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## Proximities and embedding effects

### Abstract

Clusters are supposed to enhance exchanges among firms or between firms and research institutions. This is termed “proximities effects” in this paper. There are many theories explaining proximities effects, but most of them lack a clear distinction between levels of action (individuals, social networks, firms, markets, etc.). This paper is focused on this issue, claiming that it is crucial to understand the shifts between levels of action. Embeddedness of economic activity in social networks is not viewed as a static situation, but rather as a process, with a reciprocal, decoupling. Two empirical studies on innovation in the south-west of France support this argument. One bears on the relations between academic laboratories and firms, the other on the creation of innovative companies. They show that proximity and embeddedness in local social networks are just a specific context for emergence of collaborations and access to resources in the emergence phases of new companies creation, but not necessarily a specific mode of regulation of professional or technologic relations.

Keywords : networks, start-ups, embeddedness, innovation

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One of the greatest problems in the social sciences is determining relevant levels of action and understanding their interrelations. Are the actors taken into consideration individuals, companies, groups of companies, or vaster communities? Are we considering a single level, or several interacting levels? The lack of adequate clarification of the entities taken into consideration may

lead to confusion that is very harmful to analysis. In studying economic activities, one of the most frequent confusions is the level of the individuals and that of the companies. In order to simplify the analysis, many authors tend to proceed as if the members of firms behaved in a manner completely determined by the firms' strategy and internal hierarchy. Others, in contrast, prefer to focus on the level of the individuals, presenting firms as dummy entities with no real impact on their members. Many authors could be cited as an example of either of these two positions. To simplify matters and provide reference points, I will limit myself to presenting the first version of Oliver Williamson's theory (1975) as an example of the first position and Mark Granovetter (1985) as an example of the second. Obviously there are intermediate positions that take into account both levels and attempt to understand their interrelation. Among these, I will most especially utilize the conceptualization of Harrison White (2002), partially adapting it.

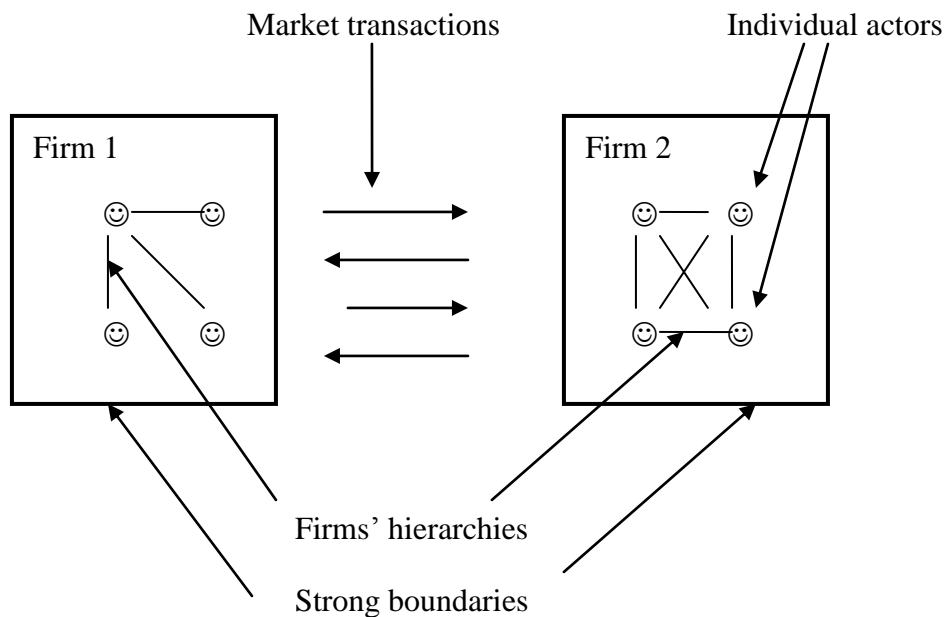
The problem of levels of action is especially important in studies involving different forms of proximity. In fact, the association of one form of proximity with a type of entity makes it possible to construct a space, which may be the ordinary geographic space (the one appropriated by individual human beings and social groups), or a space of a different nature, based on the socio-economic characteristics of the actors or their exchanges. In concrete analyses, several types of entities and proximities – and hence several sorts of spaces – are associated. Confusing levels of action may lead to major mistakes, such as, for example, disregarding the essential fact that, no matter what the space considered, the mobility of individuals is not the same as that of the firms to which they belong. It is necessary to take into account at least these two levels of action and to understand how they interact.

I will begin by briefly presenting the problem of levels of action and the concepts of embedding and decoupling. Then I will present two empirical studies that apply these concepts in the French context. One bears on the relations between academic laboratories and firms, the other on the creation of innovative companies. Finally, I will show that the concepts of embedding and decoupling make it possible to explain satisfactorily the phenomenon of the effects of spatial proximity. This phenomenon manifests itself in different ways. One of these manifestations is the fact that, all non-spatial things being equal, there is more exchange among firms or between firms and research institutions when the actors are situated in relative spatial proximity (same urban

area or same rural region, less than one hour's travel by car). Another of these manifestations is the tendency of firms arising out of academic research to be located in proximity to the laboratory whose results they use.

