Introduction: proximity relations in the 21st century

André Torre and Delphine Gallaud

1. WILL THE 21ST CENTURY BE THE AGE OF PROXIMITY?

In a time of major changes, brutal crises and even greater threats to human activity and its sustainability, the notion of proximity is emerging as a refuge value, fostering permanency in human relationships and people's ties to their territories, a guarantee of quality and fluidity in relationships, of trust and shared values, as well as embeddedness into local cultures, and communities of belonging.

1.1 Proximity as a Value

Proximity is established as the ultimate yardsticks for a number of public policies and actions or social movements, which make it the cornerstone of their vision of the world and the organization of different types of social or economic activities. This is the case of approaches based on local food systems (Feenstra, 1997), slow-food (Petrini, 2001) or short value-added chains (Kneafsey et al., 2013), which promote a vision of a world respectful of local producers and in which strong ties between human activities and their local environment are maintained and developed. These approaches contrast with an economy characterized by the production and consumption of anonymous, standardized goods transported around the world with no consideration for the consequences of their carbon emissions on the environment. An appetite for proximity – in the geographical or spatial sense of the term – is also expressed in various policies and actions for the development of clusters or local innovation networks (Porter, 1985), grounded in the idea that face-to-face relations between producers and especially between innovative firms are the basis of productivity performances and local development processes (Lawson and Lorenz, 1999).

There are many examples of more or less innovative local initiatives based on the idea that territorial embeddedness is essential to the development of more efficient, virtuous or collaborative relationships, as is the case of production cooperatives (Merrett and Walzer, 2004) or consumer cooperatives (Bacchiega and Borzaga, 2003), relations on which the social and solidarity economy is based (Amin et al., 2002), or the processes of circular economy and industrial ecology (Frosch and Gallopoulos, 1989), which endeavor to protect ecological mechanisms and to preserve local resources (Jacobsen, 2006). The outcome of this vision is the development of local government forms of design (Loughlin et al., 2010), in which increasing attention is given to questions of territorial governance and participatory democracy involving local populations in decision-making processes.

Proximity values are also promoted in other contexts, such as in situations where solidarity between relatives is needed, for example, within networks and local or global

communities. Thus, the importance of local cultures is highlighted, as they are thought to facilitate the development of stronger connections, trust, and solidarity, all conducive to more harmonious relations (Bird et al., 1993). Or, at a less local level, belonging to diasporas (Cohen, 1997), whose members can, even from a distance, develop close links and in so doing establish relations of trust and reciprocity. The same idea underpins the promotion of cooperative relations within family or knowledge exchange networks, whose participants appear to be linked by cognitive, affective, or even social proximities that transcend geographical distances and cross oceans and continents. So much so that some even talk of "the death of distance" (Cairncross, 1997), with the development of e-commerce, teleworking, and Internet-based exchanges which, above all, involve other types of proximity and solidarity, and which, all things considered, make it possible to bring distant people closer together regardless of geographical constraints.

1.2 Proximity as a Research Object

Proximity is therefore an important word, and above all a key concept of growing societal significance and the object of increasing academic interest, as it is claimed to be one of the basic values of life in society. This enthusiasm calls for reflection on the issue and requires providing solid theoretical grounding and foundations for the concept, and exploring its potentialities, expressions, and ambiguities. This is in all probability the reason why more and more scientific research is being conducted on the subject. Indeed, a cursory search of Google Scholar shows that more than 4.2 million works have been published on this subject in recent years, at a rate of approximately 200,000 publications per year. Those research studies obviously concern a wide variety of subjects, and involve many disciplines, such as physics or medicine for example, or mathematics, where modeling nearness relations is based on the notion of proximity spaces (Naimpally and Warrack, 1970) – sometimes referred to as separation spaces (Wallace, 1941), and in which proximity is defined in terms of separation – or on the use of graph theory to analyze the clustering of different variables (Matula and Sokal, 1980), two ideas that can be found in more recent literature in economics, for instance.

We are primarily interested in the research carried out in the various fields of social sciences. This literature has, for a long time, often emphasized the importance of face-to-face relations. This is the case in works on game theory for example, which focus on the relations of cooperation or conflict between human beings. Thus, in the famous prisoner's dilemma, in which two individuals have the choice between denouncing the other or keeping quiet, different and socially beneficial solutions can be found depending on whether the players are able to communicate or not (Kuhn and Tucker, 1950). The socially optimal cooperative solution (no one denounces anyone) prevails if face-to-face interaction is allowed, whereas the opposite outcome (the players denounce each other) occurs – and goes against each player's interests – if they are not able to communicate. This finding, which reveals the importance of spatial proximity, was first obtained analytically and then validated experimentally as early as the 1950s (Deutsch, 1958). However, empirical tests show that if people share strong emotional proximity, they refuse to denounce one another, and thus prefer to run the risk of being punished alone (Ormerod, 2005).

The concept of co-presence, inherited from Simmel's sociological analyses (1917), is also at the heart of reflections on proximities. This is the case in studies on work groups (Kiesler and Cummings, 2002), which highlight the importance of co-presence in situations where work is conducted by groups or collectives. These studies show that people's performance changes when an audience is present (Zajonc, 1965). Thus, the presence of an audience may improve the workers' performance (increased motivation and speed) or decrease it (distraction, stress) and can have an effect in terms of social conformity. Milgram's famous experiment (1974) – in which participants were required to punish and administer high-voltage electric shocks to individuals with learning difficulties – revealed that the instructor delivered very different levels of punishment depending on whether s/he was in the same room as the learner or gave instructions from a distance, for example. The same kind of approach is used in studies of ecological psychology (Barker, 1968) analyzing proximity in social settings. The question raised is that of situations in which people share spaces such as stores, supermarkets, restaurants, offices, meeting rooms, or even cars, and of the transformation of those spaces into territories common to many individuals. It appears that sharing these spaces encourages the sharing of experiences, and in so doing leads to a standardization of behaviors and the formation of common expectations (Edney and Uhlig, 1977).

Urry's works in the field of sociology highlighted and described the existence of various types of proximity, including in long-distance relations, taking into account the development of information and communication technologies and their impact on proximity between human beings. His work on the subject first involved a reflection on mobility and means of transport and communication (Urry, 2007), emphasizing the importance of transportation, which gives individuals the freedom to travel closer to their loved ones or to engage in tourist activities. The development of roads, railways, and aviation, and lower transport costs are changing people's lives and their relation to proximity, by allowing for short stays, round trips, temporary presence, etc., although access to transport greatly varies from one social category to another, which is revealing of social inequalities and divides. But it is the development of information and communication technologies (ICTs) that has led to the most drastic change, by offering individuals the possibility of ubiquity (Urry, 2002), defined as "being anywhere anytime", and particularly well illustrated by the use of mobile phones, which enable people to be/act "here and there at the same time" (Adey, 2010). Thus, Urry extends the notion of co-presence to that of connected co-presence and gives proximity a virtual and remote dimension that projects it into the 21st century and into the game of social networks.

The question of cognitive proximity, which refers to the degree of similarity between actors' mental maps (Noteboom, 2000), has been examined in organizational science on the basis of works conducted in psychology or cognitive science. The notion of cognitive proximity between actors helps to analyze their capacity to coordinate with one another, according to the similarities or differences in their representations and in the meaning they give to their actions. Successful coordination is presented as resulting from the ability of a group of people (Gioia et al., 1994) to develop a shared common sense. Organizations play an important role in this process (Smircich, 1983), by promoting the development of shared mental maps, which prove particularly useful in innovation management, for example. Although cognitive diversity increases the learning capacities of a group, a degree of cognitive proximity is indeed required to reduce communication costs

and ensure the success of jointly conducted operations (Cohendet and Llerena, 1997). Face-to-face interactions are then often considered to play an important role in building these mental models, and only recently has the development of ICTs introduced new questions about the possibility of building shared representations at a distance (Sarker and Sahay, 2004).

Some research studies then examined the various methods for communicating, interacting, or working at a distance and for compensating for the lack or low level of geographical proximity. Thus, historians point out that various techniques have been invented over the centuries to help individuals maintain relational ties; among those techniques are writing (letters, for example), currency or the establishment of rules of behavior and exchange (King and Frost, 2002). Specialists in diasporas study the way in which the family, community, or friendship ties that diaspora members develop and maintain (Clifford, 1994) enable them to share common cultures, values, and representations, even when they are located a great distance from one another; some authors examine how those ties are maintained despite distance and location changes (Rothenberg, 1999). Others extend the analysis of proximity between members of a work group (Monge and Kirste, 1980) to include the long-distance links between members of networks and talk of perceived or organizational proximity.

Finally, the concept of proximity also plays an important role in politics. Many authors emphasize how public policies have promoted spatial proximity, by encouraging the spatial concentration of populations into large agglomerations (Scott, 2007) or of firms into clusters and business parks. Some show how policies for promoting mobility, associated with notions such as equality or freedom, have not only facilitated mass travel (construction of roads, railways, development of air transport), but have also helped to bring people or activities closer together. Proximities largely result from political constructions (Pellegrino, 2011): geographical proximity is built through the development of transportation, and proximity between geographically distant actors is facilitated by the development of ICTs; and they have also been promoted through a change in public action, in the shift from vertical government to forms of local governance involving the participation of local populations (Torre and Traversac, 2011). Finally, the term proximity is associated with a restoration of citizens' perceived legitimacy of political action. Based on the existence of interpersonal relations, the principle of proximity is supposed to facilitate the recognition of identities (Honneth, 1992; Fraser, 1997), as well as the promotion of values such as specificity or singularity (Lind and Tyler, 1988), via care policies (Held, 2006) through which attention is paid to individuals, but which cannot be implemented at a distance.

All in all, those studies form a remarkably interesting patchwork of the different fields of application and pertinence of the principle of proximity in its different forms. They reveal the complexity and diversity of the forms and expressions of proximity, both local and global, grounded and distant, specific and universal (Rosenau, 2003). However, those studies do not form a coherent system. On the contrary, the School of Proximity (Torre and Wallet, 2014) has provided a comprehensive picture and a systematic analysis of the dimensions, characteristics, and fields of application of the principle of proximity. Its analytical assessment is the main object of this introduction to the *Handbook of Proximity Relations*.

2. PROXIMITY ANALYSIS: A SLOW EMERGENCE IN THE SCIENTIFIC COMMUNITY

Interest in proximity-related questions did not suddenly emerge in the history of science. On the contrary, it is the result of a long process through which scientists became aware of the value of this notion, and which has led to its gradual autonomization in the field of social sciences. The first phases occurred in a rather subterranean manner, with a growing interest in questions related to distance, transport, remoteness, and also to intimate relationships, their roots, and manifestations. The term itself then began to emerge in some discourses or approaches, though no real explanations were given of how it functioned or originated. Proximity, such as it was envisaged at the time, was then presented in a very laudatory manner, and as having all virtues, but with little hindsight, particularly in economics, in the field of innovation and knowledge transfer relations.

2.1 The Origins of Proximity: Proxemics

The concept of proxemics was introduced by cultural anthropologist Edward Hall, who defined it in his seminal work (Hall, 1966, p. 1) as "the interrelated observations and theories of humans' use of space as a specialized elaboration of culture." Its purpose is to account for the self-centered conception of the world thought to characterize human beings; a conception that leads them to understand and mediate their relations to others on the basis of their distance from, and therefore their degree of intimacy with them. Thus, individuals' utilization of space varies according to some general principles, but also according to cultures. Proxemics has contributed to the construction of a theory of interpersonal relations that can help to define how people interact in their daily lives, but also to shed light on how they behave in different spaces, such as houses, buildings, offices, or the urban environment (Hall, 1963).

Proxemics is based on the study of social distances and starts from the idea that individuals create a kind of bubble around themselves; a bubble which constitutes an emotionally strong zone or an individual perimeter of security. The size of this personal bubble varies from culture to culture. Generally speaking, four zone distances can be defined. The intimate zone distance allows for a high level of physical connection and sensory exchange, and is used for embracing, touching, or whispering. The personal zone distance is for private conversations, and interactions among good friends or family. The social zone distance is used for interactions with friends and co-workers, i.e. for acquaintances. The public distance zone, which is required when talking to groups, is used especially for public speaking. These different distances establish the individual's territories, which are defined according to the type of interactions and relationships s/he has with others and correspond to the territory of the social animals that humans are.

The existence of these distances results in a social positioning that varies according to the circumstances and the individuals who interact. This can be illustrated by the fact that two people will place themselves differently around a table depending on the task at hand: side by side if they are cooperating to share equipment or ideas, in a corner if they want to do business, opposite each other in a competitive situation, at diagonally opposite ends if they are working on different tasks or do not wish to interact. Cook (1971) adds the question of eye-contact, which is a marker of intimacy between two or

more people. The strongest degree of intimacy between individuals is manifested by their sitting side by side and looking into each other's eyes, while the weakest degree of intimacy requires standing far apart, in different corners, and avoiding eye contact.

Let us note here that the personal space is of particular importance for most people. Indeed, they generally feel uncomfortable, irritated or experience anxiety when other human beings enter their bubble, unless they are loved ones, such as lovers, children, and close family members, who have access to their intimate space. Entering a person's personal space is normally an indication of familiarity or intimacy, but there are situations, especially in urban communities or agglomerations, in which this distance cannot be maintained, for example on public transport. The result is physical proximity (Engleberg, 2006), which is tolerated but usually excludes eye contact, and should exclude intimate or sexual contact, which is considered unacceptable.

These spatial distances of interactions are obviously not entirely objectifiable and have a clear social dimension. Indeed, they vary according to the status of the person one is dealing with: a person positions him/herself further away from a superior or a subordinate than from a peer. But social distances are also highly cultural. Various studies show that distances and spatial proximity vary according to cultures and nationalities. Research initiated by Hall himself reveals that individuals allow for more or less physical closeness, and touch each other more or less depending on whether they are Anglo-Saxon, Latin American, or North African, and that the size of bubbles varies greatly according to people's origin (Shuter, 1976), and can be very large in Western countries and almost non-existent in Arab countries, for example. For Hall et al. (1968), however, this is merely a social adaptation of immutable biological rules, i.e. of proxemic rules, and of the various kinds of distances that exist between people living in society.

As will be shown below, this approach has in many respects played a pioneering part, and has anticipated many of the theoretical developments proposed by the School of Proximity, such as the identification of geographical proximity and of its relative nature, or the importance of social ties, for example. However, it differs strongly from the School of Proximity in terms of the ontological conception of the world and of the positioning of a researcher. The School of Proximity bases its conception of the world on a separation between actors and on the varying distance that separates them (Gilly and Torre, 2000). Thus, it positions itself as an external Cartesian observer of the world, whereas the proxemic approach is based on a subjective conception of the world that is centered on the individual being and his/her relation to the environment, and which leads to an egocentric vision of space (Moles and Rohmer, 1978); a vision in which the individual feels and experiences a space in relation to his or her own self.

However, recent research on proxemics in which the development of ICTs is examined to better understand human relations in the context of virtual games or ubiquitous computing, has mitigated this ontological difference. Indeed, various works have shown that the physical positioning of players in remote games can be understood and, above all, envisaged according to the laws of proxemics. An example of this is the way in which players position themselves in front of and not far from the console when playing games such as Nintendo Wii, Microsoft Kinect, or Sony Move (Greenberg et al. 2011). Some authors now go further and consider that the wireless zones defined by Wi-Fi, Bluetooth or NFC radio waves have similar characteristics to those defined

by traditional proxemics analysis, with an invisible proximity field, a center and area of influence affected by contacts, so that they can be described as wireless proxemics zones (Mueller et al., 2014).

2.2 Von Thünen and Marshall, Two Great Precursors

Let us now turn to the true ancestors of the School of Proximity, by examining approaches that have focused on questions of proximity, though without using the term itself as they were already equipped with a theoretical, albeit imperfect arsenal. These approaches consisted of studies in economics or geography that analyzed proximity questions without using the term per se. Although systematic attention is now paid to proximity questions, this interest is relatively new and often manifested as part of studies conducted by economists. Thus, it should not be forgotten that proximity-related questions have been present in economic analyses for a long time, even though they were often mentioned in passing or in a veiled manner. After all, economics characteristically neglects space! (Nocco et al., 2017; Thisse and Walliser, 1998). Without engaging in a tedious review of passages in the literature that deal with the concept of proximity, let us recall that it is an important topic in the works of some authors who deal with the treatment of space in economic or geographic analysis, foremost among whom were Von Thünen and Marshall.

Von Thünen (1826) was probably the first author to have explicitly discussed proximity questions, approaching them from the perspective of the advantages of location. Thus, he provides an explanation for the location patterns of urban and agricultural activities, in which he emphasizes the existence of economic forces at the scale of a market town surrounded by an agricultural hinterland. Land pressure leads to an organization of the various cultures into concentric circles. Vegetable crops and dairy production are located near the town in a zone characterized by very high land rents, which decrease as the distance from the city center increases. The second, third and fourth rings – each located at a greater distance from the center – are dedicated to forestry, cereal crops and finally livestock breeding for meat, respectively. Land rents are lower than in the first ring and also strongly drop as the distance from the marketplace grows. Thus, the first-order locations occupy the center of the system, while the others form concentric and decreasing circles. What is sought for is proximity to the city center, the rents that land users are willing to pay depending on the transport costs to the center.

