

Knowledge networks in space

Some thoughts of a Geographer on the RIS literature

This article represents a discussion of the spatial scales of knowledge networks. It takes its point of departure in some of the basic ideas of 'the territorialized innovation theories'. The perspective of the article is the implications of high mobility and globalisation to knowledge networks, and it is argued that today knowledge spaces develop more or less regardless of regional and even of national borders. While deconstructing the somewhat deterministic and systemic RIS approach an alternative approach is developed. It is thus suggested to understand the role of different types of proximities for the development of knowledge networks. Geographic, societal as well as cognitive proximities are seen as enablers of knowledge exchange among individuals as well as among economic agents on different spatial scales. Societal and individual mobility resources and individual capabilities are required to benefit from global knowledge networks.

El presente artículo aborda la discusión de las escalas espaciales de las redes de conocimiento. Para eso parte de algunas de las ideas básicas de las «teorías de innovación territorializada». El artículo incide en las implicaciones de una alta movilidad y de la globalización en las redes de conocimiento, y sostiene que hoy en día los espacios del conocimiento evolucionan, en mayor o menor medida, independientemente de las fronteras regionales e incluso de las nacionales. Al mismo tiempo que se desmonta el, de alguna manera, determinista y sistémico enfoque de los sistemas regionales de innovación, se desarrolla un enfoque alternativo. Este sugiere comprender el papel de los distintos tipos de proximidades para el desarrollo de las redes de conocimiento. Las proximidades cognitivas, societarias y geográficas se ven como elementos que posibilitan el intercambio de conocimiento entre individuos así como entre agentes económicos a diferentes escalas espaciales. Así pues, son necesarios recursos de movilidad individual y social, así como las capacidades individuales para beneficiarse de las redes mundiales de conocimiento.

Honako artikulu honek ezagutza-sareen espazio-eskalei buruzko eztabaida jorratzen du. Horretarako, berrikuntza lurraldekatuari buruzko teorien oinarritzko ideia batzuetatik abiatzen da. Artikulu honek ezagutza-sareetan izaten den mugikortasun handiaren eta globalizazioaren eraginak aztertzen ditu, eta aldeztu du gaur egun ezagutzaren espazioak bilakatzen ari direla, eskualde eta arte estatu mailako mugaldeak alde batera utzita. Ikuspen alternatibo bat garatzen ari da, berrikuntzako eskualde-sistemen aldean. Horrek iradokitzen du ezagutza-sareen garapenerako hurbiltasun mota bakoitzaren papera ulertu behar dela. Ezagutza-, sozietate- eta lurralde-hurbiltasunak honela ikusten dira: gizabanakoen zein eragile ekonomikoen artean hainbat espazio-eskalatan ezagutzaren trukea ahalbidetzen duten elementu moduan.

INDEX

1. Introduction
 2. The role and types of knowledge in innovation
 3. Geographic proximity
 4. Societal proximity
 5. Cognitive proximity
 6. Conclusion and perspective
- References

Keywords: Knowledge, Innovation, Technology, Networks, Proximity, Geographic proximity, Societal proximity, Cognitive proximity, Spatiality, Relational view

JEL classification: D83, D85, O33, R58, O31

1. INTRODUCTION

It is not an easy task to comment on the abundant literature on Regional Innovation systems (or RIS among friends), since the production of RIS related ideas still goes on, and because of the variety of contributions. RIS is a moving target. Also, by asking for the thoughts of a geographer is questionable, since economic geographers are the fathers of the notion (Cooke, Uranga & Extbarria, 1997), Many economic geographers would probably subscribe to much of the RIS universe. The reflections that will be presented in the following are not entirely geographic, but rather multidisciplinary. They are motivated by the continuous confrontation by the author between theories and empirical findings throughout almost two decades of research in local and regional development, which have lead to serious doubts in relation to the fruitfulness of simple systemic thinking.

RIS belongs to an even larger group of economic theories of innovation which share a particular focus on the local environment. This group of theories has been labelled 'the territorialized innovation theories' (Moulat & Seika, 2003). A common characteristic of these theories, which are occupied with the development of subnational regions and localities, is that the source of regional growth and competitiveness is to be found mainly in exactly this regional or local environment itself. The idea is that local, inherited competences in combination with an innovative interplay among local actors and institutions is supposed to create competitive, growth and thus wealth of the local economy. It should thus be possible for local economies to pull themselves up by their own bootstraps! This approach to local development emerged at a time when the welfare approach to public policies and spending was substituted by liberalist and minimalist approaches, involving

budget cuts as well as reduction of direct public intervention in the economy. Public investment and subsidies in industries were left as means of regional development policy. They became substituted by a much cheaper kind of strategies, as the new approach legitimised what has been called 'soft strategies' of regional development. Soft strategies focus on the development of local institutions and networks. One region where the soft strategies have been pursued very actively is in Central and Eastern Europe, with consultancy and economic motivation of the European Union (Lorentzen, 1996; Lorentzen, 2000).

