*The determinants of inward foreign direct investment: Evidence from the European regions**

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Abstract

The aim of this paper is to study the determinants of FDI in the 260 EU NUTS2 regions between 2000 and 2006. After reviewing the relevant literature and the major traits of the FDI regional distribution in the EU, we analyse its drivers. First, we specify the model and perform a factor analysis to reduce the vast number of potential determinants to a manageable size. Afterwards, we estimate a reduced version of the model with the extracted factors as independent variables. We find that *economic potential*, *labour market characteristics*, *technological progress* and *competitiveness* exert a significant impact on FDI location patterns; in contrast, *market size* and *labour regulation* do not seem to play any noteworthy role. Finally, we perform some robustness tests to make sure the results are not sensitive to outliers, spatial dependence, size of regions, endogeneity and the consideration of just the top 50 FDI recipient regions.

Keywords: Foreign direct investment; factor analysis; European regions.

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1. Introduction

In recent decades, and particularly since mid-1990s, one of the most striking developments in the global economy has been the remarkable growth of foreign direct investment (FDI).[1] As a result, FDI has become a key component of the economic strategies put forward by most developed and developing countries. Although there may be various reasons behind such behaviour, this is most likely related to the fact that FDI is generally considered to be a major factor in enhancing economic growth (e.g., Lim, 2001; Caves, 2007; Dunning and Lundan, 2008; Franco, 2013).

Europe, and more specifically the European Union (EU), has traditionally been one of the main recipients of FDI, particularly since the launching of the single market program, the introduction of the euro, and the last two enlargements. Therefore, the study of FDI in the EU is, especially from a policy-oriented point of view, of paramount interest. Numerous papers have analysed this issue (for a review, see, among others, Barba and Venables, 2004), but most have been performed either at a national level or for sets of regions of just a single EU country. This national focus (or, at best, narrow regional focus) is mostly due to a lack of homogeneous statistical information on FDI for all the EU regions.

Because of these data problems, several authors and institutions have attempted to circumvent them by producing their own statistics, among which the well-known

[1] According to OECD data, FDI inflows in the world increased more than eight-fold between 1990 and 2011, from $203,772 to $1,660,558 million.

FDIRegio and Elios databases. Although very interesting, these two databases —both of which offer directly observed regional data— suffer from a critical drawback: they provide regional information just about the number of foreign firms with affiliates in EU countries, but they fail to offer any information on the actual amounts of money invested by these companies.[2] For this reason, this paper makes use of a different, novel FDI regional database built, from national data, with the spatial Chow-Lin data interpolation method (Polasek and Sellner, 2010; and Polasek et al., 2010).[3] Although this database has also some limitations —e.g., it does not include any sectoral breakdown or the country of FDI origin—, in our opinion it is superior to the FDIRegio and Elios databases because it does offer information about the total amount of FDI in the EU regions.

Bearing all these considerations in mind, this paper attempts to contribute to the literature on inward FDI determinants in four different and simultaneous aspects. First, it uses data on all EU regions, as in this way the results obtained are more general than

[2] The FDIRegio database is obtained from the Amadeus database compiled by the Bureau Van Dijk. For each company, this database provides information about the year of incorporation, country/region of origin and destination, ownership structure, and sector of activity, among other data. The Elios (European Linkages and Ownership Structure) database, built at the University of Urbino (Italy), collects information from Dun & Brasdstreet's *Who owns whom* for the five largest European countries. For each firm, the database supplies the name/country of the ultimate owner, sector of activity, location, and year of establishment.

[3] As indicated by Polasek and Sellner (2011, p. 25) "the spatial Chow-Lin procedure uses the relationship between a dependent variable that is only measured at a more aggregate regional level (…) and independent variables that are measured at a more disaggregate regional level (…) to predict the dependent variable at the disaggregate regional level".

those coming from samples made up of just a specific group of regions; our sample comprises 260 NUTS2 regions and, for reasons of data availability, goes from 2000 to 2006.[4] Second, it uses data on the real amount of FDI received by each region rather than on the number of affiliates of foreign firms; this is one of the main drawbacks of previous papers on this topic. Third, an additional contribution of the paper rests on the way of selecting potential FDI determinants; in contrast to the more usual, ad hoc selection of variables, it employs exploratory factor analysis because this is an advisable statistical tool to simplify econometric analysis when the number of potentially explanatory variables in a model is, as in this case, very large; the results obtained are supported by appropriate theories well established in the literature. Fourth, we provide an extensive robustness checking, including results obtained after controlling for spatial dependence, the presence of outliers, endogeneity, and so on; this is an additional point of the paper because, apart from reinforcing its main results, allows us to gain additional insights.

The rest of the paper is organised as follows. In Section 2 we briefly review the theoretical literature on the main inward FDI determinants, and offer a survey of empirical studies for the EU regions. Then, to offer some insights about the specifics of our case study, Section 3 outlines the pattern of the regional distribution of inward FDI

[4] NUTS stands for Nomenclature of Units for Territorial Statistics. In this paper, we use the NUTS2 definition from 2003, such that Denmark is considered as one region. Although we are well aware that this administrative delimitation of regions could mask some key aspects of the EU economic reality, we have adopted it because it is officially used by the EU and, in addition, it is the only one for which homogeneous data on potential FDI determinants exist. For further reference on this issue, see Maza and Villaverde (2011).

in the EU. In Section 4, which constitutes the central part of the paper, we pursue four tasks: we specify the model to be estimated; we perform a factor analysis to reduce the huge number of potential FDI determinants reported by the literature to a manageable size; we estimate the model and discuss its results; and we carry out a set of robustness checks addressing five main issues: a) potential outliers; b) spatial dependence; c) different size of regions, d) endogeneity, and e) the consideration of only the top 50 FDI receiving regions. Section 5 presents the main conclusions.

2. FDI determinants: A review

2.1. *A brief theoretical survey on FDI determinants*

Because this is eminently an empirical paper, a complete summary of the FDI theory is clearly beyond its scope. In any case, it is convenient to note that, although the potential determinants of FDI have been studied extensively, no general theory has been accepted yet. As a short reference it is worthy of mention the existence of very good surveys on the issue, among which those of Blonigen (2005) and Faeth (2009) are some of the most relevant.

Drawing on Faeth's (2009) paper, the first attempts to explain FDI were proposed in the context of neoclassical trade models by MacDougall (1960) and Kemp (1964). In a nutshell, the explanation offered by these authors lies in the differences in return to capital in favour of FDI. According to Kindleberger (1969), however, FDI cannot exist in a world of perfect competition. Following on this reasoning, Hymer (1976)

developed a theory of market imperfection that explains FDI by ownership advantages in the form, for instance, of product differentiation, internal or external economies of scale, and government incentives. Caves (1971) and Knickerbocker (1973) employed a similar approach, with the former focusing on product differentiation and the latter on oligopoly rivalry. Considering the issue of firm rivalry, Vernon (1966) developed his theory of the product life cycle, according to which there is a cost-based rationale for firms changing from exporting to foreign-based production (FDI) because the products they manufacture move from one to another of the three (new, mature, standardised) stages of their life cycle. Internalisation theory (Buckley and Casson, 1976) explains FDI as an application to multinational enterprises (MNEs) of the idea of internalising transactions in response to market failures.

The aforementioned approaches were, to a certain extent, summarised and made consistent in the so-called OLI eclectic paradigm developed by Dunning (1977, 1979). According to Dunning, FDI can be explained "by identifying three types of special advantages that MNEs possess: ownership (O), location (L) and internalization (I) advantages" (Faeth, 2009, p. 171). Because we are interested in explaining the geographical distribution of inward FDI in the EU regions, here the advantages of location are of paramount importance.[5] These location advantages are usually divided into three types: economic, political, and sociocultural advantages. Table 1, taken from UNCTAD (1999), includes what we consider to be the best synthesis of the location advantages (host country determinants of FDI). Focusing our comments on the

[5] The other two advantages (ownership and internalisation) are firm-specific and considered as exogenous variables from the perspective of the host country.

economic determinants, it can be observed that they can be broken down into three groups: market-seeking, resource/asset-seeking, and efficiency-seeking determinants.

(Table 1 around here)

In addition to these approaches, the new theory of international trade and the so-called institutional approach also provide explanations for FDI. Building on the OLI paradigm, in the new theory of international trade FDI is linked to variables such as market size, barriers to entry, transport costs, and factor endowments. In the institutional approach "FDI can be seen as a game with two players, MNE and host government, or a contest between two or more host countries competing for FDI" (Faeth, 2009, p. 183). Variables such as financial incentives, fiscal incentives, and other economic incentives play a crucial role in explaining FDI in this approach.

