Local Industrial Systems and the Location of FDI in Italy

Lisa De Propris, Nigel Driffield and Stefano Menghinello

Abstract

This paper investigates the determinants of FDI location across Italian provinces. Specifically it examines the relationship between industry-specific local industrial systems and the location of inward FDI. This extends previous analysis beyond the mere density of activity, to illustrate the importance of the specific nature of agglomerations in attracting inward investment. The paper develops a model of FDI location choice using a unique FDI database stratified by industry and province. The results also suggest that the importance of agglomeration differs between industries, and offers some explanation for this.

Keywords: Local industrial systems, knowledge sourcing, agglomeration, count data econometrics.

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Lisa De Propris	Nigel Driffield	Stefano Menghinello
Birmingham Business School The University of Birmingham, Edgbaston, Birmingham B15 2TT l.de_propris@bham.ac.uk	Aston Business School, Aston University, Birmingham B4 7ET n.l.driffield@aston.ac.uk	ISTAT, Italy and Birmingham Business School The University of Birmingham, Birmingham B15 2TT menghine@istat.it

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1. Introduction

Traditionally, Italy has taken a far more cautious approach to attracting inward investment than most EU countries. Italy has had few policy initiatives designed to attract inward foreign direct investment, these being limited to conventional measures to foster development in the Southern regions of the country. Recently however, the policy emphasis appears to have shifted, bringing Italy more into line with countries such as Spain, Ireland and the UK, in terms of seeking to attract internationally mobile capital. Never the less, this is a relatively recent change. FDI in Italy has increased modestly and research on the relative appeal of Italian regions for FDI is still limited.

This paper seeks to contribute to the ongoing debate concerning the importance of agglomeration in explaining the location of FDI. Specifically, this paper focuses on the importance of local industrial systems (henceforth LISs) and of Marshallian industrial districts (henceforth MIDs), as potential stimuli in attracting foreign investment. This is consistent with recent contributions in the literature showing the superior economic performance of LISs with respect to the generic agglomeration of economic activities. For example, drawing a distinction between comparative and competitive advantages, Camagni (2002) argues that LISs generate competitive advantages at the firm level, while in general agglomeration economies merely provide a source of comparative advantage. An obvious extension of this therefore is to test whether this superior performance makes such locations attractive to inward investors. While the general performance of LISs suggest that they may exhibit an additional attraction over and above general agglomeration effects, this relationship is far from clear. Bellandi (2001) for example highlights the complex nature of LISs, and suggests that large firms may face problems when trying to embed themselves in such systems. Industries organised in LISs tend to be characterised by a flat governance structure, whereby decision-making is dispersed across all firms without a unique centre. As such, large external firms may find it problematic to establish relationships and position themselves in the firm network. Further, the benefits that such a location has to offer are often intangible and un-tradable, and only accessible to incumbent firms. One possible conclusion from this is that LISs or MIDs may only be attractive to inward investors seeking a long term presence in the locality and to become embedded within the network of local firms. Equally, LISs or MIDs may only seek to attract MNEs with a particular set of complementary firm specific assets.

The rest of the paper is set out as follows: section 2 reviews the main findings of recent theoretical and empirical literature on MNEs location choice and agglomeration, while section 3 extends the theoretical background to include LISs as sources of specific agglomeration economies. Sections 4 and 5 describe the data employed and outline the econometric model. Section 6 presents the main findings of the econometric analysis and, finally, section 7 provides some thoughts on policy implications and presents some concluding remarks.

2. The importance of local factors in explaining FDI

The dominant model of the motivations for a firm to enter a foreign market through FDI has changed little since the seminal work of Dunning (1958) and Vernon (1966). The basic framework has been one which envisages the firm generating certain firm specific assets in its home country, then seeking to exploit these further by creating income generating assets abroad. Until relatively recently location or "pull" factors were viewed as less important than "push" factors, related to ownership advantages and the benefits of internalisation.

Following Dunning's (1998) contribution on the importance of location for international business research, there has been a significant growth in the literature seeking to explain the location of foreign subsidiaries. In particular, many seek to investigate the link between agglomeration and FDI. For example, Cantwell and Santangelo (1999) argue that the technological strengths of host countries are important in determining the location options for the multinational firm. In addition, the localised nature of learning processes has changed the geographical scale of location patterns from the national to the regional or even local level. For instance, Dicken (1998), and Cantwell and Iammarino (2000) show that foreign R&D activities in the UK are strongly concentrated in the South-East of England.