It is interesting how the development of the territorialised innovation theories has taken place in a phase in which globalisation has been intensified and in which the role of distance has changed as a consequence of the space-shrinking technologies. Many efforts have been put into the claim that the role of the local environment to innovation increases because of globalisation (Bathelt, Malmberg & Maskell, 2004). Less consideration has been given to the potentials of the information and transportation technologies in linking people and places across the globe. The local focus, or the 'regional gaze' (Lagendijk & Oinas Päivi, 2005b) is connected to the idea, that knowledge is a key ingredient of growth. Knowledge, as compared to other factors of production, is argued not to be globally accessible, as inherited capabilities and innovative knowledge are seen as embedded in localised networks or clusters. Such networks or clusters serve as point of departure for globally competitive innovations, which arise from the interaction among local economic agents, the proximity of which favours knowledge exchange and innovation, not least of less tangible types

of knowledge. The view is indeed idealising the potentials and prospects of the regions, and no wonder criticism has emerged lately (See e.g. Hess, 2004; Lagendijk, 2002; Lagendijk & Lorentzen, 2007; Lagendijk & Oinas Päivi, 2005a; Lorentzen, 2008a; Lorentzen, 2008b; MacKinnon, Cumbers & Chapman, 2002; Moulart & Seika, 2003).

The core of the RIS idea seems to be that a particular relationship can be established between knowledge networks and place. This paper will therefore discuss this relationship in a way which on the one hand deconstructs some basic ideas of the RIS theories, and on the other constructively suggests an alternative understanding of this relationship.

2. THE ROLE AND TYPES OF KNOWLEDGE IN INNOVATION

In a growth perspective it is most fruitful to consider innovation in the way Porter does, as change related to every activity of the firm, that is activities along the value chain, and changes in the firm's infrastructure (Porter, 1990). This is broader than the definition of Nelson and Rosenberg who, because they are particularly focused on the role of technology, regard innovation as the process by which firms master and put into practice product designs and manufacturing processes which are new to them (Nelson & Rosenberg, 1993). Both definitions concern the application of new knowledge, more than the generation of the knowledge itself, and in both cases the firm is the key institution of application of the innovation. This means that the ability of the firm to apply new knowledge to the routines of the firm is the crux of innovative capability. Every enhancement of the

technological capability represents a step in which the company 'learns' (Bell & Pavitt, 1993). In order to maintain competitiveness it is necessary to 'learn' on a continuous basis.

Since innovation presupposes access to knowledge a problem arises: from where does a firm get all this knowledge? The knowledge base of the individual firm necessarily has its limits, embedded as it is in individuals, groups and routines of the firm. Access to knowledge from outside the firm is quite important to the firm's innovation strategy (Smith, 1995; Smith, 1997). Knowledge, however, can be of different kinds. Based on Polanyi (Polanyi, 1966), RIS literature has drawn on the suggested distinction between tacit and explicit knowledge to underscore the role of the local environment. According to Polanyi (Polanyi, 1966) the individual possesses tacit knowledge which he or she cannot immediately communicate, which means that we know more, than we can tell. This is different from explicit knowledge which can be communicated in a formalised way as for example in writing. Tacit knowledge is of great importance when it represents a foreknowledge of yet undiscovered things, as for example in science. Tacit knowledge can be a motive force in the search processes preceding innovation. Based on this Nonaka and Takeuchi (Nonaka & Takeuchi, 1995) suggest that knowledge is created and applied through a process of social interaction in which tacit knowledge is shared by socialisation, translated into explicit knowledge, combined with other elements of explicit knowledge and finally internalised into tacit knowledge into the practice of the organisation (which is the same as application of knowledge). Nonaka and Takeuchi did not see the

conversion process as a spontaneous or easy process. On the contrary it requires a series of conditions in the organisation, like group work, the rotation of personnel and redundancy in the organisation (Nonaka, 1991).

While the point of departure for the authors was the organisation or the firm, this social process of knowledge conversion may as well take place between firms and organisations (Lundvall, 1998). As for the conditions for this to take place, this is where the RIS literature comes in. It is thus argued that mutual learning processes are most likely to take place within local economies (Maskell & Malmberg, 1999b). As expressed by the authors, the more tacit the knowledge involved, the more important is spatial proximity (Maskell & Malmberg, 1999a:180). Knowledge sharing may take place in joint projects or as 'buzz' (Bathelt, Malmberg & Maskell, 2004) in the local environment.