2.2. *A brief empirical survey on FDI determinants in the EU regions*

Although the theoretical literature on FDI determinants is very rich, the empirical one about the EU regions is relatively scarce. Even so, it is possible to distinguish among three types of studies: those of regions in a single EU country, of regions within a group of EU countries, and of regions in all EU countries.

The first group is the most densely populated but, nevertheless, not very abundant.[6] Generally speaking, these studies (in particular the papers by Fallon and Cook, 2010, on UK regions, and Villaverde and Maza, 2012, on Spanish regions) provide evidence that market-seeking, resource/asset-seeking, and efficiency-seeking factors do emerge as the main determinants of FDI. It is important to stress, however, that the relative influence of these factors to attract FDI differs notably among the papers belonging to this group.

In view of the scope of this paper, we are mostly interested in the second and third types of studies, which, as mentioned in the Introduction, only employ information on the number of foreign firms establishing affiliates in the European regions. There are not many papers devoted to the analysis of FDI for regions belonging to a group of a few countries, among which those by Basile et al. (2008, 2009) offer, in our opinion, the most interesting insights. Both papers employ similar estimation techniques (a mixed logit model and a nested logit model, respectively) and achieve similar findings. They conclude that factors such as market size and market potential, agglomeration, labour conditions, R+D investment play, among others, an important role in attracting FDI. Additionally, these papers also draw two important conclusions from the point of view of our analysis in Section 4. The first paper concludes that "regions within countries that were eligible for the CF *(Cohesion Fund)* are significantly more attractive than other regions" (Basile et al., 2008, p. 336), in particular for European MNEs. The second paper (Basile et al., 2009) suggests that, as the EU is perceived to be a rather well-

[6] Main references are Crozet et al. (2004), Fazekas (2005), Pelegrin and Bolancé (2008), Chidlow et al. (2009), Majocchi and Presutti (2009), Papalia and Bertarelli (2009), Pazienza and Vecchione (2009), Cook (2010), Fallon and Cook (2010), Castiglione et al. (2012), Villaverde and Maza (2012) and Wren and Jones (2012).

integrated area, country boundaries do not matter too much for the location choice of MNEs, especially, once again, European MNEs.

The third group of studies, considering the regions of all EU countries, is even more sparsely populated than the previous ones. This last group includes, to the best of our knowledge, only two papers (Casi and Resmini, 2010; and Capello et al., 2011). The first one, starting with standard OLS techniques and then controlling for spatial dependence, estimates various specifications of the FDI equation including as FDI determinants those traditionally suggested by the literature (e.g. market potential, GDP growth, labour costs, human capital, agglomeration, among others). Once again, and mainly with relation to European MNEs, the conclusions obtained are basically in line with the theoretical predictions in that the aforementioned variables do emerge as key drivers of FDI regional location. Another important conclusion is that location patterns somewhat differ between European and non-European MNEs. In particular, location patterns of European MNEs are affected by spatial autocorrelation —this fact suggesting that the proximity to FDI receiving regions is also important in explaining them—, whereas this is not the case for non-European MNEs.

The Capello et al. (2011) paper follows roughly the same pattern as Casi and Resmini (2010) in that it considers a set of conventional FDI determinants (market potential labour costs, industrial mix, human capital, among others), but it adds different forms of spatial heterogeneity. Among its conclusions, the most relevant is that agglomeration and human capital are key factors in explaining FDI location, whereas, contrary to what theory predicts, labour costs are non-significant and market access is only marginally

significant. Finally, an important outcome in both papers is that the capacity of a region to attract FDI varies, sometimes markedly, with sector specificities. The paper finds specifically that location externalities arise in (low-tech) manufacturing and service sectors.

3. EU inward FDI flows: A regional perspective

As the starting point for our empirical analysis, this section furnishes an overview of the regional distribution of inward FDI flows in the EU for the period 2000-2006, using the database provided by Polasek and Sellner. This database provides information about the amount of inward FDI stocks at a regional level in current million euros. In this paper, FDI flows are computed as the difference between consecutive inward FDI stocks, and the data are transformed from nominal into real terms (considering 2000 as the base year) by using national deflators.

The EU is one of the largest recipients of FDI in the world. According to the *European Union foreign direct investment Yearbook 2008* (EUROSTAT, 2008), the share of EU FDI inflows (excluding intra-EU flows) in worldwide FDI flows was around 20% in 2006. In contrast, the USA presented a share of 18%. If FDI flows between EU countries were also computed, the European share would be more than double.

From the point of view of the regional distribution of inward FDI in the EU, Table 2 offers information about the average levels over the whole period. For the sake of simplicity, due to the large number of regions in the sample, the table only shows the

top 10 and bottom 10 regions. As can be observed, the position of Île de France clearly stands out. This region receives 35.5 billion euros annually, well above three times more than the second region in the ranking (Brussels). All of the regions in the top 10 belong to the EU15. Conversely, 9 out of the 10 regions with the worse performance are Greek regions.

Table 2 yields the impression that inward FDI is highly concentrated from a regional perspective. To present this result in a more precise manner, Table 3 reports the levels of inward FDI regional concentration. For the whole period, more than 30% of the total inward FDI is located in just 10 regions. Additionally, it is shown that the top 30 regions concentrate 52% of the total inward FDI, whereas the top 50 regions concentrate more than 64%. Regarding yearly data the most remarkable fact is the increase in concentration that took place in 2002 due to disinvestment.[7]

(Table 2 around here)

(Table 3 around here)

Although informative, these concentration ratios fail to offer any relevant clue about the relative FDI performance and attractiveness of the regions. To address this issue, UNCTAD (2001) proposed the use of two indicators: the FDI Performance Index and the FDI Potential Index. The Performance Index compares the shares of inward FDI to

[7] As a referee pointed out and in line with Park (2000), a conjecture to explain not only the results for 2002 but also the general evolution of FDI is that it tends to be located in areas with low wages and, once their attractiveness dissipates as wage inflation occurs, FDI moves to high wage areas. However, this is not our case as most of the disinvestment occurred in UK regions.

GDP,[8] whereas the Potential Index attempts to grasp the region's attractiveness to foreign investors by using more scaling variables than just the GDP. Specifically, in the computation of the Potential Index we employ the following scaling variables: per capita GDP, R&D expenditures as percentage of GDP, exports plus imports as percentage of GDP, and the percentage of employment in high technology sectors. Information about these two indices for the average of the sample period is reported in the first two columns of Table A.1 (in the Appendix).

For the sake of simplicity and following UNCTAD's recommendation in its *World Investment Report, 2002*, we consider "useful to compare the rankings based on the two indices as a rough guide to whether countries are performing adequately given their (restricted set of) structural assets" (UNCTAD, 2002, p. 29). The combination of the two inward FDI indices yields a 2*2 matrix, according to which host regions may be considered as *front-runners* (high potential and high performance), *above-potential economies* (low potential and high performance), *below-potential economies* (high potential and low performance), or *under-performers* (low potential and low performance).[9]

The results of this grouping are disclosed in the third column of Table A.1 (in the Appendix) and graphically presented in Map 1. As can be observed 49 *front-runner* regions arise, most of which are located in Belgium, the Netherlands, Sweden, and the

[8] In the literature, it is also very common to use the FDI/Population ratio along with the FDI/GDP ratio. However, because the coefficient of correlation between these two ratios is rather high (more than 0.8), in this paper we just employ the FDI/GDP ratio.

[9] The dividing value is always the (population) weighted average of each index.

UK. A similarly sized group of *above-potential* regions (46) exists, highlighting the presence of a high number of Spanish and Polish regions; in other words, for this regions it should be expected a decrease of FDI inflows in the near future. The *below-potential* label may be assigned to 64 regions, including German (20), French (6), and British (10) regions; these regions might receive additional FDI inflows in the future if MNEs eventually discover their opportunities and exploit them. Finally, the remaining 101 regions form the group of *under-performers*, a group with a remarkable number of regions belonging to the new EU Member States, but also regions in Germany (16), Spain (10), France (11), Italy (17), and the UK (11). Not surprisingly, most of the Greek regions also belong to this group.

