

# **Determinants of foreign direct investment in real estate in European countries – panel data analysis**

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Foreign direct investments (FDI) have been one of the core features of globalization and the world economy over the past two decades. Statistical data shows that the level of FDI was continuously increasing during 2003-2007, but the directions and amount of such inflows differs significantly between the countries. Investments in real estate are just one of these inflows and European countries proved to be successful in this process. The objective of this study is to highlight theoretical and empirical findings about determinants of foreign direct investment in real estate in developed European countries. This paper first present and analyze existing scientific theories in this area with special attention to real estate investments, then focuses on assessing the relative significance of the factors that may attract FDI in real estate via a panel data regression analysis for a representative sample consisting of 15 OECD countries for 1996-2007. Results of the study suggest that certain variables such as size of GDP, human capital and road infrastructure appear to be robust under different specifications. Significance of these factors estimates are also observed, confirming the relevant theoretical propositions. However, certain differential variables that expected to have positive effect proved to be insignificant within the estimated data sample.

Keywords: Foreign Direct Investment, Real Estate, Panel Data Analysis

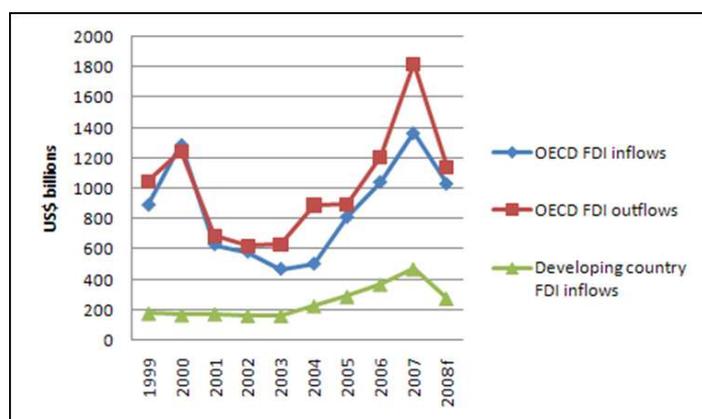
## **1. Introduction**

Foreign direct investments (FDI) have been one of the core features of globalization and the world economy over the past two decades. Statistical data shows that the level of FDI inflows and outflows was continuously increasing during 2003-2007 (Figure 1). Investments in real estate are just one of these inflows. European countries proved to be successful in attracting FDI. According to UNCTAD (2007), in 2005 total FDI inflow in the world was 945,8 billion USD, of which developed countries received 590,3 billion USD which is 62,4 percent of the total FDI inflow in the world, whereas in the same year developing countries received FDI only 314,3 billion USD. It was only 38,6 percent of the total FDI inflow in the world. Even that one can observe a slight drop in total amount of FDI inflows in the world in 2008 (Table 1) developed countries continuously dominate over the developing countries in attracting the FDI.

The objective of this study is to highlight theoretical and empirical findings about determinants of foreign direct investment in real estate in developed European countries. The analysis is done via a panel data regression analysis for a representative sample consisting of 15 OECD countries for 1996-2007.

In the beginning this paper present and analyze existing scientific theories in this area with special attention to real estate investments. The conceptual framework is outlined in the third section. Econometric model and description of variables are presented in the fourth and fifth

section. Next two sections are dedicated to econometric and sensitivity analysis, where regression is done and results of the model are discussed. Section eight concludes the paper.



Source: OECD and estimates calculated by OECD Secretariat using 2008 data supplied by Dealogic. Developing country flow data through 2007 from World Bank (2008) *Global Development Finance*. OECD Investment news, June 2008, Issue 7. Retrieved 2010-04-30 from <http://www.oecd.org/dataoecd/18/28/40887916.pdf>

Figure 1. FDI Inflows and outflows, 1999-2007, and 2008 forecast

FDI flows						
	2006	%	2007	%	2008	%
World	1 461 074	100	1 978 838	100	1 697 353	100
Developed economies	972 762	66,6	1 358 628	68,7	962 259	56,7
Europe	631 724	43,2	899 627	45,5	518 339	30,5
European union	590 305	40,4	842 311	42,6	503 453	29,7
Developing economies	433 764	29,7	529 344	26,8	620 733	36,6
FDI stocks						
	1990	%	2000	%	2008	%
World	1 942 207	100	5 757 360	100	14 909 289	100
Developed economies	1 412 605	72,7	3 960 321	68,8	10 212 893	68,5
Europe	808 943	41,7	2 281 563	39,6	6 932 525	46,5
European Union	761 897	39,2	2 163 354	37,6	6 431 893	43,1
Developing economies	529 593	27,2	1 736 167	30,1	4 275 982	28,7

