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“Conflicts and proximity in cooperation to innovate: French biotechnology Sme’s.”

Introduction :

During the eighties, Italian scholars (Baganasco, 1977, Becattini, 1979, Brusco, 1982) study Sme's of Lombardia. They underline that those Sme's look like to those of marshallian districts. These scholars demonstrate that a short distance between organizations, a great proximity allows agents who are located into the districts to have frequent interactions to circulate information and knowledge needed to innovate. These works show the way to many theories from the "milieux (Aydalot, 1986, Camagni, 1991), national or regional systems of innovation (Lundvall, 1992), scientific parks (Monck et alii, 1988) local productive systems (Courlet, Pecqueur, 1989), clusters (Porter, 1998) or the last type "poles de compétitivité" (DATAR, 2004)¹.

But all these works postulate both the existence and the importance of interactions of proximity for innovation process, what we name "local postulate". That's why we use the economic of proximity (Gilly, Torre, 2000), which allow us to exceed the so-called importance of local space.

Proximity refers to the partition of economic agents and to the importance of social links. It states in geographic terms or organizational terms. Geographic proximity analyses partition of agents in geographic space. This notion is close from Perroux's "geonomic space" and refers above all to the location of organizations, but besides it takes into account their functional distance" (Gilly, Torre, 2000). Geographic proximity refers also to the access to fast means of transport.

Organizational proximity states in two logics:

- the first one, the weaker, is the logic of "belonging". Agents who belongs to the same organization, network or group look like each other from many dimensions activated by interactions;

- The second one is the logic of "similarity". Agents look like each other because they share the same representations, knowledge or know-how.

But neither the first works on districts, milieux, clusters nor those of the economics of proximity take conflicts into account. The first focuses on cooperative dimensions ¹of transfer of knowledge. The second focuses on the analysis of coordination and above all on the causes of it's good working. But conflicts are always risky for innovation projects, because they can lead to non-profitable innovations (Perrin, 2001). Most of theoretical approaches perceive conflicts as cause of breaking of coordination. On the contrary, Commons (1924, 1950) and Schelling (1960) propose a new approach of conflicts. Conflicts are not only a cause of breaking of coordination but also the indication that agents look for evolving the rules of their interactions. The elaboration of varied means of conflict's resolution traduces this search to modify the rules.

In this paper we shall demonstrate that the choice of one means of conflicts 'resolution (cooperative or forcing resolution) explains the articulation between organizational and geographic proximity.

¹ But for any of the authors, conflicts can exist between innovators but they are not the main point of the theory (see Maillat, 1995, for example).

In the first part, we shall see that works about milieux districts, clusters postulate the existence and the importance of the interactions of proximity. The economics of proximity will allow us to exceed this postulate. We shall end the section presenting economic analysis of conflicts and their means of resolution.

In the second part, we shall analyse the industrial organization of biotechnology in France. Biotechnology are not a sector (Morvan, 1991) but are a “set of techniques and knowledge that come from life science to be used in industrial process” Lemarié, Mangematin, 1999. They are interesting to treat our research question, because biotechnology leads nowadays to many conflicts.

Then we shall present the results of a survey of persons in charge of innovative projects led in cooperation with other organizations. We obtain four groups of firms in function of their means of conflicts resolution and of the mobilization of organizational and geographic proximity.

1. From « local works »² to economics of proximity.

The main hypothesis of local work refers to tacit knowledge. This knowledge passes to another agent much easier if the distance between the owner of the knowledge and the receiver is short (Feldman, 1994). Innovative activities use much tacit knowledge. So they would be easier when innovators are closed from each other. In other words when proximity is important between innovators. But this hypothesis relies on what we call “local postulate”, because surveys on innovation don’t always demonstrate such importance of local space (Vedovello, 1997).

In this section, we shall demonstrate that authors of “local works” overestimate the importance of local interactions. This is why we shall use the economics of proximity.

1.1. Importance and frequency of interactions of proximity in local grouping of firms.

During the eighties, little Sme’s of the so-called “Third Italy” achieve such economic performances that they encourage scholars to question their organizational means. Scholars underline the importance of local interactions between those Sme’s and other organizations presents in their environment. These interactions refer both to pecuniary externalities and technological one. They are very frequent because of the short distance between all the firms. They allow the circulation both of information about recent technical development and about the knowledge needed to use it. Any firms leaders on the use of new technical process can ever teach their competitors how to use it. At last, these interactions ensure the development of learning process, which lead the grouping into a virtuous circle of growing (Courlet, 2002, Matteacioli, 1999, Lundvall, 1992).

