

**THE IMPORTANCE OF GEOGRAPHICAL SPACE IN THE  
GLOBALISING KNOWLEDGE-BASED ECONOMY:  
A BRIEF LITERATURE REVIEW**

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**ABSRTACT**

The main objective of this paper is to introduce theoretical inputs from the field of innovation studies that will be used in the design of an analytical framework for the study of innovation in the software industry. Starting from a discussion of basic concepts, such as economic growth, the knowledge-based society, systemic innovation, learning as well as proximity, the paper works its way through to the potential contradiction between the “spatial” processes of localised learning and of globalisation of economic activity. Ultimately, the purpose is to prepare the ground for further doctoral research on how learning at the local level may have regional outcomes, exemplified through case studies of the software industry, and how this learning is affected by certain aspects of the increasing economic globalisation.

## **1 INTRODUCTION**

According to observations of recent economic research, the modern economy may be described as knowledge-based, or a learning economy, due to the central role that knowledge and learning play for economic development in firms as well as in society in general (OECD 1996). Another characteristic of current society is that economic activity gradually is becoming more globalised, in both scope and structure (Archibugi and Lundvall 2001). A third observation, which admittedly has been much disputed is that the increased knowledge content in the economy combined with the process of globalisation has led to a situation where the importance of the geographical concentration, or the region is more important than ever for the economic development (Morgan 2001).

These three statements, which represent different aspects of the current state of economic organisation in society, also represent the background for me to write this essay. It is not the intention to give an exhaustive account for all the mechanisms involved in these processes. Rather, the main objective of this paper is to introduce theoretical inputs from the field of innovation studies that will be used in the design of an analytical framework for the study of innovation in the software industry. Starting from a discussion of basic concepts, such as economic growth, the knowledge-based society, systemic innovation, learning as well as proximity, the paper works its way through to the potential contradiction between the “spatial” processes of localised learning and of globalisation of economic activity. Ultimately, the purpose is to prepare the ground for further doctoral research on how learning at the local level may have regional outcomes, exemplified through case studies of the software industry, and how this learning is affected by certain aspects of the increasing economic globalisation.

## **2 BACKGROUND: ECONOMIC GROWTH**

Starting from the most influential branch of economic ideas in the 20<sup>th</sup> century, namely neo-classical economics<sup>1</sup>, one of the main problems of this theory is that it explains economic performance in terms of a production function consisting of the interaction between two factors: labour and capital. This implies that growth of the economy can only take place by increasing one or both of these factors, which corresponds poorly with empirical observations

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<sup>1</sup> The section on the neo-classical economics treatment of economic growth is entirely based on Fagerberg (1994).

of economic processes in firms, industries and in society in general. Moreover, the two production factors were assumed to operate under conditions of perfect competition<sup>2</sup>. The latter implies that all economic agents possess the same information of market opportunities and other vital facts due to the requirement of perfect information, which poses a major problem in explaining how and why technological change may come about. Hence, in this view, technology is presupposed to be a public good because there would be no incentives in the economy to put money into the process of creating new technology, or knowledge, if it was available to everybody else in the same instance as it was produced. Neo-classical economics does not recognise the effects of social and institutional factors on the formation of knowledge, and macroeconomic phenomena such as economic growth, are explained as an effect of firms' individual actions.

Against the background that the traditional neo-classical economics offered no endogenous explanation for the process of economic growth, an exceedingly heterogeneous and rich body of literature has developed attempting to escape these theoretical constraints. In particular, within the field that may be collectively referred to as innovation economics<sup>3</sup> a substantial effort has been put into scrutinising the process of economic and technological change keeping a particular eye on the role knowledge and learning processes.

## **2.1 Innovation and competitiveness: evolutionary approaches**

Standing on the shoulders of Joseph Schumpeter, a fundamental understanding shared by the proponents of the alternative economic approaches is that a theory of economic development must include a theory of innovation, or technological change (Schumpeter 1934). Innovation, or "... the process through which productive resources are developed and utilised to generate higher quality and /or lower cost products than had previously been available." (O'Sullivan 2000), is a major driving force of change because it affects the competitive situation in the economy.

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<sup>2</sup> Absence of market domination due to a myriad of small and independent price taking consumers and producers, who are understood to be perfectly rational, to the extent that they are maximising their own utility. These actors also enjoy the advantage of perfect information to avoid any kind of insecurity of their choices. Moreover, in a situation of perfect competition long-term profit is absent, due to the multiple price-takers that cannot influence the market price, i.e. there will be decreasing marginal returns to capital. A final but nonetheless very important assumption in this model is the constant returns to scale.

