# Foreign Direct Investment and Growth: a Regional European Perspective

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**Abstract**

*This paper aims at assessing empirically the link existing between FDI and the economic performance of the EU regions through a propensity score matching approach. This method has become increasingly popular in the evaluation of economic policy interventions and it seems particularly appropriate also in this context, since it allows to solve some methodological issues highly debated in the empirical literature on FDI and growth, i.e. sample selection bias and the functional form of the relationship under consideration. The adoption of a quasi-experimental design allows us to make inference on a broader variety of issues related to the interplay between FDI and growth, compared with other more traditional empirical approaches. To this respect, we demonstrate that quantitative characteristics matter less than qualitative characteristics of FDI in enhancing regions' performance. As for qualitative characteristics, we will distinguish FDI according to the country of origin (i.e. European vs. non-European countries) and the sector affiliation (i.e. low vs. high tech manufacturing sectors; business services vs. financial services, etc.). This rich approach may help policy makers in designing FDI promotion policies that are consistent with their development strategy.*

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## 1. Introduction

The purpose of this paper is to link the various theoretical arguments regarding the likely sources of knowledge and technological spillovers from foreign direct investment (FDI) to issues concerning the role these spillovers can play in fostering growth and development at regional level. In so doing, we explore the different experiences among EU regions.

Many policy makers and academics argue that FDI can have important positive effects on a host location's development efforts, the main reason being that, in addition to the direct capital financing it supplies, FDI is also a valuable source of technology and know-how. Hence, the impact of FDI on growth is expected to be manifold. FDI may complement local investment and can add to local production capacity. Moreover, it can promote growth by stimulating productivity gains resulting from spillovers to local firms. While technology may widespread through several channels, FDI is one of the main mechanism through which host economies can gain access to advanced technologies as well as managerial knowledge and skills. This may help in relaxing human capital constraints and increasing development opportunities.

Although these arguments are very common in the literature based on country level evidence, the FDI-growth relationship at regional level presents some ambiguities. Does FDI widen or shorten regions' disparities? Do FDI-related technological spillovers occur only in advanced regions – because they possess the capacity to absorb new technology and know-how – thus increasing regional disparities, or also in less advanced regions, making them able to converge towards higher levels of development as stated by the technology gap literature? Is the capital augmenting effect of FDI in advanced regions more or less relevant than in the laggard ones? Are foreign firms investing in advanced regions technological superior with respect to local firms? If not, how can they contribute positively to local growth and development?

This paper revisits the FDI and economic growth relationship by empirically assessing the link existing between FDI and the economic performance of the EU regions through a propensity score matching approach. This method has become increasingly popular in the evaluation of economic policy interventions and it seems appropriate also in this context, since it allows to solve sample-selection and self-selection problems, which represent highly debated and still open issues in the empirical literature on FDI and growth. Moreover, the latter is mainly based on traditional regression approaches where the FDI variable is added in a rather *ad hoc* manner rather than being derived consistently from the theory. By avoiding to impose a restrictive functional form on the relationship between FDI and income growth, we will be able to make inference on a broader variety of issues related to the interplay between FDI and growth, compared with other more traditional empirical approaches.

To this respect, we will try to demonstrate whether and to what extent quantitative characteristics matter more or less than qualitative characteristics of FDI in enhancing regions' performance. As for qualitative characteristics, we will distinguish FDI according to the country of origin (European vs. non-European countries) and the sector affiliation (i.e. low vs. high tech manufacturing sectors; business services vs. financial services, etc.).

An analysis of the impact of FDI using sub-national data is useful for at least two reasons. First of all, we augment the existing empirical evidence on the economic benefits of inward FDI to the host economies. Secondly, an understanding of how FDI affects host economies is vital to design policies able not only to attract FDI suitable to achieve local development goals, but also to embed them in the local economic framework thus increasing the probability to keep them for a long time.

The paper is organized as follows. Section 2 briefly discusses the theoretical foundations for our analysis. Section 3 presents some empirical evidence on FDI and growth in Europe, while Section 4 explains the methodological issues. Section 5 presents the results and Section 6 concludes by summarizing main findings and discussing their implications.

## 2. Theoretical background

The existing empirical literature on FDI has focused on three different aspects: *i)* why foreign firms invest abroad; *ii)* what drives inward FDI flows; *iii)* what the impacts on host economies are and whether they are positive or negative. Only the third aspect is of interest for the present study, especially if the sub-national level is taken into consideration.

Generally speaking, the literature acknowledges that FDI plays a relevant role in economic development processes of host economies through several channels, which go far beyond the increase in the local endowment of financial and physical capital. In the neoclassical growth models *à la* Solow (Solow, 1956) this implies that local economies switch on a higher growth path, though the growth rate maintains constant in the long run. In endogenous growth models, instead, the impact of FDI may be more relevant because of the presence of indirect effects which are able to potentially affect all variables included in the production function. Capital productivity improves because of the increase in the endowment of equipments and the number and variety of intermediates; labour productivity increases because of the acquisition of knowledge and managerial techniques coming from abroad and total factor productivity may improve because of the transfer of new technologies. Consequently, growth rates may permanently increase, thus improving development prospects in the long run.