This analysis will inspire the development of a set of works both at theoretical level and at political one. But in all cases creating local networks of innovators, which allow reducing risks and costs of innovation, must encourage production of innovation.

² Local works is a generic word to refer to milieux, districts, clusters, national and regional systems of innovation and scientific parks.

But all these works postulate the importance of local interactions, because many surveys demonstrate that they are less frequent than theory indicates.

- First contracts of the employees of a local grouping often include any clauses of non-divulgence of know-how. It's often the case of the engineer's contracts in the informatics sector (Dahl, Pedersen, 2003);
- besides, rules of knowledge transactions reduce these interactions, as the example of Japanese transplants in Silicon Valley (Veil, 1997). These firms settle in Silicon Valley to benefit of local innovation networks. But they never manage to benefit from these networks because they don't share the organizational culture of these networks, especially the quick reaction to a proposal of cooperation;
- at last, Vedovello (1997) demonstrates for the innovative firms did not favour scientific parks that local interaction between organizations located into the parks. Cooperations with distant organizations located outside the park were as frequent as the local one.

If interactions of proximity exist, their importance for innovative process is not really demonstrated. Most of "local works" postulate the importance of these interactions because of tacit knowledge. This knowledge can only circulate when the distance between their owner and their receiver is short. Tacit knowledge can't be separated from their owner. They can't be transcribed into a support (book, USB key... Polanyi, 1958). Besides they often can't be expressed in a particular language (natural or with mathematical symbols) because they are often incorporated into gesture sequences that constitute know-how. The one who wants to learn these knowledge must observe the sequence of gesture to be able to reproduce it with the same level of performance. So this implies proximity and face-to face interactions between the owner of the knowledge and the receiver (Senker, 1995). At a consequence, this fact would explain why innovative activities are much more concentrated in geographic space than production activities (Audretsch, Feldman, 1996).

But survey about innovation as CIS questioned this necessity of proximity for innovation process (Freel, 2003). Indeed, these survey demonstrate that firms establish innovative links with distant organization more often than with close organizations. Cooperation with public-funding organisms of research is the only one exception to the rule. But, this kind of cooperation is local only at the level of the region. Even if most of Sme's keep on establishing more local links than big firms (Sternberg, 2000), nowadays, one can notice an increase of the distance between these firms and their partners in cooperation (Keeble and alii, 1998). Firms establish cooperative links in function of resources and competences they need to develop their innovative projects and this whatever would be the distance between them and their partners. Firms intensive on R&D and especially biotechnology Sme's are in this case. They have many cooperations with distant organization and even with firms located abroad. In the Keeble and al's survey 33% of the Sme's are in this case.

Such fact questions the importance of proximity for innovative process, even if in the case of formal cooperation between firms.

1.2. The economics of proximity.

Nowadays, agents can act on a much larger scale in space than before (Rallet, 2000). More and more agents don't limit their action to a local space but act in different level, local, regional, national and even international one. The increase of the ICT and of work at distance make possible to realise one 's productive works in varied places, and not only on the organization place. ICT also increase the cooperation between distant organizations. Such fact implies that one can't presuppose the importance of local space. On the contrary one must use a methodology that allow to analyse the importance of local versus distant interactions. The economics of proximity allows such approach.

This theoretical approach allows to question the importance of proximity to transmit tacit knowledge. If the nature of tacit knowledge implies the co- presence of the owner and of the receiver of the knowledge, nothing indicates that this co presence must be permanent. The main hypothesis of the authors of "local work" is that agents located in a cluster would automatically transmit their knowledge to other agent located in the clusters, because they share the same organizational culture.

But Grossetti (1995) demonstrates on the contrary the importance of networks of ex pupils of engineer 's school, and whatever the distance between them. Exchange of knowledge in this case are not linked to proximity (ex pupils are often very distant from each other) but to the same culture. So this case demonstrates that organizational proximity prevails over geographic proximity. Geographic proximity doesn't function alone. Organizational proximity must activate it (Bellet et alii, 1998).

