Size and Performance of Local Clusters of Firms

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ABSTRACT. The aim of this paper is to propose an econometric application in order to detect the factors that affect the size and the performance of local clusters of small and medium firms (SMEs) such as industrial districts. Our purpose is to extend some basic issues of models in economic geography in order to account for further micro components that seem fostering the rise and performances of local clusters. We succeed in stating that, in addition to the home market effect and transport costs, firms belonging to industrial districts improve their competitiveness by exploiting some assets, such those involved by ad-hoc services, generated inside the district by the co-operation among firms. Moreover looking for fixed effects in the study of firms' competitiveness allows us to determine that sectorial differences do not affect substantially the behavior and performance of SMEs.

1. Introduction

Recently, one has witnessed a growing interest in economic literature in joining the theory of *comparative advantages* with that of the location of firms. This new stream of literature (see Audretsch, 1998; Fujita et al., 1999; Malberg et al., 1997) has been principally developed for looking at the conditions that allow the rise of local agglomerations in regions or countries. Nevertheless, the basic features of this new approach may be fruitfully applied in tackling some topics even for more micro agglomeration structures as local clusters of firms.

This paper aims at developing an empirical investigation on the determinants of export flows for local clusters of firms. In particular, we concentrate on a sample of local industrial districts. For each of them we test an econometric model in order to disentangle the original and common features that affect the intensity of their trade flow. Local districts we are referring to are better known as Marshallian districts. Indeed they are not uniquely a simple cluster of small and medium enterprises. They display a high degree of co-operation (and communication) among local firms that entails the creation of local services which district firms benefit from (Cooke and Morgan, 1998). The geographical proximity, the trust components (attached to a socio-cultural identity) and the presence of local services allow small and medium firms, associated to a network, develop a sectorial specialization (joined with an innovative capacity) that assists the competitiveness of the enterprises belonging to districts.

Since the spatial component takes an important role, our econometric applications rely mainly on some of the principal features embodied in the *gravity models*, but, at the same time, we try to get ahead of them extending the range of the field these models concern. Indeed in gravity models the intensity of trade flows results to be affected by the size of the *home market* and *transport costs*. Conversely, we aim at proving that in a more *micro* setting there exists further local factors that actively foster the export flows.

This micro contribution is concentrated on data of Italian industrial districts which belong to a single region (Lombardia). In this case, we focus on the direct relationship between the attractiveness of the districts and their international competitivity. As a consequence, we need to use very detailed information at a district level and, up to now, only Lombardia (which displays about 21 local districts in it) makes them available. Comparing the size of Lombardia's districts across four years (with a classification by sectors of activities), a pseudo-gravity model is applied. We expect to confirm that the districts size directly

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depends on the presence of services offered in those areas and on the surface of the area itself. In a broader sense, competitiveness at micro level should mainly rely on the density of the services available in a particular location, regardless of any sectorial distinction.

The remainder of the paper is organized as follows. The theoretical model introduced in Section 2. In Section 3, we concentrate our attention on the size and performance of a selected group of industrial districts. Finally, Section 4 concludes and discusses some possible extensions.

2. Some basic theoretical features

In this section we sketch the basic theoretical features we follow in our analysis. We consider two trading counterparts: a *district (R) and the rest of the world (ROW)*, as proposed by Krugman (1991). We assume that each counterpart is endowed with local firms (in a setting of monopolistic competition) and each of them hires its workers from the local population (N_R, N_{ROW}). These hypotheses are fundamental for stating that firms may have an advantage in locating in a bounded area (Krugman, 1991). Here, we do not focus on the economic effects produced by the free migration of the labor force or free movement of capital. Therefore, we do not account for the possible differences of outcomes relying on the mobility of the factors of production. Conversely, we assume that each consumer consumes both local and foreign (i.e. imported) goods and he disposes of an unique revenue stemming from work. He supplies the unit of labor (whose he is endowed) for a wage (w). As a consequence of that, the utility function of a consumer in district R is the combination of the consumption of local goods C_R (in proportion μ) and foreign goods C_{ROW} (in proportion $(1-\mu)$):

$$U_R = C_R^{\mu}\, C_{ROW}^{(1-\mu)},$$

where

$$C_R = \sum_{k=1}^{n} \left(c_k^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}},$$

and

$$C_{ROW} = \sum_{k=1}^{n^*} \left(c_k^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}.$$

