10.4867)	(12.0940)	(12.0936)	(14.9813)	(12.9842)	(11.4810)
lnalpha _cons					0.4213	
					(0.2523)+	
N	160	160	160	160	160	160
r2	0.2776	0.2776		0.1806		0.4181
R^2: within			0.1532	0.1806		
between			0.8716	0.5555		
overall			0.2776	0.0635		

Source: Authors' calculations with Stata 15.0.
*Notes: Standard errors in parentheses: + p< 0.10, * p< .05, ** p< .01.*

To empirically test whether the same incentives determined the activity of the multinationals in the new EU member states, we provide similar panel data analysis but for EU-10 only (Table no. 3). Again, we proceed in steps. To match findings between samples, we start with a pool OLS (column 1), then improve results with 2SLS (column 2), and later, estimate the country-specific effects with RE (column 3) and FE (column 4).

With results of the Hausman test (chi2=8.09, p-value=0.342), we reject RE, in contrast to the EU-28 sample, and adopt FE as the main specification (grey colored column) for logged FDI. Remarkably, earlier, the fixed effects model was selected also as the most appropriate for our bilateral FDI analysis. And, by analogy, PPML is the preferable model for FDI in levels.

From columns (4) and (6) of Table no. 3, two principal findings stand out. First, the results obtained for the new EU member states differ from the results for the whole EU sample as now a measure of the market size *lnGDP* loses its significance, while variables characterized the growth in relative factor endowments *lnGDPP* and *lnHigher* are statistically significant at the 1% level. This, in turn, would suggest that vertical FDI become more important.

Second, *EU_memb* is significant now and positively affected the FDI inflows in the selected countries, that is a factor of vertical FDI. More importantly, this result would give support a prediction that vertical-integrated MNE rise in the EU-10 countries because of inclusion in the EU.

Concretely, as seen from the FE and PPML estimates, beside *lnGDP* loses its relevance as a driver of FDI, *Openness* indicates significance and a positive sign that confronts to horizontal FDI. At the same time, positive and significant *LForce* and *lnGDPP*, as well as negative and significant *lnHigher* and *Wage*, are clear motives of the vertical FDI strategy. For instance, foreign vertical-integrated firms looked for low production cost and expected that in the selected countries with a relatively high share of unskilled labor should be lower.

Indeed, relative wages in the new EU member countries are still favorable compared to advanced Europe, even taking into account differences in skills. Finally, higher infrastructural (*Infrastr*) and equipment quality (*lnICT*, *HTln*) are associated with the stronger vertical FDI inflows in the new EU member states. It is remarkable that the WBC region's GDP (lnWBCGDP) as a proxy of the surrounding market potential for EU-10 is positive and significant now. It means that a decision about FDI in the selected countries has been taken with considering third-country effects.

The reason for this, having suppliers in the neighboring region is likely to increase complex vertical FDI (Blonigen *et al.*, 2007). Thus, the relative importance of FDI determinants has changed. Even though horizontal FDI determinants have not disappeared, their relevance is said to be on the decline.

Taking together these results, accession to the EU has changed the determinants and nature of FDI inflows. Our findings verify that efficiency-seeking and more complex form of the FDI determinants is more pronounced strategy now in the new EU member states than market-seeking FDI that is in line with recent papers (Jirasavetakul and Rahman, 2018). Moreover, in addition to the previous chapter, we argue that a variation in FDI determined the EU-2004 enlargement started earlier than official data and remains its relevance up today.

To track changes in the FDI determinants over time and across countries and understand the prospects of NMS to increase FDI inflows, we divide our sample into three periods depending on the stage of the EU integration, and compare a variation in FDI in the whole EU-28 sample, as well as in the EU-10 countries by the PPML analysis. The estimation results in the two sets are reported in Table no. 4.

