



Investigaciones Regionales - Journal of Regional Research

ISSN: 1695-7253

ISSN: 2340-2717

investig.regionales@aecr.org

Asociación Española de Ciencia Regional
España

Gutiérrez-Portilla, Paula; Maza, Adolfo; Villaverde, José; Hierro, María
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Investigaciones Regionales - Journal of Regional Research, no. 35, 2016, pp. 67-82
Asociación Española de Ciencia Regional
España

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Foreign direct investment in the Spanish regions: What are the influencing factors?

Paula Gutiérrez-Portilla*, Adolfo Maza**, José Villaverde***,
María Hierro**

ABSTRACT: The purpose of this paper is to analyze foreign direct investment (FDI) flows in Spain at regional and sectoral levels over the period 1997-2013. After showing that they are very volatile and highly geographically concentrated, the paper examines their determinants by estimating an FDI equation by GMM and GLS. This is done not only for the whole period and total FDI but also for two sub-periods (pre-crisis and crisis) and main places of origin (Europe and America). The results show that FDI inflows in Spain are mainly determined by market size, the level of human capital in interaction with wages, and the own characteristics of Madrid.

JEL Classification: F21; O16; R11.

Keywords: foreign direct investment; Spanish regions.

Inversión extranjera directa en las regiones españolas: ¿Cuáles son los factores determinantes?

RESUMEN: Este trabajo analiza los flujos de inversión extranjera directa (IED) en España desde una perspectiva regional y sectorial durante el periodo 1997-2013. Tras comprobar que estos flujos son muy volátiles y están altamente concentrados por regiones, se examinan sus determinantes a través de la estimación de una ecuación de FDI por GMM y GLS. Este análisis se realiza tanto para el periodo completo y toda la FDI, como para dos sub-periodos (pre-crisis y crisis), así como para las principales áreas de origen (Europa y América). Los resultados indican

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que el volumen de IED viene determinado, básicamente, por el tamaño de mercado, el nivel de capital humano en interacción con el salario, y las características propias de Madrid.

Clasificación JEL: F21; O16; R11.

Palabras clave: inversión extranjera directa; regiones españolas.

1. Introduction

Within a context of ongoing liberalization and internationalization of business activities there has been a process of increasing international capital movements over the last few decades. Foreign direct investment (FDI henceforth) has not been an exception to this process. In fact, FDI flows have grown dramatically over this time, despite a temporary contraction during the global crisis (OECD, 2011)¹. Understanding the factors behind FDI has become an interesting research issue, mainly because, although with some misgivings, FDI is considered to be a key driver of economic growth. Consequently, there is a vast literature devoted to the study of FDI determinants and to explain the existence of significant disparities in the distribution of FDI flows across countries.

Until recently, developed countries were the largest recipients of FDI; however, in 2012 developing countries surpassed developed countries (UNCTAD, 2013). At present, more than half of global FDI flows (54%) concentrate in developing economies, 39% goes to developed countries, and 7%, to transition economies (UNCTAD, 2014).

FDI distribution within countries is also characterized by prominent regional disparities and, in this respect, the case of Spain clearly stands out. Spain became a highly attractive destination for worldwide FDI during the mid-eighties (Bajo-Rubio and López-Pueyo, 2002; Roca, 2010), but FDI inflows have never been equally distributed among regions. The richest ones have always been the principal recipients of foreign capitals so, unlike in the FDI distribution across countries, there has not been any change in this pattern. Consequently FDI, far from promoting regional economies' harmonious development, might have helped to increase regional inequalities in Spain (Díaz-Vázquez, 2003).

With these considerations in mind, studying the factors influencing FDI decisions in Spain seems to be of paramount interest. Only when these determinants are known, policies focused on FDI attraction can be correctly designed and implemented. Additionally, knowing the determinants of FDI is helpful to ascertain how FDI-fueled development policies can affect the extent and evolution of regional inequalities.

¹ In any case, global FDI flows in 2011 exceeded the mean value for the period 2005-2007, reaching, \$1.5 trillion (UNCTAD, 2012).

