2012:6

José Villaverde and Adolfo Maza

Inward Foreign Direct Investment in the European Union

Regional Distribution and Determinants

Sieps
Swedish Institute for European Policy Studies

José Villaverde and Adolfo Maza

Inward Foreign Direct Investment in the European Union

Regional Distribution and Determinants

– SIEPS 2012:6 –

Report No. 6
December 2012

Published by the Swedish Institute for European Policy Studies.
The report is available at www.sieps.se
The opinions expressed in this report are those of the authors.

Cover: Svensk Information AB
Print: EO Grafiska AB
Stockholm, December 2012
ISSN 1651-8942
ISBN 978-91-86107-36-9

Preface

Foreign direct investment (FDI) is generally considered to be a key factor in fostering economic growth. In light of the single market programme and the introduction of the euro, studying the determinants of FDI is of vital importance in a policy perspective. This study, which has been written by professors José Villaverde and Adolfo Maza at the University of Cantabria (Spain), adds important insights to the research on FDI by choosing a regional approach. The purpose of the report is to analyse the regional distribution of inward FDI flows in the EU during the period 2000-2006, particularly with regard to its evolution over time and its main determinants. The authors employ a new FDI database that offers information about the total amount of inward FDI in the EU regions.

The report concludes that regions that are trying to attract FDI should foster their economic potential, labour situation, technological progress and competitiveness. Moreover, in the seven clusters that are identified in the report, the authors propose that regionally tailored policies should be implemented to increase regional attractiveness towards FDI. The types of policies suitable for each region could be devised by jointly considering the cluster they belong to and the factors in which this cluster is weak.

Anna Stellinger
Head of Agency

SIEPS carries out multidisciplinary research in current European affairs. As an independent governmental agency, we connect academic analysis and policy-making at Swedish and European levels.

About the authors

José Villaverde is Full Professor of Macroeconomics at the University of Cantabria and Adjunct Professor in the Kemmy Business School at the University of Limerick. He has been a consultant of the World Bank and the European Commission. His research focuses on international economics, open-economy macroeconomics, economic growth and regional economics and he has participated in numerous research projects. He has published more than 150 articles and several books dealing with these topics. Among his more recent articles are those published in journals such as The World Economy, European Urban and Regional Studies, Tijdschrift Voor Economische en Sociale Geografie, European Planning Studies, Annals of Regional Science, Journal of Policy Modeling, China and World Economy and Applied Economics.

Adolfo Maza is Associate Professor of Macroeconomics at University of Cantabria. His research focuses on international economics, European economic integration, regional economics, labour markets, internal and international migration and energy economics. He has published more than 50 refereed journal articles about these fields in journals such as Annals of Regional Science, Papers in Regional Science, European Planning Studies, Economic Modelling, Economic Letters, Urban Studies and Energy Policy. He has also participated in various research projects, most of them devoted to regional economics both at a Spanish and at a European level.

Table of contents

Executive summary

One of the most striking developments of the last few decades has been the tremendous growth of Foreign Direct Investment (FDI) in the global economy. As a result, FDI is now generally considered to be a key factor in fostering economic growth. It has become a vital component of the economic strategies put forward by most developed and developing countries.

This phenomenon has been particularly salient in the European Union (EU), especially since the launching of the single market programme, the introduction of the euro and the last two enlargements. Therefore, the study of FDI is of paramount interest in the EU, especially from a policy-oriented point of view.

There are numerous studies analysing FDI in the EU, most of them performed, mainly for statistical reasons, on a national level. However, there have been few analyses on a regional level, although these can be much more illustrative. For this reason, the present report, *Inward Foreign Direct Investment in the European Union: Regional Distribution and Determinants*, tries to contribute to the literature by filling this gap. More precisely, the aim of the report is to investigate the regional distribution of inward FDI flows in the EU during the period 2000-2006, particularly with regard to its evolution over time and its main determinants. To this end, it makes use of a new FDI database that, unlike others commonly used, offers information about the total amount of inward FDI within the regions of the EU.

The report begins by focusing attention on the definition of FDI and why it matters for the hosting economies. Subsequently, it briefly reviews the theoretical and empirical literature on the main FDI determinants. From a theoretical point of view, the so-called OLI eclectic paradigm developed by Dunning (1977, 1979) is the most generally accepted approach. According to Dunning, FDI can be explained by paying attention to ownership (O), location (L) and internalization (I) advantages. As this report is mainly interested in explaining the geographical distribution of inward FDI in the EU regions, the advantages of location are of paramount importance and key attention is paid to them. These location advantages are usually divided into three types: economic advantages, political advantages and socio-cultural advantages. From an empirical perspective, the results obtained from the scarce number of papers devoted to the analysis of FDI in the EU at regional level are summarised.

The report then outlines the pattern of regional distribution of FDI in the EU, mainly from a regional perspective, although it also offers some insights from a broader (global and countrywide) perspective. In essence, three pieces of FDI information are presented: its total amount and evolution; its geographical concentration; and some rough but useful indicators of its attractiveness. The concentration issue shows that FDI is not evenly distributed across the territory, thus raising the suspicion (confirmed on the basis of a spatial dependence analysis) that regions with higher/lower FDI flows might be geographically closer to each other than to other regions.

After that, the central part of the report focuses on the factors that affect inward FDI flows in the EU regions. Before starting this analysis, the report makes some comments about data availability and reliability. To be precise, we face two important problems. Firstly, inward FDI flows change significantly from one year to another mainly due to large mergers and acquisitions. Secondly, the data availability of some potential determinants of regional FDI is rather poor (they are incomplete or simply do not exist). For these reasons, in the present report we use average values for FDI flows and for all the variables that theoretically help to explain them. Given these considerations, our dataset initially consists of a total of 21 variables or FDI drivers.

We then proceed in three steps. Firstly, we perform an exploratory factor analysis. This is because working with such a large number of variables can be difficult and may cause problems in the regression analysis, due to the potential presence of collinearity. According to this factor analysis, the best result obtained is one that is made up of six factors, which are *economic potential*, *market size*, *labour situation*, *technological progress*, *labour regulation* and *competitiveness*. Secondly, on the basis of these six factors, the EU regions are grouped into seven clusters to better understand the FDI attractiveness of each region. Thirdly, we estimate an FDI equation, in which the six extracted factors are taken as independent variables. In particular, we find that location patterns of inward FDI in the EU regions are determined by their *economic potential*, their *labour situation*, their *technological progress* and their *competitiveness*. On the contrary, market size and labour regulation do not seem to exert any significant impact on these location patterns. Although some minor differences arise, these findings are confirmed when a dummy variable representing regions belonging to Cohesion countries, which is positively significant, is included in the regression analysis.

When controlling for the spatial dependence previously detected, the conclusions are roughly the same, which proves their robustness. Additionally, this result conveys the message that the performance of a region is largely linked to that of its neighbours. This finding suggests that a somewhat loose interpretation of agglomeration could also be regarded as an important factor in explaining FDI location.

Finally, some policy remarks are offered. The main one is that regions trying to attract FDI should implement policies to foster what we have identified as their *economic potential*, their *labour situation*, their *technological progress* and their *competitiveness*. Additionally, and considering the large number of regions in our sample and the huge differences among the seven clusters we have identified, we propose that regionally tailored policies should be implemented to increase FDI regional attractiveness. The types of policies suitable for each region could be devised by jointly considering the cluster they belong to and the factors in which this cluster is weak. In particular, regions belonging to clusters 5, 7, and, especially, 6 need to make considerable efforts to improve their *competitiveness*, whereas regions in clusters 2 and 3 need to promote their *economic potential*. Finally, regions in cluster 1 should pay attention to their *labour situation*, and those in cluster 4 need to focus on enhancing their *technological progress*.

1 Introduction

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

Europe, and more specifically the European Union (EU),[2] has traditionally been one of the main recipients of FDI, particularly since the launch of the single market programme, the introduction of the euro and the last two enlargements. Therefore, the study of FDI is of paramount interest, especially from a policy-oriented point of view. Although numerous studies have analysed this issue, most have been performed at a national level, paying no or scant attention to the regional level (for a review, see, among others, Barba & Venables, 2004).

The national focus is mostly due to a lack of homogeneous statistical information on FDI for the EU regions. Different authors and institutions have tried to circumvent this difficulty by producing various outcomes, including the so-called FDIRegio and Elios[3] databases, both of which offer directly observed regional data. Although very interesting, these databases suffer from a critical drawback: they offer regional information about the number of foreign firms with affiliates in some EU countries, but do not provide data on the amounts of money invested by these companies.[4] Considering this, the present report makes use of a different, novel FDI database built by Po-

---

1 FDI inflows in the world increased nearly fivefold between 1996 and 2007, from $386.1 billion in 1996 to $1833.3 billion in 2007.

2 We refer to the EU27.

3 Elios stands for European Linkages and Ownership Structure.

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

lasek and Sellner to analyse regional globalisation.[5] Although this database also has some limitations—e.g., it does not include any sectoral breakdown or the country of origin—in our opinion it is superior to the FDIRegio and Elios databases. This is because, even though its regional data are obtained indirectly from national data, it gives information about the total amount of FDI in the EU regions that is fully consistent with the amount of FDI in the EU countries.

In addition to using a new database on FDI, the main motivation of this report is that, the EU being one of the major FDI recipients in the world, it is highly interesting to learn as much as possible about its distribution and determinants at the regional level. Therefore, the aim of this report is to investigate the regional distribution of inward FDI flows in the EU during the period 2000–2006, particularly with regard to its time evolution and main determinants. The rest of the report is organised as follows. In Section 2, we define FDI and explain why it matters for the hosting economies. In Section 3, we briefly review the literature on the main FDI determinants from both theoretical and empirical perspectives. In Section 4, after a brief global and country analysis, we outline the pattern of the regional distribution of inward FDI in the EU and attempt to unveil its main trends and characteristics over the sample period. In Section 5, the central part of the report, we pursue three goals: we first perform an exploratory factor analysis to reduce the huge number of potential FDI determinants found in the literature to a manageable size; we then perform a cluster analysis to achieve a better classification of regions; and finally we estimate an empirical model of FDI determination and discuss its results. In Section 6, we present the main conclusions and offer some policy implications. Additionally, the report includes two appendices, the first one dealing with some technical points and the second offering some clarifying tables.

[5] This database is built with the spatial Chow–Lin data interpolation method, as described by Polasek and Sellner (2010) and Polasek *et al.* (2010). As indicated by Polasek and Sellner (2011), "the spatial Chow-Lin procedure uses the relationship between a dependent variable that is only measured at a more aggregate regional level (…) and independent variables that are measured at a more disaggregate regional level (…) to predict the dependent variable at the disaggregate regional level". We gratefully acknowledge these colleagues for offering us the use of this database.

2 What is FDI and why does it matter?

According to its simplest concept, FDI is a process by which a firm (or multinational enterprise, MNE) provides financial capital to an already existing or newly created firm in a different country. According to the OECD standard definition, FDI is a category of international investment that reflects "the objective of obtaining a lasting interest by a resident entity in one economy ('direct investor') in an entity resident in an economy other than that of the investor ('direct investment enterprise')" (OECD, 1996:p.7). As stated by the same organisation, a "lasting interest implies the existence of a long-term relationship between the direct investor and the enterprise and a significant degree of influence on the management of the enterprise" (OECD, 1996:pp.7-8). This long-term relationship is one of the two key elements that distinguish FDI from portfolio investment. The other element refers to the investor having the capability of influencing or controlling the management of the enterprise. To achieve this ability, the investor must acquire at least 10% of the voting power: that is, the investor must own at least 10% of the ordinary shares of the investee company.

FDI covers all of the financial transactions between the investor and the investee. FDI materialises mainly in two different ways: either by the establishment of a totally new company (so-called "greenfield" investment) or by the partial buying of an existing company (usually through a merger/acquisition). Another form of FDI is that of collaboration in a joint venture.

Depending on the perspective, there are various types of FDI. From the point of view of the investor, it is customary to distinguish between vertical and horizontal FDI (Caves, 1971). Vertical FDI arises when a company moves its production chain upstream or downstream (i.e., locates different stages of the production process) to different countries. As indicated by EUROSTAT, in vertical FDI, "a company slices its production chain by allocating different parts to those countries in which production costs are lower" (EUROSTAT, 2008:p.20).[6] Horizontal FDI arises when a company develops the same production process in the host country as in some other countries. EUROSTAT states that, in this case, "a company duplicates its production chain in order to place its production closer to foreign markets" (EUROSTAT, 2008:p.20).

[6] Although vertical FDI is sometimes called "international outsourcing" or "international offshoring", the difference between them is that in the first the investor controls the foreign subsidiary, whereas in the second the company subcontracts part of its manufacturing to independent producers.

In line with these definitions, vertical FDI is more engaged in efficiency-seeking, whereas horizontal FDI is mainly related to market-seeking.

Besides these two types of FDI, the so-called export platform FDI plays an important role.[7] This category of FDI is mainly determined by the host countries' costs and trading costs with third markets. It is motivated by the desire to export to these third markets rather than to service the local market. Finally, from the host country's perspective and depending on its motivation, FDI may be classified as import-substituting, export-promoting or government-initiated.

From a completely different perspective, FDI may be considered as outward (when the home country invests in a foreign country), inward (when a foreign country invests in the home country) or net (inward less outward). This report specifically refers to inward FDI. That is, for the EU countries/regions, we only analyse the FDI inflows coming from countries other than the home country.