(Map 1 around here)

The analysis conducted to this point has overlooked an important issue. It has not paid any attention to the likely existence of spatial dependence in the regional distribution of FDI. In other words, it has not considered the role potentially played by the geographic situation of each region. Consistent with assumptions and predictions based on open-economy endogenous growth models (see, for example, the books by Grossman and Helpman, 1992; and Barro and Sala-i-Martin, 2003) and new economic geographic theory (see the survey by Ottaviano and Puga, 1998), it seems logical that a certain spatial dependence exists —i.e., we may expect regions with higher (lower) FDI inflows to be geographically closer to (further from) each other. To address this important issue, we develop an exploratory spatial analysis by computing the so-called Moran's I

statistic that measures the spatial dependence across our geographical entities. This statistic is defined as follows (Anselin, 1988):

$$I = \frac{n}{\sum_i \sum_j w_{ij}} \frac{\sum_i \sum_j w_{ij} \left[fdi_i - \mu \right] \left[fdi_j - \mu \right]}{\sum_i \left[fdi_i - \mu \right]^2} \qquad (1)$$

where fdi_i and fdi_j are, in this case, FDI/GDP ratios of regions *i* and *j*; μ is the European average; w_{ij} is an element of the distance matrix W between each pair of regions; $\sum_i \sum_j w_{ij}$ is a standardisation factor that corresponds to the sum of all the weights; and *n* is the number of regions. In order to facilitate the interpretation of the statistic, the standardised value (*z*-value) is obtained. Accordingly, a significant positive (negative) value for the Moran's I statistic will imply positive (negative) spatial association. The results obtained, using the inverse of the standardised distance as a distance matrix, confirm the existence of a positive spatial autocorrelation in all of the sample years (except 2003) and the whole period (Table 4). Although the table also reveals that the degree of spatial dependence varies over time, the results clearly prove that the European regions tend to be concentrated around rather similar levels of inward FDI/GDP ratios.

(Table 4 around here)

4. Inward FDI determinants in the EU regions: An empirical analysis

Due to the scarcity of literature about the determinants of inward FDI flows among EU regions, this section attempts to add to it by simultaneously focussing on the three points mentioned in the Introduction: the consideration of all EU regions, the use of data on the real amount on FDI received by each region; and the use of factor analysis as a data reduction tool to organise the large number of potential FDI drivers into useful and uncorrelated aggregates. To accomplish this aim we operate in four stages. First, we specify our baseline model and discuss data. Second, we develop an exploratory factor analysis. Third, we estimate the model and discuss the results. Fourth, we verify the robustness of the results.

4.1. *The model and data*

In order to assess the main determinants of inward FDI in the EU at regional level, here we specify our baseline model, in which the endogenous variable (fdi_i) is defined, as previously mentioned, as the FDI/GDP ratio for region *i*. With regard to the explanatory variables, we draw on the large number of them proposed in the theoretical and empirical literature, basically those related to the economic characteristics of our sample of regions.

In any case, regarding model specification it is necessary to point out some data problems crucially affecting it. First, that inward FDI flows change significantly between years, due mainly to large fluctuations in mergers and acquisitions; second, that there are many missing observations on some potential determinants of inward FDI. Therefore, hereafter we decide to only pay attention to the whole period 2000-2006 and,

consequently, take average values both for inward FDI flows and for all of the variables that theoretically are behind them. [10]

The existence of omitted data points for certain regions is not, however, the worst situation, because data on some potential FDI drivers are totally unavailable for some regions over the whole sample period. In this case we proceed as follows: if there are no data for a large number of regions (more than 5% of the 260 regions in the sample), we completely remove these variables from our analysis; if data are unavailable for less than 5% of the regions, we do the following:

1. If NUTS1 data are available, we assign them to NUTS2 regions.
2. If NUTS1 data are unavailable but country data are available, we assign them to NUTS2 regions.
3. If neither NUTS1 nor country data are available, we proceed in three steps. First, we identify regions with a similar per capita GDP; second, for these regions, we calculate the corresponding "*variable*/GDP" average ratio; third, we assign to the region for which we have no data a value equal to the product of its GDP times the aforementioned ratio.

All in all, our final dataset of FDI determinants consists of a total of 21 variables. Table 5 includes the definitions, acronyms, units of measurement, data sources and available years for all of them. Table 6 reports summary statistics for each variable. Consequently, our baseline regression model is specified, for each region *i,* as follows:

[10] For variables with omitted data points, we compute mean values for just the available data

$$fdi_i = \alpha + \sum_{k=1}^{21} \beta_k Z_{ki} + \varepsilon_i \qquad (2)$$

where Z_{ki} represents the *k*-th explanatory variable in region *i*.

(Table 5 around here)

(Table 6 around here)

4.2. *Factor analysis*

As it is well known, working with such a large number of inward FDI drivers (21) would be difficult and could cause several problems in the regression analysis due to the presence of multicollinearity among them. To overcome this problem, we carry out a standard exploratory factor analysis, using the approach described by Nardo et al. (2005).[11]

[11] Although we are well aware of the limitations of factor analysis (it somewhat obscures the true determinants of inward FDI), it is very convenient for reducing multicollinearity between explanatory variables. A pioneering study employing factor analysis to the study of FDI determinants is Ajami and Ricks (1981). Recently a few papers have also applied this methodology to the study of FDI, among which Boermans et al. (2011), Villaverde and Maza (2012) and Bartels et al. (2013) stand out.

By applying this approach and Kaiser's criterion for factor extraction,[12] we identify six factors with eigenvalues greater than 1 (Table 7), which explain 81.0% of the cumulative variance of the 21 original variables. The composition of these six factors is reported in Table 8. The first factor (F_1) includes labour productivity, per capita GDP, wages, air and multimodal accessibility, and market potential, thus we tentatively label it as *economic potential*. The second factor (F_2), named *market size*, comprises GDP, population, and investment variables. The third factor (F_3), local *labour market characteristics*, includes the employment rate, activity rate, inverse of unemployment rate, and inverse of long-term unemployment rate. The fourth factor (F_4), *technological progress*, contains four indicators: R&D investment, R&D personnel, high technology sector, and human capital. The fifth factor (F_5), *labour regulation*, encompasses labour market regulation and the inverse of labour law rigidity and tax wedge measured at national level. Finally, the sixth factor (F_6), which we dub as competitiveness, combines openness degree (exports+imports over GDP) and manufacturing share.

(Table 7 around here)

(Table 8 around here)

Apart from the empirical rationale, the theoretical rationale for the composition of each one these factors should be obvious, as all of them are, directly or indirectly, well-grounded on the FDI determinants theory summarised in Section 2.1, as well as on the theories of economic growth and the new economic geography (NEG). Perhaps the

[12] The Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test of sphericity indicate that our sample is adequate to conduct an exploratory factor analysis. The results are available upon request.

most debatable issue revolves around the inclusion of air and multimodal accessibility (MULA) and market access in F1. As is well known, MULA is an indicator of transport infrastructure and, as the economic theory explains, infrastructure is a key ingredient for the promotion of growth.[13] In the same vein, NEG models (for a good survey see Redding, 2011) support positive correlation between GDP per capita, productivity and wages on one side, and MULA and market access on the other. In fact, the so-called wage equation of the NEG predicts that regional income is a positive function of the regional access to the main international markets.[14]

After having extracted these factors and to use them in our regression analysis, it is required to create scores to represent each region's placement on each factor. There are several approaches to compute factor scores (DiStefano et al., 2009) and in this paper, for the sake of robustness, we employ two alternative ones: the so-called 'sum scores' and 'regression scores' approaches.

4.3. *Estimation of the model*

This subsection appraises the main determinants of inward FDI in the EU at regional level. To do that we adopt the baseline model but, due to the econometric problems

[13] This idea has been empirically implemented by the EU in its Territorial Agenda (2007, p. 6), in which is stated that "mobility and accessibility are key prerequisites for economic development of all regions of the EU".

[14] A recurring concept in the literature discussing this topic is the term 'curse of distance', defined as the tendency of peripheral regions to have lower income and wages because of being far from the main markets (for a recent empirical work on this issue see López-Rodríguez et al., 2011).

mentioned above, we take advantage of the factor analysis in order to estimate a reduced version of it. To be precise, we modify equation (2) by considering the previously extracted factors (in both the 'sum scores' and 'regression scores' approaches) as independent variables plus, according to Basile et al. (2008), an additional dummy variable capturing regions belonging to a country eligible for the Cohesion Fund (*CF*).[15] Therefore, we estimate the following reduced cross-section equation:

$$fdi_i = \alpha + \beta_1 F_{1i} + \beta_2 F_{2i} + \beta_3 F_{3i} + \beta_4 F_{4i} + \beta_5 F_{5i} + \beta_6 F_{6i} + \beta_7 CF_i + \varepsilon_i \qquad (3)$$

The estimation is initially run by standard (OLS) regression techniques. As can be observed (Table 9), the results obtained with 'sum scores' and 'regression scores' approaches are very similar. These results reveal that *fdi* is, as expected, positively and significantly correlated to the *economic potential*, *labour market characteristics*, *technological progress*, and *competitiveness* of the regions. The coefficient linked to *CF* is also positive and significant; hence being a region of a Cohesion country has to be considered as another attraction factor for FDI.

