

Proximity and agglomeration, two understanding keys of city

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Abstract

Seeking proximity for informational exchanges is probably the most ancient and permanent reason for the existence of cities. In this paper we make the hypothesis that the formation and growth of every form of human agglomeration stem mostly from the need for proximity in order to interact. This need for proximity, the connections between proximity and interaction, and their relation with agglomeration processes are key features to understand urban phenomena. But the city is also a place where proximity to non-urban territories or other cities is stronger than somewhere else, which facilitates the more distant interactions. So, we claim that it is necessary, to understand which takes place within cities and between cities today, to marry two main analytical frameworks: economics of agglomeration and economics of proximity. In section 1, the roots of the concept of proximity are analyzed. Then, the implicit or explicit uses of this concept for the two significant approaches to human spatial organization - economics of agglomeration (section 2) and economics of proximity (section 3) - are recalled. Sections 4 and 5 propose a more general conceptual framework, extending both of the preceding approaches on the basis of interaction costs, and introduce the links between the different types of proximities and the city, as an emblematic agglomeration process.

Introduction

The geographic distribution of human beings, of their settlements and of their work places, of schools, health centers, and public services, of shops and shopping centers, of banks and advanced services, of cultural and leisure areas is neither uniform, nor random, but clearly organized and polarized. Geographic space is made up of human concentrations on small parts of the Earth. Such agglomerations take the form of employment centers, clusters of firms, and above all, of cities of different sizes.

The city is the most symbolic form of agglomeration of this polarization of human activities, probably because of its long-lasting character. However, it is not only a point on a map. It is, today, the living environment of more than 54 % of the human beings on the planet (World Bank, 2017). It is also the place where numerous human activities and practices spread, and mostly where the power of men exercised. The city, as a set of processes of agglomeration, is

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the place of all the diversities: economic, social, politics, architectural, religious but also that where specific groups meet. As quoted by Cantillon the landlords reside there in order to “enjoy agreeable society with other Landowners and Gentlemen of the same condition¹” (Cantillon, 1755, 19), and the search for interaction with their fellows leads the owners of lands to get closer from each other.

Seeking proximity for informational exchanges is probably the most ancient and permanent reason for the existence of cities (Hohenberg and Lees, 1995) and one of the major factor behind the formation of different types of industry clusters. In analyzing the foundations of political economy and more specifically of the division of labor, Adam Smith emphasizes the primary role of “a certain propensity in human nature, [...] the propensity to truck, barter, and exchange one thing for another”, which “is common to all men” (Smith, 1776, 1937 ed., 13). Yet, material exchanges are only one of many forms of human interaction. Interactions include all forms of relations between individuals or groups of individuals, especially within cities. They take place on markets, as in the case of exchanges of goods and services, and include labor market interactions, strategic interactions, or other imperfect competition interactions. But non-market interactions appear to be crucial as well: they encompass economic cooperation or conflict, contracts, social contacts, and information and knowledge circulation. On the whole, non-market interactions such as information exchanges generally produce pure externalities.

We make the hypothesis that the formation and growth of every form of human agglomeration stem mostly from *the need for proximity in order to interact*². This need for proximity, the connections between proximity and interaction, and their relation with agglomeration processes are, according to us, key features to understand the urban phenomena. At the same time, we think that the city is also a place where proximity to non-urban territories or other cities is stronger than somewhere else, which facilitates the more distant interactions. So, we claim that it is necessary, to understand which takes place within cities and between cities today, to marry two main analytical frames: economics of agglomeration and economics of proximity. Indeed, each of these schools of thought brings elements to the understanding of the current mechanisms, but still it is necessary to use the interaction costs approach to combine and reveal their main assets.

In market as well as non-market interactions, costs are involved, because human interactions always come up against obstacles and because overcoming these obstacles necessarily entails costs: when it comes to geographical obstacles, overcoming these latter leads to transportation and communication costs. Some obstacles arise from the spatial friction of the geographical distance separating individuals physically: these are geographical obstacles. Others are due to the diversity of human beings, of their cultures, of their beliefs, and of their practices, which

¹ Translated by the authors.

² Note that here the role of increasing returns in the economic theory of agglomeration is not overlooked. But first, internal increasing returns in a single firm are rarely sufficient to give rise to cities (Duranton and Puga, 2004), and second, external increasing returns, *i.e.* agglomeration economies, always involve interactions between individuals and/or firms (Huriot and Bourdeau-Lepage, 2009).