The analysis of FDI location choice and agglomeration has recently been extended, see for example Basile's (2002, 2004) analysis of Italy; Crozet *et al* (2004) of France; and Togo and Arikawa (2002) for Malaysia. Further, Devereux and Griffith's (1998) analysis of the UK illustrates the importance of agglomeration in explaining the location of inward investors. However, due to colinearity problems, they are unable to distinguish between proximity effects in terms of other firms, external R&D or final markets.

Linking agglomeration to FDI in itself is not a new idea. Cantwell (1991), for example, shows that there are significant benefits to both domestic and foreign firms from agglomeration (see also Shaver, 1998). Location advantages at the local or regional level could be self perpetuating where further development of a local industry makes the location even more attractive (Head, Ries and Swenson, 1995, see also Krugman, 1991, Wheeler and Mody, 1992). In a similar vein, Driffield and Munday (2001) illustrate the importance of agglomeration economies and spillovers on total factor productivity growth of UK regions. They demonstrate that a critical level of regional concentration of economic activities is a necessary condition for spillovers to occur. Much of the recent work on the determinants of the spatial distribution of FDI is based on Coughlin *et al*. (1991), who develop a model of MNE location choice based on profit maximisation. Coughlin *et al.* (1991) demonstrate that FDI is attracted to regions with high levels of final demand for the output, but also to regions with high densities of manufacturing activity and extensive transportation infrastructure. At the same time higher wages and taxes deter FDI location.

More recently, however, the focus has shifted from the extent to which multinationals' subsidiaries tend to agglomerate, or the extent to which inward investors encourage agglomeration of activity, to the attractiveness to inward investors of pre-existing agglomerations of domestic firms. Clearly in such cases the inter-firm dynamics are very different and it is to these phenomena that recent research has turned. Nachum (2000), for example, offers a link between models based on economic geography and international business analysis, by suggesting that FDI can be a force for agglomeration, while this is tested more explicitly in Driffield and Munday (2000, 2001). Pantzalis (2001) demonstrates that the location of foreign subsidiaries can contribute significantly to the value of the parent company, while Zaheer and Manrakhan (2001) address this issue of agglomeration more explicitly. They illustrate the importance of regional concentration in explaining the location patterns of FDI, highlighting the importance of local production even in the presence of virtual links between markets. Perhaps more surprising is that similar forces can be identified in a developing country context. Chew and Yeung (2001) and He (2002, 2003) for Singapore and China respectively, demonstrate the importance of the agglomeration of domestic activity in explaining inward investors location decisions.

Further, Chew and Yeung (2001) illustrate that through such clusters of local firms, a transfer of specific knowledge to the MNE can take place, improving its performance.

The issue of the specific nature of agglomeration forces is addressed by Guimarães *et al* (2000) who distinguish between four different agglomeration effects, as well as urbanisation effects. Firstly, they identify industry specific localisation economies, proxied by the local share of employment by sector at the local level. This, however, does not allow for differences in the organisation of output in the sector, whether it is concentrated in one large firm or many smaller ones for example. This distinction is of vital importance when attempting to evaluate the importance of "genuine" firm cluster or LIS effects. Secondly, they allow for a more general agglomeration effect captured through the concentration of business services at a local level. Thirdly, they allow for the more specific agglomeration effects within the foreign sector separately. This borrows from the arguments made by Mariotti and Piscitello (1995) discussed below. Finally, they include a manufacturing intensity variable, proxied by manufacturing employment density. It is not clear *ex ante*, however, how this variable may be expected to impact of the location decision of inward investors. It is possible, for example, that an already densely populated manufacturing sector would deter further entry rather than attract it. In general, however, Guimarães *et al* (2000) find that general manufacturing agglomeration (manufacturing intensity), industry-specific agglomeration, and the presence of service sector firms all attract FDI to particular locations in Portugal, while there is no significant additional foreign sector effect. These results are indicative of the fact that FDI in Portugal is strongly concentrated around Lisbon and Porto, with such urban concentrations perhaps dominating any other cluster or LIS effect.

List (2001) reports similar results for California, in that industry agglomeration, population density and land availability at a county level all act to attract FDI. List's measure of agglomeration, however, has a significant "entry" component, such that it is highly correlated with foreign entry in previous time periods. Mariotti and Piscitello (1995) report similar results for Italy, based on the information requirements attached to entering a foreign country. This is well understood within the international business literature, but seldom addressed within empirical studies. Mariotti and Piscitello (1995) argue that such information problems lead to regional concentration of inward investors. Such a phenomenon has also been suggested as part of the explanation for concentrations of Japanese investment in

South Wales (Munday, 1990). It is reasonable to assume that cluster and LIS effects in the Italian case will reinforce this, providing evidence of successful sustained activity at the local level. Coughlin and Segev (2000) extend previous analysis by including educational attainment as a possible determinant of FDI attraction, and illustrate the importance of infrastructure and tax rates. They also demonstrate that urban regions are more attractive to FDI than rural ones.