After being buried in obscurity for a long time, this simple but powerful idea re-emerged in many theoretical works that took inspiration from the Thünenian system and applied it more readily to urban spaces than to the original agricultural spaces, thus bringing back its relevance in the context of growing urbanization. Alonso (1964) and Muth (1969), for example, have prioritized studying urban land or real estate use, but have always brought to the fore the analysis of proximity to city centers, using a so-called radial-concentric approach. Following in their steps, New Urban Economics began to examine the location processes in cities and the land or property rental levels associated with proximity to city centers or to certain urban activities (Fujita and Thisse, 1986; Fujita, 1989). Thus, this variable is considered a key factor in land allocation for industrial, commercial, and residential uses in urban areas, and in particular in the setting of neighborhood retail stores.

Published almost 60 years after Von Thünen's, Marshall's (1890) works are also often cited for their contribution to spatial analysis, and although the latter is less universally celebrated than his contributions to the microeconomic approach, it was, in fact, the starting point for two very fruitful research movements, namely the agglomeration economy approach and the more recent industrial district analysis. Marshall also originated three concepts that have passed into posterity and whose meaning is often controversial. These are the famous expression "the mysteries of the trade are in the air," the concept of industrial atmosphere and the concept of industrial districts ~~or districts~~, inspired by his observation of the functioning of industrial neighborhoods in London. In all three cases, the English economist highlighted the advantages firms can draw from being located in proximity to one another, in the same area.

Two factors explain these benefits of proximity. The first is related to effects that are external to the firm; effects which Marshall contrasts with internal effects, and which have an essentially spatial dimension. These externalities are sometimes negative, as Pigou (1920), his disciple, showed with the example of environmental pollution. But they can also be positive when they benefit other firms and produce increasing returns to scale. Agglomeration economies (Fujita and Thisse, 2013), the virtues of which have been celebrated by a plethora of literature since the 1920s, with works such as those written by Weber (1929) for example, result primarily from elements such as reduced transport costs or the size of local labor and goods markets. The second factor underpinning the benefits of proximity is much less standard in economics: the spatial organization or spatial division of labor between co-located firms. The advantages of large-scale production can then be reaped through the concentration in a given area of many small, specialized firms sharing the same labor market, as is the case of districts.

But regarding Marshall or Von Thünen, it is important to note that the black box of proximity externalities was never opened in their works and that the analysis they provide is essentially based on a study of phenomena related to proximity dynamics, without truly unveiling the secret of their origin. A similar remark can be made about the pioneering work of the geographer Hägerstrand (1967), who proposed the first analysis of innovation diffusion in contexts of geographical proximity, diffusion which he likened to a contagion process. Although the principle of a diffusion process taking place in different stages helps to identify the role played by the spatial proximity between different firms or laboratories, the actual mechanism at work is not really identified or described in its essence, and rests above all on the modeling of an epidemiologic process. Thus, it is the pure probability of contact that conditions the transmission of an innovation, which is assimilated to pure information, but the proximity mechanisms involved are never described.

2.3 The Difficulty of Taking into Account the Notion of Proximity in Standard Economic Analysis

Although the issue of proximity is at the heart of many standard economics approaches, the term itself is seldom used, often obscured by references to more technical concepts. Thus, the traditional literature, particularly following the publication of Marshall's works, has primarily focused on analyzing the role of geographical spillovers in agglomeration processes. This is true of the research in geography on the role of information in

urbanization processes (Pred, 1966), or of studies on the role of interpersonal contacts in the implementation of localized interaction processes (Utterback, 1974).

2.3.1 Agglomeration processes

This positive outlook on proximity is also present in spatial externality approaches (Papageorgiou and Smith, 1983), which are based on the hypothesis that individuals have a fundamental propensity to interact and seek social contact, seen as a basic human need that is not necessarily expressed in the marketplace. In the same vein, Lucas (1988) raises the question of why economic actors choose to locate in the center of Chicago or Manhattan, even though it is expensive, sometimes uncomfortable, and many much cheaper places are available just about everywhere else. His answer is simple: it is because they want to settle close to one another. Here again, proximity is at the heart of the analysis, but is at best seen as a positive causal variable, without its ingredients being thoroughly examined. Each agent benefits from positive spatial externalities produced by others, externalities whose intensity decreases with distance. The initial spatial equilibrium can be endangered if actors' preference for mutual proximity becomes too important or dominant. In these approaches, the very existence and properties of the externalities thus identified promote agglomeration processes, since actors seeking mutual contacts seek to locate closer to one another.

This leads us to the explanation of the formation of cities given in the seminal work 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 (Duranton et al., 2015). Most of these forces result from interactions between consumer-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 (Glaeser, 2010). The need for face-to-face interaction extends to firms (Ogawa and Fujita, 1989), which seek, during the production process, to exchange information with others, information considered as an impure public good, the acquisition and conservation of which are facilitated by the concentration of agents in the same place. Producers then tend to group together to benefit from the positive externalities of proximity, i.e. information circulating more easily within a restricted perimeter and whose message tends to become diluted as distances increase.

As we can see today, it is indeed a similar idea that has motivated much of the research conducted in the field of the new economic geography. Those studies accept as a given a need for face-to-face interaction that can be satisfied by physical proximity between economic actors, a proximity thought to have great virtues. The agglomeration phenomena first studied by Krugman (1991, 2011) and subsequently by many authors can all be explained by the hypothesis that proximity is beneficial, in that the need for a spatial concentration of agents and firms is constantly highlighted. Market interactions can be illustrated by the following circular causation: firms employ workers, and as workers are also consumers, firms tend to locate in areas with large numbers of worker-consumers, and worker-consumers prefer to locate in areas with high concentration of firms. These analyses generally place emphasis on the existence of transport costs and of

upstream–downstream relations between local firms (Venables, 1996), but also emphasize factors such as the indivisibility of activities or the preference for variety, the spatial dimension of which is not proven.

2.3.2 Negative externalities of proximity

Those approaches pay little attention to the negative externalities of proximity, which, on the other hand, are widely studied in public economics, particularly in its environmental dimension. Negative externalities are for the most part related to pollution problems of various types (water, air, noise, etc.), and generally affect actors located in close geographical proximity to sources of pollution. Different categories of external effects can be distinguished; in particular, externalities may be "public" or "private" depending on the characteristics of rivalry and exclusivity of the nuisance (or of the benefit) caused (or benefiting) to the other party (Baumol and Oates 1988). Atmospheric (or olfactory) pollution is an example of a public (or indivisible) externality, insofar as the intensity of the nuisance does not vary according to the number of agents involved. On the other hand, the dumping of trash on an agent's property is a private (or divisible) externality, in that the nuisance is caused solely to the owner of the land in question.

The literature refers to three types of solutions: the Pigovian and the Coasian solutions, and a market for rights to use free goods. The Pigovian tax (Pigou, 1920) is the first solution for internalizing negative external effects. This solution involves imposing a tax on (or awarding a subsidy to) the originator of a negative (positive) externality; a tax (or subsidy) the amount of which is equal to the cost (benefit) of the externality suffered (or benefiting) a third party. Coase (1960) attempted to demonstrate the futility of government intervention through taxation, by showing that a solution for such externalities could be found through spontaneous agreements between the parties concerned, and that this is possible if there exists a structure of perfectly transferable property rights and no transaction costs. The third solution consists in the creation of markets, in which the rights to use (for a limited period) a given resource are transferable, can be bought, leased, or exchanged. An example is the right to discharge a certain quantity of pollutant into a lake (Demsetz 1967; Dales 1968). In all these solutions, the geographical proximity between the victim and the perpetrator of the nuisance appears as a constituent part of the externality, which can be avoided by relocating away from it, provided the negative effect is not felt beyond the geographical area concerned.

2.3.3 Spatial competition

Analyses in terms of spatial competition also raise the question of geographical proximity and, since Hotelling's works (1929), have attempted to provide a solution to the question of whether a firm should locate its operations in proximity to or at a distance from other firms. The answer depends largely on the prices and degree of differentiation of the goods they produce. A firm's choice to locate at a distance from competitors goes hand in hand with the differentiation strategy. When there is no product differentiation, it makes sense for a firm to choose to locate its operations at a distance from others, whereas product differentiation encourages them to locate in proximity to other firms: competition for customers is a centripetal force, which pushes firms to concentrate in the same geographical area.

But things change when prices are considered. D'Aspremont et al. (1979) modelized the location of two firms in a linear city where all consumers are located on a single road (or along a beach). If both businesses sell their goods at the same price, it is in their interest to be located in the center of the market, possibly back-to-back, in order to maximize their access to potential customers and share the market. But if prices are considered, the situation of proximity will encourage firms to lower prices in an attempt to capture the entire market. As a result, firms will tend to set up their shop at opposite ends of the city in order to try to capture as many customers as possible and will prefer to locate at a distance from rather than in proximity to each other. They can also fight the centrifugal effects of price competition through product differentiation, in order to get closer to consumers.

On the whole, these models are all characterized by a tension between competition among firms – which pushes them to locate their operations far enough from each other in order to obtain space to sell their products – and the search for the advantages that can be drawn from being located in proximity to customers (market advantages) or competitors (positive externalities). The benefits of (spatial) proximity are often praised but seldom explained and are widely confused with the very process of spatial agglomeration, to which proximity can contribute without necessarily being associated with it. This confusion will require an in-depth reflection on approaches to proximity.

2.4 Opening the Black Box of Proximity Relations

Two main characteristics differentiate the studies mentioned above. The first is an interest in proximity relations; the second is the fact that the latter are considered as a causal variable in the analysis, without their content ever being analyzed in detail. Other works, of different nature, have attempted to open the black box of proximity externalities by trying to uncover their meaning and contents. Conducted before the emergence of systematic studies on the notion of proximity, they mostly focus on the question of firms in their pursuit of proximity links.

The traditional analysis of locational factors in terms of agglomeration economies, inspired by the works of Marshall (1919) and Hoover (1948), was challenged, from the 1980s onwards, by research studies aiming to open the black box of proximity externalities and to explain not only why actors seek geographical proximity, but also the causes of these external effects. The empirical foundations of these approaches are found in works that emphasized the benefits for firms of being located near one another within a given area, for example within local production or innovation systems, such as technology or business parks (Castells and Hall, 1994). At a more analytical level, one can distinguish three main blocks of research, which have provided different explanations for the process of concentration and spatial lock-in and have partially opened the black box of proximity externalities. The subject is preferably approached from the angles of the specificity of human capital, the flexibility of the production process and the importance of non-market relations, and the development of innovations considered as a factor of knowledge transfer and production.

2.4.1 The specificity of human capital

Becattini (1991) is credited with having conducted the first research into local production systems, at a time when the competitiveness of small firms clustered within a specific area became apparent. Upon observing this phenomenon, which manifested itself particularly in the concentrations of small firms in the "Third Italy" (Bianchi, 1998), Becattini turned his attention to the old concept of district introduced by Marshall (1890) to refer to spatial concentrations of enterprises characterized by high growth rates. The basis of analysis is then no longer an isolated firm, but a group of small firms that maintain relations with one another and are located within a specific area. The most obvious characteristic of an industrial district is indeed the networking among a large number of small firms located within a circumscribed territorial area, through a combination of competitive and cooperative relationships. But the most important question here concerns the causes that explain the firms' choice of location and their attachment to a specific geographical area.

An industrial district is not the result of a (coincidental) concentration of enterprises initially attracted by favorable factors, such as primary resources for instance. Rather, it results from an organizational embeddedness within a territory, which makes it difficult for producers to free themselves from their relations to the territory (Becattini et al., 2009). This connection results from the existence of proximity externalities that represent a common good available to all within the district, externalities that generate positive internal effects and can lead firms to be "locked in" in the area. One major component of these externalities is the presence of local human resources, with specialized know-how, which further develops through successive learning processes. It has two characteristics that explain the production of proximity externalities. Firstly, the firms are certain to find the skills they need in their immediate environment, skills which they would struggle to find elsewhere. This tends to enhance their preference for, and therefore their attachment to the district (Brusco, 1982). Secondly, many workers, once trained, can become independent entrepreneurs, and engage in spin-off activities mostly within the district.

2.4.2 The flexibility of the production process and the importance of non-market relations

A second line of research into the origins of proximity externalities can be found in approaches that focus on horizontal relations within local production areas. The traditional analysis of external economies is challenged here by the fact that firm boundaries become blurred in favor of networks of collaboration, as in the emblematic case of Silicon Valley (Saxenian, 1994). Beyond the characteristics purely related to the specificities of the technologies concerned, three main dimensions explain the competitiveness of these industrial systems, namely (i) the existence of local institutions that ensure the development of a local culture, (ii) the specificity of the firms' internal organization, and (iii) the presence of a particular industrial structure, based on repeated interactions between local actors.

According to some authors (Glasmeier, 1988), the key to the performance achieved by these systems lies above all in their internal production of proximity externalities, which rests on two main elements: the existence of a flexible internal organization and the importance of non-market relations. Thus, communication between potential rivals is presented as a guarantee of flexibility, in a system that demands a capacity to adapt

quickly to cope with the high volatility of markets and advanced technologies. The ease and frequency of interaction explains the creation of a local network, in which the firm is embedded, so that the latter is able to benefit from technological advances, or even from the most recent discoveries, or to share them with its neighbors. This sharing of information often occurs informally, and therefore does not give rise to market transactions, as knowledge is disseminated through repeated interactions and the movement of workers between the various companies on the site. A similar idea can be found in the analysis of national, and then local, innovation systems (Nelson, 1993) or of innovative milieux (Maillat, 1995) in which firms pool their skills. Thus, Maskell and Malmberg (1999) show that proximity matters in that the interactive nature of learning processes introduces a geographical dimension to the relationship. In this case, the benefits of proximity can be converted into agglomeration forces by influencing the firms engaged in the interactive process.

2.4.3 The development of innovations considered as a factor of knowledge creation and transfer

A third approach for analyzing the microeconomic underpinnings of proximity externalities is found in works conducted in the field of the geography of innovation (Feldman, 1994), which draw attention to the spatial concentration of innovation activities, and from the outset integrate the notion of proximity, ~~within regions or smaller geographical areas~~. As revealed by Hägerstrand (1967), innovation is concentrated within a few areas which house not only production units, but also private research laboratories and institutions close to academic research, such as public laboratories or universities. This empirical evidence reinforces the idea according to which proximity relations play an important role in the generation of new technologies. Furthermore, a link is shown between this tendency and that of a spatial concentration of industrial activity (Jaffe et al., 1993), so that the causes behind a firm's location choices and the competitiveness of these production hubs are analyzed as being linked not only to relations between firms, but also to links between science and industry (Anselin et al., 1997).

The explanation refers to the very nature of knowledge, considered as a cognitive process that is not fully appropriable and can therefore spill over from one firm or institution to another. The local nature of knowledge transfer can be explained by the fact that "knowledge traverses corridors and streets more easily than continents and oceans" (Feldman, 1994, p. 2) and in particular that it is fostered by face-to-face interactions, which are made possible by geographical proximity. Thus, in industries in which knowledge spillovers are important, the competitiveness of firms increases when they are in a situation of spatial concentration (Audretsch and Feldman, 1996). Indeed, knowledge cannot be transferred in a fully standardized manner and requires interactions between people, largely facilitated by geographical proximity, which thus generates positive externalities. Indeed, in the first stages of technology development, communication and repeated interactions between the actors are necessary for the setting of common codes and language, a process of interpretation and translation of partial tacit knowledge, and its transformation into operational questions (Amin and Wilkinson, 1999). This process of successive improvements and feedbacks is facilitated by the proximity involved in direct interactions, which allows for mutual exchanges throughout the innovation and production process (see Chapter 4 by Stimson in this volume). Rallet and Torre (1999)

show, however, that the hypothesis according to which the transfer of tacit knowledge is facilitated by geographical proximity is not always verified in practice and that the equation tacit relations = geographical proximity must therefore be viewed with caution (see Chapter 5 by Bernela et al. in this volume). Indeed, on the one hand, some tacit knowledge can be transferred remotely; and on the other hand, the spatial concentration of high-tech firms or labs can have more prosaic explanations such as financial or land-related advantages. Thus, they paved the way for research on geographical proximity in innovation relations.

3. THE SCHOOL OF PROXIMITY

The contributions that are part of what is now commonly known as the School of Proximity are identified as the research studies conducted by a group of scholars who share a common vision of proximity relations and use similar frames of analysis for explaining concrete economic and social phenomena. They represent a variety of backgrounds, disciplines and themes, and various degrees of adherence to the core of the analytical corpus. However, they have in common several characteristics, which authorize us to place them in the same school of thought:

- The wish to treat proximity as an autonomous and theoretically grounded analytical category.
- A systematic examination of the characteristics of proximity relations.
- The definition of several categories of proximity (beyond the merely geographical proximity).
- An analysis of the effects and consequences of proximity relations.
- A review of the different areas of application and validity of this approach.

3.1 The French School of Proximity

The French School of Proximity has its origins in a small group of French economists who decided, in the early 1990s, to focus attention on this notion and to examine in more depth its analytical content. They had a background either in regional science or in industrial economics, and were all inspired by research studies conducted at the intersection of these two disciplines, as well as by approaches in terms of innovative districts and milieus, or analyses developed in the field of the geography of innovation. They all shared an interest in these approaches but also found that the theoretical foundations of proximity relations were not well enough developed and that they tended to only consider the positive effects of proximity. Thus, some authors decided to create a research group whose purpose would be to study and analyze proximity-based relations: this group is known as the "Proximity Dynamics" group. The French School of Proximity was born (see Chapter 1 by Zimmermann et al. in this volume).