Most of the papers analyzing these FDI determinants have adopted a national perspective (Bajo-Rubio, 1991; Egea and López-Pueyo, 1991a; Bajo-Rubio and Sosvilla-Rivero, 1992, 1994; Martín and Velázquez, 1996, 1997; Muñoz-Guarasa, 1999; Bajo-Rubio and López-Pueyo, 2002; Allard and Pampillón, 2005; Chislett, 2014). By comparison, little attention has been paid to regional aspects. To the best of our knowledge, the only exceptions are the papers by Egea and López-Pueyo (1991b), Pelegrín (2002), Pelegrín and Bolancé (2008), Rodríguez and Pallas (2008), and Villaverde and Maza (2012).

This paper tries to contribute to this branch of the literature by providing additional insights into the main determinants behind inward FDI flows in Spain (for the period 1997-2013) from a regional and sectoral perspective. On the one hand, because the extant regional differences deserve special attention. On the other because, according to the theoretical literature on FDI, the attractiveness of a location does not only depend on its own advantages but also on firm' and sector characteristics (Barba-Navaretti and Venables, 2004). Apart from that, with the aim to examine whether FDI determinants differ depending on the business cycle and/or the place of origin, we also perform our analysis for two sub-periods (pre-crisis (1997-2007) and crisis (2008-2013)) and the two main places of origin (Europe and America).

The remainder of the paper is organized as follows. In Section 2 a review of the theoretical and empirical literature on inward FDI determinants is performed. Afterward, Section 3 outlines basic patterns of the FDI distribution across Spanish regions. Then, in Section 4, the model to uncover the FDI determinants is specified, estimated, and the results are presented. Finally, some concluding remarks are offered in Section 5.

2. FDI determinants: Theory and empirical evidence

2.1. Theoretical approaches

Here we present a short theoretical survey on FDI determinants to gain some insight into the motivation for firms to invest abroad. To start with, it should be noted that there is no a generally accepted theory on the issue, so the need to delve into the different approaches analyzing FDI from the locational perspective arises².

The earliest attempt to explain FDI is based on the *MacDougall-Kemp model* in the context of the neoclassical trade theory. MacDougall (1960) and Kemp (1964) underlined the importance of differences in capital returns in favor of FDI. In this vein, *Kojima's theory* of foreign investment (the so-called model of pro-trade-oriented FDI) appeared as an extension of the neoclassical theory that includes cross-border transactions of intermediate products (Kojima, 1973).

² For a thorough literature review on FDI determinants readers are referred to Blonigen (2005), Faeth (2009) and Assunção *et al.* (2011).

Hymer (1976)³ criticized this approach claiming that FDI cannot exist in a context of perfect competition. Hymer, together with Kindleberger (1969) and Caves (1971), developed the *monopolistic advantage theory*. This theory states that MNEs are monopolistic rent seekers and it insists on the fact that firms operating abroad have to compete with domestic firms that keep an advantageous position in terms of culture, legal system, consumer's preference and so forth. Accordingly, foreign firms have to compensate these disadvantages with a higher market power so as to make international investment profitable. This can be done, among other ways, by resorting to the superior technology possessed by MNEs (Kindleberger) or product differentiation (Caves).

Considering the issue of firm rivalry, Vernon (1966) puts forward the *production cycle theory*⁴, according to which the FDI location might change as firms move from the innovatory to the standardized stage of production.

The *Internalization theory* is of great interest as well. This theory (Coase, 1937; Buckley and Casson, 1976; and Hennart, 1982), tries to explain the growth of transnational companies and their motivations for investing abroad⁵. It shows that MNEs organize their internal activities to develop and exploit specific advantages related to the two types of integration: vertical and horizontal. While vertical FDI positively responds to factors such as the cost and quality of production factors or the endowments of natural and technological resources, horizontal FDI is more sensitive to market characteristics.

An alternative framework for analyzing FDI is offered by the *new trade theory* (Markusen and Venables, 1998). It combines ownership and location advantages with technology and country characteristics to analyze both horizontal and vertical FDI⁶. The first type of FDI is explained using the proximity-concentration hypothesis while the second one uses the factor-proportions hypothesis.

This strand of literature was complemented by *Markusen's knowledge-capital model* (Markusen, 1997, 2002), in which vertical and horizontal motivations for FDI are integrated. Thereby, similarities in market size, factor endowments and transport costs are determinants of horizontal FDI, whereas differences in relative factor endowments explain vertical FDI.

