

Geographical and cognitive proximity effects on innovation performance in SMEs: a way through knowledge acquisition

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Abstract This study explores the relative influence of geographical and cognitive proximity to explain innovation performance. This paper deepens the controversy between the significance of both types of proximity, contributing to a better understand their interconnections. The study further analyzes to what extent knowledge acquisition provides a congruent explanation of the effectiveness of innovation in proximity contexts. The paper has tested a structural model based on a sample of 224 Spanish footwear firms. Footwear industry is a mature and traditional industry with a significant presence of the territorial agglomeration of firms all over Spain. Findings suggest both a direct and indirect effect of cognitive proximity on innovation performance. However, an excess of geographical proximity produces spatial lock-in, thus limiting the access to new knowledge and lowering innovations. By contrast, proximity in terms of goals and culture leads firms belonging to a territorial cluster to achieve knowledge acquisition resulting in relevant innovation. Findings suggest that although transferable valuable knowledge exists in clustered contexts firms should adopt a proactive behavior to have access common knowledge and in order to generate effective innovations.

Keywords Geographical proximity · Cognitive proximity · Clusters · Innovation · Knowledge

Introduction

Over the last two decades much attention has been devoted to explaining proximity or spatial advantages for firms. Moreover, this interest has arisen in diverse

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economic disciplines. It was Alfred Marshall (1925) who first defined the external economies of firms derived from the availability of qualified human resources, specialization of providers and technological spillovers in a local context. Authors have proposed a great number of concepts and notions to capture and represent the nature of this territorial agglomeration of firms (Knoben and Oerlemans 2006). However, the most widely accepted concepts are probably the *industrial district* (Becattini 1979) and the *industrial cluster* (Porter 1998).

In spite of conceptual and methodological differences, both concepts share the same internal logic. In fact, both concepts emphasize the strategic role played by localization and geographical proximity between firms. In any specific place, local firms look for global advantages and global firms look for local advantages (Martin and Sunley 2003). However, as these authors suggest, there are important challenges to be solved in the development of this theoretical argumentation. The first one consists in the delimitation of the cluster frontiers, that is, which firms and organizations can be said to belong the cluster. On the other hand, there is a lack of a theory of the firm explaining the role played by individual firms in these agglomerations (Best and Forrant 1996), although in recent years some theoretical and empirical contributions have appeared studying the heterogeneity in the behavior and performance of agglomerated firms (Stuart and Sorenson 2003; Giuliani and Bell 2005; Inkpen and Tsang 2005; Capó-Vicedo et al. 2008; Belso-Martínez 2010; among others). In our view, the best approach to consider these issues may be through the reconsideration of the concept of *proximity*.

In fact, proximity has recently been presented as a multidimensional concept—geographical, cognitive, organizational, social and institutional dimensions—(Boschma 2005). In this vein, proximity is not exclusively related to physical or geographical closeness (Knoben and Oerlemans 2006). Lately, a number of authors have underlined the influence of other dimensions of this concept in knowledge diffusion, such as the institutional, social or cognitive proximities (Torre and Rallet 2005). Authors have devoted increasing attention particularly to the cognitive dimension of proximity (Wuyts et al. 2005). This paper considers cognitive proximity as the expression of the cultural homogeneity of organizations within the cluster, including elements such as shared language, common norms and values, among others. Dei Ottati (2003) has defined all these elements as the *communitarian market*.

In this context our research attempts to contribute considering together the geographic and the cognitive proximities. In consequence, we focus on solving empirically the controversy between the significance of the two types of proximity. In addition we analyze the interconnections between both types of proximity and throwing light on the idea that both proximities are related as suggested by Boschma (2005) and Torre and Rallet (2005).

Many empirical studies have shown there to be a significant association between proximity and innovation (Mistri and Solari 2001; Muscio 2006). Traditionally, authors have argued that intense relationships are fostered in the context of physical proximity (e.g. Baptista and Swann 1998). Those relationships are potential external knowledge sources of and consequently may favor knowledge exchanges (Utterback 1974; Fuentes et al. 2010). In the same line, shared values, goals and culture—that is the cognitive proximity—favor innovation in firms. They allow the exchanging of

information, avoiding misunderstandings (Inkpen and Tsang 2005; Krause et al. 2007). Moreover, we must point out that, in these contexts of proximity, firms vary in its capacity to acquire, and learn from, valuable external knowledge (Inkpen and Tsang 2005). Thus, knowledge acquisition is crucial to explain how firms are more likely to produce effective innovations.

Specifically, this research attempts to compare the role played by geographical and cognitive dimensions of proximity to explain innovation performance and to analyze to what extent knowledge acquisition offers an explanation of innovation performance. Therefore, the main contribution of the paper is to deepen the controversy and interconnections between geographical and cognitive proximity to achieve effective innovations. Furthermore, we contribute to understanding the role played by knowledge acquisition to improve innovation in proximity contexts. To address these research questions this paper has carried out an empirical study based on a sample of 224 Spanish companies in the footwear industry. This industry is particularly suitable to study the proposed questions. This is a mature, traditional industry and the sample field is nationwide, with a significant presence of the territorial agglomeration of firms.

The paper has been structured as follows. The second section explains the main concepts and justifies the hypotheses. The third section describes the design of the empirical study and the fourth section expounds the findings. Finally, the paper proposes a number of conclusions, underlining the contribution and further implications of this research.