In a globalising world in which economic actors at large have access to still cheaper information and transportation technologies this reasoning seems to oppose common sense, according to which emerging global rather than local knowledge networks could be expected to be of importance for the development of firms and localities. Therefore, below the geographic perspectives on knowledge networks will be developed based on a discussion of the roles of different types of proximity, enabling agents to embark on knowledge sharing and innovation.

3. GEOGRAPHIC PROXIMITY

Geographic proximity is in the outset understood as the kilometric distance that

separates two actors spatially. This distance for obvious reasons represents a constraint to interaction and learning among them. However, geographic proximity is relative in terms of cost and time (Torre & Rallet, 2005). This is due to advances in information and communication technologies (ICT) and transportation technologies. These are the so-called time and space-compressing technologies, the geographic implication of which is to increase the mobility of men, information and goods (Harvey, 1990). Time-space compression is nothing new, but is a process which has been going on for ages, as illustrated in Dicken (Dicken, 2007:78 ff). Technological changes have helped progressively to change the landscape of economic geography. Thus for example technological break through in aircrafts coincided with the take-off of transnational corporations (Dicken, 1992:105). In this globalised economic landscape, mobility has grown to the extent that today an increasing number of people work by travelling (researchers, experts, salesmen). People cooperate over long distances, and if co-presence is needed, short visits can be organised. This phenomenon has been called temporary proximity (Gallaud & Torre, 2005; Torre & Rallet, 2005).

However, even 'being there' is no longer a constraint of geographic proximity (Amin & Cohendet, 2005). Global knowledge networks can be held together by travel, but also by digital communication technologies. Knowledge sharing is possible through video-conferences, chat-rooms, e-mailing of texts and pictures and so on. This means that knowledge networks are held together by cheap travel, the internet and as well as by specialist literature (Amin & Cohendet, 2005:469). With virtual travel by the internet

mobilities even become instantaneous (Urry, 2000).

Not only scientists and high tech firms operate global knowledge networks. Lorentzen has characterised the spatial extension of knowledge networks among a sample Polish manufacturing firms in traditional industries and found that the global space was most important to their knowledge sourcing (Lorentzen, 2007). These distanced relationships even involve the sharing of tacit knowledge by internet, for example in the design phase of glassware, in which photographs and sketches were the form of representation (Lorentzen, 2005). This is supported by Foray and Steinmüller (Foray & Steinmüller, 2003) who argue, that different kinds of knowledge, even tacit knowledge can be shared virtually through different forms of representation. Also Amin and Cohendet argue that knowledge, and even tacit knowledge, travel (Amin & Cohendet, 2005:471). They suggest that the purpose of modern organisation is to enable proximity at a distance. This means that practices of knowing (sharing of tacit vs. explicit knowledge) is not related to the local vs. the global distinction. The result of this is that *relations*, and not kilometres, decide whether knowledge of all types is shared.

Actors and territories are not equally equipped with ICT technologies. Access to technologies requires investment by governments and firms, and both governments and firms differ in terms of resources (financial, institutional, technological and so on). Thus a recent publication by the UNCTAD reports that there is still a substantial digital divide between developing and developed countries, even if the rapid pace of innovation in the ICT sector has reduced

the costs, thus including ICT use by poorer people (UNCTAD, 2007). To illustrate the divide the percentage of enterprises using the internet was as low as 8.7 % in Azerbaijan, and as high as 98.2% in Switzerland (UNCTAD, 2007:table 1.20). This implies that geographic proximity is relative in time and space. It not only changes historically by the development of technology. It also differs between territories and spaces, thus concentrating the mobility resources in and between developed countries and big cities.

4. SOCIETAL PROXIMITY

While it thus cannot be maintained that co-location of economic actors in the same locality is a necessity for sharing knowledge, as knowledge travel globally by different means, the next question which arise is if the potential access to knowledge, whether global or local, is enough for economic actors to start networking. What is it that motivates actors to join efforts and enable them to communicate? Some of the enabling mechanisms for knowledge sharing seem to be of the societal type, by which is understood, that they belong to the social organisation of actors rather than to the psychology of the actors. Kirat and Lung (Kirat & Lung, 1999) suggest the notion of *institutional proximity*. Institutional proximity is the assembly of agents as parties to a common space. An institutional space is formed by representations, models, and rules of the game, which form thoughts as well as actions (North, 1990). Institutions enabling knowledge exchange may be formalised in contracts or in legislation, or they may be governed by informal rules and values internalised in individuals, organisations and societies. Such enabling

mechanisms could be translations, travel, shared routines, talk, common passions, base standards, brokers, epistemic and community bonding, and the ordering and orientation provided by files, documents, codes, common software, and so on (Amin & Cohendet, 2005:473).