Source: UNCTAD. *World investment report*, 2009, pp. 247-251

Table 1. FDI flows and stocks inflows (Millions of dollars)

## 2. Literature review

Scientists determine several factors that can affect FDI, such as economic distance, transport/costs, market size, fiscal incentives, business and investment climate and political

and economic risks, the size of the market, the rate of GNP growth, economic stability, the degree of openness of the economy, as well as several other institutional variables. A number of works (Swedenborg (1979), Dunning (1980) and Papanastassiou and Pearce (1990) are related to market-size hypothesis. It implies that international investments are “attracted by both the size of the host country and by the purchasing power of its inhabitants.”<sup>1</sup> Sader (1993) in his cross-country regression, using data on 21 developing economies over the period 1988-1992, observed a strong correlation between FDI and market size. Billington (1999) has arrived to the conclusion that a larger market size is associated with a higher level of inward FDI. Holland and others (2000) reviewed a number of studies for Eastern and Central Europe and produced evidence of the importance of market size and growth potential as determinants of FDI.

Scientists determine also a number of other factors that affect FDI. Bevan and Estrin (2000) attempted to estimate determinants of Foreign Direct Investment in transition economies and found that FDI inflows are significantly influenced by risk, unit labour costs, host market size and gravity factors. Nunnenkamp and Spatz (2002), studying a sample of 28 developing countries during the 1987-2000 period, have found significant correlations between FDI flows and per capita GNP, risk factors, years of schooling, foreign trade restrictions, complementary production factors, administrative bottlenecks and cost factors. Population, GNP growth, firm entry restrictions, post-entry restrictions and technology regulation proved to be not significant. Nonnemberg and Cardoso de Medonco (2004) have made attempt to estimate the main determinants of FDI in developing countries. They have shown that such factors as the size and rate of growth of the product, the availability of skilled labor, the receptivity of foreign capital, the country risk rating, and the behavior of the stock market play important roles in FDI. Mottaleb (2007) using panel data from 60 developing countries to established that size and growth rate of GDP, business environment, as well as, modern communication facilities significantly affect the inflow of FDI, and FDI positively and significantly affects the GDP growth of a country.

As it is clearly seen from above FDI can be affected by different factors and their influence can change over time. However one can notice that there is a lack of research done for the developed countries, even that according to the statistics the bulk of FDI in the world happens to them. The previous study was done by Agiomirgianakis, Asteriou and Papatoma (2006), who have assessed the relative significance of the factors that may attract FDI via a panel data regression analysis for a sample consisting of 20 OECD countries for 23 years (1975-1997).

However, almost no research was done regarding investments in particular industries and assets, and more specifically regarding FDI in real estate. Moshirian F., Pham T. (2000) in their study of US FDI show that US financial wealth, US FDI in manufacturing and banking, US bilateral trade, foreign current account balance and US foreign financial liabilities contribute positively to the expansion of US FDI in real estate. Furthermore, by confirmed empirical results they show that as returns from the US stock market decline, there are more incentives for US investors to invest in foreign real estate.

In this study the determinants of FDI in real estate in 15 OECD Countries of European area will be estimated by using latest available data. All countries for which the data for FDI in RE was available were included in observation sample. However, only certain factors will be considered in the framework of this study due to the limited data available in OECD database.

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<sup>1</sup> Bénassy-Quéré A., Coupet M., Mayer T. (2005). Institutional Determinants of Foreign Direct Investment, p.10

### 3. Conceptual framework

The model is constructed by using the main findings in the previous academic studies. Many researches show that in terms of market oriented FDI, the most important factor to attract FDI is the size and growth of the host country.<sup>2</sup> The market-size hypothesis suggests that a large market is necessary for the efficient utilization of resources and exploitation of economies of scale: as the market size grows to some critical value, FDI will start to increase thereafter (Scapellato and Mauer, 1969). It is evident that “host countries with larger market size, faster economic growth and higher degree of economic development will provide more and better opportunities for these industries to exploit their ownership advantages and, therefore, will attract more market-oriented FDI.”<sup>3</sup> The intuition is that this factor can be significant for FDI in real estate sector.