Theory and hypotheses

Proximity and innovation performance

Geographical and cognitive proximity

Proximity is a relevant notion and broadly used in different research fields. However, there is not yet a consensus about the types of proximity (Knoben and Oerlemans 2006). Traditionally, authors have focused on geographical proximity (Marshall 1925; Becattini 1979; Porter 1998). A review of the literature reveals a great diversity in definitions and measures (Boschma 2005). For instance, some authors have established proximity depending on the distance between actors, or the perception of distance taken by the actors. Other authors have focused on the existence of groups or agglomerations of firms in a specific place¹ (Becattini 1979). Among other advantages, proximity facilitates face-to-face interactions between actors and these interactions favor the exchange of high quality information and tacit knowledge (Boschma 2005). Finally, several studies have introduced the notion of *temporary* geographical proximity. According to this notion, when actors are collaborating constant proximity is not required (Torre and Rallet 2005). In this case,

¹ In the context of this research, we define geographical proximity for membership of an industrial district. We consider the notions of district and cluster to be equivalent, although we are aware of the conceptual and methodological differences.

through meetings, short visits and temporary co-localization agents can build other forms of proximity allowing collaboration even with long distance partners. Furthermore, it can be argued that geographical proximity might only be required at certain phases of the collaboration process between firms, such as negotiation or when tacit knowledge acquisition is relevant (Knoben and Oerlemans 2006).

On the other hand, *cognitive proximity* is becoming more and more relevant in the study of knowledge and innovation processes (Nootboom 2000; Boschma 2005). This type of proximity can be associated to the similarity in the way that actors perceive, interpret, understand, and evaluate the world (Wuyts et al. 2005). In our view, elements such as common culture, values, customs, norms, routines, visions, goals and objectives determine the way the environment is approached and known, and also organizational behavior itself (Inkpen and Tsang 2005). From this perspective, organizations require a common frame of reference to transfer and acquire knowledge in an effective and efficient way. The reason for this is that knowledge creation and learning to some extent require the combination of diverse and complementary capacities from heterogeneous agents (Nootboom 2000). The cognitive proximity facilitates not only the knowledge acquisition of the environment, but also its assimilation and exploitation through the absorptive capacity of the firm (Exposito-Langa et al. 2011). This type of proximity also becomes relevant because of its close relationship to other dimensions of proximity, such as institutional,² moving these concepts from a national to regional or organizational level. In fact, geographical and cognitive proximity dimensions to some extent are similar. Thus, in line with Boschma (2005), combining geographical proximity with a certain level of cognitive proximity leads to a situation whereby interactive learning can take place. Hence, both types of proximity can have a complementary effect for developing knowledge and innovation. In other words, face-to-face contact is combined with a similar vision and understanding of the context where firms operate.

Geographical proximity and innovation performance

Agglomeration economies have traditionally been used to justify advantages of firms in industrial districts. A great deal of research on industrial districts can be found underlining how physical proximity in a district context favors innovation in firms (e.g. Capello and Faggian 2005; Muscio 2006). Moreover, the particular combination of competence and cooperation between firms are critical for the development and diffusion of new knowledge and have relevant implication for the effectiveness and efficiency in innovation by firms (Staber 2001). An increase in rivalry brings about a continuous pressure for technological improvement and innovation. In the same vein, knowledge spillovers among local firms favor upgrading innovations in clustered firms (Baptista and Swann 1998). Physical proximity fosters the transmission of knowledge and a continuous process of learning. Finally, geographical proximity encourages direct interactions between agents as innovation may require (Feldman 1994).

² Institutional proximity is associated with the institutional framework at the macro-level. This proximity may be helpful because sharing the same values and expectations with non-local organizations may be beneficial for interactive learning (Boschma 2005).

In recent years, several studies suggest that geographical proximity between firms in the district also can negatively affect firms' innovation (e.g. Capovicedo et al. 2008). It must be pointed out that an over-density or intensity in the relationships can generate spatial block-in situations, which are detrimental for learning interactions and ultimately for innovation. That happens when firms focus exclusively on the internal network jeopardizing their capacity to respond to new external opportunities and developments (Boschma 2005). Nevertheless, local institutions and supporting organizations can act as bridging agents between district firms and external networks, limiting or compensating these negative effects.

In general, we consider that firms in districts may enjoy advantages to innovate, however they vary in the degree which they exploit them (Molina-Morales and Martínez-Fernández, 2010). Therefore, district makes a positive influence on the innovative capacity of firms, improving the effectiveness of innovation processes (Muscio 2006). Based on above arguments the following hypothesis can be formulated:

Hypothesis 1: *Geographical proximity will be positively associated to innovation performance in firms.*

Cognitive proximity and innovation performance

Firms sharing the same perception about how to act as possibly diminish misunderstandings in communication channels. When parties share goals and objectives a common understanding of what is an innovation and how to carry out it can be expected, leading to an improvement of innovation performance (Krause et al. 2007).

On the contrary, when goals and cultures are incongruent, misunderstandings and conflicts between parties arise (Inkpen and Tsang 2005). Then parties are disappointed and likely to restrict information exchanges, affecting negatively the outcome for the firms (Inkpen and Tsang 2005; Krause et al. 2007). Albeit with little empirical evidence, Krause et al. (2007) showed that this category of proximity, measured in terms of shared values, is an explanatory factor in firm performance.