The economics of proximity allows an analysis of the point in which the two kinds of proximity recover each other (Gilly, Torre, 2000). For example in an industrial districts geographic proximity, which allows to launch the division of work between firms and cooperation, would not be effective without any organizational proximity.

This notion of recovery between the two kinds of proximity is fundamental for this research program. So we shall bring to the fore the cause which will explain the articulation of the two kinds of proximity.

Organizational proximity states in two logic: belonging and similarity. The first is the minimal similarity between agents. Indeed the agents only work in the same formal environment. They only share the same organizational goals (develop an innovation for example). The logic of similarity, on the contrary implies that agents look like each other much more than in the logic of belonging. The second logic is caused by the interaction during the cooperative development of innovation. Similarity can be produced by the interaction if agents manage to build the same representations of the innovative project. But this logic can be not built. We measure this second logic by the fact that agents have developed at least one task in common during the project.

At least, belonging and similarity form a continuum, indeed all situations from belonging to strong similarities between agents can be observed in reality.

We shall define geographic proximity as face-to-face interactions used during the cooperation. This proximity can be of two types:

- the first one qualified of global geographic proximity constitutes the frame in which the cooperation takes place. Proximity can be permanent or temporary

- If firms are colocated or if they remove employees during all the cooperation, and partners in cooperation have face-to face interactions every day, then firms are in a situation of **permanent proximity**;
- If firms are not co-located but interact punctually during the cooperation, then they are in a situation of **temporary global geographic proximity**.

- The second kind of proximity refers specifically to the conflicts' resolution. When conflicts appear in a cooperation, managers have the choice between use face-to-face interactions it as to say mobilise geographic proximity, or only use means of communication (as phone calls, e-mails...) to solve it.

1.3. Economic analysis of conflicts and their mode of resolution.

Economic theory, (especially neoclassic) considers conflicts as causes of rupture of the coordination between agents. So conflicts have been excluded from economic theory for a long time. Schelling 's work will permit to consider conflicts in a new aspect. Nowadays, theory is interested in the resolution of conflicts.

Classic economists are the last who try to take conflicts into account, when they study the repartition of the wealth produced in an economy. But this approach quickly disappears to favour a representation of society, which lead to progress, and the increase of wealth of all the population³. Smith was the first to develop such conception with a representation of society as a world of harmony. As a consequence if Smith recognizes the existence of conflicts they disappear gradually from his analyses. Neoclassic economist will stronger this trend by excluding radically conflicts. They consider that conflicts can be scientific objects for the economic theory because they must be the objects of psychology or political science (Carrier, 1993). On the contrary any heterodox authors will take them into account especially by linking them to the theory of innovation (Commons, 1934,1950). Innovation asks specific questions because it causes conflicts especially conflicts of property rights. Transactions are new in case of innovation (Commons qualifies them of strategic transactions) so the lack of regulation by institutions causes conflicts⁴.

The works of Commons (1934,1950), Schelling (1960) and Wall and Callister (1995) allow us to demonstrate that conflicts between agents make evolve the rules framing their interactions and as a consequence the means of coordination.

³ Marx is the only author who studies conflicts as a theoretical object. Besides conflicts are central in this approach. Class struggle is the engine of the dynamic of capitalism. We exclude this kind of approach of our analysis, because Marxist theory is a theory of revolution and of the destruction even if temporary of society. We define conflicts by excluding the most violent of them, which lead to revolution.

⁴ Commons considers as normal this lack of regulation. Conflicts allow the evolution of the rules that frame the transactions between agents. Indeed, in case of conflicts agents can go to the Court. So a judge chooses the best resolution of the conflict funding on the rule that makes consensus in the industry. But the judge can also invent a new solution. This solution will be used in all the similar cases after the first judgment. So the judge is a central actor for Commons because he has the power to make society evolves.

Conflicts can be defined as (Gallaud, 2005): any kind of tension or disagreement perceived by the two parties and traducing an opposition of their interests. This opposition can lead to threats and/or reprisals on material resources or goals of one party. However they are not breaks of coordination but also the evidence that agents are looking for modifying the rules that frame their interactions, and this to be able to keep on their transactions in the future, especially in the case of cooperation”.