In the past, governments were somewhat suspicious of inward FDI, particularly in less-developed countries. FDI was regarded as a manifestation of "corporate capitalism" that might potentially jeopardise national sovereignty and create social tensions. However, the current atmosphere is such that governments tend to court or lure FDI,[8] basically offering it different types of incentives.[9] Why have the conditions changed so dramatically over time? The most direct and simplest answer is that, although it is evident that inward FDI involves costs and benefits for the host country, in most cases it is considered that the country profits from it in net terms.

There are different macro and micro reasons for this change in attitude towards inward FDI. Generally speaking, it is thought that FDI enhances productivity, contributes to economic growth, creates employment and promotes structural change in industrial organisation in host countries. These effects result from multiple direct and indirect influences, among which the most important are those of providing long-term financial capital, new technologies and better access to foreign markets (and, therefore, improvements in the

---

[7] Recent literature on platform FDI tends to distinguish between pure and complex platform FDI (Hayakawa & Tanaka, 2011).

[8] Nevertheless, many people continue to be opposed to the role played by multinational corporations. For a survey of the pros and cons of FDI, see Lipsey (2002) and Johnson (2006).

[9] Both the UNCTAD and the OECD have produced extensive work on this issue. See, for instance, UNCTAD (1996) and Blomström (2002).

trade balance), provoking a crowding-in effect (attracting additional investments), widening the production base, increasing competition, improving the business environment and increasing know-how, managerial expertise and marketing skills.

That being said, it is worth pointing out that the materialisation of benefits of inward FDI for productivity and growth depends on many factors, among which spillover, diffusion and the competition effects, market structure and absorptive capacity[10] of the recipient economy and qualitative[11] characteristics of FDI clearly stand out. Although the theory on FDI and the empirical studies at the aggregate level for developed countries tend to conclude that its impact on growth is positive,[12] these studies, when applied at the micro or firm level and particularly when applied to emerging/developing/transition countries, show mixed, less conclusive results. This is mainly due to the fact that the value of inward investment depends as much on its nature and quality as on its quantity. Following Castellani and Pieri (2011), it can be said that inward FDI produces both direct and indirect effects on host economies. The first ones, mostly related to the effects mentioned previously, show that FDI is an important growth enhancer. As for the indirect effects, it is admitted that their impact on growth might be negative if, for instance, the local firms in the sector receiving the FDI face, as a result of it, a shrinking market and are characterised by economies of scale; additionally, this negative impact might emerge if MNEs develop only "low value added activities in the host regions while domestic firms carried out the whole production process in the region".[13]

---

[10] For instance, Borentsztein *et al.* (1998) found that the effect is positive when the stock of human capital in the host country is above a certain threshold. Similarly, Alfaro *et al.* (2004, 2010) provided evidence that only financially well-developed economies benefit from FDI.

[11] For instance, Bode and Nunnenkamp (2011), in a study of the US states, suggested that employment-intensive FDI has been conducive to growth, whereas capital-intensive FDI has not.

[12] Among the pioneering studies about the impact of inward FDI on productivity in the host country, those of Caves (1974) and Globerman (1975) found a positive correlation. For more up-to-date studies, see, among others, Haskel *et al.* (2007) and some of the references therein. More recently, Castellani and Pieri (2011) analysed the relationship between FDI and productivity for the EU regions and found a positive and significant effect of the first on the second.

[13] Kluger (2006) offered a review of empirical studies—using both cross-section and panel data—that "find the absence of a positive intra-industry productivity effect" (Kluger, 2006:p.449) of inward FDI; his own study also discussed this issue and corroborated that "there are limited intra-industry externalities" (Kluger, 2006:p.472).

3 FDI determinants: A survey

This section briefly summarises the main determinants of FDI from a theoretical and empirical perspective.

3.1 FDI determinants: Theory

Although the potential determinants of FDI have been studied extensively, no general theory has been accepted yet. However, there are some very good surveys on the issue, among which those of Blonigen (2005) and Faeth (2009) are two of the most relevant.

Drawing on Faeth's (2009) paper, the first attempts to explain FDI were proposed in the context of neoclassical trade models by MacDougall (1960) and Kemp (1964). In a nutshell, the explanation offered by these authors lies in the differences in the return to capital in favour of FDI. According to Kindleberger (1969), however, FDI cannot exist in a world of perfect competition. Following this reasoning, Hymer (1976) developed a theory of market imperfection that explains FDI by ownership advantages in the form, for instance, of product differentiation, internal or external economies of scale and government incentives. Caves (1971) and Knickerbocker (1973) more or less employed the same approach, with Caves focusing on product differentiation and Knickerbocker on oligopoly rivalry. Considering the issue of firm rivalry, Vernon (1966) developed his theory of the product life cycle, according to which there is a cost-based rationale for firms to change from exporting to foreign-based production (FDI) as the products they manufacture move from one to another of the three (new, mature, standardised) stages of their life cycle. Internalisation theory (Buckley & Casson, 1976) explains FDI as an application to MNEs of the idea of internalising transactions in response to market failures.

All these previous approaches were, to a certain extent, summarised and made consistent in the so-called OLI eclectic paradigm developed by Dunning (1977, 1979). According to Dunning, FDI can be explained "by identifying three types of special advantages that MNEs have: ownership (O), location (L) and internalization (I) advantages" (Faeth, 2009:p.171). Because we are mainly interested in explaining the geographical distribution of inward FDI in the EU regions, the advantages of location are of paramount

importance.[14] These location advantages are usually divided into three types: economic, political and sociocultural advantages. Table 1 on the next page, taken from UNCTAD (1999), offers what we consider to be the best synthesis of the location advantages or host country determinants of FDI.

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

3.2 FDI determinants: Empirical evidence for EU regions

Although the literature on the determinants of inward FDI in the EU regions is relatively meagre, it is possible to distinguish among three types of studies: those of regions in a single EU country, those of regions within a group of EU countries and those of regions in all the EU countries.

Although the first group of studies is the most densely populated, it is not very abundant.[15] Generally speaking, these papers provide evidence that market-seeking, resource/asset-seeking and efficiency-seeking factors emerge as the main determinants of FDI. However, the relative influence of these factors in attracting FDI differs, sometimes notably among this set of papers.

Given the scope of this report, we are most interested in the second and third types of studies, which, as mentioned in the introduction, employ information on the number of foreign firms establishing affiliates in European regions. Only a few studies consider regions in a specific group of European countries, among which those by Basile *et al*. (2008, 2009) offer, in our view, the most interesting insights. The two papers employed similar estimation approaches (a mixed logit model and a nested logit model, respectively) and

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

[15] The main references are Crozet *et al.* (2004), Fazekas (2005), Chidlow *et al.* (2009), Majocchi and Presutti (2009), Papalia and Bertarelli (2009), Pazienza and Vecchione (2009), Cook (2010), Castiglione *et al*. (2012), Villaverde and Maza (2012) and Wren and Jones (2012).

Table 1 Host country/region determinants of FDI

I Host country determinants
- Policy framework for FDI
- Economic, political and social stability
- Rules regarding entry and operations
- Standards of treatment of foreign affiliates
- Policies on functioning and structure of markets (especially competition and M&A policies)
- International agreement on FDI
- Privatization policy
- Trade policy (tariffs and NTBs) and coherence of FDI and trade policies
- Tax policy

II Economic determinants

III Business facilitation
- Investment promotion (including image-building and investment-generating activities and investment-facilitation services)
- Investment incentives
- Hassle costs (related to corruption, administrative efficiency, etc.)
- Social amenities (bilingual schools, quality of life, etc.)
- After-investment services

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

achieved analogous findings. They concluded that traditional determinants of FDI, such as market size and potential, agglomeration, labour conditions, R+D investment, etc., play an important role in attracting FDI. From the point of view of our analysis in Section 5, the most relevant statement of the first paper is that "being eligible for Objective 1 funds does not affect a region's attractiveness", but that "regions within countries that were eligible for the CF (Cohesion Fund) are significantly more attractive than other regions" (Basile, 2008:p.336), in particular for European MNEs. The second paper concluded that, because the EU is perceived to be a rather well-integrated area, country boundaries do not matter too much for the location choice of MNEs, especially European MNEs.

The third group of studies, which is the closest to ours as it considers the regions of all the EU countries, is even more sparsely populated than the previous one and includes only two papers (Casi & Resmini, 2010; Capello *et al.*, 2011). The first paper, starting with standard techniques and then controlling for spatial dependence, estimated different econometric specifications of the FDI equation by using as determinants those traditionally suggested by the literature. Once again, and mainly in relation to European MNEs, the conclusions obtained are in line with the theoretical predictions: variables such as market potential, GDP growth, labour costs, human capital, agglomeration, etc. emerged as key drivers of FDI regional location. However, for us, the most important conclusion refers to the fact that the localisation patterns differ somewhat between European and non-European MNEs. Although these patterns are affected by temporal autocorrelation in both cases, only European MNEs are affected by spatial autocorrelation.

Capello *et al.*'s (2011) paper followed roughly the same pattern as that of Casi and Resmini (2010), except that it added different forms of spatial heterogeneity. Among its conclusions, the most relevant is that agglomeration and human capital are crucial factors in explaining FDI location, while, contrary to what the theory predicts, labour costs are not significant and market access is only marginally significant. As for regional specialisation, the paper found that location externalities arise in (low-tech) manufacturing and service sectors. In the papers by Casi and Resmini (2010) and Capello *et al.* (2011), an important outcome was that the capacity to attract FDI varies, sometimes markedly, with firm and sector specificities.

4 EU inward FDI flows

After offering a very general picture of the main determinants of inward FDI flows, this section provides an overview of the regional distribution of inward FDI flows in the EU between 2000 and 2006. To this end, and as previously stated, the report makes use of the database provided by Polasek and Sellner, which offers information about the amount of inward FDI stocks at the regional level. Inward FDI flows are computed as the difference between consecutive inward FDI stocks, so if the stock for year t is 100 and for year t+1 it is 120 (80), this means that the FDI flows in year t+1 show an investment (disinvestment) of 20. Additionally, as the original data are given in current million euros, they have been transformed from nominal into real terms (considering 2000 as the base year) by using national deflators.

4.1 A global and country perspective

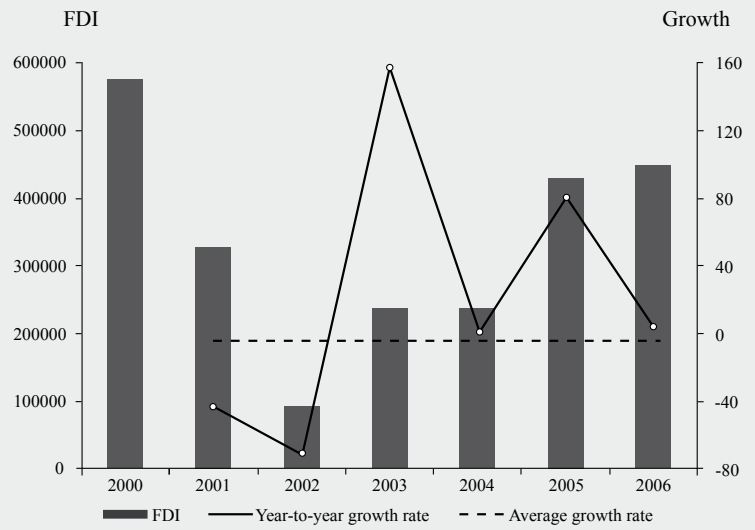
As indicated in the introductory remarks, the EU is one of the largest recipients of FDI in the world. According to the *EU Foreign Direct Investment Yearbook* (EUROSTAT, 2008), the share of EU FDI inflows (excluding intra-EU flows) in worldwide FDI flows was around 20% in 2006. In contrast, the USA (for example) presented a share of 18%. If the FDI flows between EU countries were also computed, the share would be more than double.

When calculated as the sum of FDI flows of the 27 European countries, the evolution of EU-inward FDI is characterised by a large decline between 2000 and 2006, from 575.5 to 448 million euros (Figure 1). However, this decline does not follow a steady pattern: the FDI flows decrease until 2002, when they do not even reach 100 million euros, and increase thereafter. To put it in another way, although the FDI flows to the EU decrease throughout the sample period at an average annual rate of 4%, there are years in which the decline is much more remarkable (more than 72% in 2002) and other years in which inward FDI registers outstanding increases (near 160% in 2003).

From a country point of view, Table 2 shows that, for the whole period, France and the UK are the main recipients of FDI. Given the turning point in 2002 and the large time variability in FDI flows previously shown, we split our sample period into two subperiods: 2000–2002 and 2003–2006. For the first one, in which inward FDI clearly declines, Germany shows the highest amount of FDI, much more than France and the UK. However, France and

especially the UK appear to be the main host countries during the second subperiod (2003–2006), which is a time of inward FDI expansion.

Figure 1 EU inward FDI (total and in terms of GDP)



Regarding the growth rate, we consider that the change between the averages of the two subperiods would be more informative than just the change between the initial and the final year of the sample, due precisely to the high degree of time variability. Even so, the growth rates reflect marked differences across countries, much higher than those for levels (see the last line of Table 2 on page 20-21). Twenty countries exhibit positive FDI growth rates, whereas seven show declines. As a rule, most of the 12 new EU members (NMS12) perform much better than the EU average, which suggests that the prospect of becoming a member of the EU is a very attractive factor for foreign investors.