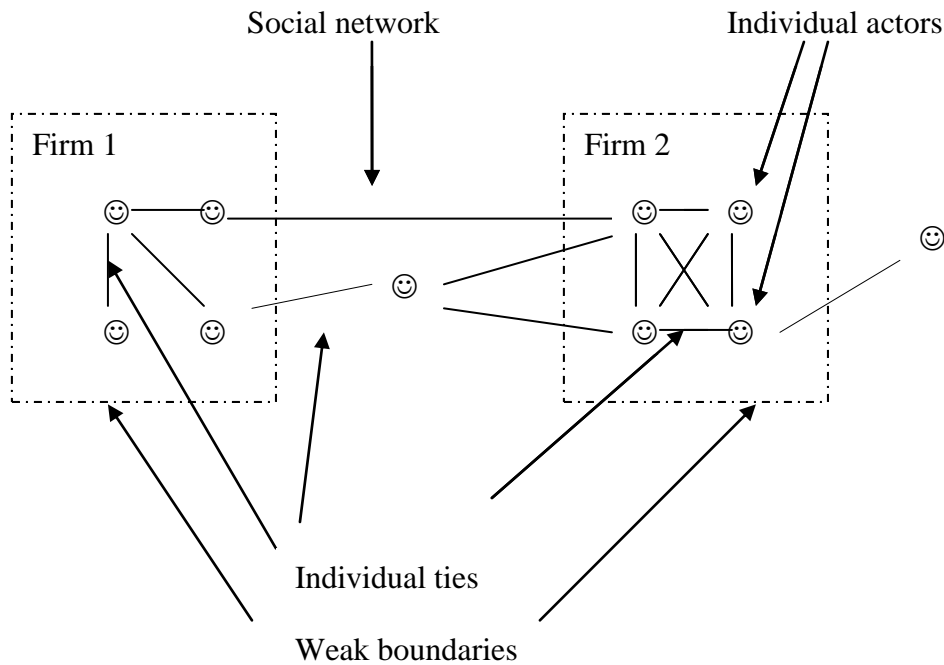
## **1. Embeddings and decouplings**

Many works consider that the behaviours of individuals are completely determined by the hierarchy of the organisations they belong to. This is one of the postulates of the transaction-cost approach (Williamson, 1975, 1981), but it is shared by many other approaches, including in sociology. This postulate has the advantage of being able to think at the level of firms and their strategies, without worrying too much about the individual actors. Figure 1 shows the conception of relations among individuals and among firms that corresponds to this postulate. The boundaries between firms are considered perfectly tight, and the relations among the members of firms are determined by their internal organization.



***Figure 1. Relations within and between firms in the transaction costs approach***

Works using the concept of embedding, in the tradition begun by Granovetter (1985), reject this postulate and, in contrast, focus on the ability of the individual actors to play their own game and to establish relations that may eventually cross organizations' boundaries. The postulate here is that it is the network of relations among individuals that constitutes the dominant structure underlying economic exchanges. Figure 2 covers this conception. The firms' boundaries here seem very porous, and the firms themselves appear as very secondary entities.



***Figure 1. Relations within and between firms in the embeddedness approach***

Each of these two approaches has its limits. The first is not realistic: all empirical studies show that there are significant exchanges among the members of different firms and that these exchanges follow logics that cannot be reduced to the strategy of the firms (Powell and Smith-Doerr, 1994). The criticisms addressed to Williamson by Granovetter himself in his famous 1985 article are all relevant with regard to the basic postulate cited above. For that matter, the second postulate is not entirely satisfactory. On the one hand, it underestimates the importance of the “group” or “circle” type of collective structures (which companies, as organizations, fall into) which cannot be reduced to a network (Grossetti and Bès, 2003). And, on the other hand, it ignores the ability of actors to cooperate other than through the intermediary of their social relations, in particular by relying on various forms of non-relational mediation (the media, intermediate organizations, etc.) (Grossetti, Barthe and Beslay, 2006).

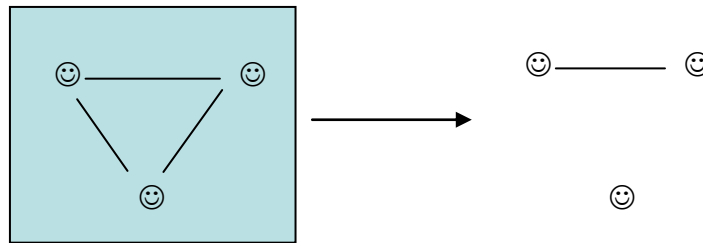
One way to get beyond the limits of these two approaches is to leave behind static points of view and to think dynamically. Not only is it possible to find situations in the social world that resemble one or the other of these two views (and also all the intermediate situations), but a single situation may evolve and go from one to the other. The problem then is no longer one of stubbornly defending a simplistic postulate but of understanding how we move from one situation to another. It is here that the concepts of embedding and decoupling formulated by Harrison White (2002) become genuinely interesting. White developed these concepts to analyse the autonomization of what he calls a “market” – i.e., a group of firms in competition for the same customers and the same suppliers – in relation to the network formed by exchanges between firms. By slightly reformulating these concepts, we can apply them to the interdependencies between the level of the organizations and that of individuals (and of their networks). Embedding, as I will use it here, does not designate a static situation as with Granovetter but rather a process of reinforcing the dependency between one social form and other social forms (between organizations and inter-individual social networks, for example). Decoupling is the reciprocal process of autonomization. The simplest way to understand these concepts is to start from two symmetrical questions: Where do interpersonal relations come from? Where do relations between organizations come from?