The fact that agents try to modify the rules that frame their interactions traduces by the elaboration of different kind of conflicts resolution. Gobeli and alii (1998) defines four kinds of conflicts resolution:

- concertation, which implies that all agents recognize the existence of the conflict ant, try to elaborate in common a cooperative resolution. The resolution should result of a consensus between agents⁵;
- “give and take” resolution, manager listen to all parties in conflict and make a proposal which is acceptable for all parties, on the basis of reciprocal concessions;
- forcing resolution, managers impose a resolution to one or both parties;
- avoiding behaviour. This is not really a means of resolution because managers deny the existence of the conflict, so they do nothing to solve it and wait for the conflicts solve by himself.

To conclude conflicts are not only the sign that the interests of agents oppose but also the one of they are trying to modify the rules of coordination. This lead to the elaboration of varied kind of conflicts’ resolution. This different kind of conflicts resolution mobilise organizational and geographic proximity in various ways.

2. Proximity and conflicts during innovation in cooperation in French biotechnology Sme’s.

Activities of biotechnology don’t constitute a sector (Morvan, 1991), but a “set of techniques and knowledge from life science and used in industrial process” Lemarié, Mangematin, 1999. Nowadays, pharmaceutical sector, chemicals and agriculture use these techniques.

OECD (1999) defines these techniques as the key technology, they are perceived as the engine of a future growth for European countries and especially for France. So authorities try to develop them and to sustain these activities by specific politics (helps for funding, subventions...). In 2001, 625 Sme’s of biotechnology are located in France (Lhuillery, 2003), which put France among European countries, which have most, develop those activities (Senker, and alii, 2001).

⁵ Cooperative resolution should not be surestimated. Managers must solve conflicts and in many cases, even if managers ask the participant to cooperation to elaborate a common resolution, it’s the manager who takes the decision of solve the conflict in one way or in another way.

These activities are interesting to analyse the articulation of organizational and geographic proximity, because many conflicts take place nowadays in biotechnology. Any of them are widely broadcast⁶. We have studied conflicts of property rights linked to the development of innovation in cooperation and the conflicts of goals or technical specification of innovation.

2.1. Industrial organization of French biotechnology Sme's.

Biotechnology have modified in important way the organization of production in the pharmaceutical sector, and rationalized the organization in agriculture by reducing cycles of production. They have converted pharmaceutical and agro chemical from scale economies sector to science-based sector (Pavitt, 1984). Indeed the traditional ways of production in these two sector consists in "random selecting" a large number of molecules having possible effects (as a medicine for example). Then these molecules are tested one by one to select the one, which will be a candidate to a new medicine or a new agrochemical substance. Then the molecule is tested in the clinical system (known as phase 2, Depret, Hamdouch, 2001). The traditional ways of production is based on a random method, is even qualified as "random drug process". So the bigger firm have an advantage in competition with this system, because they can test more products than the Sme's.

On the contrary biotechnology allows firms to find directly the good molecules to develop a new medicine or agrochemicals products, because firms use their knowledge in life science to discriminate between all possible molecules.

In agriculture, one must distinguish between agrochemical activities, which are similar to the one of pharmaceutical sector, from a set of heterogeneous activities. The second kind can be qualified of vegetal biotechnology (molecular marker, for example). Biotechnology make evolves production of seeds with the introduction of GMO's, but besides these activities a great part of seed production is always made in a conventional way of selection (Arundel, 2001).

In 2001, there were 625 biotechnology Sme's in France, they employed 125 000 persons (Lhuillery, 2003). 50% of these Sme's are less than 10 years old, 84% are independent Sme's. They can be divided into Sme's elaborating products or using biotechnological process (296 Sme's) or in Sme's of support (especially in the council sector, 232 Sme's). Most of them are small, 49% employ less than 20 salaries and 42% 20 to 499 salaries. If we only consider Sme's elaborating products or using process 65% have less than 20 salaries. This fact can be due to the fact that these firms are recent 60% are less than 10 years old. Ile de France is the first region of location of these Sme's (23% of the 296 Sme's elaborating products); Rhône- Alpes is the second region with 15% of the total. Alsace, which is the third region of settlement, groups only 7% of the total. Almost all the Sme's are concentrated in only two regions of France, which is conform to the general location of industry but causes any problems for the politics of local development.

⁶ We have not taken into account the conflict about GMO's between consumers and political power (Hommel, Godard, 2002) and neither the conflicts between pharmaceutical firms and biotechnology Sme's studied by Campart and Pfister, 2002, because this conflict refers to patent infringement and we are interested in the production of innovation. So we are interested in the process of development of a new innovation and not to the diffusion.