Finally, Table 2 also shows that inward FDI at the EU country level is concentrated in just a few countries. The average share of the top five countries (France, the UK, Germany, Belgium and Spain) in total FDI for the whole period is about 66.7%, while the average share for the top 10 countries is 86.2%.

Table 2 Inward FDI at country level

Countries	2000	2001	2002	2003	2004	2005	2006	Average			Growth rates between subperiods (%)
								Sub-period 2000-02	Sub-period 2003-06	Period 2000-06	Period 2000-06 (%)
Austria	9238	6629	2483	1047	7796	7257	24696	6117	10199	8449	2.5	66.7
Belgium	20686	32063	17078	12859	35763	83569	60894	23276	48271	37559	11.2	107.4
Bulgaria	-1568	2280	536	1098	1981	3540	3580	416	2550	1635	0.5	512.8
Cyprus	722	848	947	640	615	681	2638	839	1144	1013	0.3	36.3
Czech R.	6017	3824	2876	-502	3760	7089	7480	4239	4457	4364	1.3	5.1
Germany	214931	-27975	23111	29557	-9547	6591	65054	70022	22914	43103	12.9	-67.3
Denmark	27397	4523	-8660	-332	15543	5290	-754	7753	4937	6144	1.8	-36.3
Estonia	245	554	321	1258	1889	1646	-44	373	1187	838	0.2	218.0
Spain	40655	29426	36546	17136	11058	17563	10898	35542	14164	23326	7.0	-60.1
Finland	8196	1242	6063	9239	3636	6541	8699	5167	7029	6231	1.9	36.0
France	35354	60388	35180	71011	65653	85431	75180	43641	74319	61171	18.2	70.3
Greece	377	-618	-822	2315	1585	2368	3690	-354	2490	1271	0.4	803.0
Hungary	1313	4361	-493	-1346	7938	3247	9153	1727	4748	3453	1.0	174.9

Ireland	37494	18054	20461	13388	-14021	-12347	-19639	25337	-8155	6199	1.8	-132.2
Italy	13968	-3293	-4629	19525	12314	23077	30113	2015	21257	13011	3.9	954.8
Lithuania	24	464	833	165	455	1794	1052	441	867	684	0.2	96.7
Luxembourg	4989	3549	4352	-601	4906	-435	5922	4297	2448	3240	1.0	-43.0
Latvia	290	425	85	219	659	799	1041	267	680	503	0.1	154.9
Malta	583	342	-617	259	358	630	1283	103	632	405	0.1	516.3
Netherlands	61317	48993	12004	-8013	13401	13065	-4608	40771	3461	19451	5.8	-91.5
Poland	8413	6450	-27	5206	16194	5023	14138	4945	10140	7914	2.4	105.0
Portugal	7849	5774	361	5218	721	3280	10818	4661	5009	4860	1.4	7.5
Romania	63	1048	-1378	2611	4203	2225	6116	-89	3789	2127	0.6	4369.6
Sweden	25094	13491	11702	14011	27898	1106	22323	16762	16335	16518	4.9	-2.6
Slovenia	503	-216	751	1136	622	623	704	346	771	589	0.2	122.8
Slovakia	1430	1357	1939	3647	2506	4307	4467	1575	3732	2808	0.8	136.9
U.K.	49846	113956	-69259	35988	20278	156049	103085	31515	78850	58563	17.5	150.2
EU	575426	327941	91746	236741	238165	430008	447979	331704	338223	335429	100.0	2.0
CV								1.5	1.7	1.4		2.8

Note: All absolute figures are expressed in 2000m euros; CV denotes the coefficient of variation.

4.2 A regional perspective

This subsection is devoted to the study of the regional distribution of inward FDI in the EU, for which we consider a sample of 260 NUTS2 regions (see Table A.1 of the Table Appendix, downloadable from SIEPS's homepage, at www.sieps.se/en).[16] To begin with, Table 3 offers basic information about the levels of regional FDI and growth rates between subperiods and for the whole period. For the sake of simplicity, given the large number of regions, the table only includes the 10 highest and 10 lowest regions. Information for all the regions may be found in Table A.2 of the Table Appendix.

As regards the inward FDI levels for the whole period, the position of Île de France clearly stands out. This region receives, on average, 35.5 billion euros annually, well above three times more than the second region in the ranking (Brussels). All of the regions in the top ten belong to the EU15. Nine of the ten regions with the worst performance are Greek regions. Regarding the subperiods, three facts are remarkable: Île de France is always the leading region in the ranking; Wien is present in the top ten in the second subperiod; and the Irish regions show a dramatic change, moving from the top ten to the bottom ten in the ranking. The Irish regions, along with some German and Dutch regions, present the lowest growth rates between subperiods; in contrast, the best performances correspond to some Italian and Romanian regions. The regional dispersion is quite high in levels, but even higher in growth rates.

Table 3 on pages 23-24 gives the impression that inward FDI is highly concentrated at the regional level. To show this result in a more precise way, Table 4 reports the levels of inward FDI concentration. On average, more than 30% of the total inward FDI over the sample period is concentrated in just 10 regions. Additionally, the top 30 regions account for 52% of the total inward FDI, whereas the top 50 regions represent more than 64%. The difference between these two last percentages indicates that the change in regional concentration due to regions that are ranked between 30 and 50 is slightly more than 12 percentage points (less than 1% per region). In other words, the top 30 regions effectively account for most of the inward FDI. The results for the

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

Table 3 Inward FDI at regional level

		Code	Region	Value*
Levels 2000-02	Top 10	FR10	Île de France	33323
		IE02	Southern and Eastern	24021
		ES30	Comunidad de Madrid	13064
		NL33	Zuid-Holland	10642
		NL32	Noord-Holland	10461
		DE60	Hamburg	9680
		BE10	Bruxelles	8776
		DK00	DENMARK	7753
		SE11	Stockholm	7572
		ES51	Cataluña	5306
	Low 10	ITF4	Puglia	-115
		UKJ3	Hampshire and Isle of Wight	-138
		GR24	Sterea Ellada	-168
		GR12	Kentriki Makedonia	-185
		UKD2	Cheshire	-196
		GR25	Peloponnisos	-226
		ITF3	Campania	-242
		HU10	Közép-Magyarország	-263
		ITE4	Lazio	-276
		UKI1	Inner London	-490
	CV			2.4
Levels 2003-06	Top 10	FR10	Île de France	37137
		BE10	Bruxelles	13427
		BE21	Antwerpen	12261
		SE11	Stockholm	10952
		UKI1	Inner London	10695
		BE24	Prov. Vlaams Brabant	8444
		UKG3	West Midlands	7610
		UKK1	Gloucestershire, Wiltshire and North Somerset	6995
		AT13	Wien	4993
		DK00	DENMARK	4937
	Low 10	GR42	Notio Aigaio	2
		ES43	Extremadura	-10
		NL11	Groningen	-99
		DE93	Lüneburg	-122
		DE41	Brandenburg - Nordost	-169
		IE01	Border, Midlands and Western	-198
		NL42	Limburg	-228
		NL23	Flevoland	-605
		NL41	Noord-Brabant	-1272
		IE02	Southern and Eastern	-7957
	CV			2.3

Notes: All absolute figures are expressed in 2000m euros; CV denotes the Coefficient of Variation.

Table 3 Inward FDI at regional level (cont.)

		Code	Region	Value*
Levels 2000-06	Top 10	FR10	Île de France	35503
		BE10	Bruxelles	11434
		SE11	Stockholm	9504
		BE21	Antwerpen	8311
		ES30	Comunidad de Madrid	7232
		UKG3	West Midlands	6322
		DK00	DENMARK	6144
		BE24	Prov. Vlaams Brabant	6138
		NL33	Zuid-Holland	5999
		UKI1	Inner London	5902
	Low 10	GR14	Thessalia	7
		ITC2	Valle dAosta/Vallée dAoste	6
		GR12	Kentriki Makedonia	5
		GR41	Voreio Aigaio	2
		GR42	Notio Aigaio	2
		GR21	Ipeiros	1
		GR22	Ionia Nisia	-1
		GR13	Dytiki Makedonia	-18
		GR23	Dytiki Ellada	-19
		GR25	Peloponnisos	-62
	CV			2.1
Growth rates between sub-periods (%)	Top 10	ITF6	Calabria	21494.5
		ITD5	Emilia-Romagna	16463.3
		RO22	Sud-Est	8034.7
		RO41	Sud-Vest Oltenia	7493.3
		RO32	Bucuresti - Ilfov	5880.4
		ITD1	Prov. Aut. Bolzano-Bozen	5709.5
		ITF1	Abruzzo	4805.4
		RO11	Nord-Vest	4695.3
		ITG2	Sardegna	3605.4
		UKJ3	Hampshire and Isle of Wight	3229.4
	Low 10	DE14	Tübingen	-98.2
		DE93	Lüneburg	-112.5
		NL42	Limburg	-113.4
		IE01	Border, Midlands and Western	-115.0
		DE41	Brandenburg - Nordost	-120.2
		NL11	Groningen	-121.9
		ES43	Extremadura	-123.7
		NL41	Noord-Brabant	-126.7
		IE02	Southern and Eastern	-133.1
		NL23	Flevoland	-146.9
	CV			3.9

Notes: All absolute figures are expressed in 2000m euros; CV denotes the Coefficient of Variation.

Table 4 Inward FDI concentration at regional level

Period	Top 10	Top 30	Top 50
2000	33.5	59.9	74.8
2001	37.2	65.7	84.8
2002	163.5	222.8	250.7
2003	33.6	60.5	77.4
2004	57.5	82.8	95.6
2005	43.0	65.4	78.8
2006	32.1	55.0	68.3
2000-2002	39.4	61.2	73.4
2003-2006	34.7	55.1	68.7
2000-2006	30.6	52.0	64.3

subperiods do not show much change, although the concentration degree, especially in the second period, is always higher than that in the whole period.

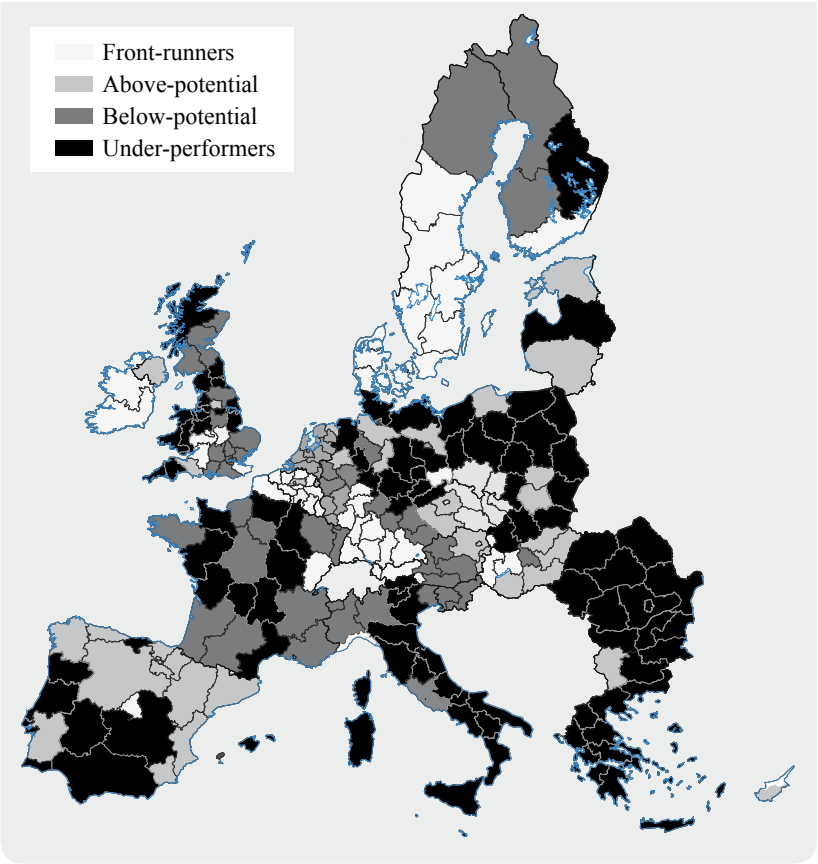
Although informative, these concentration ratios do not offer any relevant clues about the relative performance or attractiveness of the regions. To address this issue, UNCTAD (2001) has proposed the use of two indicators: the FDI Performance Index and the FDI Potential Index (see Technical Appendix, part A). The Performance Index compares the shares of inward FDI with the GDP,[17] whereas the Potential Index tries to grasp the FDI region's attractiveness by using more scaling variables than just the GDP. The information about these indices is reported in Tables A.3 and A.4 of the Table Appendix.