More recently, Basile (2004) considers the importance of public research institutions and business services in attracting FDI in Italy. In general, the measure of agglomeration (number of manufacturing establishments at the provincial level) is found to deter inward investors, while contiguity effects are largely insignificant. This again does not distinguish between different types of localisation effects, such as LIS or cluster effects, which are generally considered to be particularly important in Italy, with a strong culture of local industrial systems and clusters of small firms. Crozet *et al* (2004) also test for such agglomeration effects, though again do not distinguish between different types of localisation effects. Such analysis is focussed on whether inward investors tend to cluster together, and the extent to which the presence of local firms is important. In general, they find all three effects are significant, though the presence of local firms appears to be the most important.

In the context of the UK, Devereux *et al* (2004) examine the spatial concentration of the manufacturing sector by employing micro data. They find a good deal of evidence for the presence of agglomeration economies within industries, with entry and exit reinforcing such concentrations. Further, they find some evidence of "co-agglomeration" – related industries having similar spatial patterns. Interestingly, however, they find no relation between such phenomena and technology, with traditional industries, if anything, being the ones more likely to be concentrated and co-agglomerated.

It is clear, however, that the ability of a locality to attract FDI merely represents the potential for development, and that technology, or knowledge sourcing is by no means automatic, but depends on the actions of the firms concerned (Driffield and Love, 2003). This can be extended to the analysis of LIS following Bellandi (2001). In LISs, the embodied knowledge is embedded not in an individual firm, but in the local industrial system. Such locations are therefore attractive for knowledge sourcing MNEs, providing that they are able to foster cooperative relationships with local firms. Kogut and Chang (1991) and Neven and Siotis (1996) point out that the possibility of technology sourcing has exercised the minds of policy makers in the US and the EU, with concerns that host economies' technological base may be undermined by technology sourcing by Japanese and US corporations respectively. The literature on the internationalisation of R&D also contains an increasing amount of evidence that technology sourcing may be a motive for FDI (Cantwell, 1995; Cantwell and Janne 1999; Pearce, 1999). This literature stresses a range of reasons for FDI in R&D, much of which is concerned with the relative technological strengths of the capital exporting (i.e. 'home') firm or country versus that of the host. For example, Kuemmerle (1999) distinguishes between 'home-base exploiting' (HBE) FDI and 'home-base augmenting' (HBA) FDI. The former is undertaken in order to exploit firm-specific advantages abroad, while the latter is FDI undertaken to access unique resources and capture externalities created locally. Van Pottelsberghe de la Potterie and Lichtenberg (2001) find positive spillovers effects from outward FDI arising from accessing the R&D capital stock of host countries, leading them to conclude that FDI flows are predominantly technology sourcing in nature. Le Bas and Sierra (2002) develop such arguments further and demonstrate that domestic clusters are important for technology sourcing FDI by MNEs, as do De Propris and Driffield (2003) who show that productivity spillovers in both directions between MNEs and domestic firms are significantly greater for clusters. This is discussed in more detail in the following section

3. Local industrial systems and foreign entry

The literature seeking to examine a firm's decision to undertake FDI has recently begun to focus on the importance of agglomeration economies. This, however, has largely been limited to considering the importance of the geographical proximity of production activities; and has not taken account of a wider literature that has looked at more complex forms of firm agglomerations like LISs in general, and MIDs in particular.

As it is well understood, agglomeration economies are generated by technological externalities derived from the geographical proximity of a critical mass of firms specialised in one or more related sectors. LIS economies are, however, more specific, as they are characterised by interactions between local firms and institutions (Storper, 1995). LISs present a more flexible and complex system of production coordination, generating superior performance in terms of production efficiency and learning processes. Storper (1995) also stresses the intangible factors that are important determinants of a regions' competitiveness. He defines the LIS, as a "nexus of untraded interdependencies", to stress how strong competitive regions develop successful models of production that cannot be easily imitated or translated to other locations. They are embedded in the underlying system of shared conventions and norms.

