INDUSTRIAL DISTRICTS, AGGLOMERATION ECONOMIES, AND FDI IN ITALY

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1. Introduction

Since the pioneering work of Marshall (1920), economic theory has recognized that agglomeration economies enhance the productivity of firms and thus favour the spatial concentration of economic activity. In the past few years these ideas have become the starting point for a large number of theoretical works studying the sources and consequences of agglomeration externalities (Krugman, 1991; Fujita *et al*., 1999).

Many empirical studies have analyzed the effect of agglomeration economies on multinational investment, in other words, whether agglomerated areas attract foreign direct investment inflows (FDI).[1] So far, however, certain aspects of the link between agglomeration and FDI inflows have been neglected. For example, to our knowledge there has never been a systematic attempt to verify whether the source of agglomeration externalities relevant for FDI is the spatial concentration of firms within the same industry or in different industries. In the first case, foreign investors would try to capture industry-specific externalities, such as intra-industry knowledge spillovers. In the second case, the incentive to invest would arise from the variety of industries within a geographical region being able to activate inter-industry knowledge spillovers and diversification economies (Jacobs, 1969).

A related issue is whether industrial districts attract foreign investors. Many empirical studies have demonstrated that within industrial districts positive externalities take place, e.g. increasing firm productivity and export propensity (Fabiani *et al*. 2000; Bronzini, 2000; Bagella *et al*.

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1 Among others: Coughlin *et al*. (1991), Wheeler and Mody (1992), Woodward (1992), Head *et al*. (1994, 1995), Braunerhjelm and Svensson (1996), Billington (1999), Wei *et al*. (1999), Basile (2001).

1998). On this basis, we might expect foreign investors, wishing to capture the potential localization economies, to prefer to invest in industrial districts rather than in other areas.

This paper contributes some empirical evidence on the role of agglomeration economies in attracting foreign direct investment in Italian regions and provinces. Its purpose is threefold. Firstly, we distinguish between sector-specific and non-sector-specific externalities and inquire whether FDI is directed mainly to specialized or diversified areas. Secondly, we test the hypothesis that industrial districts attract FDI. Finally, we investigate the role played by company size in attracting FDI. Most of the empirical literature disregards this aspect, yet we believe it deserves special attention, given that in Italy the majority of enterprises are small, especially in the economically less developed South.

The empirical analysis is based on a new database on FDI provided by the Italian Foreign Exchange Office (Ufficio Italiano Cambi) for Italian regions and provinces. Regional data are also available by sector. The advantage of the region-sector panel is that it is possible to control for omitted or unobservable factors at regional and sectoral level through fixed effects. The availability of data for different degrees of geographical aggregation provides further insight.

The rest of the paper is organized as follows. In the next section the geographical distribution of foreign investment inflows in Italy is explored by means of a descriptive analysis. In the third section, we briefly review the theoretical and empirical literature on agglomeration and FDI. The fourth section is devoted to discussing the empirical model. The results of the estimates and some extensions of the benchmark model are presented in the fifth section. The sixth section concludes.

2. Territorial concentration and spatial autocorrelation of FDI

The territorial data on FDI inflows examined in this paper span the period between 1994 and the first half of 2000.[2] Following the international methodology, inward FDI is defined as cross-border investment where the

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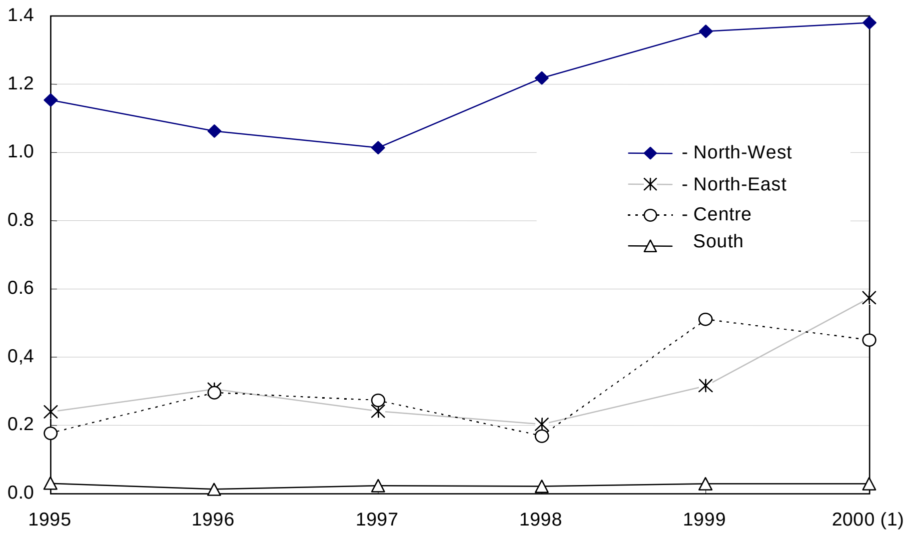
[2] Data are collected to compile the balance of payments. More information on the FDI data can be found in the Appendix.

foreign investor has the objective to obtain a lasting interest in a domestic enterprise. Foreign direct investment includes mergers and acquisitions (M&A) as well as greenfield investments. Our database has no data to distinguish between M&A and greenfield investment. On the other hand, it specifies the province and region that receive the investment.[3]

According to our data, the ratio of FDI to GDP in Italy in 1999 was about one per cent, less than half the OECD average (2.5 per cent; OECD, 2000). The majority of FDI inflows are concentrated in the North-West of the country, which accounts for over 70 per cent of the inflows accumulated from 1994 to 2000 (Table 1). This is approximately five times more than the share of either the North-East or the Centre; the South is only marginally interested by foreign investment. Despite these differences, cumulative FDI inflows as a percentage of GDP are low for all

Figure 1

FDI as a percentage of GDP



[3] The 20 Italian regions and 95 provinces correspond to Nuts-2 and Nuts-3 regions, respectively, in the Eurostat classification.

Table 1

FDI inflows by area and country of origin

(billions of lire and percentage shares in brackets; cumulative values, 1994-1st half 2000)

Country	North-West	North-East	Centre	South	Italy
Non-EMU Europe	28,677 (55.3)	7,112 (72.9)	4,367 (49.8)	333 (38.2)	51,241 (54.0)
EMU	12,223 (23.6)	1,914 (19.6)	3,543 (40.4)	282 (32.3)	29,026 (30.6)
America	9,924 (19.1)	479 (4.9)	746 (8.5)	204 (23.4)	12,849 (13.5)
Asia	891 (1.7)	131 (1.3)	103 (1.2)	50 (5.8)	1,210 (1.3)
Africa	157 (0.3)	90 (0.9)	8 (0.1)	3 (0.3)	310 (0.3)
Australia	11 (0.0)	8 (0.1)	1 (0.0)	1 (0.1)	51 (0.1)
Unspecified	10 (0.0)	27 (0.3)	7 (0.1)	0 (0.0)	147 (0.2)
Total (1)	51,893 (100)	9,761 (100)	8,775 (100)	872 (100)	94,832 (100)
Share of the national total (2)	(72.8)	(13.7)	(12.3)	(1.2)	(100)

Source: UIC. (1) The national total includes FDI not imputed to any area. (2) The total does not include FDI not imputed to any area.

macro areas; even in the North-West the ratio is only about 1.4 percentage points (Figure 1). The bulk of the investment comes from the European countries, especially from the UK, and from America (Table 1).[4] The manufacturing sector, together with financial and insurance services, covers about 70 per cent of total investments in the North and 60 per cent in the Centre-South (Table 2).