For the sake of simplicity, the UNCTAD, in its World Investment Report (2002), also considered "useful to compare the rankings based on the two indices as a rough guide to whether countries are performing adequately given their (restricted set of) structural assets" (UNCTAD, 2002:p.29). The combination of the two inward FDI indices yields a 4×4 matrix, according to which host countries may be considered as *front-runners* (high potential and high performance), *above-potential economies* (low potential and high performance), *below-potential economies* (high potential and low performance) or *under-performers* (low potential and low performance).[18]

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

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

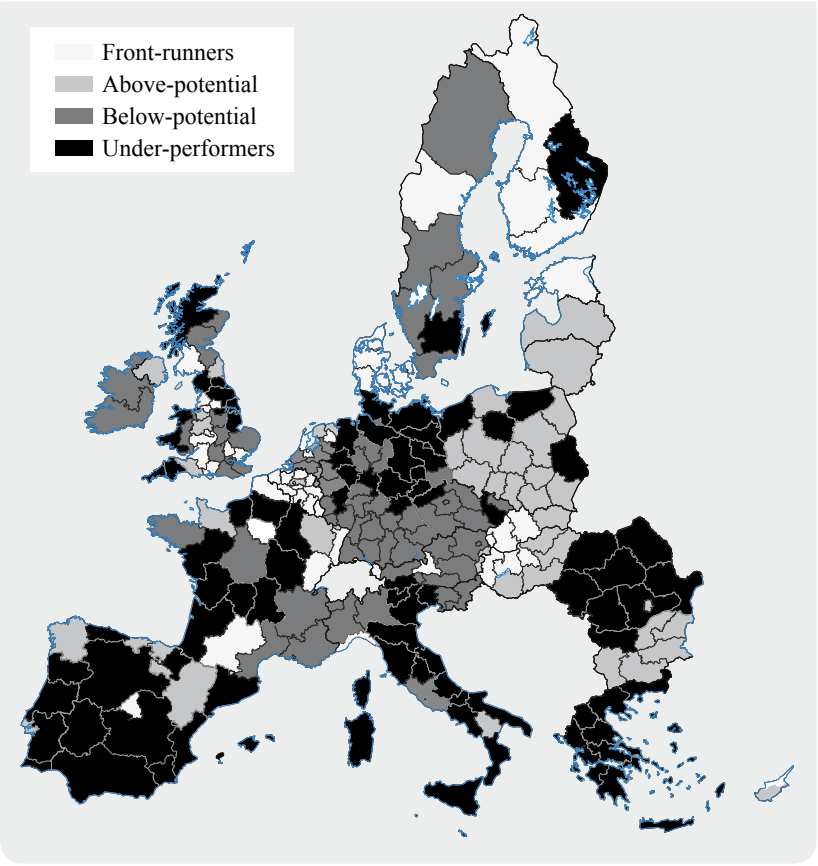
Map 1a Regional classification by FDI performance and potential indices, 2000-2002



The results of this grouping are reported in Table A.5 of the Table Appendix and graphically presented in Map 1a-c. From these results, the following conclusions may be drawn:

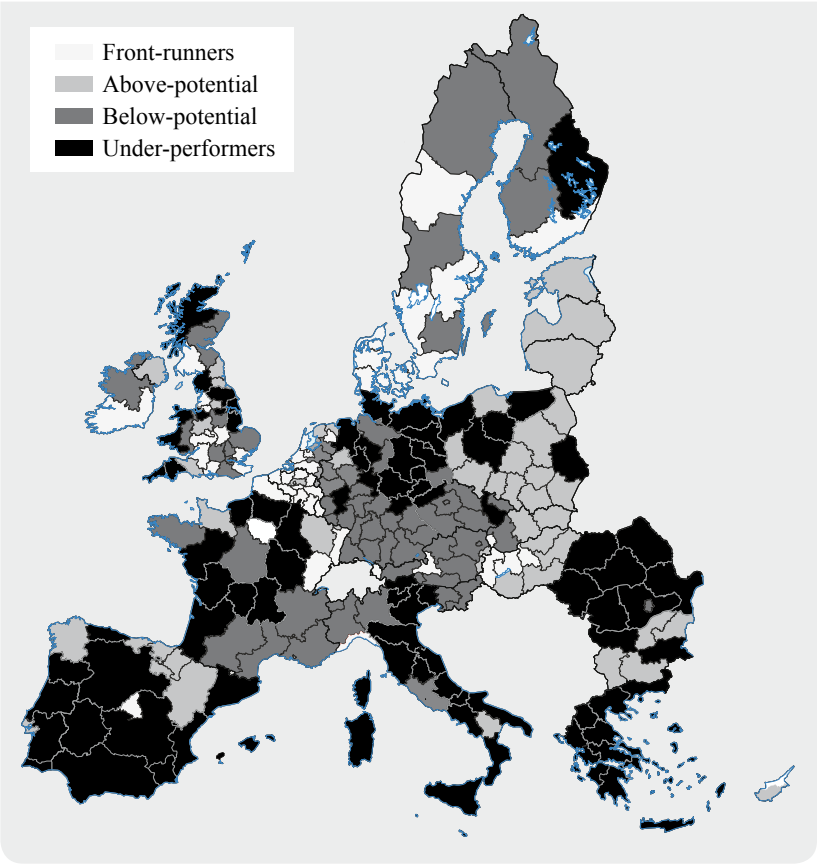
1. Most of the 49 front-runner regions are located in Belgium, the Netherlands, Sweden and the UK.
2. There is a similarly sized group of 46 above-potential regions, highlighting the presence of a significant number of Spanish and Polish regions.
3. The below-potential label may be assigned to 64 regions, including German (20), French (6) and British (10) regions.

Map 1b Regional classification by FDI performance and potential indices, 2003-2006



4. The remaining 101 regions may be designated as under-performers. This group includes a remarkable number of NMS12 regions, but also regions belonging to Germany (16), Spain (10), France (11), Italy (17) and the UK (11). Most of the Greek regions also belong to this final group.
5. The analysis for subperiods confirms that, as previously suggested, some regions have largely changed their position, most changes taking place in a horizontal direction (i.e., variability concerns the Performance Index). Irish regions, for example, move from front-runners to below potential, whereas a significant number of UK re-

Map 1c Regional classification by FDI performance and potential indices, 2000-2006

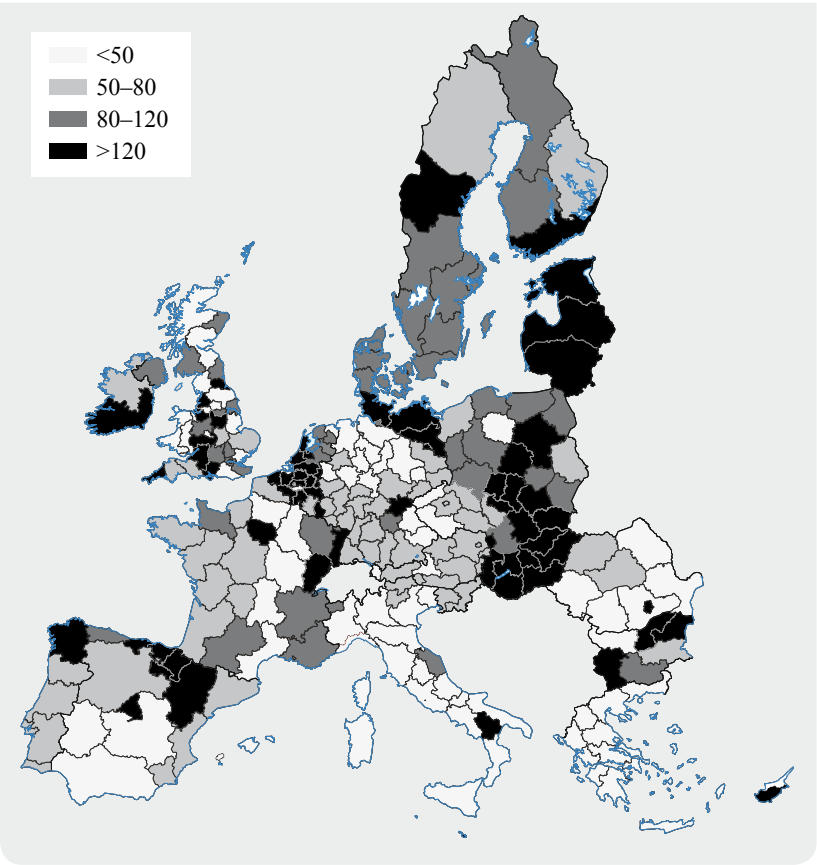


gions make the same movement but in the opposite direction. Other examples can be found in some Spanish regions that change from the above-potential to the under-performer category, whereas the opposite direction is taken by several regions belonging to NMS12 countries.

4.3 Is there any spatial dependence at the regional level?

The analysis conducted up to this point has not considered the likely existence of spatial dependence in the regional distribution of FDI. In other words, it has not considered the role potentially played by the geographic situation of each region. Consistent with assumptions and predictions based on endogenous growth models (see, for example, the seminal papers by Lucas, 1988 and Romer, 1990) and new economic geographic theory (see the survey by Ottaviano & Puga, 1998), it seems logical that a certain spatial dependence exists—i.e., regions with higher (lower) inward FDI flows may be expected to be geographically closer to each other.

Map 2 Regional FDI flows over GDP: 2000-06 average (EU=100)



This idea seems to be confirmed by a simple glance at Map 2 on the previous page, which reports four intervals of the inward FDI/GDP ratio. Apart from the existence of the large disparities mentioned previously, we observe that regions tend to be geographically concentrated around roughly similar levels (states) of the inward FDI/GDP ratio. However, some caution is recommended when interpreting this map because the conclusions to be drawn are highly sensitive to the number and width of the intervals used. Therefore, to confirm (or reject) the initial impression gained from it, we carry out an exploratory spatial analysis by computing the so-called Moran's *I* statistic, which measures the spatial dependence across our geographical entities (see Technical Appendix, part B). The results obtained (Table 5) confirm the existence of a

Table 5 Moran's *I* statistic

Period	Moran's *I*	*z* value	*p* value
2000	0.079	14.214	0.000
2001	0.086	15.342	0.000
2002	0.049	9.093	0.000
2003	-0.001	0.411	0.681
2004	0.048	8.924	0.000
2005	0.097	17.330	0.000
2006	0.045	8.357	0.000
2000-2002	0.086	15.390	0.000
2003-2006	0.055	10.143	0.000
2000-2006	0.060	11.019	0.000

positive spatial autocorrelation in all the sample years (except the anomalous 2003), the two subperiods and the period as a whole. Although the table also shows that spatial dependence varies over time, the results clearly prove that the European regions tend to be concentrated around rather similar levels of inward FDI/GDP ratios.

5 EU inward FDI determinants: Empirical analysis

Given the scarcity of literature about inward FDI flows among European regions, this section attempts to fill this gap by investigating their determining factors. To address this issue, we operate in three stages. In the first one, given the large number of variables that, according to the theory and empirical evidence, could affect FDI, we develop an exploratory factor analysis to reduce them to a smaller set of uncorrelated factors.[19] In the second stage, we group (cluster) European regions according to the factors previously extracted. Finally, we perform a regression analysis to identify the main determinants of FDI flows in the EU regions.

5.1 Factor analysis[20]

Before beginning the factor analysis, this section addresses some comments regarding the data used. As in the rest of the paper, our sample period, dictated by inward FDI data availability, is from 2000 to 2006. Here we face two important problems: on the one hand, inward FDI flows change significantly between years, mainly due to large mergers and acquisitions; on the other hand, data availability at regional level on some potential determinants of inward FDI is rather poor (the data are incomplete or do not exist). Therefore, we take the decision to pay attention only to the whole period hereafter, leaving aside subperiod considerations and taking average values not only for inward FDI flows but also for all of the variables that are theoretically behind them.

In particular, for those variables with complete regional data for the period 2000–2006, we simply calculate the mean values. For variables with omitted data points, we compute the mean values for the available data. The worst situation occurs when we find series in which, for some specific regions, data are completely unavailable. In this case, we proceed as follows:[21]

1. If NUTS1 data are available, we assign them to NUTS2 regions.

[19] This is in accordance with the fact that, because of the nature of our database, we are adding up all the different types of FDI (vertical, horizontal, greenfield, acquisitions, etc.) and that these are likely to have, al least to a certain extent, different determinants.

[20] Factor analysis is a method employed to explain the variability among observed, correlated variables in terms of a potentially lower number of unobserved variables, called "factors". For further reference, see, among many others, Hair *et al.* (2009).

[21] In cases in which data are unavailable for a large number of regions, we remove these variables completely from our analysis.

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

Given these considerations, our data set consists of 21 variables, with the definitions, acronyms, units of measurement, data source and available years reported in Table 6 on the next page.[22] According to our goal, these variables should be included in a regression analysis to identify the determinants of FDI inflows in the European regions.

Working with such a large number (21) of inward FDI drivers would be difficult and would cause several problems in the regression analysis, due to the presence of collinearity across them. To overcome this problem, we construct a set of composite indicators that adequately summarises the underlying individual drivers. To this end, we carry out a standard exploratory factor analysis, using the approach described by Nardo *et al*. (2005); the statistical details of this approach are reported in the Technical Appendix, part D.

After the exploratory factor analysis has been performed, six factors are identified, which means that the original twenty-one variables are reduced to six new variables (factors). The first factor (F1), *economic potential*, includes labour productivity, per capita GDP, wages, air and multimodal accessibility and market potential. The second factor (F2), *market size*, comprises GDP, population and investment variables. The third factor (F3), *labour situation*, includes the employment rate, activity rate, inverse of the unemployment rate and inverse of the long-term unemployment rate. The fourth factor (F4), *technological progress*, contains four indicators: R&D investment, R&D personnel, high-technology sector and human capital. The fifth factor (F5), *labour regulation*, encompasses labour market regulation and the inverse of labour law rigidity and tax wedge. Finally, the sixth factor (F6), *competitiveness*, combines openness degree (exports + imports over GDP) and manufacturing

[22] Variables such as "energy-manufacturing share", "services share", "unit labour costs", "population density", "corporate tax rate", "% researchers", "patents", "Internet", "urban rural typology index", "legal structure and security property rights index" and "business regulations index" were also initially included in the analysis but were removed for technical reasons.

