

***SHARED RESOURCES IN INDUSTRIAL DISTRICTS:
INFORMATION, KNOW-HOW AND INSTITUTIONS IN THE
SPANISH TILE INDUSTRY***

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ABSTRACT: The aim of this paper is to measure the effect of shared resources on individual firm performance. Using the Industrial District as a definition of the interorganizational context, we propose a model that includes a set of factors that are associated with the endowment of external resources, that is, collective information and know-how, and involvement in local institutions. In order to illustrate the theoretical argumentation, we develop an empirical study using a one hundred-firm sample from the Spanish Ceramic Tile industry in order to search for a statistical association between resource variables and performance of the firms. Finally, findings of the paper suggest that in order to increase performance firms must develop a distinct capacity so as to be able to shape and exploit shared or collective resources.

KEYWORDS: Industrial District, Shared Resources, Knowledge, Performance.

1. INTRODUCTION

The amount of attention given to the concept of Industrial District has been growing steadily in recent times, probably due to the success observed in similar economic activities that are geographically concentrated. Industrial district research has provided empirical support in favor of performance superiority for localized firms (e.g. Signori, 1994; Paniccia, 1999; Becchetti and Rossi, 2000). For the most part, these studies are focused on comparative analyses confronting firms from within industrial districts with those from outside them.

In contrast, this paper has tried to address a research issue that has still not been satisfactorily resolved. How can the differences in performance observed in firms inside an industrial district be accounted for?

We have conceptualized agglomeration externalities as shared resources. These refer to the resources which a firm can access through being a member of a cluster (such as an industrial district). Shared resources are semi-public by definition; in other words, they are not exclusive to one individual firm but at the same time they are not available to external (non-member) firms. Thus, what happens in firms is that the sum of their resources can be classified according to whether they are generated internally or they are provided as a consequence of external relationships. However, firms vary significantly in terms of how effectively they use and benefit from shared resources, so the firm's ability to shape and leverage shared or collective resources can be defined as a distinct capacity.

In order to address the research question, we proposed and tested a model based on the *resources shared* by the firms in the district, which include a set of factors concerning information, know-how and involvement in institutions.

The paper is structured as follows. In the first section, we offer an overview of the concept of industrial district, while in the second section we provide a theoretical framework linking recent firm strategy theories with regional analysis. In the third section, we review attempts to measure industrial district performance, and in the fourth we formulate hypotheses. Then, in order to illustrate our theoretical argumentation, we develop an empirical study using a sample of firms from the Spanish Ceramic Tile industry with the intention of finding a statistical association between resource variables (information, know-how and local institutions) and the performance of the firms. Finally, we discuss the implications of the research findings.

2. THEORETICAL FRAMEWORK

The extended relationships that develop under circumstances of physical proximity may vary considerably in their details, yet their underlying logic is constant. Industrial districts in south-western Germany or northern central Italy are based on a set of local circumstances, but the principles of mutual organization on which these districts are based are more widely applicable. Similar interfirm cooperation is often found in economic activities based in a particular region (e.g. Scandinavia) or in locales where firms from similar industries are spatially concentrated, such as Silicon Valley in the United States. In an introductory work, Pyke and Sengenberger (1992: 4) describe the main characteristics of industrial districts as the existence of strong networks of (chiefly) small firms. Through specialization and subcontracting, they share out amongst themselves the labor required for the manufacture of particular goods – specialization induces efficiency, and specialization combined with subcontracting promotes collective capability. Moreover, industrial districts promote trust and cooperation, which shows entrepreneurial dynamism and flexibility. In this paper, we use the term as defined by Becattini (1990: 39), namely, ‘A socio-geographical entity which is characterized by the active presence of both a community of people and a population of firms in one naturally and historically bounded area’. Thus, we may say that an industrial district is comprised of numerous small firms engaged in related activities and which are located in a clearly identifiable community. This *togetherness* implies a cultural homogeneity that gives rise to an atmosphere of cooperative and trusting behavior in which economic action is regulated by implicit and explicit rules (Lazerson and Lorenzoni, 1999).

Marshallian, or agglomeration, economies were the first justification for the benefits that industrial districts offered firms. The author of the original concept of industrial

district, Marshall (1925), identified a class of external economies that focus on the benefits to be obtained by individual firms or plants from the increased pooling of common factors, which include skilled human resources, specialized suppliers and technological spillovers (Krugman, 1991). Likewise, the Marshallian concept of industrial atmosphere can be transferred to the existence of some intangible resources based on experience, knowledge and information that are common to district firms.

Some authors now argue that geographical agglomerations benefit firms in the form of externalities or non-traded interdependencies (Storper and Scott, 1989; Storper, 1992), while others emphasize the superiority of this form of industrial organization over mass production and vertically integrated companies (Piore and Sabel, 1984; Best, 1990). As pointed out by Crewe (1996), Russo (1997), Paniccia (1998) or Harrison (1991), the most important implication of industrial districts goes beyond agglomeration economies and refers to the presence of a community of people. Through mutual knowledge and continual contracting and recontracting experience fosters relational trust (Harrison, 1991; Russo, 1997; Paniccia, 1998) and this relational trust in turn limits *opportunism* among partners in this communitarian industrial district market (Lorenz, 1992; Dei Ottati, 1994; Foss and Koch, 1996). Indeed, relational trust is fundamental in explaining the most important net result of this embedding – the paradoxical combination of cooperation and competition inside industrial districts (Harrison, 1991).

Industrial districts and the individual firm

In spite of the large number of studies and theoretical propositions in this field, little effort has been devoted to justifying the benefits for firms within these agglomerations in the light of recent research into firm strategy. We argue that the competitive factors

of industrial districts may be related to recent firm strategy research. This argument clearly coincides with a number of other studies, of which some of the more interesting include those by Foss (1996a), Lawson (1999) and Lawson and Lorenz (1999).

In order to link the idea of the industrial district with firm strategy perspectives, we use the notion of *shared resources*, taken as referring to any resources shared by industrial district firms. They are neither exclusive to nor the property of the individual firm and they are not made available to outside firms. In addition, these shared resources may yield rents for industrial district firms. Shared resources are generally available in districts, although not all firms in the district benefit from externalities to the same extent. The condition of membership allows firms to access these resources, although there are a number of factors moderating the use of shared resources.