### **1.1. Relation dynamics**

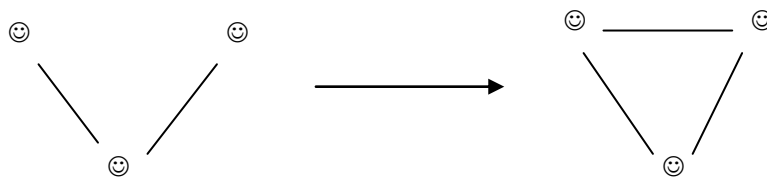
Figure 3 shows an overall view of the main contexts giving rise to social relations such as they can be reconstructed from empirical studies on personal networks (Grossetti, 2005). The first context is that of groups. For example, someone working in a company is led to interact with other members of the company under the organization’s rules. These interactions may give rise to common habits and a specific social relation that may spill over out of the organization’s framework, and possibly even survive the organization’s demise. The second context is the endogenous densification of the network: two people having a common relation are placed in contact by this intermediary and create a new relation. Finally, a relation may come out of the common connection to a single mediating resource: two neighbours build a relation out of the need to manage common spaces; two people seeking their soul mate meet because of a lonely

hearts ad; two researchers realize the proximity of their research approaches or interests through their respective publications, etc. In all cases, the relation can be decoupled from its original context and ends up existing for itself. At the same time, it is embedded in the network of relations in which the protagonists are already engaged.

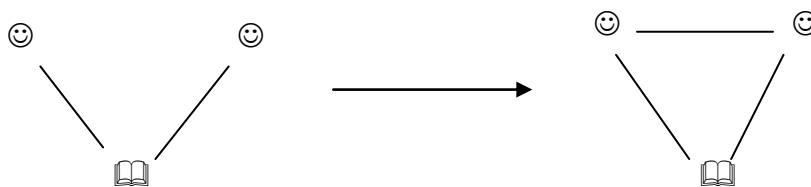
**1. From groups to individual ties**



**2. From ties to ties**



**3. From mediation resources to ties**



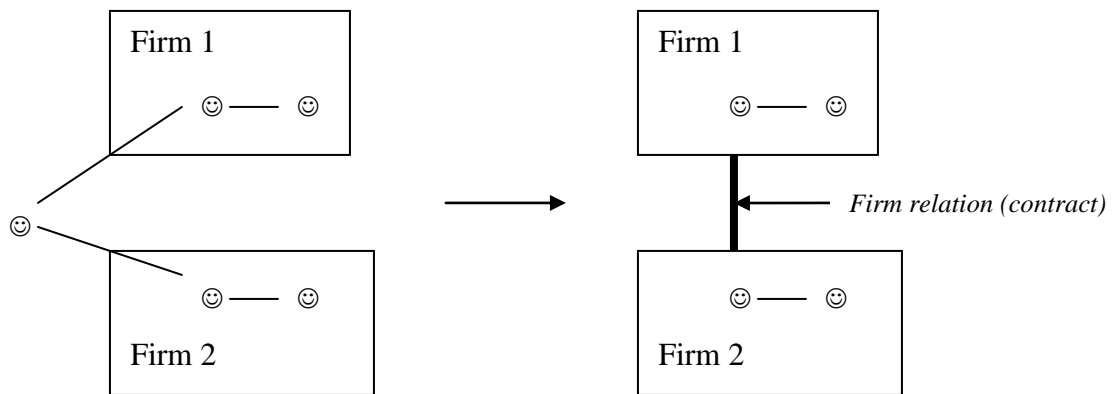
***Figure 3. Where do individual ties come from ?***

Figure 4 shows the original contexts of the relations between organizations, such as they can be deduced from a study of cooperation between firms and academic research labs in France which I will present further on (Grossetti and Bès, 2001). In the first context, there are chains of personal relations linking members of the organizations and promoting the building of a relation between