<sup>3</sup> This would include contributors from institutional economics, evolutionary economics, industrial economics, economic geography, organisational studies and strategic management to mention a few.

Another feature of the neo-Schumpeterian approach is the conception of economic change as an evolutionary process and the economy as an evolutionary system. An economy is understood to be a population of firms, or other economic agents, which represents the variation of the system. Members of the population is continuously interacting with each other and with the environment, thus constantly influencing the direction of change as well as the definition and redefinition of the environment, represented by the social and institutional structure governing the interactions. In such a system, both what is learnt and the processes of learning are cumulative which introduces the quality of path-dependency to the economy.

Furthermore, firms are operating in the market which acts as the selection mechanism necessary to secure the stability of the economy. In this view, the reason why innovation is of such crucial importance to economic growth is that being innovative, a firm will attain a temporary monopoly that makes the firm more profitable than its competitors, or more competitive. I.e., the ability to innovate signifies the fitness of the individual firm in this evolutionary process of economic survival. By including innovation into the economic process, knowledge is no longer solely regarded a public good and the Schumpeterian approach thus provide an incentive for the investment in knowledge enhancing activities in the economy. Eventually other firms will reproduce the innovation or surpass it, to secure variation to the system, and sustained competitiveness will depend on the firm's constant ability to innovate (Nelson and Winter 1982). This phenomenon, which has become known as "Schumpeterian competition", or quality competition, links the concept of innovation with competitiveness of firms in a way which finally seems to contribute to an endogenous explanation of economic growth.

### **3 THE KNOWLEDGE-BASED ECONOMY**

Many associate the concept of "the knowledge-based economy" with the increased importance and use of information and communication technology (ICT) in the current society, but this is a too narrow definition. Of course, the latest development of ICT is part of the knowledge-based economy, but it is not the whole story. Keeping in mind the evolutionary principles of economic growth indicated above, the knowledge-based economy represent a situation where most inputs to the economic processes in all sectors of the economy have a higher "knowledge content" than what used to be the case. Thus, in the knowledge-based economy, competitiveness is closely linked to innovative capacity and to

the ability to stay at the vanguard technologically. Furthermore, constituting the most crucial input to innovation, economically relevant knowledge is brought into the innovation process through the occurrence widespread learning processes in firms and in the economy in general (Lundvall and Johnson 1994). Innovation is furthermore a complex and interactive process, which implies that innovation cannot be understood to arise from managerial choice alone, but rather depends on the systemic interactions in and between firms and their institutional environment (Smith 1997, Edquist and Johnson 1997).

### **3.1 Knowledge and learning**

One way to understand how knowledge is involved in the process of innovation is by using Michael Polanyi's distinction between tacit and codified knowledge (Polanyi 1967). In Polanyi's words tacit knowledge refers to intuitive knowledge that is based on a person's many experiences and cannot easily be put into words. Tacit knowledge is thus context specific and restricted to the person who controls it and it is created through experience based learning processes such as *learning-by-doing* (Arrow 1962) and *learning-by-using* (Rosenberg 1982). Explicit knowledge, on the other hand is possible to codify, standardise and record, and is therefore more easily transmitted to other people. What makes tacit knowledge so vital in this connection, is that tacit knowledge is a prerequisite to understand and use codified knowledge, while itself possible to obtain unaided by codified knowledge (Polanyi 1969). This feature gives economic knowledge the character of being compound by both tacit and explicit elements, which makes (Nelson and Winter 1982, Nonaka and Takeuchi 1995, Cowan, David and Foray 2000, Lam 2000). The composite quality of economic knowledge also suggests that it is better communicated in face-to-face interaction between people, which implies that a social context is essential for constructive knowledge diffusion by way of *learning-by-interaction* (Lundvall and Johnson 1994).

Another important distinction to be made in this connection is between individual and collective knowledge, both of which consists of a blend between tacit and codified knowledge (McKelvey 1998, Antonelli and Calderini 1999). Here, collective knowledge would signify the common knowledge of for instance employees in an organisation. Examples of collective knowledge are company routines, norms and puzzle-solving activities. Hence, collective knowledge may constitute the generic knowledge of an organisation, an industry or a region, that governs the economic activity.