Within this framework, the *eclectic paradigm* coined by Dunning (1980, 1988, 2001) emerges as a combination of previous theories of FDI into a more comprehensive model. Dunning suggests that a firm becomes multinational to exploit owner-

³ Hymer's dissertation, presented in 1960, was published in 1976 as a book entitled *The international operations of national firms: A study of direct foreign investment*.

⁴ It seems convenient to mention that this theory has been mainly used to explain certain types of FDI, mainly FDI made by U.S. companies in Western Europe manufacturing industry after the Second World War.

⁵ This theory focuses on external market failures when explaining FDI instead of on MNEs' advantages (Hymer, 1976).

⁶ New trade models were empirically tested by Brainard (1997), who found strong support for horizontal FDI.

ship, location and internalization (OLI) advantages. Ownership advantages refer to the existence of firm-specific assets, such as superior technology, specific know-how and managerial competences, which provide foreign investors with essential advantages over local firms. As its very name implies, locational advantages refer to the peculiarities of a particular location that make it more attractive for foreign investment. Finally, internalization advantages refer to those kinds of advantages that make more profitable for a firm to carry out transactions within it rather than outsourcing.

Focusing on locational advantages, Dunning identifies four main motives for FDI: market seeking, resource seeking, efficiency seeking and strategic assets seeking. Market seeking investors are attracted by the host market size, its per capita income and the consumer demand in order to take advantage of the economies of scale. For its part, resource seeking investment is aimed basically at gaining access to cheap natural resources and/or raw materials. Efficiency seeking investment is designed to promote a more efficient division of labor or specialization of assets by MNEs. Finally, strategic asset seeking investment is designed to protect or augment the ownership advantages of the investing firms and reduce those of their competitors (Dunning, 2000).

2.2. Empirical evidence for Spain

At this point we present a brief overview of the most relevant studies analyzing the determinants of foreign direct investment in Spain, both at a national and regional level. Now then, it is worth mentioning that studies carried out at national level have been the most prolific.

From a national perspective the first noteworthy paper, by Bajo-Rubio (1991), performs both a time series and a cross-section analysis for the period 1961-1988. He finds that FDI is linked to market size and unit labor costs, but also that the qualification of the workforce plays a key role in FDI location in manufacturing industry. In the same vein, Bajo-Rubio and Sosvilla-Rivero (1992, 1994), using a cointegration analysis for the periods 1961-1989 and 1964-1989, find a long-run relationship between FDI inflows and variables such as the level of real GDP, the inflation rate, trade barriers and the lagged foreign capital stock.

With reference to the period 1986-1989 and performing a factor and cluster analysis, Egea and López-Pueyo (1991a) conclude that the sectors receiving most FDI are characterized by a huge dynamism in both production, internal demand and exports. Bajo-Rubio and López-Pueyo (2002), using data for manufacturing sectors for the period 1986-1992 and estimating by OLS with fixed effects, stress the role played by labor skills, product differentiation, productivity and domestic demand. For their part, Martín and Velázquez (1996, 1997) study the determining factors in the bilateral direct investment flows between OECD countries, particularly those received by Spain. These authors, using OLS, OLS with fixed effects and GLS estimators, conclude that the supply of skilled labor, a large and dynamic market, the availability of

good transport infrastructure and liberal regulations with respect to FDI are essential factors in attracting foreign capital. Likewise, Muñoz-Guarasa (1999) estimates a model by OLS for the period 1987-1995 obtaining similar results: market size, labor costs and the quality of the work force are factors attracting FDI into Spain.

