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The determinants of foreign direct investments: Regional vs. National characteristics

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The spatial distribution of FDI across European regions: winners and losers

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Abstract

This study aims at investigating empirically the factors that drive the uneven distribution of foreign direct investments (FDI) inflows to European regions. In order to achieve our research objective, we first perform a detailed analysis of the location determinants of foreign investments and then, we try to understand whether and to what extent regions' capacity to attract FDI is strengthened or hampered by a "country effect", which can take two different forms. The first relates to the relative performance of the country a region belongs to in Europe (across country effect), while the second concerns the relative performance of regions' within their own country (within country effect). Once identified the "national" and the "regional" components of factors able to attract FDI, more effective FDI promotion policies can be implemented at national, regional and sectoral levels.

Key words: Foreign direct investments, globalization.

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1 Introduction

Over the last decades foreign direct investment (FDI) has played a major role as a way of internationalizing the economic activity. Indeed, FDI is one of the prominent feature of the recent wave of globalization, recording growth rates higher than those of international trade flows and GDP. The importance of FDI, however, is not limited to the quantitative aspects of the phenomenon. Rather, it depends on the fact that FDI is one of the most important vehicle for transferring not only financial capitals, but also technologies, know-how and capabilities across space and national borders (Romer, 1993, OECD, 2007).

Most of the world inflows of FDI have been collected by the European Union, reflecting both the increasing internationalization of the European economies and the instigation of the European integration process (Barrell and Pain, 1999; Van Aarle, 1996; Mold, 2003). FDI inflows in the EU rose from about 97 billion of USD in 1990 to 900 billion of USD in 2007, 45% of world inflows, making the EU the world's most important recipient area for FDI.

Despite this impressive record, some concerns on the activity of multinational enterprises (MNEs) do exist and put policy makers in front of new challenges related to the harmonious development of all territories within Europe. The spatial distribution of foreign capitals in the EU, in fact, is far from being uniform, both within and across countries, as it is shown in Figure 1, which summarizes the distribution of foreign firms across the EU regions by boxplots. The presence of spatial diversity raises the question on what determines the choice of location for potential foreign investors. To provide an answer to this question may be of interest not only for scholars but also for policy makers dealing with local development issues: with a skewed distribution of foreign firms over space, the positive impact of FDI in terms of technology transfer and knowledge diffusion may be limited and it may further exacerbate the existing regional disparities. Therefore, there is a need to know more in depth the factors able to condition the distribution of FDI over space.

Potential determinants of FDI location have been extensively studied by the literature, at theoretical and empirical level (Barba Naveretti and Venables, 2004; Blonigen, 2005). However, the empirical literature is mainly based on evidence drawn from data at industry or country level.¹ Given these restrictions in focus, evidence on what explains variation in FDI across EU regions is still incomplete.

The present paper aims at investigating empirically the factors that drive the uneven distribution of FDI across EU regions. In so doing, we consider not only localisation advantages and firms' heterogeneity, as stated by the theory (Markusen, 1984 and 1995; Helpman, 1984; Shatz e Venables, 2000), but also spatial heterogeneity, which involves both within country and across country elements.²

¹Basile et al. (2009), Crozet et al. (2004), Boudier-Bensebaa (2005) and Pusterla e Resmini (2007) adopt a regional approach, though limited to regions belonging to the same country or to a small group of countries.

²Spatial heterogeneity is usually referred to as variation in relationships over space (Anselin,

In order to achieve our research objectives, we exploit a unique database, FDIRegio, which includes information on the number of foreign firms established in the EU27 regions (NUTS2 level) during the 2005-07 period disaggregated by sector and country of origin³. Our empirical analysis, carried out with spatial econometric techniques, is divided into two interrelated parts. We first perform a detailed analysis of the location determinants of foreign investments by considering a set of variables for which we have theoretical priors that they are potentially correlated with FDI inflows. Then we try to explain whether and to what extent the importance of the locational advantages previously identified varies according to two different forms of heterogeneity: variation across space and variation across different kinds of FDI. As for the latter, we distinguish between manufacturing and service FDI and between intra-European and extra-European foreign firms in order to capture the effects exerted by different motivations for becoming multinationals on the choice of a foreign location (Dunning, 2009; Cantwell, 2009).

The consideration of geographical heterogeneity represents the real novelty of this paper. Previous similar studies usually include regional and/or country dummies in order to account for variation across space (Basile et al., 2009). This methodology allows to capture unobserved regional fixed effects or specific effects which are constant over regions belonging to the same country. However, regions may substantially differ one from each other in terms of geographic and socio-economic characteristics that may vary not only across but also within countries. We model this more complex form of spatial heterogeneity by distinguishing both regions over-performing – in terms of each explanatory variable – within their own countries (within country effect) and regions belonging to countries over-performing within Europe (between country effect). In other words, this strategy allows us to understand, *ceteris paribus*, whether a laggard region in a well performing country is likely to attract more (or less) foreign firms than a over-performing region in a laggard country. Once identified the *within* and *between* country components of factors able to attract FDI, more effective FDI promotion policies can be implemented at national, regional and also sectoral levels.

Our results suggest that spatial heterogeneity is able to affect the relationship between regional characteristics and FDI flows. The within country effect is weaker than the between country effect, which, on average, is able to further boost regions' capacity to attract FDI.

The structure of this article is as follow. Section 2 provides a short overview of the regional characteristics that may affect investment patterns, while the following sections are devoted to explain the concentration of foreign activity across space. We first present the methodology (section 3) and then discuss the econometric results (section 4). Section 5 concludes with some final remarks and policy implications.

2003).

³See the Appendix 1 for an in depth description of the database and its representativeness.

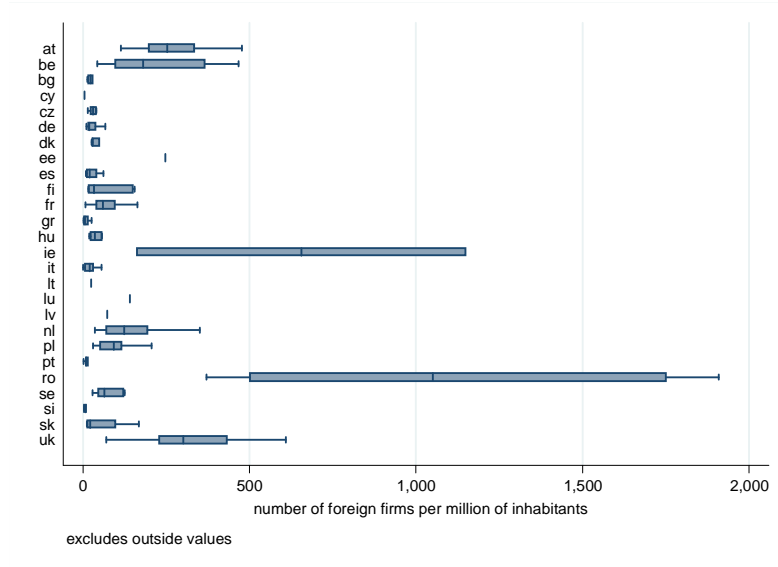


Figure 1: The distribution of FDI in the EU.