This assumption implies that both C_R and C_{ROW} are a consumption aggregate of local and foreign goods, including all possible goods produced locally or internationally. Indeed, as in a monopolistic competitive setting *à la* Dixit-Stiglitz, each firm produces a single good which is different from the others according to the elasticity of substitution equal to σ (with $\sigma > 1$). When σ becomes arbitrarily large, the differentiated varieties are closed substitutes, while for σ near to one varieties are poor substitutes.[1]

Under the assumption of a single factor of production, namely labor force, each firm hires workers (L_i) for its production (x_i) according to its marginal productivity (γ), as in the following equation

$$L_{ij} = \beta + \gamma x_{ij}, \quad j = R, ROW, \tag{1}$$

and they pay for them a wage (that we assume to be constant and equal to w). Moreover, when firms are monopolistic competitors and following Dixit-Stiglitz (1977), each of them fixes its price (p_j) as a mark-up over its marginal costs ($p_j = [\sigma/(\sigma-1)]\gamma w$). As in Krugman (1991), the selling prices of each firms is the combination between a constant mark-up (relying on σ) and constant level of wages. Both these factors are constant across firms, such to lead that the selling price results to be the same for all firms in R (p_r) or in ROW (p_{row}).

In the absence of unemployment, the number of firms in R and ROW corresponds to the following relation

$$n_R = \frac{N_R}{L_{iR}} \quad \text{and} \quad n_{ROW} = \frac{N_{ROW}}{L_{iROW}}. \tag{2}$$

Firms sell their good both on the local and foreign markets and as in Krugman (1991).When they export in foreign markets, they incur in transport costs (τ). Still following Krugman (1991), by the maximization of the utility function of each consumer (under each own budget constraint) we get the following demand function for each consumer in R (D_R):

$$D_R = \frac{n_R(p_r^{-\sigma})}{n_R(p_r)^{1-\sigma} + n_{ROW}(\tau p_{row})^{1-\sigma}}\,\mu Y_R + \frac{n_R(\tau p_r^{-\sigma})\tau}{n_R(\tau p_r)^{1-\sigma} + n_{ROW}(p_{row})^{1-\sigma}}\,(1-\mu)Y_{ROW}.$$

D_R is composed by the demand addressed to local firms and those to all the other firms. This second right hand side term corresponds to the export function (here from a firm belonging to a district to the *rest of the world*) and it is exactly equal to

$$EXP_R = \underbrace{\frac{n_R(\tau p_r^{-\sigma})\tau}{n_R(\tau p_r)^{1-\sigma} + n_{ROW}(p_{row})^{1-\sigma}}}_{H}(1-\mu)Y_{ROW}, \tag{3}$$

where τ (with $\tau > 1$) represents the iceberg transport costs that consumers incur when buying foreign goods.

In a micro setting, the ratio H in Equation (3) corresponds to the relative weight of the consumption of R's goods in comparison to the ROW's goods. Indirectly it represents the degree of competitiveness of R's goods. Given the assumption that prices and elasticities are constant, it is plausible to think of an approximation of it via an expression embodying a few elements which affect the degree of competitiveness of a region.

As we want to focus on a typical geographic setting in which the geographical dimension and the home market effect emerge, we assume that the ratio H is proportional to the following expression:

$$H \sim (Geo_R)^{\beta_1}\,(HM_R)^{\beta_2}\,(SE_R)^{\beta_3}; \tag{4}$$

where *GEO* stands for a few geographic features of the districts (for instance, its surface) that capture the effect of the existence of transport costs, *HM* represents the home market effect and *SE* accounts for a series of specific (ad-hoc) local features (e.g. typical dummy variables either capturing some structural features for one district, or witnessing the restructuring process in one sector still in one district). The meaning of this approximation relies on a few stylized facts. Indeed, a few studies that tackle the issues of performance of local agglomerations, agree in finding in the previous three components the principal sources of competitiveness of clustered firms.[2] Replacing expression (4) in Equation (3) yields

$$\mathrm{EXP}_\mathrm{R} = [(Geo_R)^{\beta_1}\,(HM_R)^{\beta_2}\,(SE_R)^{\beta_3}]\,(1-\mu)Y_{ROW};$$

that is equivalent to the following logarithmic form

$$\mathrm{Log}(EXP_R) = c + \beta_1\mathrm{Log}(Geo_R) + \beta_2\mathrm{Log}(HM_R) + \beta_3\mathrm{Log}(SE_R). \tag{5}$$

in which $c = \mathrm{Log}[(1-\mu)Y_{ROW}]$. Implicitly, by the previous definition, we assume that the level of revenue of the rest of the world (ROW) is constant and not affected by the revenue of the examined district. Even if Equation (5) recalls some basic features of the gravity models, since the intensity of the trade flows relies on the spatial dimension, *it distinguishes itself by not accounting explicitly bilateral trade flows*.