Institutions may be more or less developed in different spaces, making knowledge exchange, innovation and growth more or less difficult. 'Institutional thickness' was proposed by Amin and Thrift (Amin & Thrift, 1994) as a precondition for local and regional growth. Although hardly measurable, the notion lets know that local economies which are stripped of coherent and cohesive institutions face a bleak future (Amin & Thrift, 1994:19). While the original idea of Amin and Thrift initiated the regional 'gaze' of economic geography, the point here is that institutions are needed to assemble economic actors in any kind of space, local as well as global. And the interesting thing is that they do.

Not only do institutions on different levels represent an infrastructure of knowledge for economic agents. National education systems, academic and vocational; industrial associations and chambers of commerce; national research and development policies; labour market institutions and so on form an institutional space which connect economic agents by norms, conventions, values, expectations, and routines (Gertler, 2003). This space is more often than not national.

This is not to say that the actual knowledge sourcing practice of economic agent take place only on the national level. In her study on Polish enterprises Lorentzen finds that the global level is most important in relation to knowledge sourcing with customers, media, meetings,

fairs and suppliers. The regional scale was important in relation to training, institutions and recruitment, while the national level was approached to a smaller degree in most categories, but not used at all in relation to recruitment and media (Lorentzen, 2007:481). Two points stand out from this study: First, as part of their innovation strategy the individual actors combined knowledge assets from different institutions at different spatial levels. Second, in this endeavour the global value chain proved to be the most important source of knowledge.

The global value chain is also of great importance in the study of Vale and Caldeira of the footwear industry in northern Portugal (Vale & Caldeira, 2007). In parallel an emerging literature shows the important role of the global value chain for cluster development in developing countries (Yeung, Liu & Dicken, 2006) and in Europe (Coe et al., 2004). In sum, institutional enabling mechanisms for knowledge diffusion, sharing and creation are found on different spatial scales of which the global scale has gained considerable importance to firms, clusters and region.

Organisational proximity is another type of societal proximity which is helpful in linking agents. An organisation can be defined as a group of agents involved in practicing a finalised activity (Kirat & Lung, 1999). An organisation is a space in which actors define practices and strategies, and in which they are involved in cooperation with each other. Organizational proximity is relational (Torre & Rallet, 2005). Organisational proximity is the sharing among agents of common goals and practices, whether the agents are individuals, firm or organisations. The sharing of goals and practices is supported

by institutions (language, values, etc.) and facilitated by ICT and mobility resources. Agents in an organisation depend upon each other for the achievement of goals and the carrying out of practices, and they therefore have to cooperate to achieve their goals. Organisational relationships are for example production relationships with vertical or horizontal dependencies (Kirat & Lung, 1999:30). Organisational proximity implies relatively stable and well defined relations for a period of time between agents. The organisation uniting agents may be temporary or more enduring. Both temporary project groups and permanent organisations enable knowledge sharing.

The sharing of goals and practices which characterise an organisation can be established over long distances. Evidently organisations exist on different scales. Firms are local, national or global. Research and development projects are local, national or global. Organisational proximity is thus relational and not a matter of collocation. Therefore agglomerations, towns and cities do not in themselves facilitate coordination (Torre & Rallet, 2005).

The third type of proximity which is discussed under the headline of 'societal proximity' is related to the social relationships of economic actors, particularly of individuals. Social relationships have been stressed in the RIS literature (Cooke & Morgan, 1998). One point of this literature is that non-economic relationships among actors help them cooperate in economic matters. It is beneficial for the economy, if the actors form associations (like chambers of commerce or even civic organisations). The trust and social capital resulting from associating can be seen as an asset for development. The RIS perspective relates associations to the regional level and shows

how productive it is to involve associations in regional policy development and to delegate tasks and power to them (See also Morgan & Nauwelaers, 1999).

The reasoning draws on the work of Granovetter and of Putnam (Granovetter, 1985; Granovetter, 1973; Putnam, 1993; Putnam, 2001), and this work is worthwhile revisiting. Granovetter's concern is the sociology of the economy. He focuses on actors and networks of personal relationships. There are networks both within and between firms, regardless of the organisational form of the firm. Granovetter stresses the role of personal relations and structures and his main idea is that transactions of all kinds are rife with social relations (Granovetter, 1985). It can be argued that knowledge exchange benefits from social connections between actors, and that particularly tacit knowledge exchange necessarily involves contact between persons. The creation of a social space is therefore part of knowledge exchange, learning and innovation.

