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De Boeck Supérieur | *Journal of Innovation Economics & Management*

2014/2 - n°14
pages 83 à 104

ISSN 2032-5355

Article disponible en ligne à l'adresse:

<http://www.cairn.info/revue-journal-of-innovation-economics-2014-2-page-83.htm>

Pour citer cet article :

Torre André, « Proximity relationships and entrepreneurship: some reflections based on an applied case study », *Journal of Innovation Economics & Management*, 2014/2 n°14, p. 83-104.

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PROXIMITY RELATIONSHIPS AND ENTREPRENEURSHIP: SOME REFLECTIONS BASED ON AN APPLIED CASE STUDY

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PROXIMITY RELATIONS AT THE HEART OF FIRMS' STRATEGIES

Clusters, localized production and innovation systems, science parks or technology districts... the question of proximity has gained a growing importance in the analysis of firms' strategies and their relations with partners and competitors, or more generally with their economic and social environments. This dimension has become a central item on the public policy agenda, and policy makers unceasingly advocate the creation of structures devoted to the concentration of economic activities, such as Poles of competitiveness in France, Industrial districts in Italy, technopoles and science parks in Britain and Japan, or the different types of clusters that exist all over the world (OECD, 2001).

The studies devoted to the analysis of proximity relations were born at the intersection of industrial and spatial economics (Torre, Gilly, 1999; Torre, Wallet, 2013). In the 1990s, many authors considered that one could not study enterprises and their strategies without taking into account the spatial and geographic dimensions of their activities. This has resulted in a large number of studies – presented below – which refuse to dissociate the economic from the geographical aspects, and take into account various dimensions of proximity relations. To the spatial dimension of proximity

* The author greatly acknowledges Sofiene Lourimi, whose previous works have inspired the proposed typology, and who has provided the main data for this study.

– which is the most obvious – is combined the relational or organizational dimension. One may indeed feel close to people located great distances away, and it is also the case with work and personal relations.

The analysis of proximity relations has subsequently been extended to many other fields, such as environmental questions and urban or transport policies (Torre, Zuindeau, 2009). But the industrial and productive dominant has remained strong, and there has been a marked interest in issues related to innovation and knowledge-based economy (Bouba Olga *et al.*, 2008, Baptista, Mendonça, 2009; Gallie, 2009). Thus, a large part of the research on the different types of proximity is devoted to two topics related, primarily, to questions of entrepreneurship, with the idea that a firm must take into account, in its strategies, the two categories of proximity relations. Thus, some studies focus on analysing inter-firm relationships, approached from the perspective of local or long distant collaboration and of firms' ties with their local environment (Laursen *et al.*, 2011; Ponds *et al.*, 2007). Many other research studies have examined innovation questions related to innovative firms, their productive and scientific environments, and the issue of acquisition or transfer of technologies or knowledge (see for all these questions, Boschma, 2005).

The aim of this article is to study the role played by proximity in business relations, including face-to-face exchanges or distant relations, with a peculiar attention to innovative behaviours. Moreover, we plan to assess the role played by proximity relations in firms' strategies, whether they imply local interactions, virtual exchanges or mobility of white collars and engineers (Maskell *et al.*, 2006). We will first give a broad definition of various types of proximity relations, especially the most important ones: geographical proximity, organized proximity, and temporary geographical proximity, and then provide some developments on the theoretical origins and the development of the proximity analysis. The third part of the paper is devoted to a summary of the main applied studies and to the design of a core model of proximity relations for business firms, involving different types of proximity links, be there local or abroad. We will then apply this model to the analysis of the local and external relations of the firms in the optics cluster in the greater Paris Region, and identify four types of firms and their proximity figures.

DEFINITIONS

The following definitions of the proximity-based approach rest on a division according to two main dimensions – spatial and non-spatial – which include more refined and detailed categories (Torre, Rallet, 2005).

Geographical Proximity

Geographical proximity is above all about distance. In its simplest definition, it is the number of metres or kilometres that separate two entities. It is also relative in terms of the morphological characteristics of the spaces in which activities take place, of the availability of transport infrastructure and of the financial resources of the individuals who use these transports infrastructures.

Geographical proximity is neutral in essence but it can be activated or mobilized by the actions of economic and social actors, in our case firms, labs or institutions. Depending on their strategies or strategic choices, and according to their perceptions of their environment, the behaviours and attitudes of these actors vary and they mobilize geographical proximity differently. More precisely, actors might seek to get closer to or further away from certain people or places, or they might feel satisfied or dissatisfied with the geographical proximity of certain people, places or technical objects. Geographical proximity can be enhanced in the context of an urban area, by the creation of localized innovation clusters for example, or by the development of local networks of producers, exchanging knowledge and information through face to face contacts.

Organized Proximity

Organized proximity is a potential that can be activated or mobilized. It refers to the different ways of being close to other actors, regardless of the degree of geographical proximity between individuals, the qualifier “organized” referring to the arranged nature of human activities (and not to the fact that one may belong to any organization in particular). Organized proximity rests on two main logics, which do not necessarily contradict each other, and which are called the “*logic of belonging*” and the “*logic of similarity*”.

The logic of belonging refers to the fact that two or several actors belong to the same relationship graph or even to the same social network whether their relation is direct or intermediated. It can depend on the sector they are operating on; in this case they share common creative or innovation capital. It can be measured in terms of degrees of connectivity, reflecting more or less high degrees of organized proximity and therefore a more or less great potential of interaction or common action. Cooperation will, *a priori*, develop more easily between researchers and engineers who belong to the same firm, the same technological consortium or innovation network.

The logic of similarity corresponds to a mental adherence to common categories; it manifests in small cognitive distances between some individuals.

They can be people who are connected to one another through common projects, or share the same cultural, religious (etc.) values or symbols. Social norms, common languages partake of this organized proximity. It can also, however, correspond to a bond that sometimes emerges between individuals without the need to talk to know one another. It facilitates the interactions between people who did not know one another before but share similar references. Engineers who belong to the same scientific community will easily cooperate because they share, not only the same language, but also the same system of interpretation of texts and results.