Table 6 Regional explanatory variables

Code	Description	Units	Source	Years
OP	Openess degree	%	Polasek and Sellner	2000-2006
GDP	Gross Added Value	Constant million euros 2000	Cambridge Econometrics	2000-2006
PO	Population	Thousands	Cambridge Econometrics	2000-2006
GDPpc	Per capita Gross Added Value	Constant euros 2000	Cambridge Econometrics	2000-2006
LP	Labour productivity	Constant euros 2000	Cambridge Econometrics	2000-2006
MSHARE	Manufacturing share	%	Cambridge Econometrics	2000-2006
W	Compensation per employee	Constant euros 2000	Cambridge Econometrics	2000-2006
URinv	(Inverse of) unemployment rate	%	Cambridge Econometrics	2000-2006
LTURinv	(Inverse of) long-term unempl. rate	%	Eurostat	Selected years
ER	Employment rate	%	Cambridge Econometrics	2000-2006
AR	Activity rate	%	Cambridge Econometrics	2000-2006
INV	Investment	Constant million euros 2000	Cambridge Econometrics	2000-2006
TWinv	(Inverse of) tax wedge on employm.	%	Eurostat	2000-2006
R&D	R&D expenditure	% GDP	Eurostat	Selected years
R&DP	R&D personnel	% Active population	Eurostat	Selected years
HTC	High technology sectors	% Total employment	Eurostat	Selected years
HC	Human capital	% Students at ISCED levels 5-6	Eurostat	Selected years
MULA	Air and multi-modal accessibility	Synthetic index: EU=100	Espon	2001; 2006
LLRinv	(Inverse of) labour law rigidity	Synthetic index (0-100)	World Bank	2004
LMR	Labour market regulation	Synthetic index (0-10)	Fraser Institute	2000; 2005
MP	Market potential	Constant million euros 2000	Own elaboration based on Cambridge Econometrics*	2000-2006

* See Tecnical Appendix, part C. ISCED: International Standard Classification of Education.

share. Once these six factors have been identified, the score of every region in each of them is computed by two alternative methods: sum scores and regression scores.

5.2 Cluster analysis[23]

Considering the regression scores of the six factors extracted in the previous subsection, we are able to classify the EU regions into groups (called clusters) by means of different clustering methods.[24] In this manner, we may gain additional insights into the FDI attractiveness of the EU regions. The process we follow is explained in the Technical Appendix, part E.

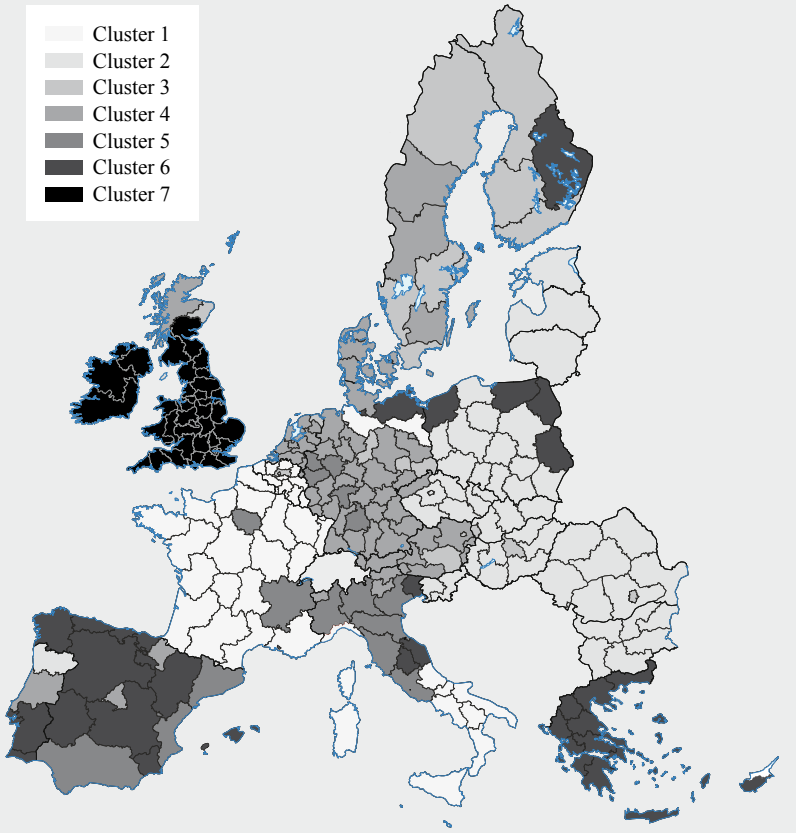
The results obtained by employing this cluster analysis are shown in Map 3 on the next page and Table A.6 in the Table Appendix. The main characteristics of each cluster are as follows (Table 7 on page 36):

- Cluster 1 includes 43 regions, mostly belonging to France, Italy and Belgium. The regions in this cluster are strong in *economic potential* (*F1*) and weak in *labour situation* (*F3*).
- Cluster 2 includes 45 regions that are located, apart from Norte (in Portugal), in the NMS12 countries. These regions are strong in *competitiveness* (*F6*) and very fragile in *economic potential* (*F1*).
- Cluster 3 includes 22 regions, mostly located in North–Central EU countries. These regions are powerful in *technological progress* (*F4*) but show an important gap in *market size* (*F2*).
- Cluster 4 includes 54 regions from Germany, the Netherlands and Austria. Although this seems incongruent, these regions are good regarding their *labour situation* (*F3*) and poor in *labour regulation* (*F5*).
- Cluster 5 includes 19 regions, largely from Germany, Spain and Italy. The regions in this cluster are potent in *market size* (*F2*) and relatively poor in *labour regulation* (*F5*).

[23] A cluster analysis is an exploratory technique used to identify groups among the subjects in a data set. The key idea of this method is that objects (in our case, regions) are more related to nearby objects than to objects that are farther away. In this sense, a cluster may largely be described by the maximum distance needed to connect parts of the cluster. For further reference, see, among many others, Hair *et al.* (2009).

[24] The results obtained using sum scores are quite similar, so we omit them.

Map 3 Regional clusters



- Cluster 6 includes 39 regions, mainly from Mediterranean countries. They are relatively poorly positioned in every factor, especially in *competitiveness* (*F6*).
- Cluster 7 includes 38 regions, 35 of them from the UK. The main positive feature of these regions lies in *labour regulation* (*F5*); on the other side, they have some problems in terms of *competitiveness* (*F6*).

Table 7 Final clusters centroids (k-means)

Factors	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7
Economic potential (F1)	0.870	-1.580	0.105	0.556	0.306	-0.644	0.497
Market size (F2)	-0.074	0.028	-0.514	-0.345	2.435	-0.444	0.117
Labour situation (F3)	-1.235	-0.167	0.251	0.855	0.137	-0.295	0.395
Technological progress (F4)	-0.349	-0.218	2.280	-0.407	0.063	-0.112	-0.034
Labour regulation (F5)	-0.155	0.215	-0.336	-0.657	-0.477	-0.551	1.913
Competitiveness (F6)	0.096	0.837	0.208	0.258	-0.011	-1.176	-0.401

5.3 Regression analysis

This subsection assesses the main determinants of inward FDI in the EU at the regional level. To achieve this, we estimate several regression equations in which the dependent variable (*fdi*) is defined as the inward FDI/GDP ratio and the previously extracted factors (in the sum scores and regression scores approaches) are included as independent variables. In particular, we initially apply standard (OLS) regression techniques to estimate the following equation:

Equation 1

$$fdi_i = \alpha + \beta_1 F1_i + \beta_2 F2_i + \beta_3 F3_i + \beta_4 F4_i + \beta_5 F5_i + \beta_6 F6_i + \varepsilon_{it}$$

The first half of Table 8 on the next page displays the regression results. Regarding the sum scores approach, FDI is, as expected, positively and significantly correlated with the *economic potential* (*F1*), *labour situation* (*F3*), *technological progress* (*F4*) and *competitiveness* (*F6*) of the regions.

Although economic analysis suggests that the *market size* (*F2*) and *labour regulation* (*F5*) variables are potential determinants of FDI, the results indi-

Table 8 FDI determinants: Regression Results

	Equation 1		Equation 1'	
Independent variables	**Sum scores**	**Regression scores**	**Sum scores**	**Regression scores**
c	0.033*** (0.000)	0.033*** (0.000)	0.028*** (0.000)	0.023*** (0.000)
Economic potential (F1)	0.006** (0.037)	0.007*** (0.008)	0.009*** (0.003)	0.018*** (0.000)
Market size (F2)	0.000 (0.965)	-0.002 (0.531)	0.001 (0.723)	0.000 (0.843)
Labour situation (F3)	0.005* (0.064)	0.004 (0.157)	0.006** (0.029)	0.006** (0.013)
Technological progress (F4)	0.009*** (0.001)	0.010*** (0.000)	0.008*** (0.002)	0.010*** (0.000)
Labour regulation (F5)	-0.001 (0.558)	0.001 (0.647)	-0.001 (0.573)	0.002 (0.324)
Competitiveness (F6)	0.017*** (0.000)	0.008*** (0.001)	0.018*** (0.000)	0.011*** (0.000)
CF			0.016*** (0.008)	0.036*** (0.000)
Adjusted R^2	0.21	0.12	0.24	0.21
LIK	494.194	480.023	497.792	492.023
AIC	-974.387	-946.023	-979.584	-968.047
SC	-949.329	-920.988	-950.946	-939.409

Note: (*) significant at 90%; (**) significant at 95%; (***) significant at 99%; p-values in brackets

cate that their coefficients are statistically non-significant at the conventional levels. A tentative explanation for the negligible impact of *market size* (*F2*) may be that the dimension of the local (i.e., regional) market in which the investment effectively occurs is of no great relevance, given the high degree of European integration. This explanation is consistent with Basile *et al.*'s finding that "European multinationals consider regions across different countries as relatively closer substitutes than regions within national borders" (Basile *et al*., 2009:p.733). With reference to *labour regulation* (*F5*), our results sup-

port the idea that an MNE does not pay any attention to the regulation of the regional labour market but to its employment/unemployment situation (recall that *F3* emerged as a relevant factor) when it comes to foreign investment in the EU.

This econometric exercise is also carried out by using, as explanatory variables, factors calculated on the basis of the regression scores approach. To avoid repetition, the only significant change worth noting is that this new estimation seems to cast some doubts on the role of *labour situation* (*F3*) as a determinant of inward FDI in the EU regions.

In addition to the two previous estimations, given their low goodness of fit and as a way to check the robustness of our results, we add two additional dummy variables (representing Objective 1 regions and regions belonging to cohesion countries) to our FDI equation. We consider that this approach could yield a better explanation of the EU inward FDI flows at the regional level. However, only the *cohesion variable* (*CF*) shows positive and statistically significant results in the analysis (second half of Table 8; equation 1'). This result reveals that being a region of a cohesion country could be considered as another attraction factor for FDI.[25] The results of the factors do not significantly change, with the same four factors arising as determinants of FDI. The relevance of the *labour situation* (*F3*) increases when the *cohesion variable* (*CF*) is included. This positive association could be due to the fact that cohesion funds indirectly improve the performance of the labour market in the recipient country, in particular in relation to the activity and employment rates.

Until now, we have used standard econometric techniques to unveil the determinants of inward FDI. At the end of Section 4, however, we made a passing reference to the presence of some spatial dependence across European regions in terms of FDI. Accordingly, it seems that a spatial analysis is pertinent to gaining a more precise understanding of the regional situation of inward FDI in the EU and, in particular, about the fact that the location patterns of MNEs may be influenced by the spatial distribution of inward FDI.

Given the presence of spatial dependence in the EU regional distribution of FDI, it is necessary to revise the regression analysis to eschew potential inconsistencies and inefficiencies in the results of the estimated equation (An-

[25] These results are broadly in line with those obtained by Basile *et al.* (2008) for a sample of 50 NUTS1 regions in 8 countries. See Section 3.

selín, 1988; Anselín & Bera, 1998). With this aim, we conduct a series of Lagrange multiplier (LM) tests based on the principle of maximum likelihood.[26] Specifically, the LM-ERR test, along with the associated robust LM-EL test, checks for the absence of residual spatial autocorrelation, which would be caused by not including a structure of spatial dependence in the error term. The LM-LAG test, together with the associated robust LM-LE test, checks for the absence of substantive spatial autocorrelation, which would be caused by the presence of spatial autocorrelation in the endogenous variable.

We apply these tests only to equation 1' (the one including a cohesion variable) because, although the fit is not very high, it proved to be better than equation 1. As shown in Table 9, the results for the LM-LAG test (24.0 and 41.6) are greater than those of the LM-ERR test (9.6 and 31.5). Therefore, it seems that we should estimate the model by including the spatial lag of the dependent variable as an additional explanatory variable. This conclusion is confirmed if we look at the associated robust test results; LM-LE remains significant at 99%, whereas LM-EL is significant at 95% in the sum scores case and loses all significance in the regression scores case.