We have tried to find similarities between the notion of shared resources and other existing concepts in the literature, our search focusing on higher order capabilities (Foss, 1996a) and advanced factors (Porter, 1990). Indeed Foss (1996b) recognized that Porter's 'diamond' framework captures some of the importance of higher-order capabilities, for instance, having access to efficient factor markets at relatively low transport costs or a pool of skilled labor, sharing in standardization, and so forth.

Proximity, a sense of belonging and other factors are mentioned as being characteristic features of district membership. These factors facilitate a set of relational-based 'shared resources'. For analytical purposes, three different kinds of resources were distinguished: information, know-how and local institutions. We point out that information and knowledge-based resources are potentially strategic in the sense of providing firms with a higher competitive position. We collected informational advantages generated in both business and non-business relational networks, as well from relationships with local institutions.

Internal heterogeneity in the industrial districts

While most of the literature was focused on the superiority of district firms in comparison with outsiders, a certain level of homogeneity inside district firms was implicitly assumed. This means that the knowledge resources and the channels they flow along are of a public or common nature for the members of the district. By being a member, i.e. belonging to the district, a firm is provided with a series of common infrastructures that it can use.

The majority of studies in this field have been based on case studies. Most of them described success stories, both in terms of social welfare in the areas and in terms of the supremacy of localized firms. Yet, this phenomenon changes significantly from place to place or from area to area (Harrison, 1991). Although these case studies have illustrated the characteristics and the evolution of industrial districts (Amin and Robins, 1990; Staber, 1998), one of their limitations is the existence of factors that are specific to the case being studied. As Paniccia (1998) pointed out, these studies are limited by the researcher's selection of a particular case. In fact, together with success stories, we also find other studies that question the validity and potential of the model (Bianchi, 1994; Harrison, 1994) or its vulnerability, as may be the case, for instance, in responding to radical external technological changes (Glasmeier, 1991). Some examples evidence the persistence of opportunism within the district, the super-exploitation of minority groups, and the persistence of groups of dominant firms that benefit from the asymmetries of demand and information (DeBresson and Amesse, 1991).

In the field of European industrial districts and more particularly in the Italian case, Paniccia (1998, 1999) conducted a comparative study of a number of Italian industrial districts. Using macroeconomic and social variables of performance to perform her analysis, she found evidence of performance superiority in industrial district firms.

Signori (1994) compared the financial performance of auxiliary companies in the province of Prato by comparing firms within and from outside the district. In similar terms, Molina (2001) carried out a comparative study for the Spanish ceramic tile district. Finally, Becchetti and Rossi (2000) have shown the positive effect of the industrial district on export performance for the Italian case.

All this research has provided empirical support in favor of performance superiority for localized agglomerations of firms. However, these studies considered the industrial district as a whole, and thus assumed high internal homogeneity. However, in reality this idea of homogeneity is not fully confirmed. A more thorough examination of districts shows that they are not populated by homogeneous communities of entrepreneurs and technicians sharing both technical know-how and generic information. In fact, on some occasions, even different firm structures can arise (Rabellotti and Schmitz, 1999). Because firms develop their own networks of social relationships, as a result what they offer is also different. According to McEvily and Zaheer (1999) firms embed themselves among the rest of the actors in the network in widely differing manners and they therefore present specific and distinctive opportunities and restrictions. Firms inside the district show significant differences, for instance, when it comes to exploiting common or shared resources or externalities (Molina and Martínez, 2004). In this vein, Morrison and Rabellotti (2005) have characterised two types of internal networks. Rather than a unitary, homogeneous vision of the district, these authors distinguish between what we could label dense networks and dispersed networks. On the one hand, there is the hard nucleus of the network (core network), where the component firms benefit from intensive flows of knowledge and information among firms. And, on the other hand, we have the periphery network, where more distant relationships occur.

We define them as shared resources because of their semi-public nature, since membership to the district provides a set of infrastructures – and even a set of relationships – which can be used economically by firms. Another issue refers to the utilization, use or exploitation of these resources. This depends not only on the nature or structure of the individual resource (suitable for combination or scale but also on individual firm strategy in order to create and adapt the endowment of resources. This means accumulation and flows of resources. Consequently, what we have tested is the utilization or exploitation of collective or shared resources.

Nooteboom (1999) claims that enterprises with knowledge bases that are too similar or, conversely, too different are of little use to the focal enterprise. The transmission of knowledge will take place more efficiently among actors that possess knowledge bases that are only relatively close to each other. This requirement concerning the degree of similarity can be considered to be an effect that moderates the ease with which resources are disseminated within the network. This argument is useful to understand one of the main points of our research. Although in districts there are a number of shared or common resources not all the firms have the same ability to exploit them.

Social Capital as a shared resource

Gordon and McCann (2000) have developed the *social network model*. In this model, social networks of certain strong interpersonal relationships can transcend firm boundaries and this results in many interfirm social interactions perhaps being stronger than their intrafirm relations. These interpersonal relationships depend on interpersonal trust and informal relationships. In fact, informality is viewed as being a potential strength rather than a weakness in its role as a control mechanism. The strength of these relationships is described in terms of the embeddedness of the social network

(Granovetter, 1985). Social networks are a form of durable social capital which is created and sustained through a combination of social history and collective action. Their strength is a problematic issue, since it depends on a number of conditions such as a prior accumulation of trust, circumstances facilitating the monitoring of the behavior of others, a source of leadership and a sense of common interest, as well as the expectation of significant gain. Access to the 'club' will depend on past experience and routine interaction as well as on investment of effort in developing personal relations and trust. These factors may favor the development and reproduction of location-specific networks, in which case co-location will be a necessary but not sufficient condition for access. In a more general sense, it reinforces the importance of both direct and indirect weak ties (Granovetter, 1973) and more pluralistic and open-ended network-building strategies in which actors develop more extensive groups of links (particularly with better connected actors) that prove to be more useful than being committed to any single actor.