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can seriously hamper mutual understanding and trust, the convergence of aims, and more generally the emergence of incentives to interact: these are human obstacles.

Any interaction has to overcome some obstacle, and this invariably implies costs. Geographical obstacles create transportation and communication costs, while human obstacles generate different kinds of learning costs. In this context, different proximities are sought in order to reduce interaction costs. In brief, the organization of human space depends on human interactions, and proximity facilitates interactions by making them less costly. So, there is circular causation between the shape of human space, the cost of interactions, and proximity. Establishing the link between interaction costs and proximity is crucial, then, to understanding the organization of human space. Within this conceptual framework, each form of interaction matches up with a specific obstacle, a specific way of overcoming it and the associated cost, and a specific variety of proximity, from geographical and organized proximities towards virtual proximity (Bourdeau-Lepage and Huriot, 2009).

In the section 1 of this chapter, the roots of the concept of proximity are analyzed, in terms of logics of similarity and distance. Then, the implicit or explicit uses of this concept for the two significant approaches to human spatial organization - economics of agglomeration (section 2) and economics of proximity (section 3) - are recalled. Sections 4 and 5 propose a more general conceptual framework, extending both of the preceding approaches on the basis of interaction costs, and introduce the links between the different types of proximities and the city, as an emblematic agglomeration process.

1. From proximity to proximities

Proximity can be defined in space, in time, or in any kind of abstract space of personal characteristics. It basically refers to the ideas of similarity and distance between objects or individuals, and interactions. So, proximity is fundamentally related to the idea of resemblance, but also to that of (geographical or non-geographical) distance. The degree of similarity can be evaluated in terms of a distance in the space of the similarity criteria, provided that these criteria can be estimated quantitatively. If qualitative criteria cannot be directly measured, it is generally possible to build more or less accurate quantitative indicators, so that the foregoing condition can easily be circumvented. So proximity expresses a certain degree of similarity, for which distance provides a generally quantitative evaluation (Huriot and Perreur, 1998, 17). On the other hand, proximity can be defined in terms of relations or interactions. This means that people who interact or are in relation develop some propensity to be proximate and, in the end, belong to the same network of interaction, more or less strong.

Similarity itself takes on different meanings depending on the specific space of criteria where it is evaluated. Similarity, like proximity, says how close the characteristics of two objects or individuals are, whether they are geographic, social, cultural, personal, psychological, or whatever. Estimating proximity comes down to comparing the position of two objects or individuals in the n -dimensional space of the n characteristics examined. If these characteristics

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are geographic coordinates, proximity is geographical and can be measured by one of the different geographical distances proposed by the literature. The geographical proximity between two individuals is the degree of similarity, or nearness, of their locations, measured in terms of distance.

Using distance here may appear too simplistic if we recall that in the sense of metrics, distance must satisfy certain mathematical conditions that are not always observed. However, the term “distance” can designate every non-negative numerical evaluation of similarity on the sole condition that, depending on the criteria chosen, this evaluation is zero between two identical elements (Huriot *et al.*, 1989). This condition seems totally intuitive. Moreover, it is well-known that in geographical space, distance is not only measured in terms of length, but also in terms of time, discomfort, cost, or any combination of these criteria.

Proximity, similarity, and distance are not limited to the geographical dimension. They may be more or less objective or may be purely mental representations. Based on the preceding principles, the educational proximity between two individuals will be evaluated by the distance between their positions in the space of educational characteristics, *e.g.* the number of years they spent at school, or their highest qualifications. Social proximity can be evaluated by a social distance reflecting differences in income, in socio-occupational status, and/or in capabilities in different fields (Sen, 1992). Cultural proximity between individuals will be represented by their distance in the space of characteristics such as education level, beliefs, economic practices, and even, why not, amenability to corruption. Other types of proximities and distances can be easily founded, as revealed by the seminal paper of Boschma (2005), like cognitive or technological proximity, mainly inspired by major papers in sociology, like Mc Person (1983) and Blau (1977).

By this approach, proximity has at least two meanings. One refers to the relative locations in geographical space, the other bears on the relative locations of individuals in any abstract space and reflects similarities not directly related to geographical space, but which frequently appear to be indirectly linked to geography. For example, cultural proximity and geographical proximity are frequently associated. The territorial dimension of non-geographical similarities makes analysis more complex, and it can be difficult to distinguish between geographical and non-geographical proximities. However, the distinction must be made to understand the links between proximity, interactions, and agglomeration. The conceptual systems examined in the following section are characterized on the basis of the dichotomy between economics of agglomeration and the economics of proximity.