In a company, there are various kinds of knowledge, which altogether constitute the knowledge base of the firm. The company knowledge base is a compound of knowledge that exists on different levels of aggregation: company specific, generic, or industry specific, and universal, and involves both individual and collective knowledge, as well as various degrees of tacit and explicit knowledge (Smith 1998). Because new knowledge is continually created through the interaction between tacit and codified knowledge, knowledge bases of firms and industries are in constant evolution. Firms learn, and by doing so they increase their knowledge base by incorporating new knowledge, which often implies that some of the old knowledge is no longer applicable. This necessitates an additional process of “creative forgetting” (Lundvall and Johnson 1994). The two processes of learning and forgetting make up the concept of *interactive learning*, which includes imitation, searching, exploring and any other activity that will lead to the increase of economically significant knowledge (Johnson 1992, Nelson and Rosenberg 1993).

Like knowledge, interactive learning is characterised by cumulateness, or path-dependency, due to the importance of institutional context for knowledge creation and transmission, and like innovation, interactive learning is a ubiquitous phenomenon that takes place on every level of the economy. Interactive learning may take place inside a firm, or between firms, or it may result from the interaction in a network of firms and other economic agents. In addition, interactive learning may be intentionally promoted, or occur as unintentional by-products of routine activities (Lundvall 1992).

Nonaka and Takeuchi (1995) highlight that the success of Japanese firms may be ascribed to a strong management focus on the importance of tacit knowledge, and willingness to deliberately aiming to capture some of it through firm knowledge creating processes. Moreover, R&D related activities is yet another important kind of interactive learning when it comes to technological development and innovation. These activities intentionally aim for the discovery of new knowledge, and tend to be very structured, involving complex modes of interactive communication. Another important example of interactive learning is the so-called *user-producer relationships*, which are vertical linkages of relatively close interactive learning associations between users and producers in different fractions of the value chain (Lundvall 1988). These may occur as joint development projects on a strategic level, as regular customer relations or licensing agreements.

Finally, interactive learning does not necessarily imply that entirely new knowledge is created. As long as the knowledge created or transferred in the process is new to at least one of the economic actors involved, interactive learning has taken place. Thus, deliberate processes such as imitation, reverse engineering and other types of knowledge reproduction must be included in the concept of interactive learning too.

### **3.2 Institutions and Innovation systems**

Some of the contemporary efforts to analyse the complexities involved in the creation and diffusion of knowledge and technology into the economy, is focussed around the idea of *innovation systems* (Lundvall ed. 1992, Nelson ed. 1993, Edquist ed. 1997). The innovation system concept suggests that there exist certain structural influences (scientific, political, and socio-economic) within any nation state, or region, that help define the pattern, nature and extent of knowledge accumulation and innovation within a given industry, region or nation. An innovation system is largely defined by the interactive learning relationships, taking place between economic actors within the institutional framework in which they are located. The institutional framework, or institutions, is further defined as the “sets of common habits, routines, established practises, rules, or laws that regulate the interaction between individuals and groups” (Edquist and Johnson 1997). In this respect, institutions seem to constitute part of what we referred to as collective knowledge above.

Furthermore, the concept "economic actors" refers to two groups. The first group are firms – private and public – engaged in innovatory activity, and the second consists of non-firms that determine the knowledge infrastructure that supplements and supports firm-specific innovation. Knowledge infrastructure is further defined in the sense proposed by Smith (1997) as being “generic, multi-user and indivisible” and consisting of public research institutes, universities, organisations for standards, intellectual property protection, etc that enables and promotes science and technology development. The word “system” does not necessarily mean that the various influences that underpin the generation of industrial innovation are systematically organised (Nelson and Rosenberg 1993). Rather, it is characterised by systemic interaction between various elements in society, such as production systems, markets, science, technology, culture, legislation and public policy (Edquist 1997). Innovation systems can be either geographically determined, such as national or regional innovation systems, or they can

be identified by the industrial sector or by the specific technology that act as the core unit of analysis.

#### **4 THE ROLE OF GEOGRAPHY**

Within the field of economic geography, the systemic and local nature of economic activity has long been a major issue of research and analysis. At the core of this research rests two fundamental observations. Firstly, that economic activity seems to cluster together in certain geographical locations and secondly, that the economic activity of firms is dependent on the environment in which it takes place (Morgan 1997, Maskell et al. 1998 etc.). Already in his 1890 “Principles of Economics”, Alfred Marshall observed and discussed the agglomeration of small firms in what he referred to as “industrial districts”. According to Maskell (2001), Marshall’s theory, as well as the literature that followed in the wake of his seminal work, explained the existence of industrial districts with reference to the cost-saving scheme of agglomeration as balanced towards the relative less cost of land and labour in the periphery. Small firms co-locate in industrial districts for three main reasons: 1) as a means to create and access a market for specialised skilled labour, 2) to create and access market of specialised services and 3) to be able benefit from knowledge-spillovers from other firms in the district (Maskell et al 1998, p.9). I.e. according to Marshall, for firms to co-locate in industrial districts, centrifugal forces like the cost saved by agglomeration through shared expenses on transport, communications, general education, skilled labour etc., must outweigh centripetal forces like the lower costs of labour and land in the periphery.