External relationships enable firms to obtain and combine knowledge-based resources from exchange partners. Through social interaction firms may increase the depth, breadth and efficiency of the mutual exchange of knowledge (Lane and Lubatkin, 1998). The external network of a firm can be considered to be a strategic resource in itself. Since networks are built by relying on a path-dependent course, they are idiosyncratic and difficult to imitate. As a result, accessible resources from the networks are also relatively inimitable and non-substitutable. Thus, networks can be considered to be strategic resources that exert an influence on the future capability of the firm and they are therefore explanatory factors of the variations in firms' performance (Andersson et al., 2002).

Consequently, a comprehensive view of strategic resources should include not only factors such as brands, technological capabilities or other similar factors, but it should also take into account the network resources or social capital of the firms (Gulati et al., 2000). In our opinion the social capital perspective is a suitable perspective to explain why firms vary in their capacity to exploit shared resources, since firms vary in their particular interorganizational networks and these determine access to and use of knowledge and informational resources. On the other hand, Leenders and Gabbay's (1999) main arguments concern, first, the multilevel application of the concept of social capital and, second, the distinction between social capital and social liability as positive and negative effects, respectively, of relationships on the attainment of goals.

According to Cooke et al. (2005), social capital affects firms' performance. In particular SMEs are studied by extending the analysis to the individual firm and regional levels. Findings supported the positive effect of social capital at the individual level but they were not so conclusive at a regional level. On the other hand, in Cooke and Clifton (2002), the key question is whether firms that make use of 'social capital' display a different business performance to those that do not, *cet. par.* Analysis showed evidence of a higher use of social capital by innovative SMEs. Regional variations in social capital use are also explored, the conclusion being that different types of social capital do indeed influence economic performance.

Firm actions and outcomes are influenced by the pattern of relationships maintained with other firms and institutions. Specifically, the social capital perspective emphasized that networks of social relations penetrate irregularly and in differing degrees (Granovetter, 1985). Since each firm develops its own networks of relationships, firms' social networks vary and consequently they lead to different outcomes. According to McEvily and Zaheer (1999), firms are embedded in highly differentiated ways that link

them to different sets of players and thereby present them with sharply distinct opportunities and constraints. In other words, firms vary in terms of their differential to discover and exploit competitive capabilities through their networks.

For example, it is said that a dense network structure is suitable for the creation of common norms and values by firms, and then they present easy tacit knowledge transmission and exploiting opportunities. On the other hand, a disperse structure of relationships seems to be best suited to capturing new and exclusive opportunities and exploring activities.

We aim to examine the effect of these shared resources on firm performance, assuming that firms vary in their ability to exploit these collective resources. Hence, we define three different types of shared resources: shared information, shared know-how and involvement in local institutions. The expected relationship between these shared resources and firm performance is the basis of our hypotheses, which we formulate as follows below.

3. HYPOTHESES

Shared information and firm performance. At an individual level, product and market information, databases, etc. constitute a relevant intangible resource (Hall, 1992, 1993). Information as explicit knowledge is considered to be a generator of new knowledge and innovation for the firm (Nonaka and Takeuchi, 1995). In districts, dense and strong tied district networks provide participants with fine-grained, high quality information exchanges. In addition, the industrial district provides norms and shared values for participants, thus facilitating cooperative behavior (Uzzi, 1997).

Inside the industrial district there is a great amount of information available for firm members, referring basically to aspects concerning markets and products. Although

information is accessible for all district members, firms vary in terms of their ability or capacity to exploit them. This depends, for example, on the human or technological resources invested for this purpose or on how well characteristic organizational features fit the district environment. Firms may also vary in the way they use this information, in terms of interest or strategic priority, since firms are likely to maintain several different external networks (outside the district) as sources of information. Information here means data about products, processes and services, specific information about procedures, technical descriptions and so on. A dense structure of ties provides information about products and processes, technologies and innovations and also about markets. The external sources are the network of customers, suppliers and competitors.

The extent to which district firms access and share collective resources in the form of information can affect how much they take advantage of these resources and improve their competitive capacity. Consequently, we link the existence of shared information and firm performance as the following hypothesis.

Hypothesis 1: *Firms that share and access more information that is commonly available in the district will have a higher firm performance.*

Shared know-how and firm performance. We understand shared know-how to be the common tacit, uncodified knowledge in the district that goes beyond collective information and data. This knowledge is based on common experience and intensive social relationships among managers and employees. Know-how is about specific tacit knowledge that flows inside a district. Basically human resources mobility was the mechanism by which this knowledge spread. Managers and technicians, as well as employees in general, frequently move from one firm to another (within the district); employees share the same local origin, which facilitates the use of a common language

and understanding; and they also have a common academic background and training. Note that this knowledge basically depends on the particularities of the industry or district.

The literature on industrial districts frequently emphasizes the existence of knowledge shared by all district firms (Maskell, 2001). This shared resource produces, for example, district-specific technologies, that is, technologies which are not exclusive to one individual firm but which are unavailable to firms outside the district (Pinch and Henry, 1999).

A number of authors also discuss several mechanisms of knowledge transmission, including high internal mobility of employees, previous job experience in the employees' district and the creation of new firms by former employees.

In our opinion, internal (district) human resources mobility is a key factor in embedded relations among people and firms. As Uzzi (1996, 1997) suggested, embedded ties entail problem-solving mechanisms that enable actors to coordinate functions and to work out problems 'on the fly'. In embedded relationships, increased feedback, learning and new combinations allow problems to be solved more efficiently. These relationships also improve firm responses by reducing production errors. They replace the simplistic response of the market and enrich the network, because working through problems promotes learning and innovation (Uzzi, 1997).

Capello and Faggian (2004) stated that in the regional approach the channels through which the relational capital (*embedded relations*) becomes collective learning are clearly defined as a high mobility of the local labor force, among others. During work, employees gather a lot of experience. If they leave a firm, they take this tacit knowledge with them and enrich the labor market (Tomlinson, 1999). For knowledge flows to successfully take place across firms' boundaries, both a certain degree of human

resource immobility with respect to the external boundaries of the district and a certain degree of internal district mobility are required (Brenner, 2000).

