3. PATTERNS OF FOREIGN DIRECT INVESTMENT IN THE NEW EU COUNTRIES

Robert SOVA*
Lucian Liviu ALBU**
Ion STANCU***
Anamaria SOVA****

Abstract

The aim of the paper is to assess the determinants of foreign direct investment (FDI) inflow for the recent members of the EU (CEEC-4[1]) using panel data methods. Our analysis is important because FDI is considered as a main contributor to economic development, modernization, income growth, catching-up process and changes in specialization structure. In this paper, we adopt a rigorous econometric model to explain the FDI inflows. We examine the role played by economic and non-economic factors in FDI attractiveness. Using the gravity model and recent econometric techniques, we obtain the unbiased and convergent estimators. From an econometric point of view, the use of a Fixed Effect Vector Decomposition (FEVD) estimator for the gravity model appears to be convenient for our data sample.

Keywords: gravity models, panel data models, FDI, CEE countries
JEL Classification: F23, P33, C23

1. Introduction

Even after the Central and Eastern European countries (CEEC-4 henceforth) became EU members, the long-term economic convergence has remained for them an important goal (Albu, 2008). Realizing the significance of FDI on economic

* *Academy of Economic Studies, Bucharest; CES, Sorbonne University, Paris; Economic and Business Research Center.*
** *Institute for Economic Forecasting, Bucharest, E-mail: albul@ipe.ro.*
*** *Academy of Economic Studies, Bucharest.*
**** *CES, Sorbonne University, Paris; Economic and Business Research Center.*
[1] *Romania, Poland, Hungary and Bulgaria.*

performance, many researchers have focused their attention on the determinants of the FDI inflows.

The increasing openness of the Eastern European countries during the gradual transition to the market economy made them targets for foreign investors. Their specific features have played an important role in the attractiveness of different types of investments, leading to changes in the market structure. There are different determinants of the FDI inflows. The literature identifies a number of factors that distinguish between relocation investment based on the production division and market seeking investment, which aim to win the local market[2]. The investment incentives are based on factors provided by literature, but other specific factors can be identified. Taking into account the role of FDI in the economic transformation of the host country, we propose an empirical analysis to identify the behaviour of FDI in host countries using a gravity approach. Inspired initially by the law of physics (Newton), the gravity model has become an essential tool in the simulations of FDI flows (Rault, Sova, 2008).

Generally, FDI is explained by the size of host and origin countries and the geographical distance between them. The empirical results suggest that, on the one hand, if the country size is important its capacity to invest abroad is higher (high FDI outflows level) and, on the other hand, if the host country size is important its market presents potential outlet (high FDI inflows). Concerning the geographical distance in theory, its influence is ambiguous. The difference in factor endowments favours the FDI in accordance with the traditional theory of international trade, but the new theory of international trade suggests that this difference is unfavorable to FDI inflows. We develop an eclectic approach under which we establish that FDI inflows are determined by the comparative advantage of production factors (unit labour costs, host market size) and gravity factors. Our analysis is based on a panel data set containing information on FDI net flows for seventeen home countries (outflows), four host countries (inflows) for the period 1990-2005. One may notice that the dynamics of FDI inflows is strongly stimulated by competitiveness factors, country size and reforms. The geographical distance represents a barrier to the FDI inflow.

The analysis of FDI behavior stays at the crossroads of the international economics and the industrial economics. The first allows for understanding the arbitration between trade and production factors movement. The second highlights the development strategies of firms and the arbitration between various modes of organizing their activities. This diversity of possible approaches explains the absence of a unified theory of FDI.

One theoretical approach, introduced by Dunning (1977, 1981), the “OLI framework", considers FDI as determined by Ownership, Location and Internalization advantages which the multinational company holds over the foreign producer;

- *the ownership advantage* includes a product or a production process such as a patent, trade secret, reputation for quality to which other firms do not have access;

[2] *Borenstein E., J. de Gredotio, J. Loo (1998), De Mello, L. R. [1999], Bos J.W.B. and M. Van de Laar (2004)*

- *the location advantage* stems directly from the foreign market, such as low factor prices or customer access, together with trade barriers or transport costs that make FDI more profitable than exporting;
- *the internalization advantage* is a more abstract concept to explain why licensing may not be practised; it derives from the firm's interest in maintaining its knowledge assets (such as highly skilled workers who know the firm's technology) internally.