These indirect effects that benefit the host economies, called more properly spillovers, arise since multinational firms cannot completely internalize the benefits of knowledge and technologies which are at the base of their competitive advantage (Kokko, 1994; Markusen, 1995). The intensity of these spillovers may vary according to their nature intra- or inter-sectoral. While multinational firms try to avoid intra-sectoral spillovers because they benefit their direct competitors, they may produce inter-sectoral spillovers since they benefit suppliers and clients (Kugler, 2006). Another important indirect effect arising from the presence of multinational firms is export spillover, which affects local firms' export decisions (Girma et al., 2004; Kneller and Pisu, 2007).

Literature suggests that FDI affects host economies through different channels, such as the composition effects, competition effects, employment effects and technological spillovers (Barba Navarretti and Venables, 2004). The transmission of the latter may occur through imitation processes, labour force training, pro-competitive effects, and input-output linkages (Blomstrom and Kokko, 1998). Regardless of the channel chosen, the impact of FDI on growth is far from being automatic; rather, it depends on the degree of complementarity and substitutability between foreign and domestic capitals (De Mello, 1999), the degree of development of the host economies (Johnson, 2006; Carkovic and Levine, 2005; Blonigen and Wang, 2005), the capacity of the host economy to absorb new technologies and knowledge brought by foreign firms (Borensztein et al., 1998), the degree of openness of the host economies (Balasubramanyam et al., 1996), the degree of embeddedness of foreign firms in the local economies (Markusen and Venables, 1999; Rodriguez-Clare, 1996) and other host economies' characteristics, such as the quality of the institutions and, generally speaking, the business environment (Olofsdotter, 1998; Blomstom and Kokko, 2003; Xu, 2000).

Despite the *plethora* of FDI-growth studies, the relationship between FDI and growth is still not clear, since many of these studies are based on *aggregate* data on FDI, which do not allow either to distinguish between different type of FDI (vertical vs. horizontal; greenfield vs. other forms of FDI), which is potentially important (Beugelsdijk et al., 2008) or to consider host economies at a finer geographical disaggregation (sub-national levels). Consequently, it is implicitly assumed that, on the one hand, different type of FDI has the same impact on economic growth, and, on the other hand, that the impact of FDI on economic growth is constant through space.

However, from the literature one can logically deduce the opposite: different types of FDI affect growth in different ways because the nature of the investment partly determines the way FDI affects growth. For examples, the impact on employment and production capacity will be higher in presence of a greenfield FDI than in presence of an acquisition of an existing local firms, either private or formerly state-owned, though the creation of spillovers may be the same (Krugman, 2000; Wang and Wong, 2009). Moreover, horizontal FDI may create more spillovers because of their relatively more intensive use of capital in local economies, while Vertical FDI has a higher impact on local labour demand (Beugelsdijk et al., 2008) and generate inter-sectoral spillovers. Finally, with few exception, most studies focus on FDI in manufacturing, while ignoring either finer disaggregation within manufacturing sector or FDI in services.[2]

When the FDI-growth relationship is considered at sub-national level, ambiguities increase even more. Generally speaking, Mullen and Williams (2005) argue that the impact of FDI on growth is not affected by the dimension of the geographical unit taken into consideration, while Girma and Wakelin (2001) claim for a regional dimension of FDI for several reasons. First of all, the effects of FDI-related spillovers are expected to be localized. Secondly, it is not clear whether laggard regions are able to benefit from the presence of foreign firms: a foreign investment increases local capital accumulation, but the host economy might not possess the capacity to absorb the knowledge and the technology incorporated in such investment (Findlay, 1978; Blomstrom and Kokko, 1998). Other ambiguities relate to the expected transfer of superior technology from foreign to domestic firms, based on the assumption that foreign firms are by definition technologically superior to domestic firms (Markusen, 1995). But, what happens when foreign firms undertake an investment in a technologically advanced region in order to exploit its knowledge (Dunning, 1999; Cantwell, 1989)?

In conclusion, there remains a clear need to quantify the impact of FDI on regional economic performance. This paper addresses the implications of FDI for regional growth in the context of the European Union. In so doing, we will not only augment the existing evidence on the impact of FDI on EU regions' performance, which is quite scarce, at least in our knowledge, but also try to overcome some of the ambiguities that still plague the literature.[3] More specifically, our study aims at uncovering whether the FDI growth effect depends more on the "quantitaty" of FDI undertaken rather than they qualitative characteristics. The latter, due to data limitations, are proxied with some structural characteristics, such as the sectoral affiliation of foreign-owned firms and the origin within or outside Europe of foreign inverstors. The sectoral affiliation matters to the extent that the benefits of FDI vary across sectors (Alfaro, 2003), while the

[2] Bobonis and Shatz (2007), Alfano (2003) and Girma and Wakelin (2001) represent notable exceptions.