2 Explaining the geography of FDI

The literature on the location-related determinants of FDI proposes few important factors that are able to condition MNEs' choice of a location for their production plants.⁴ These factors include demand and supply conditions, as well as the general business environment faced by foreign firms.

Local demand conditions usually refer to market size, market access and growth prospects. The size of the local market as well as access to other neighbouring markets is likely to exert a strong influence on FDI location. In particular, market access can magnify the impact of local demand in presence of increasing return to scale in production (Davis and Weinstein, 1999 and 2003). Therefore, it would exert a strong influence on foreign firms producing on a large scale and seeking to export their products to the rest of the EU. Despite the rapid integration process that took place over the last decade, market access is rather unequal across EU regions, mainly because of intangible barriers, such as cultural and administrative ones, to intra-EU trade that still maintain fragmented the EU market (Head and Mayer, 2004). Because of these barriers, regions with a good geographical and economic accessibility to the European core markets are likely to receive more FDI than other regions. Also GDP growth rate is often used in the literature as a proxy for potential

⁴ As argued by Dunning (1993), location advantages are only one of the three elements that firms take into consideration in order to decide whether to become multinationals. The other two are Ownership and Internalization advantages.

local demand. Many studies indicate the existence of a positive relationship between FDI and GDP growth rate (Billington, 1999; Kravis and Lipsey 1982, Wheeler and Mody 1992). It is also argued that this variable may well be expected at a local level within a host country, though in the EU its importance may be reduced because of the easy access to neighbouring regions (Cantwell and Piscitello, 1995).

Supply conditions include a wide set of factors, ranging from the structure of the local economy, factor costs, resource endowments and skills of labour force. Agglomeration effects usually signal high quality of infrastructure, specialization, higher competition and also a business environment conducive for foreign investors. The existing empirical literature shows that firms tend to locate where other firms with similar characteristics - in terms of nationality of ownership and sector of activity - are already established (Head et al, 1999; Crozet et al., 2004; Pusterla and Resmini, 2007). The role of factor costs, and, in particular, labour costs is highly debated in the literature. At theoretical level, they are likely to be important for FDI location choice. Multinationals are able to fragment production processes across space and usually chose the best location for each production stage, thus minimizing total production costs. Therefore, it can be expected that multinational firms chose low cost locations for activities relatively intensive in labour. This implies the existence of a negative relationship between labour costs and FDI. Empirically, this relationship is not very robust. Labor cost is found to be positively related to FDI by Wheeler and Mody (1992) and Feenstra and Hanson (1997), while it is negative for Culem (1988) and insignificant for Lucas (1993) and Defever (2006).⁵ Finally, It has been argued (Dunning, 1981; Schneider and Frey, 1985) that the degree of human capital development has a favorable impact on FDI inflow in terms of ensuring adequate supply of skilled labor. Moreover, skilled labour is also assumed as a proxy for productivity. The implied relationship is therefore positive, though the empirical literature is not unanimous on this.

Apart from methodological differences, this general lack of consensus on the main determinants for FDI indicates that their relevance may depend on location, and that geographic specificities can not be properly identified at national or firm level. To this respect, a regional perspective may be more appropriate.

3 Empirical Strategy

As stated above, one of the main objective of this paper is to identify those factors which are important in driving spatial patterns of FDI across EU regions. More importantly, we aim at explaining spatial diversity in those patterns. To this end, we want to uncover the answers to two key questions. First, do European regions compete on the same ground to attract foreign investors? If this is proved to be the case, factors of regional attractiveness would depend only on absolute regional characteristics.

⁵Head et al. (1999), Devereux and Griffith (1998), and Guimaraes et al. (2000) are other authors finding an insignificant or positive relationship between labour costs and FDI.

The second question concerns the role of countries in such process: can national borders affect regions' attractiveness in terms of FDI? If yes, in which way? In order to provide an answer to this question, we assume that regions' ability to attract FDI is a combination of:

1. regions' relative attractiveness with respect to all other regions belonging to the same country (within country effect)
2. countries' relative attractiveness with respect to all other countries in the EU (between country effect).

In order to provide an answer to both questions, we start from the following simple log-linear model:

$$\begin{aligned}
\ln(FDI_{j,t}) = & \beta_{00} + \beta_{01} * D_{j,RO} + \beta_{02} * D_{j,PL} \\
& + \beta_{11} * \ln(FDI_{j,t-1}) + \beta_{12} * \ln(L_COST_{j,t-1}) \\
& + \beta_{13} * GROWTH_GDP_{j,t-1} + \beta_{14} * \ln(MKT_POT_{j,t-1}) \\
& + \beta_{15} * \ln(IND_SPEC_{j,t-1}) + \beta_{16} * \ln(SER_{j,t-1}) \\
& + \beta_{17} * \ln(HUM_CAP_{j,t-1}) + \epsilon_{j,t} \quad (1)
\end{aligned}$$

As for the explanatory variables, we include foreign firms established in region j in the previous period ($FDI_{j,t-1}$), in order to account for agglomeration economies among foreign firms, labour costs ($L_COST_{j,t-1}$), the GDP growth rate and each region's market potential ($GROWTH_GDP_{j,t-1}$ and $MKT_POT_{j,t-1}$) as proxies for demand conditions. The supply side characteristics have been proxied by the specialization of the regions ($IND_SPEC_{j,t-1}$). This vector includes the shares of three manufacturing macro-branches (i.e. low tech, medium-tech and high-tech sectors), as well as the share of business services on total value added. Finally, we include the quality of labour force ($HUM_CAP_{j,t-1}$). Differently from previous similar studies we do not use the level of education of labour force, but different functions and, in particular, corporate and SMEs' managers, scientists and professionals, clerks and plant and machine operators. Finally, we include two dummies, one for Romania ($D_{j,RO}$) and one for the United Kingdom ($D_{j,PL}$), in order to account for a possible bias given by country-specific effects that have made Romania and Poland the two outstanding receivers for FDI in the EU in terms of foreign firms but not in terms of FDI value.⁶

We first estimate equation (1) by using OLS. Aware of the general result found in previous literature on FDI flows, we then test for the presence of spatial

⁶See Appendix 2 for a detailed explanation of each explanatory variables and source of data.

autocorrelation.⁷ The presence of spatial correlation either in the distribution of FDI or in regional characteristics would bias the results because, if not controlled for, it would violate the standard assumption of any OLS analysis that the error terms of the model are independent among each others and could introduce endogeneity problems. We found evidence of spatial autocorrelation (see Table 1) through the explanatory variables and the error terms; therefore, we switch to a spatial error model to take into account the spatial structure that seems to emerge from our data. Results are presented in the following section.