Temporary Geographical Proximity

Temporary Geographical Proximity (TGP) constitutes one form of geographical proximity that enables actors to temporarily interact face-to-face with one another, whether these actors are individuals or organizations such as firms or laboratories for example. It corresponds to the possibility of satisfying needs for face-to-face contact between actors, by travelling to different locations. This travelling generates opportunities for moments of geographical proximity, which vary in duration, but which are always limited in time. TGP is limited to certain times; this form of geographical proximity should not be mistaken for a permanent co-location of firms or laboratories (Torre, 2008).

The development of communication technologies and ICT nowadays facilitates long-distance exchange. A large part of the information and knowledge that are necessary for production or innovation activities can be transferred from a distance, through telephone or Internet mediated exchanges for example. Consequently co-location no longer constitutes an absolute necessity. However, times of face-to-face interaction are necessary and beneficial in this context. Face-to-face interaction cannot altogether be eliminated, including in the case of communities of practice (see for example, Torre, 2008). As a consequence, ICT cannot be considered as substitutes for face-to-face relations: both are useful tools to support or enhance the interaction between two or several individuals. Space matters, but in a new way; one that consists of temporary face-to-face contact between two or several individuals.

THEORETICAL ORIGINS AND DEBATES REGARDING THE CONCEPT

The first research studies on proximity were conducted in the early 1990s and led to the creation of the so-called “Proximity Dynamics” group in 1991, and later to the publication in 1993 of a special issue of the *Revue d’Economie*

Régionale et Urbaine, entitled “Economies of Proximity” (Bellet *et al.*, 1993). In that special issue was written entirely by researchers of this movement and subsequently resulted in the creation of what is now commonly called the “French School of Proximity”. Various articles were published in this special issue, which present the concept and approach in different ways questions pertaining to production and innovation processes. These articles are devoted to production related questions and place emphasis on the geographical component of these relations. This journal’s special issue advocates the integration of the spatial dimension in the analysis of industrial relations and provides a first interpretation of proximity relations. It introduces two types of proximity, called “geographical proximity” and “organizational proximity” respectively; at the intersection of both categories, one finds the so called “territorial proximity”, a notion which deals with the complex interplay between productive relations and spatial relations and their being inextricably linked.

The following publication by the group of a multi-authored book (Rallet, Torre, 1995) shows that the authors, most of whom are either industrial economists interested in spatial questions, or spatial economists interested in industrial issues, all prove to be passionate about the topic of productive relations, and their development at the level of territories, and have a particular interest in approaches to innovation. These authors inherited analyses carried out from a territorial perspective, on questions pertaining to localized production systems, and more particularly to industrial districts and innovative milieus. They are the followers of a relatively heterodox tradition, and reject the idea that the economy is only dependent on commercial relations. They also reject the separation between the productive dimensions – mostly studied by economists – and the spatial dimensions, which are generally examined by geographers. Thus, the approach is meant to be multi-disciplinary, even though it emerged from economic analyses.

Standard economics has not paid much attention to the questions of proximity and has seldom used the term. Indeed, it generally promotes approaches in terms of distance or location: Space is, at best, treated as data, the effects of which on economic activities and therefore firms must be taken into account. The models are characterized by a tension between inter-firm competition – which forces them to go further away in order to obtain selling space for their products – and their search for advantages drawn from location close to clients or to competitors. The benefits of proximity, much praised, are seldom explained, and are to a large extent mistaken for the very process of spatial agglomeration, to which proximity can contribute without necessarily being associated to it. Even the New Economic Geography, which is a relatively recent movement, has not shown any interest in the question.

But other studies have attempted to open the “black box” of proximity relations. Whereas the standard approaches consider proximity relations as causative variables, without their content being ever considered, other works have tried to understand proximity relations by attempting to highlight their significance as well as their different contents. This movement has been largely inspired by the highly influential district, milieu and localized productive system approaches, which have opened the way to research on “the local”. The authors in this research movement emphasized the relations between firms and the networks they develop, mostly at the local level. They have highlighted the systematic nature and the importance of these systems’ structures and modes of organization. They have also showed that industrial districts are not the result of a concentration of firms initially attracted by favourable factors, such as primary resources for instance. Rather, they are built upon an organizational settlement in the territory which makes the “disengagement” from relations to an area or a local system difficult for producers, given the presence of local skills and trained workers.

A second track of research into the origins of the externalities of proximity resides in the approaches that emphasize the horizontal links within localized production areas. The traditional analysis of external economies is challenged here because the frontier of the firm fades in favour of the organization into networks, like that found in the emblematic case of the Silicon Valley (Saxenian, 1994). Beyond the characteristics purely linked to the specificity of the technologies, three main dimensions are at the origin of the competitiveness of these industrial systems: (i) the existence of local institutions guaranteeing the circulation of a local culture, (ii) the specificity of the firm’s internal organization and (iii) the presence of a particular industrial structure based on the existence of recurrent contacts between local actors.

The third track of analysis is found in the so-called geography of innovation (Feldman, 1994) which emphasizes the process of spatial concentration of innovative activities, within regions or smaller geographical areas, and directly introduces the notion of proximity into the analysis. Innovation is concentrated essentially in a few zones in which one can find, not only units of production but also public research laboratories or universities. This empirical evidence reintroduces the idea of the importance of the relations of proximity in the generation of new technologies. Moreover the link between this movement and that of the spatial concentration of industrial activities is made: firms’ choice of location can be explained by their need to develop relationships not only with other firms (Inter-firm relations) but also with science (Science-industry relations).

The group has also inherited a great deal from the research conducted, in industrial economics, on value chains and industrial groups, or on the

micro economics of imperfect competition and firms' strategies. But it is also largely indebted to evolutionist and institutionalist approaches. The role of institutions is always emphasized, and industrial relations are presented as forces driving the processes of change and of transformation of economies, which mostly rest on innovations and technological changes. Similarly, the research on proximity moves, from the start, beyond methodological individualism by repositioning the individual or the firm within a network of social or economic relations. The firm is never considered as an isolated entity, but is always regarded as being part of groups of actions, local systems or long distance networks.