We draw our attention to the local clusters of firms (i.e. industrial districts) that are considered as the sources for regional competitiveness in some studies (for instance, Storper (1992)). We concentrate on the case of the industrial districts in Lombardia in order to (i) state some specific local agglomeration forces that induce firms to cluster there and (ii) verify whether they are really a source of competitiveness. In a broader sense we are interested in detecting what can be the linkage between the determinants of the competitiveness of the local structures of agglomerations, viewed as the micro-foundations for the competitiveness at macro-level (for instance at regional level). According to the basic assumption of Malberg and Maskell's study (1997), the long term industrial competitiveness is related to the ability of firms to upgrade continuously their knowledge, rather than relying on the exploitation of cheap resources. Hence, *the concept of regional (local) advantage may be defined as revealed comparative advantage and it depends not only on the general human and physical resources, but also on knowledge which is embedded in its industrial (and institutional) structures*.[3] The geographical proximity and the trust component (attached to a socio-cultural identity) let small and medium firms, associated to an industrial district or network, present a sectorial specialization and an innovative capacity (Schmitz and Musyck, 1994). The innovative capacity assists the competitiveness of the district production and it sometimes may be well improved by the intervention of local institutions or authorities. In particular, the innovative capacity may be filled up both by incremental improvements from the *learning by doing* and by the investment in physical capital. These kinds of investments help in sustaining the accumulation of competence embedded in individual employees as the results of acquired skills, education, qualification and training. The existence of local institutions fostering the *learning process* allow also to improve the real competitive advantages that a firm may gain. This purpose may be reached by:

- Increasing the level of available know-how without investing much capital;
- Willingness to rationalize productive capabilities;
- Keeping production flexible, but acquiring the opportunity to master the evolution of the market demand;
- Exploiting the network dimension for strengthening the firm's own bargaining power, as large enterprises do.

According to stylized facts (see, for instance, ICE (1996) or Bennet et al. (2000)), we are interested in testing the hypothesis that the *presence of local facilities toward export*[4] *sustain the rise and development of trading activities*. When referring to industrial structures like industrial districts, the framework for describing the existence of agglomeration forces may be integrated by other components, in addition to classical increasing returns to scale, home market effects or transport costs. For instance, there exists linkages incurring among the firms that may reinforce the clustering movement. This process has been precisely analyzed by Soubeyran-Thisse (1999) and we integrate their results in our framework. They prove that the clusters of firms, like industrial districts, are forms of geographical agglomerations in which members benefits from the accumulation of the know-how associated with workers residing there. We assume that the information which is spread among workers is an expression of a learning process inside the district (usually as *learning-by-doing*). As argued by Arrow (1962) and Autretsch (1996, 1998), geographic proximity matters in transmitting knowledge, because tacit knowledge is non-rival (in nature) and knowledge developed for an application can easily spill over other applications.[5] As suggested by stylized facts, we introduce in the theoretical setting a parameter (ψ) that embodies the positive externalities given by the interaction between the local associations and the firms.

In this setting, the positive effects of these externalities are expected to improve the stock of knowledge available for each firm such to produce in a more efficient manner. Therefore, it is represented such a way to reduce the demand of inputs (here labor) for one unit of output. Assuming that exists a local association that supplies services to the district firms (proportionally to the level of production of the district[6]), firms take advantage of it since that association allows them to reduce marginal costs of production. So far, Equation (1) becomes:

$$L_{iR} = (1 - \psi)\beta + \psi\gamma x_{iR}. \tag{6}$$

Local associations sustain the externalities affecting the technology of firms and involving a saving process in the costs of production.

Replacing Equation (6) in Equation (2) yields the following result

$$n = \frac{N_R}{(1 - \psi)\beta + \psi\gamma x_{iR}} \tag{7}$$

and applying the logarithm function becomes

$$\mathrm{Log}(n) = \mathrm{Log}(N_R) - \mathrm{Log}[(1 - \psi)\beta + \psi\gamma x_{iR}]. \tag{8}$$

As we described above, in this part of the analysis our purpose is to concentrate on the possible effects that the local association may exert in local districts. This approach should allow us to detect whether those associations are really an important factor to make firms cluster in a bounded area (such as a district). In order to point out this effect, we need to define some variables that capture the second term at the right hand side of Equation (8). That term refers mainly to the benefits carried out in the production function of local firms by the interventions of a local association. Given our assumptions, we may deduce that expression relies on some specific local features (for instance related to the sector or to the districts – or region – itself) and it is proportional to the amount of services supplied there by the association. Therefore, we introduce two empirical proxies (SVA_R and *DUMMY*) to account for the effects described above.