2. Proximity and agglomeration

Let us show now that economics of agglomeration investigates the processes by which interactions between producers and/or consumers give rise to agglomerations, and avoids analyzing the various kinds of proximity, whereas economics of proximity offers a detailed

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analysis of proximities and of the way they determine interactions, but disregards the process of agglomeration and the formation of cities.

Economics of agglomeration (Combes and Gobillon, 2015; Duranton *et al.*, 2015; Glaeser, 2010; Fujita and Thisse, 2013 & 2002; Rosenthal and Strange, 2001; Huriot and Thisse, 2000) brings together the works of the new economic geography started by Krugman (1991a & 1991b) and those of the microeconomics of cities first developed by the new urban economics arising from Alonso's model (1964) and thereafter generalized by the models of city formation inspired by the seminal works of Fujita and Ogawa (1982).

In brief, these approaches propose theoretical models of agglomeration formation. Spatial *equilibria* emerge from the interplay of two series of spatial forces: centripetal or agglomeration forces, which lead individuals to seek geographical proximity, and centrifugal or dispersion forces, which counterbalance and limit the effects of the former. Most of these forces result from interactions between consumers-workers and/or firms, either on land and labor markets in a monopolistic competition framework, or outside the market, in the context of social or information relations generating proximity externalities between economic agents. Market interactions can be illustrated by the following circular causation: firms employ workers who are also consumers, so firms will be more numerous where a lot of consumers-workers are located, and consumers-workers prefer to locate where numerous firms are present. Non-market interactions are mainly information interactions among firms. Finally, the number, size, and location of agglomerations depend on the relative intensity of agglomeration and dispersion forces, *i.e.* on the nature and intensity of economic and social interactions.

In the end two types of proximities appear more or less explicitly in economics of agglomeration: a classical geographical proximity and a more innovative one, founded on the use of new information and communication technologies (ICT).

Geographical proximity

The economics of agglomeration retains essentially the classical geographical dimension of proximity, in a narrow sense. The proximity between two places, or between two located individuals, is the inverse of a geographical distance measured in terms of length or cost. When evaluated in terms of costs, it is a cost-distance or a "minimum-cost distance", measured by the minimum cost incurred on a path joining two places (Huriot *et al.*, 1989). Such costs may include all interaction costs, that is, all exchange costs due to geographical remoteness. Proximity is sought, then, in order to reduce the costs of interaction due to geographical remoteness. In fact, in economics of agglomeration, these costs consist solely of transportation costs (even if they are called "exchange cost") or of communication costs. So, the degree of proximity is implicitly the inverse of transportation or communication costs.

Urban models in the line of Fujita-Ogawa (1982) bring into play two main series of interactions and of associated costs: the commuting costs of workers and the cost of information interactions between firms. The latter calls for some explanation. Firms need information interactions. Such interactions are supposed to be easier and less costly when firms are located near one another.

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This represents a proximity externality. Lower costs lead to higher profits. So each firm's profit is a decreasing function of the geographical distances between that firm and all other firms, *i.e.* an increasing function of the geographical proximity between firms.

Note that these interaction costs both depend on and determine the location of consumers-workers and firms, and the transport networks connecting them. Costs are lower in an agglomeration with fast and efficient transport networks. The results of models are somewhat complex and partly under-determined because of the existence of multiple equilibrium. In its simplest form, the model essentially predicts what is intuitively expected: other things being equal, firms are more agglomerated when (i) commuting costs are lower, and (ii) the costs of information interaction between firms are higher. Thus, if the latter falls faster than the former, firms tend to be more dispersed.

Proximity and the new information and communication technologies

An interesting extension of the seminal model of Ogawa and Fujita includes a third category of cost (Ota and Fujita, 1993). On the firm side, two costs are now distinguished: on the one hand, the cost of external interactions between the front offices of different firms, *i.e.* between their headquarters or other decision centers; on the other hand, the cost of internal interactions of each firm, between the center of decision-making and the execution units, namely the back offices. It can be reasonably assumed that external interactions consist of exchanges of complex "tacit" information and thus take the form of face-to-face interactions, while internal interactions, made up of exchanges of more standard and "codified" information, go through ICT. If the former are sufficiently high and the latter low enough, the decision units and execution units of each firm tend to separate. Decision units of different firms remain near one another, mostly in cities' central business districts, and execution units disperse to the periphery of cities.