Granovetter does not consider the role of place, however. The role of place in social relationships is relative. In a preindustrial society a considerable overlap of social and geographic space could probably be found, because the movement of persons was costly as well as risky. The situation is different in the globalised and highly mobile society of today. People travel, and families, friends and colleagues may live wide apart, while still maintaining their social network. Socially proximate individuals need not be proximate in kilometric terms.

A supplementary approach to the role of social relationships in a developmental perspective is found in Putnam (Putnam, 2001). He is the father of the notion of 'social capital'. Social capital means connections

among individuals and the reciprocity and trust which arise from these connections. Social capital can be explained as shared social responsibility. Social capital is an economic asset as it decreases transaction costs. It also stimulates agents to embark jointly on more risky endeavours of innovation. There is no argument in favour of a geographic predetermination of social capital, since social relationships today overcome local and national barriers. Social relationships and social capital can be seen, in accordance with the RIS analysis as enabling mechanisms for the exchange of knowledge among actors, however they are not spatially defined or determined. Also *social proximity* is relative in time and space.

5. COGNITIVE PROXIMITY

Geographic and societal proximity represent practical facilitation and motivation for cooperation, but they do not in themselves enable actors to communicate. In order to communicate the actors need to share common mental frameworks of reference. One could of course argue that common frameworks of reference is inherent in institutions (a code is an institution) as well as in social relations, but for analytical and strategic purposes such a reference does not seem sufficiently clear. More specific insights about the role of common understandings, culturally and professionally can be found in literature on multinational companies (MNEs) and in comparative studies of national innovation systems (NIS). Two types of common understanding shall be dealt with here: culture, and profession.

In the literature on MNEs cultural distance vs. cultural proximity have been applied to

explain the success and strategy of MMEs. In his research Dunning finds that MNEs tend to choose locations which reflect the culture of the country of origin of the mother company (Dunning, 1993:534ff). Hofstede (Hofstede, 1983) is more detailed in his approach to international firms and culture. Hofstede defines culture as 'collective mental programming, and it is part of our conditioning which we share with other members of our nation, region or group, but not with members of other nations, regions or groups. Cultural proximity among actors exists if they share the same mental maps. Hofstede distinguishes between culture and institutions but explains the relationship between the two concepts: Culture crystallizes in institutions, while institutions, once they have been established reinforce culture and represent a constraint to cultural change. Culture is operationalized into four different dimensions. Each of these can be described as a continuum: Individualism vs. collectivism; large or small power distance; strong or weak uncertainty avoidance; and masculinity vs. femininity. More specifically then, proximity among actors exists if they are more or less similar in terms of degrees of individualism, power distance, risk avoidance and masculinity. Cultural proximity will decrease transaction costs because it facilitates cooperation among economic actors.

The approach of Hofstede is applied by Dickenson et al (Dickenson, Campbell & Azarov, 2000) in their study of the role of culture to innovative behaviour in Central and Eastern Europe (CEE). Their idea is that individualism, small power distance, weak risk avoidance and masculinity are beneficial for innovative behaviour. In their study the authors found the cultural characteristics in CEE less encouraging for innovation,

in particular the culture of risk avoidance. Therefore cultural change is seen as part of the strategy to enhance innovation in these countries.

The insights of Dunning, Hofstede and Dickenson have got implications for the discussion of knowledge networks. Following Dunning, cultural proximity makes communication among economic actors more efficient. Hofstede subscribes to the importance of proximity to cooperation, and shows how difficult it can be, because culture is complex. Dickenson et al specifies the role of specific cultures to innovative behaviour of individual firms. The requirements for innovation in individual firms are not necessarily the same as for knowledge sharing in networks, however. In relation to knowledge sharing among firms it can be hypothesised that it is facilitated more by cultures characterised by collectivism, small power distance, weak uncertainty avoidance, and a certain degree of femininity. The implication is that not only does cultural proximity make interaction among economic actors more efficient, but also that certain cultural characteristics are better levers of knowledge sharing than others.

This discussion has of course no direct implications for the question of scale in cultural proximity, and it is tempting to claim that specific cultures are related historically to particular places or localities. However, in times of globalisation it can hardly be maintained that cultural proximity in the above sense of the word, is territorially restricted. Through global media, direct foreign investment and travel, among other factors, a certain levelling out of cultural differences takes place. Particular mental maps travel, just like knowledge does. Economic actors and individuals may thus find culturally proximate colleagues on

different spatial scales, locally, nationally or globally.