(Table 9 around here)

Although economic analysis suggests *market size* and *labour regulation* factors are also potential determinants of FDI, our findings indicate that their coefficients are

[15] We also included a dummy for the Objective 1 regions, but it turned out to be statistically non-significant.

statistically non-significant at conventional levels. A tentative explanation for the negligible impact of *market size* may be that the dimension of the local (i.e., regional) market in which the investment effectively occurs is of no great relevance, given the high degree of European integration. This explanation is consistent with Basile et al.'s finding that "European multinationals consider regions across different countries as relatively closer substitutes than regions within national borders" (Basile et al., 2009, p. 733). With reference to *labour regulation*, our results support the idea that MNEs do not pay any heed to regional labour market regulations but to the regional employment/unemployment situation (recall that *labour market characteristics* emerged as a relevant factor) when it comes to investing in the EU.

4.4. *Robustness checks*[16]

The aim of this subsection is to deal with the issue of robustness. We consider this analysis to be very pertinent in all empirical studies and especially when, as in this case, the explanatory power of the model is relatively weak (low R-square). In particular we perform five independent robustness checks: first, to assess whether previous results are conditioned by the presence of outliers; second, to consider the existence and influence of spatial dependence; third, to evaluate the potential impact of the different size of the regions included in the sample; fourth, to evaluate the problem of endogeneity bias, and fifth, to discern whether the results are confirmed when the number of regions in the

[16] Because of their similarity, in this subsection we only report the results for the estimation with 'regression scores'. The results with 'sum scores' are available upon request.

sample is much lower than the initial one and only includes those receiving the most FDI flows.

4.4.1. Presence of outliers

Up to now the regression analysis has considered the full sample of 260 regions. However, there seem to be several outliers especially located at the upper tail of the *fdi* distribution (see Figure 1). Because the presence of these outliers could affect the regression results, we re-estimate Equation (3) by means of two alternative methods: first, by removing outliers from the sample,[17] and second by applying quantile (mean) regression techniques. The first two columns of Table 10 report the results. As observed, in both cases they are roughly the same as before, therefore we are able to assert that the presence of outliers does not significantly affect our findings. Consequently, it seems that the initial results are robust.

(Table 10 around here)

4.4.2. Spatial dependence

Another important point is that, as mentioned, we have carried out the estimation of Equation (3) by using standard OLS econometric techniques. At the end of Section 3,

[17] As it is usual, to identify outliers we proceed as follows (see the seminal papers by Tukey, 1977; and Frigge et al., 1989): denoting by Q the quartiles of the distribution, the outliers refer to those regions with an *fdi* value below Q1 – 1.5*(Q3-Q1) and above Q3 + 1.5*(Q3-Q1). As a result of using these two expressions we identify 21 outliers, representing 8% of the initial sample.

however, we made a passing reference to the presence of some spatial dependence across European regions in terms of FDI inflows. Accordingly, it seems that a spatial analysis is pertinent to gain a more precise understanding of the regional situation of inward FDI in the EU. In other words, it appears that the location patterns of MNEs may be influenced by the spatial distribution of inward FDI. There is indeed no doubt in the literature about the fact that factors determining FDI may well span beyond regional boundaries. Considering this, it is necessary to revise the regression analysis to eschew potential inconsistencies and inefficiencies in the results of the estimated equation (Anselin, 1988; Anselin and Bera, 1998). With this aim, we conduct a series of Lagrange multipliers (LM) tests based on the principle of maximum likelihood.[18] Specifically, the LM-ERR test, along with the associated robust LM-EL test, check for the absence of residual spatial autocorrelation, which would be caused by not including a structure of spatial dependence in the error term. The LM-LAG test, along with the associated robust LM-LE test, check for the absence of substantive spatial autocorrelation, which would be caused by the presence of spatial autocorrelation in the endogenous variable.

We apply these tests to Equation (3). Table 11 reveals that the result for the LM-LAG test (41.6) is greater than that of the LM-ERR test (31.5). Therefore, it seems that we should re-estimate the model by including the spatial lag of the dependent variable as an additional explanatory variable. This conclusion is confirmed if we look at the

[18] Tests that require the normality assumption in the residuals to be satisfied. In this respect, the results obtained from the Bera-Jarque test are satisfactory.

associated robust test results; LM-LE remains significant at 1%, whereas LM-EL loses all significance.

(Table 11 around here)

These results indicate that we should correct the substantive spatial dependence in our model. Therefore, we adjust it to also include as exogenous variable a spatial lag of regional inward *fdi* (W_fdi_i), being W the same distance matrix —with elements $w_{i,j}$ reflecting the intensity of the interdependence between regions i and j— employed to compute the Moran's I statistic. This new variable intends to capture the relationship between the FDI flows towards a region and those of its neighbours.

The third column of Table 10 displays the results obtained when Equation (3) includes the spatial lag and is estimated by maximum likelihood.[19] Three points should be highlighted. First, all of the goodness of fit measures that are comparable between the reduced model (Table 9) and the new spatial model, such as the logarithm of maximum likelihood (LIK), Akaike's Information Criterion (AIC), and Schwartz's Criterion (SC),[20] demonstrate that the spatial model achieves a better fit. Second, with respect to the influence of the extracted factors, the results are equivalent to those previously obtained, which confirms their robustness. Finally, the coefficient linked to the spatial

[19] Spatial dependence invalidates the traditional OLS estimation method. It is also important to point out that, according to our tests, there are no problems of heteroskedasticity in this model.

[20] R^2 is not an appropriate measure to compare them because it does not have the same meaning in the two cases due to the inclusion of spatial lag variables.

lag of regional inward *fdi* is positive and statistically significant, confirming the results of the earlier spatial dependence tests, i.e., that the behaviour of each region is closely related to the behaviour of its neighbouring regions. To a certain extent, this result could be considered, as literature suggests, as a sign that agglomeration is an important factor in determining inward FDI.

4.4.3. Weighted regression model

We also want to ensure whether the rather different size of the regions considered in our analysis could be affecting the results obtained. To accomplish this aim we have re-estimated Equation (3) by WLS, using employment data as weights.[21] By doing this, we intend to reduce the degree of heterogeneity across regions.

The results displayed in the fourth column of Table 10, apart from reinforcing previous findings, reveal that the main difference with those obtained for the reduced model lies precisely on the coefficient linked to the *market size* factor. Now, it proves to be positive and statistically significant, this revealing that the initial estimation could be somewhat masking the influence of *market size* as another important factor to attract FDI.

4.4.4. Endogeneity

[21] Although population data are usually employed as weights, in this case we have opted for using employment data. This change tries to minimise the bias resulting from using population both as the weight in the WLS estimation and as one of the variables included in the *market size* factor.

Another important aspect of the model is that related to the potential existence of endogeneity. To carry out this robustness check it is important to recall that, because of the use of factor analysis, it is really difficult to find a good instrument for the factors included in the regressions, as they are made up of several variables. For this reason, we have taken the decision to proceed as follows. First, and due to the high volatility of FDI data, we have used the well-known HP filter for estimating trends of *fdi* regional data; that is, our dependent variable is the trend in *fdi*. Second, coping with problems regarding data availability we have obtained data for the six factors for every year of the period 2000-2006. Third, we have run a two-stage least square regression using one-period lagged factors as instruments.

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The fifth column of Table 10 confirms the role played by *economic potential*, *labour market characteristics*, *technological progress*, and *competitiveness* as FDI attraction factors. There are just two differences with previous results: first, that the *labour regulation* coefficient becomes positive and statistically significant; second, a remarkable increase in the influence of *competitiveness*.

4.4.5. Top 50 FDI receiving regions

Finally, taking into account that the top 50 FDI receiving regions concentrate more than 60% of total FDI inflows, we also want to discern whether the results obtained in Table 9 are still valid when only these regions are included in the sample. As the last column of Table 10 makes evident, the main difference is that the factor called *labour market*

characteristics now becomes non-significant, that is, the influence of this factor vanishes. In any case, factors such as *economic potential*, *technological progress* and *competitiveness* continue playing a remarkable role in explaining FDI location patterns.