[3] Studies examining the regional dimension of FDI generally deal with location choice rather than the impact on growth and productivity. Exceptions include Figlio and Blonigen (2000), Leichenko and Ericson (1997), Bode and Nunnekamp (2010), Bode et al. (2009) and Mullen and Williams (2005). All of them refer to the experience of US State. As for Europe is concerned, the existing works concentrate on specific countries or groups of them, mainly located in Central and Eastern Europe (Girma and Wakelin, 2007; Driffield, 2006; Nicolini and Resmini, 2011).

distinction between intra- and extra-Europe FDI allows us to check separately the impact on EU regions' performance of globalization and European integration processes.

**3. Empirical Evidence on FDI and Growth in Europe.**

A widespread wave of globalization has affected world economy since the beginning of the past decade, with FDI playing a major role as a way of internationalizing economic activity. Despite the slowdown caused by the recent crisis, the importance of worldwide economic integration as a fuel for sustained growth has been recognized by all international organizations, with the European Commission stating the importance of reinforcing the single market and ease investment procedures as a major stimulus for growth (Europe 2020 Agenda). Indeed, multinational enterprises (MNEs) play a leading role in shaping and driving cross-border integration through the transfer of production facilities, functions and or technology across space (Baldwin and Martin, 1999; OECD, 2007). These trends have been reinforced by the liberalization of new markets, especially in the service sectors, the reduction of capital movement restraints, and the creation of a friendly environment for foreign direct investment, especially in the EU.

Despite the cyclical character of FDI flows and their dependence from economic fundamentals, inward FDI stocks in the EU have increased exponentially since the 1980s, reaching their peak in 2007, with more than 7,000 billions of USD (about 45% of total world stocks).[4]

Although these figures are useful to understand the size of the aggregate phenomenon, they are not useful to understand their impact at local level. At this purpose, more disaggregated data at geographical level are needed. We derive them by using the FDIRegio database.[5]

Map 1 shows the number of new foreign affiliates established in the EU during the 2005-07 period . Looking at spatial patterns, the picture depicted generally corresponds to the existing evidence on MNE location patterns across Europe (EC, 2006). In particular, most new foreign affiliates appear to be located in the EU's core, i.e. the area going from the UK to the north of Italy, including regions on the border between France and Germany, Ireland, Belgium, and the Netherland. Remarkable exceptions to this traditional pattern are Austria and the Spanish regions of Madrid, Cataluña and Basque, that have also attracted a large number of new multinationals.

FDI in the new EU member states is largely concentrated in Romania, the Baltic Republics, and also, to some extent, in Poland. As a general trend we can say that capital regions seem to be able to attract a the highest number of new foreign firms. This result is particularly clear in Czech and Slovak Republics, and in Bulgaria, though in all new member states the concentration of FDI is stronger in capital regions than in other regions.

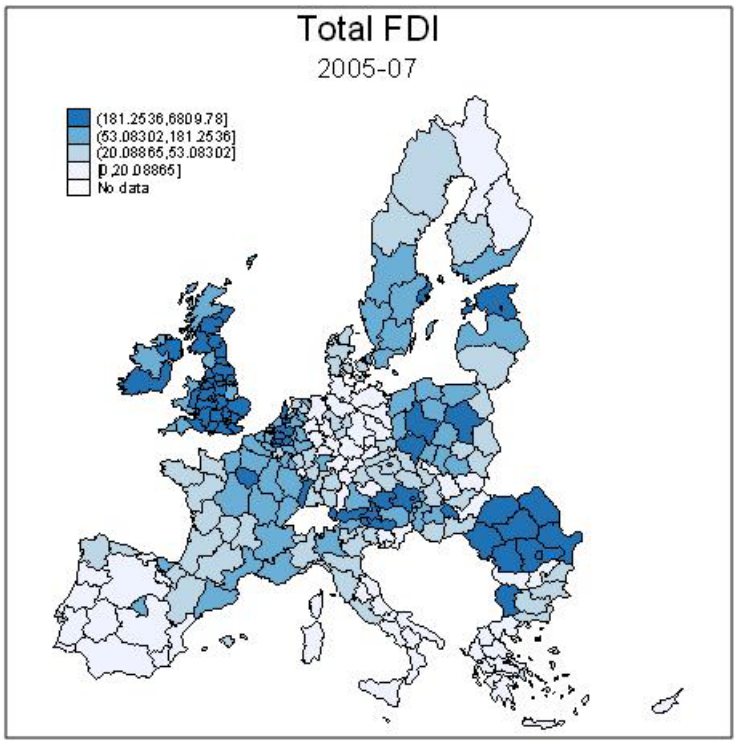
Another interesting fact that emerge from the map is that Southern and Eastern external EU borders have been clearly at the margin of the location patterns of MNEs in Europe. This phenomenon is particularly alarming in Italy, Greece, Portugal and some external regions of Poland and Romania, whose regions have attracted a very low number of foreign firms, as compared to other Western European countries.

[4] See UNCTAD, *World Investment Reports*, various issues for an in-depth analysis of FDI flows and stocks at European and world levels.

[5] The FDIregio database has been compiled on the basis of the Amadeus database. See the Annex for more details on it and its representativeness.

As a last remark it is worth noticing that, beside these general trends, foreign firms tend to be spatially clustered, both in Eastern and Western Europe. The two main clusters include most of British and Romania regions, thus suggesting that patterns of FDI may be driven, among many other things, by national specificities.