This model is significantly innovative, introducing into agglomeration models interactions between remote locations without any traveling (interactions through ICT) and its specific cost. What is new is that the corresponding concept of proximity is no longer uniquely attached to a short geographical distance in the classical sense. Proximity may be something other than a simple geographical neighborhood, something different from locating in the same city or in the same cluster. Proximity is compatible with geographical remoteness, even in the absence of traveling.

An assessment

As a matter of fact, the economics of agglomeration implicitly uses two kinds of proximities, based on distance and interactions, and make the assumption that they are sufficient conditions for diminishing interaction costs, and so for making interactions easier. This assumption is all but obvious and can readily be questioned. The crucial question is: how can these proximities, both based on material networks, generate interactions without individuals being willing and able to interact, *i.e.* without a minimum similarity between their cultural, educational, and behavioral characteristics, and without the convergence of interests and the trust that ensue. In

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the economics of agglomeration, the condition of ability and willingness is ignored, or is implicitly assumed to be always satisfied. Anyway, the tools of the economics of agglomeration do not seem to be well adapted for integrating such considerations.

3. Geographical and organized proximities as the drivers of urban agglomeration

Economics of proximity responds to the dissatisfaction due to the overly narrow concept of proximity used in economics of agglomeration as well as in classical urban economics. It offers a more accurate and more comprehensive analysis in defining different categories of proximity. Classical geographical proximity is no longer sufficient to the existence of interactions.

Permanent geographical proximity

“Permanent geographical proximity” defined in the economics of proximity (for example Torre, 2014), is equivalent to the geographical proximity implicitly present in the economics of agglomeration. It is the proximity between nearby locations in an agglomeration, a city, a district, an industrial zone, or a shopping area. Economics of proximity shows that this proximity is neither necessary nor sufficient to generate interactions, particularly information interactions, because individuals geographically near one another may coexist without interaction, if they have no common interest, and are neither able nor willing to interact. Individuals may be very near a ghetto but have no relations with its inhabitants. Two headquarters in the same building may have no reason to interact.

Permanent geographical proximity offers only the possibility or potentiality for interaction, but distant interactions still exist. An important question then arises: how do such interactions exist without any type of geographical proximity?

Temporary geographical proximity

The economics of proximity answers the question by defining “temporary geographical proximity”. However, this is only a partial response that concerns only certain specific forms of interaction without permanent geographical proximity.

Besides permanent geographical proximity defined above, temporary geographical proximity “corresponds to the possibility of satisfying certain needs for face-to-face contact between actors by travelling to different locations. This travelling generates opportunities for moments of geographical proximity, which vary in duration, but which are always limited in time.” (Torre, 2008, 881; see also Torre and Rallet, 2005 and Torre, 2014). Geographical proximity is no longer necessarily synonym of short geographical distance. The need for proximity for face-to-face interactions is rarely permanent. It appears mostly at certain stages in the implementation of firm’s strategies. Such interaction needs can easily be satisfied by traveling between distant places. Two important consequences follow: (i) temporary geographical proximity depends closely on the state of the long-distance transport networks, and (ii) permanent geographical proximity is not necessary for face-to face interactions.

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So the problem of distant interactions is solved conceptually, but only for face-to-face contacts. However, it seems that geographical proximity, whether it is permanent or temporary, is still neither necessary nor sufficient for interactions. It is not sufficient: both permanent and temporary proximities create only the possibility, whether materialized or not, for face-to-face contacts. It is not necessary, for interactions do not consist of face-to-face contacts alone, but can be effected at a distance through ICT. The latter point is investigated by economics of proximity in a way that will be questioned below. Geographical proximities create only possibilities for interaction. Interactions really occur only if a third form of proximity is realized, “organized proximity”, which is at first sight independent of the geographical dimension.

Organized proximity

“Organized proximity” is *a priori* not linked with geography, but has *de facto* a geographical dimension. “Organized proximity is not geographic but relational. By organized proximity, the ability of an organization to make its members interact is meant. The organization facilitates interactions within it and literature makes them a priori easier than with units situated outside the organization.” (Torre and Rallet, 2005, 3). In this approach, the term “organization” has a very broad meaning: “Here, ‘organization’ is a term that designates any structured unit of relations. It might take any form of structure, e.g. a firm, an administration, a social network, a community or a milieu” (Torre and Rallet, 2005, endnote 2, 12). Given the comprehensive character of concepts such as “social network”, “community” or “milieu”, organized proximity may cover a very large range of non-geographical similarities and interactions, included in the generic concept of proximity. In this context, it can be admitted that organized proximity involves elements such as the logic of belonging to a group or a network, similarities in formal or informal behavioral rules or routines, *i.e.* institutions à la North, the sharing of representations and beliefs, common interests, and a common willingness to act.