Table 1. Spatial autocorrelation
Measures of global spatial autocorrelation

Weights matrix

Name: distances
Type: Imported (non-binary)
Row-standardized: Yes

Moran's I

| Variables | I | E(I) | sd(I) | z | p-value* |
|-----------------|-------|--------|-------|--------|----------|
| FDI | 0.171 | -0.004 | 0.006 | 29.834 | 0.000 |
| lag_FDI | 0.143 | -0.004 | 0.006 | 25.055 | 0.000 |
| FDI_Country | 0.192 | -0.004 | 0.006 | 33.790 | 0.000 |
| lag_FDI_Country | 0.228 | -0.004 | 0.006 | 39.528 | 0.000 |

Geary's c

| Variables | c | E(c) | sd(c) | z | p-value* |
|-----------------|-------|-------|-------|---------|----------|
| FDI | 0.784 | 1.000 | 0.013 | -16.406 | 0.000 |
| lag_FDI | 0.830 | 1.000 | 0.014 | -12.386 | 0.000 |
| FDI_Country | 0.765 | 1.000 | 0.024 | -9.672 | 0.000 |
| lag_FDI_Country | 0.762 | 1.000 | 0.011 | -21.635 | 0.000 |

*1-tail test

In the second part of the analysis we depart from the simple econometric model described above, which allows us to answer to the first research question presented at the beginning of this section, in order to test the existence of both the within and the between country effects.

To this aim we built two sets of dummies:

- the first set comprises a dummy d_1 for each explanatory variable x included in equation (1). d_1 equals 1 if the variable x assumes in region j a value which is above the mean of the country which region j belong to and 0 otherwise.
- the second set includes a dummy d_2 for each explanatory variable x included in equation (1). d_2 equals 1 if the region j belongs to a country which performe better than the EU in the variable x and 0 otherwise.

⁷Positive spatial correlation exists when locations close to each others exhibit more similar values than those further apart (Anselin, 2003).

Given the introduction of those two sets of dummies, equation (1) becomes (using matrix notation):

$$\ln(FDI_t) = \mathbf{I}\beta_0 + \mathbf{D}_1\gamma + \mathbf{D}_2\delta + \mathbf{D}_1\mathbf{D}_2\eta + \mathbf{X}\beta_1 + \epsilon_{j,t} \quad (2)$$

where:

- \mathbf{I} is a $(j \times 3)$ matrix which include the constant term and the dummies for Poland and Romania;
- \mathbf{D}_1 is a $(j \times k)$ matrix that collects all k dummies d_1 , as described above, one for each dimension along with the performance of regions is considered;
- \mathbf{D}_2 is a $(j \times k)$ matrix that collects all k dummies d_2
- $\mathbf{D}_1\mathbf{D}_2$ is a $(j \times k)$ matrix resulting from the Hadamard product⁸ of \mathbf{D}_1 and \mathbf{D}_2 .
- \mathbf{X} is the $(j \times k)$ matrix of regressors, where j is the number of regions and k is the number of variables through which the performance of regions is assessed.

Note that eq. (2) is a multidimensional difference-in-difference econometric specifications, which allows us to capture the effect of spatial heterogeneity through the intercept term. In particular, regions are grouped along each variable into four categories:

1. Regions performing better than the respective national mean and located in a country performing better than the European mean. Therefore, the potential effect on FDI flows due, *ceteris paribus*, to the combination of a within and a between country effects is given by: $\beta_0 + \gamma + \delta + \eta$.
2. Regions performing better than the respective national mean and located in a country underperforming with respect to the European mean. The final effect on FDI flows depends on the total intercept given by $\beta_0 + \gamma$, which represents the intensity of the within country effect.
3. Regions performing worse than the respective national mean but belonging to a country performing better than the European mean. The impact of the between country effect on FDI flows can be evaluated looking at the significance and the magnitude of this intercept term: $\beta_0 + \delta$.
4. Regions performing worse than the respective national mean and belonging to a country underperforming with respect to the European mean. In that case, neither the between country or the within country effects are in place. Therefore, regions' capacity to attract foreign firms depends on their own socio-economic characteristics and the intercept term (β_0) assume the usual meaning.

⁸It is also known as entrywise product / Schur product of two matrices of the same dimension. The result is a matrix of the same dimension of the original ones, whose elements are given by the product of the corresponding elements of the initial matrices.

4 Empirical Results

4.1 The basic model.

As stated above, we start from the analysis of regional characteristics that explain spatial patterns of foreign firms in Europe. Therefore, we estimate eq. (1) with traditional OLS techniques and test for spatial autocorrelation. As suggested by spatial diagnostic, the latter does exist and can be controlled for through a spatial error models. Results of the regression analysis are shown in Table 3, while Table 2 provides evidence for spatial autocorrelation.

Table 2. Spatial diagnostics

| Diagnostics | | | |
|----------------------------|-----------|----|---------|
| Test | Statistic | df | p-value |
| Spatial error: | | | |
| Moran's I | 14.953 | 1 | 0.000 |
| Lagrange multiplier | 47.449 | 1 | 0.000 |
| Robust Lagrange multiplier | 54.244 | 1 | 0.000 |
| Spatial lag: | | | |
| Lagrange multiplier | 0.724 | 1 | 0.395 |
| Robust Lagrange multiplier | 7.518 | 1 | 0.006 |

