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On the analytical dimension of proximity dynamics

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Introduction

The term Proximity is fashionable. It is displayed in shops, on advertising boards, and also in the works of economists who never used to be interested in this notion before. The recent interest in the subject could be alarming, because, in the field of economics, modes and concepts are fugacious. However, the appearance of works dedicated to this new notion should make us think about the reasons for the emergence of a field of research which, not so long ago, was doomed to anonymity. Indeed it often reveals social evolutions or analytical insufficiencies of theoretical approaches which cannot describe all aspects of reality.

The increased use of the word proximity is recent but it has been important in economic literature, in particular with authors interested in the question of space, either in districts, milieux, technopoles, distances analyses, or in the recent advances of economic geography. The interest has even gone beyond this field and has now touched the works dedicated to the process of innovation, and the link between science and industry, the relations between users and producers, the national systems of innovation, the innovative milieux, the local labour markets, or city policies. The interest is directed towards the research made in an evolutionist framework, or even the research concerning transaction costs, towards the question of site specificity for instance. The interest has been important enough for a special issue of the Cambridge Journal of Economics (1999) to be published on the subject of proximity and knowledge relations. One must remember that proximity has always had an important significance in mathematics, geography, or

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in the analyses of technology … (see Bellet and Alii, 1998 on this topic).This new interest in the questions of proximity can be linked to a recent trend in economics, and in particular in spatial and industrial economics which are more and more dedicated to the analysis of the environment of the enterprises. Research which used to focus essentially on independent firms and on the way they function internally has now turned towards the ensembles within which they are inserted, whether them be productive systems or networks of production and innovation. The firms behaviors are nowadays explained to a great extent by their productive and institutional environment and by the relations of exchange, competition and co-operation which they keep with other economical actors, often located at a short distance, within the framework of interaction strategies. If the approach is taken seriously, the study of the relations of proximity is nothing but the extension from the initial framework of the analysis of industrial strategies to the taking into account of the localised environment of the firm, which becomes crucial and liable to new approaches (Lawson 1999).

Within this program of research on the questions of space and proximity, a pioneering role has been taken in France since the beginning of the 1990s , by the " Proximity Dynamics" group made of industrial economists interested in space, and spatial economists interested in the subject of enterprise and organisation. This group has started a collective reflection aiming at displaying convergences and coherence in the ensemble of new theoretical approaches of the economic space. This reflection lies on the common belief that space is not neutral and must be taken seriously by analysis. As soon as the group was put together, the ambition of the proximity economists was (and still is) to explain the nature of the effects of proximity and to contribute to the endogeneisation of the space variable in the economic theory.

The results of the research conducted by the French school of proximity are introduced in this article, which aims at emphasising some of the main topics concerning the theoretical definition of proximity relations. This paper has then two Parts. The first Part is devoted to a survey on the role of the notion of proximity in economic analysis, including standard and non standard analyses, and a presentation of the definitions of the group "Dynamics of proximity". In the second Part we start a discussion about the central role of various interactions and the economic co-ordination questions in the evolution of proximity relations analysis.

I. The notion of Proximity in economic analysis

The interest given to the notion of proximity is recent. However this question has been present in economical analyses for a long time, even though it only appears incidentally or discreetly. After all, economics characteristically ignores the concept of space ! Let us remember, without tediously listing all the literature dealing with the term of proximity, that this notion holds an important place with some authors who deal with the integration of space in the economical analysis, the most important of whom are Von Thünen and Marshall.

Von Thunen (1826) thinks of proximity from the angle of the advantages of location. He offers an explanation of the location of urban and agricultural activities which emphasises the economical strengths at the scale of a city surrounded by an agricultural landscape. The locations of the first order are situated in the centre of the system, whereas the others follow decreasingly the concentric circles. In this case the proximity of the city is sought after, the annuity offered according to the location originating from the differences of transport costs. This concept can be found in several theoretical works inspired by the Thunenian scheme. For example, Alonso (1964) and Fujita (1989) privilege the study of the urban occupation of the ground but they always put in the foreground of their analysis the proximity of the town centre. As shown by the New Urban Economics, this variable is a decisive factor in the allocation of land for industrial, commercial and residential uses in urban areas, and in particular, in the implantation of so called proximity shops.

The contribution of Marshall (1890), more often mentioned, constitutes at once, the starting point of studies in terms of economies of agglomeration and of the more recent analyses in terms of industrial districts. As a matter of fact , Marshall emphasises the advantages for enterprises of being close to each other. This benefit gained by proximity originates from the spatial division of labour and even from the effects of localised spillovers illustrated by the famous saying : “ the secrets of industry are in the air ”. The advantages of production on a large scale can be found thanks to the concentration, on a given area, of several specialised firms related to the same labour market. In this case, however, as with Thunen, the black box of the proximity externalities is not open and the analysis lies essentially on a study of the phenomena related to the dynamics of proximity, without the secret of their origins being really lifted.