4 The large share of the UK could be due to the fact that the main European subsidiaries of non-European multinationals are located in the UK, which is registered as the country of origin of foreign investment.

The concentration becomes even more marked if one looks at the data in finer geographical detail. Considering individual administrative regions (20) instead of statistical macro areas (5), the first three regions (Piedmont, Lombardy, Lazio) account for about 60 per cent of the cumulative national total during the period (Table 3). This may be partly due to the presence of major metropolitan systems in these regions. Table 4 shows that the concentration at the level of provinces (about 100) is higher still: the first three provinces absorb over one half of total FDI.

A study of the provincial and regional concentration of FDI as compared with value added reveals further patterns (Figure 2). First, even after controlling for value added, the investment accumulated in the period

Table 2

FDI inflows by area and sector

(billions of lire and percentage shares in brackets; cumulative values, 1994-1st half 2000)

Sector	North-West	North-East	Centre	South	Italy
Manufacturing	23,535 (45.4)	4,341 (44.5)	1,424 (16.2)	392 (45.0)	37,835 (39.9)
Financial and insurance sector	13,425 (25.9)	2,782 (28.5)	3,684 (42.0)	118 (13.5)	30,768 (32.4)
Other services	10,300 (19.8)	1,628 (16.7)	2,031 (23.1)	182 (20.9)	17,654 (18.6)
Households	1,241 (2.4)	507 (5.2)	293 (3.3)	43 (4.9)	2,180 (2.3)
Energy products	411 (0.8)	43 (0.4)	85 (1.0)	16 (1.8)	1,443 (1.5)
Construction	624 (1.2)	158 (1.6)	444 (5.1)	14 (1.6)	1,273 (1.3)
Public sector	77 (0.1)	- (0.0)	220 (2.5)	- (0.0)	323 (0.3)
Agriculture	120 (0.2)	35 (0.4)	53 (0.6)	9 (1.0)	262 (0.3)
Unspecified	2,160 (4.2)	267 (2.7)	543 (6.2)	99 (11.4)	3,093 (3.3)
Total (1)	51,893 (100)	9,761 (100)	8,775 (100)	872 (100)	94,832 (100)

Source: UIC. (1) The national total includes FDI not imputed to any area.

is still more heavily concentrated at the provincial than at the regional level. Second, the sector concentration (computable only for regions) is greater in services than in manufacturing. Last, the territorial disparities seem to be increasing with time.

Table 3

FDI inflows by region
(billions of lire and percentage shares)

	Cumulative values, 1994 - 1st half 2000	Share of national total	FDI as a percentage of GDP (average)	Index of FDI as a percentage of GDP (Italy=100)	FDI percentage changes: averages, 1994-99
Lombardy	42.329	44.6	1.5	216.5	19.0
Piedmont	7.838	8.3	0.7	94.8	15.7
Lazio	7.339	7.7	0.5	77.4	33.9
Veneto	4.818	5.1	0.4	55.6	38.5
Emilia-Romagna	3.807	4.0	0.3	45.7	5.0
Liguria	1.247	1.3	0.3	43.3	16.6
Tuscany	1.138	1.2	0.1	17.9	-10.4
Friuli-Venezia Giulia	653	0.7	0.2	29.0	21.7
Trentino-Alto Adige	482	0.5	0.2	23.7	-0.8
Valle d'Aosta	479	0.5	1.2	175.8	66.1
Campania	375	0.4	0.0	6.2	22.8
Marche	230	0.2	0.1	9.5	-7.7
Abruzzo	207	0.2	0.1	11.5	-32.1
Sicily	109	0.1	0.0	2.0	27.3
Sardinia	70	0.1	0.0	3.4	23.7
Umbria	67	0.1	0.0	5.1	13.7
Puglia	48	0.1	0.0	1.1	18.3
Molise	35	0.0	0.1	8.2	-39.7
Calabria	17	0.0	0.0	0.8	97.5
Basilicata	11	0.0	0.0	1.6	7.9
Unclassified	23.531	24.8	..	..	..
Italy (1)	94.832	100	0.7	100	20.0

Source: UIC. (1) The national total includes FDI not imputed to any region.

Table 4

FDI inflows by province

(billions of lire and percentage shares)

OBS	Province	Cumulative values, 1994-1st half 2000	Share of national total	FDI as a percentage of GDP (average)	Index of FDI as a percentage of GDP (Italy=100)
1	Milan	38,012	40.1	3.1	392.3
2	Rome	7,086	7.5	0.7	93.2
3	Turin	6,904	7.3	1.2	155.4
4	Treviso	2,456	2.6	1.3	157.4
5	Bergamo	1,261	1.3	0.6	73.2
6	Bologna	1,220	1.3	0.4	52.4
7	Genoa	1,172	1.2	0.5	62.2
8	Brescia	1,111	1.2	0.4	55.5
9	Ravenna	869	0.9	1.0	129.2
10	Como	857	0.9	0.7	88.2
11	Modena	771	0.8	0.4	55.6
12	Vicenza	681	0.7	0.3	43.3
13	Varese	677	0.7	0.4	45.5
14	Venice	599	0.6	0.3	38.9
15	Florence	517	0.5	0.2	25.6
16	Aosta	479	0.5	1.5	190.9
17	Padua	451	0.5	0.2	26.5
18	Verona	446	0.5	0.2	27.0
19	Reggio Emilia	432	0.5	0.4	48.6
20	Trieste	307	0.3	0.4	50.7
21	Vercelli	284	0.3	0.7	86.0
22	Cuneo	276	0.3	0.2	28.4
23	Bolzano	253	0.3	0.2	26.2
24	Udine	231	0.2	0.2	22.8
25	Trento	229	0.2	0.2	25.2
26	Parma	219	0.2	0.2	26.0
27	Lucca	197	0.2	0.3	31.6
28	Alessandria	192	0.2	0.2	25.2
29	Naples	189	0.2	0.0	5.6
30	Latina	162	0.2	0.2	23.3
31	Ancona	151	0.2	0.1	17.7
32	Belluno	150	0.2	0.3	40.7
33	Lecco	141	0.1	0.2	23.7
34	Forlì	123	0.1	0.1	18.7
35	Teramo	118	0.1	0.2	29.0
36	Pavia	116	0.1	0.1	15.7
37	Caserta	108	0.1	0.1	13.9
38	Pordenone	108	0.1	0.2	21.1
39	Livorno	105	0.1	0.2	20.3

(contd)

(Table 4 contd)

OBS	Province	Cumulative values, 1994-1st half 2000	Share of national total	FDI as a percentage of GDP (average)	Index of FDI as a percentage of GDP (Italy=100)
40	Novara	100	0.1	0.1	15.8
41	Pisa	87	0.1	0.1	13.1
42	Piacenza	81	0.1	0.1	15.9
43	Siena	72	0.1	0.1	17.0
44	Perugia	63	0.1	0.1	6.3
45	Biella	62	0.1	0.1	15.9
46	Palermo	61	0.1	0.0	4.3
47	Prato	57	0.1	0.1	12.5
48	Sondrio	54	0.1	0.2	21.2
49	Rimini	52	0.1	0.1	11.3
50	Frosinone	51	0.1	0.1	7.3
	Unclassified	23,531	24.8	..	..
	Italy (1)	94,832	100.0	0.8	100.0

Source: UIC. (1) The national total includes FDI not imputed to any region.