2.2. Resolution of conflicts and articulation of proximity in biotechnology.

We have surveyed 80 managers of cooperative projects of innovation in biotechnology and get the next results.

Most of cooperations take place between one Sme's of biotechnology and public organism of research (56% of the total of cooperation), or between the same and its customers (24% of the total). So they are in most cases bilateral. Besides most of cooperative agreements are concluded between distant organizations. Such a fact implies that organization don't choose to cooperate specifically with closer organizations (located in a cluster for example, included in the case of the cluster exist and the organization needed to cooperate are located into the cluster).

So in the case of cooperation with public organism, this organism is located in the same region that the innovative firms in less than 47% of the cases and in an another region in 40% of the cases, at last in an another European country on 13,3% of the cases. Cooperation with customers is less local as 63,2% are concluded with customers located in another region. Only 10% of the agreements are local. Such a fact implies that most of cooperation takes place into the frame of global temporary geographic proximity (72,5% of the cases). Indeed, organizations cooperating are not located in a cluster.

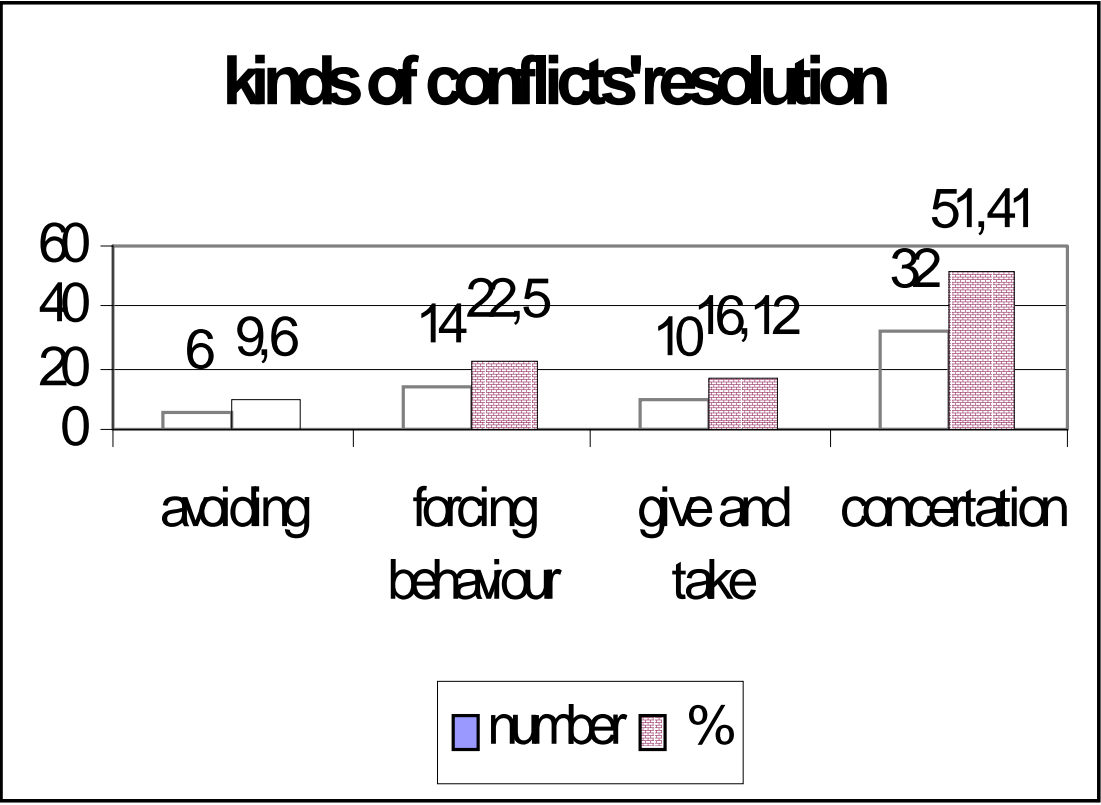
Permanent global geographic proximity is very weak (14% of the cases). But another result appears, any firms which are not located in a cluster near their partners of cooperation, have not used any kind of geographic interactions during the project .We can qualify this kind of relation of absence of proximity (14,5% of the cases).