I.1 The notion of proximity in standard analysis

Even though the question of proximity is present in many standard approaches, the word itself is seldom used, often hidden by references to more technical concepts. Thus, the analysis of the role played by geographical spillovers within agglomeration processes occupied, for a long time, an important place in traditional literature, and in particular following the publication of works lead by Marshall on the subject. The works of geography on the role of information in the urbanisation process (Pred, 1966) is one example ; those dealing with the place occupied by inter personal contacts in the setting up of localised inter action process (Utterback 1974) is another. Lucas deals with the same concept (1998) when he considers the reasons why economic agents concentrate in the centre of Chicago or Manhattan, even though those areas are more expensive, sometimes uncomfortable, and so many cheaper areas are available everywhere else. The answer is simply that they wish to settle close to each other. In this instance again, proximity is at best considered as a causative variable, with valuable virtues, without its ingredients being really studied.

Strangely enough, some parts of the research carried out in the field of the new geographical economy were motivated by a very similar concept. The agglomeration phenomena studied by Krugman (1991) and by many other authors afterwards originate from an hypothesis favourable to proximity, as the need for the concentration of agents and firms is constantly highlighted. It is already the case in the approaches in terms of spatial externalities (Papageorgiou and Smith, 1983) which lie on the hypothesis according to which individuals have a fundamental propensity to interact and to seek social contact, considered as a basic human need which is not necessarily fulfilled on the market. Each agent benefits in this case from positive spatial externalities produced by others. The intensity of these externalities diminishes with distance. It is the very existence and the properties of these externalities which encourage the agglomeration process, as the agents looking for contacts try to get closer to each other. The initial spatial equilibrium can then be overturned if the preference for contact becomes important, and explains to some extent the formation of cities or spatially concentrated geographical areas. The need for contact is considered here as fulfilled by the physical proximity between economical agents ; but this has not been proved yet. The models of economic geography aim at building, on this basis, a theory of the formation of cities, by extending the need for contacts to the case of enterprises. (Ogawa and Fujita, 1989). In this case, it is the exchange of information during the process of

production which is highlighted and which the firms look for ; information being considered as an impure public good whose conservation and acquisition are encouraged by the concentration of agents in the same space. Producers then tend to spatially concentrate in order to benefit from these positive externalities of proximity, i.e. information which circulates more easily on a restricted perimeter and whose message tends to be diluted when distance increases.

The approaches of the New Economic Geography which deal essentially with the analysis of increasing returns, relate less directly the process of polarisation of the activities to the existence of proximity relations. They generally insist rather on the presence of transport costs (Krugman, 1991) and of mutual relations between local enterprises (Venables, 1996) ; or they emphasise factors like indivisibility or the preference for variety whose spatial dimension has not been verified. However, the analyses in terms of spatial competition, have tried, since Hotelling (1929), to find a solution - different according to the situations studied - to the following question: must the firms be localised close or far from other firms? The answer given depends to a large extent on the prices and degree of products differentiation. Choosing to settle far from one's competitor balances the strategy of product differentiation. As a result, if the products are not differentiated, it is judicious, for enterprises to choose spatial differentiation; the principle of substitution between geographical and spatial differentiation, can as a consequence be stated.

The reference to Hotelling is primordial, because he has shown that competition for purchasers constitutes a centripetal force which pushes traders to concentrate in the same areas. The basis of the Hotelling analysis is well known today: consumers are situated along a linear city, considering the location of two enterprises. The prices not being taken into consideration, it would be in the firms interest to settle in the centre of the market (Nash equilibrium in pure strategies), possibly opposite one another in order to maximise access to purchasers. But this does not necessarily apply when prices are introduced (d'Aspremont, Gabszewicz and Thisse, 1979). The situation of spatial differentiation of products is going to have a strong influence on the enterprises by forcing them to lower their prices, in the second part of the game, so that they can try to appropriate the whole market, in particular if they are localised close to each other. For this reason, the firms are rather going to choose to settle at the extremities of the market and will privilege separation in space rather than proximity. Price competition is known to be a centrifugal force and proximity is only sought for in the case of product differentiation. Therefore there is a substitution between geographic differentiation and product differentiation, sellers struggling

against the centrifugal effects of price competition with product differentiation, in order to get closer to consumers and to their idiosyncratic behaviour.

As a whole, these models are all characterised 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 (advantage of the market) or to competitors (positive externalities). 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.

1.2. Opening the black box of proximity relations

The studies examined here have by two main characteristics. The first one is an interest in the relations of proximity. The second characteristic is the fact that these relations are considered as causative variables, without their content being ever considered. Other works, of different nature have tried to open the black box of the externalities of proximity by attempting to highlight their significance as well as their different contents. These works more often focus on the question of firms and on their search for links of proximity.