Table 3. Factors of regions' attractiveness

| | (1) All | (2) All | (3) IntraEU | (4) ExtraEU | (5) Services | (6) Manufacturing |
|--------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| main | | | | | | |
| lag_FDI | 0.366*** (6.53) | 0.393*** (9.67) | 0.296*** (8.01) | 0.389*** (9.15) | 0.467*** (10.72) | 0.237*** (6.84) |
| GDP_growth | 0.0387** (1.98) | 0.0422** (2.24) | 0.0533*** (3.13) | 0.0344* (1.75) | 0.0674*** (3.34) | 0.00443 (0.28) |
| Labour_Cost | 0.0776* (1.81) | 0.0788 (1.47) | 0.0878* (1.85) | 0.0722 (1.29) | 0.0652 (1.14) | 0.0866* (1.90) |
| Market_Accessibility | 0.0883 (1.65) | 0.0904* (1.83) | 0.147*** (3.31) | 0.0915* (1.77) | 0.139*** (2.62) | -0.0103 (-0.25) |
| Low_Tech | 5.136** (2.07) | 4.963** (2.32) | -2.296 (-1.18) | 5.645** (2.52) | 4.390* (1.91) | 3.318* (1.82) |
| Medium_Tech | -0.446 (-0.26) | -0.581 (-0.42) | -0.391 (-0.32) | -1.098 (-0.77) | -1.219 (-0.83) | 0.441 (0.38) |
| High_Tech | -3.848 (-1.29) | -5.670* (-1.70) | 2.865 (0.96) | -7.267** (-2.08) | -7.218** (-2.02) | -3.144 (-1.11) |
| Business_Services | 2.872* (1.81) | 2.604** (1.98) | 2.267* (1.91) | 1.992 (1.45) | 2.874** (2.04) | 1.433 (1.28) |
| Corporate_Managers | 20.84*** (8.74) | 21.37*** (8.29) | 27.15*** (12.25) | 18.78*** (6.95) | 20.80*** (7.52) | 20.02*** (9.19) |
| SMEs_Managers | -6.584 (-1.57) | -6.422** (-2.16) | -6.373** (-2.41) | -5.713* (-1.84) | -5.673* (-1.78) | -6.071** (-2.40) |
| Professionals_Scientists | 5.853*** (2.92) | 6.019*** (3.33) | 2.848* (1.77) | 6.569*** (3.47) | 6.043*** (3.11) | 3.558** (2.32) |
| Clerks | 5.838*** (2.67) | 5.260** (2.07) | 1.010 (0.45) | 6.304** (2.37) | 4.470 (1.64) | 6.702*** (3.10) |
| Plant_Machines_Operators | 11.35*** (4.29) | 10.55*** (4.85) | 6.114*** (3.11) | 11.26*** (4.95) | 7.774*** (3.33) | 12.78*** (6.90) |
| Dummy_RO | 3.942*** (7.99) | 4.013*** (8.42) | 4.302*** (10.20) | 3.920*** (7.86) | 3.942*** (7.70) | 3.981*** (9.83) |
| Dummy_PL | 1.773*** (9.76) | 1.762*** (7.40) | 0.673*** (3.17) | 1.876*** (7.53) | 1.384*** (5.42) | 2.009*** (9.94) |
| _cons | -2.869*** (-3.83) | -2.911*** (-3.24) | -2.889*** (-4.42) | -3.010*** (-3.07) | -3.393*** (-3.59) | -2.566*** (-3.73) |
| lambda | | | | | | |
| _cons | | 0.930*** (13.27) | 0.586 (1.59) | 0.937*** (14.83) | 0.926*** (12.64) | 0.897*** (8.81) |
| sigma | | | | | | |
| _cons | | 0.622*** (22.71) | 0.565*** (22.75) | 0.650*** (22.71) | 0.667*** (22.71) | 0.529*** (22.71) |
| N | 260 | 260 | 260 | 260 | 260 | 260 |
| R ² | 0.815 | | | | | |

t statistics in parentheses

(1) OLS estimation

(2)-(6) Spatial ML estimation

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

(2)

The results are interesting, though in line with previous studies. Looking at the spatial error model only (column 2 of Table 1), agglomeration among FDI seems to play an important role in foreign firms' location choice, as well as the dynamism of the region. The higher the number of foreign firms which set up production plants in the previous period and the higher the growth rate of regional GDP, the larger the number of new foreign firms that a region is able to attract. Labour costs are only marginally significant, and they enter the regression with a positive sign, indicating that regional attractiveness relies on high productivity rather than low costs of labour. As expected, market access is also marginally significant, given that all foreign firms can serve the whole EU market, regardless of the region they are located in. This may indicate that transportation costs are not important. As far as regions' specialization is concerned, location externalities arise in low-tech manufacturing sectors and in business services, while regions specialized in high-tech manufacturing sectors do not seem to be attractive, since competition effects seem to be stronger than localization externalities. What turns out to be really crucial in attracting FDI is the human capital endowment. In particular, we found that a one per cent increase in the presence of corporate managers generates additional FDI inflows of about 20%; the same increase in professionals and clerks and plant and machine operators improves regions' capacity to attract FDI by almost 6% and 11%, respectively. The SMEs manager variable represents an exception. We interpret this result as a signal that MNEs and local industrial networks are two separate world that do not collaborate and compete to each other for local production factors and local demand. Overall, these results indicate that MNEs investing in Europe are looking mainly for European regions well endowed with human capital and they are willing to pay a higher cost to access those specific skills.

When introducing firm's heterogeneity, other striking features do emerge. We model possible differences in firms' motivations for investing in Europe by considering separately, first the origin of foreign firms (intra- vs. extra-EU FDI) and then the economic activity of foreign firms (manufacturing vs. services). First of all, it is worth noticing that high labour productivity and regions' specialization in business services affect only Extra-European FDI flows, while intra-European foreign firms seem to be more industry oriented. The quality of human capital endowment, agglomeration among foreign firms and GDP growth rate are confirmed to be crucial factors for both Intra and Extra-European FDI. Not surprisingly, market accessibility is more important for Extra-European foreign firms rather than intra-European FDI.

When distinguishing between manufacturing and service FDI, we uncover that the latter is more market oriented than the former, and, more interestingly, they tend to provide services for local firms producing in traditional labour intensive sectors.

4.2 Spatial heterogeneity

In this section we depart from the baseline model outlined before in order to analyse whether and to what extent country boundaries are able to affect regions' attractiveness. This implies the estimation of equation 2. To the extent which the within and/ or the between country effects will result significantly different from zero, we provide evidence that any explanation of regional attractiveness formulated in terms of pure regional effects is only partial and may be potentially misleading in driving FDI promotion policies. Main results are reported in Table 4. Note that spatial autocorrelation is now less significant than in the previous specification, as indicated by Table 5. This result is not surprising since we are directly modeled spatial heterogeneity. Spatial spillovers, however, maintain their significance in driving the location patterns of foreign firms operating in the manufacturing sector only. This indicates that manufacturing foreign firms are mainly driven by efficiency reasons, since they try to gain efficiency by exploiting externalities generated by a high concentration of firms producing in similar or complementary manufacturing sectors, while foreign firms providing services are more market oriented, and, therefore, their location patterns are mainly driven by local market conditions.