3.1.1 The creation of a school of thought

The group, characterized by participants with a variety of backgrounds, then began its work by focusing its attention on production and innovation relations, on their spatial

nature and territorial embeddedness. The analytical frameworks tend to differ from those of standard economics, and to be more in line with evolutionary (Nelson and Winter, 1982) or interactionist (Granovetter, 1973) approaches. Over time, they expanded to include other disciplines and areas of interest. The first manifesto signed by the founders was based on a simple observation: proximity relations are at work at all levels of production and innovation processes; everyone talks about them but nobody really knows how they work (Bellet et al., 1992). It was therefore necessary to systematically examine the notion of proximity and its content in order to understand how proximity relations work. This was done with the publication of several collective works, which explore the facets of this concept and apply it to different analytical frameworks and fields of study (see, for example, Bellet et al., 1998; Gilly and Torre, 2000; Dupuy and Burmeister, 2003; Pecqueur and Zimmermann, 2004).

From the outset, and with the publication of a special issue of the *Revue d'Économie Régionale et Urbaine* (Bellet et al., 1993) by an already expanding group of authors, it was posited that different forms of proximity exist and that the latter cannot be reduced to spatial proximity (renamed geographical proximity). Emphasis was admittedly placed on spatial processes, such as firms' choice of location, the local dissemination of information and innovations, the spatial concentration of firms and laboratories or the existence of local systems of production and innovation. But the authors also argued that it is necessary to consider other types of proximity of a non-spatial nature, and related to linkages between actors, to resources, coordination and even institutions, and that territorial dynamics, growth and development processes, as well as the creation and dissemination of knowledge and innovations result from a combination of those various types of proximity.

Intensive research was then undertaken, seminars held and works published, with, initially, a marked focus on economics, which led those involved to focus primarily on industrial and innovation issues (see the assessment of Carrincazeaux et al., 2008; or Chapter 3 by Filippi et al. in this volume). The era lent itself to this; indeed deindustrialization processes were intensifying in France, with the closure of many factories and industries, many relocations in foreign countries, and the rise of the digital economy, as well as the decline of transport costs at the global level. At the same time, however, certain places were becoming very attractive locations for firms – hence the growing interest in conducting research on proximity; highly efficient innovative systems, such as Silicon Valley or industrial districts were developing on the basis of local interactions. The research conducted by the group, which was never disconnected from reality and had strong empirical foundations, was impacted by these developments. The concepts and categories were refined through work on the ground and joint studies conducted by thematic teams on cases existing in different French regions.

~~From the outset, the~~ answers provided have been nuanced – in contrast with the Manicheanism of binary oppositions such as the need for geographical proximity versus the death of distance – and have revealed the complex interplay of the different categories of proximity. The first studies took a critical approach to the idea that agglomeration effects are key determinants in the success of local production and innovation systems. They showed that geographical proximity does matter, but that it is largely inoperative if it is not coupled with other, non-spatial forms of proximity (Torre and Gilly, 2000). The local systems that have grown successfully and have positively influenced the

competitiveness of the firms, are for the most part those that rely on and promote intensive local interactions (sometimes qualified as "productive encounters"). This is the case, for example, of the Meylan cluster (near Grenoble), where cooperation is strong, and the Sophia Antipolis technopole, which has grown more slowly. The public authorities can help promote proximity between local players and reinforce the involvement of institutions, so as to support territorial embeddedness (or territorial anchoring), encourage firms to stay in the area and develop interactions with the territory, and to promote local resource development (Zimmermann, 2001). This is the case in Aix-Marseille, where the state has facilitated the setting of a nucleus of microelectronic firms, with a view to industrial development.

Proximist authors then focused their attention, primarily, on coordination issues, which led them to make a distinction between location and proximities, which have many and much more complex dimensions. Spatial coordination processes, which changed significantly with the development of the just-in-time management system and of flexible production, suggested that geographical proximity had a secondary role in production processes, ICT and computer-aided design techniques which allow firms to order parts and modules from different distant subcontractors and to assemble them at their headquarters. However, with the significant de-agglomeration processes observed in some industries, such as computer design, the need for local coordination in the automotive or robotics industries has grown, and some firms go as far as to integrate subcontractors into their plants in order to control their day-to-day operations, ensure product differentiation and meet the requirements of end customers (Frigant and Lung, 2002).

The virtues of localization, which is considered a structural constraint from the perspective of spatial economics in that it gives firms access to resources located close to them, are also called into question in the proximist approach. Geographical proximity proves essential, but not all the time, nor everywhere. It is, indeed, essential at certain key phases of a production cycle, such as the partner selection, the exploration and the institutional learning stages (Kirat and Lung, 1999), which require coordination between firms with different knowledge bases and significant cognitive distances. However, it proves less essential – or even useless – and can be replaced by long-distance relations or temporary meetings at other stages, such as during the exploitation phase, during which the dominant standard or design is developed. In passing, some authors criticize cluster approaches that aim to systematically reinforce the geographical proximity between competing firms. The risk is indeed to produce the opposite effect to what was intended, such as a deficit of interactions due to a fear of knowledge misappropriation, or industrial espionage.

The authors consider that individuals or organizations are situated, at a given period of time, and are in a position to minimize the location constraint through mobility (through which they can gain access to resources in other places), or through the use of ICT (which can create forms of ubiquity and therefore an ability to operate on multiple spatial scales). They identify nomadic firms (Zimmermann, 2001), which may or may not choose to settle in a given territory depending on their productive choices, and develop an analysis of the innovation process that contrasts with that of the economic geography according to which actors located in a given space can only use the resources that are present in this area. This results in a dynamic vision of the role played by proximities in industrial processes, as well as in the creation and transfer of innovations and knowledge.

The model is close to that of open and collaborative innovation (Chesbrough, 2003), with an increased spatial dimension. Situated actors are mobile and capable of developing networks with geographically distant actors, which gives them access to multiple resources that may be found locally or in other territories. This calls into question the need for geographical proximity (1) in the transfer of tacit knowledge and (2) during the entire innovation process, which casts doubt on the necessity for innovative firms or laboratories to be co-located in the same place (Gilly and Torre, 2000).

3.1.2 Conceptual stabilization and inclusion in the field of social sciences

After a few years of in-depth research, the need was felt to look beyond the boundaries of economics. Indeed, the questions that arose, the realities that were addressed, and the complexities that emerged, called for a broadening of the field of research and for new analytical tools. For example, the question was raised of the importance of social dynamics, of groups of people and of the cultural origins of individuals involved in proximity relationships. What is the impact of topologies, of transportation or communication infrastructures on proximity? What are the types of measures of proximities according to the types of spaces? Are the degrees and roles of proximity impacted by organizational methods, institutions, or political systems? These questions prompted the inclusion of other disciplines, mainly social sciences (Bellet et al., 1998), and an extension of the group's boundaries. Non-orthodox economists were then joined by sociologists and geographers, as well as by specialists in management sciences, and all collaborated in joint publications, on a regular basis. Thus, a particular approach in the field of social sciences took shape and gave rise to definitions of proximities that largely transcended disciplinary barriers.

In light of these case studies, applied works and of the disciplines involved, the question emerged of the definition of the different types of proximity. The idea that soon prevailed at the time was that there were two main categories of proximity, depending on whether one focuses on the spatial dimensions, or on more social or institutional aspects. Indeed, on the one hand, questions related to long distance exchanges, the location or relocation of firms and their territorial impact emerged, while on the other hand, questions arose regarding institutional thickness, inter-industrial or inter-firm relations, and the fact that the latter were based on interactions between individuals. Different definitions were proposed and made a distinction between geographical, organizational, or institutional proximity. The debate was concluded with the definition given by Torre and Rallet (2005), who refer to two types of proximity and define their characteristics and subcategories: geographical proximity and organized proximity.

The term "organized," which replaced "organizational," reflects the ambitions of the research and a clear expansion to include social sciences. The question is no longer just about organizations, but about society and how it is organized and about how it uses and exploits the different types of proximity. The two notions, which can be approached individually or in combination, are not, however, totally independent from each other. The concept of geographical proximity is about distance, but it also has a social dimension in that it encompasses questions related to infrastructures, the ability to travel and individuals' perception. Organized proximity refers to the different ways in which actors are close to one another, whether they have frequent interactions or share common cultures or representations, or ties based on common origins.

3.2 The Maturity Phase

The definition of the two main categories of proximity proposed by Torre and Rallet (2005) was then challenged, in the same special issue of *Regional Studies*, by an alternative categorization defended by Boschma (2005). The latter considers multiple types of proximity, giving them a more operational content, which makes it possible to study most of the categories independently. This approach has been quite successful, particularly because it is more testable than previous propositions. Many studies focused on one particular type of proximity and attempted to measure its effects (for example Broekel and Boschma, 2012; Hoekman et al., 2010; Chapter 6 by Caragliu in this volume), paying particular attention to aspects ~~related~~ to related variety and innovation processes. New developments were then made in the research, with a more in-depth examination of the various concepts, but above all new extensions of the notion of proximity beyond the initial framework of production and innovation relations, to include environmental and societal issues.

3.2.1 Related variety and innovation processes

One cannot, strictly speaking, talk of a Dutch school of proximity in the same way as one talks of the French school. Indeed, this movement of analysis has not shown the same desire to form a cohesive group and to create a school of thought; above all, it does not have the same group organization and meetings, nor is it animated by the permanent debates and controversies that have characterized the French School of Proximity. However, there is no doubt that, with the publication of Boschma's seminal article in 2005, a movement of thought developed, involving several authors, most of whom were Dutch or members of Dutch universities. The Dutch approach has given rise to various concepts related to proximity dimensions, which have had great success and have led to important developments in the fields of economics and geography.

Boschma identified five types of proximity. Four of them refer to the non-geographic dimensions of the relations between organizations and individuals. Cognitive proximity, clearly a concept of evolutionary inspiration, is based on the sharing of knowledge bases and competencies; this sharing promotes innovation when these bases are not identical, which leads to reduce the diversity of innovation trajectories. Organizational proximity, neo-institutionalist in nature, is inspired by the previous definitions of the French school. It refers to an arrangement constructed within an organization or between different organizations, with the market on one side and the integrated firm on the other; the most satisfactory solution for the network organization. Social proximity refers to the embeddedness approaches and to the fact that any economic relation is embedded and rooted in a social context, as a result in particular of relations of friendship, of family ties and experience. Finally, institutional proximity has to do with one's adherence to a set of rules applied at macro level, such as laws and political decisions, or religious or cultural values. Besides these non-spatial proximities, geographical proximity plays a particular but ambiguous role; it must be distinguished, from an analytical viewpoint, from other types of proximity, but it can be substituted by the latter. Boschma warns about the fact that too much proximity harms proximity; this is a constant in this approach, one that has been coined "the proximity paradox" (Boschma and Frenken 2009). For example, too much proximity between firms can

cause a lock-in effect or facilitate industrial espionage. The various forms of proximity can be seen as conducive to action, because they foster trust or facilitate learning, but they can also lead to lock-in phenomena or cause systems or regions to get confined into rigid trajectories or spurious relations (see Chapter 12 by Cortinovis and van Oort in this volume).

Emphasis is placed on two areas of analysis: questions regarding related variety and analysis of innovation processes. Reflection on the notion of related variety has reactivated and provided a solution to a long-standing debate in economics concerning the comparative virtues of specialization or diversification, as well as their impact in economic terms. Should one promote a specialized activity, at the risk of undergoing a major crisis should there occur a sudden change and conversion difficulties? Or is it preferable to diversify the production of a country or region, at the risk of causing fragmentation and a lack of comparative advantage? The sophisticated answer provided by the proximist authors lies halfway between these two options: a territory can benefit from specializing in a variety of related activities combined in the same portfolio, hence the term related variety, which refers to a particular composition of sectors within a region, for example.

The advantage in this situation lies in the fact that a local or regional economy rests on a group of highly complementary firms that have strong relations with one another thanks to their cognitive proximity. Indeed, they are specialized in one or a few key domains of production, such as agribusiness or the automotive industries, but are diversified within those domains, in the production of engines, electronic circuits, tires and chassis in this case, with different categories of subcontractors or local industrial customers. A territory or region with a significant degree of related variety is characterized by strong interactions or technological spillovers between firms or subsectors dependent on its main sectors of activity. These industrial linkages, measured by using different statistical methods (Content and Frenken, 2016) or proximity indices (Hidalgo et al., 2007), promote resilience in the local economy, as well as stronger growth due to their interactive nature.

This vision allows for a dynamic perspective on spatial development, which is particularly relevant in evolutionary approaches to economic geography (see Chapter 2 by Balland et al. in this volume) and in analyses of inter-organizational learning. Innovation activities and processes are the main fields of application of approaches in terms of proximity. Many statistical or econometric studies examine the role played by different categories of proximity in the production and dissemination of knowledge. They validate the idea, already brought forward in previous works, that the benefits attributed to geographical proximity in these processes are generally overestimated, but nevertheless show that its existence facilitates the development of other types of proximity. They also examine the complementarity of the different forms of proximity, and more particularly the phenomena whereby these categories – geographical proximity and cognitive or social proximity for example (Ponds et al., 2007) – can compensate or replace each other. Among such studies are those related to the life cycle of clusters: they show that innovation starts at local level, and emerges from collective interactive learning processes (Boschma and Frenken, 2009) that are facilitated by the spatial concentration of innovation activities, which is conducive to the creation of spin-offs in which the interplay between geographical and cognitive proximity plays a significant role. At later stages of

innovation processes, geographical proximity to other firms becomes less important and can be replaced by relations with firms or laboratories located outside the local system.

3.2.2 Thematic and conceptual extensions

In parallel with the intense research on production and innovation relations, and on the role of the different categories of proximity, conducted essentially by Dutch authors during this period, work was conducted to enhance the conceptual "toolbox," with the introduction of new concepts and an extension of the thematic scope, which is still ongoing today. The early period of the French School of Proximity and of international research developments, which spanned from the early 1990s to 2005, was marked by an almost exclusive focus on questions of production and innovation, in studies conducted in other countries – in Europe in particular – by researchers who had adopted this approach (for example, Baptista and Mendonça, 2010; Basile et al., 2012; D'Este et al., 2013; Freel, 2003; Hansen, 2014; Hong and Su, 2013; Steinmo and Rasmussen, 2016; Romijn and Albu, 2002; Sternberg, 2007). A new stage began after 2005, with in-depth investigations of the themes under consideration, and the development and improvement of the conceptual apparatus.

The first development concerns the definition of a temporary dimension of geographical proximity (Gallaud and Torre, 2004; Torre, 2008; Rychen and Zimmermann, 2008), which helps to account for the fact that individuals or firms may feel a need for geographical proximity to other actors at a given time, without this leading to a permanent change of location. This need for geographical proximity can be fulfilled temporarily through travel. Indeed, the advantages of temporary geographical proximity lie in the possibility for actors to maintain face-to-face interactions at certain times during the process. In most other stages of the relation, however, organized proximity between actors enables them to have efficient long-distance exchanges using communication technologies.

The addition of the temporary dimension was initially motivated by a reflection on the difference between proximity and location, the latter relating to the specific place or site in which two or more entities are situated, whereas proximity can also develop between geographically distant entities. The need to add this new category is justified by the possibility of frequent travel, in a personal or professional context, with, for example, the growing success of fairs, trade shows and conventions, which bring together, for very short periods of time, large numbers of people in dedicated locations (Bathelt and Schuldt, 2010; Chapter 15 by Bathelt et al. in this volume). It also refers to the possibility for employees or representatives of companies collaborating on joint production or R&D projects (Torre, 2011), to travel to and from each other's sites – to resolve any problems or conflicts that may arise, for example – and to collaborate through ICT and travel (Gallaud and Torre, 2004), while setting aside time for joint meetings two or three times a year, rather than to co-locate their operations. Even when the innovation process takes place between geographically close firms, research shows that face-to-face interactions are limited; contrary to the canonical cluster model, they are not daily but rather monthly occurrences (Lethiais and Aguilera, 2014), whereas meetings between neighbors occur at the same pace as those related to remote projects (Grossetti and Bès, 2001). On a more individual level, the development of people's mobility and the need to meet and socialize with others promotes the creation of leisure and amusement parks or spaces designed to fulfill this type of need. This approach now proves extremely

important with the development of teleworking, which the COVID crisis has accelerated, and which has led to an increase in the number of situations of temporary geographical proximity.

A second key issue emerged with the broadening of the research to include new topics, beyond production and innovation relations. Thus, environmental and land management issues were added to the agenda, which required that what was first called "the negative dimensions of proximity relations" be examined and considered, in contrast to the very positive vision of proximity conveyed until then (Mollard and Torre, 2004). Somewhat neglected for several years, geographical proximity was brought back to the forefront, its role re-examined, and its constituent categories refined. This approach drew from the standard approach to public economics based on negative externalities mentioned above and, de facto, the fields of application initially appeared to be very similar, with the study of issues related to various types of pollution (air, water, or noise), and to land uses. But also, and increasingly, the proximity approach took into account problems and nuisances generated by the development of large transport infrastructures such as ports, airports, railways, highways, etc. (Torre and Zuindeau, 2009), and local populations' opposition to such projects. New themes emerged, relating to the drawbacks and inconveniences arising from the construction of dams, of energy production or waste treatment plants or prisons, and increasingly, to all the nuisances linked to urban sprawl. The ever-continuing development of human activities, reflected for example in the growth of urban infrastructures and changes in urban–rural relations, has blurred the boundaries between two different worlds, and given rise to new tensions and oppositions that stem from excessive geographical proximity.