Of course, their tacit knowledge is related to their previous job, which often implies that the use of this knowledge is restricted to one industry or even a particular technology. It might be useful to other firms only up to a certain extent. However, many firms rely on this kind of human capital (Bramanti and Senn, 1990). Moreover, knowledge spillover that has a strong influence on the innovativeness of firms can be at least partially accounted for by the flows of workforce between firms, as well as by informal contacts between employees. Managers, technicians and employees frequently move from one firm to another but always within the district (Costa, 1993; Molina, 2001). The local labor market is highly competitive since the availability of information and knowledge and technology is governed by similar demands. However, labor mobility respects the district boundaries, since the use of specific knowledge loses its value outside the district.

In addition, new firms are mainly created by managers and employees from a parent firm and are normally located in the areas where the founders have lived and worked (Bramanti and Senn, 1990). As Johannisson and Monsted (1997) pointed out, intersectoral trust and informal social capital are accumulated in districts due to the close interconnections between business and community, thus creating an incubative arena for entrepreneurial activity. The founders of the new firms had accumulated a great deal of experience and specific knowledge from their previous jobs, and this context-specific knowledge has to do with the products and technologies present in the district.

The degree to which district firms access this collective know-how influences how much they benefit from these resources and improve their competitive capacity.

Consequently, we link the existence of shared know-how and firm performance as the following hypothesis.

Hypothesis 2: *Firms that share and access more know-how available in the district will have a higher firm performance.*

Involvement in local institutions and firm performance. Local institutions constitute another source of knowledge flows that has been extensively discussed in the literature. In fact, the role played by local institutions has been underlined as a critical factor for the development of industrial districts because they offer what Brusco (1990) defined as *real services*. The munificence of the geographic environment is manifested not just in terms of available pools of knowledgeable workers, but also in the form of access to local university researchers or university research projects. In fact, as frequently mentioned by a number of authors (e.g. Enright, 1998; Decarolis and Deeds, 1999), in industrial districts the information provided by institutions such as trade associations and professional associations flows through diverse mechanisms such as the network of formal and informal relationships among managers and employees.

Scott (1994, 1996) pointed out how industries in regions may vary in their dynamic character. Safety and trust alone do not necessarily guarantee competitive success. Unlike producers in Los Angeles, producers in Bangkok have been extremely effective in securing forceful political expression of their needs and goals.

For the purposes of this research, we have defined local institutions as locally-oriented organizations (both public and private) that provide a host of collective support services to firms in the district/region (Brusco, 1990). Examples of local institutions include technical assistance centers, universities, vocational training centers, local research institutes, industrial policy agents, and trade and professional associations. In

addition, we also provided respondents with a list of institutions to help them when answering the questions.

Beyond providing district firms with specific support services and other resource benefits, local institutions act as repositories for knowledge and opportunities for firms. Because local institutions interact with a relatively large number of firms in the industrial district, they are exposed to a wide variety of solutions to the organizational challenges typically faced by firms in the district. In fact, local institutions facilitate managerial innovation by providing access to information and resources for acquiring new capabilities and extending already existing ones. Local institutions also mitigate the costs associated with locating the external sources of knowledge and specialized expertise that are critical to the acquisition of competitive capabilities (McEvily and Zaheer, 1999).

Firms can access a greater number or amount of resources. Resources can be informational resources (data and reports on markets), human resources (people, technical assistance, consultancy), technological support by means of joint projects, machinery or specific facilities, etc. As we have pointed out above, a firm's behavior may vary significantly with respect to the local institutions within the district. We find that this dimension has two poles: firms that only sporadically use some information or data about markets or technologies, yet with no commitment or formal relationship with institutions, and, at the other end of the spectrum, firms that participate in the creation or the management of the institutions, investing as active partners in joint projects, and so on.

We use different indicators to find out the degree of involvement of firms in local institutions (e.g., trade association membership) and the participation of firms' members, executives, technicians, and so on, therein. This may be, for instance,

appointments of company CEOs to leading positions in trade associations or the number of employees belonging to professional associations, the number of contracts or joint projects with research centres, and so on.

Firms in the district vary in the extent to which they use or exploit opportunities that local institutions can provide. Apart from the discussion on the reasons behind variation in using institutions, what we have tried to capture is whether a firm lies closer to the situation expressed by a statement like “we only occasionally receive information from local institutions” or instead they feel closer to the idea that “our firm is an active partner in joint projects to be developed with institutions”. Consequently, we hypothesized that the extent to which the firm is involved with local institutions affects its creation of value.

Local institutions play the role of an intermediary and, as such, they facilitate the accumulation and diffusion of knowledge, thus reducing search costs. We can formulate the hypothesis as follows:

Hypothesis 3: Firms with a greater degree of involvement with local institutions will have a higher performance.

4. EMPIRICAL STUDY

Our empirical study was based on the population of firms that make up the Spanish ceramic tile industrial district. A preliminary question to be investigated is whether the Spanish ceramic tile cluster can be considered to be an industrial district. Indeed, a number of authors have previously identified this area as an industrial district (Utili et al., 1983; Castillo, 1989; Benton, 1990; Ybarra, 1991; Nomisma, 1992; Costa, 1993), one noteworthy example is that of Ybarra (1991), who used Sforzi’s method based on the above-average density of specialized SMEs in a bounded geographical area.

Sources. The selection of firms was collected from The Tile Guide (2003) and Listing Companies (2003). The sample was checked against the listing from the ARDAN database. These databases allowed us to identify the address of the firms and the four-digit code of the Standard Industrial Classification (SIC). The initial list of ceramic firms contained 149 companies. Most data (performance and control variables) were collected from the Trade Registry Office (*Registros Mercantiles*) for the period from 1997 to 2002. Additional descriptive data were collected from the annual report published by ASCER (2003) (the Spanish trade association of ceramic tile manufacturers).