According to Dakhli and de Clercq (2004) a higher level of shared values and common culture are associated to higher levels of innovation. First, specific aspects such as a shared vision can be regarded as a mechanism favoring knowledge integration between parties in a network (Inkpen and Tsang 2005) thus becoming a critical element in the innovation process. Secondly, the existence of common norms between firms facilitates idea exchange between parties (Dakhli and de Clercq 2004). In conclusion those firms that share vision, norms, and values and so on probably obtain better innovation performance. Accordingly the following hypothesis is formulated.

Hypothesis 2: *Cognitive proximity will be positively associated to innovation performance in firms.*

Proximity and knowledge acquisition

Knowledge acquisition

Knowledge acquisition is defined as the process by which organizations obtain knowledge. This process takes place both in the context of the external and internal relationships of the firms, and also being diverse in nature. Particularly external sources of knowledge have increasingly attracted the attention of researchers (e.g. Grant 2000). External sources include a great range of mechanisms, such as external R&D, patents and licenses acquisition, strategic alliances and other modes of cooperation (see Mowery et al. 1996; Simonin 1999). As has been suggested by a number of authors (Dyer and Singh 1998), since the innovation process requires more and more external flows of resources this external knowledge acquisition becomes critical for firms.

Knowledge does not flow rapidly and evenly among organizations. Tacit knowledge is vague and difficult to be codified and most of the times is better transmitted through repeated interactions (Audretsch 1998). Consequently, interorganizational relationships can generate opportunities for knowledge acquisition and exploitation (Dyer and Singh 1998). As a result, contexts of proximity provide sources of knowledge, since relationships among organizations are more intense. In conclusion, this paper understands proximity as a relevant condition to share, transfer and acquire knowledge among organizations, and consequently as important for firm value creation (Maula et al. 2003).

Geographical proximity and knowledge acquisition

Probably the first reference to the association of geographical proximity and knowledge acquisition draws upon the notion of *industrial atmosphere* by Marshall (1925). First, physical proximity increases the probability of collaboration and facilitates technical and market information exchanges among co-localized firms (Correia and Petiz 2007). Closeness produces spontaneous social and professional interactions among entrepreneurs and employees in the industry, which facilitate knowledge acquisition (Warren et al. 2009). In recent times, the advantages for knowledge acquisition of geographical proximity have been questioned because of the development in information and communication technologies, which facilitate knowledge exchanges between distant actors. However, tacit or uncoded knowledge acquisition requires intense interactions and therefore knowledge is more easily spread in face-to-face contacts (Dyer and Nobeoka 2000). Secondly, local institutions and organizations compile and disseminate knowledge that can be acquired by firms, reducing search costs (McEvily and Zaheer 1999). A number of authors have emphasized the role played by local universities, research centers or trade associations as generators of tacit and complex knowledge (Antonelli 2000). Thirdly, technician and employee mobility inside districts offers additional opportunities for knowledge acquisition (DeCarolis and Deeds 1999).

To sum up, intense interorganizational relationships, which are involved in geographical proximity, are regarded as a driver of a broad range of knowledge sources (Parra-Requena et al. 2010). Thus, they facilitate formal and informal

communication from friendship and family relationships, human resources mobility, shared educational background from the same local institutions and spin-off processes, among others. These arguments can be formulated in the following hypothesis.

Hypothesis 3: *Geographical proximity will be positively associated to knowledge acquisition of the firms.*

Cognitive proximity and knowledge acquisition

When firms have similar referral structures, knowledge can be communicated, transferred and acquired more effectively and efficiently (Knoben and Oerlemans 2006). Cognitive proximity facilitates tacit knowledge acquisition since agents involved act in a very similar way. Therefore, knowledge acquisition is favored by elements like similarity in practices, institutional legacy and work culture. By contrast, cultural conflicts and misunderstandings can limit information and knowledge acquisition and interorganizational learning (Simonin 1999). Specifically, Mowery et al. (1996) confirm that when cultures are similar more knowledge may be transferred and acquired. Moreover, in the context of intellectual capital creation shared goals and expectations derived from cognitive closeness and affect knowledge acquisition. Hence, when actors involved in the same network, share vision, they have similar perceptions about how to act with each other, and to promote a mutual understanding and the exchange of ideas and resources (Tsai and Ghoshal 1998).

To sum up, cognitive proximity facilitates the interactions between actors and consequently access to external knowledge in spite of geographical distance. Thus, following Parra-Requena et al. (2010:68) these aspects not only has a positive effect, but it is fundamental to the external knowledge acquisition in firms. These arguments lead us to formulate a positive association between cognitive proximity and knowledge acquisition. More formally:

Hypothesis 4: *Cognitive proximity will be positively associated to knowledge acquisition of the firms.*

Knowledge acquisition and innovation performance

Knowledge is important in the innovation process, and consequently in the value creation for the firm (Nonaka 1994). The innovation process of a firm requires external knowledge flows (Dyer and Singh 1998). External knowledge acquisition provides opportunities for integration with a firm's already existing knowledge, thus creating new knowledge (Yli-Renko et al. 2001), and increasing the relevant knowledge in the firm (Galunic and Rodan 1998). Thus, knowledge acquisition favors identification and assimilation of relevant knowledge for firms, particularly new ideas that improve the ability to create future innovations and to exploit them in a more effective and efficient way (Cohen and Levinthal 1990). Several recent studies have supported the positive effect of external knowledge acquisition on innovation performance (for instance, Chen and Huang 2008), particularly in

product innovation (Yli-Renko et al. 2001). To sum up, acquisition of the external knowledge is critical for firms searching for competitive advantages since they generate new opportunities for innovation, improving the ability of firms to exploit them and allowing them to obtain better innovation results. In accordance with these arguments the following hypothesis is formulated.