5. Conclusions and policy implications

As the EU is one of the main recipients of FDI in the world, this paper has examined its determinants at regional level over the period 2000-2006. The paper departs from previous analysis in four key aspects: first, it considers all EU regions rather than regions belonging just to a single country or a reduced number of them; second, it uses a database that provides information on the actual amount of regional inward FDI, whereas the small number of papers studying regional FDI in more than one EU country only employ information on the number of foreign firms established in them; third, it applies factor analysis to empirically select potential FDI drivers in a compact way; and fourth, it performs a large number of robustness tests that, leaving the main results of the paper essentially unchanged, also allows us to qualify them.

After reviewing the theoretical literature and offering an empirical survey for the EU regions, the paper analyses the FDI regional distribution as a previous step to examine its determinants. We obtain three interesting results. First, FDI shows a high degree of concentration; on average, 64% of inward FDI is located in only 50 regions. Second, according to the FDI typology proposed by UNCTAD, 49 regions can be labelled as *front-runners* and 101 as *under-performers*; similarly, 46 regions exhibit *above-*

potential and 64 exhibit *below-potential* performances. Third, EU regions are geographically concentrated around similar levels of inward FDI.

The second and main part of the paper, devoted to the study of FDI drivers, proceeds in four steps. We first specify the FDI model based on the theoretical and empirical literature on the topic. Then, we perform an exploratory factor analysis to reduce the large number of variables potentially affecting FDI to a manageable one. At this point, the best result obtained is made up of six factors, labelled as *economic potential, market size, labour market characteristics*, *technological progress*, *labour regulation*, and *competitiveness*. Afterwards, we estimate a reduced FDI equation in which we take, as independent variables, the six extracted factors, plus a dummy variable capturing regions located in cohesion countries (CF). In particular, we find that the main determinants of the location patterns of FDI in the EU regions are their *economic potential*, *labour market characteristics, technological progress* and *competitiveness*; in contrast, *market size* and *labour regulation* do not seem to exert any significant impact on these location patterns.

Finally, we carry out a robustness check of the results. The conclusions are very similar when controlling for outliers, spatial dependence, region's size, endogeneity and the top FDI receiving regions, which proves their robustness. In addition, this analysis conveys three important messages. First, inward FDI performance of a region is largely linked to that of its neighbours, this suggesting that a somewhat vague interpretation of agglomeration could also be regarded as an important factor in explaining FDI location. Second, *market size* could also be a factor attracting FDI, as we pointed out when taking

into account region's size. Third, *labour market characteristics* factor becomes non-significant when we only include the top 50 regions of the sample, while *labour regulation* becomes significant when we deal with endogeneity.

Some general policy implications can be drawn from this analysis. First and above all, it seems clear that regions trying to attract more FDI should implement policies fostering what we have dubbed as their *economic potential* and *competitiveness*, and specifically the variables behind them. Additionally, measures trying to improve *labour market characteristics* and *technological progress* could be also pertinent because, although probably to a lesser extent, these factors also affect FDI location. In any case, bearing in mind the large number of regions in our sample and the huge economic differences among them, we also believe that regionally tailored policies would be the best option to remarkably increase FDI inflows. This really means that, although the European Commission and the various national governments can be helpful in this task, regional authorities should be directly involved in the design and implementation of policies focussed on the improvement of those specific economic factors in which their regions are relatively weak.

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Table 1. Host country/region determinants of FDI

Host country determinants
I. Policy framework for FDI
• Economic, political and social stability • Rules regarding entry and operations • Standards of treatment of foreign affiliates • Policies on functioning and structure of markets (especially competition and M&A policies) • International agreements on FDI • Privatization policy • Trade policy (tariffs and NTBs) and coherence of FDI and trade policies • Tax policy
II Economic determinants
III Business facilitation
• Investment promotion (including image-building and investment-generating activities and investment-facilitation services) • Investment incentives • Hassle costs (related to corruption, administrative efficiency, etc.) • Social amenities (bilingual schools, quality of life, etc.) • After-investment services

Type of FDI classified by motives of TNCs		**Principal economic determinants in host countries**
A	Market-seeking	• Market size and per capita income • Market growth • Access to regional and global markets • Country-specific consumer preferences • Structure of markets
B	Resource/asset-seeking	• Raw materials • Low-cost unskilled labour • Skilled labour • Technological, innovatory and other created assets (e.g. brand names), including as embodied in individuals, firms and clusters • Physical infrastructure (ports, roads, power, telecommunication)
C	Efficiency-seeking	• Cost of resources and assets listed under B, adjusted for productivity for labour resources • Other input costs, e.g. transport and communication costs to/from and within host economy and costs of other intermediate products • Membership of a regional integration agreement conductive to the establishment of regional corporate networks

Table 2. Inward FDI at regional level (average levels 2000-06)

	FDI		
	Code	**Region**	**Value**
Top 10	fr10	Île de France	35503
	be10	Bruxelles	11434
	se11	Stockholm	9504
	be21	Antwerpen	8311
	es30	Comunidad de Madrid	7232
	ukg3	West Midlands	6322
	dk00	DENMARK	6144
	be24	Prov. Vlaams Brabant	6138
	nl33	Zuid-Holland	5999
	uki1	Inner London	5902
Bottom 10	gr14	Thessalia	7
	itc2	Valle dAosta/Vallée dAoste	6
	gr12	Kentriki Makedonia	5
	gr41	Voreio Aigaio	2
	gr42	Notio Aigaio	2
	gr21	Ipeiros	1
	gr22	Ionia Nisia	-1
	gr13	Dytiki Makedonia	-18
	gr23	Dytiki Ellada	-19
	gr25	Peloponnisos	-62

Note: All figures are expressed in millions of euros of the year 2000.

Table 3. Inward FDI concentration at regional level

Period	Top 10	Top 30	Top 50
2000	33.5	59.9	74.8
2001	37.2	65.7	84.8
2002	163.5	222.8	250.7
2003	33.6	60.5	77.4
2004	57.5	82.8	95.6
2005	43.0	65.4	78.8
2006	32.1	55.0	68.3
2000-06	30.6	52.0	64.3

Note: The year 2002 is rather remarkable mostly because the significant disinvestment in some regions led to a huge increase in the FDI concentration of well over 100%. The concentration indices for the period 2000-06 are computed by adding FDI flows for all years.

Map 1. Regional classification by FDI Performance and Potential Indices

Note: 1. Front-runners; 2. Above-potential economies; 3. Below-potential economies; 4. Under-performers

Table 4. Moran's I statistic

Period	Moran's *I*	*z* value	*p* value
2000	0.079***	14.214	0.000
2001	0.086***	15.342	0.000
2002	0.049***	9.093	0.000
2003	-0.001	0.411	0.681
2004	0.048***	8.924	0.000
2005	0.097***	17.330	0.000
2006	0.045***	8.357	0.000
2000-06	0.060***	11.019	0.000

Note: (***) denotes significance at the 1% level.

Table 5. Regional explanatory variables

Code	Meaning	Definition (if necessary)	Units	Source	Years
OP	Openness Degree	Exports plus Imports over GDP	%	Polasek and Sellner	2000-2006
GDP	Gross Added Value		Constant mio euros 2000	Cambridge Econometrics	2000-2006
PO	Population		Thousands	Cambridge Econometrics	2000-2006
GDPpc	Per capita Gross Added Value	GDP over Population	Constant euros 2000	Cambridge Econometrics	2000-2006
LP	Labour Productivity	GDP over Total Employment	Constant euros 2000	Cambridge Econometrics	2000-2006
MSHARE	Manufacturing Share	Manufacturing Employment over Total Employment	%	Cambridge Econometrics	2000-2006
W	Compensation per Employee	Remuneration over Employment	Constant euros 2000	Cambridge Econometrics	2000-2006
URinv	(Inverse of) Unemployment Rate		%	Cambridge Econometrics	2000-2006
LTURinv	(Inverse of) Long-term Unemployment Rate		%	Eurostat	Selected years
ER	Employment Rate		%	Cambridge Econometrics	2000-2006
AR	Activity Rate		%	Cambridge Econometrics	2000-2006
INV	Investment		Constant meuros 2000	Cambridge Econometrics	2000-2006
TWinv	(Inverse of) Tax Wedge on Employment	Labour Taxes over Total Labour Costs	%	Eurostat	2000-2006
R&D	R&D Expenditure	R&D Expenditure over GDP	%	Eurostat	Selected years
R&DP	R&D Personnel	R&D Personnel over Active Population	%	Eurostat	Selected years
HTC	High Technology Sectors	High Technology Employment over Total Employment	%	Eurostat	Selected years
HC	Human Capital	Students at ISCED levels 5-6	%	Eurostat	Selected years
MULA	Air and Multimodal Accessibility	An index combining several modal accessibility indicators, such as road, air, inland waterways and rail. The higher the index, , the higher the accessibility	Synthetic index: EU=100	Espon	2001 and 2006
LLRinv	(Inverse of) Labour Law Rigidity	Average of indexes for alternative employment contracts, cost of increasing working hours, of firing workers and dismissal procedures. The lower the index, the higher the rigidity	Synthetic index (0-100)	World Bank / Doing Business	2004
LMR	Labour Market Regulation	An index giving high marks to countries allowing market forces to regulate wages and establish the conditions of dismissal, circumvent excessive unemployment benefits and refrain from the use of conscription	Synthetic index (0-10)	Fraser Institute / Economic Freedom of the World Annual Reports	2000 and 2005
MP	Market Potential	(See note)	Constant meuros 2000	Own elaboration based on Cambridge Econometrics	2000-2006

Note: Market potential for region *i* is calculated as follows:

$$MP_i = \sum_{i \neq j} w_{ij} * GDP_j$$

where w_{ij} are the elements of the distance matrix *W* between each pair of regions (*i*,*j*). Once again, we have used the inverse of the standardised distance as a distance matrix.