MIDs are a particular type of LIS. Becattini (1990) argued that MIDs provide firms with additional competitive advantages in terms of production and output flexibilities. These stem from collective learning, and the coordination and integration between economic activities, local community values and institutions. Becattini (1990) defines the industrial district as "a territorial entity characterised by the active presence of a group of persons and a population of firms in a given historical and geographical dimension". This definition highlights the strong interplay of social and economic factors as basic conditions for the successful development of industrial districts. Industrial districts are characterised by a high degree of specialisation and complementarity. This generates dynamic processes of knowledge creation (learning and innovation) and knowledge transfer (diffusion and synergies).

An innovative and competitive district can produce positive externalities to its entire region, in that as it grows, the extent of vertical and horizontal product differentiation increases. As a result, the industrial district becomes a centre of accumulated competencies across a range of related industries, and across various stages of production (the so called production *filière*). Italian industrial districts can also be identified in relatively low tech sectors. For example, certain traditional industries in Italy demonstrate tendencies to form MIDs. For example, the Sassuolo ceramic tile industrial district accounts for one third of the sectors world exports (De Propris *et al* (2003).

These localised centres of accumulated knowledge can be very attractive to outside firms. Indeed, the analysis of LISs and MIDs suggests that in seeking to link agglomeration to FDI location the type of agglomeration is crucial. The very general classification of agglomeration economies so far adopted in FDI location choice models is likely to underestimate the specific role of LISs and MIDs in explaining the location of inward investment. In this paper, we explore the conditions affecting the location choice of MNEs. This extends the analysis beyond general agglomeration economies, and considers LISs and MIDs as attractive locations for foreign investment.

4. Data

The data employed in this paper combine information on foreign entry with Census of Industry and Services statistics, both stratified by location and industry. The territorial unit of analysis is the Italian province. There are currently 103 such provinces in Italy, representing a further disaggregation from the 20 standard Italian regions. Provinces provide a more suitable level of analysis for industrial location. Industries are identified at the 2 digit level; data are available for 1996-1999 (see Table 1 below).

Data on the number of enterprises under foreign control were provided by CNEL-ICE- Politecnico di Milano. The standard dataset available at the provincial and industry level refers to the stock of foreign firms under foreign control for the reference period 1996-1999. As Basile (2004) shows, the scale of foreign entry into the Italian manufacturing sector was very limited over this period, with an average of 10 green field entries per year and less than 20 foreign acquisitions per year.

LISs, as well as MIDs, are defined at the provincial and industry level. LISs are identified using standard Census data at the industry and provincial level provided by ISTAT (Italian Office of National Statistics). This is done by combining two indicators: manufacturing density and industry specialisation. The first is measured using the share of manufacturing over total employment, while the second is detected by location quotient (LQ). The LQ is defined as follows:

$$LQ_{ij} = \frac{\dfrac{emp_{ij}}{emp_j}}{\dfrac{emp_i}{emp_{tot}}}$$

Where *Emp* represents employment in local manufacturing plants and *i* and *j* denote respectively sector and province. Values of LQ_{ij} above 1 denote local specialisation in a given industry. This quotient, combined with local manufacturing density above the national average, generates a set of industry-specific dummy variables that vary across provinces and identify 311 LISs with respect to more than 2,150 potential industry and province combinations. Although, this approach suffers from major limitations, it is still consistent with the purpose of the paper to discriminate LISs from more general forms of agglomeration.

The identification of MIDs is based on a more accurate statistical analysis that has mapped MIDs at the sub-regional level (ISTAT ,1997 and Sforzi, 1990): in particular, MIDs were identified at the provincial level based on ISTAT (1997) and Becattini and Menghinello (1998). From the analysis of 784 travel-to-work-areas[1] for 1991, ISTAT identified 199 MIDs with respect to a limited number of sectors[2]. A set of dummy variables to identify MIDs at the provincial level was then developed by Becattini and Menghinello (1998) in order to employ data only available at the administrative region level.[3] 40 MIDs were identified with respect to the about 200 LISs defined for the same group of industries.