Hypothesis 5: *Knowledge acquisition will be positively associated to the innovation performance in firms.*

Indirect effect of geographical proximity

As previously noted, industrial districts generate a higher potential of innovation (Capello and Faggian 2005). However, geographical proximity is not a sufficient condition to assure a high innovation performance. Firms territorially clustered can vary in the degree to which they access tacit knowledge flows. Access depends on the intensity in relationships (Dyer and Nobeoka 2000). Ultimate, innovation performance is determined by firm's ability to obtain valuable knowledge from close actors (Agrawal et al. 2006). Therefore, clustered firms which are capable of acquiring relevant knowledge from local agents will have a better position in the district. Then, knowledge acquisition mediates the effect of belonging to a district on innovation performance. In accordance with these arguments the following hypothesis is formulated.

Hypothesis 6: *Knowledge acquisition mediates in the association between geographical proximity and innovation performance in firms.*

Indirect effect of cognitive proximity

As previously argued, cognitive proximity generates superior innovation performance (Dakhli and de Clercq 2004). Thus, similarity in perceiving, interpreting, understanding and evaluating among firms would be expected to facilitate a higher innovation, in spite of geographical distance (Nooteboom 2000). However, these cognitive similarities are not a sufficient condition for an effective and efficient innovation. Firms unevenly acquire and integrate relevant knowledge from their cognitive close contacts. Following this line of argument, we regard knowledge acquisition as a major explanatory mechanism mediating between the cognitive proximity and innovation performance of a firm. Those firms which are able to take advantages of a similar culture, values, norms and routines with parties to acquire information and learning will obtain a better innovation performance. Consequently, cognitive proximity will have an indirect effect on innovation performance through knowledge acquisition. More formally:

Hypothesis 7: *Knowledge acquisition mediates in the association between cognitive proximity and innovation performance in firms.*

Figure 1 captures the theoretical proposition, where direct and mediator effects are represented and the hypotheses are formulated. The analysis also includes age and size as control variables (Yeoh and Roth 1999; Autio et al. 2000).

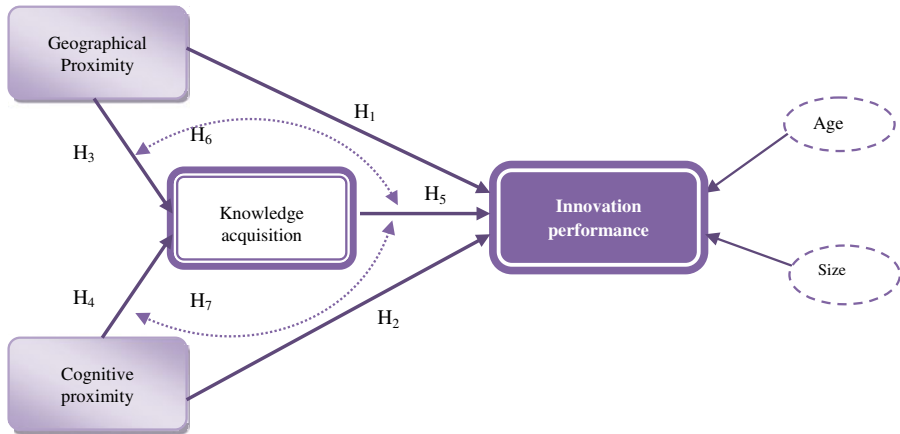


Fig. 1 Innovation performance factors framework

Methods

Sample

The empirical study has been focused on the Spanish footwear industry.³ This industry is characterized by the predominance of small and medium sized enterprises (accounting for more than 99.5%) involving the 2.3% of Spanish employment and the 1.2% of Spanish GDP.⁴ Most of these firms are highly specialized in specific stages of the production process. This specialization stimulates collective efficiency and improves the internationalization and global competitiveness of firms (Ybarra 2006; Tortajada et al. 2005). In this vein, we must highlight the role played by leather and components suppliers in this industry. Thus, following (AEC 2008) their activities facilitate the incremental innovations, for instance, with the introduction of trendy and quality materials. Furthermore, this industry is mainly structured in industrial districts, so we can find 30 industrial districts (Boix and Galletto 2006). Most of them are located in the Valencian Community (65.9%), especially in the province of Alicante –Elche, Elda, Villena, Crevillente, etc.; however, other important industrial districts can be found in Castilla-La Mancha (9.94%) –Almansa and Fuensalida-, and in La Rioja (7.1%)—Arnedo y Calahorra- among others. All these industrial districts account for the 76.7% of total Spanish footwear employment. In 2007, according to the official register of enterprises (DIRCE), the industry was composed of 4,366 firms, including individual entrepreneurs. In the same year, these firms produced 108.4 million pairs of shoes, with a value of 1,905 million Euros, mostly from export (93.7% of total in 2007).

It must be mentioned that there are a number of institutions supporting the footwear territorial concentration. These institutions offer diverse services and

³ This study is part of a broader Research Project of the Regional Plan of Scientific Research, Technological Development and Research of Castilla-La Mancha.