Consequently, in order to be estimated, the previous expression may be reduced to the following equation

$$\text{Log}(n) = c + \alpha_1\text{Log}(N_R) + \alpha_2\text{Log}(SVA_R) + \alpha_3 DUMMY + \varepsilon_R. \quad (9)$$

In Equation (9), N_R stands for the size of the district (i.e. the size of its local market), *SVA* represents an index of the services offered to the firms and *DUMMY* encapsulates some of local features for the selected districts.

3. The case of industrial districts in Lombardia

Considering the case of the industrial districts in Lombardia (see Appendix) we want to test the relation between the number of firms that belong to a district and some other territorial components. The database we consider is made available by the Lombardia region via the Union Camere Lombardia web-site. These data belong to the contents of a regional census promoted by Lombardia, in compliance with the prevision of Italian law introduced in 1991. That law draws some basic criteria to plan systematic interventions for the economic development of regional areas displaying high concentrations of SMEs. By local areas, industrial districts are meant. In that sense, each Italian region was in charge to collect information to define as precise as possible the structure of its territory. So far, the database we dispose is quite complete and features very well on some basic local characteristics (such as the surface of districts or population) in addition to data more properly connected with the activity of firms (such as number of plants, number of workers hired in each plant, number of firms supplying services to producers and so on).

According to this first regional census, Lombardia contains in its territory 21 industrial districts. They display three main branches of specialization in textile, mechanical, wood and furniture sectors. We evaluate the performances of those districts which display one of three main sectors of specialization. We consider them across four years (1981, 1992, 1994, 1996) and we perform a cross-section estimation. In Box 1, we define the variables we use in this section. In the first series of estimations, we want to test if the size of the local population and the presence of services addressed to the activities of the local firms are two sources for inducing firms cluster in an area (i.e. affecting the number of firms in a district). The number of persons located in an area stands for the potential level of demand that could be addressed to the local firms and its size represents potential economies of scale. In this particular framework, the *home market effect* should be viewed as an advantage that one district may display against other districts. In other words, as featured in economic geography models, the larger is the size of the local population, the higher is the probability that they will exploit the benefits of increasing returns to scale (as displayed both in Equations (1) and (6)), enabling a higher degree of competitiveness in comparison of the other districts. Moreover we will also focus the attention on the relationship incurring between the presence of firms devoted to supply services to the other firms and the size of the district, via the hypothesis that this presence should be a sort of cohesion force for attracting more and more firms.

In order to select the most efficient combina-

BOX 1

D3	Temporal dummy for 1981
D4	Dummy for border adjacency with foreign countries
D7	Sectorial dummy (wood & furniture)
LEXPAD	Logarithm of per-worker level of exports in a district (ECU)
LPOP	Logarithm of the population of each district
LPOPS	Logarithm of the density of population in a district
LSSS	Logarithm of the size of service firms in a sector, as number of employees per firm
LSUP	Logarithm of the surface of a district (km^2)
LSVA	Logarithm of the number of firms that provide produces *services* in each district
LSVAS	Logarithm of the density of service firms in a district
LSVI	Logarithm of the density of employees in service activities in a district
LUNP	Logarithm of the number of firms active in the sector of specialization of a district
LUNPS	Logarithm of the density of firms active in the sector of specialization of a district

tion among all the proxies we introduced to test Equation (9), we propose various specifications in Table I. By these regressions we derive some fundamental results. First, the presence of local services (SVA or SVAS) for district firms seems to affect positively (when it is significant) the number of firms that belong to a district. However, this result is not really robust: the lack of data prevents us from testing properly its robustness. This sustains our hypothesis that interfirm services may be a sort of inner centripetal force for a cluster. At the same time, even the size of the local population affects positively the size of the district. In this setting, the surface is viewed as a measure of the dimension of the internal market and so it engages the same kind of effects that the population itself. As a last remark, we add that the role of the dummies in these specifications is the same as in the other case. Indeed, the temporal dummy assumes importance statistically. The dummy variable for the adjacency with foreign countries matters only for levels of significance at 5% and the magnitude of its coefficient is lower than that of the other regressors.

Having taken into account that the presence of services matters for the rise of local industrial agglomeration, the study continues with the purpose of proving that the existence of services devoted to firms may affect positively outgoing trade flows.