The traditional filiation of the analysis of the factors of localisation in terms of economies of agglomeration, issued from the works of Marshall and Hoover, has recently been challenged by some works of research aiming at opening the black box of the externalities of proximity and at explaining, not only the search for proximity, but also the very causes of the production of these external effects. The empirical foundations of these approaches are built by works which emphasise the virtues of the localisation of several enterprises in a limited area. At a more analytical level, three main blocks of research can be schematically distinguished. They give different explanations to the process of concentration and the spatial " lock in " of enterprises : (1) the specificity of the human capital, (2) the flexibility of the process of production and the importance of untraded relations and learning attitudes and (3) the development of innovations considered as a factor of knowledge.

(1) Becattini (Pyke, Becattini and Sengenberger, 1990) carried out the first research on localised production systems, at a time when the signs of competitiveness between small firms located in the same area, first appeared. Taking the evidence into account, he went back to the old

notion of district initiated by Marshall to qualify some zones of local growth of industrial districts. The basis of analysis is no longer one isolated firm, but rather a group of small enterprises in contact with each other and situated in a given area. The most obvious characteristic of the industrial district is the networking of many small firms in a geographical perimeter, through relations of competition and co-operation. But the most important question for us resides in the analysis of the causes of the localisation of firms and their fidelity to a given geographical area. The industrial district is not the result of a concentration of firms initially attracted by favourable factors, such as primary resources for instance. Rather, it is an organisational settlement in the territory which makes the " disengagement " from relations to an area or a local system difficult for producers. This privileged link is due to the existence of externalities of proximity which constitute a common asset available to all within the district. These externalities generate positive external effects and are at the origin of a " lock in " of the firms in this zone. One of the main components of these externalities is the presence of localised human resources with specialised know-how, which increases with successive learning. This presence has two characteristics which are at the origin of the production of externalities of proximity. First of all, enterprises are bound to find, in their immediate environment, skills which they would have difficulties in finding in other places, which contributes to their fidelity and which increases their preference for the district. Besides, many workers, once trained, can become independent entrepreneurs within the same area.

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

According to some authors (Glasmeier, 1988 and Maskell, 1998) the key to the performances achieved by these systems, must be looked for in the internal production of the externalities of proximity which leans on two main elements: the existence of a flexible internal

organisation and the importance of the untraded relations. The communication between potential rivals is presented like a pledge of flexibility in a system which " commands " rapid changes linked to the great volatility of markets and modern technologies. The facility and frequency of the interactions are at the origin of the creation of a local network in which the firm fits, so that it can benefit from technological advances and even from more recent discoveries, and share them with its neighbours. This sharing of information is often carried out informally and therefore does not lead to transactions, the diffusion of knowledge being carried out by recurrent interactions and by the circulation of workers between the different firms of the site. A similar idea exists in the analysis of national and local systems of innovation (Lundvall, 1992, Nelson, 1993). It lies on the sharing of skills within a group of localised firms or within innovation milieux (Bramanti and Ratti, 1998). Maskell and Malmberg (1999) show how proximity matters, in particular thanks to the interactive character of the learning processes, which provides a geographical dimension to the relationship. In this case, the benefits of proximity change into agglomeration forces, by acting on the firms engaged in the interaction process.

(3) The third track of analysis is found in the so-called geography of innovation (Feldman, 1994) which emphasises the process of concentration of innovation of space, be there regions or smaller geographical areas, and directly introduces the notion of proximity into the analysis. Innovation, as shown by Hagerstrand (1967) in his pioneering work, 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 the new technologies. Moreover the link between this movement and that of the spatial concentration of the industrial activities (Jaffe, Trajtenberg and Henderson, 1993) is made, so that the analysis of the causes for the localisation of the firms and for the competitivity of these production areas lies not only on the industrial relations but also on the science industry relation (Anselin and Alii, 1997).

The explanation refers to the very nature of knowledge, which is presented as not totally appropriable and thus liable to cause spillover effects from an enterprise or institution towards another. The localised character of transmission is explained by the fact that "knowledge traverses corridors and streets more easily than continents and oceans " (Feldman, 1994). Thus, the industries, characterised by the importance of the spillover effects, see their competitiveness increase in the case of geographical concentration (Audretsch and Feldman, 1996). The

externalities of proximity are caused by the very characteristics of knowledge. Innovation is, then, considered as a cognitive process, different from information, which can be transmitted at distance without any loss ; whereas the transmission of knowledge cannot be made in a totally standard manner. The first stages of the development of technology necessitate communication between actors, recurrent interactions, which are essential to the establishment of codes and common languages, a process of interpretation and of translation of partial tacit knowledge, and the transformation of this knowledge into operational questions (Amin and Wilkinson, 1999). This process of successive improvements is facilitated by the proximity content of direct interactions which allow reciprocal exchanges during the process of innovation and production. Rallet and Torre (1999) show, however, that this hypothesis must be considered with care and that the assimilation between tacit knowledge and proximity relations is not always verified in the case studies.