APPLIED STUDIES AND THEORETICAL ADVANCES: THE PROXIMITY MODEL TO FIRMS' STRATEGIES

On the basis of the above-mentioned principles, a large series of applied studies were conducted, focusing primarily on industrial firms and their relations, or on technological interactions; and these applied studies have rested on a proximity based approach. They have mostly examined the case of France, and have focused essentially on productive systems such as the Toulouse, Grenoble or Marseille "technopoles" or on organizational structures such as innovation networks or cooperatives for instance. They reveal that the formation of relations between firms located in the same areas is not exclusively related to their geographical proximity. Social ties, inter-firm relations, trust, networks of actors, friendships, successful collaborations all contribute to forming a web locally; a web which matters at least as much as co-location. In light of this network, one clearly understands the factors of what can be called the firms' "ties to their territory". Each tie is fragile, must be nurtured and stands as a veritable resource for firms, which hesitate to move to different locations as the web they have woven with other local actors is strong.

Nevertheless, the development of the research on proximity, which continues to bring about collective publications that provide provisional assessments of the analysis and of its progress (see for example, Torre, Gilly, 1999, or Pecqueur, Zimmermann, 2004), has quickly led to an in-depth debate on the different forms of proximity. Besides the authors who argue that there are two main types of proximity, called geographical and organized (or organizational) proximity respectively – as seen above – there is a variant school of thought that considers that, since the political and institutional dimensions play a central role, it is necessary to posit the existence of a third category:

institutional proximity. The latter is defined as the actors' adherence to a space that is defined by common rules of action, representations, thought patterns (Kirat, Lung, 1995). The authors of this school reckon that the political dimension, the importance of the legal component of the rules that govern the social and economic relations justify the creation of this category; especially as organized proximity is thought to be essentially cognitive in nature. As for the defenders of the first approach, they consider that these dimensions are encapsulated within the logic of similarity.

With the rising popularity of the research on proximity, new, non-French-speaking researchers have, since the 2000s, joined the debate and have contributed in new directions and taken into account new concerns. One of the most remarkable contributions has resulted in an increase in the number of proximity categories, which the pioneers had preferred to limit for the sake of analytical coherence, but which has exploded in order to take into account the different facets of proximity and reveal their extraordinary malleability as tools of reflection. Five types of proximity are nowadays often described: they are called cognitive proximity (common knowledge bases and competences), organizational proximity (the extent to which relations are shared in an organizational arrangement), social proximity (the embeddedness of trust relations based on friendship, family ties and experience), institutional proximity (adherence of the economic actors to common rules, such as structures, laws, political rules, and to common values), and geographical proximity (Boschma, 2005).

Simultaneously, as a result of the emergence of new societal concerns and of the arrival in the group of sociologists, geographers and land planning experts, there has been an extension of the topics and themes addressed. This extension has taken several directions consisting, for example, in taking into account issues related to the environment, land planning, transport, urban or rural planning, or, of a question of particular interest: the importance of new Information and Communication Technologies in the relations between firms located in proximity to or far from one another. It has also sounded the knell of the eulogistic way of looking at proximity. The negative dimensions of the various types of proximity are now highlighted, particularly those of geographical proximity, which appears not only to generate land use conflicts in situations where space is scarce, but also to be conducive to problems in terms of relations between innovative firms for example (Broeckel, Boschma, 2009). Indeed a classic finding is that geographical proximity facilitates industrial espionage and therefore the unwanted appropriation of knowledge by firms' rivals, and also that production systems that give priority to internal relations ahead of external relationships may find themselves in negative development trajectories.

Many research studies have been conducted, particularly in European countries, on the basis of the proximity based approaches, and often by using field data and econometric tools. They often begin with the analysis of one particular sector – software or aeronautics for example – with a marked interest in knowledge-intensive industries or technological innovation sectors. They seek to test the importance of the different types of proximity in firms' performance, and often confirm that geographical proximity cannot alone ensure high performance, nor does it in itself facilitate the exchange or interactive creation of knowledge. Thus, it is the non-spatial dimensions of proximity that now have the place of honour, and more particularly their role in the creation of networks of economic actors, located either in proximity to or far from one another. Indeed, these networks rest mostly on different dimensions – social, relational, cognitive ... – which do, indeed, correspond to the components of the different types of proximity (Boschma, Frenken, 2010).

The most recent development of the analysis of Proximity relations, dating from the second half of the 2000s, has been the publication of research studies on the temporary dimensions of proximity (Torre, 2008, 2011; Ramirez-Pasillas, 2010) and particularly of geographical proximity. They have been based on three findings. The first has to do with the increasing number of fairs, trade shows and conventions, which bring together, in given places and for very short periods of time, people located varying distances away from one another but who nevertheless are able to communicate through ICT. The second finding is related to the increasing mobility of individuals, which concerns private persons but also engineers or business owners or managers. The third and last finding is linked to the analysis of the relations developed by firms that form clusters in specific fields such as that of biotechnologies for example. Though they reap financial and real estate related advantages from being located in the same areas as other firms that belong to the same sectors of activity, they often prefer to form relationships with outside firms so as to prevent problems related to the leaking or loss of intellectual property between themselves and rival companies.