The level of human capital is important determinant of the marginal productivity of capital. Different researches shows that skill-related variables are host-country specific. “When a host country is more appealing to labor-intensive foreign investment that requires a relatively low level of skills, the importance of the human capital variable tends to be small. On the other hand, labor skills can be a more significant factor for a host country, in which more capital and technology intensive investment projects are concentrated.”<sup>4</sup> In another research Lastly, Buckley and others (2002) used panel data for several regions in China for the 1989-98 period. They had not found any evidence support the hypothesis according to which the efficiency of FDI depends on a minimum level of human capital. Contrastingly, human capital is more significant in less developed provinces, while FDI stimulates growth notably in the more developed provinces.

Root and Ahmed (1979) has made a first attempt to establish the role of the general infrastructure level on FDI. Schneider and Frey (1985) estimated impact of infrastructure for less developing countries. Loree and Guisinger (1995) also constructed an indicator for infrastructure that encompassed measures such as highways, ports, communications and airports using principal components factor analysis and showed that the level of infrastructure did influence the flow of US direct investment. Kinoshita (1998) by using FDI data for seven Asian countries reported that infrastructure encourage firms to invest in a certain country. Kumar (2001) after analysis of composite index of infrastructure availability in 66 countries concluded that infrastructure development should become an integral part of the strategy to attract FDI inflows in general. That is why the variable of transport infrastructure will be also examined in this study.

Considering researches that have been done in this area before and the available data the dependence of FDI in RE on such variables as the real GDP growth, GDP size, human capital and road infrastructure will be estimated. Econometric model using these variables is presented in the next section.

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<sup>2</sup> Main determinants and impacts of foreign direct investments on China's economy. OECD Working papers on international investments, November, 2000/4. p.11

<sup>3</sup> Main determinants and impacts of foreign direct investments on China's economy. OECD Working papers on international investments, November, 2000/4. p.11

<sup>4</sup> Chantasawat B., K.C. Fung, Iizaka H., Siu S. (2004). Foreign Direct Investment in East Asia and Latin America: Is there a People's Republic of China Effect? ADB Institute Discussion Paper No.17, p.12

## 4. Econometric models

The assessment of the determinants of FDI In RE in OECD countries of European area by using panel data methodology. The main objective of this section is to outline the model used to empirically test the level of influence the explanatory variables have on FDI in RE. The panel data methodology combines information on the variation of the European countries with information taking place over time. One advantage of this methodology is that it allows heterogeneity among countries to be considered. The annual panel data consists of 15 OECD countries of European area and runs from 1996-2007 both are inclusive. A list of the countries and the sources of data are presented in the Appendix and the references.

The next step is to formally develop the panel data methodology in order to address the direct investment issue. Since both cross-section and time-series data are available, in general a panel data regression appears as follows:

$$y_{it} = a_i + \beta x_{it} + \varepsilon_{it} \quad (1)$$

where the pair of terms (i, t) expresses the transversal and temporal aspects of the per country panel data, y and x are respectively the dependent variable and the matrix of explanatory variables, and  $a_i$  (unobserved country heterogeneity) captures all unobserved, time constant factors that affect the dependent variable and  $\varepsilon_{it}$  is an idiosyncratic error term that represents unobserved factors that change over time and  $\varepsilon_{it}$  follows  $\varepsilon_{it} \sim (0, \sigma_{\varepsilon^2})$ , while  $a_i$  follows  $a_i \sim (0, \sigma_{a^2})$ . The set of independent variables is measured prior to the investment decision. In order to assess the influence of the variables described, a foreign investment equation may be built up in the following linear form:

$$FDIRE_{i,t} = a_i + \beta_1 GY_{i,t-1} + \beta_2 y_{i,t-1} + \beta_3 h_{i,t-1} + \beta_4 road_{i,t-1} + \varepsilon_{it} \quad (2)$$

where FDIRE - FDI in real estate,

GY - real GDP growth,

y - GDP,

h - human capital,

road – road infrastructure.