Except for some few works carried out a few years ago in the field of transaction cost analysis on the questions of asset specificity of site (Jeskow, 1985) the analyses of the relations of proximity situated outside the field of local systems are still rare : Eymard Duvernay (1997) wrote on the question of labour, Huriot (1998) on the policy of cities, several authors in favour of a conception of the firm as a nexus of contract solicit the notion of geographical proximity, which generates informal exchanges, in the exploitation of learning creating horizontal co-ordination mechanisms (Aoki, 1990). However, the concept of proximity cannot be reduced to the economic approach only; disciplines like geography, sociology or agronomy have been interested in the concept. Let’s take as an example, the contributions of a formalised type, to the elaboration of this notion (Gutmann, 1968, Kruskal 1964) which could turn out very useful in future developments of analysis and be mobilised for a stricter definition of the relations of proximity. As shown by Largeron and Auray (1998) there exist various mathematical definitions of proximity relations, all of an Euclidean nature, but one can easily imagine other topological or pre-topological measures (Matula and Sokal, 1980). For example, in the case where the distance between i and any item, y belonging to the ensemble A, is inferior to a threshold t, i is then in the proximity of A and every i possessing the same properties is also in the proximity of A (Auray and Alii, 1998). Moreover proximities can be many and can induce the creation of different

neighbourhoods according to the criteria taken into account. Applications of these approaches are found in recent literature (Zimmerman and Steyer, 1998)

I.3. Geographical proximity versus organisational proximity: the research lead by the group "Proximity Dynamics"

Non standard research has been carried out, in France, on the characteristics, the effects, the advantages and drawbacks of the relations of proximity. This research was launched by an informal group of industrial economists called «Proximity dynamics» focussing on the spatial dimension concerning the enterprise and the organisation. This group of around thirty members carried out a collective work aiming at pointing out the coherence and the consistency of the new economic space approaches and to explain the very nature of the proximity effects. The point of departure was that space matters in the industrial economic analysis. Consequently, the objective of these economists was (and is still) to endogenize the spatial variable in the economic theory. Different collective works have been carried out in the last few years by the " Proximity Dynamics " group (see Bellet, Colletis, Lung 1993 ; Rallet and Torre 1995 ; Bellet, Kirat, Largeron 1998 ; L'Industria 1998 ; Gilly and Torre 1999). Their activities include the publication of research works and the organisation of scientific discussions on questions related to the group's central thematic.

Beyond the novelty of the concept, this research work lies on the following : the existence and the permanency of the links of proximity between people or enterprises, which contradicts the hypothesis of a destructive globalisation of local relations but also the opposite hypothesis suggesting the ineluctable race towards polarisation. The thesis according to which the increasing importance taken by telecommunications and international exchanges could lead to the disappearance of local relations in favour of decentralised relations such as the generalisation of telecommuting or the localisation of families outside metropolises, is contradicted to a large extent by the empirical evidence. And so is the thesis of exclusive monopolarisation within dominating ensembles, which suggests that the concentration of activities at the heart of the metropolis are established in the univocal mode of the centre-periphery hierarchy. The thesis defended here is not as categorical. It is the significant statement that human grouping and networks of poles have not disappeared.

The position of our researches is not a blind defence and illustration of the proximity virtues. We are aware of the advantages and the dynamism the proximity relations can bring about, but they can also be a factor of mistrust or brake. Proximity plays a role, whether it is considered as a causative variable or as the consequence of human activities. It emerges in a relational conception of the economic reality and of the social reality (in the sense of Bourdieu): this notion deals both with the economical, geographical separation of the individual or collective agents endowed with various resources, and with their close position in an economic problem resolution process. In this frame, our spatial-industrial problematics have two dimensions namely organisational proximity and geographical proximity.

The organisational proximity is based on two types of logics:

- according to the adherence logic, the actors close in organisational terms belong to the same space of relations (firms, networks,...), that is, they are in interactions of various nature (see after) ;

- according to the similarity logic, the actors close in organisational terms are quite alike, that is, they have the same reference space and share the same knowledges. In this case, the institutional dimension matters.

Concerning the first case, the adherence depends on the effectiveness of the coordinations, while in the second case, the similarity depends on the closeness of the representations and functioning modes. These two logics can be both involved. For example, when an adherence relation based on horizontal intra-industrial relations implies the emergence of interdependencies between organisations, characterising a similarity relation (or institutional proximity) between actors.

While the organisational proximity deals with the economical separation and the relations in terms of organisation of the production, the geographical proximity deals with the separation in the space and the relations in terms of distance.

The geographical proximity refers to the notion of geonomic space, in the sense of Perroux, that is, it deals with the localisation of the enterprises and involves the social dimension of the economical mechanisms, sometimes called functional distance. In other terms, the references to the physical and natural constraints in the definition are not sufficient. The

geographical proximity implies also some aspects of the social construction as the transport infrastructures, which can modify the access time, or else the financial means allowing the utilisation of some information technologies.