As seen from columns (1) and (4), before and during the EU-2004 enlargement, in the EU-28 countries sample the estimated coefficients of *lnGDP*, *lnGDPP*, *LForce*, and *Openness* are statistically significant and display the expected signs, that supports horizontal FDI; whereas in EU-10 these variables are not significant. Just opposite, initially, in the enlargement period *(EU_memb)* investors were attracted by favorable wage *(Wage)* of workers with not high qualification *(lnHigher)*, so vertical FDI were dominated (Wach and Wojciechowski, 2016).

The estimation results from columns (2) and (5) show that five years later after the EU-2004 enlargement, the FDI activity across all EU countries become similar, and motivated both horizontal and vertical FDI factors. Namely, impact of the economics size *(lnGDP)* is positively associated with horizontal FDI.

Table no. 4 – Variation in the FDI determinants across countries and over time

Model	**PPML(1)**	**PPML(2)**	**PPML(3)**	**PPML(4)**	**PPML(5)**	**PPML(6)**
Sample		**EU-28**			**EU-10**	
Period	2002-2004	2005-2009	2010-2017	2002-2004	2005-2009	2010-2017
D.variable		FDI			FDI	
lnGDP	1.6872	1.8956	1.5957	1.8046	1.1338	0.9884
	(0.1926)**	(0.4066)**	(0.6486)*	(0.2218)	(0.3633)**	(0.2828)**
lnGDPP	-2.3546	-2.9707	-1.0006	2.1217	1.9862	-1.7290
	(0.6772)**	(0.4971)**	(1.3341)	(0.5166)	(2.6333)**	(1.2827)
LForce	-0.0583	-0.0 585	-0.0441	-0.0010	0.3150	-0.0033
	(0.0121)**	(0.0247)*	(0.0236)+	(0.0683)	(0.1183)**	(0.0321)
lnHigher	0.0900	-1.4927	-0.3376	0.7855	-0.5404	-2.2905
	(0.3549)	(0.3406)**	(0.5218)	(0.3451)*	(0.7931)	(0.5081)**
Infrastr	0.0043	0.0229	0.0204	0.0167	0.0146	0.0232
	(0.0054)	(0.0098)*	(0.0105)+	(0.0153)	(0.0084)+	(0.0200)
lnTax	0.1239	-0.8619	-0.5786	-0.6573	-0.5908	-0.1920
	(2.0860)*	(0.8765)	(0.4960)	(1.8400)**	(1.2856)*	(0.5395)
lnWBCGDP	-1.3547	0.2302	0.0471	-2.0822	0.9373	0.3736
	(0.5191)	(0.1316)+	(0.4000)	(0.7594)	(0.2000)**	(1.0121) **
lnICT	0.4739	0.5085	0.6179	1.5127	2.8236	1.9467
	(0.2503)+	(0.2704)+	(0.2853)*	(0.6367)*	(0.7206)**	(0.5377)**
EU_memb	0.5898	-0.6817	-0.2868	0.7785		
	(0.2336)*	(0.4674)	(0.4428)	(0.1249)**		
NaturResour	0.1912	-0.3277	0.1204	0.4712	-0.4090	-0.0291
	(0.2367)	(0.2578)	(0.3480)	(0.2827)+	(0.2686)	(0.4214)
Openness	-0.0199	0.0210	-0.0169	0.0096	0.0073	0.0000
	(0.0033)**	(0.0032)**	(0.0060)**	(0.0102)	(0.0040)+	(0.0038)
HTln	0.0674	-0.1832	-0.1434	-0.5610	-1.1224	-1.0948
	(0.1651)	(0.1258)	(0.2793)	(0.1365)**	(0.3096)**	(0.1603)**
Wage	-0.0222	0.0297	-0.0259	-0.0904	-0.0851	-0.1310
	(0.0088)*	(0.0190)	(0.0410)	(0.0530)*	(0.1299)*	(0.0799)
_cons	-8.2567	22.4476	5.8581	-50.3317	-43.1971	50.5329
	(6.3011)	(6.7964)**	(12.5432)	(10.3455)**	(36.5242)	(24.5214)*
N	84	140	224	30	50	80
r2	0.7761	0.8733	0.5844	0.9340	0.6595	0.7163

Source: Authors' calculations with Stata 15.0.