A simple analysis of the geographical concentration of FDI does not provide full information about the patterns of FDI agglomeration. More specifically, concentration per se says nothing about the tendency of areas (say, provinces) in close proximity to have similar FDI levels. Such a pattern would be captured by (positive) spatial autocorrelation, while a negative autocorrelation would suggest competition among neighbouring provinces for FDI.

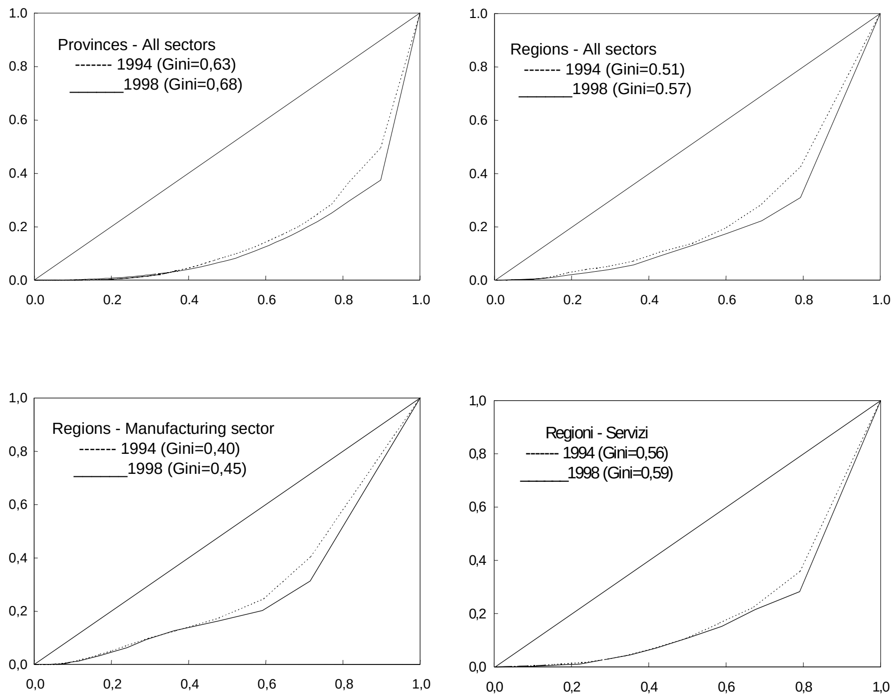
In order to test for spatial autocorrelation we must first define geographical proximity. This is done through a spatial weight matrix, whose generic element w_{ij} defines the weight of province *i* for province *j* in autocorrelation tests. For example, the matrix can take the form of the contiguity matrix, where $w_{ij}=1$ if the provinces have a border in common and $w_{ij}=0$ otherwise; or it can take the form of a distance matrix, where w_{ij} equals the inverse of the distance in kilometres between each pair of provinces.

As a first pass on the data, we test for the spatial autocorrelation by running the Moran *I* test using the two matrices described above.[5] The test is carried out on the ratio of FDI to provincial value added, both calculated as time averages.

Figure 2

FDI concentration across provinces and regions: Lorenz curves

(calculated over the share of value added)



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5 Moran (1948). For a discussion of the test see among others Anselin (1988) and the special issue of the International Regional Science Review, Vol. 20, No. 1-2 (1997). The Moran *I* test is carried out under the hypothesis of normality of the statistic *Z*.

The Moran I tests, reported in Table 5, reveal a global spatial dependence of provincial FDI: the spatial autocorrelation is positive and statistically significant with both contiguity and distance matrices; similar results are obtained if foreign investment is broken down by country of origin. However, while spatial dependence emerges clearly in the provinces of the South, in the rest of the country the test has non-significant values. In other words, the empirical evidence indicates stronger territorial polarization inside the South than in the Centre-North.

To summarize, in this section foreign investment appears to be highly concentrated in space, especially when the data include the services sector. The effect may depend on the attractiveness of the metropolitan areas for investors in services. Moreover, proximity seems to play a role in explaining the geographical distribution of investment: neighbouring provinces follow similar patterns. We investigate these aspects in greater detail in the following sections.

Table 5

Spatial autocorrelation across provinces: FDI to value added ratio

Area	No of prov.	Moran I ($w_{i,j}$=contiguity)	Test – Moran Z (w_{ij}=contiguity)	Moran I (w_{ij}=distance)	Test – Moran Z (w_{ij}= distance)
Centre-North provinces	67	0.04	0.78	-0.01	0.51
Southern provinces	36	0.27	2.59*	0.14	3.70*
Total	103	0.16	2.72*	0.06	4.37*

Moran $I=(n/So)\sum_i\sum_j w_{ij}(x_i-\mu)(x_j-\mu)/\sum_i(x_i-\mu)^2$, where n=number of observations; $So=(\sum_i\sum_j w_{ij})$ is the sum of weights; x= (FDI/Value added); i,j=province; μ=mean of x; w_{ij} =spatial weights.
Moran Test $Z=[I-E(I)]/SD(I)$.
Under normality of Z, the theoretical mean is $E(I)=(-1/(n-1))$; and $SD(I)$ is the theoretical standard deviation; the reference distribution is the normal.
* denotes significance at 1 per cent.

3. Related literature

3.1 *Industrial districts and agglomeration economies in the theoretical literature*

A common location of firms within the same industry can generate positive externalities, called MAR externalities for Marshall-Arrow-Romer (see Glaeser *et al*., 1992). The theory indicates three main sources for this type of agglomeration economy: knowledge spillovers, labour pooling, and input sharing. The first source is based on the idea that physical proximity facilitates the transmission of knowledge among firms and workers. The flow of ideas and the knowledge of new technologies spreads more rapidly among firms that are concentrated in specialized areas, thanks to informal contacts and the mobility of workers across firms; as a consequence, the growth of productivity within these areas should be faster. The second source of externalities is related to the formation of specialized local labour markets. Firms in the same industry are attracted to areas where large numbers of skilled workers are available, so that labour shortages or bottlenecks are less likely. At the same time workers are attracted by firms' agglomeration because in this way they reduce the likelihood of finding themselves without work; other things being equal, this mechanism reduces the risk premium embodied in wages by increasing the supply of specialized workers and favouring firms, which pay lower wages. The third source of externalities is the availability of a wide range of services and productive inputs within a geographically concentrated market. In this case the benefits for firms stem from the high specialization of input suppliers and the low transaction costs due to proximity.

A specific form of agglomeration economies relating to the spatial concentration of firms within the same industry is supposed to occur in industrial districts. The study of industrial district dates back to the works of Marshall and more recently Becattini. An industrial district is a local concentration of independent small and medium-sized manufacturing firms which enjoy certain idiosyncratic, community-based advantages. With respect to MAR externalities, district economies present some peculiarities. First, as pointed out by Becattini (1990), firms in industrial districts belong to vertically integrated branches rather than to one specific industry. District firms specialize in one phase, or only a few phases, of the production process, and within districts an intense local network of specialized transactions operates among enterprises. This pronounced division of labour, typical of districts, is seen as one of the primary sources of the efficiency of this kind of local productive system. A further peculiarity of the district lies in the linkages between the social environment and the productive structure. Within the industrial district agents, firms and institutions share a common system of social values and views: this commonality enhances collaboration among firms and among workers, and ultimately improves the global efficiency of the local productive organization. Finally, in the industrial district innovation and the adoption of new technologies are reinforced by an "industrial climate" that causes rapid dissemination of information and fosters a peculiar mix of competition and cooperation among firms. In theory, positive externalities may induce foreign firms to invest in district areas. Foreign investors might be attracted by the possibility of absorbing the stock of knowledge accumulated in the districts, or of benefiting from the particularly rapid and efficient transfer of knowledge in the districts, as well as from the dense network of vertically integrated firms.