The articulation of these two main components of the proximity (organisational and geographical) brings about and justifies the relevance of the «Proximity Dynamics» group researches.

Our research object involves these two types of proximity, because space matters in the relations of an organisational nature. The empirical studies seem to confirm this analytical position. For example, an industrial district combines the two types in its definition: the enterprises involved in the district are linked both in terms of adherence and similarity. However, these enterprises have also a functional distance between them. Then, when an enterprise looks for a specific external know-how, both the nearest productive environment and the choice of enterprises having this specific competencies matters (the ideal being often to combine these two elements). The question of the scale of space considered, or that of the frontier between what is close and what is far can be dealt with in a technical manner by the use of thresholds which introduce appropriate partitions to the type of relations considered (see Auray and alii, 1998). The question can, in a conventional way, lie on one rule which keeps the social dimension of geographical proximity of the following type: the economic agents or individuals are considered close geographically when they have daily face to face relationships.

Besides these two basic definitions, the proximity concept can be analysed according to some various dimensions. For example, the circulatory dimension of the proximity depends on the characteristics of the markets segmentation and of the productions steps: intermediary or final products, information and people have to circulate, implying transport costs and time but also some characteristics like the quality, the liability, the security ... This dimension allows to catch the link between the two types of proximity (organisational and geographical) including besides the spatial aspect of the accessibility, the organisational aspect concerning the operationality of the flows and their interconnection. Moreover, another dimension, the relational dimension, interacts with the circulation dimension because the transformation activities and the activities concerning the interactions individual-individual are distinguished. This last dimension takes into account the relations between the individuals (the social networks), considered as the basis of the

organisational relations, involving sharply the productive aspects. The institutional dimension of proximity, very close to the logic of similitude of organisational proximity expresses the adhesion of agents to a common space of representation, of patterns, and of rules of thought and action.

II. Interactions and co-ordination at the heart of the definition of proximity relations

Once the definition of both notions of proximity is given, one must consider the components of these relationships and analyse more precisely their contents as well as their effects on the processes of economic dynamics. Two elements deserve to be highlighted: the interactions between actors and the modalities of co-ordination, which play an essential role in the integration of space into economical relations.

The definition of the proximity refers to the existence of interactions between economic actors or based on a technical origin, and also between actors and objects. These interactions have a spatial as well as an organisational nature. This is the very ground of the proximity notion, which refutes the exclusive reference of the transport costs as it is in the standard analysis. According to that, the relation established by Marshall, Young or Becattini between the division of labour and the enterprises localisation is at the origin of the proximity recognition involving the social and economical dimensions. As well, the enlarged conception of the interactions including the spatial dimension leads to a renewal of the co-ordination problems analysis, involving the proximity relations.

II.1 The central role of interactions

Various forms of interactions can be distinguished. They can be formal or informal, market or non-market, they can refer to the agents-agents relations (in the adoption and diffusion of innovations for example), or the agents-innovations relations (collective innovation activities), or the innovations-innovations relations (technological complementarities), etc. The interactions are sometimes distinguished whether they are intentional (in reference of market exchanges, contracts, co-operation, partnership) or non-intentional (because of the technological externalities, or according to the technological atmosphere of Marshall). Then, a frontier between the elements depending on the actors actions (intentional interactions) and the elements depending on the technical or distance conditions (non-intentional interactions). In this way, this

distinction grounds analytically the introduction of the economic actors action in the proximity analysis, while it also includes factors as the existence of non rival goods, environmental factors, or the research on diversity.

- ***non intentional interactions***

We refer here to an old tradition originated in the works of Marshall and Hoover, which was developed in the regional analysis especially with agglomeration economies. The externality notion behind this analysis has to be deeper studied according to the recent economic literature. A set of interactions including the spatial and the industrial dimensions could then be highlighted with this notion. Moreover, this notion, added to the two types of proximity, highlights the process of development and «agglomeration» at the local level.

According to the debates on the externality notion, two tightly linked dimensions can be pointed out about this notion. These two dimensions concern either the market relations or the non market relations. The technological externalities, external to the firm but internal to the industry, refer to non-market interdependencies. Numerous studies can be found in the literature dealing with the spatial and regional economy problems, and especially in their inter-sectoral dimension. The path dependence property appears to be a key factor in our approach. This property reveals that the agglomeration and localisation factors resulting from the external effects between firms, can quickly have an irreversible dimension within a given territory. In these conditions, the success of the adoption of a specific trajectory (right or not) depends on an essay-error process rather than on the intrinsic superiority property of the selected technological scheme. For example, when firms settle down within a production area in order to take advantage of local external effects, the path dependence constraint can prevent them to reach their objective.