Table 1 Data Summary

Variables	Description	Source	Number	Mean	Std Dev	Min-Max
FDI	No. firms under foreign control (1996-99)	CNEL-ICE-Politecnico di Milano	3,093	1.43	7.71	0-240
LIS	Dummy variable that detects local industrial systems (all manufacturing industries, 1996)	Authors' elaboration on ISTAT, Census of Industry and Services data	311	0.14	0.35	0-1
MID	Dummy variable that identifies Marshallian industrial districts, 12 industries only (Nace two digit codes: 15, 17, 18, 19, 21, 22, 26, 29, 30, 31, 33, 36) - 1991	ISTAT (1997) and Becattini-Menghinello (1998)	40	0.04	0.20	0-1
EP	Export performance (value of export (.000 euro) per employees, 1996)	ISTAT, Foreign trade statistics and Census of Industry and Services data	-	60.13	947.12	0-43,829
AS	Firm average size	ISTAT, Census of	-	19.24	57.12	1-1,051

[1] Travel-to-work-areas were identified by ISTAT on the basis of the Census of Population data. Italy is divided in 784 TTWA.

[2] The methodology adopted by ISTAT to identify the 199 MIDs from the total set of 784 TTWA is discussed in detail in ISTAT (1997). It involves a two step procedure. The first identifies manufacturing intensive TTWA, and then further discriminates these latter on the basis of the relative concentration of SMEs (using 250 person employed as threshold to distinguish SMEs from large companies). This classification, based on statistical criteria, proved to be consistent with more qualitative approaches in detecting industrial districts in Italy.

[3] Since the TTWA classification is derived on the basis of socio-economic variables, it is not necessary coherent with the main administrative repartitions of the Italian territory such as the regions and the provinces. In effect, a single TTWA may be included in different provinces or regions. However, it is possible to indirectly link the 784 TTWA and 103 provinces at the municipality level (about 8.500 territorial units) and obtained aggregated share of MIDs over total employment by industry and province. In particular, Becattini and Menghinello (1998) defined as "district-like" provinces the subset of province and industry combination for which the MIDs' employment share is proved to be above 60 per cent.

(number of employees per manufacturing firm, 1996)	Industry and Services data

In order to construct a model of the determinants of foreign entry, other variables are also included in the analysis, again stratified by sector and location. Local industry export performance (EP) is included and measured as the value of export per employee. Average firm size, (AS) is measured as number of employee per manufacturing firm.

We also classify manufacturing industries (defined according to the two digit NACE classification) according to their technology intensity: this enables us to test for differential effects across industries of differing technological intensity. The definition of technological intensity is based on an OECD-EUROSTAT classification (Laafia, 2002) and distinguishes four types of manufacturing industries: high technology, medium-high technology, medium-low technology and low technology industries (see Appendix A and Table 2 below).

Table 2 Distribution of FDI, LIS and MID by technology-intensive industries

Technology-intensive industries	Number of FDI	Number of LIS	Number of MID
High-technology industries	252	20	-
Medium-high-technology industries	1,522	76	8
Medium-low technology industries	771	80	-
Low technology industries	548	135	32
Total	**3,093**	**311**	**40**

5. Econometric analysis

Industrial location modelling has significantly improved since McFadden-Carlton seminal works. McFadden (1974) derived discrete choice models directly from the microeconomic theory of firm behaviour, while Carlton (1979, 1983) first applied the random utility maximisation-based conditional logit model (CLM) to firm location choice.

The basic theoretical framework in industrial location modelling assumes an individual behavioural rule that a firm will locate in a particular region and industry if and only if that choice will provide the highest return to its investment:

$$\Pi^*_{ijk} = \max\{\pi_{ijk}; j = 1.....n; k = 1.......m;\} \qquad (1)$$

where *i* denotes the firm, *j* indicates the locality and *k* the industry providing the highest profit among a set of *n* regions and *m* industries. Following Guimarães *et al.* (2004) the profit function can be re-written as follows:

$$\pi_{ijk} = \gamma' x_k + \theta' y_j + \beta' z_{jk} + \varepsilon_{ijk} \qquad (2)$$

where γ,θ and β represent vectors of unknown parameters, $\mathbf{x}_k$ is a vector of industry specific variables, $\mathbf{y}_j$ is a vector of location specific variables, and z_{jk} is a vector of the industry and location join specific effects. The random term ε_{ijk} is introduced to account for the idiosyncrasies specific to each investor and for the unobserved variables relevant for location choice. The random term is assumed to be identically and independently distributed across firms, regions and industries and to follow an Extreme Value Type I distribution. These hypotheses are closely connected with the introduction of a specific and quite restrictive assumption on individual choice behaviour, in effect the Independence of Irrelevant Alternatives (IIA) axiom first introduced by Luce (1959). In the framework of location modelling, this axiom states that all locations are similar once the decision-maker has taken into account the differences measured by observable variables.