**Map 1. The distribution of FDI across EU27 regions**




If we look at the relationship between the distribution of FDI and economic performance of the EU regions we uncover that the penetration of FDI increases with GDP level and growth rates, as indicated by Figure 1. This implies that foreign firms tend to locate in richest regions and regions receiving more FDI grow faster than other regions. Thus, foreign firms may weaken or reverse convergence processes in Europe.

However, these relationships do not seem very robust. There is in fact a large number of regions with quite similar GDP level but with a very different concentration of FDI, as well as there are several regions with high growth rates and a low concentration of foreign firms and vice versa.

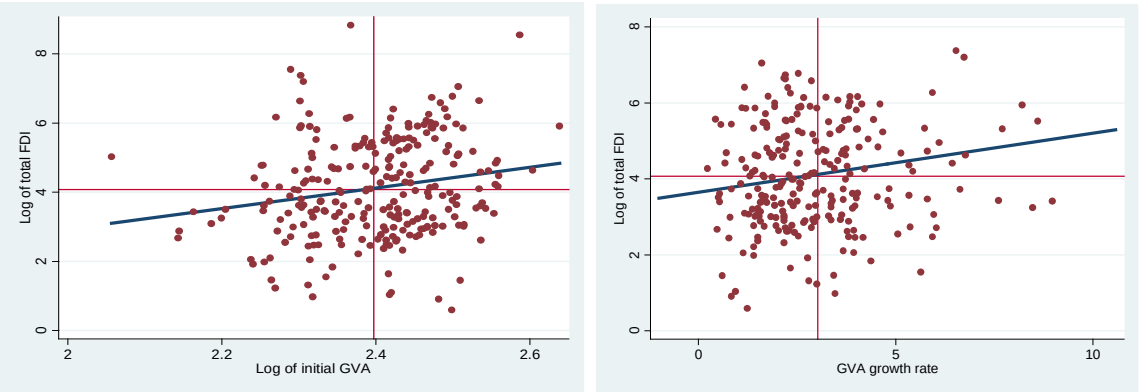
In conclusion, the empirical evidence suggests us that the relationship between FDI and growth is more complex than it can seem at first sight and deserves a thorough evaluation that goes far beyond traditional linear regression analysis.

## 4. Methodological issues

When analyzing the relationship between foreign investment and regional growth several methodological issues have to be taken into consideration. First of all, it is not possible to define a priori the direction of causality: do foreign investors identify more dynamic regions as best destinations of their capital flows because they anticipate higher future profits or does regional growth depend directly on the contribution of foreign investors? The best answer is probably that both mechanisms are acting contemporaneously and

reinforce each other.[6] For this reason, simple OLS regressions explaining regional growth in terms of FDI would most likely lead to inconsistent results due to reverse causality bias. This source of endogeneity should be partially mitigated by the regional perspective, given that foreign investors locating in any of European regions are more likely interested in the whole EU market rather than in the local one, which is surely too small for their profit objectives.

**Figure 1. The FDI and economic performance in the EU regions.**




Apart from this endogeneity-related aspect, two other issues seem to be more relevant in our context. First of all, though growth theory provides well-established suggestions for the estimation of growth relationships (Islam, 2003), it is *ex ante* unclear which functional form is more appropriate for the effects of FDI. Since, as stated by the theory, FDI may affect simultaneously each element of the production function, there may be non-linearities - highlighted by the empirical evidence, too – and interactions which may lead to biased estimates if not accounted for. Secondly, there may be a selection bias. In order to properly estimate the impact of FDI on regional growth rates, we should know the difference between regions' growth rates with and without FDI. Clearly, we cannot observe both growth rates for the same region at the same time and taking the average growth rate of regions without FDI as an approximation may not be advisable since regions with and without FDI may differ in many aspects other than the presence of FDI.

These considerations bring us to chose a quasi-experimental research framework that allows us to mitigate some of the problems discussed above: Propensity Score Matching (PSM). This methodology is based on the idea that the bias due to sample selection is reduced when the comparison is performed using treated and control groups which are as similar as possible. Since matching may be difficult, especially in large samples, this method summarizes pre-sample characteristics into an index, the propensity score, that makes the matching feasible (Becker and Ichino, 2002). The Propensity Score (PS) is defined as the probability of receiving a treatment. It is a function of all relevant observed characteristics *X* such that the conditional distribution of *X*, given PS, is independent of the assignment to the treatment.

In our context, this implies, first, the estimate of each regions' propensity to receive FDI of a given type as a function of some (observable) regions' characteristics, and then matching regions with similar propensities.

[6] The existence of a reciprocal relationship between FDI and growth is confirmed by Choe (2003) and Chowdhury and Mavrotas (2006), while Feridun and Sissoko (2006) find that, according to Singapore's experience, it is growth to determine FDI. An opposite result has been found by Zhang (2001) and partially by Chowdhury and Mavrotas (2006).