A questionnaire was developed and run in the Spanish industrial district. In this district there are diverse related activities included in the same productive process. To identify a homogeneous group of firms enabling us to run the empirical analysis we chose the *final firms*, which are those that carry out the final phases of the production process of the ceramic tile and which are in contact with external markets. Their denomination as ‘final firms’ has been borrowed from Brusco (1992), who classified firms in a district into three different categories, namely final, specialized and integrated firms, depending on their position in the production process. Hence, the questionnaire was administered face-to-face to managers from the final firms in the district.

The total number of respondents was 100 from a population of 149 firms. With regard to non-respondent firm bias, there were no significant differences in terms of size and technological attributes. Item selection was also based on the feedback obtained from a pilot questionnaire. For the sake of simplicity, we employed a five-point Likert scale, where a score of 5 means ‘I strongly agree’ and a score of 1 means ‘I strongly disagree’ with indicators of the different selected variables.

Variables

We agree in considering sources that are outside the district as a potential competitive advantage. However, in our research we attempted to capture these external relations indirectly through local institutions as intermediary agents. Rather than measuring direct links of the firms with external networks, we prefer local institutions, since in this way we measure a more 'homogeneous' variety of links and also this measurement can be obtained more easily. Furthermore, firms in districts are faced with a number of barriers hindering them from connecting directly with external networks.

Asking directly about external networks can be difficult to express and may make it hard for respondents to understand what we are really trying to measure. This may be due to the fact that there are so many different, heterogeneous external networks.

We have assumed that firms in districts have to overcome significant barriers in order to gain direct access to external networks so that they can be provided with resources. Findings from the case studies suggested several explanations for the barriers that prevent firms from gaining direct access to external networks.

First, as we have said, one primary reason preventing direct access to external networks is the small size of the firms in districts. Indeed, in most cases these firms do not have significant R&D and marketing departments. Thus, they cannot afford to make the large financial investments required by research projects or marketing campaigns. By definition, one of the characteristic features of the industrial district is the small size of these specialized firms.

The second reason concerns the need for an intensive exchange and combination of resources in the innovation process and, consequently, an important interfirm coordination effort is also required. In the industrial district there is a high degree of specialization and, hence, knowledge and innovation involve efforts by other groups of

firms. Local institutions may act as coordinators of this process. They play the role of a third party in coordinating activities among different firms within the district.

Finally, the high transaction cost of knowledge transfer in the open external markets is also observed. The barriers can be justified since searching for new opportunities to improve the innovation capabilities of firms implies high levels of uncertainty and risk. Firms can avoid risks by using local institutions to provide a feasible source of information about the existing options.

The *shared information* (INFORMATION) variable attempted to capture the existence of collective information in the district. This shared information is provided by diverse entities. We asked managers to assess the importance of this information in the endowment of resources of the individual firm. We defined this variable using the items described in Exhibit I.

The *shared know-how* (KNOW-HOW) variable attempted to go beyond the scientific and codified knowledge and data. Its purpose was to capture the existence and the importance of the flows of collective learning that take place because of exchanges of the tacit knowledge that stems from the common experience among the firms in the district. We defined this variable using the items described in Exhibit I.

The *involvement in the local institutions* (INSTITUTIONS) variable attempted to capture the role played by the local institutions in the exchanges of information and knowledge. We defined this variable using the items described in Exhibit I.

Control variables. As suggested in many previous works in our field (e.g. Grant et al., 1988), we also controlled for other variables that were likely to affect performance, including firm Size and Age (Exhibit I). The size variable (SIZE) allows us to control for economies and diseconomies of scale at the firm level (Hitt et al., 1997). Age (AGE)

was also included, since some authors have suggested that in industrial districts temporary evolution affects performance (Glasmeier, 1991; Poudier and St. John, 1996).

Organizational performance variables. The selection of the proper indicator with which to measure organizational performance is a question that has been discussed at length although no common agreement has yet been reached among authors. In our case, the difficulty involved in finding the most suitable indicator increased because we sought to assess the effect of a firm's membership to an interorganizational network. Consequently, in order to reinforce the measurement of performance we used a two-dimensional measure (Tallman and Li, 1996). On the one hand, we used a subjective measure based on the degree of firm satisfaction while, on the other, we employed an objective measure based on two indicators, namely, return on assets and growth of the firm.

In the strategic alliance and interorganizational networks, many authors argue in favor of subjective measures of organizational performance (e.g. Inkpen and Birkenshaw, 1994). In our case, we defined a subjective performance variable (SATISFACTION) to assess the degree to which the firms are satisfied with the advantages associated with industrial district membership. We defined this variable using five different items, the result being a final indicator obtained by simple computation (Exhibit I). To solve the potential construct validity problem we controlled with Cronbach's Alpha, in accordance with Table 1.

Two different indicators were used to measure performance: return on assets and growth (Exhibit I). Accounting-based measures of a firm's profitability have received criticism from some authors (e.g. Aaker and Jacobson, 1987), but their use has been justified by others (Hoskisson et al., 1993; Robins and Wiersema, 1995). In fact, many

studies focused on homogeneous firms have used ROA as a measure of firm performance (e.g. Grant, 1987; Robins and Wiersema, 1995; Hitt et al., 1997). This indicator allows us to isolate the assessment of the quality of firm management since it is not affected by financial interests and costs. With respect to ROA, data were collected for the three first years from the Trade Registry Office. The last three years of the period considered were completed from the ARDAN database (ARDAN, 2002, 2003, 2004).

The second objective indicator was the growth of the firm (GROWTH), which provides a measure of operating performance to complement measurements of accounting performance (Geringer et al., 2000). The ROA and GROWTH variables were used to calculate the average value for the period under consideration. We contrasted the responses with available objective data and then we considered any cases that presented significant differences to be missing values.

Analysis techniques

First, to find construct validity, Cronbach's Alpha was calculated for each variable, as measured by multi-item scales to indicate adequate reliability and internal consistency (Nunnally, 1978). The discriminant validity was calculated for all pairs of variables by examining the matrix of correlations.

Second, models of conditioned probability, such as *Logit*, allow us to consider the interactions between different variables or factors explaining the firms' behavior. So, this analysis by means of *Logit* regression can be used to model the impact of the explanatory variables on the performance measured by SATISFACTION and GROWTH as discrete variables.