The available data we dispose include only the export flows (by sectors) of all the regional small and medium firms in 1992 and 1994. It is well known that industrial districts in Lombardia are made of small and medium firms (SMEs) which encounter considerable problems when they decide to follow an internationalization process alone.

According to a few studies (for instance, Nassimbeni (2001)), the small and medium enterprises (as those compose industrial districts in Lombardia) have to overcome not negligible difficulties in increasing their presence on the international markets. They clearly suffer from internationalization problems. Focussing on the role that organization and management variables play in internationalization perspectives, Nassimbeni (2001) succeeds in disentangling that the affiliation to consortia (or more generally other forms of co-operation among firms) reveals to be for SMEs really a basic discriminant factor for sustaining the propensity of export.

Once accounted for this situation, it is reasonable to think that export flows are mainly the outcome of the firms belonging to districts. So far, our principal hypothesis consists in *identifying the export flows of all the small and medium firms in Lombardia with those of district structures*.[7] In other words, on the base of the basic features of local districts, we attribute the amount of export (shared by sector) outgoing form all the SMEs in Lombardia to all the SMEs belonging to industrial districts in Lombardia. It is likely that our assump-

TABLE I
Size of industrial districts in Lombardia
Dependent variable **LUNP**[a] for models (1) and (2) and **LUNPS** for models (3) and (4)

	(1)	(2)	(3)	(4)
C	–7.02 (0.00)	–0.47 (0.46)	–0.06 (0.54)	–6.00 (0.00)
LSUP	–0.04 (0.75)	0.41 (0.00)		
LSVA	–0.02 (0.84)	0.68 (0.00)		
LSVAS			0.68 (0.00)	0.01 (0.92)
LPOP	1.19 (0.00)			
LPOPS				1.15 (0.00)
D3		0.56 (0.00)	0.56 (0.00)	0.06 (0.68)
D4		0.28 (0.03)	0.30 (0.02)	0.02 (0.77)
R^2-Adjusted	0.86	0.75	0.66	0.80
N. Obs.	84	84	84	84

Values in round brackets: 2-tail statistics.
[a] We repeted the computations for Equations (1) and (2), replacing LSVA with LSVI and we obtain the same outcome. Indeed the correlation between LSVA e LSVI is equal to 0.978.

tion does not fit exactly the real sample of exporting SMEs, but on the base of information included in Nassimbeni (2001) and available from local sources of information,[8] any possible excluded firms turns out to be marginal (such as an outlier).

In order to make this hypothesis testable and since we dispose only of the total amount of SME exports by sector:

- we divide the total amount of sectorial exports from SMEs among all the districts that display an industrial specialization in that sector (according to a regional ranking);

and then

- we share each sectorial amount of export among all the involved districts (in that sector of specialization), in accordance with the total size of the labor force active in the sector of specialization of a district which the amount of exports refers to.[9]

By these assumption in the following estimation, the dependent variable becomes the level of export per worker (*LEXPAD*). Proceeding with the reformulation of Equation (5), we need to redefine the proportionality of expression H, still maintaining our interest for the geographical aspects and the home market effect. In particular we want to include in our test an index of the district competitiveness (relative to the rest of the world) by adding a proxy for the services available in them (variable *SER*). So, now we are dealing with[10]

$$H \sim (Geo_D)^{\beta_1} (HM_D)^{\beta_2} (SE_D)^{\beta_3} (SER_D)^{\beta_4};$$

and replacing it into Equation (5) yields to

$$\text{Log}(EXP_D) = c + \beta_1 \text{Log}(Geo_D) + \beta_2 \text{Log}(HM_D) + \beta_3 \text{Log}(SE_D) + \beta_4 \text{Log}(SER_D). \quad (10)$$

The results of the estimation of Equation (10) are reported in Table II, while a key for the symbols adopted are included in Box 1.

In general, the specifications adopted to estimate Equation (10) reveal to be satisfactory. The three versions of the estimations computed for Equation (10) are substantially equivalent both in terms of significance of the regressors and explicative power. Indeed their outcomes are perfectly in agreement. Across all the specifications *what seems to really matter for the intensity of export flows is the diffusion and size of services supplied to the local exporters, while neither the geographic components nor the home market effect seems to deeply affect the export decisions of firms*. Indeed, the geographical dummy for sharing borders is not significant, while surface is significant only in model (1) and in that case its effects toward exports is in accordance with the usual results of gravity models. Indeed, in those models the local surface influences negatively the trade flows, since it captures the transport costs that provide negative effects on the intensity of trade exchanges. Finally, what is always significant is the dummy associated to a sector which (at that time) was following a restructuring process.