Apart from MAR externalities, the economic literature has emphasized other types of agglomeration externalities which, unlike MAR economies, apply to firms belonging to different industries located in a common area. This type of external economy, called Jacobs externalities from Jacobs (1969), is based on the idea that the diversity of spatially proximate industries promotes the transfer of knowledge and productivity growth. According to this view, it is the overall industrial variety and scale rather than the specialization in one branch that boosts economic growth through the cross-fertilization of ideas and the transmission of innovations from one industry to another. In this case the emphasis is on the process of inter-industry transmission of knowledge.

Other features of the economic structure of a geographical area may affect firm productivity. Porter (1990) for example pointed out that local competition fosters growth because it encourages firms to innovate or rapidly adopt new technologies. Consequently, if there are many, possibly small, competing firms the flow of ideas will be rapid and likewise productivity growth. A similar view can be found in the literature on Italian industrial districts (see Pyke *et al.*, 1990; Signorini, 2000), which emphasizes the benefits of local competition among many specialized small firms. Thus. foreign firms may want to invest in diversified areas or where small firms prevail.[6]

3.2 *Agglomeration and FDI in the empirical literature*

One expects foreign firms to invest in the region with the highest expected profits net of any fixed costs, including sunk costs. Thus, in the empirical literature FDI inflows are assumed to be a function of a set of host country or region characteristics which affect the ability of firms to expand profits by either reducing production costs or increasing revenues. In general, the empirical model takes the form $y_i=\beta'X_i$, where y_i represents the FDI localized in country or region i, and X_i is a vector of explanatory variables referring to i.[7] The explanatory variables include proxies of market size, infrastructures, labour costs, fiscal variables and public incentives.

When proxies of agglomeration are included as explanatory variables, a positive effect is generally found. In the literature, the areas considered vary in size (countries or regions). Here two considerations are in order. First, in choosing the proxy for agglomeration the literature does not follow a unified approach; the models use different measures of agglomeration that only sometimes are sector-specific. Among the works that use non-industry-specific variables we cite Coughlin *et al*. (1991) and Wei *et al.* (1999), where the ratio of manufacturing employment, or population, to land area is used as proxy for density. Others consider the weight of the manufacturing sector: Woodward (1999) and Basile (2001) use the total number of manufacturing establishments within the area, while Wheeler and Mody (1992) and Billington (1999) use the degree of industrialization, in turn measured by the weight of the manufacturing sector as percentage of GDP. Other proxies for agglomeration include infrastructure endowments and previously accumulated FDI (e.g. Wheeler and Mody, 1992). On the other hand, certain studies consider explicit industry-specific proxies for agglomeration that are more closely related to what we call MAR externalities. Braunerhjelm and Svensson (1996) employ a sectoral specialization index, given by the ratio of sectoral

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6 Empirical evidence on the effect of specialization, diversity and Porter externalities on firm productivity is provided, among others, by Glaeser *et al*. (1992), Henderson *et al*. (1995), Deckle (2002), and Cingano and Schivardi (in this volume).

7 Coughlin (1998) presents an extensive survey of the empirical literature on FDI in the US.

employees to total manufacturing employees, while Head *et al*. (1994, 1995) use the number of foreign plants already located in the area belonging to the same sector and country of origin.

A second consideration relates to the way in which the empirical works disentangle the effect of agglomeration from the effect of productive factor endowment. As Head *et al*. (1995) pointed out, both domestic firms and foreign investors may be attracted to regions with better factor endowment. Therefore, the significance of agglomeration measures may in fact capture the correlation between the location of domestic firms and FDI due to the endowment effect, rather than agglomeration externalities. For instance, if there is considerable availability of industry-specific inputs in a particular area, we can expect that firms of the same industry, both national and foreign, will be located in that region; e.g. the availability of ports will attract firms in the shipping industry. For this reason the endowment effect could lead to spurious results on the agglomeration effect. To overcome this problem Head *et al*. (1995), when studying Japanese investment in the United States, used the number of domestic establishments in the corresponding sectors as a control for industry-specific location factors, and the number of incumbent Japanese plants in the same sector as a proxy for agglomeration. They argued that the geographical distribution of national establishments in a particular industry should incorporate all the relevant information on the distribution of inputs intensively used in that industry; thus they consider the distribution of domestic plants an appropriate control variable for factor endowment. Furthermore, they introduced industry and geographical fixed effects to control for unobserved characteristics relating to industries and geographical areas. In our paper we deal with this issue by making an appropriate standardization of the dependent variable.

4. The empirical model

4.1 *The regional model and the "district effect"*

The dependent variable of the econometric model is the FDI intensity, defined as the cumulative FDI inflows divided by value added, for each region and sector. The cumulative FDI is the sum of the gross investment inflows from 1994 to 2000; value added refers to 1994, the initial year for the foreign investment data. We preferred to cumulate the inflows as foreign investment is highly variable over time. For region *i* and sector *j* the FDI intensity is measured as:

$$(FDIVAD)=(\text{Cumulative FDI 1994-2000})_{i,j}/(\text{Value added 1994})_{i,j}$$

The reason for using this ratio as the dependent variable is that it controls for the effect of productive factor endowment. As we noted above, Head *et al.* (1995) argued that regions with favourable factor endowment attract domestic as well as foreign investors. As a result the correlation between domestic firms and foreign investment can be confused with the effect of agglomeration economies, and a model testing for agglomeration without controls for endowment may lead to spurious results on the agglomeration effect. Head *et al.* suggested introducing proxies for the geographical distribution of input as a control for the endowment effect. In our model, value added by region and sector is the control variable for factor endowment. In fact, the number of firms located in a given area should depend on factor endowment, and therefore value added will be larger in the regions with more favourable endowment. Value added is not included in the econometric model as explanatory variable because it can be positively correlated with some regressors and induce multi-collinearity. Thus, to control for endowment FDI is divided by value added and this ratio is used as the dependent variable.[8]

Using this variable also allows us to take into account, to some extent, the correlation between foreign investment and location of domestic firms that is due to investment by acquisitions. In the data we cannot distinguish between greenfield investments and acquisitions. However, we expect the acquisition of domestic firms to follow the geographical pattern of incumbent firms, and so by dividing FDI by value added we control for acquisitions as well as for the endowment effect.[9]

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8 In a log-linear regression of FDI on value added, to divide FDI by value added is equivalent to constraining the coefficient of value added to be equal to one. If the "true" coefficient were greater than one the model would be misspecified. We ran several regressions to test this hypothesis and the coefficient turned out not to be significantly different from one (results are available on request).

9 Mariotti and Piscitello (1994) use a similar dependent variable for the same reason. The FDI intensity should also account for other omitted factors that attract both foreign and domestic investors, such as labour costs.