Table 6. Regional explanatory variables: Summary statistics

Code	Mean	Decile 1	Decile 9	Decile 9 / Decile 1	Coef. Variation
OP	69.67	38.10	118.94	3.12	0.55
GDP	36155	5088	78441	15.42	1.18
PO	1836	487	3678	7.55	0.80
GDPpc	19278	4376	30039	6.86	0.53
LP	42482	11792	60408	5.12	0.44
MSHARE	19.35	10.02	28.50	2.84	0.37
W	20747	5214	30566	5.86	0.48
URinv	0.1544	0.0601	0.2673	4.45	0.53
LTURinv	0.5377	0.1140	1.2303	10.79	1.01
ER	43.17	34.63	50.82	1.47	0.15
AR	47.18	40.38	53.51	1.33	0.12
INV	7185	1100	14478	13.16	1.16
TWinv	0.0260	0.0212	0.0342	1.61	0.21
R&D	1.38	0.25	3.14	12.38	0.89
R&DP	1.23	0.36	2.42	6.77	0.71
HTC	4.05	1.73	6.51	3.75	0.44
HC	14.58	8.53	22.53	2.64	0.42
MULA	93.84	46.88	141.24	3.01	0.38
LLRinv	0.0222	0.0149	0.0357	2.39	0.32
LMR	5.29	3.40	7.70	2.27	0.25
MP	37677	26973	44643	1.66	0.18

Table 7. Factor analysis. Total variance explained

Factor	Eigenvalue	% Variance	% Cumulative variance
1	**7.484**	**35.639**	**35.639**
2	**3.269**	**15.568**	**51.206**
3	**1.957**	**9.321**	**60.527**
4	**1.736**	**8.267**	**68.794**
5	**1.454**	**6.922**	**75.717**
6	**1.105**	**5.261**	**80.977**
7	0.799	3.806	84.784
8	0.741	3.531	88.314
9	0.546	2.601	90.915
10	0.517	2.462	93.377
11	0.352	1.678	95.054
12	0.296	1.412	96.466
13	0.260	1.236	97.702
14	0.134	0.639	98.341
15	0.115	0.550	98.891
16	0.092	0.438	99.329
17	0.063	0.300	99.629
18	0.035	0.165	99.793
19	0.017	0.080	99.874
20	0.016	0.076	99.949
21	0.011	0.051	100.000

Note: In bold factors with eigenvalue greater than 1.

Table 8. Factor analysis. Rotated component matrix

Variable	F1	F2	F3	F4	F5	F6	Communalities
OP	-0.042	-0.207	-0.093	0.051	0.068	**0.817**	0.729
GDP	0.346	**0.893**	0.103	0.157	-0.019	-0.076	0.959
PO	-0.071	**0.952**	-0.043	0.049	-0.053	-0.038	0.920
GDPpc	**0.835**	0.136	0.348	0.253	0.033	-0.124	0.917
LP	**0.931**	0.116	0.149	0.183	-0.025	-0.105	0.947
MSHARE	-0.126	0.043	0.184	-0.052	-0.100	**0.717**	0.579
W	**0.929**	0.120	0.168	0.189	0.008	-0.054	0.944
Urinv	0.393	-0.106	**0.667**	-0.048	0.338	0.085	0.734
LTURinv	0.376	-0.216	**0.577**	-0.066	0.392	-0.072	0.685
ER	0.230	0.126	**0.898**	0.196	0.128	0.068	0.934
AR	0.112	0.168	**0.873**	0.218	0.034	0.035	0.853
INV	0.301	**0.903**	0.085	0.142	-0.064	-0.079	0.943
TWinv	-0.119	-0.047	0.125	-0.071	**0.662**	-0.435	0.664
R&D	0.444	0.097	0.220	**0.664**	-0.048	0.200	0.738
R&DP	0.342	0.102	0.200	**0.855**	0.004	0.018	0.898
HTC	0.437	0.251	0.285	**0.537**	0.250	0.251	0.748
HC	-0.324	0.141	-0.093	**0.678**	-0.122	-0.330	0.717
MULA	**0.599**	0.347	0.216	0.314	0.024	0.306	0.719
LLRinv	0.345	-0.075	0.336	0.064	**0.708**	0.030	0.744
LMR	-0.030	-0.009	0.065	-0.020	**0.939**	0.113	0.901
MP	**0.805**	0.143	0.142	-0.123	0.158	-0.044	0.731

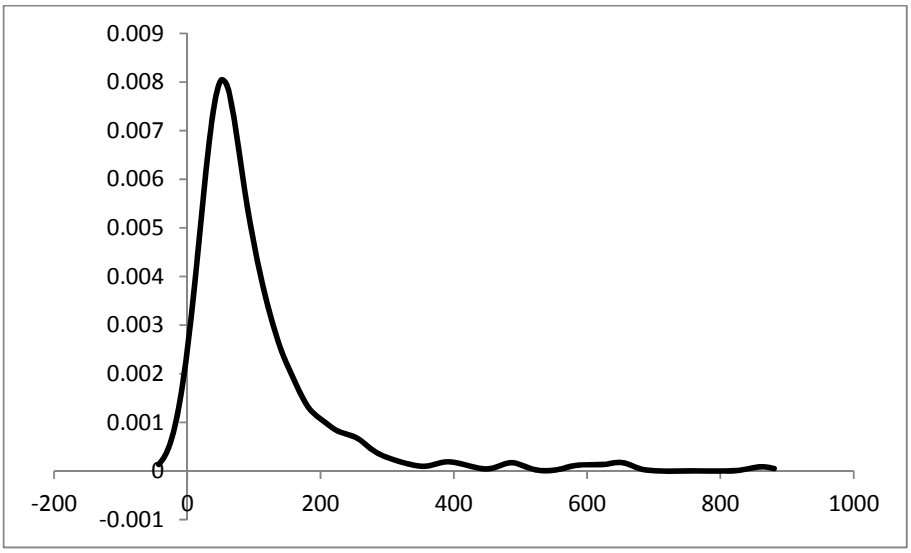
Note: In bold the factor in which each variable loads higher.

Table 9. FDI determinants. Reduced model

Exogenous variables	Sum scores	Regression scores
c	0.028*** (0.000)	0.023*** (0.000)
Economic potential (F1)	0.009*** (0.003)	0.018*** (0.000)
Market size (F2)	0.001 (0.723)	0.000 (0.843)
Labour market characteristics (F3)	0.006** (0.029)	0.006** (0.013)
Technological progress (F4)	0.008*** (0.002)	0.010*** (0.000)
Labour regulation (F5)	-0.001 (0.573)	0.002 (0.324)
Competitiveness (F6)	0.018*** (0.000)	0.011*** (0.000)
CF	0.016*** (0.008)	0.036*** (0.000)
R-square	0.24	0.21
LIK	497.792	492.023
AIC	-979.584	-968.047
SC	-950.946	-939.409
Number of observations	260	260

Note: (***), (**) and (*) denote significance at 1%, 5% and 10% levels; p-values in brackets.

Figure 1. European *fdi* distribution at regional level



Note: The density function is estimated by using a Gaussian kernel function with optimal bandwidth according to Silverman's rule-of-thumb.