From these definitions, it follows that organized proximity involves every similarity between human beings that (i) is not strictly geographical and (ii) is likely to make interactions easier and less costly. More simply and more generally, organized proximity arises from an ability and willingness to interact.

The definition of organized proximity in terms of human similarities prompts a theoretical remark. There is no doubt that a certain degree of similarity between individuals favors interactions, because it conditions their ability and willingness to interact. Even if it is difficult to measure it, we can refer to the degrees of homophily, as described in network theory (see Me Pherson et al., 2001, or Polge and Torre, 2017, for an application to proximity analysis). However, it can be asserted that absolute similarity is absolutely irrelevant, because it would make interactions irrelevant. Two individuals interact because they have different endowments (in goods, services, or information) and/or different personal characteristics (skills, capacities, cultures, beliefs, etc.), because one is able to bring to the other something he or she is missing.

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Microeconomic theory asserts that the exchange of goods and services arises from unequal initial endowments. If everyone produces and/or possesses everything they need, no trade will occur: we are thus in something like backyard capitalism: “if the distribution of natural resources is uniform, the economy is such that each person produces for her own consumption, we therefore have backyard capitalism.” (Fujita and Thisse, 2002, 27). People seek information they do not have. If we have exactly the same information as you, we have nothing to gain from information interactions. In the theory of perfect competition, the assumption of perfect information of economic agents necessarily leads to the absence of any interaction between them: indeed, each individual reacts exclusively to prices anonymously given by the market, and individuals are in a situation of strategic isolation.

Thus, too much and too little similarity hamper interactions. This suggests that interactions are significant only for a wide range of intermediate degrees of similarity. That’s close to the idea of an optimum range of similarity. But the limits of such a range are largely undetermined. It is the principle of the so-called proximity paradox. Too much proximity kills proximity. This is going to come true in terms of geographical proximity, with the problems of congestion or conflicts between neighbors in cities (see latter), but is confirmed also frequently by the analysis of the innovations processes, in which the quality of innovation networks depends widely on the diversity of the profiles of their participants and thus on their low organized proximity links, in terms of similarity (Broekel and Boschma, 2012; Crescenzi *et al.*, 2016).

Organized proximity makes interactions between individuals easier and less costly whether they are geographically close or not. Geographical proximity needs to be accompanied by organized proximity, which appears to be a necessary condition for interactions. But organized proximity itself is by no means sufficient to get interactions. Even between individuals sharing the same culture, the same values, the same practices, there is no possibility of interaction in the absence of efficient transportation and communication networks, *i.e.* if there is no geographical proximity, whether permanent or temporary.

The existence of common rules of the game, of similar behaviors, of the same representations is more probable in nearby locations, or in sets of well interconnected locations. The causality here is certainly circular and cumulative. Other things being equal, individuals who live in the same place, or work in the same organization may more easily share common representations and the same culture because permanent geographical proximity increases the possibility of interaction. However, too much dissimilarity between groups living in the same area can produce tensions and conflicts. Conversely, similar individuals may live near one another, because they wish for proximity (for example, gated communities generally assemble people with similar social characteristics) or because they have no alternative (for example, poor people have too few resources to live in the neighborhood of rich people). Individuals who are well interconnected by networks will more probably share common cultures and behaviors, because proximity between them allows frequent contacts. Conversely, these common cultures and behaviors create incentives to seek network connections and proximity. In short, geographical and organized proximities are often linked in a dynamic cumulative process, like in the case of cities or industrial clusters for example.

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Questions on hold

Economics of proximity proposes a precise and detailed analysis of proximity in relation to interactions. However, some problems remain without satisfactory answers regarding the question of agglomeration, and most of all of the formation of cities. The first problem is the lack of cost considerations: proximity could be analyzed in terms of costs, because costs reflect the actual ease of interactions. The second one is the incomplete character of the set of proximities relative to the set of existing modes of interaction. In fact, temporary geographical proximity essentially concerns the possibility of satisfying needs for temporary face-to-face contacts through social or business travel. This includes the ease of interactions needed in the exchange of services, mainly of advanced services, for example in the case of services co-produced by the provider and the customer. But two forms of interactions are ignored: the trading of goods and the exchange of information between distant locations through ICT.