On the basis of the theoretical discussion of section 2, the regional model is the following:

$$
\begin{aligned}
(FDIVAD)_{i,j} = \; & \alpha_1(Specialization)_{i,j} + \alpha_2(Diversity)_{i,j} + \alpha_3(Small)_{i,j} + \\
& \alpha_4(Big)_{i,j} + \alpha_5(Sforzi\ Districts)_{i,j} + \alpha_6(Iuzzol\ Districts)_{i,j} \\
& + \alpha_7(Iuzzol2\ Districts)_{i,j} + \alpha_8(Infrastructures)_i + \\
& \textstyle\sum_i \alpha_i(Regional\ Effects) + \sum_j \alpha_j(Sectoral\ Effects) + \varepsilon_{i,j}
\end{aligned} \qquad (1)
$$

where i and j stand for the 20 regions and 10 industrial sectors, respectively.

The first hypothesis to be tested is whether the positive externalities deriving from the agglomeration of firms belonging to the same industry, the so-called MAR externalities, attract foreign investment. A common measure of MAR economies is a sector specialization index computed on industry employment (see Glaeser *et al.* 1992):

$$Specialization_{i,j} = (\text{IS-1})_{i,j}/(\text{IS+1})_{i,j};$$

where $\text{IS}=(\text{N}_{i,j}/\sum_j \text{N}_{i,j})/(\text{N}_{Italy,j}/\sum_j \text{N}_{Italy,j})$; and $\text{N}_{i,j}$ is employment in region i and industry j. In our case the index is standardized and constrained within the interval (–1, 1) (see Paci and Usai, 2000).

Various types of agglomeration economies can arise from the diversity of the regional economic structure. As Jacobs (1969) pointed out, inter-sectoral knowledge spillovers may strengthen firm productivity; therefore industrially diversified regions could attract foreign investors. However, knowledge spillovers are not the only source of agglomeration economies related to sectoral diversity. For example, FDI can be attracted by sectorally diversified areas because the geographical concentration of firms producing different goods and services can reduce transaction costs and so expand the profits of foreign investors located in the same area. Our econometric model is unable to distinguish between the two sources of externalities; we regard both as falling into a broad category of non sector-specific agglomeration economies. Following Henderson *et al.* (1995), as a measure of Jacobs externalities we employ the relative Hirschman-Herfindahl index:

$$Diversity_{i,j}=(\text{Herfindahl}_{i,j}/\text{Herfindahl}_{Italy,j});$$

where $\text{Herfindahl}_{i,j} = \sum_{j^* \neq j} s_{i,j^*}^2$; $s_{i,j^*} = (N_{i,j^*}) / \sum_{j^* \neq j} (N_{i,j^*})$ and $j^*=1,\ldots 10$. For the region *i* and sector *j* the index is measured over all sectors except *j* and it decreases with the relative diversity of the area with respect to the national average. In other words, a higher index indicates a less diversified area. Thus we expect a negative sign for the corresponding coefficient.[10]

An additional issue that is examined in this paper is whether the average firm size in the host area can affect inward FDI. On the one hand, Porter (1990) claimed that local competitive markets foster innovation and the diffusion of information; hence we expect that in the regions where firms are small with respect to the market, competitive conditions will prevail and therefore knowledge spillovers and productivity growth will be higher. Similarly, the literature on industrial districts has highlighted the efficiency gains of local productive systems based on small enterprises, mentioning the benefits of a greater division of labour and the competition-collaboration relationships among small firms (Pyke *et al.*, 1990; Signorini, 2000). From this point of view, the regions where small firms prevail should attract more foreign investors. On the other hand, large enterprises could affect the flows of foreign capital because, in a context of incomplete information, their presence could signal the area's efficiency and enhance its reputation.[11] Moreover, large enterprises may attract foreign investors because they generate forward and backward economic linkages with other firms. For these reasons we employ two different explanatory variables to test for the effect of firm size on FDI inflows:

Small = (Share of workers employed in small firms compared with the national average)$_{i,j}$;

Big = (Share of workers employed in large firms compared with the national average)$_{i,j}$;

where small firms are those with less than 200 employees and large firms are those with more than 1,000 employees.[12]

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10 *Diversity* is computed including services.

11 On the links between incomplete information and foreign investment see Mariotti and Piscitello (1994).

12 In a robustness check we also employ different threshold values. See the Appendix for the sources of the data.

Let us now turn to the district effect. As we said there is empirical evidence that districts are efficient local economic systems, with high productivity and export propensity.[13] District externalities might induce foreign enterprises to invest in district areas. Testing for this hypothesis requires classifying geographical areas into districts and non-districts, and there is no single criterion for this classification.

A first method for identifying a district, based on certain characteristics of Local Labour Market Areas (LLMAs), has been proposed by Sforzi (1990). Districts are defined as those manufacturing LLMAs that are specialized in a particular branch of manufacturing and where small-medium enterprises prevail.[14] Following the Sforzi algorithm, we define the district intensity of a particular region as the share of district employment in total regional employment:

$$\textit{Sforzi districts}_i = (\textstyle\sum_j \text{District employees}_{ij})/(\sum_j \text{Employees}_{ij}),$$

where, for each region *i*, district employees are only those employed in the sector of specialization of the Sforzi districts.

For the purpose of this paper, however, the Sforzi criterion could be too restrictive. Following this approach, for an LLMA to be classified as a district it must be specialized in manufacturing, and therefore the algorithm rules out areas where a substantial share of employment is in the services sectors, notably metropolitan systems, even though in cities the agglomeration externalities are likely to attract foreign firms.[15] Furthermore, it excludes LLMAs based on large firms, although it is plausible that in such systems agglomeration economies could occur.

An alternative method of classifying geographical areas that is not limited in this way is proposed by Iuzzolino (in this volume). This defines a district as a continuum of territorial units specialized in vertically integrated sectors, corresponding to a *filière*, with a high agglomeration intensity. Without going into the details of this method, what matters here is that the criterion does not exclude either urban areas or local systems of

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13 See, for example, Bagella (1998), Bronzini (2000) and Fabiani *et al.* (2000).

14 LLMAs are discussed in other papers in this volume, for example by Iuzzolino. For a further discussion of the methods of identification see Cannari and Signorini (2000).

15 For example, the algorithm does not classify as a district the local system specialized in transport equipment centred in Turin.

large firms, as happens with the Sforzi algorithm.[16] Thus, we employ an alternative explanatory variable:

$$Iuzzol\ districts_i = (\sum_j \text{Districts employees}_{ij})/(\sum_j \text{Employees}_{ij}),$$

where *i* and *j* refer to region and sector, respectively; district workers are those employed in the sector of specialization of the district.[17]

The last district-intensity indicator used in the model is similar to the previous one, but it is computed for each region and sector and not only for each region:

$$Iuzzol\ districts2_{ij} = (\text{District employees}_{ij})/(\text{Employees}_{ij}).$$

Finally, a common result in the literature on FDI is that infrastructures attract foreign investment because they reduce production and transport costs (among others see Coughlin, 1991; Wheleer *et al.*, 1992; Wei *et al.*, 1999; Basile, 2001). Therefore we include infrastructures in the model as a further explanatory variable.