The UNCTAD distinguishes three types of FDI determinants: market seeking, resources or assets seeking, and efficiency seeking. By combining the two last determinants two FDI strategies are defined. The FDI relocation strategy is based on differential competitiveness of the comparative advantages exploitation of host countries and encompasses the motivations of resource seeking and efficiency seeking. In this case, the firms hope that they will increase their efficiency by exploiting the benefits of economies of scale and scope, and also those of common ownership. The relocation strategy is related to the international specialization in accordance with the traditional trade theory. The market seeking FDI strategy aims at penetrating new markets or at maintaining the existing ones.

Regarding the integration effects on the firms' location, many studies have evaluated the risks of concentration. According to a preliminary work (Krugman1991), a centre-peripheral structure is accompanied by an economic specialization of territories. According to these models, the Eastern economies' integration intensifies the divergence.

Our study focuses on certain specific features of the transition economies. The wage gap, industrial productivity and the human factor quality less adapted to the international competition, however, characterize these countries. Some recent studies have focused on the successful transition, especially on productivity growth. For the intermediate integration stages, there is a risk of increasing divergence. Our analysis is important because FDI is considered as a main contributor to economic development, modernization, income growth, catching process and changes in the specialization structure.

The rest of the paper is organized as follows. Section 2 presents the panel data estimation methods, the empirical investigation, as well as the econometric results. Section 3 concludes.

2. Econometric Analysis

2.1. Panel data estimation methods

As a research method we propose the statistical modeling of the FDI flows. Statistical modeling is especially used for the empirical determination of the economic laws. The economic theories deal only with the types of relations achieved between variables. The quantitative estimation of these relations represents the duties of stochastic modeling. This uses the economic statistics which has as main goal data gathering and their placement into a suitable form for statistical studies and statistical mathematics which provide the necessary tools and methods to perform testing and measurement of the links between the variables.

Most studies estimate the FDI inflow in the gravity model framework applying the ordinary least square (OLS) method to cross-section data. Recently, several papers have argued that standard cross-section methods lead to biased results, because they do not account for heterogeneity. On the other hand, the potential sources of endogeneity bias in gravity model estimations fall under three categories: omitted variables, simultaneity, and measurement error (see Wooldridge, 2002).

A solution is to use an estimator to control bilateral specific effects as in a fixed effect model (FEM) or in a random effect model (REM). The advantage of the former is that it allows for unobserved or miss specified factors that simultaneously explain the FDI volume between two countries and lead to unbiased and efficient results[3]. The choice of the method (FEM or REM) is determined by economic and econometric considerations. From an economic point of view, there are unobservable time-invariant random variables difficult to be quantified, which may simultaneously influence some explanatory variables and the FDI inflow. From an econometric point of view, the inclusion of fixed effects is preferable to random effects because the rejection of the null assumption of no correlation between the unobservable characteristics and explanatory variables is less plausible (see Baier and Bergstrand 2007).

Another method which has gained considerable acceptance among economists (see Egger and Pfaffermayr, 2004) is the Hausman-Taylor's panel incorporating time-invariant variables correlated with bilateral specific effects (see, for instance, Hausman-Taylor, 1981; Wooldridge, 2002; Hsiao, 2003). Plümper and Troeger (2004) have proposed a more efficient method called “Fixed Effect Vector Decomposition (FEVD)” to accommodate time-invariant variables. Using Monte Carlo simulations they compared the performance of the FEVD method to some other existing techniques, such as the fixed effects or random effects, or the Hausman-Taylor method and their results indicate that the most reliable technique for small samples is FEVD if time-invariant variables and the other variables are correlated with specific effects. This is the case of our study. Next, we provide more details of the alternative methods mentioned above, i.e. random effect estimator (REM), fixed effect estimator (FEM) and fixed effect vector decomposition (FEVD).