Because knowledge for innovation is highly specialised and related to particular professions or sciences, knowledge exchange requires more than shared mental maps. The scientific community has never been known to be spatially restricted to particular geographic areas, and with ICT and the ease of travel it has become much easier than ever before for epistemic communities to collaborate internationally. Already in 1996 (Rabinow, 1996) described how the circulation and coordination of knowledge has never been more rapid or more international. His example is the international human genome project (quoted in Amin & Cohendet, 2005:480). Nothing, according to Amin and Cohendet (Amin & Cohendet, 2005) suggests that the local context is better equipped to ensure the accumulation of knowledge.

The mutual understanding among professionals having passed comparable educations or professional experiences is a must for knowledge sharing. This sharing of knowledge may eventually lead to innovation. From a perspective of innovation Nonaka (Nonaka, 1991) thus explains how, within an organisation, redundancy, or overlaps, are beneficial to the innovative knowledge conversion of the organisation. Individuals with comparable competences are in other words needed. Also across organisations comparable backgrounds are beneficial for knowledge exchange. Saxenian's work on Silicon Valley can be taken as an illustration of how technological proximities among professionals stimulate processes of learning and innovation among firms (Saxenian, 1994).

A host of institutions enable the sharing of knowledge among professionally and

technologically proximate actors. Literature shows how innovations systems (with institutions and routines) are connected to industrial sectors rather than to geographies (Breschi & Malerba, 1997). The existence of international consultancy firms would not be possible without professional and technological proximity on a global scale. Neither would international research and development projects. The role of international fairs and conferences is to bring professionally and technologically proximate actors together temporarily. Websites and professional magazines present knowledge for an international professional community. In sum, professional and technological proximity is crucial for knowledge sharing, and it takes place on different scales. The global scale is no doubt a very important scale for professional and technological, as well as scientific knowledge spaces to develop.

By unfolding the notion of *cognitive proximity* into cultural and professional/technological proximity the construction of proximities enabling knowledge sharing is complete.

6. CONCLUSION AND PERSPECTIVE

The notion of proximity is a useful prism through which the geographies of knowledge sharing can be regarded. Proximities can be regarded as enabling mechanisms for knowledge networks on different spatial scales. There are different types of proximities. *Geographic proximity* refers to the physical possibility of actors to interact, by meeting physically or virtually, for shorter or longer periods of time. *Societal proximity* contains the aspects of institutional, organisational and social proximity, which denote the different societal

mechanisms and structures that motivate actors to share goals. *Cognitive proximity* covers the cultural and technologically shared mindsets that enable actors to understand each other. The discussion of the three different categories of proximity has clearly shown that in the highly mobile and globalised society of today it is not justified, neither theoretically not empirically, to maintain the priority of the local level in knowledge exchange and learning among economic actors. Rather evidence seems to suggest that knowledge networks today go beyond regional as well as national borders.

The proximity approach can be seen as part of a trend in economic geography named 'the relational turn' (Boggs & Rantisi, 2003), and to which the RIS approach also belongs. Relational theories deal with the way in which social interactions among economic agents shape economic geography. There are important differences between the RIS approaches and the proximity approach as developed here, however. Compared to RIS approaches, the proximity approach is spatially non-deterministic, as it is open to relationships between and across different spatial scales. Compared to the RIS approach it is also non-systemic. In stead of regarding innovation as a result of systemic linkages among regional institutions and actors in a more or less 'closed' system, a proximity approach

regard knowledge sharing relationships as amorphous, because proximity mechanisms are more complex and spatially diversified than a systemic and functional approach can grasp. They are probably also more changeable, a point which has not been discussed. But maybe most importantly, proximities can never be more than enablers of firm specific innovation. They do not in themselves produce innovation, because in a market economy the firm in is the key institution of innovation (Nelson & Rosenberg, 1993). This means that the story of knowledge exchange, innovation and growth does not end with proximity, it only begins there. The rest of the story must be sought in the firm specific capabilities and resources of the individual firms (Ray, Barney & Muhanna, 2004; Teece, Pisano & Shuen, 1997).

To governments this implies a quest for carefully designed policies, which respond to the particular weaknesses of the local economic and infrastructural environment. Measures could focus on societal mobility resources (infrastructure), or relational capabilities of local firms (language or technology skills). They could consist in value chain policies, inviting MNEs to locate, or motivating local firms to export. But proximity is only the beginning, and that is the problem of proximity policies. There is a saying that 'you can take a horse to the water but you cannot make him drink'.