The model can be defined as follows:

$$P_i = E(y=1|x_i) = 1 / (1 + e^{-z})$$

$$Z = \alpha + \beta_1 \text{Size} + \beta_2 \text{Age} + \beta_3 \text{Information} + \beta_4 \text{Know-How} + \beta_5 \text{Institutions} + \varepsilon$$

(+/-) (-) (+) (+) (+)

Where the dependent variable y takes values [1-5], α is the intercept term, and β_i ($i=1-5$) is the coefficient of the explanatory variable I ; finally, the expected sign appears in brackets. Note that in building the model, economic coherency has been a priority rather than other considerations (e.g. pursuing maximization of correct cases in the classification). Above all we aim to obtain indicators explaining firms' outcomes.

The linear regression model (OLS) was run with the ROA performance measures used as the dependent continuous variable. All regression models included control variables.

Results

Insert Table 1 about here

Table 1 includes descriptive statistics, Cronbach's Alpha for the multi-item variables and Pearson's correlations for all pairs of variables. As expected, the results show that the explanatory variables are correlated, although the control variables were not. On the one hand, the dependent variables ROA and SATISFACTION were correlated, but this was not the case with GROWTH. This means that SATISFACTION, as a measure of subjective performance, is related to ROA but not to GROWTH.

From the Pearson correlation matrix we know that INFORMATION, KNOW-HOW and INSTITUTIONS are correlated. From a statistical point of view this presents some limitations since these indicators may be a measure of the same construct and, consequently, adding more explanatory variables does not provide a better explanation

of the dependent variable. However, as we understand it, theoretically it is important to control all three variables. It can be expected that firms that enjoy more collective information are, at the same time, those which receive more knowledge (for instance via internal mobility) and also use more services offered by the local institutions.

The full explanation of the benefits of the systemic effects probably comes from the perspective of individual firm capabilities. The distinct capabilities of the firm may be based on specific resources for exploiting the local environment or on fitting characteristic organizational features to the district environment. These capabilities allow synergies to be obtained from the use of different shared resources. In any case, no reason can be found to believe that the use of one particular collective resource limits or restrains the use of the others.

Finally, in order to investigate a possible problem of collinearity, we used the tolerance test of the statistic VIF (Variance Inflation Factor). This is the reciprocal value of the tolerance. The result of this test indicated that the least favorable value of this statistic was 1.212. We considered this value as being close enough to 1 to be considered a satisfactory test of tolerance.

Regarding the α value, the least favorable value belongs to the multi-item scale of the KNOW-HOW variable. This value was at the lower limit of tolerance (0.6), yet, bearing in mind the nature of the study, we considered the feasibility of the scales used as being satisfactory tested (Nunnally, 1978; Malhotra, 1997).

Insert Table 2 about here

Table 2 shows the results of this Logit estimated model for each of the dependent variables. The X^2 test (29.958 and 27.486, respectively) accepts the alternative

hypothesis that all parameters of the model are simultaneously different from zero, significantly at 1%. All coefficients have the expected sign, with the exception of the KNOW-HOW variable. The Wald Statistic shows that the INFORMATION and INSTITUTIONS variables are significant, whereas the rest of the variables are not. Consequently, estimations of the multivariate model reveal the explanatory capacity of the proposed variables for firms' performance.

Insert Table 3 about here

Table 3 shows the proposed OLS regression model. The results allow the following common conclusions to be drawn.

INFORMATION and INSTITUTIONS were significant at levels $p < 0.10$ and $p < 0.01$, respectively. We agree that the R^2 value in the case of ROA was not particularly high. However, considering the complexity of the dependent variable (cause by many non-hypothesized factors) we find the explanatory capacity of our variable high enough. Moreover, levels of significant are acceptable, both individually, and particularly globally.

Regarding the results of both analysis techniques, the following considerations must be mentioned. On the one hand, the model possesses a higher explanatory capacity for subjective performance measures than for objective one, while on the other hand the KNOW-HOW variable appeared as the only non-significant value for the regression models. At first sight, we found no satisfactory explanation for this fact and linked it with the results in Table 1, where the α value for this variable was the least favorable. This fact and the results for this variable indicated the need to improve the selection of items for measuring the variable. In order to control the effect of the KNOW-HOW variable with more precision we ran an alternative analysis considering the components

of the variable. This new analysis consisted in breaking the variable up into two different variables, one based on the indicators related to previous experience gained from a district job, local origin and common background, and the other based on internal mobility. Results confirmed a non-significant effect of these variables.

In any case, as direct interpretation of the results of the regression model indicates, the impact of explicit or codified knowledge on the SATISFACTION and ROA of the firms is lower than that exerted by the involvement in local institutions. In contrast, explicit knowledge has an important impact on the GROWTH of the firms.

Models attempt to observe the degree to which the three performance measures are accounted for by the control variables, and are hence exogenous to our model. Results show that these variables do not significantly explain the different performance. Regarding SIZE, this conclusion is consistent with other previous works in the field of industrial districts. In the industrial district, economies of scale do not play a decisive role as occurs in other interorganizational contexts. The industrial district literature used to argue that collaboration agreements, the existence of local institutions supporting R&D activities and highly specialized suppliers reduce the effect of the economies of scale. The same conclusions can be found in Russo (1985), who suggested that economies of scale played a secondary role in the development of the Italian ceramic industrial district.

Regarding AGE, some authors (e.g. Poudier and St. John, 1996) suggested that as a result of public and private incentives to the creation of new clusters and certain characteristics of their evolution, AGE is negatively related to firm performance. Along the same lines, Glasmeier (1991) pointed out that production systems and innovativeness are time dependent in industrial districts. In spite of these suggestions, at least in our case, this hypothesis cannot be confirmed, since AGE was not significantly

related to any performance variable. An explanation can be found in the fact that the ceramic district is now in a mature phase of its development where even the new firms enjoy similar conditions with respect to already existing firms.