Although not so abundant, the regional perspective has also been brought to the forefront of this field of research. For example, in the study by Egea and López-Pu-eyo (1991b) a cluster analysis for the period 1985-1989 is carried out, identifying per capita and per employee income, human capital and the productive structure as main determinants of the FDI location; however, the unemployment rate, infrastructure endowment and subsidies are not found significant. Pelegrín (2002), for the period 1993-1998 and using different methods of estimation, shows that market size, the quality labor force and aid and official incentives positively influence the regional location of FDI flows. On the contrary, infrastructure is not found to be a significant driver for FDI. Pelegrín and Bolancé (2008) paper, using a model estimated by GLS, reveals that agglomeration economies and the concentration of research and development activities are important drivers for manufacturing FDI. Nevertheless, the importance of FDI location determinants varies across industries. Rodríguez and Pallas (2008), for the period 1993-2002 and employing GLS (with cross-section weights) and by W2SLS, make clear that demand factors, the evolution of human capital, the export potential of the sectors, and the differential between labor productivity and the cost of labor play a vital role in attracting flows of FDI.

Finally, Villaverde and Maza (2012), adopting quite a novel methodological approach, analyze the regional distribution of FDI in Spain and its main determinants between 1995 and, depending on the case, 2005/2008. They perform an explanatory factor analysis which leads to four extracted factors labelled as economic potential, labor conditions, market size and competitiveness. The econometric analysis, by GLS and two stage GLS, reveals that economic potential, labor conditions and competitiveness are important for attracting FDI, both at aggregate and sectoral levels. Additionally, when extending the analysis to take into account spatial effects, they find negative geographical spillovers associated to the economic potential and competitiveness factors.

Overall, although the results of the empirical evidence are somewhat mixed, a preliminary conclusion can be drawn from the above literature review: the main factors attracting FDI inflows in Spain are those linked to market-seeking FDI (market size) and resource-seeking FDI (human capital, labor conditions and physical infrastructure endowment). The next two sections, adopting a regional (and also sectoral) perspective, will try to reinforce, or qualify, this conclusion.

3. FDI in Spain: Regional and sectoral distribution

As the starting point for our empirical analysis, this section offers an overview of the distribution of inward FDI flows across Spanish regions and sectors over the

Table 1. Inward FDI in Spanish regions and sectors
Flows (million euros of 2000). 1997-2013 Average

Regions	Total		Sectoral distribution				Main places of origin	
	Total	CV	%	Agriculture	Industry	Construction	Services	America
Andalucía	406.00	0.44	2.15	10.26	132.35	83.52	179.88	83.06
Aragón	446.45	2.43	2.37	0.76	316.05	2.31	127.32	369.58
Asturias	235.36	1.65	1.25	0.01	224.29	1.37	9.70	26.06
Baleares	225.15	0.56	1.19	3.80	1.88	58.60	160.88	16.76
Canarias	518.76	0.83	2.75	9.20	265.78	13.38	230.40	338.50
Cantabria	13.52	1.17	0.07	0.45	6.94	0.80	5.33	3.71
Castilla y León	65.66	1.04	0.35	0.81	21.07	2.74	41.04	6.23
Castilla-La Mancha	85.13	1.33	0.45	1.62	34.32	10.73	38.46	26.75
Cataluña	2,836.52	0.37	15.04	26.24	1,232.80	109.42	1,468.07	600.02
C. Valenciana	714.91	1.18	3.79	1.52	509.09	15.72	188.59	309.48
Extremadura	19.40	1.01	0.10	1.73	16.37	0.07	1.23	6.62
Galicia	165.28	0.99	0.88	1.43	98.23	8.97	56.65	20.35
Madrid	12,154.16	0.66	64.45	62.83	4,329.99	334.10	7,427.24	3,950.39
Murcia	104.81	1.80	0.56	1.40	86.25	5.22	11.95	52.97
Navarra	54.78	0.78	0.29	0.48	37.74	3.34	13.21	7.44
País Vasco	798.54	0.89	4.23	1.74	492.02	75.73	229.05	369.47
Rioja (La)	14.62	1.21	0.08	0.07	10.74	0.05	3.76	0.36
Spain	18,859.06	0.50	100	124.34	7,815.89	726.06	10,192.76	6,187.29

Note: CV: Coefficient of Variation

period 1997-2013. To do so, we collect raw information from DataInVex (Spanish Ministry of Economy and Competitiveness).