2.1.1. Within Estimator and Random Estimator

In the presence of correlation of the unobserved characteristics with some of the explanatory variables, the random effect estimator leads to biased and inconsistent estimates of the parameters. In order to eliminate this correlation, it is possible to use a traditional method called “within estimator or fixed effect estimator”, which consists in transforming the data into deviations from the individual means. In this case, even if there is correlation between unobserved characteristics and some explanatory variables, the within estimator provides unbiased and consistent results.

The fixed effect model can be written as:

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[3] *Egger (2000), Egger (2002).*

$$y_{it} = \sum_{k=1}^{K} \beta_k x_{itk} + \alpha_i + u_{it} \tag{1}$$

where: - t = 1, 2,…,T, k=1, 2,….K regressors, i=1, 2, …N individuals

- α_i denotes individual effects fixed over time and
- u_{it} is the disturbance term.

In the fixed effect transformation, the unobserved effect, α_i, disappears, which yields unbiased and consistent results. The random model has the same form as before,

$$Y_{it} = â_0 + â_1 x_{it1} + â_2 x_{it2} \ldots\ldots\ldots + â_k x_{itk} + á_i + u_{it} \tag{2}$$

where an intercept is included so that the unobserved effect, $á_i$, has a zero mean. Equation (2) becomes a random effect model when we assume that the unobserved effect, $á_i$, is uncorrelated with each explanatory variable:

$$Cov(x_{itk}, á_i) = 0,\ t = 1,2,\ldots, T;\ \ k = 1,2,\ldots, K. \tag{3}$$

The within estimator has, however, two important limits: it may not estimate the time-invariant variables that are eliminated by data transformation and it ignores variations across individuals. The individual's specific features can be correlated or not with the explanatory variable. In traditional methods, these correlated variables are replaced with instrumental variables uncorrelated to unobservable characteristics. To make a choice between random and within estimator, one must do the Hausman x2 test that consists in testing the null hypothesis of no correlation between unobserved characteristics and some explanatory variables.

2.1.2 Fixed Effect Vector Decomposition Estimator

Plümper and Troeger (2004) suggest an alternative to the estimation of time-invariant variables in the presence of unit effects. The alternative is the model discussed in Hsiao (2003). It is known that unit fixed effects are a vector of the mean effect of omitted variables, including the effect of time-invariant variables. It is therefore possible to regress the unit effects on the time-invariant variables to obtain approximate estimates for invariant variables. Plümper and Troeger (2004) propose a three-stage estimator, where the second stage only aims at identifying the unobserved parts of the unit effects, and then uses the unexplained part to obtain unbiased pooled OLS (POLS) estimates of the time-varying and time-invariant variables only in the third stage. The unit effect vector is decomposed into two parts: a part explained by time-invariant variables and an unexplainable part (the error term). The model proposed by Plümper and Troeger (2004) yields unbiased and consistent estimates of the effect of time-varying variable and unbiased for time-invariant variables if the unexplained part of unit effects is uncorrelated with time-invariant variables.

This model has the robustness of a fixed effect model and allows for the correlation between the time-variant explanatory variables and the unobserved individual effects. In brief, the fixed effect vector decomposition (FEVD), proposed by Plümper and Troeger (2004), involves the three steps: - estimation of the unit fixed effects by the FEM excluding the time-invariant explanatory variables; - regression of the fixed effect vector on the time-invariant variables of the original model (by OLS); - re-estimation of the original model by POLS, including all time-variant explanatory variables, time-invariant variables and the unexplained part of the fixed effect vector. At least in theory, this method has three obvious advantages (see Plümper and Troeger, 2004):

a) the fixed effect vector decomposition does not require prior knowledge of the correlation between time-variant explanatory variables and unit specific effects;

b) the estimator relies on the robustness of the within-transformation and does not need to meet the orthogonality assumptions (for time-variant variables) of random effects;

c) the FEVD estimator maintains the efficiency of POLS.

Essentially, FEVD produces unbiased estimates of time-varying variables, regardless of whether they are correlated with unit effects or not, and unbiased estimates of time-invariant variables that are not correlated. The estimated coefficients of the time-invariable variables correlated with unit effects, however, suffer from omitted variable bias. To summarize, FEVD produces less biased and more efficient coefficients. The main advantages of FEVD come from its lack of bias in estimating the coefficients of time-variant variables that are correlated with unit-effects.