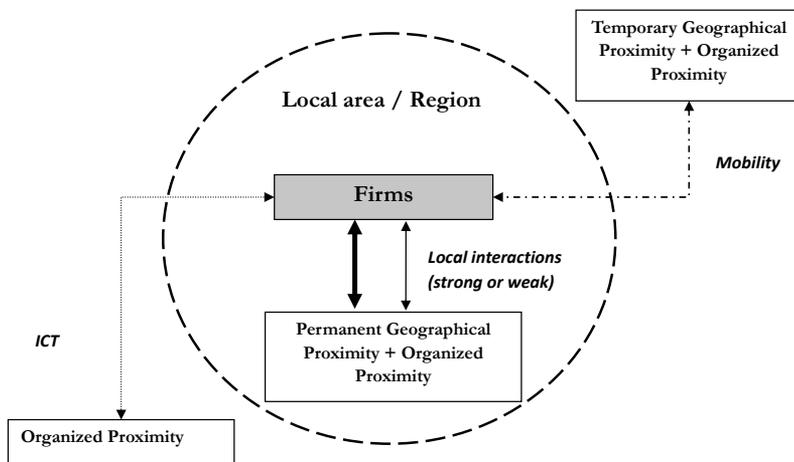
This has led some researchers to examine the way in which firms located distances away from one another communicate (Weterings, Ponds, 2008; Biggiero, Sammarra, 2010). One knows that they mostly do so through ICT but also through the inevitable implementation of geographic interfaces. Different cases of communication are examined: long distance communication, fairs, conferences, as well as temporary “platforms” of project teams, implemented by large manufacturing groups such as EADS or Renault, in order to enable the participants of a project to work together in the same place for short periods of time (participants who will subsequently go back “home”

and work together from a distance). According to the studies on proximity, space and geography do matter, but researchers have moved far beyond the exclusive analysis of clustered firms, even though these new considerations have considerably enriched it (Weterings, Boschma, 2009).

Taking the main elements of our working method, we can draw a graph of the different types of relations between proximate and distant firms located in a cluster (Figure 1). As a matter of fact, relations can be:

- Permanent Geographical Proximity relations, activated by Organized Proximity relations and which are based on local interaction through meetings or more informal encounters (face to face). To a greater or lesser extent, these relations may be accompanied by;
- Temporary Geographical Proximity relations, which also rely on Organized Proximity relations and involve the organization of short visits and trips using different means of transport (mobility);
- Long-distance Organized Proximity relations that depend on the use of ICT, such as the telephone or internet.

Figure 1 – The proximity relations of firms belonging to a cluster



This diagram characterizes the relations between firms and their local or wider environment in terms of Geographical and Organized Proximity as well as in terms of internal or external links to the cluster. It is only a general and broad image, which does not take into consideration the peculiarities of various groups of firms. In the following case study, we will try to clarify the respective combination or exclusion of geographical and organised

proximity. We will also describe the complete set of proximity interactions of firms, while at the same time focusing on the analysis of research and innovation partnerships.

AN EXAMPLE OF THE MIXING OF VARIOUS PROXIMITY RELATIONS: THE CASE OF THE OPTICS CLUSTER IN THE GREATER PARIS REGION

The objective of this case study is to illustrate the role played by the different types of proximity (internal *vs* external, geographical *vs* organised and permanent *vs* temporary) within innovative firms' strategies and behaviours and to understand the balance between local and long-distance relations in the field of clustered innovation activities. We want to explore the different proximity relations maintained by innovative firms in a cluster, using an applied example. The goal is (i) to confirm the combination of internal and external links of clustered firms, (ii) to clarify the respective combination or exclusion of Geographical and Organised Proximities, (iii) to investigate the role played by Temporary Geographical Proximity in clustered innovation processes.

The work is based on previous and more elaborated studies on this topic (see Boufaden *et al.*, 2009; Torre, Lourimi, 2013), and the only goal is to assess the complementarity of the various proximity schemes and to reveal how firms elaborate complex strategies in order to manage both local and distant relations by means of face to face relations, mobility and virtual exchanges. The case is the one of the optics and photonics industry in the Ile de France area: about half of the French-based industry and research entities in optics and photonics can be found in this location¹, namely approximately 556 firms with more than 16 700 employees and 103 public research teams (more than 5000 employees), thus forming a very large cluster dedicated to these activities. In addition to this significant presence, a high concentration of research activity in various optics-related fields is carried out in major university centres within the region. The area also brings together more than half of the national research entities in the field of optics as well as large scientific facilities.

1. This significant base in the greater Paris region is characterized by the setting in 1999 of a structure to lead and promote the optics and photonics sector, *Opticsvalley* (<http://www.opticsvalley.org/>). Since 2005, *Opticsvalley* has also included branches of software engineering and electronics.

Optical and photonic technology is characterized by a strong level of technological innovation; it is multi-applicative and supplies all the major strategic industrial sectors. The industry develops critical technology (*enabling technology* and *constitutive technology*; ISTAG; 2006) that, when combined with the electronics and software industries, enables the creation of finished products (calculators, endoscopes, film cameras, RFID, CAD, telecommunication networks). This combination with other technologies – especially electronics, signal processing, or mechanics – allows advances to be made in relation to the integration of advanced functionality within sensors or optical equipment, thus opening out the field to new uses such as pollution control, non-destructive analysis and control, image recognition, holographic control procedures, etc. Optical equipment and instruments – which are sometimes in competition with other technological solutions (for example, water jet or plasma for cutting – are the focus of research that aims to address certain weaknesses such as environmental protection or high production costs (Opticsvalley, 2004). The main markets for firms within the optics and photonics industry are ICT (optical and photonic components), the aerospace and arms industries, health and life sciences, scientific instruments, industrial production and other markets (LED sources with higher light output than traditional incandescent lamps).

The relevant actors for this study were identified using data and knowledge bases developed by the economic development organization *Opticsvalley* and the global competitiveness cluster *System@tic-Paris-Région*, encompassing over 1100 firms in the greater Paris region that carry out production and/or development activities in the optics, electronics and software industries. Of these entities, there are:

- 42 large entities (greater than 100 employees) with over 8500 employees,
- 77 medium entities (between 20 and 99 employees) with over 4600 employees,
- 437 small entities (fewer than 20 employees) with over 3500 employees,

In order to study the characteristics of the optics sector and the inter-relations in terms of proximity, we have used two main sources. The first is a database in which all firms based in the greater Paris region (123 firms) that develop and/or produce optical and photonic technology are identified and classified in terms of number of employees, turnover, location, focus on R&D, technology and products developed. The second is the output of 44 qualitative in-depth interviews conducted with the most representative

local actors in the industry² (industry, research, institutions)³. We made the choice, for sake of completeness, to maintain other relations than innovation ones in the graphs, but they are depicted in grey (relations with suppliers or standard customers, for example).