REFERENCES

- AMIN, A. & COHENDET, P. (2005): "Geographies of Knowledge Formation in Firms", *Industry & Innovation*, 12, 4: 465-486.
- AMIN, A. & THRIFT, N. (1994): "Living in the global," in *Globalisation, institutions and regional development in Europe*, AMIN, A. & THRIFT, N. eds., Oxford University Press, Oxford, 1-22.
- BATHELT, H., MALMBERG, A., & MASKELL, P. (2004): "Clusters and knowledge: Local buzz, global pipelines and the process of knowledge creation", *Progress in Human Geography*, 28, 1: 31-56.
- BELL, M. & PAVITT, K. (1993): "Technological accumulation and industrial growth. Contrasts between developed and developing countries", *Industrial and corporate change*, 2, 2: 157-200.
- BOGGS, J. S. & RANTISI, N. M. (2003): "The 'relational turn' in economic geography", *Journal of economic geography*, 3: 109-116.
- BRESCHI, S. & MALERBA, F. (1997): "Sectoral innovation systems: Technological regimes, Shumpeterian dynamics and spatial boundaries.", in *Systems of innovation: Technologies, institutions and organisations*, EDQUIST, C. ed., Pinter, London, 130-156.
- COE, N. M., HESS, M., YEUNG, H. W.-C., DICKEN, P., & HENDERSON, J. (2004): "'Globalizing' regional development: a global production networks perspective", *Transactions of the institute of british geographers*, 29: 468-484.
- Cooke, P. & Morgan, K. (1998): *he associational economy*. Firms, regions and innovation, 1st edn, Oxford University Press, Oxford.
- COOKE, P., URANGA, M. G., & EXTEBARRIA, G. (1997): "Regional innovation systems: Institutions and organisational dimensions, *Research Policy* 26:475-491.
- DICKEN, P. (2007): *Global shift. Mapping the changing contours of the world economy*. 5th edn, Sage Publications, London.
- 1992: *Global Shift. The internationalization of Economic Activity*, 2nd edn, Paul Chapman, London.
- DICKENSON, R. P., CAMPBELL, D., & AZAROV, V. (2000): "Will western managerial methods work in transitional societies?" *Problems of Post-Communism* 47, 3: 48-56.
- DUNNING, J. H. (1993): *Multinational enterprises and the global economy*. Addison-Wesley.
- FORAY, D. & STEINMUELLER, W. E. (2003): "The economics of knowledge reproduction by suscription", *Industrial and corporate change* 12, 2: 299-319.
- GALLAUD, D. & TORRE, A. (2005) "Geographical proximity and the diffusion of knowledge. The case of SMEs in biotechnology," in *Rethinking regional innovation and change. Path dependency or regional break through*, G. FUCHS & P. SHAPIRA, eds., Springer, USA, 127-146.
- GERTLER, M. S. (2003): "Tacit knowledge and the economic geography of context, or the undefinable tacitness of being (there)", *Journal of economic geography*, 3: 75-99.
- GRANOVETTER, M. (1985): "Economic action and social structure: The problem of embeddedness", *The American Journal of Sociology*, 91, 3: 481-510.
- GRANOVETTER, M. S. (1973): "The strength of weak ties", *The American Journal of Sociology*, 78, 6: 1360-1380.
- HARVEY, D. (1990): *The conditions of postmodernity: An enquiry into the origins of cultural change*, 1st edn, Blackwell, Cambridge, MA.
- HESS, M. (2004): "'Spatial' relationships? towards a reconceptualisation of embeddedness", *Progress in Human Geography*, 28, 2: 165-186.
- HOFSTEDE, G. (1983): "The cultural relativity of organisational practices and theories", *Journal of International Business Studies*, 14: 75-89.
- KIRAT, T. & LUNG, Y. (1999): "Innovation and proximity. Territories as loci of collective learning processes", *European Urban and Regional Studies*, 6, 1: 27-38.
- LAGENDIJK, A. (2002): "Beyond the regional lifeworld. against the global systemwoeld: Towards a relational scalar perspective on spatial-economic development", *Geografiska Annaler B*, 84, 2: 77-92.
- LAGENDIJK, A. & LORENTZEN, A. (2007): "Proximity, knowledge and innovation in peripheral regions. On the intersection between geographical and organisational proximity", *European Planning Studies*, 15, 1.
- LAGENDIJK, A. & OINAS PÄIVI (2005a): "Proximity, external relations and local economic development," in *Proximity, distance and diversity: issues on economic interaction and local development*, LAGENDIJK, A. & PÄIVI OINAS eds., Ashgate, Aldershot, 3-22.