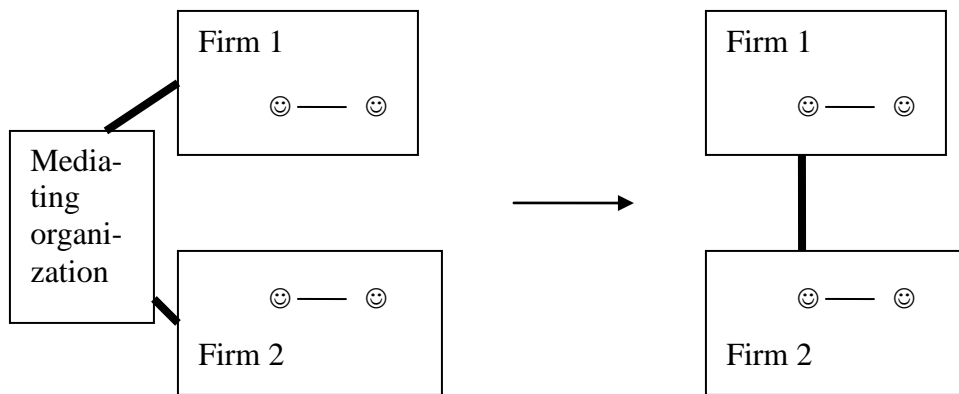


organizations. It is because they know each other, or have a common relation, that individual actors are led to interact and to decide to establish a contract or agreement between their respective organizations. The second context in which organizations are put in contact is the intervention of an outside organization. This may be a public or interprofessional organization whose role is to promote exchanges among certain types of organizations (laboratories and companies, for example). Finally – third context – the two organizations may come into contact through various mediation resources, ranging from the media to events specifically intended to promote meetings (trade shows, fairs). We might also include in mediation resources all shared cognitive resources (language, cultural references, social and technical norms, etc.) that promote exchanges, on the condition, obviously, that we can bring them to light empirically.

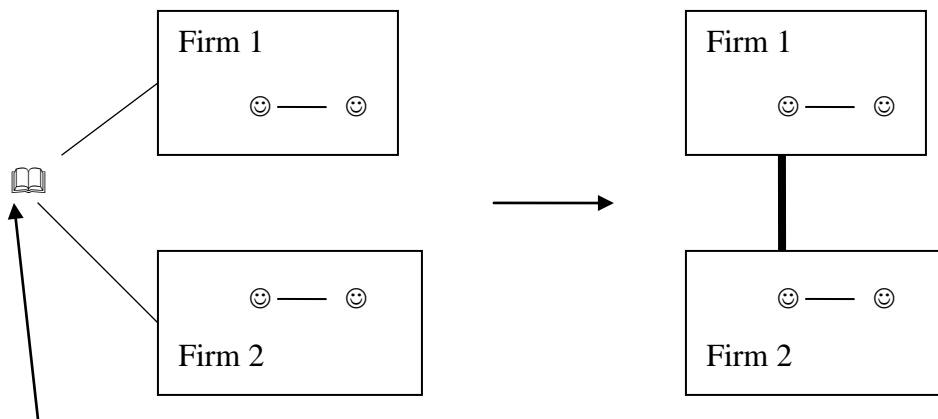
**1. From personal networks to firms relations**



**2. From institutional links' ties to firms' relations**



**3. From mediation resources to firms' relations**



*Mediating resource*

**Figure 4. Where do organizational relations come from ?**

These two figures complement one another. Organizations can manage personal relations, which can themselves generate relations between organizations. The various situations described may also lead to one another as part of a dynamic process. Now let us examine how this overall analytical framework can be utilized to understand proximity effects.

## **1.2. How can spatial proximity effects be explained?**

Logics of relation creation, at the level of individuals and of organizations, can explain the spatial proximity effects. Let us briefly recall two manifestations of these effects on productive organizations. The first of these manifestations involves exchanges between companies or between companies and “academic” laboratories.<sup>1</sup> All empirical studies show that these exchanges are more frequent – all non-spatial things being equal – in situations of spatial proximity, i.e., if the two organizations are in the same urban area or no farther apart than one hour by car (Bélis-Bergouignan *et al.*, 2004). The second manifestation of proximity effects relates to the location of companies created on the basis of academic research results: they locate overwhelmingly in proximity to the laboratories that gave rise to them.

How can these spatial proximity effects be explained? Let us begin by the first manifestation, relations between organizations. We have seen that there are three types of contexts that may give rise to these relations: personal networks; intermediary organizations; mediation resources. Hence everything depends on the spatial structure and on each of these types of contexts. Are personal relations more or less local? Do intermediary bodies have a local area of action? Are mediation resources general or specific to a given area? With regard to social networks, we have generic results on personal networks (all types of relations together) which show a variation in the share of “local” relations (less than an hour by car between the places of residence of the protagonists) from 67% in a study by Claude Fischer on a Californian population (Fischer, 1982) to 83% for the transposition of the same method to the Toulouse region (Grossetti, 2002), with 75% in a study by Barry Wellman on a sample of inhabitants of Toronto (Wellman, 1979). Social networks are in large part local. Hence chances are that relations between organizations arising out of

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<sup>1</sup> In France, public research; in the United States, university research.

personal networks will be local. The intermediary organizations intervening in the relations between companies and academic research generally come out of regional communities and are therefore dependent on their policies. In the case of the European countries, this includes the various levels of government action: cities, regions, nation, European Union. There is no study evaluating the impact of various policies on relations between companies and laboratories, but we can hypothesize that the national level remains important, since it was practically hegemonic in this area during the period 1945-1975. For relations between companies, we must take into account interprofessional bodies, which can play a major role in certain sites, such as Silicon Valley, for example (Saxenian, 1994). But, here again, we do not have any systematic study on the spatial effects of these bodies. Finally, mediation resources can range from the most local (a local newspaper, for example) to the least local (library databases, the Internet, etc.).