The importance of Permanent Geographical Proximity between «breakthrough technology» start-ups and public research laboratories

The main characteristic of “breakthrough technology” start-ups is to introduce products, using new technology, to the market. They do not yet have catalogue products and their products are in an operationalization phase, mainly characterized by numerous interactions, especially significant exchanges of knowledge and information with research laboratories and large companies that can be defined as *early users*. These *early users* are the first customers; they identify the new product or service and pinpoint a significant potential application for it within their own production processes or products. *Early users* are: public institutions (national and/or regional) that decide to purchase products or services utilizing this new technology, or public laboratories, that can also be a potential market for these start-ups. They provide initial feedback to the start-up on the feasibility of and interest in their product. This valuable source of information strengthens the ability of start-ups to issue competitive products and services to the market.

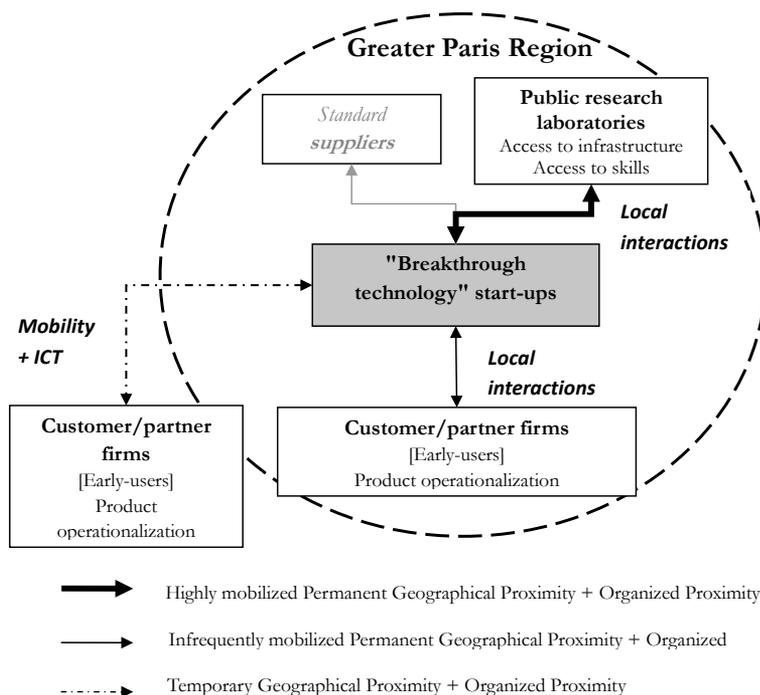
“Breakthrough technology” start-ups have a fundamental requirement for permanent Geographical Proximity with research laboratories (especially with laboratories from where the start-ups originated, which creates a sense of belonging in terms of Organized Proximity). They require access to the skills and tools/infrastructures available in nearby laboratories in order to test and develop their products. The role Geographical Proximity plays is particularly central in allowing start-ups to execute their innovation processes

2. 21 industrial firms, 6 economic development organizations, 5 local authorities, 3 financial institutions and 9 public research laboratories.

3. The identification of the optic-photonic firms took three steps: 1) we used the most representative NAF codes (of the French National Institute of Statistic) of the optic-photonic activity as a starting point to identify the French located firms which produce, develop and/ or put these technologies on the market. More than 2500 firms declare their activity under these NAF Codes in the Greater Paris Region, 2) we identified the local firms whose activity is built upon optic-photonic technologies, based not only on the NAF Codes but also on various information (including web sites) 3) this list was validated and completed by the extensive set of information collected through firms visits performed by *Opticsvalley*. It allowed us to integrate in the data base several firms which do not declare an activity related to the previous NAF Codes. Finally, we incorporated some firms registered which proved to be involved in optics-photonic activities.

in the product operationalization phase; they are very closely linked to the research laboratories within their local environment, especially with their laboratory of origin. Indeed, the use of skills and tools/infrastructures, which are too costly for a young firm to acquire, are critical and a determining factor in the ability of the start-up to solve technical and scientific problems and propose an end product. These exchanges are difficult to perform at a distance as they require a frequent repetition and mobilize tacit dimensions. Thus, research laboratories are often a source of materials (test and measurement tools, for example) and skills (access to the research skills) for breakthrough technology start-ups, in addition to the existing resources within the firm itself. This relationship is essential for firms with limited financial and human resources (i.e. insufficient turnover to guarantee the immediate survival of the firm) which restricts their capacity to acquire materials in order to develop new products or services and which firmly anchors them at a local level.

Figure 2 – The proximity relations of “breakthrough technology” start-ups



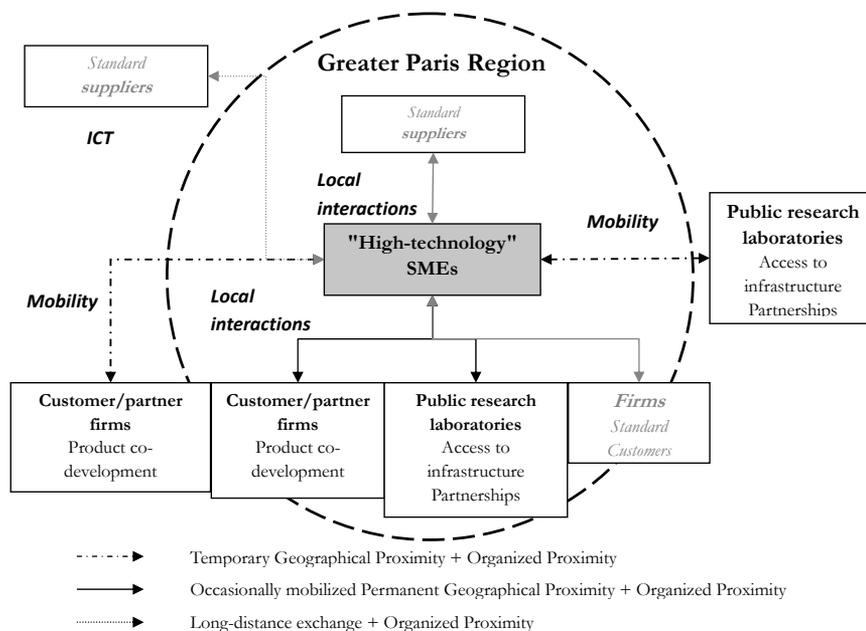
Furthermore, the role of Geographical Proximity depends on the relations between *start-ups* and other firms:

- Permanent Geographical Proximity with *early user* customers is not a prerequisite for effective interaction in the product operationalization phase. Start-ups interact with firms (in general with large groups of firms) that are interested in their technology, regardless of location. The product operationalization phase requires “instant” interaction with a view to adapting the products to specific customer needs and effectively assessing the potential of the new technology in relation to their products or processes. An indispensable factor in this operationalization phase, Temporary Geographical Proximity is mobilized by partners located at a distance from one another, and Permanent Geographical Proximity is infrequently mobilized by relations with partners within the cluster.
- Geographical Proximity is incidental in the interaction between “breakthrough technology” start-ups and “standard” suppliers, whether located in the same region or elsewhere, and without the interactions having to be especially strong. Although the purchase of intermediate goods does not require face-to-face contact, it is often carried out locally, especially in the case of economic areas with a large and diversified industrial fabric. The firms purchase their inputs locally if they are satisfactory from a quality/price perspective. This results in occasional relations with other partners in the cluster. The potential of Permanent Geographical Proximity is infrequently mobilized and local relationships are not vectors of knowledge or skills transfer for this category of local interaction, which is easily replaced by supra-local interaction.

The key role of Temporary Geographical Proximity in relation to “high-technology” SMEs

“High-technology” SMEs are characterized mainly by a strong internal R&D organization, required in order to maintain their competitiveness in the global market. These firms need to introduce successive series of products to the market at regular intervals. These characteristics encourage them to establish interactions with other firms and public laboratories and result in very different requirements regarding Geographical Proximity.

Figure 3 – The proximity relations of “high-technology” SMEs



Geographical Proximity plays a central role in the interactions between these firms and their customers/partners. Temporary Geographical Proximity relations with customers/partners situated outside the region are mobilized using ICT during phases of long-distance collaboration. Indeed, “high-technology” SMEs - whose goal is to adapt highly technological products to the new needs of a customer (generally large companies) - have many face-to-face interactions, especially during the requirements gathering phase in which the SME ascertains the customers’ needs and the customer evaluates the ability of the SME to supply a complementary technology. Temporary Geographical Proximity plays a fundamental role in these preliminary phases, but it is also a key element in the intermediary phases of product co-development and adaptation to the customer’s specific needs. Temporary Geographical Proximity takes the form of meetings aimed to evaluate progress on cooperation projects. Co-location is not necessarily a prerequisite for these temporary meetings to take place: co-location with local customers is rather the result of the history of the region and the search for skilled labour.

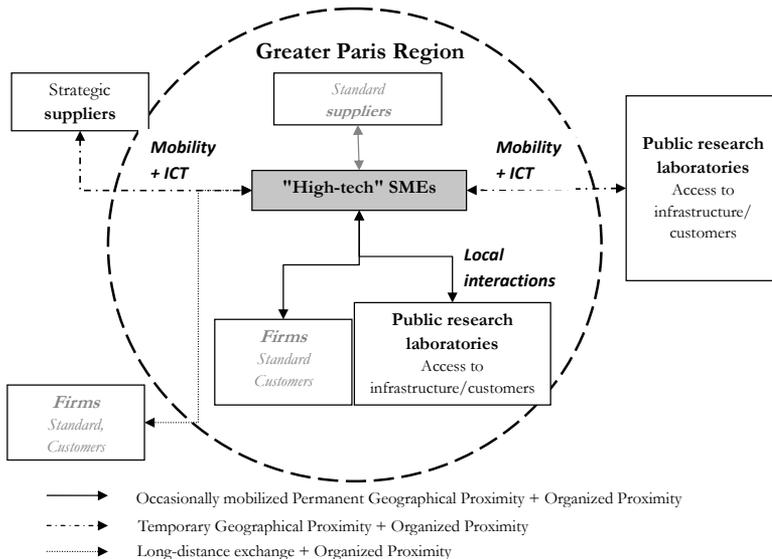
Interactions between “high-technology” SMEs and research laboratories also require regular meetings, especially in the initial and control phases of collaborative R&D projects when frequent face-to-face meetings take place.

Direct contact is also essential if the firm wishes to access the infrastructure and/or skills available in public research laboratories. These relations are all the more important as the actors behave in different ways, according to different logics. Similar to partner firms, there are two different types of mobilized Geographical Proximity for “high-technology” SME/laboratory relations: it is temporary for laboratories located outside the region, and permanent for laboratories co-located within the greater Paris region. In both cases, mobilization is only occasional.

The accessory role of Permanent Geographical Proximity in relation to «high-technicality» SMEs

Our “high-technicality” SMEs are characterized by a high level of technical specialization, by the production of limited series and custom-made products for clearly identified markets. Products supplied by firms in this category have technical characteristics that are known and mastered by customers and leave little room for interactive innovation with other firms. The main elements of the incremental innovation process are produced internally using a technology and market watch.