Table 4. *Spatial heterogeneity*

| All FDI | | | | |
|--------------------------|----------------------------|----------------------------|------------------------------|--------------------|
| | slope | d1 | d2 | d1d2 |
| main | | | | |
| lag_FDI | 0.616*** (11.52) | 0.105 (0.83) | 0.0453 (0.25) | -0.0824 (-0.63) |
| GDP_growth | 0.0475** (2.40) | 0.00653 (0.07) | 0.783*** (4.25) | -0.164 (-1.20) |
| Market_Accessibility | 0.0171 (0.37) (2.40) | 0.0914 (0.98) (0.07) | 0.367*** (2.94) (4.25) | (-1.20) |
| Low_Tech | 7.544*** (3.18) | -0.151 (-1.39) | 0.502 (1.60) | -0.0565 (-0.42) |
| Medium_Tech | 1.712 (1.13) | -0.0614 (-0.54) | 0.287* (1.77) | 0.0269 (0.22) |
| High_Tech | -1.856 (-0.43) | 0.101 (1.17) | 0.154 (0.71) | -0.114 (-0.73) |
| Business_Services | 4.089*** (3.03) | -0.161 (-1.14) | -0.217 (-0.80) | 0.0311 (0.18) |
| Corporate_Managers | 9.080** (2.16) | 0.0155 (0.17) | 1.041*** (4.82) | -0.316* (-1.94) |
| SMEs_Managers | -7.407* (-1.83) | 0.0127 (0.14) | -0.183 (-0.92) | 0.114 (0.78) |
| Professionals_Scientists | 6.282*** (2.59) | -0.177 (-1.27) | -0.720*** (-3.87) | 0.160 (1.05) |
| Clerks | 0.00411 (0.00) | 0.262* (1.89) | 0.697** (2.32) | -0.254* (-1.65) |
| Plant_Machines_Operators | -1.488 (-0.54) | 0.133 (1.20) | 0.315 (1.53) | 0.0814 (0.56) |
| Dummy_RO | 3.032*** (6.51) | | | |
| [1em] Dummy_PL | 1.485*** (4.92) | | | |
| _cons | -4.612*** (-5.23) | | | |
| lambda | | | | |
| _cons | 0.651* (1.84) | | | |
| sigma | | | | |
| _cons | 0.439*** (22.72) | | | |
| N | 260 | | | |
| R ² | | | | |

t statistics in parentheses

Spatial ML estimation

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5. *Spatial diagnostics*

| Diagnostics | | | |
|----------------------------|-----------|----|---------|
| Test | Statistic | df | p-value |
| Spatial error: | | | |
| Moran's I | 6.385 | 1 | 0.000 |
| Lagrange multiplier | 0.709 | 1 | 0.400 |
| Robust Lagrange multiplier | 0.139 | 1 | 0.710 |
| Spatial lag: | | | |
| Lagrange multiplier | 1.002 | 1 | 0.317 |
| Robust Lagrange multiplier | 0.432 | 1 | 0.511 |

Apart from these general considerations, spatial heterogeneity does exist and it is able to affect regional factors of attractiveness. Only a small group of factors of attractiveness are not affected by national boundaries. We refer here to agglomeration among foreign firms, regions' specialization in low tech manufacturing sectors and in business services, as well as the regions' endowment of SMEs managers. In particular, the larger the flow of FDI received in the past, the higher the share of low-tech manufacturing sectors and business services on total regional GVA and the lower the share of SMEs manager in a given region, the larger the number of new foreign firms this region is able to attract, regardless of the performance of the country it belongs to.⁹

As far as the other factors are concerned, country effects are no longer neutral. More interestingly, the between country effect is stronger than the within country effect. This implies that being a well-performing region in a laggard country does not assure any additional advantages in terms of FDI attraction, while the opposite does it. Generally speaking the between country effect boosts regions' capacity to attract FDI. We refer here to the GDP growth rate, market potential, industry specialization (medium tech manufacturing sectors) and human capital endowment (corporate manager and clerks). However, the interplay between regional and country effects is not always easy to interpret.

According to our results, regions growing faster than others attract more foreign firms. This general effect is further boosted by the performance of the country the region belongs to. In particular, all else equal, regions belonging to countries with a GDP growth rate above the EU average see an increase of about 0.7 per cent in the number of foreign firms they are able to attract, regardless of the rate the regional GDP is growing to. Market accessibility matters more at country than at regional level. In other words, regions located in countries with high market potential attract more FDI, regardless of their relative

⁹It is however worth noticing that specialization in business service is the only factor of attraction of FDI with a pure regional dimension in all specifications. The relationship between past and present flows of FDI is in fact boosted by both the within and the between country effects in case of extra-EU foreign firms, while the regions' specialization in low-tech manufacturing sectors become even more important for manufacturing foreign firms if the region belongs to a country whose specialization in those sectors is above the EU mean. See tables A.2-A.5 in the appendix for the details.

position within either the country or the EU. When we look at the human capital endowment as a determinant of FDI, the interplay between regional and country level characteristics becomes even more sophisticated. For example, as in the baseline model, it turns out that the larger the region's endowment of corporate managers the larger is its capacity to attract FDI. This effect is further boosted by the country performance but only up to a certain edge. In particular, if a region is located in a country that has relatively more corporate managers than other European countries it attracts a one percent more FDI inflows; however, if the region itself has a specialization in command and control function which is above the national mean, then the "FDI premium" is lower. A similar, though weaker, effect regard clerks, while a country's endowment of professionals above the EU mean weakens regions' attractiveness of about 7 per cent. Therefore, once a foreign firm chooses to locate in a country well-endowed in terms of professionals and scientists, single regions' endowment of this kind of human capital become irrelevant. Finally, it is worth noticing that labour costs enter negatively in the regression when the country effect is taken into account. However, the combination of the within and between country effect is positive, meaning that productivity considerations are more important than efficiency considerations. Intra-EU manufacturing foreign firms are more sensitive to country cost considerations than extra-EU and service foreign firms, while the latter are more attracted by productivity considerations which however work at regional level only. To sum up, results confirm the idea that regional absolute characteristics are not enough to explain regional ability to attract FDI. Indeed the ability of regions to attract foreign investments is influenced by the country they are located in, in an interplay of within-country effects and at between-countries effects that assume different roles along the different dimensions of the analysis.