Paradoxically, according to recent researches carried out by the new economic geography, the pecuniary externalities can be taken into account in the analysis for the notion of transport costs. In fact, they refer to market relations, and especially to prices effects, more tangible than non-market externalities. They appear quite interesting in the frame of our analysis because they reveal the polarisation capacity of large enterprises or groups of enterprises at the local level. These enterprises have traditional relations like buying, selling, subcontracting, or else the relation between the production of the firm and the firm products consumption by the employees.

- ***voluntary interactions***

This aspect concerns the basis of the agents action, whether the individual action (even socialised) or the collective action.

First, the frequency of the interactions is a dynamic factor contrasting with the static aspect of the firms localisation motives. The evolution of the system, the attraction/repulsion processes between agents, organisations and activities depend on the density and the length of the interactions. The density of interactions implies the number of interactions, but also their duration, and their transitivity degree. The density level changes through time. It is a proximity indicator concerning organisational proximity, spatial proximity, or both. The analogy with some of the technological innovation process analysis (especially in the work of Rosenberg) is quite noticeable. These analyses consider that the existence of tight interactions is a key factor to identify the proximity links between the actors. Consequently, we can say that the geographical proximity is associated to tight interactions, whether the distance is only possible when the interactions are less tight or already existent. However, as Granovetter (1973) has demonstrated, there is a high number of non-standard information even in the case of low interactions. Consequently, if the density is a proximity indicator, it also reveals the limits of the proximity in the case of its exclusive utilisation.

Concerning the intentional interactions schemes structuring the agents strategies, our approach focuses on those which imply some relationships with other partners, but not competition relationships or threats. They can be relations of co-operation, confidence, technical exchange of information, partnership, etc. Some of them are only grounded on a relational basis (for example the confidence of ones neighbours), but some can also ensure the neutrality of a third partner in an economic activity. The relations on which we focus have a productive or organisational dimension because the firms, their strategies and their environment are mainly concerned.

The interactive nature of the proximity as well as the density of the interactions are involved in the analysis we develop on the co-operation relations, the partnership relations and the exchanges of technological know-how. These phenomena are based on an iterative and procedural process, which implies not only the bounded rationality of actors but also the cognitive dimension and the specific characteristic of knowledge. The difference between

information and knowledge (tacit and codified) introduced by Polanyi and Machlup, and then summarised by Nonaka (1994), is involved in the analysis of innovation and its relationship with the territory. This difference has two consequences:

- First, it reveals that the informations refer to the capacity of emission, circulation and reception of messages flows, whereas the knowledges refer to the individuals actions beginning a process of comprehension of the informations received, implying some learning mechanisms. In this frame, the difference between tacit and codified knowledges leads to distinguish the knowledges which can be communicated in a formal way from the knowledges which cannot, because of the difficulty to formalise them. The tacit knowledges are involved in the exchanges of informations, but they cannot imply a market exchange.

- Second, it reveals the importance of learning processes, which can take various forms according to the literature (by practising, by using, ...). Because of their interactive character, these processes concern both the individual and the groups of individuals, whether inside the firm (between departments) or outside (social networks). There are at the core of innovation processes, defined as processes of new knowledges creation or as processes of existing knowledges combined in a new way. In the frame of an adapted organisational and institutional context, the geographical proximity implies cognitive interactions. Then, the innovation process analysis is the result of complex and changing relations game, between the organisational proximity (conceived as the adoption of behaviour norms, social rules,...) and the geographical proximity : in a Local System of Innovation implied in this dynamic, the two proximities are articulated.

- ***Time and Space***

All these analytical positions appear relevant for the proximity analysis. First, they contradict the approach (simplistic and rarely confirmed by the facts) suggesting that the relations involving tacit knowledges imply a geographical proximity, while the relations based on codified knowledges can cope with the distance, this approach being grounded on a limited conception of the relation proximity/distance, and ignoring :

- the frequent cohabitation between tacit and codified knowledges within enterprises or networks ;

- the time factor in the proximity effects (the various stages as appropriation, learning, decodification, recodification of the information) ;

- the successive steps of the process of acquisition and transfer of know-how which concern more the tacit knowledges or those which concern more the codified knowledges.

However, this approach appears relevant in pointing out the complex temporal organisation, including various steps through time according to the learnings and appropriations of knowledges. In this frame, the geographical proximity is especially necessary at the initial stage of know-how and technologies transfer and appropriation mechanism, whereas a distant interaction can operate at less critical stages.

II.2. Proximity and economic co-ordination

Various approaches aim at taking into account the localisation aspects or at introducing the space in the standard economic analysis. However, our approach is different in the sense that it is not only based on the prices co-ordination system:

- in introducing non-prices co-ordination elements, but various external effects, in the relations of agents ;

- in taking into account the collective action phenomena and particularly the groups behaviour ;

- in pointing out the often essential role of institutions.