Under these hypotheses and following McFadden (1974), it can be demonstrated that the random utility maximisation (RUM) approach can be reformulated in terms of the conditional logit model (CLM):

$$p_{j/k} = \frac{\exp(\theta' y_j + \beta' z_{jk})}{\sum_{j=1}^{n} \exp(\theta' y_j + \beta' z_{jk})} \qquad (3)$$

Guimarães *et al.* (2003) demonstrate, on the basis of the equivalence of CLM and Poisson log-likelihood functions, that same results can be obtained under the assumption that the number of investments in region *j* and industry *k*, hereafter denoted by n_{jk}, follows a Poisson distribution with

$$E(n_{jk}) = \exp(\alpha_k + \theta' y_j + \beta' z_{jk}) \tag{4}$$

where α_k represents industry specific dummy variables.

As stressed by McFadden (1974), the primary limitation of this model is that the assumption on the IIA is inconsistent with empirical settings when alternative choices are close substitutes. Head *et al.* (1995) and, more recently, Guimarães *et al.* (2004) highlight that the violation of IIA assumption is likely to plague industrial location modelling. In particular, Head *et al.* (1995) show that the available set of regional or local based variables is usually very limited, allowing non observable characteristics to play a significant role in location choice and thus making IIA assumption unrealistic. In addition, they underline that observable variables, like overall industry agglomeration, are frequently correlated with unobservable variables, like the endowment of natural resources. Guimarães *et al.* (2004) state that with very disaggregate spatial data, the potential for violating IIA increases, with contiguous regions being close substitutes.

Alternative approaches for dealing with the IIA problem are proposed in the literature (see Guimarães *et al.* (2004) for a review). These, however, appear to have been only partially successful, while introducing the potential for further bias. Guimarães *et al.* (2004) provide a more consistent framework to deal with IIA violation problem. First, they introduce in the CLM model an additional specific effect to each location alternative to account for unobserved spatial variables. Then, they reformulate the CLM model in terms of a Poisson model, by taking advantage of the above mentioned equivalence between the log-likelihood functions (Guimarães *et al.* (2003). The Poisson model is consistent with the theoretical framework underling the CLM, and places no significant restrictions on the model in terms of cross-regional effects. In particular, if we assume that the location specific effects are fixed in the Poisson model they can be "conditioned-out" after proper transformations. Following Guimarães *et al.* (2004) we introduce a location specific variable η_j in equation 2:

$$\pi_{ijk} = \gamma' x_k + \theta' y_j + \beta' z_{jk} + \eta_j + \varepsilon_{ijk} \qquad (5)$$

Assuming η_j is a deterministic dummy variable, in effect a sort of fixed effect, we can reformulate, the random maximisation problem in terms of the following probability function:

$$p_{j/k} = \frac{\exp(\beta' z_{jk} + \eta_j)}{\sum_{j=1}^{n} \exp(\beta' z_{jk} + \eta_j)} \qquad (6)$$

Where η_j completely absorbs the effects of y_j variables. Again, Guimarães *et al.* (2004) demonstrate, in the light of CLM and Poisson log-likelihood equivalence, that the probability can be reformulated in terms of a Poisson model with fixed effects for both location and industry dimension.

$$E(n_{jk}) = \exp(\alpha_k + \eta_j + \beta' z_{jk}) \qquad (7)$$

In this model the introduction of a location specific dummy variable prevents the use of other pure location variables. The importance of regional specific variables such as tax rates, crime rate, educational attainment, infrastructure endowment have been explored many times in the literature, so we do not intend to revisit them here. Hogenbirk and Narula (2004) provide a review of this literature and Basile (2004) an analysis of the Italian case. We therefore intend to focus on the importance of local agglomeration effects within an appropriately specified spatial model. The introduction of a set of location specific dummy variables presents significant advantages. It captures all of the industry-invariant effects, such as regional crime rate, and removes the IIA violation problems that beset other models. Thus, we are able to focus on the importance of combined industry-location variables on FDI location. Specifically, we test for the importance of different types of industrial agglomeration in determining FDI: LIS effects, MID effects. These effects are tested individually, and interacted with export performance and local industry firm average size. These additional variables are considered to test a) the superior attractiveness of export oriented LISs and b) the deterrence effect of large firms being localised in LISs. The final equation to be estimated takes the form:

$$E(n_{jk}) = \exp(\alpha_k + \eta_j + \beta_1 AS_{jk} + \beta_2 LIS_{jk} + \beta_3 MID_{jk} + \beta_4 AS_{jk} * LIS_{jk} + \beta_5 EP_{jk} * LIS_{jk}) \quad (8)$$

where parameters β_3, β_4 and β_5 respectively test for industrial district governance; the combined effect of firm size and LISs; and the combined effect of export performance and LISs. In order to allow for the importance of technological differences between sectors, we estimate the model for the full sample, and also separately for subsets of industries characterised by similar levels of technology intensity. The classification of technological intensity into four groups is based on an OECD-EUROSTAT classification (Laafia, 2002).