Table 1 provides three main results. First, foreign investment is highly concentrated in just a few regions. For the whole sample period, Madrid and Cataluña received, on average, 79.5% of total FDI, although the amount got by the first is four times that of the second. Besides, should we add the volume picked up by País Vasco and Comunidad Valenciana, the amount received by these four regions would reach nearly 87.5% of total FDI. So, we can see that the distribution of inward foreign investment is very heterogeneous across the Spanish regions. Besides, FDI inflows are very volatile over time, as the coefficient of variation (CV) clearly shows; in any case, differences are quite remarkable across regions, with Aragón, Murcia and Asturias standing out. Second, considering a broad sectoral breakdown (agriculture, industry, construction and services), it can be appreciated that the distribution of inward FDI is not homogeneous either, as industry and services sectors concentrate, on average, 41.4% and 54%, respectively, of total. And third, regarding the main places of origin, it should be noted that FDI coming from Europe and America accounts, on average, for 54.2% and 32.8%, respectively, of total FDI.

To get a great insight into the regional distribution of FDI, we compute the so-called *Inward FDI Performance Index*, proposed by UNCTAD (2001)⁷. This index, allowing us to benchmark the extent to which Spanish regions succeed in attracting FDI, is defined as the ratio of a region's share in FDI inflows to its share in GDP (collected from INE):

$$\text{Performance Index}_i = \frac{FDI_i / \sum_{i=1}^{17} FDI}{GDP_i / \sum_{i=1}^{17} GDP} \quad (1)$$

Table 2 shows the value of the index over the period 1997-2013. It is important to note that Madrid is in the first position, being the only region with an index greater than one; in particular, the index reveals that FDI inflows in Madrid are more than three and a half times its share of GDP. The disparity between the percentages of FDI and GDP in the case of Madrid could be due to the so-called headquarter effect⁸. For its part, Cataluña gets a bit less than expected according to its share of GDP. The rest of regions receive lower shares of FDI with respect to GDP. Finally, the last column of the table unveils the fact that there is a large volatility of the index over time for all regions, although in this case Madrid stands out for being the region with the lowest volatility.

⁷ UNCTAD also proposes the so-called FDI Potential Index. A new version of this index can be seen in Maza and Villaverde (2015).

⁸ Although we are well aware of the relevance of this effect, it is virtually impossible to remove it from the analysis.

Table 2. Regional distribution of FDI and GDP in Spain
(Average for the period 1997-2013)

	$FDI_i / \sum_{i=1}^{17} FDI$ (%)	$GDP_i / \sum_{i=1}^{17} GDP$ (%)	<i>Performance Index</i>	<i>CV</i>
Andalucía	2.24	13.63	0.16	0.58
Aragón	2.46	3.15	0.78	2.34
Asturias	1.30	2.19	0.59	1.80
Baleares	1.24	2.50	0.50	0.65
Canarias	2.86	4.11	0.70	0.82
Cantabria	0.07	1.24	0.06	0.84
Castilla y León	0.36	5.44	0.07	0.81
Castilla-La Mancha	0.47	3.49	0.13	1.33
Cataluña	15.63	18.54	0.84	0.40
C. Valenciana	3.94	9.73	0.40	0.97
Extremadura	0.11	1.67	0.06	1.00
Galicia	0.91	5.29	0.17	0.81
Madrid	66.95	17.84	3.75	0.20
Murcia	0.58	2.52	0.23	1.74
Navarra	0.30	1.72	0.18	0.92
País Vasco	4.40	6.18	0.71	0.83
Rioja (La)	0.08	0.75	0.11	1.12

4. Empirical analysis

After the descriptive study of the distribution of FDI flows across the Spanish regions, in this section we address the analysis of its determinants. Our basic regression equation (all variables apart from the dummy- are expressed in logs) is as follows:

$$fdi_{ij,t} = \alpha + \rho_1 fdi_{ij,t-1} + \beta_1 MS_{i,t-1} + \beta_2 W_{ij,t-1} * HC_{ij,t-1} + \beta_3 RI_{i,t-1} + \beta_4 d_{Madrid} + \epsilon_{ij,t} \quad (2)$$

where the subscripts i, j and t denote region, sector and time, respectively, and ϵ is the error term.