In addition, we also verified for our sample of districts the presence of a fixed sectorial effect that could partially contribute in explaining the intensities of the trading flows.

As a consequence of the results presented in Table II, let us consider a simplified version of Equation (10). We consider the intensity of the trade flows (outgoing from local district firms) exclusively as a function of the number and size of the local firms which supplied their services to the manufacturing firms. We estimate this simple form of Equation (10) by a POLS estimator and we compare it with a LSDV estimator that accounts for sectorial fixed effects in Table III (see Appendix for details). This new specification improves the R^2 of the regression and the level of significance of the selected regressors. So, the

TABLE II
Exportation flows from Lombard districts
Dependent variable **LEXPAD**

	(1)	(2)	(3)
C	18.10 (0.00)	20.75 (0.00)	20.74 (0.00)
LSUP	–0.86 (0.03)	0.11 (0.48)	0.11 (0.48)
LPOP	0.35 (0.30)	0.13 (0.70)	0.13 (0.71)
LSVA		0.89 (0.00)	
LSSS		1.58 (0.00)	0.69 (0.03)
LSVI	0.69 (0.01)		0.89 (0.00)
D4	0.10 (0.39)	–0.01 (0.93)	0.01 (0.93)
D7	–1.70 (0.00)	–1.85 (0.00)	–1.85 (0.00)
R^2 Adj	0.90	0.91	0.91
N. Obs	42	42	42

Values in brackets: 2-tail significance.

TABLE III
Lombard Districts: Dependent variable **LEXPAD**
Fixed effects: Sectorial effects; Observations: 42

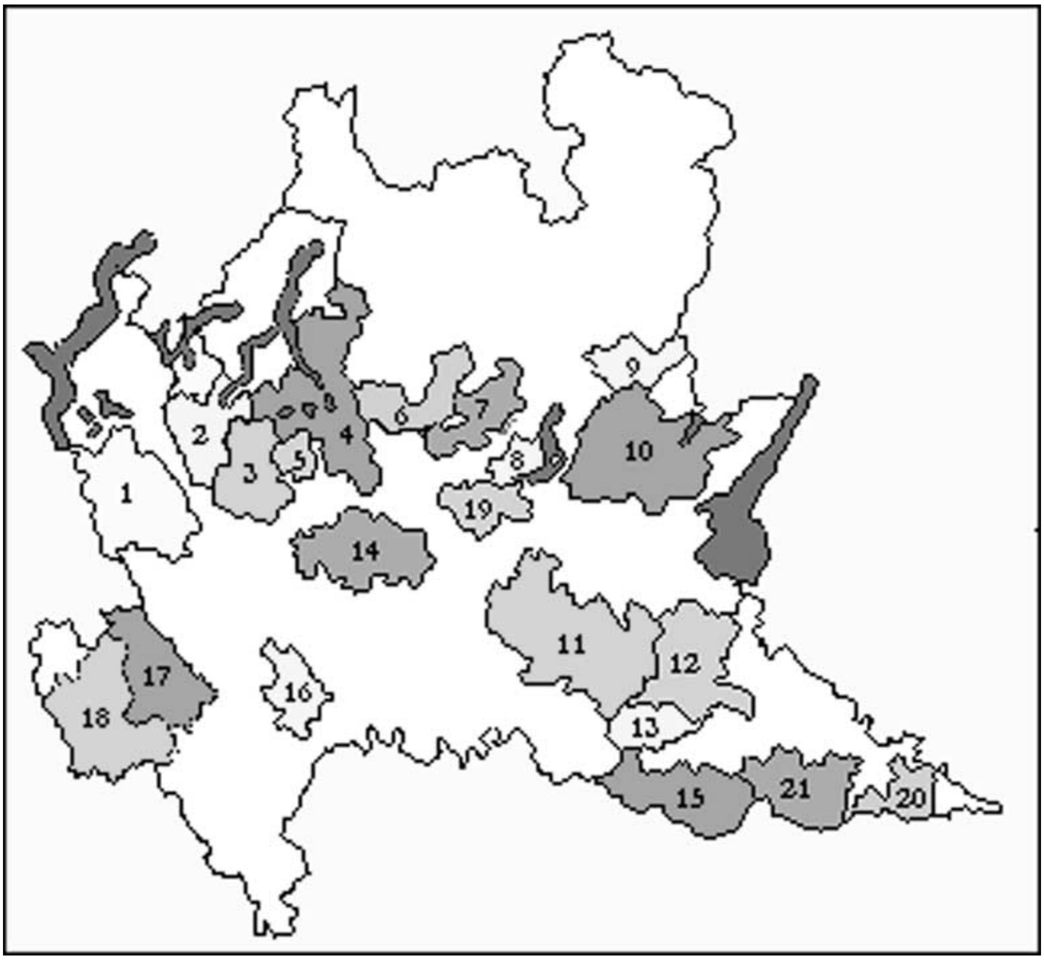
#	Dep. var.	Method	Const.	LSVI	LSSS	F-test1	R^2 adj.
1	LEXPAD	POLS	20.98 (0.00)	1.04 (0.00)	0.01 (0.98)		0.72
2	LEXPAD	LSDV	22.36 (0.00)	1.03 (0.00)	0.93 (0.00)	2.72 [2.16**/3.00*]	0.92