5 Conclusions

This paper has explored the spatial distribution of FDI across EU regions and tried to understand whether European regions' capacity to attract FDI is affected by national boundaries. In order to achieve this research objective, we first explored which are the determinants of foreign direct investment at regional level. In so doing, we were inspired by the economic literature, which has stressed the importance of several variables as determinants for foreign investments, at country, region, industry, and firm level. We found that foreign firms are attracted by dynamic regions with a good market access, though this effect is weaker than the former. Supply conditions matter more than demand conditions. In particular, we found that agglomeration forces are important, but only in two specific sectors, i.e. traditional labour intensive manufacturing sectors and business services. More importantly, FDI prefers to locate in regions where other foreign firms have already set up production plants, and well endowed with different varieties of human capital, ranging from command and

control functions to plant and machine operators.¹⁰

Generally speaking, these effects also hold when firms' heterogeneity is accounted for, with few notable exceptions. We refer here to market access that is relevant for extra-EU foreign firms only, and to regions' specialization in high-tech manufacturing sectors, which seems to exert a negative effect on intra-EU foreign firms because of competition effects.

Spatial heterogeneity seems to be more important than firms' heterogeneity. In particular, we found that the intensity of the above mentioned relationships substantially change when regional and country performance are interlinked. We have considered to different effects: the first relate to the relative performance of a region within the country it belongs to, while the second concerns the relative performance of the country in the EU. We demonstrated that second effect proved to be more strong and significant than the previous one. The between country effect is on average positive, therefore it further boosts regions' capacity to attract FDI, with a notable exception which concerns regional endowment of human capital and, in particular, scientists and professionals.

These results, though preliminary, have important policy implications. From our analysis it becomes clear that spatial heterogeneity, more than spatial autocorrelation, matters for foreign firms location processes. This makes the implementation of FDI promotion policies more difficult, since they have to take into account both regional and country characteristics in order to be effective. The lack of co-ordination between the two levels of governance may be a possible explanation of the unsatisfactory performance of several regions in terms of attraction of FDI.

6 References

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¹⁰This broad results reflect that foreign firms operate in several economic sectors and, therefore, need a labour force with a wide range of specificities.

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7 Appendix 1

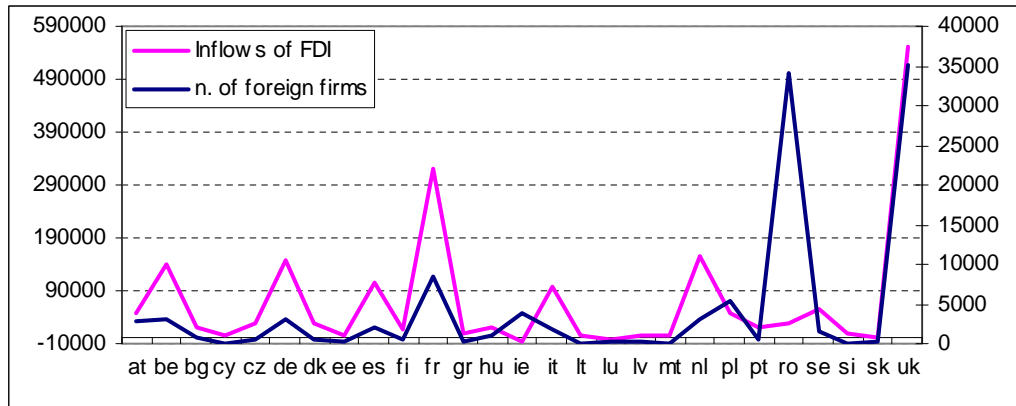
This paper exploits a new database, FDIRegio, which has been built up starting from Amadeus database. It consists of company accounts reported to national statistical offices concerning 11 million public and private companies in 41 European countries. For each company Amadeus provides the year of incorporation, the country/region and the ownership structure by nationality. The data also include the region where the firm were founded, as well as the sector of activity. Firms newly created during the 2005-07 period whose percentage of assets owned by non-residents was at least 10% have been considered as foreign. Then they were aggregated in each European NUTS2 region by sector and by origin within or outside Europe. The overall sample includes 264 NUTS2 regions and 25 NACE1 manufacturing and service sectors.

A limitation of these data for studying the geographical patterns of foreign firms is that they include either plant or firm level information. This can potentially bias the location of FDI in favour of regions and/or countries where headquarters tend to locate. An advantage of this approach is instead represented by the fact that the regional distribution of foreign firms is directly observed and not indirectly derived from a "regionalization" of national data. This top-down approach, in fact, is based on the simplifying assumption that the sensitivity of foreign firms to employment data – or whatever it is used to

regionalize patterns of FDI – is constant across foreign firms, regardless the internationalization strategy they pursue (efficiency, market and resource seeking FDI), the country of origin and the role foreign affiliates can play within the group (productive vs. research units).

In order to have an idea of the degree of inclusiveness of the dataset, we compared official (UNCTAD) data on inward FDI flows at country level with the total number of foreign firms extracted from Amadeus following the criteria described above. Figure A1 shows the results. It is worth noticing that the correlation between the two measures of FDI flows is quite high. Thus, by considering number of foreign firms instead of values of FDI we do not introduce any significant distortion in the patterns of FDI, though foreign investments in some destination countries have a relative importance that is different in terms of number of firms with respect to the value of FDI inflows.

Table A1. Representativeness of the sample: Official inflows of FDI (millions of USD) vs. newly established foreign firms (2005-07)



Pearson correlation coefficient: 0.626; p-value > 0.000.