*Notes: Standard errors in parentheses: + p< 0.10, * p< .05, ** p< .01.*

In fact, among the new EU member states, the three largest economies, Poland, Hungary, and the Czech Republic, captured almost two-thirds of all FDI inflows (UNCTAD, 2018). At the same time, measures of the relative factor endowments *(lnGDPP, LForce)*, and a degree of trade openness *(Openness)* show expected signs in favor of the efficiency-seeking FDI strategy.

In addition, the quality of infrastructure (*Infrastr, lnICT)* and a lower corporate tax rate (*lnTax*), as measures of appropriate environment for doing business, become important for both estimates groups of countries.

Hence, in contrast to the previous period, the FDI activity in the EU-10 countries is entered a new stage of development and motivated, as in the EU-28 countries, by both horizontal and vertical reasons.

Despite the future process of the EU expansion, in 2010-2017 years some of the FDI determinants remain their importance and stability, whereas globalization highlights the significance of new FDI determinants. More specifically, comprising columns (3) and (6), it is remarkable, that, beside the relevance of the host country's market size and the significance of the factor cost of production, the effects of surrounding market potential (*lnWBCGDP*) is significant now.

This could introduce for the new EU-10 member states the presence of the more complex vertical FDI determinants, which is not solely driven by the domestic market size, but accounting for the opportunity to make larger market via neighboring countries. The evidence of the changing the nature of the FDI motives in the selected countries could be also confirmed by the rising labor shortage and population ageing.

Moreover, a reinvestment, which now counts for a large share of total FDI inflows to these countries, indirectly indicates about the declining domestic market potential of the new EU member states. Hence, FDI determinants in the EU evaluate over time and across countries, from pure horizontal or vertical FDI - before and during the EU enlargement, - to the combination of both vertical and horizontal FDI, setting KC model, - after accession in the EU; and now, on the mature stage of their development, - to the more complex vertical FDI strategy with accounting for third-country effects.

5. CONCLUSIONS

While many theories propose the explanation of the significant growth of FDI, there are two main reasons for FDI activity are distinguished in the literature: market seeking (horizontal) with intending to access to a new market, and efficiency seeking (vertical), implying splitting up production between countries via differences in relative factor endowments.

By comparing the determinants of FDI activity in the EU-10 countries with determinants in the whole EU-28 countries over 2002-2017 period via different estimators, we verify the evolution of the FDI determinants in the EU, and in the new EU member states particularly.

Performing econometric experiments in steps, for all EU countries as well as for the subsample of the EU-10, and making all necessary statistical tests, we figured out the appropriate statistical method. Hence, the analysis was provided for both types of the dependent variable, in logged and in levels form, separately for the different subsamples.

As a result, for logged FDI inflows in the EU-28 countries is more suitable RE method, whereas for FDI in levels – PPML. At the same time, in the new EU member states FE and PPML are preferable models for FDI inflows in log and levels forms.

The estimation findings from the whole EU sample demonstrate that more than 70% of the explanatory variables are statistically significant and supports both horizontal and vertical motives of MNE activity that confirms the theoretical knowledge capital FDI model in the EU. By contrast, the majority of the significant explanatory variables for the new EU member countries identify vertical FDI as a more pronounced MNE strategy.

At the same time, the variables of the economic growth and market size remain their significance that characterizes a variability of FDI determinants over time and across countries. Our findings verify that FDI motivators in the EU evaluate over time and across countries, from pure horizontal or vertical FDI - before and during the EU enlargement, - to the combination of both vertical and horizontal FDI, setting KC model, - after accession in the EU; and now, on the mature stage of their development, - to the more complex vertical FDI strategy with accounting for neighboring effects.

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