2.2 Model specification and data

The specification retained to characterize the FDI inflows between CEEC-4 and the 17 main FDI investors is :

$$Ln(Inflows_{ijt}) = \beta_0 + \beta_1 ln(PIB_{it}) + \beta_2 ln(PIB_{jt}) + \beta_3 ln(DIST_{ij}) + \beta_4 ln(DPIBT_{ijt}) + \\ + \beta_5 STP_{it} + \beta_6 REF_{it} + \beta_7 CSU_{ijt} + B_8 ln(TCR_{ijt}) + \theta_t + \varepsilon_{ijt} \quad (4)$$

where: - β_0 is the intercept;

- θ_t is a time specific effect (t = 1,…..T);
- ε_{ijt} is the idiosyncratic error, which is assumed to be normally distributed with a zero mean and a constant variance for all observations and to be uncorrelated.

As regards the dependent variable, we use the logarithm of the inflows of FDI in host country (CEE country) from home country (OECD countries).

The data used concerns a 16-year period (from 1990 to 2005), and covers a sample of main seventeen investor countries (Austria, Belgium-Luxemburg, Denmark, the United Kingdom, Finland, France, Germany, Greece, the Netherlands, Italy, Portugal, Spain, Sweden, Canada, Japan, Switzerland and the United States of America) as FDI exporters and Romania, Poland, Hungary and Bulgaria as FDI importers. Data are organized in a panel with two dimensions (country pairs and year). Data are taken from several well-known international databases, as following:

$Inflows_{ijt}$ denotes the inflows of FDI in host country i from home country j at time t with i ≠ j (source : UNCTAD database);

GDP_{it} and GDP_{jt} represent the Gross Domestic Product of country i and country j at time t and measure the size of the importing country, and the potential supply of the FDI exporting country, respectively (source: CHELEM - French CEPII database);

$Dist_{ij}$ represents the distance between two countries, as proxy for resistance to FDI - transactional costs (source: CHELEM - French CEPII database);

Accijt is a dummy variable that equals one if country i and country j have signed the European Free Trade Agreement, and zero otherwise;

$DPIBT_{ijt}$ is the difference of GDP per capita between partners and is a proxy of economic distance (source: CHELEM - French CEPII data base);

STP_{it} is a dummy variable equal to one if host country has political stability and zero otherwise;

REF_{it} is the reform progress index (source: BERD structural indicators);

CSU_{ijt} denotes the average hourly labor costs ratio between country i and country j at time t (source EUROSTAT database);

TCR_{ijt} is the real exchange rate, which indicates the price competitiveness;

$$TCR_{ijt}=TCN_{ijt} \times P_{it} / P_{jt} \quad (5)$$

where: TCNijt is the real exchange rate (CHELEM - French CEPII data base)

- P_{it} (P_{jt}) is the consumer price index (WORLD BANK – World Tables).

2.3 Empirical results

We apply different panel data estimation methods, such as Fixed Effect Model, Random Effect Model and Fixed Effect Vector Decomposition. The results of FEM, REM, FEVD estimations are presented in Appendix for the whole sample (FEM - column 1, REM - column 2, and FEVD - column 3). We use these panel data techniques to control heterogeneity, due to a possible correlation between some explanatory variables and unobserved characteristics in order to avoid getting biased results.

The coefficients are statistically significant and have the expected signs in accordance with the gravity model: a positive effect of variables such as country size, difference in GDP per capita, the association agreement, political stability and reform progress of FDI flows and a negative impact of geographical distance, average hourly labor costs ratio and real exchange rate.

The robustness of the estimators obtained is very important, because it allows us to quantify better the impact of variables upon the FDI inflows. That is why we use here a panel data approach, which permits to identify a country's bilateral specific effects and to isolate them.

Since we have used logs of data, the heteroscedasticity is eliminated or considerably reduced. Moreover, for FEVD we used robust option.

Using a correlation matrix, we do not find that the predictor variables are highly correlated.