The objective is to describe a situated agent, being both here and somewhere else. Here because of its localisation within a geographic and an economic space, and somewhere else because this agent interacts with other economic entities (firms, productive actors). A relevant case of this non-standard approach of the co-ordination is the construction of a specific and territorialised resource, that is a resource tightly linked to its organisational and institutional context creation. Neither available, nor reproducible somewhere else, this resource is the result of local co-ordination of actors mechanisms and of the role played by « external constraints » (economical, legal ...). Such a local co-ordination is based on the three dimensions discussed above. It can only emerge when there is a similarity between these actors, when there is an agreement on a common system of collective representations, often built partly by formal institutions.

- ***non market co-ordinations***

In the approach developed, the co-ordination between actors goes beyond the informations given by the prices. This co-ordination can be appreciated at two levels :

- a set of other modalities of co-ordination exists beside the interaction based on prices : co-operation relations, confidence relations, technological interaction relations, ... This position is close to the game theory postulate concerning the «direct» communication (as called by Kirman, 1996) rather than the communication based on the prices ;

- the reference to the information notion appears too restrictive (see above). The various co-ordination forms depend, in the analysis we suggest, on the cognitive dimension. Therefore, there is an impact on our analysis on proximity relations implying directly the spatial dimension (see the interaction between the geographical proximity and the organisational proximity).

In this frame, the relations between actors, the technological transfers, the co-operation between firms, are analysed according to a spatial dimension. For example, this analysis appears especially relevant when there is a dilemma between spatial competition and proximity localisation of the enterprises. This problem is one of the key debate in the literature about space and industry : is it more attractive for a firm to be localised far from the other firms belonging to the same activity sector in order to take advantage of a monopolistic power resulting from the transports costs, or is it more attractive for a firm to be localised in a geographical proximity with other firms in order to take advantage of the proximity externalities generated by the knowledges, the informations and the technologies transfers ?

This question leads to the issue of enterprises nomadism and territorial implementation. To avoid the contradiction implied in this issue, the idea of « productive meeting » between a firm and a territory is to be introduced, that means a common process of learning and construction of specific territorialised resources (see above). This dialectic firm-territory is issued from the articulation modalities between the geographical proximity and the organisational proximity (in its double dimension of complementarity and co-operation between productive actors and of agreement on common rules on thought and action). These modalities lead to the emergence of an interaction dynamic, characterising a common dynamic of a firm and a territory. This point of view on the problem of complex relations between a firm and a territory stands against the position postulating the anteriority of productive questions on the space questions. We rather postulate that the productive and spatial components are tightly associated.

- ***Collective action***

The standard walrassian model is also questioned in our analysis of collective action forms. In identifying the spatial inequality, the difference between the individual level and the social order can be pointed out. All the individuals or enterprises are in various positions concerning the geographical proximity relation as it is revealed by the two following examples : the handicaps of the isolated subscriber of a network, or the handicaps of outlying areas. But these actors can take advantage of the spatial dimension in carrying collective actions. These behaviours question the relation between the micro and the macro levels. At least, these relations involve agents having not only individual logics (even if their environment influences them), but also group strategies. These approaches partly refer to the work of Hayek (and especially his notion of «yellow brick road»), to the work of Schelling pointing out that the behaviours are often based on imitation, and to the work of Kirman on the mimetic evolutions.

These works suggest three main ways to analyse the factors of emergence of local dynamics in local systems of production and also the modalities of emergence of collective actions spatialised forms :

- the notion of situated networks of actors is used to analyse the local functioning of producers. The network functioning avoid the possible isolation, make easier the transmission of informations and learnings, and define in a collective way the common norms and rules concerning the products properties or the knowledges exchange ;

- the confidence relations and/or the co-operation relations are used to study the systems organised by not formalised norms, in which the emergence endogenous dynamics are not formalised by explicit common rules. The processes of local interactions are analysed by the evolutionary game theory, the genetic algorithms or the neuronal network modelisations. These approaches demonstrate the importance of recurring actions between neighbours, as well as the quickness of opinions or behaviours diffusion within small groups weakly connected ;

- the local systems endowed with explicit common rules (like AOC or AOP[3]), changing through time. In this case, the local actors agree on a set of common rules excluding other agents of the system. The struggle for power within these systems, as well as the problem of rules interpretation can lead to the instability of the system.

[3] Original Controlled Appellations and Protected Original Indications, including the local producers in order to protect the products quality of the territory.

The analysis of situated agents according to the diptych organisational proximity / geographical proximity leads to a conception of the micro-macro relations in a non-deterministic manner. The collective action is embedded in economic structures and social institutions historically built. However, the individual or collective actors are always able, when there is a crisis, to transform collectively the existing macro-structures. This approach leads to analyse intermediary socio-economic spaces where the structural forms (inherited from the past) and the collective action of situated agents (anticipating the future) are articulated and regulated in the resolution process of a productive problem. The territory is then a specific intermediary space : it is not a data but a construction. It is the result of the interactions between local actors, and also between local actors and non-local actors (firms, unions, syndicates, banks, the State,…). In this complex dynamic of interactions, the key actors are those who play a mediation/hybridisation role between the local level and the global level, taking part in this way in the articulation process between geographical proximity and organisational proximity.