The information about the variables used in our econometric model, their units of measure and the statistical sources are concisely provided in Table 3. Some additional comments about the inclusion of these explanatory variables are pertinent:

Table 3. Variables, measures and data sources

<i>Variable</i>	<i>Measurement (*)</i>	<i>Data source</i>
Dependent variable		
Host region sector inward FDI (FDI_{ij})	Flows of inward gross FDI as percentage of GDP	Spanish Ministry of Economy and Competitiveness (Data-Invox) and Spanish National Statistical Institute (INE)
Independent variables		
Host region market size (MS_i)	GDP, expressed in constant thousand euros of 2000	Spanish National Statistical Institute (INE)
Host region sector wages in interaction with human capital ($W_{ij} * HC_{ij}$)	W_{ij} : Monthly remuneration per employee, expressed in constant thousand euros of 2000	Cambridge Econometrics
	HC_{ij} : Education index (**) computed with data of employed population by educational attainment	Valencian Institute of Economic Research (IVIE)
Host region infrastructure endowment (RI_i)	Kilometers of motorways per 1000 km ²	Eurostat
Dummy for Madrid (d_{Madrid})	A dummy variable for Madrid	Author's own

Notes: (*) The monetary variables are expressed in constant thousand euros of 2000;

(**) The education index for each sector is defined as $HC = \sum_{i=1}^7 \varphi_i A_i$ where φ_i indicates the weight associated with each level of human capital i over the total employed population and A takes the values 0, 6, 10, 12, 14, 15 and 17 for $i = 1, 2, 3, 4, 5, 6$ and 7 . The levels of human capital are as follows: $i = 1$ = illiterate, $i = 2$ = without studies and primary education, $i = 3$ = compulsory secondary education, $i = 4$ = high school and middle-level training program, $i = 5$ = higher level training program, $i = 6$ = previous to superior and $i = 7$ = superior studies.

- 1) *MS*: According to theory, the characteristics of the market of the recipient economies greatly influence the decision of an MNE to invest. In particular, market-seeking investors are attracted to regions with large markets because they provide more opportunities for sales and profits. Then, a positive relationship between FDI and market size is expected.
- 2) *W * HC*: As it is well known, wages have traditionally been considered as a variable influencing the decision of where to invest. Skill intensity, measured by the level of human capital, is as well a key variable to consider as a potential explanation for inward FDI flows (Dunning, 1980, 1988). Although according to theory wages and human capital could be included separately, we found out, in a preliminary estimation, that the wage variable was picking up the effect of human capital on FDI. Accordingly, we include both variables as an interaction one.

- 3) *RI*: Good infrastructure allows faster transport and communication, increasing the productivity of investment and, therefore, stimulating FDI inflows⁹.
- 4) *d_{Madrid}*: We include a dummy for Madrid because we try to somewhat capture the headquarter effect.

After specifying the model, here we would like to make some comments about the estimation technique. As for our econometric strategy, we should take into account that there are concerns about potential endogeneity problems between some variables in equation (2); that is, causality might run in both directions and the explanatory variables may not be strictly exogenous (correlated with past and possibly current realizations of the error). For this reason, and in order to correct the potential endogeneity bias, we firstly decided to use the Generalized Method of Moments (GMM) developed by Arellano and Bond (1991) and Arellano and Bover (1995), a dynamic panel data technique that provides unbiased and efficient estimates. These authors propose first-differencing the model in order to eliminate the individual specific effects, and using valid instruments (lagged values of the instrumented variables) to tackle the problem of the new error being correlated with the lagged dependent variable. Additionally, the instruments are required to control for the potential endogeneity of the explanatory variables.

The difference GMM estimator has, however, a drawback. With highly persistent data (a trait of some of our variables), the lagged levels of the regressors may be poor instruments for the first-differenced regressors. So, to solve this problem Arellano and Bover (1995) and Blundell and Bond (1998) proposed the system GMM estimator, which builds a system of two equations: the regression in differences in addition to the regression in levels with lagged differences as instruments. A further assumption of no correlation between the variables in differences and the fixed effects is required, although there might be correlation between the levels of the explanatory variables and the fixed effects. This allows the introduction of more instruments and can dramatically improve efficiency.

Given these considerations in mind, firstly a one-step system GMM model is, for the whole sample, estimated. The results are reported in the first column of Table 4¹⁰. As can be seen, the two specification tests (bottom of this column) reinforced our decision: neither the null hypothesis of no second-order serial correlation (AR(2) test) nor the validity of the instruments used in the estimation can be rejected (Hansen test). It should also be noted that standard errors robust to heteroskedasticity and autocorrelation are considered¹¹.