Conflict analysis in proximity relations, which differs greatly from that of negative externalities (see Chapter 18 by Magsi and Sabir in this volume) represents a break from the standard approach to public economics. While the externality-based approach strives to remedy the drawbacks of pollution through taxes or other mechanisms and to avoid conflicts through the bargaining of rights, the new approach consists of closely examining the ins and outs of conflict, to understand its function as well as its spatial and human dimensions, and in so doing giving it legitimacy. Conflicts, caused by unwanted geographical proximity (Magsi and Torre, 2014) – for example in situations of unwelcome neighboring activities or actors – should not be systematically resolved or eliminated, as they are considered as an integral part of the governance (Torre et al., 2014) or territorial development process. Negative effects can arise when there is unwanted geographical proximity not only between individuals or organizations, but also between individuals and technical objects or places, from which they might then seek to move away. Sought for geographical proximity, on the contrary, corresponds to a situation in which an actor wants to locate in close proximity to another actor(s) or facility(ies) in order to benefit from their positive effects, as in the case of residential neighborhoods or remarkable places. The interplay and combination of proximities are at work here again, but in a totally different way. Unwanted geographical proximity generates oppositions and rejections, which can lead to conflicts, around methanization processes for example (Bourdin et al., 2019), whereas the benefits of organized proximity can be activated to support coordination between opposing groups, or to help them to structure themselves (Torre, 2014).

Finally, developments occurred on the question of proximity dynamics. Presented from the start as inseparable from the proximity approach, this question remained a

blind spot for a long time and its exploration is still in its infancy. Indeed, it was not until the late 2000s that formalized theoretical grids were developed, around territorial development processes and innovations. The French school, above all interested in micro-relations, focused on the role played by temporary geographical proximity and coordination capacities in processes of collaboration between geographically distant firms. Thus, authors show how geographical and organized proximities follow from each other and combine over time, during innovation projects carried out by collaborating firms (Torre, 2011), or how they change in configuration according to the conflicts that arise between the participants during this process (Gallaud, 2018). The model proposed by the Dutch school links micro foundations to meso or macro approaches and focuses on the co-evolution of different types of permanent proximity in innovation networks (Balland et al., 2015) to explain development processes. The analysis, inspired by the life cycle of clusters, explains the processes through which the five categories of proximity evolve. Thus, learning reinforces cognitive proximity, increasing interactions promote social proximity, institutionalization develops institutional proximity, integration facilitates organized proximity, and agglomeration leads to geographical proximity. However, the two schools agree on the idea of a proximity paradox: a minimum degree of proximity is necessary for firms to be able to coordinate; but too much proximity ends up limiting innovation performance, the development and innovation trajectories ultimately giving firms little room for maneuver.

4. A MANUAL OF PROXIMITY

After 30 years of research by the School of Proximity, we can now take stock of the research conducted, as well as of its contribution to the body of knowledge in the field of social sciences. Beyond the clarification and in-depth analysis of the concepts, it is the role played by the different types of proximity in social and economic life, as well as their impact on the dynamics of change and evolution in societies that are at stake. Let us begin by defining the two main categories of proximity and their variations (see Figure I.1), before making an inventory of the main achievements of this research program.

4.1 The Two Main Categories of Proximity

There are several definitions of proximity relationships and their division in various subcomponents. We choose to follow the distinction made by Torre and Rallet (2005) and Torre (2014), which appears to be the simplest and more rigorous one. We consider the distinction between two main categories of proximity: geographical proximity and organized proximity. They refer, above all, to potentialities given to individuals, groups, and human actions in general, in their technical and institutional dimensions. This potential may, or may not exist at a time t, and therefore may or may not be usable or actionable through the action and representations of the actors.

4.1.1 Geographical proximity

Geographical proximity is above all about distance. In its simplest definition, it is the number of meters or kilometers that separate two entities. But it is relative in three ways:

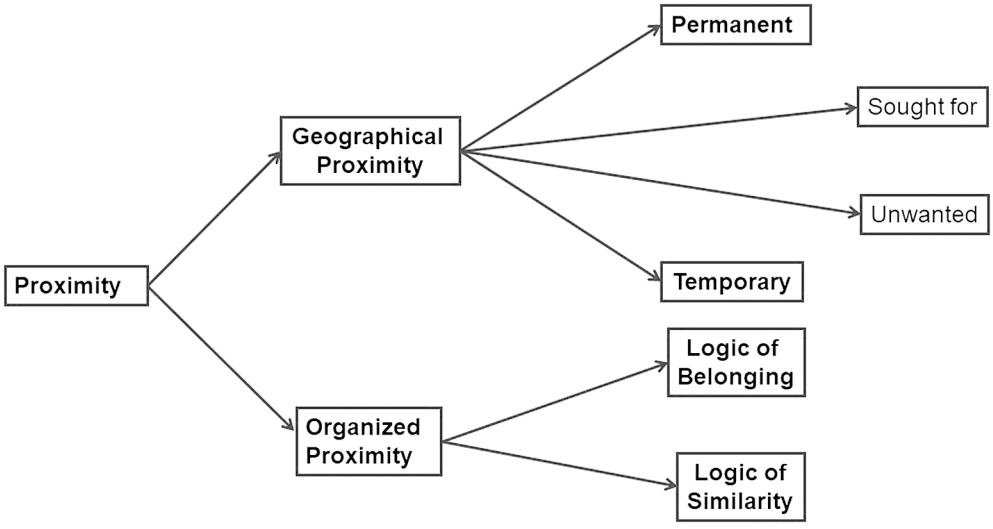

Figure I.1 The categories of proximity

in terms of the morphological characteristics of the spaces in which activities take place; in terms of the availability of transport infrastructure; and in terms of the financial resources of the individuals who use these transport infrastructures (see Chapter 8 by Bertoncin and Pase in this volume).

Geographical proximity is neutral in essence. It is the human actions and perceptions that give it a more or less positive or negative dimension, as well as certain usefulness. It is the way in which actors use it that matters. It can be activated or mobilized by the actions of economic and social actors. Depending on their strategies or strategic choices, or according to their perceptions of their environment, the behaviors and attitudes of these actors vary, and they mobilize geographical proximity differently.

Sought for geographical proximity refers to the quest, by some actors, for geographical proximity to other economic or social actors, to natural or artificial resources, to places or technical objects. It can be permanent or temporary: The need for permanent geographical proximity is met by being in what is considered an appropriate location or by moving and settling in a place deemed more likely to help the actors concerned meet their needs or conduct certain activities. The need for temporary geographical proximity can be fulfilled without having to settle in a different place, but by traveling and undertaking occasional trips of a limited duration.

Unwanted geographical proximity corresponds to cases of actors finding themselves in situations of unwanted geographical proximity to people, activities, technical objects, or places, without being able to move and change locations. Geographical proximity is the source of negative externalities, which correspond to the disadvantages of being in proximity to objects of concern, such as a polluted site or a waste incineration plant for example. It is also the case when firms find themselves in proximity to competitors that seek to appropriate part of their knowledge through industrial espionage for instance, or by hiring their best engineers.

4.1.2 Organized proximity

Organized proximity too is a potential that can be activated or mobilized. It refers to the different ways of being close to other actors, regardless of the degree of geographical proximity between individuals. Just like geographical proximity, organized proximity refers to a potential that is neutral in essence. It is the perceptions and actions of individuals that give it a more or less positive or negative dimension, and therefore a certain usefulness.

The logic of belonging refers to the fact that two or several actors belong to the same relationship graph or even to the same social network whether their relation is direct or intermediated. It can depend on the sector they operate in; in this case they share a common creative or innovation capital. It can be measured in terms of degrees of connectivity, reflecting more or less high degrees of organized proximity and therefore a more or less great potential of interaction or common action.

The logic of similarity corresponds to a mental adherence to common categories; it manifests itself in small cognitive distances between some individuals. They can be people who are connected to one another through common projects, or share the same cultural, religious (etc.) values or symbols. The logic of similarity possesses two facets. It can develop within a reciprocal relationship; a relationship which shortens the cognitive distance between the actors involved (common project, common education and knowledge circulating within a network, etc.), but it can also emerge from a common basis, facilitating the communication between strangers (see the example of diasporas).

4.1.3 Temporary geographical proximity

Temporary geographical proximity (TGP) constitutes one form of geographical proximity that enables actors to temporarily interact face-to-face with one another, whether these actors are individuals or organizations such as firms or laboratories for example.

Space matters, but in a way that consists of temporary face-to-face contact between two or more individuals. TGP corresponds to the possibility of satisfying needs for face-to-face contact between actors, by traveling to different locations. This traveling generates opportunities for moments of geographical proximity, which vary in duration, but which are always limited in time. TGP is limited to certain times; this form of geographical proximity should not be mistaken for a permanent co-location of firms or laboratories.

The necessity of TGP is embodied in the existence of places that are especially made for TGP based activities. In the case of private individuals, they can be conferences, or theme or recreational parks. In the case of firms or laboratories they are specialized venues like trade shows, conferences and exhibitions or common "platforms" of project teams.

4.2 Key Achievements

The contributions of the School of Proximity are rich and varied. Rather than listing them in detail, it is more interesting to focus on its main analytical achievements. Some of the advances have to do with the specific characteristics of the various forms of proximity, with a clarification and in-depth examination of the concept itself, its content, and

its manifestations. Others are related to the effects of proximities, as well as their influence on social and economic relations.

4.2.1 Geographical proximity alone cannot account for the development of economic or social relations

The first contribution has been to define the characteristics of geographical proximity, which is the most obvious category as the term proximity originally refers to physical or geographical distance. Geographical proximity alone is clearly not sufficient to ensure the success of a social or economic relation. The first studies on the issue focused primarily on this dimension, and essentially sought to highlight the benefits of geographical proximity, which was thought to facilitate the transmission of tacit knowledge, via face-to-face interactions between firms or labs and universities, which are very fruitful but cannot occur between physically distant actors (see Chapter 13 by Steinmo and Lauvås in this volume). This idea underpins the studies that have sought to highlight the advantages of local production and innovation systems or clusters, as well as many policies promoting technopoles or science parks, for example. However, it soon became clear that geographical proximity alone could not explain the development of successful relations and that it could even have harmful effects. The most telling example is that of a "working" cluster, i.e. one that is characterized by successful knowledge exchanges and co-creations of innovations. To obtain such an outcome, it is not enough for firms or labs to be co-located in the same geographical area; indeed, interactions have to be fruitful and cannot be solely based on spatial proximity (see Chapter 10 by Crescenzi et al. in this volume). Two firms can be located at a very short distance from each other and have no interaction at all, just like two people who live in the same building and meet from time to time in the elevator but do not communicate or interact with each other. As many managers of local business parks have observed, geographical proximity is a necessary but insufficient condition for a cluster to exist and be successful. Indeed, they are often no more than concentrations of firms or labs attracted by tax or real-estate advantages, but without any relations with one another. The same applies to city dwellers, who may enjoy geographical proximity to certain actors or facilities as well as some organizational advantages but have no social interactions with others and might even suffer the disadvantages of excessive proximity to sources of nuisance (congestion or pollution related problems for example).

4.2.2 The importance of interactions

One important contribution of the School of Proximity is to have thoroughly theorized non-geographical proximities and to have brought them to the forefront. It has identified the best-known forms of proximity, namely institutional, organizational, cognitive, or organized proximities, and the focus has been placed on different questions or dimensions related to their existence. However, one aspect stands out: it is the emphasis on the importance of interactions, which has paved the way to an analysis in terms of networks. This interest in the question of interactions is linked to the general conception of human relationships and individual behaviors that underlies the work of scholars on proximity. These behaviors are clearly distinct from the overall view of methodological individualism and from the idea that individuals act – with perfect or imperfect rationality – solely to pursue their own interests. Most of the studies do not adopt an institutionalist or

Marxist approach according to which individuals are entirely overdetermined by social structures or classes, but rather tend to draw attention to group behaviors, in which individuals find their place in a more or less formal way. These affiliations, which can be associated to the notion of embeddedness, can take multiple and diverse forms, such as cooperation in a network of innovative entrepreneurs, alumni membership, or participation in the activities of tennis club (see Chapter 9 by Rozenblat in this volume). Within these groups, or networks, what matters is the interactions between the members. They are more or less formalized, through rules, or more or less strong and regular institutional commitments. But it is the combination of these different interactions that determines the configuration and potency of non-spatial proximities, otherwise known as organized proximities. Indeed, they structure relations between individuals. Within a local production or innovation system for example, exchanges between participants can take place in dedicated places, or simply in the cafeteria, but they can also be long-distance interactions through communication technologies such as email, chat, video-conferencing or Skype meetings. Local or distant proximities are activated or reinforced through these interactions.

4.2.3 The key role of coordination between actors

Interactions are undoubtedly important, but they cannot alone account for proximity dynamics and even less territorial for development processes. Indeed, to draw maximum benefit from the positive dimensions of proximity and limit their negative influences, interactions must be organized and coordinated. Proximity approaches consider three main forms of coordination: cooperation, trust, and conflict. In the 1990s and early 21st century, proximity economists have focused primarily on cooperation in the context of innovation or knowledge creation processes. Cooperation is a way for individuals or firms to organize themselves so as to be able to work in groups or pairs, to pool knowledge, to develop knowledge or know-how together, and to exchange information or innovations. In doing so, the actors utilize organized proximity, particularly in its logic of belonging, whether they are geographically distant from one another, or, more effectively, through face-to-face interactions at the local level. As for trust, it can contribute to the success of a cooperation, but the latter does not guarantee the existence of trust. Indeed, trust is not necessary to cooperate, and many forms of cooperation are in fact based on well understood mistrust, which is countered by repeated interactions and the establishment of common rules. Trust, however, allows for smoother functioning as it reduces the need for control and therefore its associated costs. It is considered as a given, when it results from the logic of similarity associated with organized proximity. For example, the members of a business school alumni or of a fraternity will easily trust one another, even if they have never met before, which will prove particularly useful in a work relationship. Trust can also be built step by step, through repeated interactions, and then be associated with the logic of belonging of organized proximity. Finally, it can be generated, within an organization, through the implementation of rules and procedures that will facilitate the development of the relationship and in so doing activate the benefits of organized proximity (Dupuy and Torre, 2006). The third form of coordination is conflict, which is most often analyzed within the framework of territorial governance processes, that is to say, the way in which different categories of local actors discuss and agree on territorial development paths and methods. Proximity specialists

do not consider conflict as a failure to be overcome. On the contrary, it is conceived as a part of the governance process, just like other forms of coordination: indeed, it is a way in which opponents exchange and interact, sometimes aggressively, but without ending their relationship. Organized proximity can then be mobilized in two different ways during phases of conflict. Relations based on organized proximity can develop between members of opposing groups and bring them together around common visions and points of view. Furthermore, the resources of organized proximity can also be utilized to reconcile the conflicting parties, by finding what the opposing actors have in common, and in so doing encouraging them to engage in discussion and exchange.

4.2.4 Agglomerations arise from the combination of two main categories of proximity

Our era is characterized, even more so than previous ones, by the existence of massive agglomerations of activities and people, which present advantages that outweigh the drawbacks associated with excessive concentration. This is the case, not only of urban agglomerations, which now house more than 50 percent of the world's population, sometimes within very large megacities, but also, in the productive sector, of production and innovation systems or clusters, which are characterized by high concentrations of companies or R&D laboratories within limited geographical areas (see Chapter 11 by Cooke in this volume). Geographical proximity is obviously at work in both cases, in that both people and firms are co-located, and therefore at a short distance from one another, and benefit from this proximity. But, as we have seen above, geographical proximity alone cannot account for the benefits of this co-location, especially as the latter has negative dimensions that cannot be ignored. The disadvantages associated with city living include congestion, promiscuity, pollution of all kinds, and neighborhood conflicts. Those associated with clusters are related to industrial espionage, systematic imitation, and the impossible protection of one's inventions. Proximity approaches have shown that the attractiveness of these agglomerations is due, at least in part, to their efficiency (for cities) or competitiveness (for clusters), which result from the combination of two proximities. On the one hand, the desire for geographical proximity plays an obvious role in the agglomeration phenomenon. But organized proximity also does so because it gives rise to interaction between actors. In clusters, for example, it is thanks to organized proximity that exchanges can take place between firms and/or laboratories, through two mechanisms: (1) the fact that businesspeople, engineers, or scientists belong to the same network and therefore have intense relations with one another with a high frequency of interactions – this corresponds to the logic of belonging; (2) they share a common culture (of the scientific or diaspora type), family or friendship ties – this is the logic of similarity. Similarly, in urban agglomerations, organized proximity gives rise to interaction between individuals and helps prevent the isolation and loneliness that can emerge even in the heart of megacities. When geographical proximity combines with one of these logics, human agglomerations prove more attractive than other ways of life between human beings.