Concerning goods trading, it seems that the foregoing concepts could be applied. Long distance wholesale trade needs a form of temporary geographical proximity, based on the efficiency of commodity transportation networks. Given that in general the cost of transportation per unit of commodity is a very small part of the total unit cost, even for long distances, this form of temporary proximity is generally high. Retailing requires more frequent interactions, especially for commodities consumed daily or frequently, and stores are located close to consumers. This is a form of permanent geographical proximity brought about by neighborhood stores. As for information exchange between distant locations by ICT, the problem is more acute. As it has been claimed above, on the one side the geographical proximities depend on material conditions: the organization of human locations and the structure of human space, the configuration of agglomerations and above all the transportation networks that connect more or less remote locations.

4. Looking for different proximities for the city

Our goal is to build a comprehensive conceptual system that takes ideas from the two preceding approaches and adapts them in order to achieve a theoretical analysis of the city and urban relationships. Considering that the economics of proximity currently provides the most accurate and complete analysis of proximities, we integrate its concepts, *i.e.* the two geographical proximities and the organized proximity, but we redefine them in terms of interaction costs, which are the foundations of economics of agglomeration and which materialize the ease of interactions.

In that context, it is easy to extend the concepts of proximity to “virtual proximity”, reflecting the ease of interactions through ICT, and which is implicitly present in the Ota-Fujita model of economics of agglomeration. Although it is strikingly absent from economics of agglomeration, the idea of organized proximity proposed by economics of proximity appears crucial to understand the functioning and the development of the city.

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A cost-based vision of proximities

Nowadays, the world displays varying degrees of spatial, social, and economic frictions. We can admit the axiom that any interaction between two individuals requires an action in order to establish contact and that this action always requires some effort and therefore implies some costs, whatever the geographical, social, or economic distance between individuals. Every time an interaction is desired or necessary and since it involves a cost, the lower this cost is, the more easily the interaction is carried out.

Permanent geographical proximity corresponds to interaction costs between geographically close locations, for example inside a city, or a district, such as a business district. These are intra-urban transport costs including mainly costs of time and eventually of discomfort, stress, and so on. They vary inside the city (but also among cities) with the state of intra-urban transport technologies, and the capacity and saturation of the corresponding networks. Even in a dense city, where geographical distances are short, interactions will be hampered if the transport networks are congested. Within the city, certain territories can thus be enclosed and maintain few relations with the others and in particular with the city center or the Central Business District. The quality of the infrastructures of communication and the geography of the land prices explain partially its socio-spatial structure and its functioning, and in a way its urbanity.

Likewise, temporary geographical proximity is interpreted in terms of interaction costs between remote locations and it depends on long distance (*e.g.* interurban) transport costs and on the characteristics of the corresponding networks, which are more or less rapid and comfortable, and more or less congested. It is well adapted to the relations between cities, or through networks of cities. The nature and intensity of relations between two cities are often related to the quality and type of infrastructure they provide. Most big cities present generally the most successful long-distance infrastructures of transport in terms of time of transport, frequency of the connections and accommodation facilities. It is due to the fixed costs of these equipment and the search for economies of scale. Consequently, the relations between two or several cities depend on their size but also on their economic functions or on the role assured by the latter in the system of national or global cities.

Thus geographical proximity makes face-to-face interactions less costly, but neither is sufficient to create interactions without organized proximity. The combination of one particular form of proximity with organized proximity is sufficient for the existence of the corresponding form of interaction.

Organized proximity

Organized proximity is relative to *a priori* non-geographical characteristics of individuals. It is thus linked to non-geographical frictions, which hamper interactions by making them more costly. Those costs arise from social, cultural, and religious differences between individuals, or from differences in their institutional environments (in the sense of North, 1990), that is, in the formal or informal rules of the game of the society or of the group of which they are members. Slighter differences improve mutual understanding and confidence, facilitate contract

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negotiation and agreement enforcement, allow better anticipation of behaviors and of reactions to information, and make any form of information exchange easier, that is, they reduce interaction costs. These costs could be considered as non-geographical costs of coordination, and include some form of transaction cost. In North's conception, transaction costs are "the costs of protecting rights and policing and enforcing agreements" (North, 1990: 27).

Besides transaction costs, which by definition result from the management of economic transactions, organized proximity reduces cooperation costs, the costs of managing all sorts of conflicts, and the costs of organizing and effecting all forms of non-market interactions such as social contacts. Although these coordination costs are non-geographical, they play a major role in spatial organization and in the process of agglomeration, through their effects on interactions. For example, we consider that global cities are organized so as to reduce the costs of coordination of the global economy (Bourdeau-Lepage and Huriot, 2005).