As for the coefficients included in equation (2), it can be seen that the one linked to the lag *fdi* is positive and statistically significant, this result supporting

⁹ For a comprehensive study about spillovers and infrastructures in Spain see Roca and Sala (2006).

¹⁰ The instruments for the equation in differences used for the System-GMM estimation are the second and third lags of *fdi* and *MS*. For the equation in levels, the instruments are the first difference of the two variables mentioned.

¹¹ The presence of heteroskedasticity is confirmed by Breusch-Pagan test.

the presence of inertia in FDI flows. Furthermore, market size turns out to be an important driver for FDI attraction, a finding that is in line with that obtained by Egea and López-Pueyo (1991b) and Pelegrín (2002). Besides, the coefficient of the interaction variable is positive and statistically significant, indicating that FDI is attracted by regions with high levels of human capital that, accordingly, pay high wages; although not explicitly using this same variable, this finding is in tune with previous literature (see, e.g. Egea and López-Pueyo, 1991b). Additionally, transport infrastructure endowment does not seem to be a factor helping to attract FDI flows into the Spanish regions. Though somewhat counterintuitive, this result picks up the idea that infrastructure is a less relevant determinant of FDI in developed countries compared to developing ones (Porter, 1991); there is also empirical evidence supporting it (Pelegrín, 2002). As regards the dummy for Madrid, its coefficient turns out to be positive and statistically significant, meaning that the own characteristics of the capital region (including the headquarter effect) help to attract FDI.

As mentioned above, the purpose of the paper is to unveil FDI determinants not only for the whole sample but also to assess whether the results change when splitting the sample into pre-crisis (1997-2007) and crisis (2008-2013) periods. Additionally, and both for the whole period and the two sub-periods, we are also interested in evaluating whether there are some changes depending on the place of origin, for which we disentangle the FDI coming from Europe and America¹². For these reasons, we performed the same estimates for sub-periods and places of origin. In these cases, however, the specification tests did not support the use of a GMM estimator, so we decided to employ, in order to address the presence of heteroscedasticity, a GLS estimator. To be precise, we estimate the following equation:

$$fdi_{ij,t} = \alpha + \rho_1 fdi_{ij,t-1} + \rho_2 fdi_{ij,t-2} + \beta_1 MS_{i,t-1} + \beta_2 W_{ij,t-1} * HC_{ij,t-1} + \beta_3 RI_{i,t-1} + \beta_4 d_{Madrid} + \varepsilon_{ij,t} \quad (3)$$

in which all variables have the aforementioned meanings. As can be seen, in this case two lags of the dependent variable are included, this decision being guided by the Akaike's Information Criterion (AIC).

The results are shown in the rest of columns of Table 4. First of all, it must be pointed out that the findings obtained for the whole sample are roughly the same to those obtained by GMM: this implies that our results are robust regardless of the econometric approach. As for the business cycle, it is shown that agglomeration effects are greater during the pre-crisis period than during the crisis; just the opposite happens with market size. Additionally, the intensity of the interaction variable's effect is much stronger during the crisis than before, and something similar occurs with the dummy for Madrid.

¹² Europe is made up of 55 countries, and America of 48 countries. For specific names we refer the reader to the DataInVex website.