Now let us examine the second manifestation of spatial proximity effects, the fact that companies arising out of research most often locate in proximity to the laboratory. One common explanation rests on the distinction between tacit knowledge and codified knowledge and assumes that proximity is necessary for the face-to-face exchange implied by the transmission of tacit knowledge (Zucker *et alli*, 2002 for example). This explanation does not involve the intervention of relations and reduces the phenomenon to a mere communication constraint. With Marie-Pierre Bès I argued empirically that the cause of this proximity effect is instead to be found in the individual logics of the creators and the way in which they access various resources (Grossetti and Bès, 2002).

In order to make this clearer, I will present two empirical studies that utilize the general analytical framework I presented above. One bears on relations between companies and academic research labs, the other on the processes of creation of innovative companies.

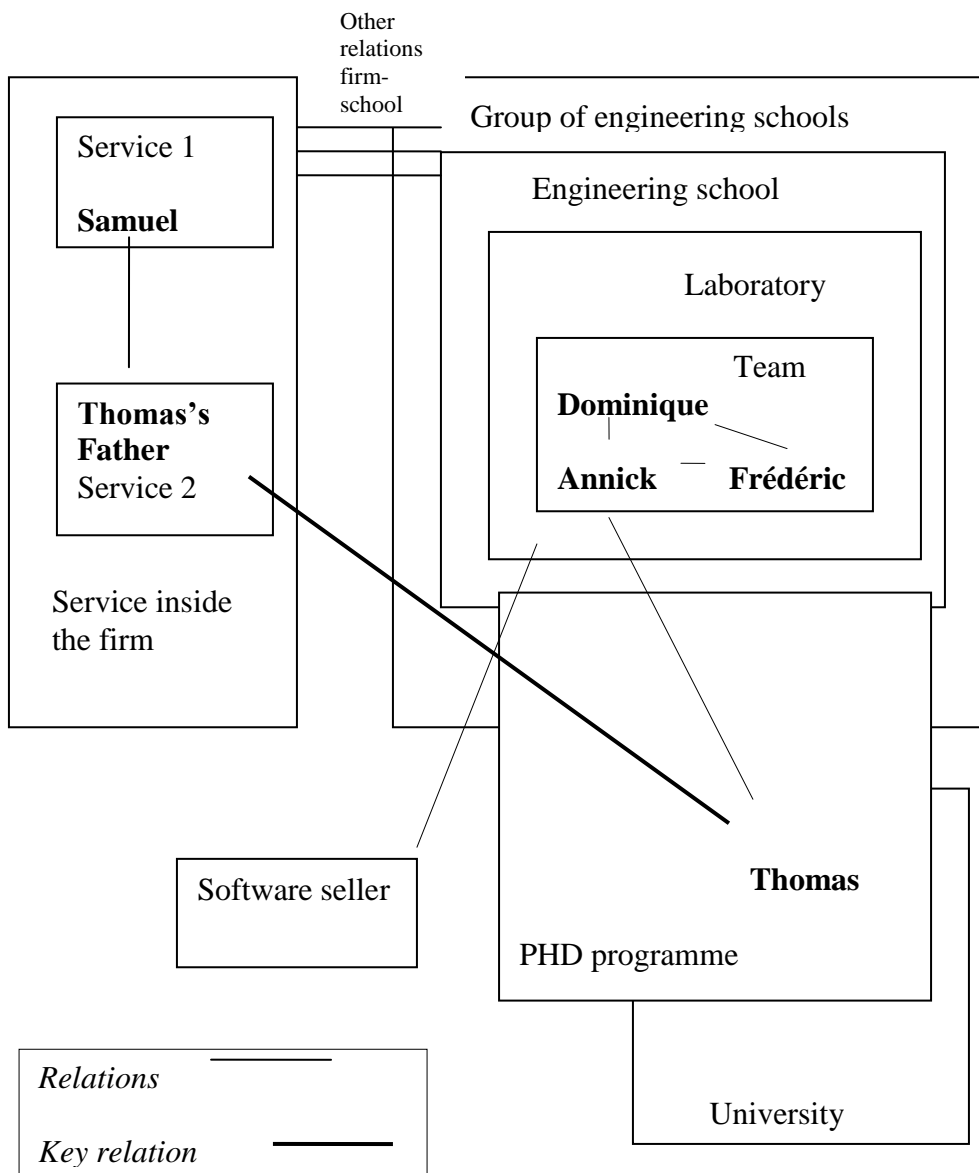
## **2. Two empirical studies**

The two studies I present here were intended to assess the role of interpersonal relations in innovation activities.