We identify treatment and control groups as top receiving regions[7] in terms of FDI and all the others, respectively. This methodology allows us to get rid of all pre-treatment differences and matches treated regions with control group ones that are similar to the former in all relevant characteristics. Once the matching takes place it is possible to derive the Average impact of the Treatment on Treated regions (ATT) as:

$$ATT=E(Y_{1,i}-Y_{0,i}|T_i=1)=E(Y_{1,i}|T_i=1)-E(Y_{0,i}|T_i=1)$$

Note that $E(Y_{1,i}|T_i=1)$ is observed and represents the average outcome (GDP growth rate) of region *i* with the treatment (FDI). $E(Y_{0,i}|T_i=1)$, instead, represents the potential outcome of region *i* without the treatment. It is unobserved and needs to be estimated. In PSM technique, it is proxied with the outcome of control regions presenting the same value of PS(Xi).

PSM technique is based on 3 identifying assumptions:

1. *Conditional Independence*: $Y_{1,i} \perp T_i \mid X_i$ and $Y_{0,i} \perp T_i \mid X_i$. This implies that the potential outcomes are independent on the treatment status conditional on $X_i$, i.e. the multidimensional vector of pre-treatment characteristics. Note that Rosembaum and Rubin (1983) show that if potential outcomes are independent of treatment conditional on X, then they are independent of treatment also conditional on a balancing score such as PS. The implication of this assumption is that systematic differences in the outcomes between treated and control units with the same values of these covariates are attributable to the treatment (Imbens, 2004).

2. *Common Support*: $0 < Pr(T_i = 1 \mid X_i) < 1$. This assumption excludes situations of perfect predictability of the treatment status given $X_i$, ensuring that regions with the same X have a positive probability of being both participants and non-participants (Heckman, LaLonde and Smith, 1999).

3. *Stable Unit Treatment Value*: $Y_i \perp T_j \mid X_i$, for any $i \neq j$. This assumption requires that the distribution of outcome for one region is to be independent from the potential treatment status of another unit, given the observed covariates (see Rubin,1980, and Imai and van Dijk, 2004)

Before implementing ATT estimates, thus, we have to make sure that such assumptions are respected. Given the objective of our paper, the first two assumptions are not problematic, since the conditional independence assumption or unconfoundedness simply implies that all variables that influence treatment assignment and potential outcomes are simultaneously observed by the researcher and it is quite similar to the standard exogeneity assumption (Imbens, 2004), while the common support or overlap assumption is directly imposed by the estimation system.

As for the stable unit treatment variable assumption, we report in the table 1 the result of an OLS regression explaining growth[8], i.e. our outcome variable, augmented with a spatial lag of the treatment

[7] Top receiving regions are defined as the ones getting an amount of FDI per inhabitant higher than the 6$^{th}$ decile of FDI penetration distribution.

[8] Following the literature on economic growth determinants, we include the initial level of VA, a dummy identifying Central and Eastern European regions, the treatment variable (FDI in the period 2005-2007), labour costs, and index of specialization in business services (I and K Ateco 2002 setors), command and control function endowments, proxied with SMEs and Corporate Managers as a percentage of working population of the region, Human resources in Science and technology as a percentage of active population, expenses in R&D as a percentage of GDP and population of the region. See the appendix 2 for a detailed explanation of each variable and data sources.

variable (FDI). The spatial lag of the treatment for region i is built as weighted average of treatment participation indicators for every other unit j≠i, where weights are identified by standardized coefficients of inverse distance. Results show that given the observed covariates the distribution of outcome for each unit is independent from treatment participation of other regions, since the coefficient of the spatial lag is not significantly different from 0.[9] Therefore, the methodology seems to be appropriate for evaluating the FDI-growth relationship at regional level.

**Table 1. Stable Unit Treatment Assumption**

| GVA growth 05-07 | Coef. | sig. |
|---|---|---|
| gross VA 05 | -0,3364058 | |
| dummy EU12 | 3,23924 | *** |
| FDI | 0,585809 | ** |
| Spatial lag FDI | -0,2545784 | |
| Labour cost | 0,1903415 | |
| Business Services | 3,469872 | *** |
| Corporate Managers | -7,523902 | |
| SMEs Managers | 28,13182 | *** |
| Human resources in S&T (% of active population) | 0,0344241 | ** |
| R&D (% GDP) | 0,0628854 | |
| Population | 0,153457 | |
| Costant | 0,569225 | |
| Number of obs | 242 | |
| Adj. R-squared | 0,4806 | |

**, *** denote significance at 5 and 10 percent level.

In implementing the PSM technique we consider the following set of variables:

- *Treatment*: n. of foreign firms per million of inhabitants established in each EU27 region (NUTSII level) during the period 2005-07. We used different measures for FDI, from total number of FDI to more disaggregated penetration variables, which distinguish between sector of economic activity and origin of the foreign investors;
- *Outcome*: real gross value added growth rate of each region. The latter is measured as average yearly growth rate in the period 2005-2007.
- *Pre-treatment characteristic vector*: it includes the number of new foreign firms established in the region in the previous period (2001-2003), the GVA growth rate of the previous period, and region's market potential as proxies for the business environment and for demand conditions. The supply side characteristics include labour costs and the quality of human capital, proxied with the regional endowment of professionals and scientists.[10] We also included a dummy that identifies EU12 regions. Since regions' attractiveness is not independent from country relative attractiveness (Casi and Resmini,

[9] This result is consistent with Driffield (2006), who demonstrates that interregional spillovers from FDI are not existing in the case of the UK.
[10] See Appendix 2 for a detailed explanation of each explanatory variable and source of data.