4.2.5 Proximity does not only come with advantages but also negative dimensions

The original research conducted by the School of Proximity primarily aimed to show that geographical proximity alone could not explain the quality of local interactions, as some approaches had suggested a little hastily. However, while early works sought to

downplay its advantages, they did not envisage the opposite situation, i.e. its possible disadvantages. It was not until the late 1990s that the first studies were conducted to examine more closely the negative dimensions of geographical proximity, in particular by broadening their thematic scope. The interest taken by some scholars in questions related to land-use governance led them to examine the disadvantages that can result from geographical proximity to people or places and objects, as well as its consequences in terms of opposition or conflict. The disadvantages they identified are similar to those already highlighted by public economics, i.e. air or water pollution, neighborhood quarrels or congestion, but are not only addressed in terms of negative externalities. Geographical proximity can in fact manifest in three, more or less distanced forms: neighborhood – which corresponds to a short distance – contiguity and juxtaposition. Immediately apparent is the fact that these forms of geographical proximity are not purely physical and have a social and human component. In particular, the notion of juxtaposition involves human intervention since it refers to a situation in which property or land use rights between two parties are not clearly established, thus giving rise to a dispute between the land users. This suggests that geographical proximity can negatively affect and therefore be unwanted by individuals, who might then seek to escape its negative effects (pollution for example) or avoid negative contact with the actions of their neighbors. This approach paved the way for important developments in conflict analysis; conflict being a direct consequence of unwanted proximity. This is particularly true in high density areas, such as urban or periurban agglomerations, where the population concentration increases the probability of interaction, and therefore of oppositions between actors. But the negative effects of geographical proximity can also occur in the production sector, and consist of problems related to imitations, or excessive lock-in effects, which are in dissociable from the concentration of innovative firms or labs in the same place. This approach developed significantly from the mid-2000s, and gave rise to two offshoots, which deserve further examination. The first concerns sought for geographical proximity, which implies that individuals seek to get closer to certain places, such as remarkable or tourist sites, people, or organizations, in order to enjoy the benefits of their presence. The second concerns the negative dimensions of organized proximities: difficult to grasp in the framework of the proximity approach, given the initial postulate that actors voluntarily seek to coordinate with each other (Gallaud, 2020).

4.2.6 Geographical proximity can be permanent or temporary

The analysis of geographical proximity reveals its duality: indeed, it may be permanent or temporary. The term "permanent geographical proximity" does not mean that it is "perpetual," but that it exists over a significant period of time. It is the case when two firms are located in close proximity to each other, when a group of people reside in the same area, or when a household lives in close proximity to a polluting factory or a remarkable site. For several years, researchers focused all their attention on this permanent proximity; so much so that geographical proximity was sometimes confused for co-location. However, the development of long-distance exchanges via ICTs began to cast doubt on the actual importance of co-location and led some researchers to consider that it only played a secondary role in coordination processes. Analyses suggesting a death of distance then emerged, defending the idea that ICTs had reached or would soon reach such a level of perfection that there would no longer be any advantage to being located in

proximity to others, or even to face-to-face meetings. Exchanges for which geographical proximity used to be necessary would now be replaced by long-distance interactions, and face-to-face relations would become useless or secondary, all the more so as individuals would now have the gift of ubiquity, i.e. would be able to be present here and there at the same time, through telecommunication technologies. Thus, they would become what proximity approaches call situated individuals. But, at the same time, two facts were clear: the development of trade shows, conferences and amusement parks, where large numbers of people meet for often short periods of time, and the overall increase in the frequency of private and professional travel, with engineers traveling to meet colleagues or people traveling to meet family relations. These observations have led to the idea that geographical proximity remains essential and indispensable, but that it has become a temporary rather than permanent necessity. Much of the interaction involved in professional collaborations, or in human relations, can take place remotely, using ICTs. However, it is necessary for people who collaborate in this way to meet face-to-face on a regular basis. For example, in the initial phase of a collaboration project, it is still necessary for the participants to have regular face-to-face meetings in order to reach agreements on the various aspects of the project and to build mutual trust, and subsequently to have regular but less frequent meetings to reaffirm their agreements or resolve conflicts. In the case of trade shows, congresses or amusement parks, human beings feel the need to meet face-to-face, touch, feel and share moments with each other in order to be able to build or reinforce relations based on mutual trust. This is in line with approaches based on proxemics, according to which geographical proximity can be temporary if it is supplemented by virtual interactions.

5. APPROACHES INSPIRED FROM PROXIMITY ANALYSIS: A DISCIPLINARY OVERVIEW

Many disciplines, mostly in social sciences, mobilize today various notions of proximity, generally without referring to the framework of the School of Proximity. Some works concern geographical proximity, often considered as a physical distance, or in connection with notions of accessibility or mobility to actors or to objects and places. Others tend to focus more on non-spatial dimensions, and on the importance of proximities that develop or continue to grow in the context of long-distance exchanges. Finally, some studies have recently started to address the question of negative effects, particularly in the field of epidemiology. Generally speaking, proximity is hardly ever conceptualized in these approaches. However, the reflections developed in certain disciplines open up interesting fields of research, which could bring new fields of study to the School of Proximity, or even enrich its toolbox with the contribution of new concepts whose scope appears interesting. This is the case of social network analysis, marketing, supply chain management, organizational science and medicine.

5.1 Social Network Analysis: An Approach That Has Yet to Consider Proximities

Network analysis originated in several disciplines. The approach we know today first emerged in Simmel's work (1917), who laid the foundations for a science of social

relations structure. Research in sociometry and more broadly in social psychology (Moreno, 1934), anthropology (Lévi-Strauss, 1969), and applied mathematics (graph theory and linear algebra) (Harary et al., 1965; White et al., 1976) also contributed to the evolution of the concept of network. A network is defined as a set of nodes (individuals, organizations) and the relations that link the nodes (Wasserman and Faust, 1994). An analysis of the relationships between members of an organized social milieu seeks to describe their interdependencies and interactions (through the presence or absence of links) and helps to simplify their representation. It focuses essentially on questions related to the network's form, with an emphasis on the density of network links, the degree of centrality of a node (i.e. an actor(s)) or the formation of subgroups or cliques, and on the sociological characteristics of the actors.

Far from referring, as in regional science, to a differentiated space in terms of actors' characteristics and resources, this approach considers space only as a Euclidean distance. The mathematical approach makes it possible to position the nodes of the network in a two- or three-dimensional space; as in economic geography distance is integrated, with reference to an administrative space (belonging to the same region for example) or as a cost of coordination of the actors. The reference work published by Lazega and Snijders (2015) is representative of this approach; it presents the mathematical and statistical advances made in the modeling of networks' structure, but no new methodology for considering the spatial dimension. Yet, Milgram's (1967) pioneering experiment on the small-world phenomenon paved the way for some reflection on the spatial embeddedness of social networks. The goal was to identify the number of intermediaries needed for a parcel forwarded by people living in the cities of Wichita, Kansas and Omaha, Nebraska to reach a stockbroker living and working in Boston, Massachusetts. The senders of the parcels were not supposed to know the target person or his/her address, which forced them to use their network of family, friends, or business acquaintances, to compensate for the distance and therefore the limited geographical proximity. Only a minority of the contact chains reached the target destination, but those that did reach it included an average of five individuals. Milgram places emphasis on individuals' utilization of their social networks to have the parcel transported over significant interstate distances and make it reach the recipient's city of residence, the shortest chains being those whose intermediates were more likely to bridge the initial individuals' relationship circles and those of the target individual. It was therefore necessary to rely on people whose social characteristics somewhat differed from those of the initial individual, to be able to deliver the package from one circle to another. The results also show the number of intermediaries increases as the parcel gets closer to the target person, which tends to indicate that intra-urban geographical proximity does little to break social barriers and might even reinforce them. This experiment illustrates the fact that the structure of social relations, and therefore of organized proximity, plays a central role whether or not it is accompanied by geographical proximity. Its difficulty of realization explains the weakness of its empirical confirmations. Herrera-Yagüe et al. (2015) make a similar observation and show that the difficulty in crossing social barriers is an obstacle to intra-urban transfer. In a majority of chains, two individuals who work in the same organization serve as final relay individuals, but there are cases when an outsider to the organization is utilized because s/he is likely to have a very large number of contacts (a clothing store owner in this case).

However, other studies emphasize the importance of geographical proximity, as nearly 70 percent of the interactions between members of an interpersonal network of friends take place in this context (Wellmann, 1979 cited by Stephens and Poorthuis, 2014). Some reveal that local interactions are maintained with the development of Internet-based communication. Goldenberg and Levy (2009), for example, show that 41 percent of emails are exchanged between individuals located in the same city, in the United States, and that their number declines as the distance between the sender's residence and that of the receiver increases. More recent research (Bailey et al., 2018) confirms a geographical concentration effect: people on Facebook tend to communicate more with those who reside in a contiguous state. However, they also highlight that the influence of geographical proximity on interactions between individuals varies according to the socio-demographic proximity between them. Networks of actors with a high level of income or education rely less on geographical proximity: indeed, networks formed by San Francisco residents can extend beyond the local area and involve more relations with individuals who reside on the East Coast of the United States than with individuals living in the neighboring, less urbanized county.

5.2 Marketing: Promising Leads

Space or proximity relations are not currently an essential research topic for marketing researchers, as recent reviews of the literature have shown (e.g. Leonidou et al., 2018). Paradoxically, the topic is not addressed either in studies on territorial marketing (Vuignier, 2017). Space is mainly considered in reference to places (essentially cities or regions), where specific territorial resources can be developed and exploited in order to enhance the area's attractiveness relative to that of other territories. Like "classic" marketing, territorial marketing seeks ways of influencing individual consumer decisions to purchase goods and services, or not. However, this presupposes the creation of a shared representation between the public actors in charge of this marketing and the potential users of the territorial resource. This points to the idea of a logic of similarity used by the School of Proximity, but in another theoretical framework.

The development of digital marketing, in which connected technologies are used to provide consumers with information about products, brands or promotions and to create a community of users on social networks, opens up interesting avenues for research (Lamberton and Stephen, 2016). Indeed, digital marketing relies on geolocation tools to send advertisements to consumers on their cell phones, with the aim of encouraging them to buy a product or take advantage of a promotional offer when they happen to be close to a store. The authors do not systematically define "proximity" to a store in terms of concrete distance: right next to the shop window or within a wider perimeter? Measuring the effect of sending a promotion for a movie theatre when the consumer is 200 meters away from the latter shows that the time effect is important, and that a consumer can make a 30-minute car trip to reach a new competing offer (Fong et al., 2015).

These approaches look at consumers as being mobile; consequently what matters is less the consumer's distance or geographical proximity to the point of sale, than sending him/her the information, advertising or promotion at the right time, and in so doing convince him/her to stop by. This tends to correspond to temporary geographical proximity; indeed, the studies link the notions of space and temporality to define a form of

"time-space" (Lamberton and Stephen, 2016). It is important for firms to perform the right action in a given space at the right time. In this regard, research in digital marketing distinguishes itself from the school of proximity. Indeed, while the latter approaches actors as having a fixed location and secondarily the ability to move in space, digital marketing research approaches them as being essentially mobile, without giving much consideration to their fixed location.

Finally, studies on consumer loyalty to brands have developed an approach based on psychological concepts that refer to consumers' tendency to anthropomorphism or animism (Fournier, 1998), whereby the users of a product attribute human characteristics to it. This may occur if the product is associated with a mascot or spokesperson who advertises it, but users can also project onto the product the positive characteristics of the people who offered it to them, thus reinforcing their sense of proximity to it. Loyalty building works if the consumer manages to develop an organized proximity – based on a logic of similarity – between his or her values and representations and those offered by the brand. Before purchasing the product, s/he assesses whether the proposed representations and values associated with the brand are close to his/her own, and then performs a second evaluation once s/he has purchased the product to confirm or disconfirm this proximity (Grace et al., 2020).

5.3 Supply Chain Management: The Question of the Last Mile

Research on logistics and supply chain management could be expected to consider space as a key factor since it involves examining how goods are delivered from one physical point to another, points that may be thousands of kilometers apart. Yet, space is often viewed as a contextual variable (geographical dimensions), a transport cost, or a constraint to be managed by firms, a constraint related to the location of port or road infrastructures and logistics companies (Holl and Mariotti, 2018). Firms initially tended to locate in urban centers, so as to benefit from proximity to end customers. However, with the increase in land costs and logistics needs related to the sharp rise in e-commerce and home parcel delivery, they have gradually moved away to periurban or even rural areas.

Since the 1980s and the rise of a global division of labor in the organization of production systems, the logistics sector has grown considerably. But firms have been less concerned about distances than about product delivery times or temporal flow management since the introduction of just-in-time systems. With the decrease in oil prices and the resulting drop in transport costs, space and consumer location are now only considered as a factor that increases the risk of delivery failure, among others. Thus, recent literature reviews (Ivanov et al., 2017) mostly pay attention to the management of resources, of internal competencies and organizational factors. In the global supply chain, geographical distances are less complicated to manage than differences in culture, organizational culture and level of development, which can take the form of poorly developed logistics infrastructures in developing countries and above all in a low qualification of the labor force (Meixell and Gargeya, 2005). This is in line with one of the theses of the proximity approach: that of the key role of organized proximity in facilitating long-distance interactions when it is associated with the implementation of organizational methods for organizing the exchange of information and building collaborations, including remotely (Li and Lin, 2006).

One exception concerns last-mile logistics, a major component in the supply chain, which has given rise to much research on the paradoxical effects of geographical proximity: the closer the logistics provider gets to the customer, the higher the unit cost of transport becomes, to the point that it represents almost 30 percent of the total cost of delivery (Ranieri et al., 2018). Urban delivery to the final customer thus represents a cost comparable to that of long-distance inter-urban transport. This is mainly due to urban congestions, which slow down traffic and therefore increase delivery times. Thus, in the case of e-commerce companies, logistics firms understandably prefer to locate in periurban or even rural areas, since inter-city delivery costs have little impact on the profitability of the activity.

5.4 Organizational Science: A Form of Proximity Close to the Logic of Similarity

The development of global value chains (Gereffi et al., 2005) and the diffusion of the open innovation model have shed new light on the question of inter-organizational coordination. Different organizations, which do not share the same culture and are distant in organizational and geographical terms, collaborate. Following research on project teams and virtual teams (Kiesler and Cummings, 2002), it is interesting to analyze the factors that enable them to coordinate, thanks to the development of a sense of proximity between their members (Wilson et al., 2008; Boyer-O'Leary et al., 2014). Studies on the "paradox" of proximity reveal that actors that are co-located in the same building and participate in the same projects do not often feel "close" to one another, whereas an IT developer located in California and one located in India can feel "close" to each other, despite the lack of geographical proximity. These are situations similar to those described by the School of Proximity; co-location does not in all cases imply a development of organized proximity.

The sense of proximity between geographically distant actors can be explained by what authors call subjective proximity, which essentially refers to a symbolic dimension. Proximity includes both cognitive dimensions (a common professional culture, for example) and emotional dimensions (such as having common values) and develops on the basis of a process described as "identification" with others, through which two actors represent themselves as sharing a common "background" or set of experiences. These may be socio-demographic characteristics, social affiliation, experience of parenthood, individual values such as a sense of professional commitment or a common body of knowledge. Actors must perceive that they have a minimum level of similarity in order to interact; otherwise they are merely concentrated in the same space, are located at a short distance from each other, but without activating geographical proximity. Even though this definition of subjective proximity does not refer to the concepts developed by the School of Proximity it is relatively close to the logic of similarity of organized proximity described by proximist scholars.

On the other hand, those authors agree with the School of Proximity on the importance of the meaning given to an action or to values to activate it, as well as on process-related dimensions. They consider that no sense of proximity can develop between two actors if they do not represent themselves as having a basic set of common characteristics. This identification process, which contributes to triggering future interactions, generates a self-reinforcing pattern. When two actors have a sense of closeness to each

other, they interact more, which in turn reinforces their feeling of proximity. This is the case, for example, of an IT developer located in California who feels a strong sense of proximity with a programmer located in India, due to the fact that they represent themselves as sharing a similar professional commitment, and which has led to an increase in their interactions. A converse example is that of programmers located in the United States, who had a negative representation of India-based colleagues suspected of invoicing for unperformed work hours, and developed a sense of difference from their Indian colleagues, causing them to limit interactions, which negatively impacted the cooperation.

5.5 Medical Research: Subjective and Sought for Geographical Proximity

Since the 1990s, medical research has paid increasing attention to the role of spatial variables. Studies initially examined the question of users' distance to urban facilities supposed to have a positive effect on health. However, space is only considered as one of the possible explanatory variables. Researchers subsequently focused attention on the negative effects of proximity.

Urban populations are growing rapidly and develop health problems related to sedentary lifestyles and lack of physical activity, as well as to the effects of pollution, stress, and noise. Some medical research studies have focused on urban facilities that can contribute to remedying those problems, by studying the positive effects of parks and green spaces on health as a whole, and on physical activity and obesity (Larson et al., 2016; Wolch et al., 2011). The key issue is that of the geographical proximity between residents and urban parks located within a certain radius of their homes, bearing in mind that the availability of facilities varies greatly depending on the neighborhood and the socio-demographic characteristics of the inhabitants. Thus, studies on the controversial topic of differential access to public facilities depending on what community individuals belong to, conclude that US people living in Hispanic or African-American neighborhoods have access to smaller and lower quality parks than those living in white residential areas.