## **2.1. Collaboration between research laboratories and companies**

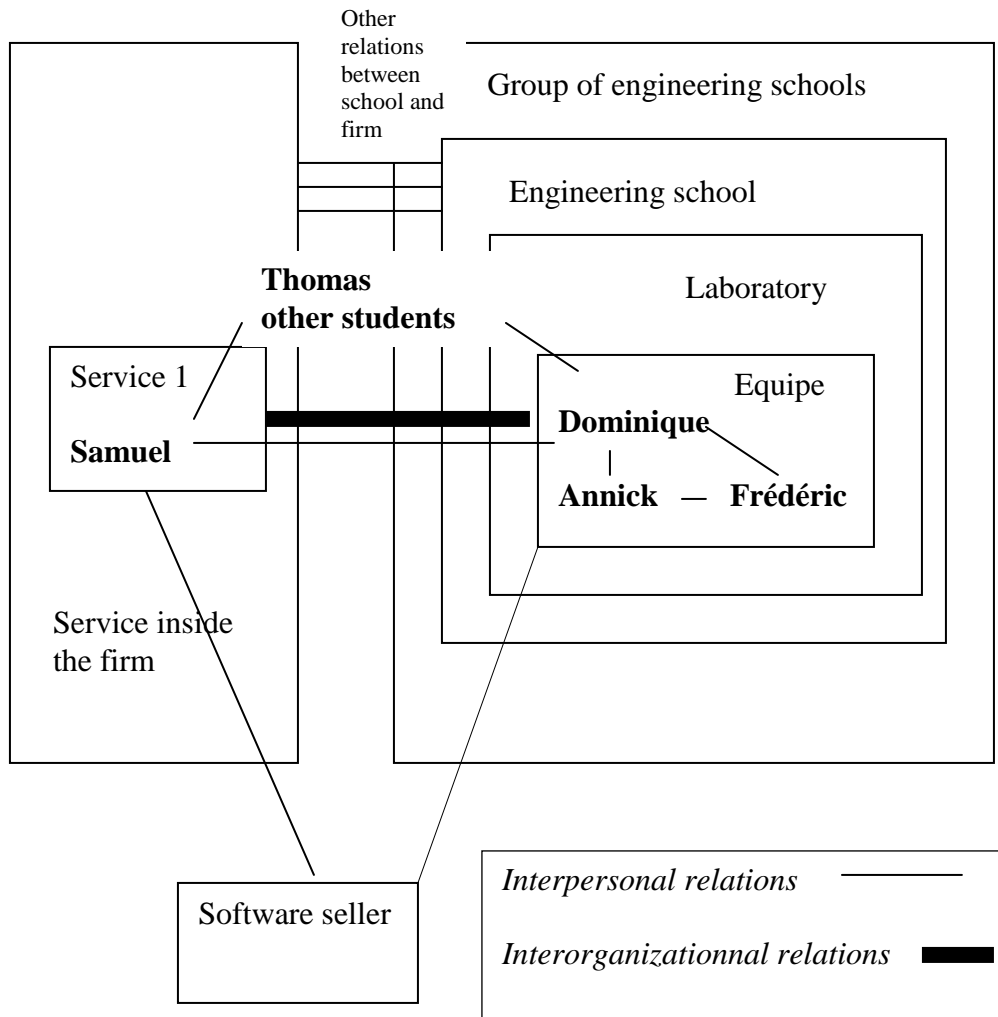
This study sought primarily to understand the logics of how public research labs and companies enter into relations in France. Marie-Pierre Bès and I reconstructed 130 histories of collaboration between the CNRS labs and industrial companies, using cross-interviews. We grouped the situations encountered into three categories, corresponding to the three figures displayed above.

In the first category – network logic – the contact results from the existence of a pre-existing relation chain linking the people who made the decision to collaborate. This is the most frequent category (44% of cases). Figures 5 and 6 illustrate one example of this type of situation with one of the histories that we reconstructed. In this case, Thomas, a student seeking to write a thesis in a laboratory attached to an engineering school, used his own means to find a manufacturer willing to co-fund his thesis rather than relying on the customary laboratory relations. He mobilized his father who worked in a firm in the aeronautical sector, who put him in contact with one of his colleagues, the head of a research department. The student then put this department head in contact with his professors, and the thesis received its funding. The thesis consisted of adapting a modelling method and a specific software the laboratory had taken to using to the needs of the company. Once the thesis was under way, other students associated with the lab were recruited by the company and pursued the work begun by Thomas, and the relation between the company and the lab was institutionalised by an agreement. The relation between the two organizations was decoupled from the individual relations in which it had been embedded at the start.



**Figure 5. Example of cooperation between a firm and an academic research laboratory starting from a social network of individuals (starting situation)**

I've taken an example in which the decisive relation (the one that serves as bridge between the organizations) is a family relation, but in other histories these decisive relations derive – in four out of five cases – from teaching (former students, professor/student) or from professional activity (colleagues). It is mobility within local job markets that explains most of the local relations that we observe. People maintain links in the organizations they have passed through (university, companies) and these links can be mobilized in their professional activity.