Figure 4 – The proximity relations of “high-technicality” SMEs



Nevertheless, Temporary Geographical Proximity plays a role in the innovation process. When interactions with research laboratories take place outside the cluster, they require long-distance contacts, especially if the firm requires access to their infrastructure in order to carry out tests and/or measurements relating to product innovations they would like to introduce. Temporary Geographical Proximity is therefore necessary in the initial and control phases of collaborative R&D projects. Face-to-face contact is also indispensable in the use of tools/infrastructure or skills of public laboratories (shared tools). These laboratories are also customers in the market for products produced by the SMEs. The requirement of firms in this category is to have access to infrastructure (or technological platforms) provided by the research laboratories, requiring travel and mobility in cases where the infrastructure is located outside the region.

In contrast, Permanent Geographical Proximity only plays an accessory role in the interactions between the “high-technicality” SMEs and other firms. Products from “standard” suppliers have characteristics that are known and mastered by the customers; therefore they do not require privileged and repeated interactions. In essence, firms favour local interactions as they allow for greater responsiveness and shorter procurement lead-times. However, the fact remains that there are greater exchanges of knowledge and information between “high-technicality” SMEs and their “partner” customers or “strategic” suppliers located in others countries than at a local level.

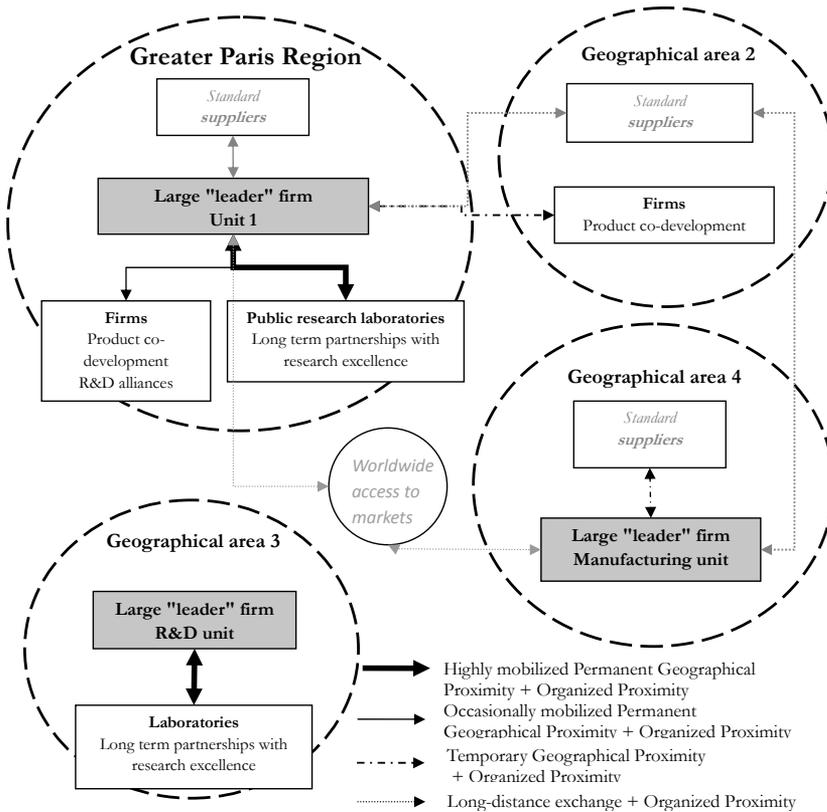
The role of Proximity in relation to large “leader” firms

In the Paris region optics sector, the group of large “leader” firms is radically different to the three other categories due to its relations with technology, the state and the territory. These firms develop numerous different interactions with other firms, ranging from simple customer/supplier relationships at one end of the scale, to the establishment of common research centres or manufacturing units at the other, with product co-development projects and sub-contracting relationships located between the two extremes. They have R&D and manufacturing units located in several countries, but this global organization does not preclude the fact that they need to be located in the major production centres for goods, services or knowledge. One has to notice that these types of firms are not easily fundable in every type of clusters, especially in small industrial districts for example.

Figure 5 shows the organization of a large leader firm located in the greater Paris region. It maintains relations within the strategic group with an R&D

unit (Geographical Zone 3) and a manufacturing unit (Area 4), and it also maintains external relations with standard suppliers and partners for product co-development (Area 2). For the purpose of this study, we shall focus on external relations: the role played by proximity is very different depending on the nature of the interactions that large “leader” firms develop with other economic actors, whether located in the region or elsewhere. The complete range of proximity types is represented below.

Figure 5 – The proximity relations of large “leader” firms



It should be noted that two broad categories of strategic relations, involving significant exchanges of information and knowledge, result in a strong mobilization of proximity relations:

- Permanent Geographical Proximity (co-location) plays an important role in the ability of large firms to establish long-term close relations with research centres of excellence (public laboratories). An

example of this is the location of *Thalès Research and Technology* or *Danone's* global R&D Centre on the campus of the *Ecole Polytechnique*, at the core of several research centres of excellence.

- Temporary Geographical Proximity (face-to-face meetings) plays an important role, especially in relations where the large firm seeks to co-develop a new product (or to adapt it according to its needs). This is the situation for collaborative relations with “high-tech” SMEs located outside the greater Paris Region.

On the other hand, relations with standard suppliers or partner firms located in the region only involve the occasional mobilization of Permanent Geographical Proximity relations, while relations with standard suppliers located outside the region always require long-distance exchanges.

CONCLUSION

Proximity analyses have nowadays turned out to be a part of the toolbox of regional scientists and this notion recently became very popular in the position of politics, and private or public stakeholders. Proximity is an argument for selling food or financial products, as well as a good slogan for local networks or social devices or even for policymakers. In parallel, the notion of proximity spreads in the academic literature and is now commonly used by scholars in regional science, geography or spatial economics. The use of the word proximity increased and grown in importance, in particular for authors interested in the question of milieus, districts, distance analyses, or in recent advances in economic geography or evolutionary geography. Interest is affecting now the works dedicated to innovation process, links between science and industry, relations between users and producers or sub-contractors, national systems of innovation, innovative milieus, about also local labour markets or urban policies.