8 Appendix 2

Table A1. Spatial heterogeneity

| All FDI | slope | d1 | d2 | d1d2 |
|---|----------------------|---------------------|----------------------|---------------------|
| main | | | | |
| lag_FDI | 0.612*** (8.57) | 0.119 (0.94) | 0.0306 (0.14) | -0.102 (-0.77) |
| GDP_growth | 0.0481** (2.26) | -0.00319 (-0.03) | 0.725*** (3.27) | -0.155 (-0.98) |
| Labour_Cost | 0.0827 (1.24) | -0.335 (-1.57) | -0.262 (-0.58) | 0.340 (1.47) |
| Market_Accessibility | 0.0110 (0.25) | 0.106 (1.04) | 0.371** (2.15) | |
| Low_Tech | 7.702** (2.58) | -0.154 (-1.47) | 0.465 (1.15) | -0.0534 (-0.38) |
| Medium_Tech | 1.877 (1.02) | -0.0601 (-0.47) | 0.298 (1.45) | 0.0272 (0.21) |
| High_Tech | -2.054 (-0.43) | 0.105 (1.11) | 0.181 (-0.65) | -0.118 (-0.73) |
| Business_Services | 4.258*** (2.75) | -0.161 (-0.93) | -0.211 (0.63) | -0.0212 (0.13) |
| Corporate_Managers | 10.29** (2.39) | 0.0155 (0.12) | 1.037*** (4.14) | -0.357** (-2.45) |
| SMEs_Managers | -7.738 (-1.12) | 0.0117 (0.12) | -0.134 (-0.47) | 0.131 (0.82) |
| Professionals_Scientists | 6.281* (1.93) | -0.199 (-1.21) | -0.712*** (-3.13) | 0.172 (0.91) |
| Clerks | 0.126 (0.04) | 0.265 (1.61) | 0.615 (1.53) | -0.259* (-1.72) |
| Plant_Machines_Operators | -1.950 (-0.62) | 0.138 (1.11) | 0.338 (1.48) | 0.0887 (0.52) |
| Dummy_RO | 3.143*** (5.74) | | | |
| Dummy_PL | 1.507*** (4.08) | | | |
| _cons | -4.687*** (-4.17) | | | |
| N | 260 | | | |
| <i>t</i> statistics in parentheses | | | | |
| OLS estimation | | | | |
| * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ | | | | |

Table A2. Spatial heterogeneity

| ExtraEU_FDI | slope | d1 | d2 | d1d2 |
|--------------------------|----------------------|--------------------|--------------------|---------------------|
| main | | | | |
| lag_FDI | 0.403*** (7.06) | 0.324** (2.41) | 0.450** (2.39) | -0.0535 (-0.39) |
| GDP_growth | 0.0548*** (2.60) | -0.0437 (-0.45) | 0.813*** (4.42) | -0.126 (-0.87) |
| Labour_Cost | 0.109* (1.74) | -0.0783 (-0.56) | 0.0928 (0.31) | 0.132 (0.76) |
| Market_Accessibility | 0.117** (2.45) | -0.129 (-1.27) | 0.330*** (2.60) | |
| Low_Tech | -4.629* (-1.86) | 0.108 (0.95) | 0.210 (0.64) | 0.0549 (0.39) |
| Medium_Tech | 1.017 (0.64) | 0.0242 (0.20) | -0.167 (-1.03) | -0.0592 (-0.46) |
| High_Tech | 10.67** (2.35) | 0.152* (1.69) | 0.380* (1.74) | -0.399** (-2.44) |
| Business_Services | 0.281 (0.20) | 0.261* (1.75) | -0.176 (-0.63) | -0.139 (-0.75) |
| Corporate_Managers | 17.33*** (3.88) | -0.0778 (-0.79) | 0.319 (1.43) | -0.226 (-1.26) |
| SMEs_Managers | -5.411 (-1.28) | -0.110 (-1.15) | 0.114 (0.56) | 0.0597 (0.39) |
| Professionals_Scientists | 2.742 (1.08) | -0.193 (-1.33) | -0.206 (-1.05) | 0.205 (1.28) |
| Clerks | -6.014** (-2.23) | 0.0429 (0.30) | 1.023*** (3.43) | -0.0507 (-0.32) |
| Plant_Machines_Operators | -5.308* (-1.84) | 0.0850 (0.75) | 0.901*** (4.26) | -0.0735 (-0.49) |
| Dummy_RO | 3.308*** (6.87) | | | |
| Dummy_PL | 0.522* (1.73) | | | |
| _cons | -3.984*** (-4.37) | | | |
| lambda | | | | |
| _cons | -0.604 (-0.62) | | | |
| sigma | | | | |
| _cons | 0.456*** (22.72) | | | |
| N | 260 | | | |
| R ² | | | | |

t statistics in parentheses

Spatial ML estimation

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A3. Spatial heterogeneity

| IntraEU_FDI | slope | d1 | d2 | d1d2 |
|--------------------------|----------------------|--------------------|----------------------|--------------------|
| main | | | | |
| lag_FDI | 0.616*** (10.91) | 0.0587 (0.44) | -0.0567 (-0.29) | -0.0738 (-0.54) |
| Labour_Cost | 0.0689 (1.07) | -0.281* (-1.90) | -0.327 (-1.04) | 0.279 (1.53) |
| Market_Accessibility | 0.00676 (1.07) | 0.169* (1.71) | 0.361*** (2.75) | |
| Low_Tech | 8.735*** (3.48) | -0.173 (-1.51) | 0.541 (1.64) | -0.0762 (-0.54) |
| Medium_Tech | 1.565 (0.98) | -0.0665 (-0.55) | 0.338** (1.98) | 0.0352 (0.27) |
| High_Tech | -4.352 (-0.95) | 0.0881 (0.97) | 0.0556 (0.24) | -0.0289 (-0.18) |
| Business_Services | 3.919*** (2.74) | -0.194 (-1.31) | -0.154 (-0.54) | 0.0171 (0.09) |
| Corporate_Managers | 7.315 (1.64) | 0.0190 (0.19) | 1.102*** (4.83) | -0.293* (-1.70) |
| SMEs_Managers | -7.801* (-1.82) | 0.0389 (0.41) | -0.210 (-1.00) | 0.111 (0.72) |
| Professionals_Scientists | 7.227*** (2.83) | -0.189 (-1.28) | -0.748*** (-3.81) | 0.167 (1.04) |
| Clerks | 2.347 (0.83) | 0.252* (1.72) | 0.500 (1.56) | -0.244 (-1.50) |
| Plant_Machines_Operators | -1.020 (-0.35) | 0.154 (1.33) | 0.278 (1.28) | 0.0750 (0.49) |
| Dummy_RO | 3.082*** (6.27) | | | |
| Dummy_PL | 1.549*** (4.87) | | | |
| _cons | -4.791*** (-5.15) | | | |
| lambda | | | | |
| _cons | 0.562 (1.24) | | | |
| sigma | | | | |
| _cons | 0.464*** (22.73) | | | |
| N | 260 | | | |
| R ² | | | | |