Table 9 Spatial tests

	Equation 1'	
Tests	**Sum scores**	**Regression scores**
LM-ERR	9.615*** (0.002)	31.455*** (0.000)
LM-EL	5.866** (0.015)	0.362 (0.548)
LM-LAG	24.007*** (0.000)	41.604*** (0.000)
LM-LE	20.258*** (0.000)	10.510*** (0.001)

Note: LM-ERR = Lagrange multiplier for spatial errors; LM-EL = LM-ERR associated robust; LM-LAG = Lagrange multiplier for spatial lags; LM-LE = LM-LAG associated robust. (**) significant at 95%; (***) significant at 99%; p-values in brackets.

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

These results indicate that we must correct the substantive spatial dependence in Equation 1' estimated above. Therefore, we adjust this equation to include a spatial lag of regional inward FDI, so that it becomes:

Equation 2

$$fdi_i = \alpha + \beta_1 W\_fdi_i + \beta_2 F1_i + \beta_3 F2_i + \beta_4 F3_i + \beta_5 F4_i + \beta_6 F5_i + \beta_7 F6_i + \beta_8 CF + \varepsilon_{it}$$

In this equation, W_fdi_i denotes the spatial lag measuring the intensity of spatial autocorrelation in the dependent variable, W once again being the distance matrix (its elements wi,j reflect the intensity of the interdependence between regions i and j). This new variable aims to capture the relationship between the FDI flows towards a region and those towards its neighbours.

Table 10 on the next page shows the results of the estimation of Equation 2 by maximum likelihood.[27] The following points should be emphasised:

1. All of the goodness-of-fit measures that are comparable between the two models, such as the logarithm of maximum likelihood (LIK), Akaike's Information Criterion (AIC) and Schwartz's Criterion (SC),[28] demonstrate that Equation 2 achieves a better fit.
2. With respect to the influence of the extracted factors, the results are roughly the same, which reveals their robustness. However, there are some minor differences related to the role of *competitiveness* (*F6*), which now becomes less significant.
3. The coefficient β_1 is positive and statistically significant, confirming the results of the earlier spatial dependence tests, i.e., that the behaviour of each region is closely related to the behaviour of its neighbouring regions. To a certain extent, this result could be considered, as the literature suggests, as a sign that agglomeration is an important factor in determining inward FDI.

---

[27] Spatial dependence invalidates the traditional ordinary least squares estimation method. Likewise, according to our tests, there are no problems of heteroskedasticity in this model.

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

Table 10 FDI determinants: Spatial Regression Results

	Equation 2	
Independent variables	**Sum scores**	**Regression scores**
c	-0.001 (0.812)	-0.007* (0.073)
W_fdi	0.863*** (0.000)	0.899*** (0.000)
Economic potential (F1)	0.005* (0.073)	0.013*** (0.000)
Market size (F2)	0.001 (0.734)	-0.001 (0.788)
Labour situation (F3)	0.005** (0.028)	0.006** (0.014)
Technological progress (F4)	0.008*** (0.002)	0.010*** (0.000)
Labour regulation (F5)	0.000 (0.894)	0.003 (0.198)
Competitiveness (F6)	0.014*** (0.000)	0.008*** (0.001)
CF	0.015*** (0.010)	0.031*** (0.000)
LIK	504.607	501.501
AIC	-991.214	-985.003
SC	-958.996	-952.785

Note: (*) significant at 90%; (**) significant at 95%; (***) significant at 99%; p-values in brackets.

5 Conclusions and policy implications

Considering that the EU is one of the main recipients of FDI in the world, this report examines its regional distribution and determinants over the period 2000–2006. The report departs from previous papers by dealing with this issue in two key ways: first, it considers all the EU regions (260 regions) instead of regions belonging just to a single country or a reduced number of them; second, it uses a database that provides the total amount of regional inward FDI, whereas the limited number of papers studying regional FDI in more than one EU country employ information on the number of foreign firms established in them.

After defining the concept of FDI and stressing its relevance, the report addresses the analysis of the main determinants of inward FDI from a theoretical and (for the EU regions) empirical perspective. Next, it describes the dynamics of FDI, paying special attention to its regional distribution. We obtain some interesting results that allow us to gain a better understanding of the patterns of FDI. First, FDI flows are highly volatile over time. Second, FDI is greatly concentrated at the regional level. On average, 30% of inward FDI is located in 10 regions. Third, the FDI Performance Index and Potential Index are calculated and compared, which allows an inward FDI typology to be established. According to this, and for the whole sample period, 49 regions are labelled as *front-runners* and 101 as *under-performers*; similarly, 46 regions show *above-potential* and 64 show *below-potential* performance. Fourth, an exploratory spatial analysis reveals that the EU regions are geographically concentrated around similar levels of inward FDI.

The main part of the paper proceeds in three steps. First, we perform an exploratory factor analysis to reduce the large number of variables potentially affecting FDI to a manageable number. The best result is one that is made up of six factors, labelled *economic potential*, *market size*, *labour situation*, *technological progress*, *labour regulation* and *competitiveness*. Second, on the basis of these six factors, the EU regions are grouped into seven clusters, to understand better the FDI attractiveness of each region. Third, we estimate an FDI equation, in which the six extracted factors are taken as independent variables. In particular, we find that the location patterns of FDI in the EU regions are determined by their *economic potential*, *labour situation*, *technological progress* and *competitiveness*; on the contrary, *market size* and *labour regulation* do not seem to exert any significant impact on these location patterns. Although some minor differences arise, these findings are confirmed

when a dummy variable representing regions belonging to cohesion countries, which is positively significant, is included in the regression analysis.

When controlling for spatial dependence, the conclusions are roughly the same, which proves their robustness. Additionally, this result conveys the message that the performance of a region is largely linked to that of its neighbours. This finding suggests that a somewhat loose interpretation of agglomeration could also be regarded as an important factor in explaining FDI location.

To conclude, and given the data limitations, some broad policy remarks derived from the results previously obtained are offered. Regions that are trying to attract FDI should implement policies fostering what we have dubbed as their *economic potential*, *labour situation*, *technological progress* and *competitiveness*. Considering the large number of regions in our sample and the huge differences among the seven clusters we have identified, we propose that regionally tailored policies would be the best way to increase FDI regional attractiveness. The types of policies suitable for each region could be devised by jointly considering the cluster they belong to and the factors in which this cluster is weak. In particular, regions belonging to clusters 5, 7 and, especially, 6 should make remarkable efforts to improve their *competitiveness*, whereas regions in clusters 2 and 3 should promote their *economic potential*. Finally, regions in cluster 1 should pay attention to their *labour situation*, and those in cluster 4 should focus their policies on enhancing their *technological progress*. This being said, these policy remarks should be taken with some caution, mainly because, as often happens in economics, the empirical analysis might suffer from endogeneity, implying that the results should be seen more as correlations than as absolutely convincing causal effects.

Finally, it is important to note that the report has examined the determinants of inward FDI in the EU regions. It has not, however, studied the issue of whether there is too much or too little inward FDI in some groups of regions (clusters) from a social welfare perspective. This is, in fact, an issue that falls beyond the scope of the report, in that it would need to provide arguments to explain why the so-called market solution results in too little (or too much) inward FDI in some groups of regions (clusters) and how public intervention could help to solve the problem. Everything, of course, is based on the (implicit) assumption that its costs are low compared with the potential benefits of changing the direction of inward FDI flows.

References

Alfaro, L., Chanda, A., Kalemli-Ozcan, S. & Sayek. S. (2004) FDI and economic growth. The role of local financial markets. *Journal of International Economics*, 64, 605-618.

Alfaro, L., Chanda, A., Kalemli-Ozcan, S. & Sayek. S. (2010) Does foreign direct investment promote growth? Exploring the role of financial markets on linkages. *Journal of Development Economics*, 91, 242-256.

Anselín, L. (1988) *Spatial Econometrics: Methods and Models*. Dordrecht, Kluwer Academic Publishers.

Anselín, L. & Bera, A. (1998) Spatial dependence in linear regression models with an introduction to spatial econometrics. In: Ullah, A. & Giles, D. (eds.), *Handbook of Applied Economic Statistics*. New York, Marcel Dekker, pp. 237-289.

Barba, G. & Venables, A. (2004) *Multinational Firms in the World Economy*. Princeton, Princeton University Press.

Basile, R., Castellani, D. & Zanfei, A. (2008) Location choices of multinational firms in Europe: The role of EU cohesion policy. *Journal of International Economics*, 74, 328-340.

Basile, R., Castellani, D. & Zanfei, A. (2009) National boundaries and the location of multinational firms in Europe. *Papers in Regional Science*, 88 (4), 733-749.

Blomström, M. (2002) *The Economics of International Investment Incentives*. Paris, OECD.

Blonigen, B. A. (2005) A review of the empirical literature on FDI determinants. *Atlantic Economic Journal*, 33, 383-403.

Bode, E. & Nunnenkamp, P. (2011) Does foreign direct investment promote regional development in developed countries? A Markov chain approach for US states. *Review of World Economics*, 147 (2), 351-383.

Borensztein, E., De Gregorio, J. & Lee, J. W. (1998) How does foreign direct investment affect economic growth? *Journal of International Economics*, 45, 115-135.

Buckley, P. J. & Casson. M. (1976) *The Future of Multinational Enterprise*. London, Macmillan.

Capello, R., Fratesi, U. & Resmini, L. (2011) *Globalization and Regional Growth in Europe. Past Trends and Future Scenarios*. Berlin, Heidelberg, Springer-Verlag.

Casi, L. & Resmini, L. (2010) Evidence on the determinants of foreign direct investment: The case of EU regions. *Eastern Journal of European Studies*, 1 (2), 93-118.

Castellani, D. & Pieri, F. (2011) *Foreign Investment and Productivity. Evidence from European Regions*. Quaderni del Dipartimento di Economia, Finanza e Statistica, no. 83, University of Perugia.
Castiglione, C., Gorbunova, Y., Infante, D. & Smirnova, J. (2012) FDI determinants in an idiosyncratic country. A reappraisal over the Russian regions during transition years. *Communist and Post-Communist Studies*, 45, 1-10.
Caves, R. (1971) International corporations: The industrial economics of foreign investment. *Economica*, 38 (149), 1-27.
Caves, R. (1974) Multinational firms, competition, and productivity in host-country industries. *Economica*, 41, 176-193.
Caves, R. (2007) *Multinational Enterprise and Economic Growth*. Cambridge, CUP.
Chidlow, A., Salciuviene, L. and Young, S. (2009) Regional determinants of inward FDI distribution in Poland. *International Business Review*, 18, 119-133.
Cook, M. (2010) Explaining the determinants of manufacturing and non-manufacturing FDI inflows in five UK regions. *International Journal of Management Practice*, 4 (1), 1-26.
Crozet, M., Mayer, T. & Mucchielli, J. L. (2004) How do firms agglomerate? A study of FDI in France. *Regional Science and Urban Economics*, 34, 27-54.
Dunning, J. H. (1977) Trade, location of economic activity and the MNE: A search for an eclectic approach. In: Ohlin, B., Hesselborn, P. O. & Wijkman, P. M. (eds.), *The International Allocation of Economic Activity*. London, Holmes and Meier, pp. 395-418.
Dunning, J. H. (1979) Explaining changing pattern of international production: In defence of eclectic theory. *Oxford Bulletin of Economics and Statistics*, 41, 269-296.
Dunning, J. H. & Lundan, S. M. (2008) *Multinational Enterprises and the Global Economy*. Cheltenham, UK, Edward Elgar.
EUROSTAT (2008) *European Union Foreign Direct Investment Yearbook 2008*. Luxembourg, European Commission.
Faeth, I. (2009) Determinants of foreign direct investment. A tale of nine theoretical models. *Journal of Economic Surveys*, 23 (1), 165-196.
Fazekas, K. (2005) Effects of FDI inflows on regional labour market differences in Hungary. *Economie Internationale*, 102, 83-105.
Globerman, S. (1975) Technological diffusion in the Canadian tool and dye industry. *Review of Economics and Statistics*, 57 (4), 428-444.
Hair, J., Black, W., Babin, B. & Anderson, R. (2009) *Multivariate Data Analysis*. Cloth, Pearson.

Haskel, J., Pereira, S. & Slaughter, M. (2007) Does inward foreign direct investment boost the productivity of domestic firms? *Review of Economics and Statistics*, 89 (3), 482-496.
Hayakawa, K. & Tanaka, K. (2011) Export platform FDI and firm heterogeneity. IDE Discussion Papers no. 310.
Hymer, S. H. (1976) *The International Operations of National Firms: A Study of Direct Investment*. Cambridge, MA, MIT Press.
Johnson, A. (2006) *The Effects of FDI Inflows on Host Country Economic Growth*. CESIS Working Paper no. 58.
Kemp, M. C. (1964) *The Pure Theory of International Trade*. Englewood Cliffs, NJ, Prentice Hall.
Kindleberger, C. P. (1969) *American Business Abroad: Six Lectures on Foreign Direct Investment*. New Haven, CT, Yale University Press.
Kluger, M. (2006) Spillovers from foreign direct investment: Within or between industries? *Journal of Development Economics*, 80, 444-477.
Knickerbocker, F. T. (1973) *Oligopolistic Reaction and Multinational Enterprise*. Boston, MA, Harvard University Press.
Lim, E. G. (2001) *Determinants of, and the Relation between, Foreign Direct Investment and Growth: A Summary of the Recent Literature*. IMF Working Paper WP/01/175.
Lipsey, R. (2002) Home and host country effects of FDI. Paper for the *ISIT Conference on Challenges to Globalization, Lidingö, Sweden*.
Lucas, R. E. (1988) On the mechanism of development planning. *Journal of Monetary Economics*, 22 (1), 3-42.
MacDougall, G. D. A. (1960) The benefits and costs of private investment from abroad: A theoretical approach. *Economic Record*, 36, 205-266.
Majocchi, A. & Presutti, M. (2009) Industrial clusters, entrepreneurial culture and the social environment: The effects on FDI distribution. *International Business Review*, 18, 76-88.
Maza, A. & Villaverde, J. (2011) EU regional convergence and policy: Does the concept of region matter? *Journal of Policy Modeling*, 33, 889-900.
Nardo, M., Saisana, M., Salteyi, A. & Tarantola, S. (2005) *Handbook on Constructing Composite Indicators: Methodology and User Guide*. Paris, OECD, STD/DOC 3.
Nicoletti, G., Scarpetta, S. & Boylaud, O. (2000) *Summary Indictors of Product Market Regulation with an Extension to Employment Protection Legislation*. Paris, OECD, ECO/WKP (99)18 no. 226.
OECD (1996) *OECD Benchmark Definition on Foreign Direct Investment*. 3rd ed. Paris, OECD.