⁴ Data from the General Section of Analysis, Strategy and Evaluation (2009).

supporting activities. In this line, it is important to highlight the role played by some national associations (FICE,⁵ INESCOP⁶) and some local associations located in the different industrial districts that offer services including specialized training, research, marketing and innovation activities, quality consultancy, and so on (examples of these associations are AICE or AIDECA).⁷

We consider to this industry particularly appropriate to our research. Since the industry includes firms located in industrial districts and isolated firms, thus allowing us to analyze the effect of geographical proximity. On the other hand, as the cognitive proximity requires a certain period of time to be fully developed, such as mature industry as the footwear industry, is adequate for the analysis. Furthermore, the high competitive environment of the industry permits to analyze aspects related to the accumulation and diffusion of knowledge and firms' innovation. Thus, recent studies, as Belso-Martinez (2010), indicate that this globalized manufacturing sector is characterized by incremental innovation. In this respect, recently FICE has emphasized that according to the "Survey of technological innovation in companies" the effort in innovative activities⁸ registered a growth in the footwear industry 26% vs 4% of the industry in general. Thus, the innovative intensity of Spanish footwear is higher than the industry average.

Data sources were based on SABI⁹ and Camerdata¹⁰ databases. We decided do not include those firms with less than five employees. This is because a minimal operative structure is needed to define performance and behavior of the firms. We obtained a population of 1,403 firms, once the initial list of firms was filtered from the different sources. After sending a postal questionnaire to the total population, we obtained a final sample of 224 firms that results a response rate of 16.97%. This can be considered a satisfactory rate in comparison with similar surveys. For a confidence level of 95% and the least favorable situation of $p=q=0.5$, the sampling error was 5.96%. We tested non-response bias. In this line, we compared the size and age variable means between the sample's firms and the whole population and we obtained very similar values for both groups. So, following Armstrong and Overton 1977, a non-response bias was not detected.). Furthermore, we developed an ANOVA test¹¹ and the Chi-square test¹² between the firms that responded to the first and second sending and we found no differences in any of the analyzed variables.

⁵ FICE is the Spanish footwear manufacturers federation. This institution seeks to promote the competitiveness of the footwear firms through internationalization strategies, promotion, training, information, marketing, quality, brand support, innovation... These activities are conducted directly and through INESCOP's key support.

⁶ INESCOP is the Technological Institute of Footwear. This institution provides direct services, transfers knowledge and research on topics of general interest.

⁷ AICE is the local association of Elche and AIDECA is the local association of Almansa.

⁸ Expenditure on innovative activities in the sector over the business volume of this sector.

⁹ SABI is a directory of Spanish and Portuguese firms that provides financial data and general.

¹⁰ The Camerdata database is a directory of all Spanish firms from the network of local Chambers of Commerce.

¹¹ For cognitive proximity, innovation performance and knowledge acquisition variables

¹² For the variable of geographical proximity

Independent variables

Geographical proximity Different studies define the level of geographical proximity in terms of the *distance* between the actors. Other studies focus on the presence of groups of companies in a geographical unit for example membership of an industrial district or clusters. Thus geographical proximity was established when the firm was located in one of the industrial districts which has been previously identified. To operationalize district membership following previous researches (Hundley and Jacobson 1998; among others)¹³ we use a dummy variable. To be sure that the industrial districts are homogenous enough to be integrate in the same sample, we have analyzed mean differences between variables those included in the study for firms belonging to each of the industrial districts. In order to test for bias, we have run an ANOVA and a Scheffe's tests between pairs of districts and we found no significant differences.

Cognitive proximity This paper focuses on the organizational level of cognitive proximity (Knoben and Oerlemans 2006). Shared goals and shared culture are two main aspects of this proximity. Shared culture can be defined as the set of institutionalized norms and rules that guides an appropriate behavior on the network (Gulati et al. 2000:205). Thus, shared culture involves sharing action paths, routines etc. (Rowley, 1997). In order to measure this variable we used the scale based on Simonin (1999) with two-item scale, while *shared goals* a six-item scale was the result of adapting various previous scales (Tsai and Ghoshal 1998; Young-Ybarra and Wiersema 1999 and Yli-Renko et al. 2001), to our particular context. In addition we use a second order construct to measure cognitive proximity, formed by the two first order constructs -shared culture and shared goals-.¹⁴

Knowledge acquisition We capture this variable adapting Kale et al. (2000) and Maula et al. (2003) scales to the context of our study. This six-item scale allows to measure knowledge acquisition of the organization resulting from the relationships with other agents. The construct measures the acquisition of knowledge referring to aspects as technical issues, trends, competition and customer needs resulting from the relationships with other agents.

Dependent variable

Innovation performance In order properly to reflect innovation performance, this paper has focused on new product performance. New product performance is considered to be a good innovation performance indicator, particularly for manufacturing firms (Laursen and Salter 2006). Following previous innovation

¹³ When we test our hypotheses, we considered all firms that were members of any district to be in the same category. Through an ANOVA and a Scheffe's test between firms belonging to each industrial district, we observed no differences in the mean of the variables of the study.

¹⁴ The different items refer to the relationships with the firm's contacts, which include people, firms or institutions of the same industry.

research, the construct includes profitability and sales derived from new products (Zhang et al. 2009). Finally, and based on Gupta and Govindarajan (1984) and Zahra (1996), the construct has been operationalized, considering CEOs' self-reported importance and satisfaction for the two items (profitability and sales of the new products). The period considered was 3 years. A period of this length permits to capture more than the results of a specific moment, namely, the sustainability of the innovation performance (Spanos and Lioukas 2001). In this sense, respondents had to evaluate the two items over the previous 3 years.