Most of conflicts⁷ during the project refer to the goals or technical specification of innovation (37,5% of the total) or property rights (21,25% of the total) and a kind of conflicts named "others"⁸ (22,5% of the cases). Conflicts are solved by concertation in 52% of the cases, by give and take in 16% of the cases. The two cooperative resolutions represent 70% of the resolution. Forcing behaviour represents 22,5% of the resolution and avoiding only 10%. Managers choose very few this last means of resolution.

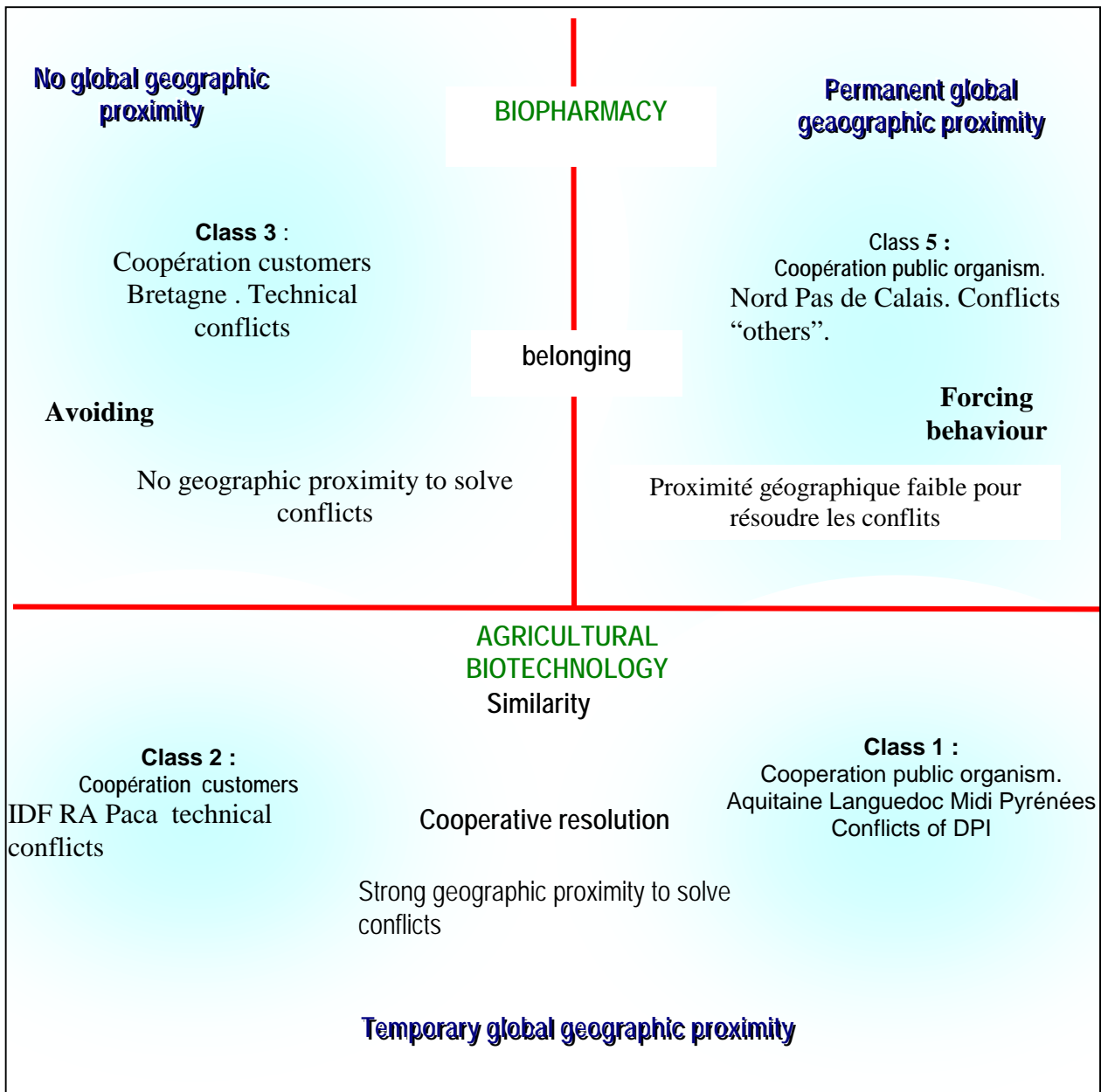
We have used a hierarchical classification that allowed us to obtain a typology of the cooperation of biotechnology function of their modes of conflicts resolution and their mobilization of organizational and geographic proximity. We obtain four groups of firms as indicated in the following graphic.