Ottaviano, G. & Puga, D. (1998) Agglomeration in the global economy: A survey of the "new economic geography". *World Economy*, 21 (6), 707-731.

Papalia, R. B. & Bertarelli, S. (2009) The role of local agglomeration economies and regional characteristics in attracting FDI: Italian evidence. *International Journal of the Economics and Business*, 16 (2), 161-188.

Pazienza, P. & Vecchione, V. (2009) A preliminary investigation of the determinants of the FDI distribution in Italy. *Journal of Business Economics and Management*, 10 (2), 99-107.

Polasek, W. & Sellner, R. (2010) Spatial Chow-Lin methods for data completion in econometric flow models. *IHS Economic Series*, 255. Vienna, Institute for Advanced Studies.

Polasek, W. & Sellner, R. (2011) Does globalization affect regional growth? Evidence for NUTS-2 regions in EU27. *Economic Series*, 266. Vienna, Institute for Advances Studies.

Polasek, W., Llano, C. & Sellner, R. (2010) Bayesian methods for completing data in spatial models. *Review of Economic Analysis*, 2, 194-214.

Romer, P. M. (1990) Endogenous technological change. *Journal of Political Economy*, 98 (5), 71-102.

UNCTAD (1996) Investment and foreign direct investment. *Current Studies, Series A*, 30. New York and Geneva, United Nations.

UNCTAD (1999) *World Investment Report 1998. Trends and Determinants*. New York and Geneva, United Nations.

UNCTAD (2001) *World Investment Report, 2001*. New York and Geneva, United Nations.

UNCTAD (2002) *World Investment Report, 2002*. New York and Geneva, United Nations.

Vernon, R. (1966) International investment and international trade in the product cycle. *Quarterly Journal of Economics*, 80, 190-207.

Villaverde, J. & Maza, A. (2012) Foreign direct investment in Spain: Regional distribution and determinants. *International Business Review*, 21, 722-733.

Wren, C. & Jones, J. (2012) FDI location across British regions and agglomerative forces: A Markov analysis. *Spatial Economic Analysis*, 7 (2), 265-286.

Technical Appendix

A. FDI Performance and Potential Indices

The Inward FDI Performance Index

This index is given by the expression:

$$Performance\ Index = \frac{(FDI_i / \sum_i FDI_i)}{(GDP_i / \sum_i GDP_i)} 100$$

where *i* refers to the total number of countries/regions considered in the analysis.

The Inward FDI Potential Index

Drawing from UNCTAD (2002) we have constructed our own Inward FDI Potential Index for the EU countries/regions by using the following variables: per capita GDP, R&D expenditures as percentage of GDP, exports plus imports as percentage of GDP, and the percentage of employment in high technology sectors.

The index for a country/region *i* is computed as the simple average of the scores on the chosen variables for that country/region. The score for each variable is computed as:

$$Score = \left[\frac{(V_i - V_{\min})}{(V_{\max} - V_{\min})} \right] 100$$

where V_i refers to the value of the variable for country/region *i* and $V_{\min}$ and $V_{\max}$ refer, respectively, to the lowest and highest values of the variable among the countries/regions.

B. Spatial dependence

The Moran's I statistic (I) is given by the expression:

$$I = \frac{n}{\sum_i \sum_j w_{ij}} \frac{\sum_i \sum_j w_j \left(fdi_i - \overline{fdi}\right)\left(fdi_j - \overline{fdi}\right)}{\sum_i \left(fdi_i - \overline{fdi}\right)^2}$$

where, as known, $fdi_{i(j)}$ is FDI in terms of GDP of region $i(j)$, $\overline{y}$ is the European average, and the weights w_{ij} are elements of the distance matrix W between each pair of regions (i, j). The sum of all weights $\sum\sum w_{ij}$ is a normalisation factor, and n is the number of regions. A significant positive value of standardised Moran's I (Z_I-value) indicate positive spatial dependence (autocorrelation), while a significant negative value reflects a pattern of spatial association between dissimilar values.

As reckoned by most geographers and regional scientists, choosing matrix W is a crucial part of the exploratory spatial data analysis. Its role is to put more weight in those observations belonging to neighbouring regions. Regarding this issue, we use as distance matrix the inverse of the distance between regions, this distance defined as the geographic distance between the corresponding regional centroids. In any case, we also compute the test with other distance matrices as well (the "5 nearest neighbours" matrix and several cut-off distance matrices), being the results obtained very similar.

C. Market Potential

The market potential for a region i has been computed as the weighted average of GDP of all EU regions j other than i. Therefore, this variable is calculated as follows:

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

where w_{ij} are, once again, the elements of the distance matrix W between each pair of regions (i, j).

D. Factor analysis

The application of factor analysis consists of mainly four steps. First and before properly starting factor analysis we compute the correlation between each pair of original variables. Table 1 indicates that most of them have at least one correlation coefficient over 0.5 (shown in bold). Because the determinant of the correlation matrix is null, the conclusion is that a factor analysis is appropriate.

Second, we analyse the correlation structure of the variables by using conventional tests. For this step, we rely on the KMO measure of sampling adequacy (whether or not there are sufficient items for each factor) and Bartlett's test of sphericity (to check whether or not original variables are sufficiently correlated). Table 2 shows that this KMO statistic is greater than 0.5 (meaning that is significant), and Bartlett's measure on the correlation matrix passes at the 0.05 significance level. These results once again indicate that our sample is adequate to conduct an exploratory factor analysis.

Subsequently, by applying this approach and Kaiser's criterion for factor extraction, we identify six factors with eigenvalues greater that 1 (Table 3), which explain 81.0% of the cumulative variance of the 21 original variables. The composition of these six factors is reported in Table A.4. The first factor (F1), *economic potential*, includes labour productivity, per capita GDP, wages, air and multimodal accessibility, and market potential. This factor explains more than 35.6% of the entire variance. The second factor (F2), *market size*, comprises GDP, population, and investment variables. The third factor (F3), *labour situation*, includes the employment rate, activity rate, inverse of unemployment rate, and inverse of long-term unemployment rate. The fourth factor (F4), *technological progress*, contains four indicators: R&D investment, R&D personnel, high technology sector, and human capital. The fifth factor (F5), *labour regulation*, encompasses labour market regulation and the inverse of labour law rigidity and tax wedge. Finally, the sixth factor (F6), *competitiveness*, combines openness degree (exports + imports over GDP) and manufacturing share.

To this point it is worth mentioning that there is no doubt of the suitability of this sixth-factor solution because of three additional reasons (see also Table 4). First, almost all of the original variables are highly correlated with just one factor and quite weakly with the others. Second, all of the variables have at least one factor loading greater in absolute value than 0.5, which is regarded as being very significant. Finally, the reliability of the extracted fac-

tor structure is patent because it explains between 57.9% and 95.9% of the variance of each original variable; in fact, in 18 out of 21 cases, it explains more than 70% of it.

The fourth and last step consist in that, once the factor analysis has been developed, and as a previous step to the estimation process, we must create scores to represent the position of each region's placement on the factors. There are several approaches to compute factor scores (for a recent survey, see, for example, DiStefano et al., 2009) and to test the reliability of the results. In this report we use two approaches: 1. Sum scores, which factor loadings are obtained on the basis of the rotated matrix (Nicoletti et al., 2000). 2. Regression scores, which is the matrix of factor loading for the case reported in Table 5.

Table 1 Correlation matrix

Variables	OP	GDP	PO	GDP-pc	LP	MSH-ARE	W	Urinv	LTUR-inv	ER	AR	INV	TWinv	R&D	R&DP	HTC	HC	MULA	LLR-inv	LMR	MP
OP	1.00																				
GDP	-0.23	1.00																			
PO	-0.24	0.81	1.00																		
GDPpc	-0.14	0.51	0.05	1.00																	
LP	-0.14	0.48	0.05	0.93	1.00																
MSHARE	0.36	-0.05	0.01	-0.11	-0.11	1.00															
W	-0.11	0.48	0.05	0.92	0.97	-0.08	1.00														
Urinv	0.11	0.12	-0.14	0.53	0.43	0.05	0.40	1.00													
LTURinv	-0.03	0.02	-0.20	0.47	0.39	-0.05	0.38	0.86	1.00												
ER	-0.01	0.29	0.04	0.57	0.39	0.13	0.43	0.66	0.49	1.00											
AR	-0.06	0.28	0.08	0.48	0.28	0.09	0.34	0.45	0.35	0.94	1.00										
INV	-0.22	0.98	0.83	0.46	0.44	-0.05	0.43	0.09	0.00	0.25	0.25	1.00									
TWinv	-0.25	-0.06	-0.11	0.02	-0.06	-0.22	-0.07	0.19	0.23	0.14	0.10	-0.07	1.00								
R&D	0.03	0.35	0.12	0.54	0.53	0.15	0.55	0.26	0.22	0.42	0.38	0.33	-0.15	1.00							
R&DP	-0.01	0.38	0.12	0.59	0.50	0.00	0.52	0.22	0.20	0.42	0.39	0.35	-0.06	0.80	1.00						
HTC	0.11	0.46	0.18	0.59	0.52	0.07	0.54	0.41	0.32	0.53	0.48	0.41	-0.02	0.65	0.64	1.00					
HC	-0.17	0.13	0.22	-0.06	-0.09	-0.17	-0.13	-0.21	-0.22	-0.04	-0.01	0.15	-0.02	0.08	0.39	0.06	1.00				
MULA	0.19	0.53	0.27	0.65	0.61	0.05	0.65	0.36	0.18	0.49	0.44	0.48	-0.20	0.52	0.51	0.64	-0.01	1.00			
LLRinv	-0.10	0.08	-0.13	0.42	0.36	0.05	0.42	0.50	0.60	0.46	0.38	0.00	0.32	0.25	0.23	0.41	-0.23	0.29	1.00		
LMR	0.15	-0.05	-0.07	0.02	-0.06	-0.03	-0.01	0.33	0.33	0.21	0.13	-0.10	0.50	-0.06	-0.02	0.22	-0.13	0.04	0.67	1.00	
MP	-0.12	0.35	0.05	0.66	0.73	-0.07	0.75	0.40	0.32	0.38	0.27	0.32	0.09	0.32	0.20	0.37	-0.26	0.54	0.34	0.18	1.00

Table 2 KMO and Bartlett's test

Test		Value
KMO measure of sampling adequacy		0.697
Bartlett's test of sphericity	Approximate χ^2	6621.943
	Degrees of freedom	210
	Significance	0.000

Table 3 Factor analysis. Total variance explained

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

Table 4 Factor analysis. Rotated component matrix

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

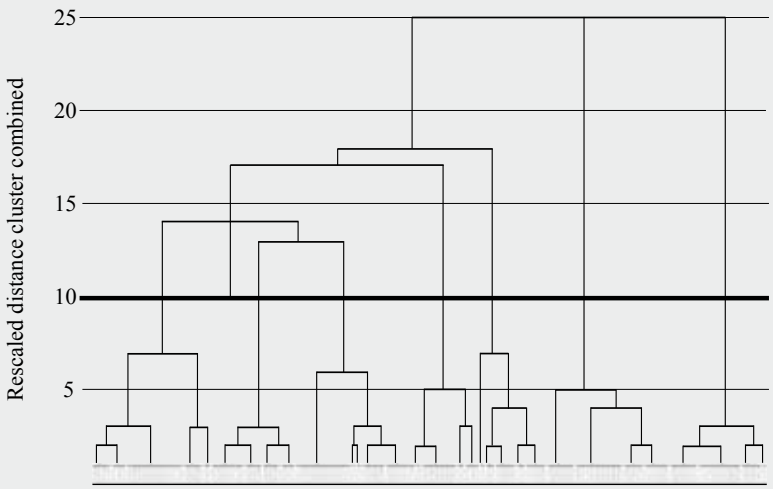
Table 5 Factor loadings

Variable	F1	F2	F3	F4	F5	F6
OP	-0.011	0.063	-0.339	0.104	0.229	0.279
GDP	0.083	-0.191	0.157	0.079	0.184	0.016
PO	0.030	-0.219	0.182	0.193	0.238	0.017
GDPpc	0.121	-0.001	0.003	-0.171	-0.070	-0.048
LP	0.112	-0.022	-0.013	-0.279	-0.029	0.038
MSHARE	0.000	0.018	-0.276	0.184	0.292	-0.040
W	0.114	-0.014	-0.025	-0.258	-0.010	0.056
Urinv	0.083	0.164	0.009	0.050	0.067	-0.187
LTURinv	0.071	0.184	0.064	-0.004	-0.013	-0.147
ER	0.097	0.083	-0.022	0.222	-0.018	-0.385
AR	0.084	0.051	-0.021	0.252	-0.043	-0.432
INV	0.076	-0.202	0.154	0.083	0.187	-0.007
TWinv	0.005	0.130	0.325	0.098	-0.108	0.141
R&D	0.091	-0.050	-0.191	0.060	-0.187	0.138
R&DP	0.089	-0.066	-0.133	0.115	-0.349	0.186
HTC	0.102	-0.011	-0.092	0.141	-0.041	0.230
HC	-0.006	-0.130	0.036	0.194	-0.439	0.093
MULA	0.102	-0.056	-0.120	0.006	0.112	0.118
LLRinv	0.072	0.174	0.111	0.074	0.030	0.231
LMR	0.023	0.176	0.178	0.200	0.116	0.471
MP	0.091	0.030	0.064	-0.250	0.152	0.045

E. Cluster analysis

The process we follow to establish our regional clusters consists of two steps. First, we perform a hierarchical clustering method based on distance connectivity to determine the number of clusters. Using the conventional Ward's method and squared Euclidean distance as a proximity measure, we derive a dendrogram (tree diagram representing a hierarchy of categories based on the degree of similarity or number of shared characteristics among objects) (Figure 1). The literature suggests that clusters be defined at a consistent level of similarity, such that one could draw a line at some chosen level of similarity and all objects that intersect that line form a cluster.[29] According to our dendrogram (see the horizontal bold line in Figure 1), the most reasonable choice implies the existence of seven clusters of regions.