Virtual proximity

Virtual proximity creates a possibility of information interaction without face-to-face contact (Bourdeau-Lepage and Huriot, 2009). It is therefore different from organized proximity which defines the rules for interacting. Virtual proximity is determined by the channel through which the interactions occurs. Remote interactions existed long before the development of ICT. The new technologies result from a real revolution in information processing and diffusion, but it is also the last stage of a long and gradual evolution. Although they were limited to short distances and to poor information, carrier pigeons, light signals or church bells allowed communications between remote individuals before the telegraph, the telephone, and fiber-optic or satellite networks.

Virtual proximity reduces the costs of interaction between remote individuals. These costs include a money component, which is itself composed of fixed costs and variable (marginal) costs. If these communication costs appear extremely low at first sight, it is only in terms of the marginal costs of sending a piece of information. But the fixed costs may be very high. They concern hardware equipment, fiber-optic cables, teleports, etc. Additional costs arise from a time component (internet communication is almost instantaneous, but the processing of information consumes incompressible time) and from a human capital component (the learning and updating of knowledge needed for information processing).

5. Within and between the cities: an extended system of interdependent proximities

The resulting conceptual system involves strong interdependencies between the different types of proximities and interactions, giving rise to cumulative processes. Let us examine the logics of interrelations between them without ignoring the question of virtual interactions between distant partners, in order to understand the whole system of proximities, within and between cities.

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A set of interdependent concepts

Geographical proximities generate categories of potential interactions, which become effective in the presence of organized proximity. So, geographical and organized proximities play complementary roles in the generation of human interactions. Proximities make interaction possible and effective but in return, interactions affect proximities. Proximities give birth to interactions, and the intensification of interactions can create more proximity. Intense interactions may create needs for new transport and communication networks, the fulfillment of which increases geographical proximity by lowering interaction costs. The existence of intense interactions may also be an incentive to technological progress in the conception of transport and communication networks, which is another source of lower interaction costs that increases proximities.

Moreover, the different geographical proximities are themselves complementary because, as is well-known, the different forms of interaction are complementary (Duranton, 2004; Gaspar and Glaeser, 1998). In particular, face-to-face interactions are frequently used in combination with ICT interactions in the successive stages of a project, from the design stage to completion. Critical stages need face-to-face interactions, while intermediate and more standard stages can be managed by ICT interactions. In addition, the development of ICT interactions can lead to new needs for face-to-face contacts. Regular interactions can be developed through frequent ICT contacts and temporary meetings. So, virtual proximity can create more face-to-face interactions.

At the level of the global economy, the complementarity of the geographical proximities lies at the foundation of the system of global cities. Each global city concentrates advanced services and headquarters of large companies. Frequent face-to-face contacts are facilitated by permanent geographical proximity. Global cities are linked one to another in global networks (Taylor, 2004 and 2009), including transport and communication networks, which increase the ease of temporary face-to-face contacts and of virtual interactions.

The consideration of organized proximity complicates the system. Organized proximity was defined on the basis of non-geographical individual or group characteristics. But, as was said above, it depends partly on permanent and temporary geographical proximities. The formation of common rules of the game and of common representations is made easier by local interactions. In particular, organized proximity is linked to social networks that have a strong territorial dimension (Torre, 2008). In return, permanent and temporary geographical proximities may increase through the process of agglomeration if organized proximity is sufficiently high.

It is well-known that virtual interactions are more intense between individuals living in close permanent geographical proximity. One reason is that virtual interactions depend on the sharing of interests and tastes, of a common culture. Thus it depends on organized proximity, which is strong in a situation of permanent geographical proximity. Moreover, permanent geographical proximity offers the possibility of easily combining virtual and face-to-face interactions. To

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sum up, the different categories of proximities are closely linked in a system of circular causation. This generates cumulative processes that play a major role in the process of agglomeration, particularly in the formation and the growth of cities.

Cities and proximities

The city offers by definition permanent geographical proximity, that of the more or less direct neighborhood, which facilitates complex interactions, as well as frequent and repeated face to face contacts between a large diversity of individuals. It makes possible regular and repeated face to face interactions by reducing their cost, and appears as a nexus for the road, maritime or air transport networks. It is a front door in most of these networks, because it shelters the terminals of these networks (stations, airports...), which are subjected to important economies of scale. By reducing the costs of long distance travels, it offers a temporary geographical proximity allowing the realization of distant, temporary and infrequent face-to-face interactions.