The studies cited by McCormack et al. (2010), Larson et al. (2016) and Rigolon (2016) present results that are well known to the School of Proximity. For example, living close to an urban park is not a sufficient condition to use it regularly. This finding is all the more interesting in that the surveys on which those studies are based indicate that the acceptable walking time to the facility corresponds to a short distance (0.5 mile). The notion of perceived distance is more important than objective distance in people's use of the space: actors can be located close to parks without activating this geographical proximity, which remains a potential and therefore has no effect on people's health (Maddison et al., 2010). The park's level of safety, its perceived characteristics (Lackey and Kaczynski, 2009), and number of facilities also influence people's willingness to use it: playgrounds for children, pedestrian paths for jogging or cycling, but also the park's aesthetics, or the presence of trees in sufficient numbers and varieties. Thus, accessibility depends on spatial and non-spatial factors related to transport, to individuals' social characteristics, and to their knowledge (or lack thereof) of the existence of transport services to access those public facilities (Wang et al., 2013).

More recent studies have focused on the negative effects of consumer geographical proximity to the supply of goods, particularly in terms of obesity (Hunter et al., 2016). Proximity to food supply strongly influences consumers' probability of over-consuming foods that have negative health effects (Scully et al., 2019), and more generally has a negative impact on consumers' eating practices (organization of food intake, table layout in relation to products, lighting, etc.) (Bucher et al., 2016). Studies on micro proximity have analyzed the effects of the behavior of a consumer when a bowl of M&Ms, on the one hand, and a bowl of fruit pieces, on the other, are placed 20 or 70 cm from him/her (Knowles et al., 2019; Hunter et al., 2016). They observed an increase in the consumption of M&Ms when the bowl is closer and over-consumption of fruit pieces when the M&Ms are placed further away.

Research in medicine and environmental science increasingly takes into account geographical proximity to pollution sources as a health risk factor (White et al., 2018). Here, geographical proximity is equated to a relative distance, weighted by the time of exposure to the pollutant (Zhang et al., 2017), which is pertinent in a context of epidemiological research and could be partially assimilated to the notion of proximity activation defined by the School of Proximity. The actor conducting polluting activities generates a negative effect that impacts all the people located nearby, but which varies depending on the time of exposure. The mobility pattern of an individual influences his/her time of exposure. For example, if the source of pollution is close to the person's home, his/her working away from home implies traveling away from the source of pollution and therefore reduces his/her potential time of exposure.

There is still limited consideration of the negative effects of geographical proximity in the context of research in the fight against infectious diseases or pandemics. Recent research on COVID-19 is no exception. The authors consider proximity in urban areas as a contextual factor, but the latter is not systematically integrated into diffusion models. The relatively little consideration given to spatial dimensions might well be due to difficulties in integrating spatial data, even though behaviors linked to individuals' intra-urban mobility or to their mobility between different areas (migration) are variables known to have an impact on the spread of diseases. New developments in modeling techniques have had to be made (Fujiwara et al, 2015) and applications tracing COVID-infected individuals have had to be invented (Li and Guo, 2020) to be able to better consider the negative effects of geographical proximity.

6. CURRENT STATE OF RESEARCH ON PROXIMITY AND AGENDA: THE ISSUES IN DEBATE

The legacy of the School of Proximity is immense, and the topics it addresses have grown in numbers over the years, along with theoretical controversies and economic and societal developments. Proximity-based approaches are mobilized by researchers in many fields of study in social science, and the toolbox has grown extensively both in quantity and quality through research studies conducted in many disciplines by groups of scholars sometimes driven by very different objectives. New challenges have emerged, and new topics are now included in the research agenda. This approach, which has now become

mainstream and is taught in handbooks and textbooks, needs to be developed and to be extended, in two directions: analytical refinements and further extensions.

6.1 Analytical Refinements

Proximity approaches need some complements regarding some of their more popular research topics. Further analytical refinement and elaboration of some notions are required, to complement the toolbox of proximities and give it more coherence, on subjects like innovation, production systems, and territorial development.

6.1.1 Proximity and innovation

Innovation has been a major area of focus for the School of Proximity and the research it has conducted has largely contributed to its success and reputation. It is therefore pertinent to ask how much remains to be said on the subject today. However, as new ways of innovating are developed all the time, it seems judicious to wait for new developments in this direction. New studies are required to explain the as yet little-studied emergence of isolated innovators in territories whose characteristics do not, at first sight, seem to be conducive to the development of their activity (see Chapter 10 by Crescenzi et al. in this volume). One may also question the validity of proximity approaches in situations of open (Chesbrough, 2003) or collaborative innovation, as in fab labs or living labs for example, and ask whether geographical proximity plays as important a role in these new forms of micro clusters as it does in more traditional models of innovation. The development of so-called "third places" highlighted by Oldenburg (1991), and whose organization is characterized by a combination of professional and amateur users, who therefore combine expert and lay knowledge to develop inventions or prototypes, raises the question of the type of organized proximities mobilized and of the relations that develop between the participants. The development of such places also calls for an examination of activities other than high-tech innovation, and of more modest or incremental forms of innovation, and for the inclusion, in the analysis of proximity, of organizational innovation, of course, but also of social (Moulaert and MacCallum, 2019) and institutional (Hargrave and Van De Ven, 2006) innovation. This implies accepting that the term innovation also applies to less radical changes and advances made at a local level. This is, for example, the case of innovations produced by small and medium-sized enterprises (SMEs) (Marchesnay, 2011), which have received little scholarly attention so far, especially those that are located in isolated or peripheral areas, or operate in territories or sectors deemed to have low rates of innovation, such as agriculture or rural areas, but which nonetheless have proved to be highly resilient and inventive (Doloreux and Shearmur, 2012). In this regard, it is important to study – in line with the research conducted by proximist scholars on knowledge-related issues – the ways in which local actors build solidarity, create and share knowledge, to examine the type and origin of this knowledge, as well as the ways in which interaction and cooperation take place, and therefore how the various forms of organized proximity are mobilized.

Similarly, the topic of entrepreneurship has so far been little studied (see Chapter 14 by Sternberg in this volume). Some studies have highlighted the importance of geographical proximity for start-up firms, which must have access to the various

resources needed for the creation process, while authors who focus more specifically on new technology based-firms emphasize the importance of proximity to universities and technology parks (Rydehell et al., 2019). The analysis of the creation of new independent firms also reveals the central role played by the Internet in their access to non-local networks of actors, which is often of proportionally greater importance than face-to-face interactions (Rice et al., 2007). Moreover, it would be interesting to analyze firms' needs in terms of proximity according to the phase of development they find themselves in (Schutjens and Stam, 2003). The need for geographical proximity is strong during the initial stages of an innovation project as the network of relations involve the founders' social and friends' networks. It decreases as soon as the firm makes its market entry and must then develop customer–supplier relationships. These relations develop with actors located in, or even outside the region. The environment also has an influence on the need for proximity; indeed, entrepreneurs located in the most cosmopolitan cities tend to rely on networks whose members are often located in different areas, regions, or even countries. Finally, entrepreneurial orientation is a decisive factor in that some entrepreneurs envisage their market as strictly local, whereas others see it, from the outset, as international – some are described as being "born to be global" (Moen and Rialp-Criado, 2019). Finally, it would be interesting to examine the question of the possible specificities of entrepreneurship in relation to the needs of non-geographical proximity.

6.1.2 Proximity and production systems

The question of the organization of production, like that of innovation, has been abundantly examined by proximist authors, which might lead one to believe that there is little left to say on the subject. But two revolutions, which pull in opposite directions, are underway. The first tends towards a reduced need for proximity, especially geographical proximity, with the emergence of the fourth industrial revolution, also referred to Industry 4.0 (Dallasega et al., 2018), which tends towards the integration of the Internet of Things into production processes. The new intelligent factories, equipped with Internet-connected sensors to collect and process information in real time, reduce the need for geographical proximity between firms, by making it possible to perform some functions – such as maintenance operations – remotely. The increasing use of consumer data by businesses enables them to track consumer preferences in real time and therefore to adjust their production processes and even product development so as to better meet consumer demand, and thus successfully achieve product differentiation, while maintaining the advantages of mass production. This tendency has accelerated with the COVID crisis, which has resulted in a strong development of white-collar teleworking and in the downsizing of some offices, with firms' employees working remotely, from home. This industrial revolution could further reduce the need for temporary geographical proximity in intra-firm coordination, modify the articulation between the different forms of proximity and open up an avenue of investigation into proximity relations between firms and consumers. The second shift, in the opposite direction, concerns the repatriation of production systems, and leads to a re-evaluation of the role of proximity between producers and consumers. An example of this tendency is found in the development of short supply chains, characterized by few intermediaries and shorter physical distances between producers and consumers, especially in the food sector (see Chapter 16

by Mundler in this volume). Their implementation, which is not without its challenges, requires the activation of geographical and organized proximities, between producers, but above all with customers – the need for proximity being temporary in the case of online platforms that connect farmers to buyers and drive-ins. The question must be raised of the sustainability of these supply chains and of how they are integrated into local dynamics, which prompts us to examine, from a new perspective, the question of firms' embeddedness in their local environment.

6.1.3 Proximity and territorial development

The School of Proximity has seldom ventured into the analysis of territorial development processes. This deficit may seem paradoxical, as there are many commonalities between both approaches. But proximity analysis, derived from local production systems approaches, has also developed, in part, in opposition to the industrial districts or innovative milieus, with the aim of putting in perspective the importance of actors' ties to their location and of freeing itself from localist presuppositions. Thus, proximity analysis focused for a long time primarily on relations between firms or between local actors, without giving much consideration to issues related to development or its systemic nature. Indeed, the studies on development often concentrated on matching classes of patents or techniques or on comparing the efficiency of different forms of clusters (Giuliani and Bell, 2005). Exceptions include works on territorial resources and on the way in which their identification and exploitation can contribute to territorial development dynamics (Colletis and Pecqueur, 1993), on firms' territorial embeddedness, which helps to understand processes of development and relocation (Zimmermann, 2001), or on the development of a local system based on proximity relations of various kinds within local clusters, based on innovation processes (Frenken and Boschma, 2007). New studies on territorial development are being published and highlight the dual dimension of production and governance processes, which is based on the combination of geographical and organized proximities (Torre, 2019). However, a great deal of work remains to be done, including re-examining production processes and the dynamics that characterize them, addressing the question of the dimensions and rules of governance at the level of territories, which very few studies have done (Torre and Beuret, 2012), or investigating the role played by cooperation or adversarial relations. It is also important to consider territorial development patterns, particularly alternative proposals that advocate giving pride of place to locally based relationships, those based on circular approaches, local producer organizations or production cooperatives and cooperation networks, such as those associated with the social and solidarity economy.

6.2 Further Extensions

Proximity analysis must be extended to the study of topics that have not yet been addressed and new questions that have emerged as a result of changes in society and the economy. Circular economy, city and urban behaviors, and proximity dynamics appear to be good candidates for further investigations (see also the Conclusion by Capello in this volume).

6.2.1 Circular economy, sustainability and proximity

The question of the local dimension of environmental variables has recently forced itself onto the agenda of the sustainability of production processes. The "think global, act local" principle, first proposed during the 1972 Earth Summit, has undeniably given ecological approaches a spatial dimension. But the manifestations of the sustainable development principle in public policies or programs have mostly deviated from the first recommendations of the Brundtland Report (World Commission on Environment and Development, 1987), to systematically – and often mechanically and programmatically – place emphasis on the three economic, social and environmental pillars, and with little consideration for the spatial component. At a time when the sustainable development rhetoric is gradually being replaced by the promotion of the circular economy (Boulding, 1966), which is less ambitious and more operational, the question arises of its spatial dimension. The School of Proximity has drawn attention to the environmental facet of proximity-based relations (Mollard and Torre, 2004), by highlighting the impacts of pollution in terms of location or reduction in the price of goods (Torre and Zuindeau, 2009). Very early on, it placed emphasis on a number of aspects such as the inequality in relation to space, in situations of water runoff for example, or of sought for and unwanted geographical proximity to a pleasant or polluted place (see Chapter 17 by Beaurain and Dermine-Brullot in this volume). The School of Proximity has also extensively analyzed the tensions and conflicts that arise regarding the environmental impacts of certain activities, as well as the role of organized proximity in either mitigating or intensifying them (see Chapter 18 by Magsi and Sabir in this volume). In today's context of relocalization and emerging new productive models, it is important to address the question of the role of relations based on geographical proximity in the implementation of local projects such as industrial and territorial ecology experiences (Frosch and Gallopoulos, 1989), or the iconic Kalundborg symbiosis project (Jacobsen, 2006). Indeed, some loops are local, while others cause undeniable rebound effects internationally, as in the case of recycling or eco-design. Local experiences such as methanation projects, which highlight the positive effects of geographical proximity, are often met with opposition from some local residents who disapprove of the presence of such infrastructures. This raises the question of the mobilization of the various forms of organized proximity and of their complex interplay in terms of coordination and stakeholder strategies (Bourdin et al., 2019).

6.2.2 City and proximity: an emerging theme

Research on urban agglomerations seems to be a perfectly suitable field of study for proximity-based approaches. Indeed, cities are often described as the ultimate places for both geographical and organized proximities (see Chapter 20 by Bourdeau-Lepage in this volume), whether their effects are positive or negative (see Chapter 19 by Kourtit et al. in this volume). The relative rarity of studies on the subject can be explained by the fact that the research conducted by the School of Proximity originally focused specifically on industrial and production-related questions and that its interest in urban or societal issues did not develop until much later. The advantages offered by cities have long been highlighted by authors in several fields of study, especially in urban economics, with the concept of positive agglomeration externalities (Duranton et al., 2015). The disadvantages of city living have also been extensively investigated, particularly by sociologists, who have brought to light the fact that, in a densely populated environment

such as a city, individuals are exposed to many different external stimuli (Milgram, 1970), which make it difficult to process information and interact with others (Moser, 1988), and consequently lead to a decreased social life – and the paradox of loneliness in crowded cities. The few studies that have been conducted on the subject of cities by researchers of the School of Proximity (Bourdeau-Lepage and Torre, 2020) draw attention to the fact that the negative and positive effects of both geographical and organized proximity balance each other out. Although proximity is sought by individuals for its advantages in terms of socialization, easier access to services and amenities, as well as to work (Capello, 2009), it also has undesirable effects such as congestion or pollution and can generate oppositions or conflicts. It would be interesting to further develop these considerations and apply them to the study of concrete cases such as that of smart cities (Caragliu et al., 2011), which develop based on the idea that urban proximity promotes the diffusion of innovations and the creation of inventions or knowledge, thanks, in particular, to the development of ICT. Conversely, the Slow City movement (Knox, 2005) is an expression of a reticence towards excessive geographical and organized proximities, and the excesses of urban technological development. These elements could be the object of further research, as could the issues related to urban parks or to nature in the city, seen as solutions to remedy excessive proximity and the behavioral disorders it can cause in urban areas.

6.2.3 Proximity dynamics

The question of proximity dynamics, which was investigated from the outset (hence the name: Dynamics of Proximity), has gradually become less central. Indeed, studies have successively explored the various forms of proximity and how they mutually develop, the distinction between permanent and temporary proximities, and finally the question of the negative effects of proximity. The question of dynamics, which had often been raised but had never been tackled directly, has received a partial answer with the analysis of how the different forms of proximity develop mutually in the framework of inter-firm partnerships (Torre, 2011), although no general theory has emerged yet. This relative lack of consideration given to the question of dynamics is largely due to the difficulty of modeling spatial coordination processes and their evolution over time. A first step has been taken in this regard by Balland et al. (2015), who present an analysis of the process of evolution of the different forms of proximity as well as of the negative effects of excessive proximity between actors, in the context of a local production system. However, this model is based on a single process, in which the different proximities are supposed to progressively grow stronger before reaching an "optimal" point beyond which the efficiency of interactions decreases. The study does not specify whether the actors will choose to continue activating proximities once this point is reached, despite the decrease in performance. Modeling the process of proximity construction and its evolution is therefore a promising research avenue and an important issue for the school of proximity, as this would contribute to refining and strengthening the analytical framework. The aim would then be to take into account not only local but also remote interactions, and to analyze both the positive effects of proximities and their potentially negative impacts, both on the actors themselves and on their coordination patterns.

REFERENCES

Adey, P. (2010). *Mobility*. London: Routledge.

Alonso, W. (1964). *Location and Land Use*. Cambridge, MA: Harvard University Press.

Amin, A., Cameron, A., and Hudson, R. (2002). *Placing the Social Economy*. London: Routledge.

Amin, A. and Wilkinson, F. (1999). Learning, proximity and industrial performance: An introduction. *Cambridge Journal of Economics*, 23, 121–125.

Anselin, L., Varga, A., and Acs, Z. (1997). Local geographic spillovers between university research and high technology innovations. *Journal of Urban Economics*, 42, 422–448.

Audretsch, D. and Feldman, M. (1996). R&D spillovers and the geography of innovation and production. *The American Economic Review*, 86(3), 630–640.

Augé, M. (1995). *Non-Places: Introduction to an Anthropology of Supermodernity*. London: Verso.