t statistics in parentheses

Spatial ML estimation

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4. Spatial heterogeneity

| Services_FDI | slope | d1 | d2 | d1d2 |
|--------------------------|----------------------|---------------------|----------------------|---------------------|
| main | | | | |
| lag_FDI | 0.671*** (11.32) | 0.161 (1.14) | -0.0775 (-0.39) | -0.0470 (-0.32) |
| GDP_growth | 0.0639*** (2.90) | 0.101 (0.99) | 0.800*** (3.88) | -0.304** (-2.00) |
| Labour_Cost | 0.111* (1.65) | -0.209 (-1.33) | -0.410 (-1.25) | 0.160 (0.83) |
| Market_Accessibility | 0.0401 (0.78) | 0.157 (1.49) | 0.381*** (2.78) | |
| Low_Tech | 6.578** (2.50) | -0.163 (-1.35) | 0.303 (0.87) | -0.0208 (-0.14) |
| Medium_Tech | 0.710 (0.42) | 0.0227 (0.18) | 0.218 (1.22) | -0.00994 (-0.07) |
| High_Tech | -2.992 (-0.62) | 0.0350 (0.37) | 0.235 (0.99) | -0.0423 (-0.24) |
| Business_Services | 4.346*** (2.89) | -0.118 (-0.75) | -0.369 (-1.23) | -0.0893 (-0.46) |
| Corporate_Managers | 11.85** (2.52) | -0.00568 (-0.05) | 1.003*** (4.21) | -0.407** (-2.21) |
| SMEs_Managers | -9.357** (-2.08) | 0.0709 (0.71) | -0.0684 (-0.31) | 0.0816 (0.50) |
| Professionals_Scientists | 7.093*** (2.65) | -0.315** (-2.02) | -0.702*** (-3.41) | 0.296* (1.75) |
| Clerks | 1.414 (0.48) | 0.218 (1.42) | 0.655* (1.94) | -0.244 (-1.44) |
| Plant_Machines_Operators | -4.422 (-1.44) | 0.174 (1.43) | 0.400* (1.77) | -0.00542 (-0.03) |
| Dummy_RO | 3.417*** (6.62) | | | |
| Dummy_PL | 1.208*** (3.66) | | | |
| _cons | -5.601*** (-5.77) | | | |
| lambda | | | | |
| _cons | 0.332 (0.50) | | | |
| sigma | | | | |
| _cons | 0.485*** (22.77) | | | |
| N | 260 | | | |
| R ² | | | | |

t statistics in parentheses

Spatial ML estimation

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A5. *Spatial heterogeneity*

| Manufacturing_FDI | slope | d1 | d2 | d1d2 |
|--------------------------|----------------------|----------------------|----------------------|--------------------|
| main | | | | |
| lag_FDI | 0.434*** (9.43) | 0.0233 (0.21) | 0.429*** (2.73) | -0.0951 (-0.85) |
| GDP_growth | 0.0178 (1.04) | -0.0450 (-0.57) | 0.598*** (3.82) | -0.117 (-0.99) |
| Labour_Cost | 0.0385 (0.73) | -0.312*** (-2.60) | -0.154 (-0.60) | 0.308** (2.07) |
| Market_Accessibility | -0.0109 (-0.28) | -0.0960 (-1.20) | 0.231** (2.15) | |
| Low_Tech | 4.012* (1.96) | 0.00228 (0.02) | 1.003*** (3.72) | -0.104 (-0.90) |
| Medium_Tech | 2.218* (1.70) | -0.0330 (-0.34) | 0.422*** (3.03) | 0.0413 (0.39) |
| High_Tech | -0.920 (-0.25) | 0.196*** (2.66) | 0.224 (1.20) | -0.171 (-1.27) |
| Business_Services | 3.032*** (2.61) | -0.133 (-1.09) | 0.255 (1.09) | 0.0972 (0.64) |
| Corporate_Managers | 4.104 (1.13) | 0.0520 (0.64) | 1.205*** (6.47) | -0.208 (-1.48) |
| SMEs_Managers | -4.694 (-1.34) | -0.0441 (-0.57) | -0.291* (-1.71) | 0.135 (1.07) |
| Professionals_Scientists | 2.451 (1.17) | 0.0221 (0.18) | -0.521*** (-3.25) | -0.0671 (-0.51) |
| Clerks | 1.167 (0.50) | 0.0971 (0.81) | 0.538** (2.08) | -0.127 (-0.96) |
| Plant_Machines_Operators | 1.925 (0.81) | 0.0584 (0.61) | 0.225 (1.27) | 0.135 (1.08) |
| Dummy_RO | 2.628*** (6.60) | | | |
| Dummy_PL | 1.902*** (7.34) | | | |
| _cons | -3.837*** (-5.06) | | | |
| lambda | | | | |
| _cons | 0.632* (1.75) | | | |
| sigma | | | | |
| _cons | 0.378*** (22.73) | | | |
| N | 260 | | | |
| R ² | | | | |

t statistics in parentheses

Spatial ML estimation

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A6. Variable Description

| VARIABLES | DESCRIPTION |
|--------------------------------|---|
| GDP growth | % change real regional GDP (2004). Data source: Eurostat |
| Labour Cost | Average annual labour cost: salaries and wages in 2004 (excluding apprentices and trainees). Data source: Eurostat |
| Market Accessibility | Weighted average of GDP of all European regions j other than i. The weights are the reciprocal of the time distances between the respective capitals. Reference year: 2004. Data source: Eurostat and DGRegio |
| FDI /Lag_FDI | Number of new foreign firms per million inhabitants. Reference period: 2005-07 for the dependent variable and 2001-2003 for the independent variable. Data source: Eurostat and Amadeus |
| Low Tech | Specialization Index. Share of regional value added generated by sectors with low technological intensity on total value added generated by the region. Reference year: 2004. Source Eurostat |
| Medium Tech | Specialization Index. Share of regional value added generated by sectors with medium technological intensity on total value added generated by the region. Reference year: 2004. Source Eurostat |
| High Tech | Specialization Index. Share of regional value added generated by sectors with high technological intensity on total value added generated by the region. Reference year: 2004. Source Eurostat |
| Business Services | Specialization Index. Share of regional value added generated by business services sectors on total value added generated by the region. Reference year: 2004. Source Eurostat |
| Corporate Managers | ISCO-88/ 12 employment share on total regional employment (three-year average, 2002-2004). Data provided by DGRegio |
| SME's Managers | ISCO-88/ 13 employment share on total regional employment (three-year average, 2002-2004). Data provided by DGRegio |
| Professionals and Scientists | ISCO-88/ 2 employment share on total regional employment (three-year average, 2002-2004). Data provided by DGRegio |
| Clerks (White Collars) | ISCO-88/ 4 employment share on total regional employment (three-year average, 2002-2004). Data provided by DGRegio |
| Skilled Workers (Blue Collars) | ISCO-88/ 8 employment share on total regional employment (three-year average, 2002-2004). Data provided by DGRegio |