Table 4. Estimation results

Dependent variable: FDI_{ijt}	One-step System-GMM	GLS				GLS				GLS			
		Aggregate FDI				FDI from Europe				FDI from America			
		All period	Pre-crisis period	Crisis period		All period	Pre-crisis period	Crisis period		All period	Pre-crisis period	Crisis period	
Constant	-16.657** (4.590)	-5.287** (1.004)	-4.653** (1.148)	-7.873** (2.046)		-4.911** (1.143)	-4.737** (1.223)	-6.776** (2.361)		-6.039** (1.734)	-8.545** (2.566)	-10.807** (2.884)	
FDI_{ijt-1}	0.448** (0.105)	0.387** (0.032)	0.385** (0.039)	0.388** (0.055)		0.382** (0.032)	0.376** (0.040)	0.275** (0.056)		0.408** (0.038)	0.417** (0.046)	0.282** (0.059)	
FDI_{ijt-2}	—	0.299** (0.031)	0.334** (0.039)	0.218** (0.048)		0.313** (0.031)	0.367** (0.038)	0.308** (0.050)		0.264** (0.038)	0.225** (0.047)	0.335** (0.050)	
MS_{it-1}	0.892** (0.281)	0.257** (0.058)	0.213** (0.067)	0.341** (0.113)		0.245** (0.068)	0.228** (0.073)	0.384** (0.140)		0.318** (0.105)	0.417** (0.123)	0.394** (0.151)	
W_{ijt-1}^{*HC}	0.464** (0.165)	0.195** (0.072)	0.194* (0.085)	0.370* (0.144)		0.218** (0.075)	0.209** (0.077)	0.197 (0.153)		-0.019 (0.105)	0.110 (0.301)	0.294 (0.228)	
RI_{it-1}	-0.282 (0.256)	-0.032 (0.101)	0.046 (0.110)	0.059 (0.249)		-0.153 (0.108)	-0.070 (0.116)	-0.381 (0.278)		-0.195 (0.191)	-0.160 (0.249)	0.399 (0.336)	
d_{Madrid}	1.197* (0.462)	0.666** (0.156)	0.488** (0.184)	0.786* (0.323)		0.546** (0.164)	0.415* (0.184)	0.922** (0.348)		1.114** (0.259)	0.984** (0.290)	1.064* (0.435)	
AR(2) test	0.29	—	—	—		—	—	—		—	—	—	
Hansen test	0.98	—	—	—		—	—	—		—	—	—	
Adjusted R ²	—	0.45	0.50	0.38		0.45	0.49	0.35		0.42	0.41	0.47	

Note: Robust standard errors in parentheses; the values for AR(2) and Hansen tests are p-values; ** Significant at 1%, * Significant at 5%.

In general terms, the results for aggregate FDI are maintained regardless of place of origin, with the exception of the interaction variable that becomes non-significant for the FDI coming from America. There are also some variations in the intensity of the FDI determinants' effects depending on the FDI origin. The market size of the recipient regions is more relevant for the FDI coming from America, mainly during the pre-crisis period. As for the dummy for Madrid, it seems that the attractiveness of this region is also larger in the case of FDI coming from America, both during the whole period and the pre-crisis sub-period.

5. Conclusions

This paper provides new insights into some key factors influencing FDI location choices in the Spanish regions. Specifically, it develops a study of the determinants of FDI using regional and sectoral data over the period 1997-2013, and two sub-periods (pre-crisis and crisis). The study also provides evidence on the main determinants of FDI flows coming from Europe and America.

As its starting point, the paper reviews the main theoretical models trying to explain FDI location. Then, it delves into an examination of empirical studies on inward FDI determinants devoted to the Spanish case. According to this review, market size, human capital, labor conditions and infrastructure endowments are the main drivers for FDI in Spain¹³.

The next section of the paper offers an overview of the distribution of inward FDI flows. It can be noted that the evolution of inward FDI over GDP has been very volatile over the sample period. Additionally, it has been shown that Madrid concentrates the bulk of the foreign investment received in Spain. In fact, the *Performance Index* indicates that Madrid gets a much greater share of Spanish FDI than that of GDP. Finally, the sectoral breakdown shows that industry and services sectors concentrate, on average, 95% of total FDI, although with a huge regional dispersion.

The central part of the paper is devoted to exploring the main drivers of FDI over the 1997-2013 period. To do so, an FDI model is specified based on the theoretical and empirical literature on the topic. Then, the FDI equation is firstly estimated by GMM and then by GLS. The results show that the main determinants of the FDI location patterns in the Spanish regions are market size, human capital in interaction with wages, and the own characteristics of Madrid. These results are, as a general rule, maintained for the FDI coming from Europe and America, but for the interaction variable.

Regarding the two sub-periods of the sample the most relevant traits are the increase in the intensity of the effects of market size, interaction variable and the dummy for Madrid during the crisis.

¹³ These results are in line with those obtained by most empirical studies for other countries.

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