Bacchiega, A. and Borzaga, C. (2003). The economics of the third sector. In H. Anheier and A. Ben-Ner (eds.), *The Study of the Nonprofit Enterprise*. New York: Kluwer, 27–48.

Bailey, M., Cao, R., Kuchler, T., Stroebel, J., and Wong, A. (2018). Social connectedness: Measurement, determinants, and effects. *Journal of Economic Perspectives*, 32(3), 259–280.

Balland, P. A., Boschma, R., and Frenken, K. (2015). Proximity and innovation: From statics to dynamics. *Regional Studies*, 49(6), 907–920.

Baptista, R. and Mendonça, J. (2010). Proximity to knowledge sources and the location of knowledge-based start-ups. *The Annals of Regional Science*, 45(1), 5–29.

Barker, R. G. (1968). *Ecological Psychology*. Stanford, CA: Stanford University Press.

Basile, R., Capello, R., and Caragliu, A. (2012). Technological interdependence and regional growth in Europe: Proximity and synergy in knowledge spillovers. *Papers in Regional Science*, 91(4), 697–722.

Bathelt, H. and Schuldt, N. (2010). International trade fairs and global buzz, Part I: Ecology of global buzz. *European Planning Studies*, 18, 1957–1974.

Baumol, W. J. and Oates, W. E. (1988). *The Theory of Environmental Policy*. Cambridge: Cambridge University Press.

Becattini, G. (1991). Italian districts: Problems and perspectives. *International Studies of Management & Organization*, 21(1), 83–90.

Becattini, G., Bellandi, M., and De Propris L. (eds.) (2009). *A Handbook of Industrial Districts*. Cheltenham, UK and Northampton, MA, USA: Edward Elgar Publishing.

Bellet, M., Colletis, G., Lecoq, B., Lung, Y., Pecqueur, B., Rallet, A., and Torre A. (1992). Et pourtant ça marche! Quelques réflexions sur l'analyse du concept de proximité. *Revue d'Économie Industrielle*, 61(1), 111–128.

Bellet, M., Colletis, G., and Lung, Y. (eds.) (1993). Économie de proximités. *Revue d'Économie Régionale et Urbaine*, 3.

Bellet, M., Kirat, T., and Largeron, C. (eds.) (1998). *Les approches multiformes de la proximité*. Paris: Hermès.

Bianchi, G. (1998). Requiem for the Third Italy? Rise and fall of a too successful concept. *Entrepreneurship & Regional Development*, 10(2), 93–116.

Bird, J., Curtis, B., Putnam, T., Robertson, G., and Tickner, L. (eds.) (1993). *Mapping the Futures: Local Cultures, Global Change*. London and New York: Routledge.

Boschma, R. (2005). Proximity and innovation: A critical assessment. *Regional Studies*, 39, 61–74.

Boschma, R. and Frenken, K. (2009). *The Spatial Evolution of Innovation Networks: A Proximity Perspective*. Utrecht University, Department of Human Geography and Spatial Planning, Group Economic Geography.

Boulding, K. E. (1966). The economics of coming spaceship earth. In H. Jarret (ed,), *Environmental Quality in a Growing Economy*. Baltimore, MD: Johns Hopkins University Press, 3–14.

Bourdeau-Lepage, L. and Torre, A. (2020). Proximity and agglomeration, two understanding keys of city. In E. Glaeser, K. Kourtit, and P. Nijkamp (eds.), *Urban Empires: Cities as Global Rulers in the New Urban World*. London: Routledge, 158–172.

Bourdin, S., Colas, M., and Raulin, F. (2019). Understanding the problems of biogas production deployment in different regions: Territorial governance matters too. *Journal of Environmental Planning and Management*, 1, 1–19.

Boyer-O'Leary, M. B., Wilson, J. M., and Metiu, A. (2014). Beyond being there. *MIS Quarterly*, 38(4), 1219–1244.

Broekel, T. and Boschma, R. (2012). Knowledge networks in the Dutch aviation industry: The proximity paradox. *Journal of Economic Geography*, 12(2), 409–433.

Brusco, S. (1982). The Emilian model: Productive decentralisation and social integration. *Cambridge Journal of Economics*, 6, 167–184.

Bucher, T., Collins, C., Rollo, M. E., McCaffrey, T. A., De Vlieger, N., Van der Bend, D., and Perez-Cueto, F. J. (2016). Nudging consumers towards healthier choices: A systematic review of positional influences on food choice. *British Journal of Nutrition*, 115(12), 2252–2263.
Cairncross, F. (1997). *The Death of Distance: How the Communications Revolution Will Change Our Lives*. Boston, MA: Harvard Business School Press.
Capello, R. (2009). Indivisibilities, synergy and proximity: The need for an integrated approach to agglomeration economies. *Tijdschrift voor Economische en Sociale Geografie*, 100(2), 145–159.
Caragliu, A., Del Bo, C., and Nijkamp, P. (2011). Smart cities in Europe. *Journal of Urban Technology*, 18(2), 65–82.
Carrincazeaux, C., Lung, Y., and Vicente, J. (2008). The scientific trajectory of the French School of Proximity: Interaction- and institution-based approaches to regional innovation systems. *European Planning Studies*, 16(5), 617–628.
Castells, M. and Hall, M. (1994). *Technopoles of the World: The Making of Twenty-First Century Industrial Complexes*. London and New York: Routledge.
Chesbrough, H. W. (2003). *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Boston, MA: Harvard Business Press.
Clifford, J. (1994). Diasporas. *Cultural Anthropology*, 9(3), 302–338.
Coase, R. H. (1960). The problem of social cost. *Journal of Law and Economics*, 3, 1–44.
Cohen, R. (1997). *Global Diasporas*. London: Routledge.
Cohendet, P. and Llerena, P. (1997). Learning, technical change and public policy: How to create and exploit diversity. In C. Edquist (ed.), *Systems of Innovation*. London: Pinter, 223–241.
Colletis, G. and Pecqueur, B. (1993). Intégration des espaces et quasi-intégration des firmes: Vers de nouvelles rencontres productives? *Revue d'Économie Régionale et Urbaine*, 3, 489–508.
Content, J. and Frenken, K. (2016). Related variety and economic development: A literature review. *European Planning Studies*, 24(12), 2097–2112.
Cook, M. (1971). Experiments on orientation and proxemics. *Human Relations*, 23(1), 61–76.
Dales, J. H. (1968). Land, water and ownership. *Canadian Journal of Economy*, 1, 791–801.
Dallasega, P., Rauch, E., and Linder, C. (2018). Industry 4.0 as an enabler of proximity for construction supply chains: A systematic literature review. *Computers in Industry*, 99, 205–225.
d'Aspremont, C., Gabszewicz, J. J., and Thisse, J. F. (1979). On Hotelling's "Stability in competition". *Econometrica*, 47(5), 1145–1150.
Demsetz, H. (1967). Toward a theory of property rights. *The American Economic Review*, 57(2), 347–359.
D'Este, P., Guy, F., and Iammarino, S. (2013). Shaping the formation of university-industry research collaborations: What type of proximity does really matter? *Journal of Economic Geography*, 13, 537–558.
Deutsch, M. (1958). Trust and suspicion. *Journal of Conflict Resolution*, 2, 265–279.
Doloreux, D. and Shearmur, R. (2012). Collaboration, information and the geography of innovation in knowledge intensive business services. *Journal of Economic Geography*, 12(1), 79–105.
Dupuy, C. and Burmeister, A. (eds.) (2003). *Entreprises et territoires: Les nouveaux enjeux de la proximité*. Paris: La documentation française.
Dupuy, C. and Torre, A. (2006). Local clusters, trust, confidence and proximity. In C. Pitelis R. Sugden, and J. Wilson (eds.), *Clusters and Globalisation: The Development of Urban and Regional Economies*. Cheltenham, UK and Northampton, MA, USA: Edward Elgar Publishing, 175–195.
Duranton, G., Henderson, V., and Strange, W. (eds.) (2015). *Handbook of Urban and Regional Economics*. Amsterdam: North-Holland.
Edney, J. J. and Uhlig, S. R. (1977). Individual and small group territories. *Small Group Behavior*, 8, 457–468.
Engleberg, I. N. (2006). *Working in Groups: Communication Principles and Strategies*. London: Pearson.
Feenstra, G. W. (1997). Local food systems and sustainable communities. *American Journal of Alternative Agriculture*, 12(1), 28–36.
Feldman, M. P. (1994). *The Geography of Innovation*. Dordrecht: Kluwer Academic Publishers.
Fong, N. M., Fang, Z., and Luo, X. (2015). Geo-conquesting: Competitive locational targeting of mobile promotions. *Journal of Marketing Research*, 52(5), 726–735.
Fournier, S. (1998). Consumers and their brands: Developing relationship theory in consumer research. *Journal of Consumer Research*, 24(4), 343–373.
Fraser, N. (1997). *Justice Interruptus: Critical Reflections on the "Postsocialist" Condition*. New York: Routledge.
Freel, M. (2003). Sectoral patterns of small firm innovation, networking and proximity. *Research Policy*, 32(5), 751–770.
Frenken, K. and Boschma, R. A. (2007). A theoretical framework for evolutionary economic geography: Industrial dynamics and urban growth as a branching process. *Journal of Economic Geography*, 7(5), 635–649.

Frigant, V. and Lung, Y. (2002). Geographic proximity and supplying relationships in modular production. *International Journal of Urban and Regional Research*, 26(4), 742–755.
Frosch, R. A. and Gallopoulos, N. E. (1989). Strategies for manufacturing: Wastes from one industrial process can serve as the raw materials for another, thereby reducing the impact of industry on the environment. *Scientific American*, 261(3), 144–152.
Fujita, M. (1989). *Urban Economic Theory: Land Use and City Size*. Cambridge: Cambridge University Press.
Fujita, M. and Ogawa, H. (1982). Multiple equilibria and structural transition of non-monocentric urban configurations. *Regional Science and Urban Economics*, 12, 161–196.
Fujita, M. and Thisse, J. F. (1986). Spatial equilibrium with a land market: Hotelling and von Thünen unified. *Review of Economic Studies*, 53, 819–841.
Fujita, M. and Thisse, J. F. (2013). *Economics of Agglomeration: Cities, Industrial Location, and Globalization*, 2nd edition. Cambridge: Cambridge University Press.
Fujiwara, N., Sonawane, A. R., Iwayama, K., and Aihara, K. (2015). Contribution of hidden modes to non-linear epidemic dynamics in urban human proximity networks. arXiv: 1512.01901.
Gallaud, D. (2018). Dynamiques de proximité: pistes de réflexion pour un enrichissement des modèles. *Revue d'Économie Régionale et Urbaine*, 5, 1077–1097.
Gallaud, D. (2020). Proximité organisée 'subie' et effets négatifs des proximités. *Revue d'Économie Régionale et Urbaine*, 1, 113–128.
Gallaud, D. and Torre, A. (2004). Geographical proximity and circulation of knowledge through inter-firm cooperation. In R. Wink (ed.), *Academia–Business Links: European Policy Strategies and Lessons Learnt*. Basingstoke: Palgrave Macmillan, 137–157.
Gereffi, G., Humphrey, J., and Sturgeon, T. (2005). The governance of global value chains. *Review of International Political Economy*, 12(1), 78–104.
Gilly, J.-P. and Torre, A. (eds.) (2000). *Dynamiques de Proximité*. Paris: L'Harmattan.
Gioia, D. A., Thomas, J. B., Clark, S. M., and Chittipeddi, K. (1994). Symbolism and strategic change in academia: The dynamics of sensemaking and influence. *Organization Science*, 5(3), 363–383.
Giuliani, E. and Bell, M. (2005). The micro-determinants of meso-level learning and innovation: Evidence from a Chilean wine cluster. *Research Policy*, 34(1), 47–68.
Glaeser, E. L. (ed.) (2010). *Agglomeration Economics*. Chicago: University of Chicago Press.
Glasmeier, A. (1988). Factors governing the development of high-tech industries agglomerations: A tale of three cities. *Regional Studies*, 22, 287–301.
Goldenberg, J. and Levy, M. (2009). Distance is not dead: Social interaction and geographical distance in the internet era. arXiv: 0906.3202.
Grace, D., Ross, M., and King, C. (2020). Brand fidelity: Scale development and validation. *Journal of Retailing and Consumer Services*, 52, 101–108.
Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology*, 78, 1360–1380.
Greenberg, S., Marquardt, N., Ballendat, T., Diaz-Marino, R., and Wang, M. (2011). Proxemic interactions: The new ubicomp? *Interactions*, 18(1), 42–50.
Grossetti, M. and Bès, M. P. (2001). Interacting individuals and organizations: A case study on cooperation between firms and research laboratories. In A. Kirman and J.-B. Zimmermann (eds.), *Economics with Heterogeneous Interacting Agents*. Dordrecht: Springer, 287–302.
Hägerstrand, T. (1967). *Innovation Diffusion as a Spatial Process*. Chicago: University of Chicago Press.
Hall, E. T. (1963). A system for the notation of proxemic behavior. *American Anthropologist*, 65(5), 1003–1026.
Hall, E. T. (1966). *The Hidden Dimension*. New York: Anchor Books.
Hall, E. T., Birdwhistell, R. L., Bock, B., Bohannan, B., Diebold, A. R., Durbin, M., Edmonson, M. S., Fischer, J. L., Hymes, D., Kimball, S. T., La Barre, W., Lynch, S. E., McClellan, J. E., Marshall, D. S., Milner, G. B., Sarles, H. B., Trager, G. L., and Vayda, A. P. (1968). Proxemics (with Comments and Replies). *Current Anthropology*, 9(2–3), 83–108.
Hansen, T. (2014). Juggling with proximity and distance: Collaborative innovation projects in the Danish cleantech industry. *Economic Geography*, 90, 375–402.
Harary, F., Norman, R. Z., and Cartwright, D. (1965). *Structural Models: An Introduction to the Theory of Directed Graphs*. New York: Wiley.
Hargrave, T. and Van De Ven, A. H. (2006). A collective action model of institutional innovation. *The Academy of Management Review*, 31(4), 864–888.
Held, V. (2006). *The Ethics of Care: Personal, Political and Global*. New York: Oxford University Press.
Herrera-Yagüe, C., Schneider, C. M., Couronné, T., Smoreda, Z., Benito, R. M., Zufiria, P. J., and Gonzalez, M. C. (2015). The anatomy of urban social networks and its implications in the searchability problem. *Scientific Reports*, 5, 10265.
Hidalgo, C. A., Klinger, B., Barabasi, A. L., and Hausmann, R. (2007). The product space conditions the development of nations. *Science*, 317, 482–487.

Hoekman, J., Frenken, K., and Tijssen, R. J. W. (2010). Research collaboration at a distance: Changing spatial patterns of scientific collaboration within Europe. *Research Policy*, 39, 662–673.
Holl, A. and Mariotti, I. (2018). The geography of logistics firm location: The role of accessibility. *Networks and Spatial Economics*, 18(2), 337–361.
Hong, W. and Su, Y. S. (2013). The effect of institutional proximity in non-local university-industry collaborations: An analysis based on Chinese patent data. *Research Policy*, 42, 454–464.
Honneth, A. (1992). *The Struggle for Recognition: The Moral Grammar of Social Conflicts*. Cambridge: Polity Press.
Hoover, E. M. (1948). *The Location of Economic Activity*. New York: McGraw-Hill.
Hotelling, H. (1929). Stability in competition. *The Economic Journal*, 39, 41–57.
Hunter, J. A., Hollands, G. J., Couturier, D. L., Marteau, T. M. (2016). Impact of altering proximity on snack food intake in individuals with high and low executive function: Study protocol. *BMC Public Health*, 16(1), 504.
Ivanov, D., Dolgui, A., Sokolov, B., and Ivanova, M. (2017). Literature review on disruption recovery in the supply chain. *International Journal of Production Research*, 55(20), 6158–6174.
Jacobsen, N. B. (2006). Industrial symbiosis in Kalundborg, Denmark: A quantitative assessment of economic and environmental aspects. *Journal of Industrial Ecology*, 10, 239–55.
Jaffe, A., Trajtenberg, M., and Henderson, R. (1993). Geographic localization of knowledge spillovers as evidenced by patent citations. *Quarterly Journal of Economics*, 108, 577–598.
Kiesler, S. R. and Cummings, J. N. (2002). What do we know about proximity and distance in work groups? A legacy of research. In P. J. Hinds and S. Kiesler (eds.), *Distributed Work*. Cambridge, MA: MIT Press, 57–82.
King, J. L. and Frost, R. L. (2002). Managing distance over time: The evolution of technologies of dis/ambiguation. In P. J. Hinds and S. Kiesler (eds.), *Distributed Work*. Cambridge, MA: MIT Press, 3–26.
Kirat, T. and Lung, Y. (1999). Innovation and proximity: Territories as loci of collective learning processes. *European Urban and Regional Studies*, 6(1), 27–38.
Kneafsey, M., Venn, L., Schmutz, U., Balázs, B., Trenchard, L., Eyden-Wood, T., Bos, E., Sutton, G., and Blackett, M. (2013). *Short Food Supply Chains and Local Food Systems in the EU: A State of Play of their Socio-Economic Characteristics*. Luxembourg: European Commission.
Knowles, D., Brown, K., and Aldrovandi, S. (2019). Exploring the underpinning mechanisms of the proximity effect within a competitive food environment. *Appetite*, 134, 94–102.
Knox, P. L. (2005). Creating ordinary places: Slow cities in a fast world. *Journal of Urban Design*, 10(1), 1–11.
Krugman, P. (1991). Increasing returns and economic geography. *Journal of Political Economy*, 99(3), 483–499.
Krugman, P. (2011). The new economic geography, now middle-aged. *Regional Studies*, 45(1), 1–7.
Kuhn, H. W. and Tucker, A. W. (eds.) (1950). *Contributions to the Theory of Games*. Annals of Mathematical Studies. Princeton, NJ: Princeton University Press.
Lackey, K. J. and Kaczynski, A. T. (2009). Correspondence of perceived vs. objective proximity to parks and their relationship to park-based physical activity. *International Journal of Behavioral Nutrition and Physical Activity*, 6, 53.
Lamberton, C. and Stephen, A. T. (2016). A thematic exploration of digital, social media, and mobile marketing: Research evolution from 2000 to 2015 and an agenda for future inquiry. *Journal of Marketing*, 80(6), 146–172.
Larson, L. R., Jennings, V., and Cloutier, S. A. (2016). Public parks and wellbeing in urban areas of the United States. *PLoS One*, 11(4).
Lawson, C. and Lorenz, E. (1999). Collective learning, tacit knowledge and regional innovative capacity. *Regional Studies*, 33(4), 305–317.
Lazega, E. and Snijders, T. A. (eds.) (2015). *Multilevel Network Analysis for the Social Sciences: Theory, Methods and Applications*. Dordrecht: Springer.
Leonidou, L. C., Katsikeas, C. S., Samiee, S., and Aykol, B. (2018). International marketing research: A state of the art review and the way forward. In L. C. Leonidou, C. S. Katsikeas, S. Samiee, and B. Aykol (eds.), *Advances in Global Marketing*. Cham: Springer, 3–33.
Lethiais, V. and Aguilera, A. (2014). Les déterminants de la fréquence du face-à-face dans les relations interentreprises: une analyse empirique. *Revue d'Économie Regionale et Urbaine*, 4, 613–641.
Lévi-Strauss, C. (1969). *The Elementary Structures of Kinship*. Boston, MA: Beacon Press (first published 1947).
Li, J. and Guo, X. (2020). COVID-19 contact-tracing apps: A survey on the global deployment and challenges. arXiv: 2005.03599.
Li, S. and Lin, B. (2006). Accessing information sharing and information quality in supply chain management. *Decision Support Systems*, 42(3), 1641–1656.
Lind, A. E. and Tyler, T. R. (1988). *The Social Psychology of Procedural Justice*. New York: Plenum Press.