The equation (2) will be estimated by first-differencing(FD) over time and first-difference estimators will be obtained and as well as by fixed effect(FE) model in order to obtain the fixed effect estimators. For cross-sectional observation i, when the regression equation for year t is subtracted from the regression equation for year t+1(each variable is differenced over time),

$$FDIRE_{i,t+1} = a_i + \beta_1 GY_{i,t} + \beta_2 y_{i,t} + \beta_3 h_{i,t} + \beta_4 road_{i,t} + \varepsilon_{i,t+1} \quad (3)$$

$$FDIRE_{i,t} = a_i + \beta_1 GY_{i,t-1} + \beta_2 y_{i,t-1} + \beta_3 h_{i,t-1} + \beta_4 road_{i,t-1} + \varepsilon_{it} \quad (4)$$

First-difference equation is set as follows:

$$\Delta(FDIRE)_{i,t} = \beta_1 \Delta GY_{i,t} + \beta_2 \Delta y_{i,t} + \beta_3 \Delta h_{i,t} + \beta_4 \Delta road_{i,t} + \Delta \varepsilon_{it} \quad (5)$$

When time-demeaned transformation (fixed effects estimation) is applied to equation 1, the general time demeaned equation for each country i is:

$$y_{i,t} = \beta x_{i,t} + \varepsilon_{it}$$

$$\text{where } \bar{y}_{i,t} = (y_{i,t} - T^{-1} \sum_{t=1}^T y_{i,t}),$$

$$\bar{x}_{i,t} = (x_{i,t} - T^{-1} \sum_{t=1}^T x_{i,t}),$$

$$\bar{\varepsilon}_{i,t} = (\varepsilon_{i,t} - T^{-1} \sum_{t=1}^T \varepsilon_{i,t})$$

and is unbiased within estimators will be produced under the strict exogeneity assumption on explanatory variables. Both methods explained above are used for estimating unobserved effect models by eliminating the unobserved effect from the equation with different transformations. The choice between FE and FD should be done according to the relative efficiency of estimators and this is determined by serial correlation in the idiosyncratic error

term. Serial correlation will be tested by Wooldridge test for autocorrelation whose null hypothesis is that there is no first order correlation in  $\varepsilon_{it}$ . When  $\varepsilon_{it}$  are serially uncorrelated, fixed effects model is more efficient than the first differencing.<sup>5</sup>

## 5. The data

The main sources of the data for analysis were statistical databases from OECD website. More detailed information about the data, criteria of sample choice and list of the selected countries is presented in the Appendix. The main variables that were used for this study are:

*FDI in RE* is measured in millions US Dollars.

*The Gross Domestic Product (GDP)* measured in billion US Dollars is the way of measuring the size of country's economy.

Real GDP growth is measured in percentage and GDP per capita in US dollars.

*Human capital* is measured as a tertiary rate of the country. This is a percentage of population age 24-65 that enrolled in the tertiary schools.

*Road* reflects road infrastructure in the country and is measured as road fatalities per million inhabitants.

Variable		Mean	St.deviation	Observations
FDI in RE	overall	581.7441	1150.948	N = 152
	between		631.6752	n = 15
	within		939.7749	T-bar = 10.1333
Real GDP growth	overall	3.203606	1.619906	N = 179
	between		.8831472	n = 15
	within		1.379072	T-bar = 11.9333
GDP	overall	577.2047	665.2582	N = 180
	between		671.8814	n = 15
	within		137.4232	T = 12
Human capital	overall	21.96808	7.551647	N = 148
	between		7.416081	n = 15
	within		2.278317	T-bar = 9.86667
Road infrastructure	overall	106.9778	39.64309	N = 180
	between		37.8827	n = 15
	within		14.98888	T = 12

Table 2. Descriptive statistics of the variables

## 6. Results

Equation (2) is considered by using 2 different methods to estimate unobserved model, first differencing and time-demeaned transformation (within estimator). The panel data set consists of 15 countries, and runs for a time span of 11 years (one year is missed due to the lags introduced in the equation). The estimated results are summarized in Table 3.

<sup>5</sup> Wooldridge J.M. (2009) Introductory Econometrics: A modern approach. Fourth edition, South-Western, Cengage learning. P.487

Dependent variable	FDIRE		
Sample	Time period 1996-2007 (T=11), Number of countries N=15		
Independent variables	First difference model *	Independent variables	Fixed effect model
$\Delta Gy_{i,t-1}$ (t-stat)	-156.435 (1,49)	$Gy_{i,t-1}$ (t-stat)	104.7135 (1,47)
$\Delta y_{i,t-1}$ (t-stat)	1.594518 (1,02)	$y_{i,t-1}$ (t-stat)	2.332434 (2,38)**
$\Delta h_{i,t-1}$ (t-stat)	-31,31869 (-0,35)	$h_{i,t-1}$ (t-stat)	-149.926 (-2,56)**
$\Delta road_{i,t-1}$ (t-stat)	-20,42877 (-1,46)	$road_{i,t-1}$ (t-stat)	-28.38157 (-2,78)**
R-squared (overall) (within) (between)	0,0431 0,0444 0,0142	R-squared (overall) (within) (between)	0.1132 0,1957 0,1270
*Regression with robust standard errors			
** statistically significant at %95 level of significance			