2010), we interact labour cost, human capital endowment and FDI agglomeration variables with specific country dummies in order to take into account this potential country effect.[11]

Please note that we believe this set of variables is the best compromise between the need for taking into account all relevant variables in order not to bias results (Rubin and Thomas, 1996) and the importance of parsimony in order to avoid support problem and ensure efficiency (Bryson, Dorsett and Purdon, 2002).

We estimate the propensity score with both a logit and a probit model.[12] Since the estimated ATT may differs according to the matching techniques, we check the robustness of the results by jointly considering four of the most widely used matching algorithms proposed by the literature (Becker and Ichino, 2002; Caliedo and Kopeing, 2005). In particular we use:

a) *Single Neighbor matching with replacement*: in this case the closest region in terms of propensity score from the control group is matched with each treated unit. Allowing replacement increases the average quality of matching while decreasing the bias in ATT estimation. At the same time it increases variance because it reduces the number of distinct control units used to build the counterfactual outcome.

b) *50 Neighbors matching with replacement*: it is the same technique as case a) except that it allows oversampling, i.e. more than one neighbor is used to build the counterfactual. In this case variance is reduced but it increases the bias.

c) *Radius matching*: this method allows to match a treated unit with all other regions falling within a radius. In doing so it uses few extra controls when good matches are not available.

d) *Kernel and Local Linear matching*, instead, are non parametric matching estimators that use weighted averages of all individuals in the control group to construct the counterfactual outcome. They achieve higher level of efficiency because more information is used. At the same time they increase the risks of bad matching.

**5. Results**

Table 2 presents the estimates generated with propensity score matching techniques of the average treatment effect on the treated of receiving aggregate FDI on economic growth. As explained in the previous section this coefficient can be interpreted as the FDI growth premium that benefits regions with a high concentration of FDI.

On average, these results confirm that FDI can enhance economic growth at regional level. As for the quality of FDI, our findings are less robust, and deserve more analysis. In particular, we found that both intra and extra-Europe FDI are, on average, able to positively affect growth processes, though the effect generated by extra-Europe FDI is weaker than that of the former. Quite surprisingly, the growth premium arises in presence of FDI in services only, while the impact of FDI in manufacturing on growth, when significant, turns out to be negative.

[11] These variables have been inspired by the literature on FDI determinants. See among many others Barba Navarretti and Venables (2004), Markusen (1995), Helpman (1984), and Bloningen, (2005).

[12] Since estimates are robust, we discuss here only results obtained by estimating the propensity score with a logit techniques. As for probit analysis, results are available upon request.

**Table 2. Average Treatment Effect on Treated, results using different matching techniques**

| Treatment | | Single NN (logit) | | 50-NN (logit) | | Radius | | Kernel | | LL regression | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FDI tot | | 0,9894309 | * | 0,71508944 | * | 0,682434 | ** | 0,679837 | * | 0,8378326 | * |
| FDI services | | 0,1843333 | | 0,71689333 | * | 0,758667 | * | 0,540811 | | 0,1923428 | |
| FDI mananufacturing | | -1,686574 | ** | 0,35247685 | | 0,29253 | | -0,95028 | * | -0,945938 | |
| FDI extraEU | | 0,1153061 | | 0,39173466 | * | 0,476589 | * | 0,122512 | | 0,1253778 | |
| FDI intraEU | | 0,5317708 | | 0,73990627 | * | 0,723894 | ** | 0,610034 | | 0,4502899 | |

***, **, * indicate significance at 1, 5 and 10 percent level, respectively. Bootstrap SE.

These first results highlight, on the one hand, the important difference between the increasing integration among all European countries and the threat of globalization that sometimes represents a challenge for local economies. European integration thus seems to represent an opportunity for harmonious growth of regions. On the other hand, they confirm that the impact of FDI on growth is strongly determined by the structural characteristics of the investment.

By exploring more in-depth to what extent sectoral affiliation affect economic growth, we uncover other interesting results that deserve further analysis. As shown in Table 3, the positive impact of FDI in services on growth is mainly driven by FDI in business services (transport, storage services, communication services, computer services, R&D, machinery renting, technical assistance). Also foreign investments in financial and local services seems to be beneficial, although the result is not robust to all specifications. The negative impact of foreign investment in manufacturing, instead, is driven by FDI in medium (chemicals, transport vehicles, mechanical industries) and low tech (food and beverages, textile and clothing, leather and leather products, furniture, etc.) industries, while FDI in high tech industries is able to positively affect growth, though the estimated coefficient is never significant. Foreign investments in less technological intensive sectors might be undertaken for efficiency reasons, in order to exploit cheaper labour force. Given the low technological content of this kind of investments, technological spillovers may not arise.