5. DISCUSSION AND CONCLUSIONS

The primary research question investigated in this paper has been to analyze the factors affecting a firm's performance in the context of territorial agglomerations such as Industrial Districts. Throughout the theoretical discussion, we have argued that it may be useful to extend recent contributions to firm strategy perspectives in order to include the industrial district level. This aim coincides with previous works, particularly those by Foss (1996a), Lawson (1999) and Lawson and Lorenz (1999). However, we found no satisfactory answers in previous research, since authors have shifted their attention between two different levels of factors, i.e. individual and aggregated levels, without considering an integrated view.

The tradition of the Resource-Based View (Barney, 1986, 1991) focused on the individual firm as a unit of analysis, considering firms' heterogeneity to be one of their basic principles. From this point of view, there is no a clear explanation of how firms in industrial districts display better performance than non-members, even within the same industry and country, as some research has proved (Molina, 2001). It is clear that some kind of systemic or collective effect benefits these firms.

In contrast, in the Industrial District tradition, most authors have considered the district as a whole, analyzing only aggregate data and results. According to the literature, the geographically 'bounded' agglomerations may yield a number of beneficial non-traded interdependencies. These interdependencies are significant factors in explaining why some geographically bounded entities may prosper or lag behind other entities. This perspective does not take into account the fact that firms may present

significant internal (i.e. within the district) differences in terms of characteristic features and performance. As McEvily and Zaheer (1999) pointed out, individual units vary in form and the exploitation of collective goods.

We suggest that strategic resources (those which are involved in the competitive advantage of the firms) can be classified for analytical purposes on two different levels: one on a systemic or district level and the other on an individual firm level. Accordingly, the variation in firm performance can be explained not only by individual resources but also by shared resources inside districts. In the industrial district, there are shared resources which are neither exclusive to nor the property of the individual firm and they are unavailable to external firms.

In order to isolate the effect of the industrial district on performance of the firms, we have presented a set of factors that comprise the shared resources in industrial districts. We have proposed and tested a model of shared resources, including factors related to information, tacit knowledge and support by local institutions.

The empirical section has explored the explanatory relationships of the industrial district on firm performance. Although we have focused on shared resources, this means that wholly internal factors do not affect firm performance. We have analytically separated both levels, i.e. individual and collective, as we understand them to be closely interrelated. The results of our work suggested that firms operating in contexts with strong interconnections with other organizations must develop what we can define as a distinct capacity focused on the shaping and leverage of shared or collective resources. Consequently, we agree with Lam's (2000) suggestion to move away from the traditional professional model of the relationship between firm and local institutions and to draw closer to a more interactive model. The growing importance of cross-disciplinary knowledge and the new dynamics in the formation of codified knowledge

call for a reassessment of institutional arrangements. Firms should develop close links with local institutions. Social networks facilitate the rapid transmission of evolving codified knowledge.

Before discussing possible contributions of this paper, mention must be made of some of its limitations. Because of the nature of the district membership variable, we are cautious about inferring any degree of causality among the key constructs. Although we have presented hypotheses in a manner that implies certain independence among variables, it is possible that district membership explains other variables. Consequently, further research is needed to elaborate the relationship between the different elements of the model. Another question may be raised as to the diversity of the local institutions. Since local institutions may be predominately from the same industry, the information accessed by local firms may be less diverse. Thus, a deeper analysis is needed of how local institutions vary in terms of the scope of the activities they carry out. A final challenge we confronted was that of operationalizing the dimensions of the shared resources in the territorial context. Their definitions must, therefore, be tentative and future research is needed to confirm them. In the same way, the choice of small manufacturing firms as the focus of this study limits the extent to which the findings can be generalized. An argument worth exploring, and which may help to explain performance differences among firms in industrial districts (not differences in access, but rather differences in utilization), is that even with access to the same resources, firms may benefit differently from the resources because of extra advantages of combining external resources with some of their internal resources or some firms may have some similar resources already, hence enjoying scale economies (Dierickx and Cool, 1989).

The main contribution of our paper is to isolate the effect of the interfirm (inter-organization) relationships on firm performance in industrial districts. We consider that the ability to exploit externalities is a part of the capabilities of the firm, and this is particularly important in the case of district members. The firm strategy perspective (resource-based view) can help us to gain a better understanding of the nature and characteristics of the externalities, since they may accomplish Barney's conditions of rarity, economic value and difficulty to be copied and substituted.

By emphasizing the role played by local institutions, this paper is in line with those which alert against over-embeddedness in relationships (Yli-Renko et al., 2001) and encourage autonomous relationships (Woolcock, 1998). According to Uzzi (1996, 1997) and Burt (1992), over-embeddedness could be produced when all the firms in a network are connected through embedded ties. This can reduce the flow of new or novel information into the network because of redundant ties. This means that there are few or no links to outside members who can potentially contribute innovative ideas. In our approach we do not analyze the decrease in benefits at a certain level of embedded relationships. We considered that firms can manage with a portfolio of diverse types of ties and can thus compensate or moderate this possible negative effect. Each type of ties (weak and strong ones) serves a different strategic purpose (Rowley et al., 2000). In particular, as some previous research has suggested, local institutions may play an intermediary role between external (*under-embedded*) networks, or structural holes, and internal, *over-embedded*, networks (Molina et al., 2002). Through a portfolio of ties or intermediary agents, both approaches argue mechanisms to moderate the negative effects of over-embeddedness on providing the flow of new or novel information. This combination of ties prevents us from considering the industrial district as a limited model, in contrast to the arguments of some authors (Bianchi, 1994; Harrison, 1994),

and offers the possibility of escaping from certain risks, such as external technological shocks (Glasmeier, 1991).

Our proposition supported a number of prescriptions for firms' strategies. We argue that firms should interact with local institutions and other cluster participants in order to improve environmental conditions. Dynamics between the formation of tacit and codified knowledge and other elements of the innovation processes call for a reassessment of institutional arrangements. Firms may pursue diverse strategies for knowledge and skills resourcing, including, among others, strategic partnerships with key institutions to influence the education and training of future researchers; research collaboration with individual academics or departments in universities in order to gain early access to research; or, finally, the creation of hybrid research organizations between firms and institutions to develop common research programs.