**Figure 6. Example of cooperation between a firm and an academic research laboratory starting from a social network of individuals (situation after 2 years)**

In the second category – the intervention of intermediary organizations – contact is established under the aegis of an external player who, willingly or otherwise, causes interactions between members of the organizations, which will then be led to collaborate. For example, a ministerial agency appointed one of the laboratory researchers and a member of the company to a limited group of experts who then decided to engage their respective organizations in cooperation. Or, again, a local organization seeking to promote exchanges between labs and companies intervened

to put the two organizations in contact. This category is less common than the previous one (18%).

Finally, in the third category – use of mediation resources – contact results from the partners’ initiative (based on public information, as for example scientific publications) or their meeting at a collective event (conference, trade show). Or the contact may be the result of the functioning of the student in-service training market: a student responds to a broadly distributed offer for in-service training, and the negotiations place the future partners in contact (the professor organizing the in-service training and the manufacturer taking in the trainee) who then decide to pursue their collaboration by other means. This third category accounts for 38% of cases.

When we cross these meeting logics and the partners’ location, we get results that clearly lobby for explaining proximity effects by the existence of local personal networks.

**Table 1. Contact type and partner location**

Contact type Partner location	Networks	Intermediary organizations	Mediation resources	Total
Partner industrial establishment in the same region as the laboratory	24 (60%)	8 (20%)	8 (20%)	40 (36%)
Partner industrial establishment in Paris	17 (41%)	7 (17%)	17 (42%)	41 (37%)
Partner industrial establishment in another region or abroad	7 (24%)	5 (17%)	17 (59%)	29 (27%)
Total	48 (44%)	20 (18%)	42 (38%)	110 100%

(Khi2 = 11.89, p=0.018)

Although the correlation is clear, we need to be careful not to confuse local relations with the logic of networks, since the latter applies broadly to cases in which the partners are distant. Furthermore, these other two contact logics may also be involved in the genesis of local relations. One way to explain the correlation is to say that these relations favour local relations more than the other modes of bringing entities together, because the intermediary organizations are for the most part at the national level (in France’s case) and the mediation resources are not very local.



Science-industry relations are therefore partly dependent – through personal relations – on other types of exchanges such as the teaching activities of researchers and the job market.

However, there is a limit to the embedding of relations between organizations in personal networks. In our data, the logics of contact between companies and laboratories do not appear to be correlated with the location of the laboratories studied, with the type of partners, with technological content, or with the duration of the collaboration. It is as if the partners' geographic location were the main consequence of the context of formation of the collaboration in its unfolding. Overlooking the conditions of construction of the relation involves processes that may produce “decoupling,” i.e., a weakening of the dependence on relations between organizations in relation to personal relations or, in contrast, a strengthening of this embedding. These well-known processes range from the formal legal framework constituted by the contract to the technical systems that allow joint work (prototyping, modelling, specific software, instruments, data produced, hardware, intermediate documents) and include the internal rules of organizations. In our analysis, we have stressed another process, “personification,” which is founded on the involvement of particular social actors who, for a time, embody the relation: trainees, co-funded doctoral candidates, researchers or on secondment. For a time, these actors belong to both groups. It might be said that they belong to the collaboration group and the project group associated with it. In more than nine out of ten cases, collaboration relies on the work of these intermediary actors. Like material intermediaries, human intermediaries contribute to making the relation partially independent of the groups involved. At the same time, to the extent that PhD students or trainees tend to get recruited by participating companies, and the engineers or researchers maintain relations with their old colleagues, this fourth process produces embedding in the social networks and may contribute to undoing the decoupling that resulted from the three preceding ones.

## **2.2. Processes of creation of innovative companies**

Studying the relations between academic laboratories and firms gave us arguments against explaining proximity effects by the constraints of exchange of tacit knowledge. Indeed, we have

never encountered a case in which engineers or members of the companies went regularly to the partner laboratories outside of the three or four annual project coordinating meetings, a frequency that practically never changes and in no way differentiates local relations from others. When cooperation requires major exchanges, which happens frequently but not systematically, there is generally a doctoral candidate who stays for successive periods, more or less long, in the laboratory and in the company. The technical constraints that may be involved in working at two sites distant from one another are easily compensated by methods like double prototyping (in electrical engineering, for example), in which a prototype identical to the system to be designed is created simultaneously at the laboratory and in the company. The idea that members of the company seek to appropriate the researchers' knowledge, tacit or otherwise, no longer stands up to analysis. What interests the companies questioned is the result and not necessarily the methods or concepts, but if that is the case, recruiting a doctoral candidate resolves this issue. However, that does not mean that there is no tacit dimension in these exchanges (there is a certain number of them, see Grossetti and Bès, 2002), but they in no way explain spatial proximity effects. Long-distance collaborative work is not especially difficult so long as certain participants are able to travel without a problem, and the technical and organizational set-ups are adapted to this situation.

It might therefore be thought that the constraints of exchange of tacit knowledge do not explain the choices of location of companies resulting from research. To better understand these choices, it is best to put them into the overall process of creating new companies. To understand this process, I will rely on a collective study now under way, the first phase of which produced results that are useful for understanding proximity effects.