Control variables Size and age were used to control variables. The firm's size is one of the traditional factors affecting innovation performance. However, controversy exists about the nature of its effect (Galende and de la Fuente 2003). In this line, the influence of size on innovation has led to great debate (Cáceres et al. 2011) Thus, in literature can be found arguments supporting the view that larger firms have greater innovation performance thanks to greater access to or provision of financial and human resources (Yeoh and Roth 1999). However, by contrast, some studies suggest that smaller firms may be more intensive in innovation than large firms because of their greater flexibility, greater communication, etc. (Acs and Audretsch 1988). On the other hand, with respect to the second control variable, older firms can gain advantages from their experience of knowledge acquisition (Autio et al. 2000), which they can use or apply for a greater innovation performance. Size was measured by the number of employees and age by the number of years from the foundation of the company up to 2008.

Analysis techniques

Partial Least Squares (PLS)¹⁵ was used to test the hypotheses. This specific structural equation analysis is preferred in comparison with other traditional multivariate techniques (Haenlein and Kaplan 2004). Moreover, as noted James et al. (2006), for testing mediation hypotheses structural equations modeling (SEM) techniques are particularly recommended. PLS, in particular, is more suitable for small samples, demanding minimum requirements on measurement scales and sample and does not require assumptions about multivariate normality, (Falk and Miller 1992; Chin, 1998). To determine the statistical significance of the coefficients we used a bootstrap re-sampling procedure (500 sub-samples). In order to evaluate the structural model -the acceptance of hypotheses- we examined the size and significance of the path coefficients and the R^2 values of the dependent variable.

Results

Measurement model

Reliability of the items was controlled through the value of the loadings (λ). In this case, all loading values surpass the threshold of 0.7 as it is recommended in literature

¹⁵ We use PLS-Graph 3.0

(Carmines and Zeller 1979). The composite statistic of reliability (ρ_c) is used to evaluate the construct reliability. As with the Cronbach's alpha, we need values above 0.8 to consider that the construct is strictly reliable (Nunnally 1978). As shown in Table 1, all constructs exceeded the accepted value of 0.8. On the other hand, to evaluate convergent validity we used the average variance extracted (AVE). In this case, the construct excess the value of 0.5 (Fornell and Larcker 1981), consequently in our study all constructs exceeded this value.

Finally, following Fornell and Larcker (1981), we used the mean extracted variance to evaluate discriminant validity. Thus, the square root of the AVE (the diagonal in Table 2) with the correlations between constructs (the off-diagonal elements in Table 2) were compared. As can be observed in the Table 2, each construct relates stronger to its own measures than others as the values of the diagonal are greater than the off-diagonal values. So we can say that model obtains strong discriminant validity.

Structural model

The structural model was evaluated by examining the size and significance of the path coefficients and the R^2 values of the dependent variable (Table 3). The results show that cognitive proximity has a positive and significant effect on innovation performance ($\beta=0.446$; $p<0.001$) and on knowledge acquisition ($\beta=0.551$; $p<0.001$); consequently hypothesis 2 and 4 were supported. However, geographical proximity has no positive or significant effect on innovation performance ($\beta=0.021$) or on knowledge acquisition ($\beta=0.018$); thus hypothesis 1 and 3 were not supported.

The results of the Table 4 allow to confirm hypothesis 5 ($\beta=0.533$; $p<0.001$). This hypothesis proposed that knowledge acquisition is positively associated to the innovative performance of the firm.

To confirm the hypotheses 6 and 7, which proposed an indirect effect of both proximities on innovation performance through knowledge acquisition, must be fulfilled the four conditions established by Baron and Kenny (1986). With respect to cognitive proximity, the first condition for the mediator effect states a significant relationship between independent variable (*cognitive proximity*) and dependent variable (*innovative performance*). This condition was satisfied since we corroborated hypothesis 2. The second condition was also satisfied since the independent variable has a positive and significant effect on the mediator variable (*knowledge acquisition*). The third condition was satisfied since we corroborated hypothesis 5 which established a relationship between the mediator variable (*knowledge acquisition*) and the dependent variable (*innovation performance*). Finally, to satisfy

Table 1 Reliability

Construct	Composite reliability	AVE
Cognitive proximity	0.919	0.851
Knowledge acquisition	0.954	0.774
Innovation performance	0.966	0.934

Table 2 Discriminant validity and correlations

Construct	Cognitive proximity	Knowledge acquisition	Innovation performance
Cognitive proximity	0.922		
Knowledge acquisition	0.552	0.880	
Innovation performance	0.449	0.529	0.966

the fourth condition, is required that the relationship between the cognitive proximity and the innovative performance must be eliminated—or at least significantly reduced—when knowledge acquisition is included in the model. In our case, when we introduced these three variables into the model, we can observed that the effect of cognitive proximity on innovative performance was reduced (from β 0.446 to 0.221) and the relationship is significant at the level of $p < 0.01$. So, we can establish that knowledge acquisition partially mediates the relationship between cognitive proximity and innovative performance. Consequently, we can confirm that cognitive proximity has an indirect effect on innovation performance through knowledge acquisition, as a result the hypothesis 7 was accepted. This indirect effect has a value of 0.224.¹⁶

With regard to geographical proximity, only the third condition established by Baron and Kenny (1986) was satisfied. Consequently, hypothesis 6 must be rejected. Thus, an indirect effect of geographical proximity on innovation performance was not supported.