Our goal in this paper was to draw some lines about the application of proximity analysis in business relations. We have showed that large diversified firms are likely to mobilize the resources of the various proximity types and remove local constraints. At the other end of the scale, smaller, more specialized firms are more anchored, dependent on their local relations and trapped within the cluster. The figures about the optics cluster in the Paris region also reveal that the proximity approach allows for a better understanding of the strategies and the behaviours of innovative clustered firms with regards to their own peculiarities. More precisely, they show that the four groups of innovative firms have different profiles in terms of management of

proximity relations, be there strategic interactions or more standard market relations. In particular, proximity mobilization patterns in terms of strategic interaction and partnership strongly vary depending on:

- The size of the firms,
- The maturity of their technology or their technological level (from low to high tech),
- Their place in the value chain,
- Their degree of specialization.

REFERENCES

- BAPTISTA, R., MENDONÇA, J. (2009), Proximity to knowledge sources and the location of knowledge-based start-ups, *The Annals of Regional Science*, 45(1), 5-29.
- BELLET, M., COLLETIS, G., LUNG, Y. (1993), Économie de proximités, *Revue d'Économie Régionale et Urbaine*, 3, 357-606.
- BIGGIERO, L., SAMMARRA, A. (2010), Does geographical proximity enhance knowledge exchange? The case of the aerospace industrial cluster of Centre Italy, *International Journal of Technology Transfer and Commercialization*, 9(4), 283-305.
- BOSCHMA, R. A. (2005), Proximity and innovation. A critical assessment, *Regional Studies*, 39(1), 61-74.
- BOSCHMA, R., FRENKEN, K. (2010), The spatial evolution of innovation networks: a proximity perspective, in Boschma, R., Martin, R. (eds) *The Handbook on Evolutionary Economic Geography*, Cheltenham, Edward Elgar, 120-135.
- BOUBA-OLGA, O., CARRINCAZEUX, C., CORIS, M. (eds) (2008), La proximité: 15 ans déjà!, special issue, *Revue d'Économie Régionale et Urbaine*, 3.
- BOUFADEN, N., LOURIMI, S., TORRE, A. (2009), The clustering of R&D through the institutional mechanisms in the Paris Region, in Belussi, F., Sammarra, A. (eds), *Business Networks in Clusters and Industrial Districts. The Governance of the Global Value Chain*, London, Routledge.
- BROECKEL, T., BOSCHMA, R. (2009), Knowledge Networks in the Dutch Aviation Industry: The Proximity Paradox, *Papers in Evolutionary Economic Geography*, 09-15.
- CARRINCAZEUX, C., LUNG, Y., VICENTE, J. (2008), The scientific trajectory of the French school of proximity: interaction- and institution-based approaches to regional innovation systems, *European Planning Studies*, 16(5), 617-628.
- FELDMAN, M.P. (1994), *The Geography of Innovation*, Boston, Kluwer Publishers.
- GALLIE, E. P. (2009), Is geographical proximity necessary for knowledge spillovers within a cooperative technological network? The Case of the French Biotechnology Sector, *Regional Studies*, 43(1), 33-42.
- LAURSEN, K., REICHSTEN, T., SALTER, A. (2011), Exploring the effect of geographical proximity and university quality on university-industry collaboration in the UK, *Regional Studies*, 45(4), 1-17.

- MASKELL, P., BATHELT, H., MALMBERG, A. (2006), Building global knowledge pipelines: The role of temporary clusters, *European Planning Studies*, 14, 997-1013.
- OECD (2001), *Innovative clusters, drivers of national innovation systems*, Paris, OECD.
- OPTICSVALLEY (2004), *Les marchés de l'optique-photonique: Eclairage-Affichage, Les marchés de l'optique-photonique : Procédés industriels, Les marchés de l'optique-photonique: Santé et science du vivant*, Optics Valley.
- PECQUEUR, B., ZIMMERMANN, J.-B. (eds) (1994), *Economie de Proximités*, Paris Hermès, Lavoisier.
- PONDS, R., VAN OORT, F., FRENKEN, K. (2007), The geographical and institutional proximity of research collaboration, *Regional Science*, 86(3), 423-443.
- RAMIREZ-PASILLAS, M. (2010), International trade fairs as amplifiers of permanent and temporary proximities in clusters, *Entrepreneurship & Regional Development*, 22(2), 155-187.
- SAXENIAN, A. L. (1994), *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*, Cambridge, MA, Harvard University Press.
- TORRE, A. (2011), The role of proximity during long-distance collaborative projects. Temporary geographical proximity helps, *International Journal of Foresight and Innovation Policy*, 7(1/2/3), 213-230.
- TORRE, A. (2008), On the role played by temporary geographical proximity in knowledge transfer, *Regional Studies*, 42(6), 869-889.
- TORRE, A., GILLY, J.-P. (1999), On the analytical dimension of Proximity Dynamics, *Regional Studies*, 34(2), 169-180.
- TORRE, A., LOURIMI, S. (2013), Proximity relations and firms innovative behaviours. Different proximities in the optics cluster of the greater Paris region, in Kourtit, K., Nijkamp, P., Stimson, R. (eds), *Applied Regional Growth and Innovation Models*, Springer Verlag.
- TORRE, A., RALLET, A. (2005), Proximity and localization, *Regional Studies*, 39(1), 47-60.
- TORRE, A., WALLET, F. (eds) (2014), *Regional development and proximity relations*, London, Edward Elgar.
- TORRE, A., ZUINDEAU, B. (2009), Proximity economics and environment: assessment and prospects, *Journal of Environmental Planning and Management*, 52(1), 1-24.
- WETERINGS, A., BOSCHMA, R. (2009), Does spatial proximity to customers matter for innovative performance? Evidence from the Dutch software sector, *Research Policy*, 38(5), 746-755.
- WETTERINGS, A., PONDS, R. (2008), Do Regional and Non-regional Knowledge Flows Differ? An Empirical Study on Clustered Firms in the Dutch Life Sciences and Computing Services Industry, *Industry and Innovation*, 16(1), 11-31.