4.2 *The provincial model*

The provincial model differs from the regional model in three respects. First, since at the provincial level the FDI data are not available by sector, the model is estimated for the whole economy, taking manufacturing and services together. Second, as emerged from the descriptive section, FDI is spatially correlated across provinces. Therefore, the provincial model incorporates the spatially lagged dependent variable to capture spatial dependence and avoid misspecification due to spatial autocorrelation. Since spatially lagged dependent variables are endogenous (Anselin, 1988), the model is estimated by instrumental variables, using the spatially lagged infrastructures as instrument.[18]

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16 Another characteristic is that the agglomeration is measured on vertical integrated branches instead of individual industries.

17 For more information about the construction of the variables see the Appendix.

18 Anselin (1988) suggests using as instruments for spatially lagged dependent variables some spatially lagged explanatory variables of the model. Spatially lagged *Infrastructures* seemed to us the appropriate instrument given that they are strongly correlated with spatially lagged FDI, with a coefficient of 0.78.

$$
\begin{aligned}
(FDIVAD)_i = \ & \alpha_1(FDIVAD\_Spatial\ lagged)_i + \alpha_2(Diversity)_i + \\
& \alpha_3(Small)_i + \alpha_4(Big)_i + \alpha_5(Sforzi\ Districts)_i + \qquad (2) \\
& \alpha_6(Iuzzol\ Districts)_i + \alpha_7(Infrastructures)_i + \\
& \textstyle\sum_g \alpha_g(Regional\ Effects) + \varepsilon_{i,j}
\end{aligned}
$$

where i=1,…95 are Italian provinces, *FDIVAD*, *Density*, *Small* and *Big* are calculated as in the regional model but are computed for industry and services together; *Infrastructures* is the index that measures the total infrastructure endowment; the spatially lagged dependent variable is equal to:

$$(FDIVAD\ Spatially\ Lagged)_i = \textstyle\sum_k (w_{ik}\ FDIVAD_k);$$

where the spatial weight $w_{ik}=(\text{Bord}_{ik}/\sum_{k\neq i}\text{Bord}_{ik})$ comes from the contiguity matrix (Bord_{ik}=1 if provinces i and k have a border in common and 0 otherwise). Finally, for provinces *Diversity* is computed over all sectors:

$$Diversity = (\text{Herfindahl}_i/\text{Herfindahl}_{Italy});$$

where $\text{Herfindahl}_i=\sum_j s^2_{i,j}$; $s_{i,j}=(\text{N}_{i,j})/\sum_j(\text{N}_{i,j})$ and j=1,…15 are the same industrial and service sectors as in the regional model.[19]

5. Empirical strategy and results

The models have been estimated in log-linear form. Since regional FDI is sometimes zero, we have estimated a Tobit model by Maximum Likelihood, assuming a normally distributed error term. For the logarithm transformation to be always defined, we added a constant to the dependent variable and to some explanatory variables. The fixed effects are represented by additive dummies.[20]

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[19] For the source of the data see the Appendix.

[20] This choice requires a brief discussion. The ML estimates of the coefficients of a Tobit model with fixed effects is not consistent for T fixed and $N\rightarrow\infty$ (see among others: Hsiao, 1986; Baltagi, 1995; Arellano and Honoré, 2001). As in other non-linear models (logit, probit), in the Tobit the number of parameters increases with the number of observations to infinity, and it is not possible to change

(continues)

The provincial model has been estimated over the 95 provinces using Ordinary Least Squares. Because of the endogeneity of the spatially lagged dependent variable, the model that includes it has been estimated by IV, using the spatially lagged infrastructures and the contiguity matrix as instruments (Anselin, 1988).[21]

Data on FDI are available from 1994; in order to avoid endogeneity all independent variables refer to 1991. However, because of data availability *Infrastructures* refers to 1998.

Table 6 gives some descriptive statistics. The results of the regional model are presented in Table 7. The three district variables, which are correlated to each other, are inserted one at a time. In the first step we insert only the industry fixed effect, then the regional fixed effect.

The first three models in the table have been estimated with district intensities, fixed effect and dummies for geographical areas: the district variables turn out to be statistically significant with a positive sign. However, in the larger model of columns 4-6 only *Iuzzol districts* is significant, together with *Specialization* and *Big* firms; *Small* firms and *Diversity* do not seem to have any effect on foreign investment.

The results of columns 7-9 show that *Infrastructures* have a positive and largely significant impact, as does *Specialization*, whereas if we take account of the infrastructure endowment the coefficients of the district variables drop substantially and become statistically insignificant.

On the whole, no robust evidence emerges of the positive impact of district areas on FDI inflows, while *Specialization* turns out to be significantly correlated with FDI. It may be worth exploring whether

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the model in order to rule out the fixed effect as in linear models. For the Tobit model with fixed effects, Honoré (1992) proposes a semi-parametric estimator that is consistent and asymptotically normal. But through a Monte Carlo experiment he demonstrates that the asymptotic distribution is a good proxy for the actual one only if $N \geq 200$. Besides, the results of Heckman (1981) suggest not to overestimate the bias of the ML estimates of the Tobit model with additive dummies that control for the fixed effects. Indeed he shows, by means of a Monte Carlo method, that the bias of the ML estimates of a static probit model with fixed effect is negligible if N is not much greater than T (in the experiment N=100 and T=8). Based on these results, Arellano (2000) suggests estimating by ML the non-linear model with fixed effects if the ratio N/T is finite and not too large. Since in our paper the size of the panel respects these constraints (i=20 and j=15), following Braunerhjelm *et al.* (1996) we decided to use additive dummies for the fixed effect and estimate the model by the ML method.

21 Spatially lagged FDI and *Infrastructures* are correlated, with a coefficient equal to 0.78.

Specialization within the district regions has a significant differential effect on FDI attraction: in other words if district areas that are also specialized attract more FDI than the areas that are only specialized. In order to test this hypothesis we interacted *Specialization* with a district dummy equal to one for the regions with high district intensity.[22] The results are reported in the first three columns of Table 8. The specialized district areas do not seem to have a significant impact on FDI: only *Specialization* and *Infrastructures* are significant.

Table 6

Descriptive statistics of the regional sample

Variable	Obs.	Mean	Standard dev.	Coeff. of var.	Minimum	Maximum
Log(1+FDI/Value added)	200	2.22	1.82	0.82	0.00	6.99
Log(1+Specialization)	200	-0.17	0.36	2.18	-1.76	0.50
Log(Diversity)	200	0.14	0.17	1.23	-0.15	0.55
Log(1+Small)	200	0.71	0.17	0.24	0.03	1.35
Log(1+Big)	200	0.37	0.57	1.54	0.00	2.95
Log(1+Sforzi districts)	200	0.07	0.08	1.11	0.00	0.25
Log(1+Iuzzol districts)	200	0.14	0.13	0.91	0.00	0.37
Log(1+ Iuzzol2 districts)	200	0.10	0.16	1.61	0.00	0.66
Log(Infrastructures)	200	4.45	0.22	0.05	4.09	4.86

In columns 4-7 of Table 8 we show the results of the models estimated with regional fixed effects and with regressors that vary across industries. As regard the district variables, the results are unaltered: none is significant. *Specialization* remains significant while now *Diversity* is significant and has the expected negative sign.

[22] The variable is calculated as the interaction between specialization and a district dummy equal to one if the corresponding continuous district variable falls in the last quartile of the distribution. The use of different thresholds does not change the results.