A comparison between the estimation leads to the following conclusion. The estimated coefficients of the FEM are different from those obtained with the REM, which can be explained through a correlation between some explanatory variables and the bilateral specific effect. Moreover, the calculated statistics of the Hausman test (chi2=53.26, Prob>chi2=0.00) reject the null assumption of the absence of a correlation between the individual effects and some explanatory variables. In this case, the random estimate is biased and the fixed effects model is preferred. Using FEVD method, we obtain coefficients similar to FEM, and we have also emphasized the importance of time-invariant variables, and their important impact on FDI inflows. These results highlight how controlling unobserved heterogeneity in gravity models can avoid overestimating the effects of variables on the FDI volume.

3. Conclusion

This paper tested some hypotheses found in the literature related to the FDI inflow patterns. The particular contribution is that these issues are examined within the particular economic and political context of the CEE countries, currently EU members. The literature suggests that country size, difference in GDP per capita, the association agreement, political stability, reform progress, geographical distance, average hourly labor costs ratios and real exchange rate may be important drivers that can influence the FDI inflow patterns. Our findings generally support the literature. The empirical results enable us to draw the following conclusions.

The use of the panel econometric method in empirical analysis of FDI inflows is convenient, because it permits us to control the individual heterogeneity in order to avoid biased results. As it is widely known, the time-series and cross-sections not controlling heterogeneity run the risk of obtaining biased results (Baltagi, 2001). Since we deal in our study with a small sample, the FEVD is the most reliable technique for our gravity model estimation. The estimated method highlights the significant impact of invariant time variable as a barrier to FDI inflows.

The difference in labour costs between the centre and the periphery is the source of potential gain, which encourages the firms to invest. Firm investors are labour-intensive sectors, where they have a comparative disadvantage in their country of origin and a comparative advantage in the host country. On the other hand, the market size of the new members has attracted market seeking investment, generally in services (trade, and financial)[4]. In conclusion, our model emphasizes a divergent tendency of activities. The economic distance stimulates the firms to relocate labor-intensive sectors on the periphery.

Also, we find that institutions matter. In particular, our results point out to political stability and reform progress as important determinants of FDI inflows. These results are encouraging in the sense that efforts towards increasing the quality of institutions may help the CEEC-4 countries to receive more FDI, hence help them to catch up, independently of the indirect impact of higher GDP per capita. The orders of magnitude found in the paper are large, meaning that moving from a low level to a high level of institutional quality could have significant impact on the FDI inflow.

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[4] *In Eastern European countries’ FDI in services (trade, financial, etc) represent 51%).*

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Appendix

VARIABLES	FEM	REM	FEVD
	(1)	(2)	(3)
	$Inflows_{ijt}$	$Inflows_{ijt}$	$Inflows_{ijt}$
PIB_{it}	4.456	1.117	4.456
	(2.77)***	(6.26)***	(2.76)***
PIB_{jt}	3.773	5.203	3.773
	(3.21)***	(5.25)***	(3.20)***
$DIST_{ij}$	0.000	-1.077	-3.356
	(.)	(3.20)***	(3.38)***
$DPIBT_{ijt}$	1.004	0.819	1.004
	(5.20)***	(5.37)*	(5.21)***
Acc_{ijt}	0.465	0.425	0.465
	(3.59)***	(3.48)***	(3.61)***
STP_{it}	0.434	0.454	0.434
	(3.38)***	(3.80)***	(2.82)***
REF_{it}	0.649	0.543	0.649
	(4.21)***	(3.67)***	(4.37)***
CSU_{ijt}	-0.256	-0.199	-0.256
	(1.72)*	(1.79)*	(6.13)***
TCR_{ijt}	-0.074	-0.093	-0.074
	(1.78)*	(2.36)**	(1.84)*
Residuals	-	-	1.000
	-	-	(52.87)***
Time dummy	*	*	*
Constant	-30.909	-26.751	-19.571
	(5.12)***	(4.88)***	(65.13)***
Observations	1088	1088	1088
Number of group	19	19	-
R-squared	0.67	0.71	0.82
Hausman test(chi2)		53.26	
Prob>chi2		(0.00)	
Absolute value of t statistics in parentheses			
*significant at 10%; ** significant at 5%; *** significant at 1%			