Table 10. FDI determinants. Robustness check

Exogenous variables	Regression scores					
	Outliers		Spatial dependence	Size	Endogeneity	Top 50 regions
	Removing outliers	Quantile regression				
c	0.019*** (0.000)	0.016*** (0.000)	-0.007* (0.073)	0.016*** (0.000)	0.036*** (0.000)	0.022 (0.235)
Economic potential (F_1)	0.008*** (0.000)	0.009*** (0.000)	0.013*** (0.000)	0.010*** (0.001)	0.008*** (0.000)	0.028** (0.043)
Market size (F_2)	0.001 (0.421)	-0.0001 (0.55)	-0.001 (0.788)	0.004*** (0.000)	-0.002 (0.208)	-0.003 (0.662)
Labour market characteristics (F_3)	0.004*** (0.001)	0.005*** (0.000)	0.006** (0.014)	0.005** (0.032)	0.002* (0.078)	0.005 (0.596)
Technological progress (F_4)	0.005*** (0.000)	0.006*** (0.001)	0.010*** (0.000)	0.014*** (0.000)	0.015*** (0.000)	0.014** (0.041)
Labour regulation (F_5)	0.001 (0.463)	0.000 (0.863)	0.003 (0.198)	0.003 (0.206)	0.005*** (0.000)	0.007 (0.398)
Competitiveness (F_6)	0.007*** (0.000)	0.009*** (0.000)	0.008*** (0.001)	0.010*** (0.003)	0.035*** (0.000)	0.022*** (0.004)
CF	0.015*** (0.000)	0.028*** (0.000)	0.031*** (0.000)	0.033*** (0.000)	0.013*** (0.000)	0.100*** (0.004)
W_fdi			0.899*** (0.000)			
R-square	0.22	0.24		0.28	0.37	0.29
LIK			501.501			
AIC			-985.003			
SC			-952.785			
Number of Observations	239	260	260	260	1560	50

Note: (***), (**) and (*) denote significance at 1%, 5% and 10% levels; p-values in brackets.

Table 11. Spatial tests

Tests	Regression scores
LM-ERR	31.455*** (0.000)
LM-EL	0.362 (0.548)
LM-LAG	41.604*** (0.000)
LM-LE	10.510*** (0.001)

Note: LM-ERR = Lagrange multiplier for spatial errors; LM-EL = LM-ERR associated robust; LM-LAG = Lagrange multiplier for spatial lags; LM-LE = LM-LAG associated robust.
(***) denote significance at the 1% level; p-values in brackets.

APPENDIX

Table A.1. FDI Performance and Potential Indices. Regional classification (Average 2000-2006)

Code	Region	Performance Index	Potential Index	Regional classification
at11	Burgenland	117.0	21.8	2
at12	Niederösterreich	68.2	24.9	3
at13	Wien	193.5	44.8	1
at21	Kärnten	76.5	31.6	3
at22	Steiermark	74.0	34.5	3
at31	Oberösterreich	70.2	31.8	3
at32	Salzburg	103.7	28.2	1
at33	Tirol	69.7	32.4	3
at34	Vorarlberg	130.6	35.7	1
be10	Brussels	650.7	43.5	1
be21	Antwerpen	484.3	50.8	1
be22	Limburg	390.2	42.9	1
be23	Oost-Vlaanderen	226.0	41.1	1
be24	Vlaams Brabant	650.0	50.0	1
be25	West-Vlaanderen	297.2	36.6	1
be31	Brabant Wallon	243.2	65.9	1
be32	Hainaut	164.3	34.5	1
be33	Liège	200.7	38.7	1
be34	Luxembourg	58.7	35.6	3
be35	Namur	286.1	36.0	1
bg31	Severozapaden	24.0	16.5	4
bg32	Severen tsentralen	140.0	14.9	2
bg33	Severoiztochen	250.6	11.2	2
bg34	Yugoiztochen	53.2	16.0	4
bg41	Yugozapaden	583.2	20.2	2
bg42	Yuzhen tsentralen	102.9	13.5	2
cy00	CYPRUS	263.1	11.0	2
cz01	Praha	610.3	35.8	1
cz02	Strední Cechy	52.1	34.8	3
cz03	Jihozápad	42.9	26.5	3
cz04	Severozápad	42.7	23.3	4
cz05	Severovýchod	52.7	25.9	3
cz06	Jihovýchod	55.9	25.8	3
cz07	Strední Morava	55.0	23.4	4
cz08	Moravskoslezsko	49.4	20.2	4
de11	Stuttgart	61.4	48.3	3
de12	Karlsruhe	71.7	46.6	3
de13	Freiburg	70.0	38.1	3
de14	Tübingen	66.6	41.8	3
de21	Oberbayern	70.0	50.2	3
de22	Niederbayern	39.9	31.9	3
de23	Oberpfalz	36.8	30.3	3
de24	Oberfranken	32.6	24.6	4
de25	Mittelfranken	55.7	36.5	3
de26	Unterfranken	52.4	27.7	3
de27	Schwaben	53.5	27.4	3
de30	Berlin	85.6	34.3	3
de41	Brandenburg - Nordost	38.6	16.5	4
de42	Brandenburg - Südwest	54.9	20.6	4
de50	Bremen	110.2	32.1	1
de60	Hamburg	199.1	34.7	1
de71	Darmstadt	56.8	39.8	3
de72	Gießen	61.5	28.9	3
de73	Kassel	40.0	22.6	4
de80	Mecklenburg-Vorpommern	22.7	16.0	4
de91	Braunschweig	25.3	43.9	3
de92	Hannover	36.9	27.1	3
de93	Lüneburg	31.7	16.5	4
de94	Weser-Ems	42.7	17.8	4
dea1	Düsseldorf	39.8	28.8	3
dea2	Köln	71.0	33.9	3
dea3	Münster	54.3	20.8	4
dea4	Detmold	44.8	23.6	4
dea5	Arnsberg	34.2	23.8	4

deb1	Koblenz	50.6	21.3	4
deb2	Trier	53.5	22.1	4
deb3	Rheinhessen-Pfalz	60.4	31.4	3
dec0	Saarland	41.3	25.2	3
ded1	Chemnitz	50.5	19.5	4
ded2	Dresden	80.0	31.6	3
ded3	Leipzig	31.4	23.6	4
dee0	Sachsen-Anhalt	42.2	16.5	4
def0	Schleswig-Holstein	20.5	22.7	4
deg0	Thüringen	58.0	22.4	4
dk00	Denmark	98.4	35.9	1
ee00	Estonia	310.4	24.8	2
es11	Galicia	135.9	11.3	2
es12	Asturias	92.0	12.9	4
es13	Cantabria	154.5	12.6	2
es21	Pais Vasco	153.8	21.7	2
es22	Navarra	163.9	20.3	2
es23	La Rioja	222.9	15.1	2
es24	Aragón	220.2	16.8	2
es30	Madrid	169.3	30.4	1
es41	Castilla y León	61.4	12.9	4
es42	Castilla-la Mancha	29.8	9.4	4
es43	Extremadura	3.1	9.0	4
es51	Cataluña	69.4	22.5	4
es52	Comunidad Valenciana	71.6	13.1	4
es53	Illes Balears	30.5	11.7	4
es61	Andalucia	40.7	10.2	4
es62	Murcia	50.2	10.3	4
es63	Ceuta	216.4	12.2	2
es64	Melilla	418.7	11.9	2
es70	Canarias (ES)	49.7	8.8	4
fi13	Itä-Suomi	70.4	24.3	4
fi18	Etelä-Suomi	155.6	45.7	1
fi19	Länsi-Suomi	90.5	36.8	3
fi1a	Pohjois-Suomi	91.2	44.4	3
fi20	Åland	47.9	28.3	3
fr10	Île de France	238.8	46.1	1
fr21	Champagne-Ardenne	33.7	20.6	4
fr22	Picardie	28.9	22.2	4
fr23	Haute-Normandie	68.9	24.3	4
fr24	Centre	60.2	25.4	3
fr25	Basse-Normandie	100.2	18.7	2
fr26	Bourgogne	39.5	20.2	4
fr30	Nord - Pas-de-Calais	65.7	21.0	4
fr41	Lorraine	102.1	24.1	2
fr42	Alsace	196.6	30.7	1
fr43	Franche-Comté	131.4	32.6	1
fr51	Pays de la Loire	76.8	22.2	4
fr52	Bretagne	78.6	25.1	3
fr53	Poitou-Charentes	55.4	17.1	4
fr61	Aquitaine	58.9	23.1	4
fr62	Midi-Pyrénées	89.5	34.7	3
fr63	Limousin	53.5	19.7	4
fr71	Rhône-Alpes	55.7	32.3	3
fr72	Auvergne	30.3	24.3	4
fr81	Languedoc-Roussillon	35.0	24.9	3
fr82	Provence-Alpes-Côte d'Azur	66.1	26.7	3
fr83	Corse	7.8	19.7	4
gr11	Anatoliki Makedonia, Thraki	13.4	6.1	4
gr12	Kentriki Makedonia	0.7	8.0	4
gr13	Dytiki Makedonia	-15.5	6.9	4
gr14	Thessalia	2.3	5.4	4
gr21	Ipeiros	0.8	7.6	4
gr22	Ionia Nisia	-1.5	9.3	4
gr23	Dytiki Ellada	-7.9	7.5	4
gr24	Sterea Ellada	13.1	8.2	4
gr25	Peloponnisos	-24.2	6.4	4
gr30	Attiki	49.4	14.6	4
gr41	Voreio Aigaio	3.4	6.9	4
gr42	Notio Aigaio	1.1	7.5	4
gr43	Kriti	5.6	7.7	4
hu10	Közép-Magyarország	159.6	32.4	1
hu21	Közép-Dunántúl	195.6	36.2	1