Finally, our research has raised a number of further questions. The fine-grained process through which network structure is created or modified is an interesting and important area for future research. Further research is needed to elaborate the relationship between the different elements of the model and to confirm the definitions and scales used in the constructs. Another fruitful area of inquiry is the dynamics of how firms' networks evolve and change in response to external challenges and opportunities. In other words, to what extent does inertia constrain a firm's ability to reconfigure its pattern of network ties? In particular, we intend to investigate the effects of social capital structure (dense or disperse) and the nature of the ties (strong or weak) and study their effects on firms' capacity to exploit common resources in the district and, ultimately, to develop innovative capacity.

On the other hand, the processes of cooperative competition in geographical clusters could benefit greatly from a more detailed analysis of the mix of cooperation and

competition in networks. The balance between interfirm cooperation and competition, while a popular idea, warrants greater research attention, particularly in the network context.

In fact, we believe that externalities are not statically given in the environment but, on the contrary, firms can improve these conditions through active interaction with local conditions, government and other firms. Firms should interact with local institutions and other district participants in order to improve environmental conditions. Dynamics between the formation of tacit and codified knowledge and other elements of innovation processes call for a reassessment of institutional arrangements. Firms may pursue diverse strategies for knowledge and skills sourcing including, among others, strategic partnerships with key institutions in order to influence the education and training of future researchers; research collaboration with individual academics or departments in universities in order to gain early access to research; or, finally, the creation of hybrid research organizations between firms and institutions allowing common research programs to be carried out.

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Exhibit I. Computing variables

(1) INFORMATION

- (1) In your opinion, your company finds product information available in the district or local area.
- (2) In your opinion, your company finds process information available in the district or local area.
- (3) In your opinion, your company finds customer and market information available in the district or local area.
- (4) In your opinion, your company finds technology and innovation information available in the district or local area.
- (5) In your opinion, your company finds a network of information with local customers, suppliers and competitors.

Use a 5-point Likert scale where 1= fully disagree and 5= fully agree

(2) KNOW-HOW

- (1) In your opinion, in your company there are managers, technicians and employees with previous experience in district jobs
- (2) In your opinion, in your company managers, technicians and employees have a local origin.
- (3) In your opinion, in your company there is a common academic background and training by local academic institutions of the managers, technicians and employees.
- (4) In your opinion, in your company there is a relevant turnover of managers, technicians and employees.
- (5) In your opinion, there is a relevant degree of human resources mobility within the district.

Use a 5-point Likert scale where 1= fully disagree and 5= fully agree

(3) INSTITUTIONS

- (1) In your opinion, your company receives a relevant support in R&D activities by local institutions.
- (2) In your opinion, your company employees receive specific training by local institutions.
- (3) In your opinion, your company benefits from collective promotion of the district's products and firms by local institutions.
- (4) In your opinion, your company receives flows of information and knowledge from local institutions.
- (5) In your opinion, the role of the local trade associations is very important and relevant for your company.

Use a 5-point Likert scale where 1= fully disagree and 5= fully agree

(4) SIZE

- (1) Total average sales for the period considered.

(5) AGE

- (1) We used the year 2002 as a reference.

(6) SATISFACTION

- (1) You find high quality, efficiency and effectiveness in the auxiliary industry.
- (2) You find a lot of natural resources and qualified and specialized human resources in your industry.
- (3) You find a high degree of coordination of the spatial environment through local institutions, and the availability and support of services to R&D activities.

Use a 5-point Likert scale where 1= fully disagree and 5= fully agree

(7) ROA

- (1) The earnings before interests and taxes divided by total assets.

(8) GROWTH

- (1) Please indicate the comparative growth of your company regarding local competitors in terms of total revenues.

Use a 5-point Likert scale where 1= much less and 5= much more

Table 1: Means, standard deviations and bivariate correlations for all variables

Variables	Mean	S. D.	α	1	2	3	4	5	6	7
(1) INFORMATION	3.65	0.72	0.71							
(2) KNOW-HOW	3.66	0.45	0.60	0.169*						
(3) INSTITUTIONS	3.65	0.75	0.85	0.454***	0.348***					
(4) SIZE	1446	1686	-	0.084	0.156	0.178*				
(5) AGE	25.30	12.80	-	0.023	0.322**	-0.149	0.050			
(6) SATISFACTION	3.33	0.47	0.70	0.502***	0.381***	0.506***	0.057	-0.033		
(7) ROA	0.12	0.07	-	0.289***	0.235**	0.272***	0.055	-0.051	0.331***	
(8) GROWTH	3.28	1.00	-	0.483***	-0.007	0.304***	-0.008	-0.104	0.077	0.083

N=100

Pearson's correlation is significant at the levels: *p<0.10; **p<0.05; ***p<0.01.

α = Alpha de Cronbach

Table 2: Logit Regression Results

Dependent	Expected sign of the coefficient	Estimation (1)	Estimation (2)
		SATISFACTION	GROWTH
		Coefficient (Statistic Wald)	Coefficient (Statistic Wald)
Constant		1.917*** (0.5499)	-3.042 (1.358)
INFORMATION	(+)	0.143** (0.054)	0.473** (0.194)
KNOW-HOW	(+)	-0.088 (0.143)	-0.042 (0.408)
INSTITUTIONS	(+)	0.283*** (0.009)	0.384*** (0.176)
SIZE	(+/-)	-2.674E-08 (0.000)	-1.78E-08 (0.000)
AGE	(-)	0.008 (0.004)	-0.003 (0.009)
X^2 of the model		29.958****	27.486***
-2 Log Likelihood ratio		444.276	459.268

N=100

*p<0.10; **p<0.05; ***p<0.01; and ****p<0.001.

Table 3: Regression results

Model (3)	
Dependent	ROA (a)
Constant	-0.099 (0.101)
INFORMATION	0.033* (0.019)
KNOW-HOW	-0.015 (0.023)
INSTITUTIONS	0.047*** (0.018)
SIZE	-2.105E-09 (0.000)
AGE	-1.519E-05 (0.001)
R ²	0.217
R ² Adjusted	0.128
F Statistic	2.433**

N=100

*p<0.10; **p<0.05;***p<0.01; and ****p<0.001.

(a) Coefficients of regression not standardized (errors within brackets).