Such an approach was developed in the analysis of the spatial dynamic of industrial models, implying the acception of the technical, organisational and social systems as coherent and articulated to their environment. In these models, the emergence phase involves a process of organisational and institutional learning implying the geographical proximity. Their diffusion in new spaces needs hybridisation processes (Boyer, 1995) to reach a compatibility with the existing practices within these spaces.

- ***The institutions role***

As a third argument to take into account the space and the proximity notions in the analysis of the coordinations, the role of the institutions is pointed out in the analyses of the French School of Proximity. This is the domain of the governance of territories. We have already pointed out the influence of the institutional processes, whether the institutions are formal or not. In this approach, the territory is defined as a process of recovering-articulating the organisational and geographical proximities. This vision demonstrates the institutional dynamic and specify the territorial governance, variously defined as a contractual co-ordination mode (Williamson, 1985), as a legal-political co-ordination mode (Kooiman, 1993), as a social co-ordination mode (Granovetter, 1983),…

Our conception of governance implies productive and institutional mechanisms, both in the local dimension (geographical proximity versus organisational proximity) and in the local-global dimension (local institutional proximity versus global institutional proximity). The territorial governance constitutes a process of recovering and hybridisation of institutional proximities. As a result, there is an « alliage » (in the sense of Dumont) of various representation systems. This « alliage » reveals and activates the productive potential of the geographical and organisational proximities: the territory is built on the articulation of the two proximities leading to the emergence of localised productive regularities.

This notion of territorial governance is not only an endogenous process. It involves also the relations between formal and informal local institutions and global institutional forms. In this frame, there is neither determinism of the micro-economic behaviours issued by the macro-structures, nor the emergence of a spontaneous order issued by individual agents behaving in a structureless world. In fact, this is the local-global mediations, characterising the governance, that ensure the dominant principles diffusion (from the global to the local) when the Economy is stable, or the emergent principles (from the local to the global), in case of crisis. We last want to insist in the important role of the formal institutions, and especially the Territorial Collectivities, which influence the agents behaviours, and the viability of the territorial governance. The institutional density is a characteristic of the territorial governance, in terms of interactions between institutions, specifying the territorial dynamic in complementarity with the organisational density.

This is on this basis that we suggest to analyse the co-ordination modalities of the actors. This approach refers both to the spatial variable and to the situated agent notion, depending on its productive and relational environment as well as on the spatial interactions and neighbourhood the agent faces. The space and the time are then both questioned. Any analysis of the co-ordination denying the unique rile of the market prices is confronted to the inheritance of the past as well as to the limited capacities to know the future. For example, the technology exchanges within a localised network depend on the inherited past relations specifying the interactions forms and the acceptance of some rules, as well as on the willingness to conceive a common future within a group in the frame of an identified territory.

Conclusion

The objective of this paper was to contribute to the theoretical background concerning the proximity notion in explaining the work of the French School of Proximity. We started (Part I) by a survey of different works performed by various researchers on the topic of proximity in the frame either of the regional science renewal or of the (re)birth of the economic geography. Then we defined the so-called notions of geographical and organisational proximities. It was demonstrated that the Organisational proximity is based on two main logics, which are similarity and adherence (economic actors being involved into an organisational proximity relation when they belong to the same relational framework or when they share the same common knowledge and capacities). It was also demonstrated that the Geographical proximity deals the spatial separation between economic actors (in reference to physical factors but also to social constructions such as transport infrastructures or telecommunication technologies). In the second part of the paper we made a presentation of our theoretical and applied results. We put the stress on the central role played by various interactions, both between actors and of technical nature, based on spatial or organisational relations. These informal and formal interactions are differentiated, and include the voluntary character of the relation. We also developed the role played by co-ordination problems in the analysis of proximity relations. Three main points are underlined. The non-market co-ordination between economic agents, the collective action processes (groups and networks behaviours), and the essential role played by local and non-local institutions in the spatial dimension of the economic process.

A long research agenda still remains in the domain of proximity analysis, concerning local public policies, employment, cities,…., all these themes having high research potentialities. It is now important to bring confrontations between various research domains, especially interdisciplinary confrontations mainly concerning Legal Science (property, regulation, public actions, rules determination, infrastructure management), Sociology (one of the main source of confrontation, concerning especially the relations between individuals, the actors strategies, the analysis of groups, or the relations between science and technique), Geography (conception of the space, territorial representations, physical networks), or Mathematics (mainly the formalisation of the connexity relations and the spatial interaction phenomena). These various confrontations can both deepen previous analyses and suggest new questions, on the space and time notions, or on

the questions of the role of institutions in the definition of local policies (and especially technological policies).

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