⁷ Questions about conflicts lead to a high number of non-answers, so our survey is reduced to 62 managers surveyed.

⁸ This category gather conflicts linked to organization of work into the cooperation and personal disagreement between members of the cooperation.



Graphic 1 : *Kinds of conflicts' resolution (Gallaud, 2005).*



Graphic 2 : *Conflicts ‘resolution and articulation of proximities.* (Gallaud, 2005).

- the first class (in the lower dial of the graphics) gathers cooperation that take place in a frame of global geographic proximity temporary. Managers solve conflicts using concertation that lead to the following articulation of proximities. Organizational proximity follows a logic of similarity. Managers use a lot of geographic proximity to solve conflicts (they travel more than one time to solve the conflicts). Besides, it's the firms located in Aquitaine, Languedoc Roussillon and Midi-Pyrénées which choose these kind of conflicts' resolution. They are specialized on agricultural biotechnology. They cooperate with a public organism. Conflicts refer to property rights between firms and public organism;
- the second class gathers cooperation, which take place in a frame of global geographic proximity temporary (lower dial of the graphics). Managers solve conflicts using give and take resolution. They present the same articulation of proximities that the previous class. But firms are located in Ile de France and Rhône Alpes PACA. Cooperation take place with customers and conflicts are linked to technical goals of the innovation project;
- the third class (left upper dial of the graphics) gathers cooperation with distant organizations and with no interactions during the project. So the global frame is the one defined as global absence of geographic proximity. Managers solve conflicts using avoiding behaviour. This case is linked with the following articulation of proximities. Organizational proximity is in a logic of belonging and geographic proximity is not mobilized to solve conflicts. Managers use only means of telecommunication to solve conflicts. Besides firms of this type are located in Bretagne, Centre Pays de la Loire they are specialised in pharmaceutical biotechnology and are small. They cooperate with their customers to innovate. Conflicts are linked to technical goals of the innovation;
- the last class (right upper dial of the graphics) gathers cooperation, which take place in a global geographic proximity permanent. Managers use forcing behaviour to solve conflicts. This lead to the following articulation of proximity. Organizational proximity is in a logic of belonging and geographic proximity is little used (only one travel to solve conflicts. Firms are located in Nord pas de Calais, Picardie and Alsace. They are specialised in pharmaceutical biotechnology. They cooperate with public organism and suffer conflicts qualified as "others".

| | Class 1 | Class 2 | Class 3 | Class 4 |
|---|----------------|----------------|-------------------------------------|----------------|
| Kind of conflicts resolution | Concertation | Give and take | avoiding | forcing |
| Organizational proximity | similarity | similarity | belonging | belonging |
| Geographic proximity to solve conflicts | strong | Strong | Not used. Only telecommunication | weak |
| Kind of biotechnology | agricultural | agricultural | biopharmacy | biopharmacy |

Tableau 1: *Conflicts resolution and articulation of proximity (Gallaud, 2005).*

Conclusion :

Conflicts were used to be perceived as causes of breaking of coordination for a long time. But they are also the sign that agents look for modifying the rules that frame their interactions. Such a fact can be seen in the various kind of conflicts' resolution that agents elaborate. This is why conflicts constitute a privileged moment to examine the coordination process. The choice between various kinds of conflicts' resolution (cooperative or forcing resolution) appears to be liked to various articulation of proximity.

We select firms for the survey using the following databases Biotechnologie France <http://www.biotech.education.fr>, réseauftei.com, Kompass.com. We surveyed the managers in charge of cooperative R&D by phone calls of about ten minutes, in May 2003. To be included into the survey, the firm must have ended one innovation in cooperation since 1995, or since their creation. Because most of these firms develop many projects simultaneously, we asked to the managers to choose one randomly among the projects in development. Firms were located in entire France except Normandie, Champagne Ardennes, Lorraine, Franche comté, Limousin, Poitou Charente, Corse and DOM-TOM, because the number of firms located in these regions is too small. We get 80 answers that give a rate of answers of 17,5%. Conflicts are a "sensitive" topic for firms. So we can't survey them asking directly about their conflicts. So we use the word "obstacles", that introduce a bias, but that seems reduced because we indicated a list of possible conflicts into the questions.

Methodology.

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