Qualitatively similar results are obtained by modifying the thresholds for *Big* and *Small* (from 1,000 to 500 employees for *Big*, and from 200 to 50 for *Small*), excluding the regions where FDI is more heavily concentrated (namely Lombardy, Lazio and Piedmont), and finally changing the thresholds used to compute the district dummies of Table 8.

Table 7

Results for the regional model: industrial sectors

Dependent variable: Log(1+FDI/Value added)
Tobit model; Maximum likelihood estimates

Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log(1+Specialization)				0.87** (0.43)	0.73* (0.42)	0.60 (0.47)	0.84** (0.39)	0.90** (0.39)	0.96** (0.44)
Log(Diversity)				-1.76 (0.97)	0.16 (1.05)	-1.61 (0.84)	-0.35 (0.90)	-0.56 (0.99)	-0.79 (0.77)
Log(1+Small)				1.01 (0.92)	0.85 (0.89)	0.82 (0.92)	0.79 (0.84)	0.87 (0.84)	0.92 (0.85)
Log(1+Big)				0.61** (0.25)	0.49** (0.24)	0.57** (0.24)	0.21 (0.23)	0.18 (0.23)	0.19 (0.23)
Log(1+ Sforzi districts)	3.26* (1.91)			0.10 (2.27)			1.75 (2.07)		
Log(1+ Iuzzol districts)		4.92*** (1.03)			4.01*** (1.40)			0.45 (1.43)	
Log(1+ Iuzzol2 districts)			2.69*** (0.81)			1.19 (0.93)			-0.22 (0.87)
Log(Infrastructures)							5.04*** (0.75)	4.86*** (0.82)	5.02*** (0.77)
North-West	2.61*** (0.34)	2.12*** (0.34)	2.54*** (0.33)	2.31*** (0.34)	2.13*** (0.34)	2.28*** (0.34)	0.43 (0.41)	0.48 (0.41)	0.45 (0.41)
North-East	2.17*** (0.37)	1.88*** (0.33)	2.33*** (0.33)	2.06*** (0.36)	1.91*** (0.34)	2.08*** (0.34)	0.76** (0.37)	0.86** (0.36)	0.83** (0.36)
Centre	1.21*** (0.39)	0.77** (0.35)	1.33*** (0.33)	1.04*** (0.38)	0.76** (0.35)	1.01*** (0.34)	-0.06 (0.38	0.07 (0.34)	0.07 (0.34)
Sectoral fixed effect	yes	yes	yes	yes	yes	yes	yes	Yes	yes
Log-likelihood	-342.18	-332.64	-338.19	-332.47	-328.46	-331.67	-311.29	-311.60	-311.62
Left censored observations	42	42	42	42	42	42	42	42	42
Number of observations	200	200	200	200	200	200	200	200	200

Standard errors in brackets. *, **, *** indicate significance at 10, 5 and 1 per cent, respectively. North-West, North-East, Centre are regional dummies equal to one if the region belongs to the corresponding geographical areas (the baseline is South).

Table 8

Results for the regional model: interaction of specialization and districts

Dependent variables: Log(1+FDI/Value added)
Tobit model; Maximum likelihood estimates

Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log(1+Specialization)	1.11*** (0.42)	0.96** (0.41)	1.04** (0.46)	2.64** (0.80)	2.49*** (0.79)	2.62*** (0.80)	2.46*** (0.79)
Log(Diversity)	-0.56 (0.81)	-0.37 (0.88)	-0.81 (0.78)	-23.48** (9.54)	-23.65** (9.69)	-24.21** (9.53)	-24.77** (9.64)
Log(1+Small)	0.81 (0.84)	0.86 (0.83)	0.88 (0.85)	1.06 (0.83)	1.09 (0.83)	1.04 (0.83)	1.06 (0.83)
Log(1+Big)	0.18 (0.23)	0.19 (0.23)	0.20 (0.23)	0.21 (0.23)	0.23 (0.23)	0.25 (0.23)	0.23 (0.23)
Dummy Sforzi	0.00 (0.31)						
Dummy Iuzzol		0.24 (0.34)					
Dummy Iuzzol2			-0.06 (0.32)				
Dummy Sforzi* Log(1+ Specialization)	-1.42 (1.06)			-1.15 (1.03)			
Dummy Iuzzol* Log(1+ Specialization)		-0.81 (1.20)			-0.31 (1.16)		
Dummy Iuzzol2* Log(1+ Specialization)			-0.64 (0.99)			-0.84 (0.93)	
Log(1+ Iuzzol2 districts)							0.35 (0.91)
Log(Infrastructures)	5.07** (0.76)	4.90*** (0.75)	4.91*** (0.78)				
North-West	0.46 (0.41)	0.43 (0.41)	0.51 (0.42)				
North-East	0.81** (0.36)	0.78** (0.36)	0.86** (0.36)				
Centre	0.00 (0.35)	0.08 (0.34)	0.08 (0.34)				
Regional fixed effects	no	no	no	yes	yes	yes	yes
Sectoral Fixed Effects	yes	yes	yes	yes	yes	yes	yes
Log Likelihood	-310.72	-311.11	-311.44	-294.93	-295.52	-295.14	-295.48
Left censored observations	42	42	42	42	42	42	42
Number of observations	200	200	200	200	200	200	200

Standard errors in brackets. *, **, *** indicate significance at 10, 5 and 1 per cent, respectively. North-West, North-East, Centre are regional dummies equal to one if the region belongs to the corresponding geographical areas (the baseline is South).

The results of the provincial models are reported in Table 9. Besides the regional dummies, the first two models include *Infrastructures*, which is positive and significant, and the district variables, which are non-significant. Columns 3-6 report the results for the full models; since *Small* and *Big* are highly correlated, they are not inserted contemporaneously. In columns 3-4 only *Infrastructures* comes out as significant, whereas from columns 5-6 it emerges that small firms discourage FDI. The loss of significance of the infrastructure coefficient might be due to multi-collinearity, since *Infrastructures* and *Small* are negatively correlated.[23]

In Table 10 the models include the spatially lagged FDI intensity as an explanatory variable. Since this variable is endogenous, the models must be estimated by IV. Following Anselin (1988), we have chosen the spatially lagged *Infrastructures* as the instrument for our spatially lagged

Table 9

Results for the provincial model: industry and services

Dependent variables: Log(FDI/Value added); OLS estimates

Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
Log(Infrastructures)	1.43** (0.54)	1.29** (0.53)	1.17* (0.64)	1.14* (0.63)	0.45 (0.64)	0.52 (0.65)
Log(Diversity)			-0.53 (1.16)	-0.39 (1.15)	0.31 (1.11)	0.16 (1.11)
Log(1+Big)			0.19 (0.40)	0.10 (0.39)		
Log(1+Small)					-13.61** (5.38)	-10.10* (5.11)
Log(1+Sforzi districts)	0.95 (1.38)		1.02 (1.44)		2.10 (1.43)	
Log(1+ Iuzzol districts)		1.39 (0.87)		1.30 (0.90)		1.09 (0.88)
Regional dummies	yes	yes	yes	yes	Yes	yes
Adj. R2	0.63	0.64	0.63	0.64	0.65	0.65
St. error of the regression	1.09	1.08	1.10	1.09	1.06	1.06
Observations	95	95	95	95	95	95

Standard errors in brackets. *, **, *** indicate significance at 10, 5 and 1 per cent, respectively.