**Table 3. ATT: sector affiliation.**

| treatment | | Single NN (logit) | sig. | 50-NN (logit) | sig. | Radius | sig. | Kernel | sig. | LL regression | sig. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FDI utilities | | -0,04197 | | 0,159269 | | 0,394498 | * | 0,068183 | | 0,069497 | |
| FDI local services | | 1,089474 | ** | 0,612798 | | 0,707059 | * | 0,764691 | * | 0,832373 | |
| FDI financial services | | 0,603889 | | 0,972374 | *** | 0,576172 | * | 0,572164 | | 0,494624 | |
| FDI business services | | 1,082313 | *** | 0,800129 | ** | 0,790327 | ** | 1,011189 | ** | 1,032415 | |
| FDI public goods | | 0,766954 | * | 0,302465 | | 0,493379 | * | 0,617386 | ** | 0,690112 | |
| HT manufacturing | | 0,070996 | | 0,2261 | | 0,365826 | | 0,104199 | | 0,277948 | |
| MHT manufacturing | | -1,16415 | * | -0,42871 | | -0,22791 | | -0,9717 | * | -0,64179 | |
| MLT manufacturing | | -0,23071 | | -0,1102 | | 0,080893 | | -0,4577 | | -0,55755 | |

***, **, * indicate significance at 1, 5 and 10 percent level, respectively. Bootstrap SE.

The different impact of manufacturing and services FDI on growth can be explained by several factors. First of all the null or negative effect of manufacturing foreign firms' might be signaling that those enterprises are export platforms or assets exploiting FDI; thus the territory is not able to retain any gain from the value they create. This cannot happen in the case of services, whose horizon is typically local as they delocalize to reach the consumer base and whose relapses have an immediate effect on the territory. Firms operating in the services sectors, indeed, are bound to create linkages with local economy if they want to succeed. A second explanation can be traced back to the different time horizon necessary to concretize gains in efficiency due to the presence of foreign firms: in the case of services the gains, if any, are expected to be almost contemporaneous to the establishment of the firm (improve in service level, increase in market competition, capital accumulation, etc). In the case of manufacturing sectors, instead, the positive impact is likely to show up in the long term.

Finally, by distinguishing between intra- and extra-Europe FDI and sector of affiliation, we can further qualify the FDI-growth relationship. In particular, we found a confirmation of the importance of the European integration process for growth, as it is shown in Table 4. Generally speaking, intra-EU FDI generates a growth premium larger than that generated by extra-Europe FDI. Moreover, the positive impact of the latter is confined to financial services, while intra-Europe FDI exerts a positive effect on growth even when undertaken in local (wholesale and retail trade, Hotels and restaurants, etc.) and business services. Neither intra- nor extra-Europe FDI in manufacturing are able to affect economic growth at regional level. The different impact exerted on regional growth rates by intra- and extra-Europe FDI can be explained by the fact that the former are more integrated into the local economies than the latter, thus yielding to positive growth effects.

## 6. Conclusions

The aim of this paper is to evaluate the growth effect of FDI at the regional level. In contrast with the existing literature, we avoid any functional forms and apply a treatment effect model that allows to overcome some methodological issues concerning the estimate of the relationship between FDI and growth. In so doing, we employ a database that record the number of foreign firms established in each EU regions during the period 2005-2007, the only available data at regional level, at least in our knowledge. The dataset also records the origin of the foreign investor and the sector of activity of the foreign affiliate. This allows us to analyze whether and to what extent the potential growth effect is due to the intensity of FDI or to the characteristics of it.

Statistical tests indicate that the approach is suitable for balancing pre-treatment differences among regions; therefore, we yield unbiased estimates of the regional growth effect of different types of FDI. In particular, our findings indicate that FDI has positive effects on European regions' growth rates. These positive effects are mainly driven by FDI in the service sectors and mainly in business services and financial intermediation, and by intra-EU FDI. This last result confirms the growth effect of the European integration process, while does not seem to support the beneficial effect of globalization in terms of economic growth.

Our major findings are quite robust through different specifications. This encourage us to suggest some tentative policy implications. First of all, FDI should be attracted on a selective base: quantity is not necessarily more important than quality. Secondly, in order to enhance growth, policy makers should open service sectors to foreign competition instead of attracting FDI in the manufacturing sector. Thirdly, the

single market program should not be postponed or further delayed in order not to slow down growth processes at regional level.