The explained variance and the results of the model are shown in Fig. 2. We can confirm that it has a high consistency, since the value of the explained variance is over the 0.1 established by Falk and Miller (1992). Specifically, our model allows explaining the 32.4% of the total variance of the firms' innovation performance. In addition, the model shows values of Q^2 above zero, ensuring the predictive relevance of the model.

According to findings, geographical proximity has no significant influence on the analyzed variables -knowledge acquisition and innovative performance-. Then, geographical proximity has no direct or indirect effect on innovation performance. That happens because in the current environment, geographical proximity only benefits to the firms if at the same time it favors other kinds or dimensions of proximity, such as cognitive proximity. Thus, geographical proximity is not a sufficient condition to enable firms to access knowledge and to obtain innovation performance. Findings suggest further research should be undertaken to explore whether geographical proximity has a significant influence on cognitive proximity. In this vein, Capó-Vicedo et al. (2008) suggested that firms with geographical proximity determine attitudes, beliefs, and values. In this way, geographical proximity exerts an indirect influence on both knowledge acquisition and innovative performance through cognitive proximity. Therefore, an expanded model is presented in which are included the relationships between geographical and cognitive proximities. The results obtained are gathered in the next section.

¹⁶ This value is computed by multiplying the significant structural paths.

Table 3 Effect of proximity on innovation performance and knowledge acquisition

Construct	Innovation performance			Knowledge acquisition		
	Path	T	R ²	Path	T	R ²
Geographical proximity	0.021	0.290 ^{ns}	0.210	0.018	0.288 ^{ns}	0.305
Cognitive proximity	0.446	7.511 ^{****}		0.551	8.865 ^{****}	

N=224; ***p*<0.05; ****p*<0.01; *****p*<0.001

Extended model: effect of geographical proximity through cognitive proximity

As Fig. 2 reports, geographical proximity has a positive and significant effect on cognitive proximity ($\beta=0.213$; $p<0.001$). Result suggests an indirect effect of geographical proximity on knowledge acquisition and innovation performance, and hence cognitive proximity acts as mediator in the relationship. In fact, the indirect effect of geographical proximity on knowledge acquisition is 0.117 while on innovative performance is just 0.095.

Discussion and conclusions

This research explores the importance of cognitive and geographical proximity to explain innovation performance. We have analyzed the degree to which knowledge acquisition offers a congruent explanation for innovation performance for firms in territorial proximity contexts. First, findings show that cognitive proximity becomes much more relevant than geographical proximity to explain both knowledge acquisition and the results of innovation. In fact, cognitive proximity exerts a positive and significant influence on both. On the contrary, geographical proximity does not significantly affect any of them. According to the structural model, an indirect and significant effect of cognitive proximity on innovation performance through knowledge acquisition exists. This effect of partial mediation indicates that in fact the knowledge acquisition mediates the relationship between cognitive proximity and innovation performance however proximity still preserves a direct effect on this variable. Thus, the effect of cognitive proximity on innovation performance is not limited to its influence through the knowledge acquisition. So its total effect is comprised by both a direct and indirect effects. An excess of geographical proximity generates spatial lock-in, thus limiting cluster firms'

Table 4 Effect of knowledge acquisition on innovation performance

Construct	Innovation performance		
	Path	T	R ²
Knowledge acquisition	0.533	10.306 ^{****}	0.290

N=224; ***p*<0.05; ****p*<0.01; *****p*<0.001

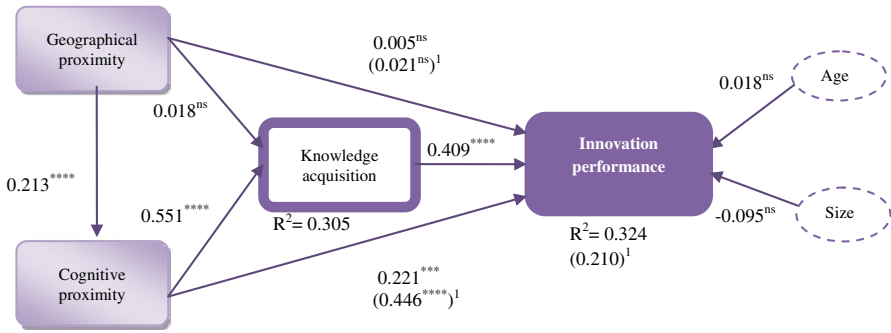


Fig. 2 Extended model: effect of geographical proximity through cognitive proximity. ¹Value without the mediator variable

potential access to new and exclusive knowledge and restricting interactive learning and efficiency innovation.

The failure of geographical proximity to have an effect on either knowledge acquisition or innovation performance has led us to propose new and amplified model to analyze the indirect effect of geographical proximity through cognitive proximity. In this case, findings suggest a significant mediator role of cognitive proximity in the relationship between cluster membership and knowledge acquisition and innovation performance. Therefore, instead of the assumption of a direct and unrestricted access to common knowledge in territorial agglomerations (Storper 1992), this research proposes that access to new and exclusive knowledge as well developing innovation depend on the capacity of firms to share goals and culture with the other agents in the cluster. Therefore, cognitive proximity links geographical proximity to knowledge acquisition and innovation.