Table 3. Estimation results

When the estimators of first-difference model are considered, the coefficients indicate trade off between explanatory variables and FDI in real estate. These estimated coefficients are not statistically significant at 95% level of statistical significance level. Both methods FE and FD are used for estimating unobserved effect models and choice between FD and FE is made after performing Wooldridge autocorrelation test for testing serial correlation in the idiosyncratic errors. By Wooldridge autocorrelation test autocorrelation in  $\epsilon_{it}$  is not detected. Therefore, it is more efficient to estimate unobserved effect model with time-demeaned transformation on data of OECD countries of European area.

The column FE represents within estimators under the assumption that there is no differences between countries. An important finding is the positive and significant effect of GDP as expected before. FE estimation results suggest that road infrastructure and human capital are significant on the determination of FDI in RE, while GDP growth is insignificant. Results reveal that foreign investors are influenced by signal transmitted by GDP indicator. Human capital is negatively associated with FDI inflows, suggesting that all things being equal, investors are less likely to invest in the countries which have achieved a certain level of development. This result is unexpected, but seems to be reasonable for developed countries in contrast to developing countries, where this variable seems to play an opposite role according to recent studies. Road infrastructure estimate that is measured as a road fatalities per million inhabitants negatively affects investments in real estate, that is consistent with the expected result.

## 7. Sensitivity analysis

As it has been found in the previous section, the significant explanatory variables that have effect on determination of FDI in RE inflows were GDP, human capital and road infrastructure of the host country. The sensitivity analysis is done in order to check how sensitive results to changes in model. The insignificant variable GDP growth is taken away from the model. The FE estimators are presented in table 4.

Dependent variable	FDIRE
Sample	Time period 1996-2007 (T=11), Number of countries N=15
Independent variables	Fixed effect model
yi,t-1	2.090772 (2,16)**
hi,t-1	-150.2921 (-2,55)**
roadi,t-1	-29.29578 (-2,86)**
R-squared (overall)	0.0920
** statistically significant at %95 level of significance	

Table 4: Summary of FE estimators for sensitivity analysis

For GDP, human capital and road infrastructure almost the same result is obtained as before, so the changes in the model do not affect the statistical significance of these variables.

## 8. Conclusion

FDI inflows could bring important benefits to the recipient economies in the form of capital inflows, technology transfer, human capital formation, international trade integration and enterprise development. That is why it is important to know what factors affect the FDI inflow to the country and especially investments in real estate. The objective of this study was to highlight the determinants of foreign direct investment in real estate in developed countries since they have shown a great success in attracting FDI. An econometric model based in panel data analysis for 15 OECD countries of European area for the 1996-2007. The variables selected to explain direct foreign investment in real estate were the real GDP growth, size of GDP, the level of human capital and development of road infrastructure.

It was found that estimates of GDP (as a measure of market size) have positive effect and are significant for the selected sample. The degree of the human capital and road infrastructure were included as a proxy to reflect the willingness of a country to accept foreign investment in real estate. These variables proved to be important in attracting foreign capital.

Estimate of GDP growth (as a measure of market size growth) was not significant for the selected sample. This can be explained by the fact that GDP growth historically does not differ greatly between European countries as for example between developing countries, where according to the recent studies this variable positively affect FDI inflows.

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### **Electronic resource links:**

Data source for FDI in real estate, GDP, Real GDP growth, Tertiary rates, Road infrastructure: <http://stats.oecd.org/index.aspx>

### **Appendix**

List of selected countries:

- |                   |                     |
|-------------------|---------------------|
| 1. Austria        | 9. Netherlands      |
| 2. Czech republic | 10. Norway          |
| 3. Denmark        | 11. Poland          |
| 4. Finland        | 12. Slovak republic |
| 5. France         | 13. Spain           |
| 6. Germany        | 14. Sweden          |
| 7. Greece         | 15. United Kingdom  |
| 8. Hungary        |                     |