[23] The coefficient of correlation is –0.55.

FDI intensity.[24] Since the lagged FDI intensity is highly correlated with regional effects, only dummies for geographical macro areas are used.

The results obtained with IV appear similar to those obtained previously. The district variables continue to have no impact on FDI, while in the restricted model the only significant effect is that of *Infrastructures* (column 1-2).

Overall, the empirical evidence tends to reject the hypothesis that district areas attract investment from abroad. The district variable based on the Sforzi algorithm is never significant, probably because the method excludes cities from the district areas as well as areas in which small firms do not prevail. A significant effect emerges from the district variable based on the Iuzzolino algorithm, but it disappears once the model includes other explanatory variables such as *Infrastructures*.

The variable *Infrastructures* turns out to be positively correlated with FDI distribution, a result that is consistent with several previous empirical findings. Furthermore, FDI seems to be attracted by the sectoral specialization of a region. The more a region is sector-specialized, the more it will attract FDI in that sector: an outcome that supports the hypothesis of MAR externalities and that can be found in other empirical investigations (Braunerhjelm and Svensson, 1996). This result apparently conflicts with the insignificant district effect and is probably due to the fact that districts are geographical areas specialized in a group of vertically integrated sectors, not a single sector. Thus, it seems that foreign investors take more account of the spatial concentration of firms belonging to the same sector, thanks to technological spillovers or the availability of specialized labour, than of the advantages arising from a network of firms connected by forward and backward linkages.

Finally, in the regional model sectoral diversification seems to attract FDI. By contrast, FDI does not seem to be affected by the average size of the incumbent firms: in the majority of the estimated models neither the share of small firms nor that of large firms have a significant correlation with FDI in an area.

[24] The spatially lagged FDI intensity is correlated with the spatially lagged *Infrastructures*, with a coefficient equal to 0.78.

Table 10

Results for the provincial model: industry and services

Dependent variables: Log(FDI/Value added); IV estimates (1)

Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
Log(FDIVAD_spatially lagged)	0.07 (0.56)	0.06 (0.56)	-0.13 (0.64)	-0.15 (0.66)	-0.01 (0.64)	-0.01 (0.66)
Log(Infrastructures)	1.42** (0.56)	1.22** (0.58)	1.06 (0.70)	1.02 (0.71)	0.59 (0.68)	0.62 (0.69)
Log(Diversity)			-2.08 (1.25)	-2.16 (1.31)	-1.25 (1.33)	-1.70 (1.36)
Log(1+Big)			-0.03 (0.40)	-0.11 (0.37)		
Log(1+Small)					-8.19 (5.66)	-4.83 (5.36)
Log(1+ Sforzi districts)	1.76 (1.53)		0.99 (1.60)		1.89 (1.54)	
Log(1+ Iuzzol districts)		1.22 (0.98)		0.61 (0.96)		0.57 (0.94)
Area dummies	yes	yes	yes	yes	yes	yes
Adj. R2	0.53	0.53	0.51	0.51	0.54	0.53
St. error of the regression	1.24	1.24	1.27	1.27	1.22	1.24
Observations	95	95	95	95	95	95

Standard errors in brackets. *, **, *** indicate significance at 10, 5 and 1 per cent, respectively. (1) The spatially lagged dependent variable has been instrumented by the spatially lagged infrastructures.

6. Concluding remarks

In this paper we investigated FDI inflows in Italian regions and provinces in the period 1994-2000. From the descriptive analysis, FDI appears to be very concentrated territorially, with only a small share absorbed by the regions of the South. The spatial concentration is even higher in the services sector and across small areas such as provinces: this is a reflection of the powerful attraction exerted by big cities on foreign investors.

The econometric analysis verified the effect of some characteristics of the local productive structure on the inflows of foreign investment, such as sectoral specialization and diversity, district intensity, infrastructures, and firm size.

Sectoral specialization is strongly correlated with FDI inflows: the most specialized areas are those that attract most investment from abroad. This result suggests the existence of MAR externalities, and is similar to previous results in the literature. Sectoral diversity seems also to play a positive role.

On the other hand, the positive "district effect", often found in the literature for, e.g., higher productivity and export propensity, does not seem to exist for FDI inflows. In most regressions the coefficient of district intensity turns out to be non-significant, whichever of a number of methods is chosen to measure it.

A possible explanation of this result is that district economies are based on strong links between the local productive structure and the social community, which favour local entrepreneurs but have little value for investors from outside the district, such as foreign investors. In the case of a foreign investor much of the community-based informative advantage of the district is lost.[25] A further suggestion that emerges from the analysis is that the close links among local firms belonging to vertically integrated branches, or *filières*, typical of districts do not seem relevant to foreign investors, whereas there seems to be an important effect of the territorial concentration of firms belonging to the same industry.

Finally, two further results are worth mentioning. First, as in many previous empirical studies we find that the infrastructure endowment is positively correlated with FDI inflows. Second, there is no evidence that firm size matters for foreign investment: neither small firms nor large firms seem to attract foreign investors, but nor do they discourage them.

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[25] Some evidence supporting the hypothesis of a closure of district areas with respect to foreign investors can be found in Mariotti and Mutinelli (2001).

APPENDIX: DATA AND CONSTRUCTION OF THE DISTRICT VARIABLES

The data on FDI are provided by the Italian Foreign Exchange Office (Ufficio Italiano Cambi). Data are the amount of gross FDI inflows, by region and province, collected for the compilation of the balance of payments. In our data, FDI includes greenfield investments and acquisitions. Greenfield investment refers to the construction of new production facilities, while acquisitions are the purchase of existing assets. For acquisitions to be registered as direct investments they must amount to at least 10 per cent of the domestic firm's assets. At the regional level FDI is broken down into 10 one-digit industrial sectors: energy products, iron production, non-ferrous metal production, chemical products, metal products, transport equipment, food and beverages, textiles and clothing, paper and printing, wood and other manufactured products. At the provincial level data are not available by sector but only for the whole economy, including industry and services together. The data on employment by establishment are from Istat, *1991 Census*; regional value added comes from Istat, *Regional Economic Accounts*. The regional and provincial index of total infrastructure takes account of the availability of different kinds of productive infrastructure such as roads, railways, telecommunication, ports, and airports. The index is standardized by the size of the area (region or province) and is provided by Istituto Tagliacarne (1998). Provincial value added comes from Istituto Tagliacarne (2001).

The method used to compute district intensity based on the Iuzzolino classification is the following. Let *c* be the (sub-provincial) territorial unit, *s* the three-digit Ateco sector, *m* the macro sector by which the industrial sectors are aggregated by the algorithm and *j* the (macro) sector by which FDI is classified. The number of district workers in area *c* and sector *s* is: *EDIST(c,s)*=Number of workers in district (*c*,*s*) if county *c* belongs to a district of sector *m* and if $s \in m$; *EDIST(c,s)*=0 otherwise. If *E(c,j)* is the number of workers in area *c* and sector *j*, the district intensity of region *r* and sector *j* is: *Iuzzol districts* $(r,j)=\sum_c\sum_s EDIST(c,s)/\sum_c\sum_s E(c,s)$ with $c \in r$; and *Iuzzol2 districts*$(r,j) = \sum_c\sum_s EDIST(c,s)/ \sum_c\sum_s E(c,s)$ with $c \in r$ and $s \in j$.

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