In this study, we decided to consider the creation of a company as a complex process that involves many actors, and especially different levels of action. In this process, the founder or founders, considered as individual actors, give rise to a collective actor, an organization, by mobilizing resources and relying both on individuals and on existing organizations, sometimes in a more global milieu or an established market. We were especially interested in situations of access to resources. Mobilization of a resource is a sequence of actions in which one of the creators mobilizes or receives a resource he does not have. For example, consultation with an

attorney to draw up the articles of association is a sequence that involves one or more creators, the attorney, and the advice he dispenses. The attorney may be a relation of one of the creators, or a relation of a relation, in which case we consider that mobilization of the resource is achieved through social relations, or he may have been selected from a directory, in which case we consider that this is a mediating resource that allowed access to the resource. Hence, for example in case n. 107, the sentence (made anonymous here) “The articles of association are drawn up voluntarily by an auditor whom [the creator] met while dancing” makes it possible to code that the resource is a counsel, that it was obtained through mobilization of a relation (by a relational chain of length 1), a relation established during leisure time. For the 40 companies we studied,<sup>2</sup> the number of situations of resource mobilization averaged 15.3 per history (the minimum is 2 and the maximum 34), or 612 in all.

The first result is that social relations occupy a predominant place in the processes of company creation: 55% of the coded situations involve calling on relations. Relations are more present in the initial phase, before filing of the articles of association (66% of situations of access to resources involve relations). The following phases leave greater space to mediation resources (68% of access to resources through these mediations during the second year of existence), which illustrates the idea of a progressive decoupling of the new organization vis-à-vis the relations of its founders. It is as if the organization little by little succeeded in making itself independent of the founders’ relations, as if the initial embedding, essential to its creation, gradually weakened to the benefit of non-relational logics. The relations mobilized are above all professional ones (80% of cases), but quite often connoted affectively (36% of these relations are “friendly-professional”).

The other modes of access to resources can be divided into two categories. The first consists of professional or public bodies, which are the equivalent of the intermediary organizations seen in the study on relations between laboratories and companies. This mode of access to resources is present in 21% of cases. The second category includes mediating systems, which may be media, various human mediators, seminars, trade shows or fairs. They represent 24% of cases.

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<sup>2</sup> These companies were selected for their innovative character, attested by the fact that they received innovation subsidies or are housed in a nursery. They are located in the Toulouse region and in the sectors of IT, biotechnologies, chemistry, and mechanics..

Now let us examine the more or less local nature of the resources accessed by company founders through these various means. In the following table, I have distinguished between a local level corresponding to the greater urban area, and a “non-local” level encompassing everything beyond that.

**Table 2. Access type and resources location**

Type of access to resources	Networks	Intermediary organizations	Mediation resources	Total
Local (urban area)	258 (57%)	103 (23%)	91 (20%)	452 (75%)
Non-local	75 (50%)	24 (16%)	51 (34%)	150 (25%)
Total	333 (55%)	127 (21%)	142 (24%)	602 100%

(Khi2 = 12.66, p=0.02)

In this case, social relations tend to favour access to local resources, just as intermediary organizations do, whereas mediation resources are slightly less oriented towards local resources. The result is close to the preceding study, but the intermediary bodies here are more local. The resources mobilized are overwhelmingly local. Customers are the only type of resource not primarily local in origin (only 45%).

Of the companies studied, some came out of academic research labs or used research results. The tacit-knowledge constraint does not appear here more than in the preceding study. In general, companies recruit young doctors coming out of laboratories in order to apply and develop technology, which resolves the problem of knowledge transfer. Location choices are therefore not closely linked to this constraint. Rather, they are explained by the initial location of the founders (whether the researcher or a collaborator): in general, people create companies where they live (and where their families live).

## Conclusion

A consideration of proximities benefits greatly from taking into account the existence of multiple levels of action. It is absolutely necessary to distinguish at least the level of individual actors and that of organizations. It is often useful to go beyond that and to define more or less vast groups of organizations. Clarification of the levels makes it possible to conceptualize the articulation among levels, and the processes by which the action moves from one level to another. I developed the concepts of embedding and decoupling here in this perspective.

Explaining spatial proximity effects thus becomes easier. For relations between organizations, the hypothesis by which personal networks are the cause of proximity effects is confirmed in most empirical studies, including the one I have just presented. In these studies, proximity and embeddedness in social networks are just a specific context for emergence of collaborations and access to resources in the emergence phases of new companies creation, but not necessarily a specific mode of regulation of professional or technologic relations. The effects of emergence last more than their causes. But the theoretical framework leaves the possibility of observing other causes, associated with the activity of intermediary bodies or with the setting up of specific mediating systems. It therefore becomes possible to compensate the various contexts for which spatial proximity effects are more or less accentuated and can be explained differently. As the social networks always have a strong local part, if specific mediation resources wouldn't exist, embedding effects would lead mainly to geographical clusters, as it was at the beginning of modern industry with putting-out systems for instance. Mediations resources decouple economic activities from social networks but, according to their own spatial localization and effects, they can enhance local clusters or, at the opposite, they can sustain more geographically scattered systems.

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