This paper contributes the strand of research that focuses on the heterogeneity of firms in agglomerations. In this line, the results confirm that not all companies belonging to an industrial district have the same degree of innovation. On the other hand, we have analyzed together both dimensions of proximity—geographical and cognitive- and its significance in a relevant variable as innovation performance is. Thus, we go deeper into the controversy and interconnections between both proximities. In this line, the potential contribution of this research is to show that cognitive proximity is much more significant than geographical proximity in explaining knowledge acquisition and innovation performance (Stuart and Sorenson 2003; Agrawal et al. 2006). Consequently, belonging to a cluster is not sufficient to exploit its innovative potential fully. But this does not mean that geographical proximity is not relevant for the firm competitiveness. In fact it serves to generate cognitive proximity between agents. Therefore, it will be social and cultural homogeneity between agents that leads firms to a higher innovation performance.

The findings of this research connect the different dimensions of proximity and innovation as Boschma (2005) suggested. Moreover, this paper has used contributions from the knowledge view (Nonaka 1994) to go further into the relationships between proximity and innovation performance. Additionally, this research contributes to the theoretical distinction between cognitive and geographical proximity (Knoben and Oerlemans 2006). On the other hand, the findings have at

least partially, questioned previous research on geographical proximity who have emphasized its systematic advantages for innovation (Mistri and Solari 2001). This paper suggests to rethinking the heterogeneous behavior and performance among clustered firms (Giuliani and Bell 2005). In this vein, cognitive proximity at organizational level (Wuyts et al. 2005; Torre and Rallet 2005) can contribute to explaining the uneven access to valuable knowledge and innovation in clustered firms.

As a result of the research some prescriptions can be suggested to firms in the context of mature industries such as the footwear industry. On the one hand, although in clustered contexts transferable valuable knowledge exists (Utterback 1974) firms should adopt a proactive behavior to access common knowledge and thus to generate effective innovations. Firms should dedicate more attention to establish relationships those which allow them to develop shared goals and culture with its network of district internal and external contacts. New knowledge transmission and acquisition can thus be facilitated and lead to innovation development. In this respect, it can be advised to the footwear firms particularly to maintain relationships with local institutions because they can be an important agent, since they can act as disseminators of shared objective and norms as well as the non-redundant knowledge. On the other hand, it would be advisable for cluster institutions (local universities, technology institutes, chambers of commerce, policy maker agencies and so on) to develop coordinated activities to favor a shared vision and culture and in this way they will encourage the knowledge acquisition. In this vein, activities in specific training, technology and joint marketing projects can develop mutual understanding, and exchange of knowledge, ideas and resources. Likewise, institutions can establish mechanisms to facilitate contacts with external agents to promote innovation, so they can act as a bridge agent to limit the negative aspect of geographical proximity.

Limitations and future research

The static nature of the study should be mentioned as a potential limitation, due to the unavailability of required data. Moreover, the perceptions of CEOs with regard to the main aspects of this study—cognitive proximity, knowledge acquisition and innovation performance— might lead to possible biases in the results obtained. In fact, a considerable effort has been made to ensure the robustness of the data and constructor validity tests of. Notwithstanding these efforts, some biases cannot be avoided. Finally, this study drew upon a particular industry, the Spanish footwear industry, which might question the potential generalization of the findings. In any case, in our view findings can be extended, with caution, to other mature industries.

The findings of this research indicate the need to continue analyzing how proximity affects the competitive advantages of a firm. However, the insignificant effect of geographical proximity would suggest a deeper study of other proximity dimensions such as the cognitive, organizational, social or institutional, and how they affect knowledge acquisition, innovation and firm performance. One complementary research strand would be to analyze the connections between diverse dimensions of proximity. Additionally, this paper proposes to develop this analysis of the causes of heterogeneity in behavior and results in the clustered firms. In this vein, an important line of study would be to inquire into the role played by certain

internal factors, such as market and competence scanner capacity or the combination of external and internal knowledge capacity to explain the uneven exploitation of territorial externalities by firms.

Appendix I

Please, show your level of agree with the next assertions about the shared elements with your contacts (1 = totally disagree; 7 = totally agree)

Cognitive social capital (shared goals)

We share the same ambition and vision as our contacts¹.

My firm is enthusiastic about pursuing the collective goals and missions of our relationships. We share our goals and objectives with our contacts.

We understand our contacts' strategy and needs.

My firm's employees and my contacts' employees have positive attitudes toward a cooperative relationship.

My firm and my contacts tend to agree on how to make the relationship work.

Cognitive social capital (shared culture)

The business practices and operational mechanisms of your contacts are very similar to yours.

The corporate culture and management style of your contacts is very similar to yours.

Please, show your level of agree with the next assertions about the acquisition of knowledge (1 = totally disagree; 7 = totally agree)

Knowledge acquisition

Your company has learnt or acquired new or important information from your contacts.

Your company has learnt or acquired critical capability or skill from your contacts.

Your relationships or contacts have helped your company to enhance its existing capabilities/skills.

Your contacts have been an important source of information/know-how for you on customer needs and trends.

Your contacts have been an important source of information/know-how for you on competition.

Your contacts have been an important source of information/know-how for you in technical issues.

Please, show your level of agree with the next assertions both how important is this objective for the firm and how successful is the achievement of this objective in relation to the expected results in the innovation performance (1 = totally disagree; 7 = totally agree)

Profitability of new products

Sales of new products

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