hu22	Nyugat-Dunántúl	169.5	37.1	1
hu23	Dél-Dunántúl	151.8	22.7	2
hu31	Észak-Magyarország	144.1	22.5	2
hu32	Észak-Alföld	240.7	19.3	2
hu33	Dél-Alföld	130.7	17.0	2
ie01	Border, Midlands and Western	55.1	32.9	3
ie02	Southern and Eastern	164.8	42.8	1
itc1	Piemonte	41.9	28.2	3
itc2	Valle d'Aosta	5.6	24.7	4
itc3	Liguria	37.0	21.8	4
itc4	Lombardia	20.5	27.1	3
itd1	Bolzano-Bozen	22.8	17.0	4
itd2	Trento	50.7	21.9	4
itd3	Veneto	34.8	21.5	4
itd4	Friuli-Venezia Giulia	43.9	24.2	4
itd5	Emilia-Romagna	29.1	23.0	4
ite1	Toscana	25.5	19.5	4
ite2	Umbria	18.5	17.4	4
ite3	Marche	82.4	17.1	4
ite4	Lazio	29.5	29.8	3
itf1	Abruzzo	42.3	17.2	4
itf2	Molise	41.8	13.1	4
itf3	Campania	39.7	14.2	4
itf4	Puglia	23.9	10.9	4
itf5	Basilicata	122.1	11.2	2
itf6	Calabria	14.8	10.5	4
itg1	Sicilia	10.3	12.0	4
itg2	Sardegna	26.7	13.0	4
lt00	Lithuania	126.5	17.0	2
lu00	Luxembourg	382.7	41.4	1
lv00	Latvia	133.1	13.7	2
mt00	Malta	271.2	29.2	1
nl11	Groningen	22.5	34.8	3
nl12	Friesland	100.4	24.8	2
nl13	Drenthe	133.6	26.4	1
nl21	Overijssel	39.3	31.2	3
nl22	Gelderland	91.6	35.5	3
nl23	Flevoland	86.4	44.0	3
nl31	Utrecht	152.1	40.1	1
nl32	Noord-Holland	201.4	33.2	1
nl33	Zuid-Holland	182.9	34.9	1
nl34	Zeeland	255.6	31.7	1
nl41	Noord-Brabant	58.2	47.5	3
nl42	Limburg	62.5	42.6	3
pl11	Lódzkie	120.3	10.5	2
pl12	Mazowieckie	127.3	18.7	2
pl21	Malopolskie	175.2	11.8	2
pl22	Slaskie	122.5	12.0	2
pl31	Lubelskie	69.6	8.0	4
pl32	Podkarpackie	117.5	6.9	2
pl33	Swietokrzyskie	98.4	5.8	2
pl34	Podlaskie	104.2	6.1	2
pl41	Wielkopolskie	95.5	11.8	4
pl42	Zachodniopomorskie	78.8	11.9	4
pl43	Lubuskie	118.0	11.2	2
pl51	Dolnoslaskie	99.6	13.3	2
pl52	Opolskie	146.4	12.1	2
pl61	Kujawsko-Pomorskie	48.4	10.7	4
pl62	Warminsko-Mazurskie	85.8	6.8	4
pl63	Pomorskie	105.4	14.9	2
pt11	Norte	72.4	11.8	4
pt15	Algarve	74.9	11.1	4
pt16	Centro (PT)	72.7	10.3	4
pt17	Lisboa	189.3	19.7	2
pt18	Alentejo	56.4	13.8	4
ro11	Nord-Vest	50.4	9.4	4
ro12	Centru	51.1	8.9	4
ro21	Nord-Est	21.6	6.0	4
ro22	Sud-Est	28.4	6.0	4
ro31	Sud - Muntenia	19.3	7.8	4
ro32	Bucuresti - Ilfov	488.8	21.4	2
ro41	Sud-Vest Oltenia	29.1	8.1	4
ro42	Vest	14.6	12.6	4

se11	Stockholm	336.6	56.0	1
se12	Östra Mellansverige	103.2	42.7	1
se21	Småland med öarna	84.9	25.4	3
se22	Sydsverige	107.7	44.2	1
se23	Västsverige	106.3	46.3	1
se31	Norra Mellansverige	85.6	30.6	3
se32	Mellersta Norrland	120.4	31.0	1
se33	Övre Norrland	59.1	32.6	3
si00	Slovenia	72.0	25.9	3
sk01	Bratislavský kraj	862.2	40.4	1
sk02	Západné Slovensko	92.6	27.1	3
sk03	Stredné Slovensko	143.4	24.5	2
sk04	Východné Slovensko	165.7	19.1	2
ukc1	Tees Valley and Durham	151.0	21.1	2
ukc2	Northumberland, Tyne and Wear	104.2	22.6	2
ukd1	Cumbria	34.4	21.8	4
ukd2	Cheshire	118.5	42.7	1
ukd3	Greater Manchester	65.4	23.9	4
ukd4	Lancashire	162.0	28.8	1
ukd5	Merseyside	107.7	22.6	2
uke1	East Yorkshire and Northern Lincolnshire	73.5	17.4	4
uke2	North Yorkshire	36.0	24.5	4
uke3	South Yorkshire	80.7	21.3	4
uke4	West Yorkshire	53.0	21.8	4
ukf1	Derbyshire and Nottinghamshire	121.6	27.7	1
ukf2	Leicestershire, Rutland and Northants	70.7	29.4	3
ukf3	Lincolnshire	21.9	17.7	4
ukg1	Herefordshire, Worcestershire and Warks	123.3	26.8	1
ukg2	Shropshire and Staffordshire	99.7	22.2	2
ukg3	West Midlands	257.6	26.3	1
ukh1	East Anglia	68.6	42.6	3
ukh2	Bedfordshire, Hertfordshire	86.2	44.8	3
ukh3	Essex	99.9	35.0	1
uki1	Inner London	83.1	42.0	3
uki2	Outer London	85.6	27.9	3
ukj1	Berkshire, Bucks and Oxfordshire	90.3	52.8	3
ukj2	Surrey, East and West Sussex	61.6	32.6	3
ukj3	Hampshire and Isle of Wight	136.7	43.5	1
ukj4	Kent	111.5	29.1	1
ukk1	Gloucestershire, Wiltshire and Bristol/Bath area	205.7	38.7	1
ukk2	Dorset and Somerset	113.2	20.8	2
ukk3	Cornwall and Isles of Scilly	59.0	19.6	4
ukk4	Devon	72.7	22.1	4
ukl1	West Wales and The Valleys	39.6	18.8	4
ukl2	East Wales	71.6	28.4	3
ukm2	Eastern Scotland	49.2	26.9	3
ukm3	South Western Scotland	118.2	27.0	1
ukm5	North Eastern Scotland	81.2	32.5	3
ukm6	Highlands and Islands	8.0	23.2	4
ukn0	Northern Ireland	99.3	19.9	2

Notes: The Performance Index (PI) is defined by the expression: $PI = \frac{(FDI_i / \sum_i FDI_i)}{(GDP_i / \sum_i GDP_i)} 100$.

Regarding the Potential Index we have constructed, drawing from UNCTAD (2002), our own Index for the EU regions by using the following variables: per capita GDP, R&D expenditures as percentage of GDP, exports plus imports as percentage of GDP, and the percentage of employment in high technology sectors. The index for a region *i* is computed as the simple average of the scores on the chosen variables for that region. The score (S) for each variable is computed as: $S = \left[\frac{(V_i - V_{\min})}{(V_{\max} - V_{\min})} \right] 100$, where V_i refers to the value of the variable for region *i* and $V_{\min}$ and $V_{\max}$ refer, respectively, to the lowest and highest values of the variable among the regions.

As for the classification, 1 denotes *front-runners*, 2 denotes *above-potential economies*, 3 represents *below-potential economies*, and 4 denotes *under-performer*s.

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