The city is also the most sought place for the intensive use of virtual networks of ICT, telephone and internet, because of economies of scale in the installation of their terminals (for example teleports). Thus it allows interactions without human travel by the networks of ICT and offers a strong virtual proximity. The latter applies to the inner cities, with a strong propensity to the intra urban interaction, but it also develops outside, and in particular in the exchanges and the interactions between cities, especially global ones.

Finally, the city favors in a way organized proximity because the latter is not independent from other forms of proximities, as stated previously. Organized proximity naturally tends to be strong when geographical permanent proximity raised itself, thus that we are in a city. It is the consequence of the territorial anchoring of organized proximity (Torre, 2008), in other words of its spatial dimension. Besides, the city, as the peak of the phenomenon of urban agglomeration, with its diversity and its complexity, is more certainly inductor of organized proximity than any other form of urban agglomeration, because it involves, in a reduced space, any types of agents and of stakeholders.

So, the city, as a result of a permanent geographical proximity, is the privileged place of interactions of all kinds, at a lower cost. It is the most significant example of the game of proximities. While clusters stand for the most convincing example of the overlapping of proximities at the production and knowledge transmission levels, the city is the archetypal place of the interaction and the causalities between proximities.

Negative effects of proximities

The city, as the place where the various proximity bloom, sought for by the inhabitants, is also the place where the negative effects of proximity spread. It can show himself hell for which people try to run away because of too many geographical or organized proximities that they undergo without being capable of deleting or decreasing them. "Hell is other people" to resume Sartre (1947).

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Indeed, the presence of permanent geographical proximity in all the strata of the society very often leads to the formation of districts where are located people of the same origin, social class, educational level or lifestyle. It can be ghettos or shanty towns, districts of suburbs, where meet poor inhabitants, attracted by weak rents or dedicated policies of social housing. But it is also related to the desire to live together of the easiest (most well-to-do) people. Spatially this leads to what is named in France the *bourgeois* districts or the ghettos of rich. In certain cases, this phenomenon can take the shape of closed enclaves, gated communities, or condominiums, protecting their inhabitants of the proximity of people which they consider not desirable, and in particular of people poorer or belonging to other social classes.

But in a city, all the individuals do not choose completely their residential location. Many are those who suffer from forced choices, constrained in particular by their income. They are then affected by unwanted geographical proximity which takes various forms, in particular crowding and non-desired neighborhood. Given their reduced financial resources certain individuals find themselves forced to remain in a very densely populated environment, undergoing everyday any sorts of nuisances: sound, olfactory, light... They can also suffer from negative externalities, as for example when they are forced to live along an axis regularly blocked which generates pollution or next to a discharge.

Organized proximity, which is connected to geographical proximity as previously underlined, brings several unwanted effects in town. It can prevent the individuals to act and to think freely, as well as to have the feeling to feel watched, judged, and to respect the codes of their environment and of their place of life. This shape of tyranny, produced by the combination of organized and geographical proximity, is very representative of community districts, in which the logics of similarity and belonging of the organized proximity come to strengthen, within networks displaying at the same time common cultural dimensions and geographical neighborhood. So, the city appears one more time as a nexus of proximities, but now in the sense of sought proximities and the costs which they create in terms of congestion for example, but also of social discomfort and of losses of well-being.

Conclusion

In this paper we tried to understand how the game played by the different proximities is at the core of the creation and the existence of cities, on the basis of economics of agglomeration and economics of proximity, using costs analysis. We showed that both approaches bring partially interesting responses to the question of the existence of cities and the polarization of human activities, but that a more general and interesting explanation could be driven from their combination. Given that, we described the processes of urban agglomeration, but also the relations between cities, by means of proximity tools, modified to take into account the main principles of urban agglomeration or remote exchanges.

Our proposition takes into account the most interesting characteristics of both approaches and offers a new perspective of understanding of the urban systems and their relations. It presents

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the advantage to handle and to bring an explanation to intra-urban level phenomena, including the limits of the processes of urban agglomeration in terms of conflicts and congestion, and to leave opened the interpretation of the existence of city networks and global metropolises or global cities (Bourdeau-Lepage and Huriot, 2005) and of their global impact in terms of growth. We intend to forge links between the borders of both paradigms - agglomeration and proximity economics - and to show that their crossed pollination allows to bring explanatory essential elements in the understanding of contemporary urbanization processes.

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