**Table 4. ATT: extra- vs. intra FDI by sector affiliation**

| treatment | | Single NN | Sig. | 50-NN | Sig. | Radius | Sig. | Kernel | Sig. | LL regr. | Sig. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Extra EU FDI utilities | | 0,420202 | | 0,07677781 | | 0,010724 | | 0,147015 | | 0,0054835 | |
| Extra EU FDI local services | | -0,201311 | | 0,4008427 | | 0,355743 | | 0,020893 | | 0,0550338 | |
| Extra EU FDI financial services | | 0,2701754 | | 0,58439765 | ** | 0,503311 | * | 0,485033 | * | 0,5508616 | |
| Extra EU FDI business services | | -0,211789 | | 0,39657316 | | 0,324173 | | -0,22658 | | -0,282591 | |
| Extra EU FDI public goods | | 0,3567073 | | 0,41380083 | | 0,530409 | * | 0,379593 | | 0,3306479 | |
| | | | | | | | | | | | |
| Intra EU FDI utilities | | 0,2920833 | | 0,28034169 | | 0,478079 | ** | 0,166998 | | 0,1927415 | |
| Intra EU FDI local services | | 0,9289216 | * | 0,89033333 | ** | 0,904941 | *** | 1,04461 | ** | 1,032778 | * |
| Intra EU FDI financial services | | 0,2277778 | | 0,76989681 | *** | 0,408074 | * | 0,338283 | | 0,3268763 | |
| Intra EU FDI business services | | 1,0248485 | ** | 0,66692726 | ** | 0,685464 | ** | 0,899461 | ** | 0,9865208 | ** |
| Intra EU FDI public goods | | 0,6812057 | * | 0,19165247 | | 0,412804 | | 0,548549 | | 0,5960423 | |
| | | | | | | | | | | | |
| Extra EU HT | | -0,286806 | | -0,0146736 | | -0,18826 | | -0,38276 | | -0,290476 | |
| Extra EU MHT | | -0,302381 | | -0,003898 | | -0,21632 | | -0,32522 | | -0,345035 | |
| Extra EU MLT | | -0,27029 | | 0,02094927 | | -0,34023 | | -0,29924 | | -0,247016 | |
| Extra EU LT | | -0,250926 | | -0,1119519 | | 0,242778 | | -0,04743 | | -0,084156 | |
| | | | | | | | | | | | |
| Intra EU HT | | -0,239071 | | 0,37930601 | | 0,373828 | | 0,258055 | | -0,024659 | |
| Intra EU MHT | | -0,249625 | | -0,1197154 | | -0,03819 | | -0,04721 | | -0,232572 | |
| Intra EU MLT | | -0,321723 | | 0,04491011 | | 0,102206 | | -0,3797 | | -0,367182 | |
| Intra EU LT | | -0,293958 | | 0,16708333 | | -0,06362 | | -0,23164 | | -0,143723 | |

***, **, * indicate significance at 1, 5 and 10 percent level, respectively. Bootstrap SE.

The present analysis also invites further research in related aspects. First of all, it would be desirable to account for other aspects of the heterogeneity of FDI, given that the growth effect of greenfield FDI may differ from that of M&A FDI, as well as horizontal and vertical FDI may impact differently on economic growth (Wang and W0ng, 2009; Beugelsdijk et al., 2008). Secondly, the scarce impact generate by extra-EU FDI needs further investigation on FDI of different source. Is the growth effect of FDI coming from advanced countries larger than that of FDI coming from emerging countries? Needless to say, these analyses are constrained by data availability at EU regional level. Finally, from the methodological point of view, a further issue deserve attention, at least in our opinion: the need to explore and taking into account possible

indirect effect of FDI on regional growth rate mediated by regional spillovers. This implies a combination of propensity score and spatial econometric techniques.

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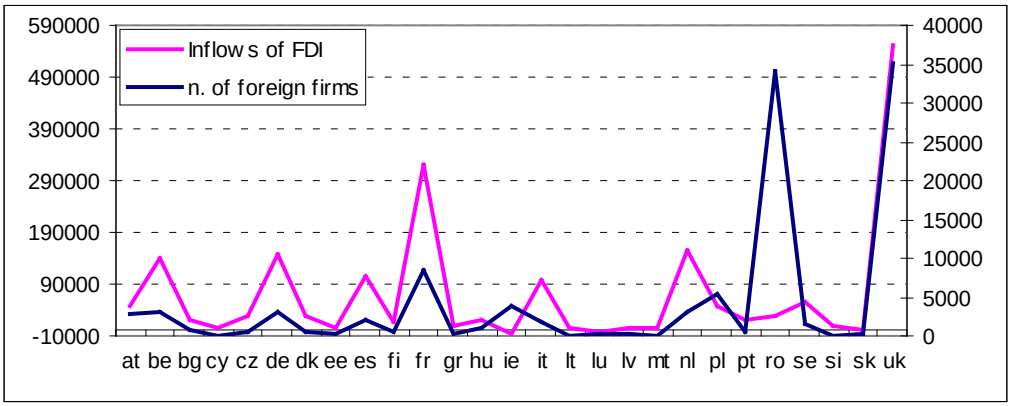
## Appendix: Representativeness of the sample

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 firms 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 firms 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. Official inflows of FDI (millions of USD) vs. newly established foreign firms (2005-07)*




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

## Definition source of variables

| VARIABLES | DESCRIPTION |
|---|---|
| GDP growth | % change real regional GDP (2001-2007). 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 |
| 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 |
| HR in Science and Technology | Share of active population employed in science and technology related tasks (2000). Data provided by DGRegio. |
| R&D expenses | Expenses in R&D as a percentage of total GDP of the region (2003). Data provided by DGRegio |
| Population | Regional population measured in millions of people resident in the region in 2005. Source: Eurostat |