6. Results

This was then estimated by means of a Poisson fixed effects model. This employs a dummy variable for each location, to account for pure location effects. The estimation results are summarised in table 3 below.

Table 3. Location Determinants of foreign-owned manufacturing firms in the Italian provinces by level of industry technology intensity (1996-1999)

Parameter	All industries	High-technology industries	Medium-high-technology industries	Medium-low technology industries	Low technology industries
LIS	0.780 (10.33)***	1.330 (3.71)***	0.806 (4.26)***	0.491 (2.94)***	1.031 (4.32)***
AS	0.004 (7.86)***	0.006 (2.07)**	0.004 (4.62)***	0.003 (3.87)***	0.011 (2.36)**
AS*LIS	-0.001 (-1.88)*	-0.022 (-1.38)	-0.001 (-1.41)	-0.002 (-0.40)	0.001 (0.05)
EP*LIS	0.002 (1.73)*	0.004 (0.85)	0.005 (2.14)**	-0.002 (-0.46)	0.003 (0.59)
Log Likelihood	-2,044.8	-87.49	-519.95	-425.04	-413.40
Prob>Chi2	***	***	***	***	***
N_{obs}=J*K	2,163	309	515	515	824

Notes: t-values are in parentheses. The symbols ***,**, and * denote significance at the 1%, 5%, and 10% levels, respectively.

The results reported in table 3 indicate that LISs are positively related to MNEs' location choice. This result is particularly strong given that the model controls for province-specific effects. In addition, the presence of large firms within LISs seems to deter foreign entry, while superior export performing LISs appear to present additional chances to attract or keep FDI. These results are consistent with economic theory that states that LISs hold superior competitive advantages that act as catalyst to attract and maintain FDI.

In high-technology industries, foreign firms will benefit from the externalities generated in specialised LISs through their engagement in formal and informal linkages with local high-tech firms or institutions. In other industries, foreign firms are very likely to benefit from location spillovers through learning-by-interacting processes, mainly realised via user-producer linkages with other local firms along the local production *filière*. The LIS effects is also relevant in low technology sectors where knowledge sourcing from these LISs is viewed as very risky but also very profitable. The interaction terms appear to add little to the analysis, with the exception of export-intensive LISs in medium to high technology industries, where the combination of LIS and export effects render a location even more attractive.

The analysis of the importance of LIS effects on MNEs' location choice is further extended to consider different types of LISs. MID effects are included in the form of an additional dummy variable. Table 4 illustrates the significance of MID effects. However, as MID locations are only found in low-technology and medium-high technology industries, the analysis is limited to those sectors.

Table 4. Location Determinants of foreign-owned low and medium-high technology firms in Italian provinces (1996-1999)

Parameter	Low technology industries	Medium-high-technology industries
LIS	0.960 (4.01)***	0.793 (4.18)***
MID	1.021 (4.39)***	0.368 (1.73)*
AS	0.009 (1.81)*	0.004 (4.54)***
AS*LIS	0.001 (0.06)	-0.001 (-1.34)
EP*LIS	-0.000 (-0.06)	0.005 (2.17)**
Log Likelihood	-404.04	-518.43

Prob>Chi2	***	***
N_{obs}=J*K	824	515

Notes. t-values are in parentheses. The symbols ***,**, and * denote significance at the 1%, 5%, and 10% levels, respectively.

The results in table 4 are consistent with those in table 3, but demonstrate an additional MID effect. MIDs exert a stronger additional influence in attracting FDI, over and above the more generic LIS effects. The export interaction term remains significant for medium to high technology industries, indicating that the MID variable is demonstrating a different effect from simply industrial performance. This related to the superior competitive advantages stimulated by a more efficient system of local governance.

7. Concluding remarks and policy implications

The analysis performed in this paper is based on a consistent and theoretically grounded methodology, and extends previous empirical literature on agglomeration and FDI location choice. The analysis encompasses the role of LISs in general and MIDs in particular as specific catalysts to attract and retain multinational enterprises.