Values in round brackets: 2-tail statistics – Values in square brackets: critical value.
F-value significance: * at 1%; ** at 5%.

basic results appear to be quite robust. Moreover, applying the F test to this estimation (see the second part of Table III), we conclude that sectorial fixed effects are significant (only at 5%), so that the POLS estimator cannot be better than the LSDV one. Namely, this test signals the importance of sectorial fixed effects in explaining the intensity of district export flows. Nevertheless, the test of fixed effects is not so much robust, so this results should allow for other intuitions: the decision choices about exports of the SMEs might be driven also by extra-sectorial components. As it has been often argued, the problems that these firms have to face in the internationalization process are not merely linked with the sector of the activity.[11] They are principally connected with specific characteristics, such as the small dimension or low bargaining power, that are not peculiar of a sector, but that are common shared in that category of firms.

4. Conclusions

This study offers an empirical approach of a subject widely treated theoretically, but not so well considered empirically. The analysis of micro agglomerations of firms (such as industrial districts) takes into account that comparative advantages may also benefit from the support of other activities such as services to enterprises. In particular they could represent another kind of centripetal force because they reinforce the clustering of firms in a location. At this micro-level, the structural differences across exporting units or sectors are not fundamental for stating the intensity of the trade flows in districts. Indeed, the reasons for the performances of these industrial systems seem to be connected with different forms of organizations among small and medium firms. All these results confirm that firms may be seen as active and strategic agents on the market. Given the availability of data, further empirical studies along these lines at a level of local agglomerations are warranted. Indeed it could be also worthwhile to extend this analysis to a wider dimension that might include more detailed information on the learning process inside each district (as a source of competitiveness). This possibility would also allow comparative studies among the performances of various forms (and degrees) of agglomeration.



Legend (in brackets the sector of specialization of each district

1. *Asse Sempione* (Textile-Clothing)
2. *Comasco* (Silk Industry)
3. *Brianza* Comasca/Milanese (Wood and Furniture)
4. *Lecchese* (Metal and Mechanical Industry)
5. *Brianza* (Mechanics)
6. *Valbrembana* (Mechanics)
7. *Valseriana* (Textile-Clothing)
8. *Sebino Bergamasco* (Rubber Gasket Industry)
9. *Camuno Sebino* (Metal Industry)
10. *Valtrompia-Valsabbia* (Metal products)
11. *Bassa Bresciana* (Textile-Clothing)
12. *Castelgoffredo* (Clothing)
13. *Canneto s/Oglio* (Wood and Furniture)
14. *Trevigliese* (Metal and Mechanical Industry)
15. *Casalasco* Viadanese (Wood and Furniture)
16. *Belgioioso* (Mechanics)
17. *Vigevanese* (Shoe industry)
18. *Lomellina* (Clothing and Goldsmith industry)
19. *Palazzolo s/Oglio* (Textile and Textile Machinary Industry)
20. *Oltrepo Mantovano* (Textile-Clothing)
21. *Basso Mantovano* (Metal Carpentry and Farm Machine Industry)

Figure 1. The Industrial Districts in Lombardia (*Source:* Union Camere della Lombardia).

5. Appendix

5.1. *Looking for fixed effects*

In the last econometric exercise we studied the exports outgoing from local districts as a panel with two dimensions: 21 local districts (ranked according to 3 sectors of specialization) and 2 years.

In addition to the classic goodness-of-fit test, in our exercises we propose a further test: *F* test. This test allows for the possibility to test the presence of fixed effects (in this case by sectors). Looking for the presence of fixed effects across our sample means controlling for the possibility to include other variables that are constant over regions (or over sectors). In particular, applying an *F-test* we plan to test whether the individual effects (α_{it}) – constant overtime – are constant across all unities.