- 2005b: *Proximity, Distance and Diveristy*, 1st edn, Ashgate, Aldershot.
- LORENTZEN, A. (1996): "Regional development and institutions in Hungary: Past, Present and Future Development", *European Planning Studies*, 4, 3: 259-277.
- 2000: "Regional development and innovation. Experiences from Poland", *Graue Reihe des Instituts Arbeit und Technik*, 16: 38-59.
- 2005: "Strategies of learning in the process of transformation", *European Planning Studies*, 13, 7.
- 2007: "The geography of Knowledge sourcing. A case study of Polish manufacturing enterprises", *European Planning Studies*, 15, 4: 467-486.
- 2008a: "Knowledge networks in local and global space", *Entrepreneurship & Regional Development*, 20, 6: 533-545.
- 2008b: "The scales of innovation spaces," in *Networks, Governance and Economic Development. Bridging Disciplinary Frontiers*, QUEREJETA, J. A., LANDART, I. & WILSON, J.R. eds, Edward Elgar, Cheltenham: 40-56.
- LUNDVALL, B.-Å. (1998): "The learning economy: Challenges to Economic Theory and Policy," in *Institutions and economic change*, 1st edn, NIELSEN & B. JOHNSON, eds., Edward Elgar, Cheltenham, UK; Northampton, MA.USA, 33-54.
- MACKINNON, CUMBERS, A., & CHAPMAN, K. (2002): "Learning, innovation and regional development: a critical appraisal of recent debates", *Progress in Human Geography*, 26, 3: 293-311.
- MASKELL, P. & MALMBERG, A. (1999a): "Localised learning and industrial competitiveness", *Cambridge Journal of Economics*, 23, 2: 167-185.
- 1999b, "The Competitiveness of Firms and Regions: 'Ubiquitification' and the Importance of Localized Learning", *European Urban and Regional Studies*, 6, 1: 9-25.
- MORGAN, K. & NAUWELAERS, C. (1999): *Regional Innovation strategies. The challenge for less favoured regions.*, 1st edn, The stationary Office with the Regional Studies Association, London.
- MOULART, F. & SEIKA, F. (2003): "Territorial innovation models: A critical Survey", *Regional Studies*, 37: 289-302.
- NELSON, R. R. & ROSENBERG, N. (1993): "Technical innovation and national systems," in *National innovation systems. A comparative analysis*, 1st edn NELSON R. R. ed., Oxford University Press, New York, Oxford, 3-21.
- NONAKA, I. (1991): "The knowledge creating company", *Haward Business Review*, 1991, November-December, 96-104.
- NONAKA, I. & TAKEUCHI, H. (1995): *The knowledge creating company*, 1st edn, Oxford University Press, New York, Oxford.
- NORTH, D. C. (1990): *Institutions, institutional change and economic performance*, 1st edn, Cambridge University Press, Cambridge.
- POLANYI, M. (1996): "Tacit knowing," in *The tacit dimension*, 1st edn, M. Polanyi, ed., Doubleday and company inc., New York, 3-25
- PORTER, M. E. (1990): *The competitive advantage of nations*, 1st edn, The MacMillan Press Ltd, Hong Kong.
- PUTNAM, R. D. (1993): *Making democracy work. Civic traditions in modern Italy* Princeton University Press, Princeton, NJ.
- 2001: *Bowling alone: The collapse and revival of American community* Simon & Schuster.
- RABINOW, P. (1996): *Essays on the Athropology of Reason* Princeton University Press, PRINCETON NJ, RAY, G., BARNEY, J. B., & MUHANNA, W. A. 2004, "Capabilities, business processes, and competitive advantage: choosing the dependent variable in empirical tests of the resource based view", *Strategic Management Journal*, 25, 1: 23-37.
- SAXENIAN, A. (1994): *Regional advantage. Culture and competition in Silicon Valley and route 128* Harvard University Press, London.
- SMITH, K. (1995): "Interaction in knowledge systems: foundations, policy implications and empirical methods", *STI Review*, 16: 69-102.
- 1997: "Economic infrastructures and innovation systems," in *Systems of innovation. Technologies, institutions and organisations.*, Pinter, London, 86-106.
- TEECE, D. J., PISANO, G., & SHUEN, A. (1997): "Dynamic capabilities and strategic management", *Strategic Management Journal*, 18, 7: 509-533.
- TORRE, A. & RALLET, A. (2005): "Proximity and localization", *Regional Studies*, 39, 1: 47-59.
- UNCTAD (2007): *Information Economy Report 2007-2008* United Nations Publications, New York and Geneva.
- URRY, J. (2000): *Sociology beyond Societies. Mobilities for the twenty-first century*, 1st edn, Routledge, New York.

VALE, M. & CALDEIRA, J. (2007): "Proximity and Knowledge Governance in Localized Production systems: The Footwear Industry in the North Region of Portugal", *European Planning Studies*, 15, 4: 531-548.

YEUNG, H. W.-C., LIU, W., & DICKEN, P. (2006): "Transnational Corporations and Network Effects of a Local Manufacturing Cluster in Mobile Telecommunications Equipment in China", *World Development*, 34, 3: 520-540.