From a theoretical point of view, we felt there was a need to overcome the conventional wisdom that limits the role of territory in terms of competitiveness and FDI attraction to pure geographically driven agglomeration economies. LISs, and in particular MIDs, generate specific competitive advantages due to localised industry specialisation and governance structures. This meant finding some common ground between the MNEs and LIS literatures and to explore the possibility of synergies between these two very different models of firm organisation.

MNEs entering manufacturing industries in Italy target their investments into LISs, defined as local areas characterised by a cluster of highly specialised domestic firms. This effect is found in both high and low tech manufacturing sectors. A possible explanation for that can be found in the intangible nature of learning processes and innovation that represent one of the main competitive advantages of LISs. These rely on a combination of tacit and/or codified knowledge, varying across industries and localities. However, such knowledge is difficult to access from outside the system, and therefore requires access to the local network of information and knowledge exchange.

In high-technology industries knowledge is mostly codified, and thus is more easily transferable from the host to the foreign firms. This happens through foreign firms' engagement in R&D activities with local firms and institutions (science-based industries) and where inter-firm relations are structured in user-producer linkages. An important channel for information and knowledge transfer is given by inter-firm vertical networking along the production chain (buyer-supplier transactions).

For quite different reasons, we also find that LISs also attract MNEs in low-technology industries. The success of these industries is more likely to be based on output flexibility and incremental innovation, rather than the use of "cutting edge" technology. As such, LISs have a genuine competitive advantage over more standardised systems of production and innovation. On the other hand, low-technology sectors rather than medium-high technology industries seem to lead MNEs in industrial districts. This is due to the fact that there are certainly more MIDs in low-technology industries, but more importantly to the competitive advantage that these have shown in such industries in comparison with other localities. Marshallian industrial districts appear to offer an additional attraction to MNEs. The presence of specific kind of local governance, such as the Marshallian industrial district' division of labour, seems to provide an additional factor to attract FDI, this being probably related to the superior performance of MIDs with respect to other kinds of LISs. However, it is possible that both the tacitness of knowledge and the specific mode of firms' interaction may impinge on the ability of the MNE to access the embedded knowledge in the local network. Thus, such local structures may act as a deterrent to foreign entry.

Our findings have important implications for regional or national policies designed to attract and retain FDI. It would appear that FDI is attracted to locations characterised by specific forms of local governance. As such, subsidies designed to attract FDI to such locations are unnecessary. By contrast, lagging regions or those lacking specialised industrial areas may require a wider range of inward investment incentives. The extent to which such policies can prove successful into the longer term however is open to question. The results presented here do however highlight the importance of determining whether potential inward investors will seek to become locally embedded. This is associated with long-term investments in both physical and human capital. The results presented here suggest that LIS's have attracted MNEs that will seek to become embedded locally. This may produce significant benefits for local industry and community, although the long-terms effects on local governance should be carefully evaluated.

To conclude, we would suggest that policy-makers have to be aware of the need to strike a balance between encouraging foreign investment and guaranteeing sustainable regional development. Rather than adopting short-term measures to attract foreign investors, policies towards FDI ought to be selective and strategic in order to ensure that incoming foreign firms are committed to a certain locality and take a long-term view on their investment. In fact, only embedded FDI bring about benefits for both foreign and host firms.

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Appendix A: Classification of manufacturing industries by level of technology intensity

Level of technology intensity	**NACE two digits code (Divisions)**
High-technology sectors	Manufacture of office machinery and computers (30); Manufacture of radio, television and communication equipment and apparatus(32); Manufacture of medical, precision and optical instruments, watches and clocks (33).
Medium-high technology sectors	Manufacture of electrical machinery and apparatus n.e.c. (31); Manufacture of motor vehicles, trailers and semi-trailers (34); Manufacture of chemicals and chemical products (24); Manufacture of machinery and equipment n.e.c. (29); Manufacture of other transport equipment (35)
Medium-low technology sectors	Manufacture of coke, refined petroleum products and nuclear fuel (23); Manufacture of rubber and plastic products (25); Manufacture of other non-metallic mineral products (26); Manufacture of basic metals (27); Manufacture of fabricated metal products, except machinery and equipment (28)
Low technology sectors	Manufacture of food products and beverages (15); Manufacture of tobacco products (16); Manufacture of textiles (17); Manufacture of wearing apparel; dressing and dyeing of fur (18); Tanning and

	dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear (19); Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials (20); Manufacture of pulp, paper and paper products (21); Publishing, printing and reproduction of recorded media (22); Manufacture of furniture; manufacturing n.e.c. (36) Recycling (37)

Source: Eurostat-OECD classification of technology-intensive sectors