We consider the general regression form of Equation (5) for our panel at two dimensions

$$y_{ijt} = \alpha_{it} + \underline{\beta_{it}} x_{it} + \varepsilon_{it},$$

with $i = 1, \ldots, n$, $t = 1, \ldots, T$, as index for sectors and time.

When we estimate the previous equation by ordinary least squares, if we consider $\alpha_{it} = \alpha$ as a constant over all the three dimensions we obtain a *POLS* estimator. In addition, when we let α_{it} vary just across one dimension (for instance $\alpha_{it} = \alpha_i$), we introduce $(n - 1)$ sectorial dummies variables in our specification and the estimation of this model is known as *least square dummy variable model (LSDV)*.

The *F-test* we propose is useful for selecting which one of the previous estimators is the most efficient. In our tables, when we apply the *F-test 1 we want to test the hypothesis that the constant terms are all equal (i.e. LSDV versus POLS estimators). This means that when this hypothesis is accepted, the most appropriate estimator is pooled least squares (POLS).* In other words, considering an F-function that corresponds to the following statistics

$$F(n - 1, nT - n - k) = \frac{(R_u^2 - R_{Pols}^2)/(n - 1)}{(1 - R_{Pols}^2)/(nT - n - k)}$$

in which k represents the number of regressors (excluding the constant), and R_u^2 and R_{Pols}^2 are statistics coming from the alternative and POLS estimations, we test the following hypothesis:

for sectorial effects
$H_0 = \{\alpha_{it} = \alpha \text{ for all } i, t\}$ v.s.
$H_1 = \{\alpha_{it} = \alpha_i \text{ for all } t\}$

Each time the statistic *F-test* leads us to reject H_0 (i.e. the value of our statistical test is larger that those accounted for the tables for a *F* distribution at 1% or 5% level of significance), we conclude that the sectorial or regional effects are not the same in our sample. This finding implies that the *LSDV*, estimator is the most appropriate estimator.[12]

5.2. *The industrial districts in Lombardia*

Our analysis of local forms of agglomeration (viewed as industrial districts) takes into account the industrial districts of an Italian region: Lombardia. According to the information extracted from the documents of the regional Union Camere, Lombardia accounts for 21 industrial districts (see Figure 1). The regional legislation on districts is well organized basing on the regional law n.531/91. In Lombardia, local authorities dispose of clear criteria for distinguishing a simple cluster of firms from a real district. Indeed a cluster may be viewed as a district if a series of indices are grater than one. These indices consider the level of local industrialization in manufacture and the relative specialization in production, the degree of concentration of the activities, the size of the firms and the entrepreneurial density.

Moreover data related to industrial districts in Lombardia may be found on the web site of the Unioncamere at the following addresses:

– http://www.unioncamere.it,
– http://www.ring.lombardia.it,

while data on regional export for small and medium firms by sector come from the CIDEL – Istituto G. Tagliacarne web database at the following address *http://www.tagliacarne.it*.

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Notes

[1] For sake of simplicity, in this setting we assume implicitly that the number of varieties supplied inside regions R and ROW is the same. This assumption will not affect our outcomes, since we do not concentrate on the degree of substitution among varieties.

[2] See Storper (1992) and Musyck (1994) for more details.

[3] The more such local capabilities are rare and difficult to imitate the more they translate into durable competitive advantages for the firms located in that area.

[4] We evaluate them as the local density of services addressed to firms.

[5] The more workers produce, the more they acquire skills in production and the experiences of each worker become common shared information across the members of a district.

[6] The level of the local production should be defined as the cumulated production of the goods in that district. However, this assumption is not binding in this context because we do not want to focus on the differences in productivity induced by a learning process.

[7] Specifically, we assume that total exports of small and medium firms (SMEs) in a sector are connected with the activity of all the districts that display a specialisation in that industry. So, we share the amount of sectoral exports of SMEs among the districts that display a specialisation in that particular sector, proportionally to the number of workers hired in that sector in each district.

[8] For instance, Camera di Commercio di Milano (http://www.mi.camcom.it) or Union Camere della Lombardia (http://www.lom.camcom.it).

[9] Indirectly, we assume the same labor productivity in each firm by sector. This hypothesis is as much realistic as our sample is made of SMEs which belong to districts and cooperate among them in planning their production and market strategies.

[10] We recall that GEO stands for geographical features, HM for the home market effect and SE for other local features.

[11] For instance, they do not seem to be principally affected by unexpected changes in the economic trends.

[12] See Greene (2000) for more details.

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