Loughlin, J., Hendricks, F., and Lidstrom, A. (eds.) (2010). *The Oxford Handbook of Local and Regional Democracy in Europe*. Oxford: Oxford University Press.
Lucas, R. E. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, 22, 3–42.
Maddison, R., Jiang, Y., Vander Hoorn, S., Mhurchu, C. N., Exeter, D., and Utter, J. (2010). Perceived versus actual distance to local physical-activity facilities: Does it really matter? *Journal of Physical Activity and Health*, 7(3), 323–332.
Magsi, H. and Torre, A. (2014). Proximity analysis of inefficient practices and socio-spatial negligence: Evidence, evaluations and recommendations drawn from the construction of Chotiari reservoir in Pakistan. *Land Use Policy*, 36, 567–576.
Maillat, D. (1995). Territorial dynamic, innovative milieus and regional policy. *Entrepreneurship & Regional Development*, 7(2), 157–165.
Marchesnay, M. (2011). Fifty years of entrepreneurship and SME: A personal view. *Journal of Small Business and Enterprise Development*, 18(2), 352–365.
Marshall, A. (1890). *Principles of Economics*. London: Macmillan.
Marshall, A. (1919). *Industry and Trade: A Study of Industrial Technique and Business Organization; and of Their Influences on the Conditions of Various Classes and Nations*. London: Macmillan.
Maskell, P. and Malmberg, A. (1999). Localised learning and industrial competitiveness. *Cambridge Journal of Economics*, 23(2), 167–185.
Matula, D. X. and Sokal, R. R. (1980). Properties of Gabriel graphs relevant to geographic variation research and the clustering of points in the plane. *Geographic Analysis*, 12, 205–222.
McCormack, G. R., Rock, M., Toohey, A. M., and Hignell, D. (2010). Characteristics of urban parks associated with park use and physical activity: A review of qualitative research. *Health & Place*, 16(4), 712–726.
Meixell, M. J. and Gargeya, V. B. (2005). Global supply chain design: A literature review and critique. *Transportation Research Part E: Logistics and Transportation Review*, 41(6), 531–550.
Merrett, D. and Walzer, M. (eds.) (2004). *Cooperatives and Local Development. Theory and Applications for the 21st Century*. Armonk, NY: M. E. Sharpe.
Milgram, S. (1967). The small world problem. *Psychology Today*, 2(1), 60–67.
Milgram, S. (1970). The experience of living in cities. *Science*, 167(3924), 1461–1468.
Milgram, S. (1974). *Obedience to Authority*. New York: Harper & Row.
Moen, Ø. and Rialp-Criado, A. (2019). European SMEs and the Born Global concept. In G. Suder, M. Riviere, and J. Lindeque (eds.), *The Routledge Companion to European Business*. Abingdon: Routledge, 79–90.
Moles, A. and Rohmer, E. (1978). *Psychologie de l'espace*. Tournai: Casterman.
Mollard, A. and Torre, A. (eds.) (2004). Proximity and environmental dimensions. *International Journal of Sustainable Development*, 7(3).
Monge, R. R. and Kirste, K. K. (1980). Measuring proximity in human organizations. *Social Psychology Quarterly*, 43, 110–115.
Moreno, J. L. (1934). *Who Shall Survive? A New Approach to the Problem of Human Interrelations*. Washington, DC: Nervous and Mental Disease Publishing Company.
Moser, G. (1988). Urban stress and helping behavior: Effects of environmental overload and noise on behaviour. *Journal of Environmental Psychology*, 8(4), 287–298.
Moulaert, F. and MacCallum, D. (2019). *Advanced Introduction to Social Innovation*. Cheltenham, UK and Northampton, MA, USA: Edward Elgar Publishing.
Mueller, F. F., Stellmach, S., Greenberg, S., Dippon, A., Boll, S., Garner, J., Khot, R., Naseem, A., and Altimira, D. (2014). Proxemics play: Understanding proxemics for designing digital play experiences. Presented at Designing Interactive Systems Conference, June 21–25, Vancouver, Canada.
Muth, R. F. (1969). *Cities and Housing*. Chicago: University of Chicago Press.
Naimpally, S. A. and Warrack, B. D. (1970). *Proximity Spaces*. Cambridge: Cambridge University Press.
Nelson, R. (ed.) (1993). *National Innovation Systems: A Comparative Analysis*. New York: Oxford University Press.
Nelson, R. and Winter, S. G. (1982). *An Evolutionary Theory of Economic Change*. Cambridge, MA: Belknap Press/Harvard University Press.
Nocco, A., Ottaviano, G. and Saltoca, M. (2017). Monopolistic competition and optimum product selection: Why and how heterogeneity matters. *Research in Economics*, 71(4), 704–717.
Nooteboom, B. (2000). Learning by interaction: Absorptive capacity, cognitive distance and governance. *Journal of Management and Governance*, 4(1–2), 69–92.
Ogawa, H. and Fujita, M. (1989). Nonmonocentric urban configurations in a two-dimensional space. *Environment and Planning A: Economy and Space*, 21, 363–374.
Oldenburg, R. (1991). *The Great Good Place*. New York: Marlowe & Company.
Ormerod, P. (2005). *Why Most Things Fail: Evolution, Extinction and Economics*. London, Faber & Faber.
Papagiorgiou, Y. Y. and Smith, T. R. (1983). Agglomeration as local instability of spatially uniform steady-states. *Econometrica*, 51, 1109–1119.

Pecqueur, B. and Zimmermann, J.-B. (eds.) (2004). *Économie de proximités*. Paris: Hermès Sciences Publications.
Pellegrino, G. (ed.) (2011). *The Politics of Proximity*. Burlington, VT: Ashgate.
Petrini, C. (2001). *Slow Food: The Case for Taste*. New York: Columbia University Press.
Pigou, A. C. (1920). *The Economics of Welfare*. London: Macmillan.
Ponds, R., van Oort, F. G., and Frenken, K. (2007). The geographical and institutional proximity of research collaboration. *Papers in Regional Science*, 86, 423–443.
Porter, M. E. (1985). *Competitive Advantage*. New York: Free Press.
Pred, A. (1966). *The Spatial Dynamics of US Urban-Industrial Growth*. Cambridge, MA: MIT Press.
Rallet, A. and Torre, A. (1999). Is geographical proximity necessary in the innovation networks in the era of global economy? *GeoJournal*, 49(4), 373–380.
Ranieri, L., Digiesi, S., Silvestri, B., and Roccotelli, M. (2018). A review of last mile logistics innovations in an externalities cost reduction vision. *Sustainability*, 10(3), 782.
Rice, D. J., Davidson, B. D., Dannenhoffer, J. F., and Gay, G. K. (2007). Improving the effectiveness of virtual teams by adapting team processes. *Computer Supported Cooperative Work (CSCW)*, 16(6), 567–594.
Rigolon, A. (2016). A complex landscape of inequity in access to urban parks: A literature review. *Landscape and Urban Planning*, 153, 160–169.
Romijn, H. and Albu, M. (2002). Innovation, networking and proximity: Lessons from small high technology firms in the UK. *Regional Studies*, 36(1), 81–86.
Rosenau, J. N. (2003). *Distant Proximities: Dynamics beyond Globalization*. Princeton, NJ: Princeton University Press.
Rothenberg, C. E. (1999). Proximity and distance: Palestinian women's social lives in diaspora. *Diaspora: A Journal of Transnational Studies*, 8(1), 23–50.
Rychen, F. and Zimmermann, J.-B. (2008). Clusters in the global knowledge-based economy: Knowledge gatekeepers and temporary proximity. *Regional Studies*, 42(6), 767–776.
Rydehell, H., Isaksson, A., and Löfsten, H. (2019). Business networks and localization effects for new Swedish technology-based firms' innovation performance. *Journal of Technology Transfer*, 44(5), 1547–1576.
Sarker, S. and Sahay, S. (2004). Implications of space and time for distributed work: An interpretive study of US–Norwegian systems development teams. *European Journal of Information Systems*, 13(1), 3–20.
Saxenian, A. (1994). *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*. Cambridge, MA: Harvard University Press.
Schutjens, V. and Stam, E. (2003). The evolution and nature of young firm networks: A longitudinal perspective. *Small Business Economics*, 21(2), 115–134.
Scott, A. J. (2007). *The Urban Land Nexus and the State*. London and New York: Routledge.
Scully, J. Y., Moudon, A. V., Hurvitz, P. M., Aggarwal, A., and Drewnowski, A. (2019). A time-based objective measure of exposure to the food environment. *International Journal of Environmental Research and Public Health*, 16(7), 1180.
Shuter, R. (1976). Proxemics and tactility in Latin America. *Journal of Communication*, 26(3), 46–52.
Simmel, J. (1917). *Grundfragen der Soziologie* (*Fundamental Questions of Sociology*). Berlin: Göschen.
Smircich, L. (1983). Organization as shared meaning. In L. R. Pondy, P. J. Frost, G. Morgan, and T. C. Dandridge (eds.), *Organizational Symbolism*. Greenwich, CT: JAI Press, 55–65.
Steinmo, M. and Rasmussen, E. (2016). How firms collaborate with public research organizations: The evolution of proximity dimensions in successful innovation projects. *Journal of Business Research*, 69, 1250–1259.
Stephens, M. and Poorthuis, A. (2015). Follow thy neighbor: Connecting the social and the spatial networks on Twitter. *Computers, Environment and Urban Systems*, 53, 87–95.
Sternberg, R. (2007). Entrepreneurship, proximity and regional innovation systems. *Tijdschrift voor Economische en Sociale Geografie*, 98(5), 652–666
Thisse, J. F. and Walliser, B. (1998). Is space a neglected topic in mainstream economics? *Recherches Économiques de Louvain/Louvain Economic Review*, 64(1), 11–22.
Torre, A. (2008). On the role played by temporary geographical proximity in knowledge transfer. *Regional Studies*, 42(6), 869–889.
Torre, A. (2011). The role of proximity during long-distance collaborative projects: Temporary geographical proximity helps. *International Journal of Foresight and Innovation Policy*, 7(1–3), 213–230.
Torre, A. (2014). Proximity relations at the heart of territorial development processes: From clusters, spatial conflicts and temporary geographical proximity to territorial governance. In A. Torre and F. Wallet (eds.), *Regional Development and Proximity Relations*. Cheltenham, UK and Northampton, MA, USA: Edward Elgar Publishing, 94–134.
Torre, A. (2019). Territorial development and proximity relationships. In R. Capello and P. Nijkamp (eds.), *Handbook of Regional Growth and Development Theories*, 2nd edition. Cheltenham, UK and Northampton, MA, USA: Edward Elgar Publishing, 326–343.

Torre, A. and Beuret, J. E. (2012). *Proximités territoriales: Construire la gouvernance des territoires, entre conventions conflits et concertations*. Paris: Economica Anthropos.
Torre, A. and Gilly, J. P. (2000). On the analytical dimension of proximity dynamics. *Regional Studies*, 34(2), 169–180.
Torre, A., Melot, R., Magsi, H., Bossuet, L., Cadoret, A., Caron, A., Darly, S., Jeanneaux, P., Kirat, T., Pham, H. V., and Kolokouris, O. (2014). Identifying and measuring land-use and proximity conflicts: Methods and identification. *SpringerPlus*, 3(1), 85.
Torre, A. and Rallet, A. (2005). Proximity and localization. *Regional Studies*, 39(1), 47–59.
Torre, A. and Traversac, J. B. (eds.) (2011). *Territorial Governance: Local Development, Rural Areas and Agrofood Systems*. New York: Springer Verlag.
Torre, A. and Wallet, F. (eds.) (2014). *Regional Development and Proximity Relations*. Cheltenham, UK and Northampton, MA, USA: Edward Elgar Publishing.
Torre, A. and Zuindeau, B. (2009). Proximity economics and environment: Assessment and prospects. *Journal of Environmental Planning and Management*, 52(1), 1–24.
Urry, J. (2002), Mobility and proximity. *Sociology*, 36(2), 255–274.
Urry, J. (2007). *Mobilities*. Cambridge: Polity Press.
Utterback, J. (1974). Innovation in industry and the diffusion of technology. *Science*, 183, 658–662.
Venables, A. J. (1996). Equilibrium locations of vertically linked industries. *International Economic Review*, 37(2), 341–359.
Von Thünen, J. H. (1826). *Der isolierte Staat in Beziehung auf Landwirtschaft und Nationalökonomie*. Wirtschaft & Finan. Published as *The Isolated State*. London: Pergamon, 1966.
Vuignier, R. (2017). Place branding & place marketing 1976–2016: A multidisciplinary literature review. *International Review on Public and Nonprofit Marketing*, 14(4), 447–473.
Wallace, A. D. (1941). Separation spaces. *Annals of Mathematics*, 42(3), 687–697.
Wang, D., Brown, G., and Mateo-Babiano, I. (2013). Beyond proximity: An integrated model of accessibility to public parks. *Asian Journal of Social Sciences & Humanities*, 2(3), 486–498.
Wasserman, S. and Faust, K. (1994). *Social Network Analysis: Methods and Applications*. New York: Cambridge University Press.
Weber, A. (1929). *Theory of the Location of Industries*. Chicago: University of Chicago Press.
Wellman, B. (1979). The community question: The intimate networks of East Yorkers. *American Journal of Sociology*, 84(5), 1201–1231.
White, A. J., Bradshaw, P. T., and Hamra, G. B. (2018). Air pollution and breast cancer: A review. *Current Epidemiology Reports*, 5(2), 92–100.
White, H. C., Boorman, S. A., and Breiger, R. L. (1976). Social structure from multiple networks: I. Blockmodels of roles and positions. *American Journal of Sociology*, 81, 730–780.
Wilson, J. M., Boyer O'Leary, M., Metiu, A., and Jett, Q. R. (2008). Perceived proximity in virtual work: Explaining the paradox of far-but-close. *Organization Studies*, 29(7), 979–1002.
Wolch, J., Jerrett, M., Reynolds, K., McConnell, R., Chang, R., Dahmann, N., and Berhane, K. (2011). Childhood obesity and proximity to urban parks and recreational resources: A longitudinal cohort study. *Health & Place*, 17(1), 207–214.
World Commission on Environment and Development (1987). *Our Common Future*. Oxford: Oxford University Press.
Zajonc, R. B. (1965). Social facilitation. *Science*, 149, 269–274.
Zhang, C., Ding, R., Xiao, C., Xu, Y., Cheng, H., Zhu, F., … and Cao, J. (2017). Association between air pollution and cardiovascular mortality in Hefei, China: A time-series analysis. *Environmental Pollution*, 229, 790–797.
Zimmermann, J.-B. (2001). The firm/territory relationships in the globalisation: Towards a new rationale. *European Journal of Economic and Social Systems*, 15(1), 57–75.