Figure 1 Dendogram



Second, hierarchical methods imply that once a cluster is formed it is impossible to split it. As a second step, we apply nonhierarchical methods, which are more flexible than hierarchical ones. In particular, we carry out a nonhierarchical k-means clustering method, using the centroids (group-means) obtained in Ward's method as starting values.

[29] Several methods have been proposed but their application is somewhat arbitrary.

Sammanfattning på svenska

De senaste årens globala ekonomiska utveckling har lett till en markant ökning av utländska direktinvesteringar (*foreign direct investment*, FDI). FDI är av stor vikt för att främja ekonomisk tillväxt och har därför också blivit en viktig del i de ekonomisk-politiska strategierna i såväl utvecklade som mindre utvecklade länder. Tendensen är särskilt framträdande i EU, i synnerhet efter inre marknadsprogrammet, euron och de senaste två utvidgningarna. Det är med andra ord av stort intresse att studera FDI, inte minst ur ett policyperspektiv.

Det finns flera studier som analyserar FDI i EU. Av statistiska skäl utgår de flesta från den nationella nivån, trots att vi får en tydligare bild när vi studerar FDI på den regionala nivån. Den här rapporten – *Inward Foreign Direct Investment in the European Union: Regional Distribution and Determinants* – försöker att fylla detta hål genom att analysera den regionala fördelningen av FDI-inflödet till EU under perioden 2000-2006. I synnerhet analyseras de faktorer som förklarar fördelningen och utvecklingen över tiden. En ny FDI-databas används, som till skillnad från andra databaser också ger information om det *totala* FDI-inflödet till EU:s regioner.

Rapporten fokuserar inledningsvis på att definiera vad FDI är och vilken betydelse direktinvesteringarna har för mottagarekonomierna. Därefter granskas den teoretiska och empiriska litteraturen om FDI och dess bestämningsfaktorer. Den mest accepterade teoretiska ansatsen representeras av det så kallade ”eklektiska OLI-paradigmet” som har utvecklats av Dunning (1977, 1979). Enligt Dunning kan FDI förklaras utifrån fördelar baserade på ägande (*ownerhship*, O); lokalisering (*localisation*, L); och internalisering (*internalisation*, I). Eftersom rapporten framför allt söker förklaringar till den geografiska fördelningen av FDI-inflödet i EU:s regioner, läggs särskild vikt vid lokaliseringsfördelarna. Dessa delas i sin tur in i tre olika typer: ekonomiska, politiska och socio-kulturella lokaliseringsfördelar. Kapitlet avslutas med en sammanfattning av resultaten från de få studier som hittills har analyserat just regional FDI i EU.

Därefter ges en översikt över fördelningen av FDI i EU, framför allt ur ett regionalt perspektiv men även ur globalt och nationellt perspektiv. Tre insikter avseende FDI formuleras i rapporten: den totala mängden och dess utveckling över tid; dess geografiska fördelning och koncentration; samt några grova men användbara indikatorer avseende regioners attraktionskraft. När det gäller koncentrationen visar rapporten att FDI-inflödet inte är jämnt

fördelat över EU:s territorium. Regioner med ett högre (lägre) FDI-inflöde är sannolikt placerade geografiskt närmare varandra, något som bekräftas av en så kallad spatialanalys.

Rapportförfattarna fokuserar på de faktorer som påverkar FDI-inflödena i EU:s regioner. Det är viktigt att notera att det finns problem med såväl tillgängligheten som tillförlitligheten hos de data som används: för det första förändras FDI-inflödena markant från år till år, framför allt till följd av stora företagsfusioner och företagsförvärv. För det andra är datatillgängligheten förhållandevis svag för några av de potentiella bestämningsfaktorerna av regional FDI. Författarna löser detta genom att använda genomsnittliga värden för både FDI-flöden och samtliga variabler som enligt teorin kan förklara flödena. Med hänsyn tagen till dessa överväganden skapas en databas med 21 variabler.

Därefter går rapportförfattarna vidare i tre steg. Till att börja med genomför de en faktoranalys. Orsaken till detta är att det skulle vara svårt att arbeta med ett så stort antal variabler. Det skulle sannolikt även orsaka problem med kolinjäritet mellan variablerna i själva regressionsanalysen. Faktoranalysen resulterar i sex ”FDI-faktorer”, vilka i rapporten benämns *ekonomisk potential*, *marknadsstorlek*, *arbetsmarknadssituation*, *teknisk utveckling*, *arbetsmarknadslagstiftning* och *konkurrenskraft*. I det andra steget grupperas EU-regionerna i sju kluster, baserade på de ovan nämnda sex faktorerna, för att på så sätt bättre förstå varje regions attraktionskraft.

I det tredje och sista steget estimeras en FDI-ekvation där de sex FDI-faktorerna används som oberoendevariabler. Estimeringen leder författarna till slutsatsen att FDI-inflödena till EU:s regioner bestäms av regionernas *ekonomiska potential*, *arbetsmarknadssituation*, *tekniska utveckling* och *konkurrenskraft*. De resterande två faktorerna, marknadsstorlek och arbetsmarknadslagstiftning, tycks inte ha något statistiskt signifikant inflytande på lokaliseringsmönstren.

Slutsatsen bekräftas när författarna för in så kallade dummy-variabler i regressionsanalysen för att på så sätt ta hänsyn till regionerna i sammanhållningsländerna: dummy-variablerna blir positivt statistiskt signifikanta men de ändrar inte slutsatsen i någon större utsträckning för hur övriga variabler förhåller sig till beroendevariabeln (FDI-inflöde).

Rapportförfattarna kan bekräfta att resultaten är robusta, eftersom de landar i samma slutsats även efter det att det rumsliga (spatiala) beroende som upptäcktes tidigare i analysen har kontrollerats. Resultatet ger uttryck för att en regions prestationsförmåga hänger ihop med prestationsförmågan hos grannregionerna. Detta leder i sin tur till den tentativa slutsatsen att *agglomerering* i sig kan vara en viktig faktor för hur FDI fördelas.

Rapporten avslutas med ett antal policyrelevanta slutsatser. Framför allt bör regioner som vill attrahera utländska direktinvesteringar främja *den ekonomiska potentialen*, *arbetsmarknadssituationen*, *den tekniska utvecklingen* och *konkurrenskraften*. Därtill föreslår författarna – med hänsyn tagen till det stora antalet regioner och den mycket stora skillnaden mellan de sju klustren i studien – att politiken bör anpassas regionalt. Politiken skulle med andra ord utformas gemensamt i de respektive sju kluster som regionerna tillhör, det vill säga att särskild hänsyn bör tas till faktorer som är svaga i dessa regioner. Mer specifikt skulle regioner som hör till klustren 5-7 försöka att öka *konkurrenskraften*, medan regioner i klustren 2 och 3 skulle söka att främja *den ekonomiska potentialen*. Kluster 1 skulle istället fokusera på *arbetsmarknadssituationen*, medan kluster 4 skulle satsa på *den tekniska utvecklingen*.

SIEPS publications available in English

2012

2012:5
Europe Unplugged: Progress, Potential and Limitations of EU External Policy Three Years Post-Lisbon
Author: Bart Van Vooren

2012:3
On the Legitimacy of Monetary Union
Author: Christopher Lord

2012:2
Voting in the Council of the European Union:
Contested Decision-Making in the EU Council of Ministers (1995-2010)
Author Wim Van Aken

2012:1
The External Dimension of the EU's Area of freedom, Security and Justice: Progress, potential and limitations after the Treaty of Lisbon
Author: Jörg Monar

2012:2op
The Cyprus EU Presidency: "Riders on the Storm"
Authors: Argyris G. Passas and Evangelia I. Katakalou

2012:1op
The 2012 Danish EU Presidency:
Going green and economical in extraordinary times
Authors: Rebecca Adler-Nissen, Julie Hassing Nielsen och Catharina Sørensen

2012:15epa
Evaluating the Prospects for Enhanced Solidarity in the Common European Asylum System
Authors: Eiko Thielemann and Carolyn Armstrong

2012:14epa
Consumers´ Interest and the EU:
A Framework for Analysis, with Evidence from the Italian Case
Author: Paolo R. Graziano

2012:13epa
New Paradigms for Banking Regulation
Author: Xavier Freixas

2012:12epa
Response to Crisis
Author: Axel Leijonhufvud

2012:11epa
Stuck in the Exit: the Dynamics of British-EU Relations
Author: Roderick Parkes

2012:10epa
The EU and Nuclear Safety: Challenges Old and New
Author: Anna Södersten

2012:8epa
The Commission´s Posting Package
Authors: Jonas Malmberg and Caroline Johansson

2012:7epa
The Greek Elections of 2012 and Greece´s Future in the Eurozone
Author: Dionyssis G. Dimitrakopoulos

2012:6epa
Common Fisheries Policy Reform and Sustainability
Author: Jill Wakefield

2012:4epa
Eurobonds, Flight to Quality, and TARGET2 Imbalances
Author: Erik Jones

2012:3epa
The Hungarian Constitution of 2012
and its Protection of Fundamental Rights
Author: Joakim Nergelius

2012:2epa
The EU and Climate Treaty Negotiations after the Durban Conference
Author: Katak Malla

2012:1epa
The EU's Cooperation and Verification Mechanism:
Fighting Corruption in Bulgaria and Romania after EU Accession
Authors: Milada Anna Vachudova och Aneta Spendzharova

2011

2011:6
Achieving Europe´s R&D Objectives:
Delivery Tools and Role for the EU Budget
Authors: Jorge Núñez Ferrer and Filipa Figueira

2011:4
Regional Disparities in the EU:
Are They Robust to the Use of Different Measures and Indicators?
Authors: José Villaverde and Adolfo Maza

2011:3
The EU Budget – What Should Go In? What Should Go Out?
Authors: Stefan Collignon, Friedrich Heinemann, Arjan Lejour, Willem Molle, Daniel Tarschys and Peter Wostner

2011:2
Which Economic Governance for the European Union?
Facing up to the Problem of Divided Sovereignty
Author: Nicolas Jabko

2011:1
The Financial Crisis – Lessons for Europe from Psychology
Author: Henry Montgomery

2011:1op
An Interim Review of the Hungarian Presidency
Author: Gergely Romsics

2011:14epa
Public Services at the Local Level
– is a Decentralisation of State Aid Policy Necessary?
Author: Jörgen Hettne

2011:13epa
Euro Plus Pact:
Between Global Competitiveness and Local Social Concerns
Author: Karolina Zurek

2011:12epa
The EU and Strategies for New Climate Treaty Negotiations
Author: Katak Malla

2011:8epa
Brussels Advocates Swedish Grey Wolves:
On the encounter between species protection according to Union law and the Swedish wolf policy
Author: Jan Darpö

2011:7epa
A New Proportionality Test for Fundamental Rights
Authors: Anna-Sara Lind and Magnus Strand

2011:6epa
The European Treaty Amendment for the Creation of a Financial Stability Mechanism
Author: Bruno de Witte

2011:5epa
Comment on the European Commission´s "Green Paper towards adequate, sustainable and safe European pension systems"
Author: Conny Olovsson

2011:1epa
How Small are the Regional Gaps? How Small is the Impact of Cohesion Policy? A Commentary on the Fifth Report on Cohesion Policy
Author: Daniel Tarschys

Swedish Institute for European Policy Studies

Fleminggatan 20
SE-112 26 Stockholm
Ph: +46-(0)8-586 447 00
Fax: +46-(0)8-586 447 06
E-mail: info@sieps.se
www.sieps.se