After a longer period of time, in which transaction cost explanations<sup>4</sup> dominated the field of economic geography, the industrial districts notion reappeared in the literature in the 1970ies and 1980ies. Contributors to this field of “new economic geography” endeavoured to incorporate some ideas from evolutionary economics into the traditional conception on agglomeration of economic activity. In particular, the importance of institutions, innovation and learning for economic growth and development were core concepts here. Hence, during the 1980ies and 1990ies the industrial districts idea experienced resurgence as a large body of new economic geography literature claimed institutions and therefore innovation processes too to be spatial in nature, and thereby developing a knowledge-based approach of the study

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<sup>4</sup> I.e. firms tend to locate in clusters due to reduce transactions costs (the costs of carrying out a market transaction) induced by market failure.

of regional economic development. Examples of this include for instance work on post-fordism and flexible specialisation (Piore and Sabel 1984), industrial clusters (Porter 1990), Industrial Systems (Saxenian 1994), the Learning Region (Morgan 1997), Regional Worlds (Storper 1992) and Regional Innovation Systems (Cooke 1992, Braczyk et al 1998) to mention a few. In addition, the “new economic geography” literature included a very large bulk of empirical research was carried out on various regions around the world.

#### **4.1 Proximity, localised learning and higher-order capabilities**

Both the “new economic of geography” and the innovation systems literature would agree with the traditional understanding of the industrial district, i.e. that small firms tend to locate together for cost-saving purposes. However, both will further contend that this argument alone is not enough to explain the phenomenon entirely. For instance, the cost-saving argument does not seem to give a satisfactory explanation to why some regions prosper and persist over time, while others do not. Neither does the cost-saving scheme say much about the evolution of the economic activity in a region, what it is exactly that makes it grow, develop and diversify into new branches and sectors. Hence, there is something about the synergies created in geographical agglomerations not being captured by the early theories about geographical concentration that the “new economic geographers” wanted to explain with reference to evolutionary principles such as innovation, institutions and path-dependency.

Central to the understanding of the dynamics of location is the notion of proximity, and that of localised learning, where the existence former is a necessary condition for the existence of the latter. Gertler et al (2000) argues that innovation is fundamentally a geographical process for three main reasons. Firstly, spatial proximity encourages face-to-face contact, which again is a necessary condition for interactive learning. In addition, being able to meet face-to-face stimulates establishment of trust between economic agents, which is indeed important for co-operation and other market transactions. Secondly, proximity may also stimulate the creation of common cultural contexts, which also facilitates interactive learning processes crucial for innovation. In particular, this would be the case when a high degree of tacit knowledge is involved in the learning processes. This point bear some resemblance to the concept of *collective knowledge* discussed above, which leads us to Gertler et al’s third point; namely that innovation is a spatial process due to the tendency of regional cultures to become

institutionalised as rules of conduct, that govern the relations and interactions of economic agents within the geographical area. Hence, over time proximity are necessary for the institutionalisation of learning processes themselves in patterns of localised learning.

Taken together, the three arguments incorporate much of what Storper seems to imply by his notion of “untraded interdependencies (Storper 1992). Thus, Storper explains the existence of synergy effects in the industrial district with reference to the two concepts of traded and untraded interdependencies. In Storper’s terminology, traded interdependencies are the formal transactions, the local input-output relations that take place between the economic agents in the region. Untraded interdependencies, on the other hand are the intangible assets of accumulated knowledge and localised learning of a geographical area that determines the direction of it’s development. The untraded interdependencies are present the crucial context for innovation and according to Morgan (1997), the notion is an improvement of Lundvall’s concept of collective tacit knowledge, and a prerequisite for the effective function of the “learning region” (Morgan 1997).

Taking a resource-based or capability-based view on the dynamics of the industrial region, this must be viewed as a collection or a concentrated pool of resources, embedded in the coordinated and uncoordinated relations within the specific geographical area in question. From this point of view, Foss (1996) argues that in the same way that firms possess certain capabilities that make them competitive in the market, geographical space, or regions are characterised by possessing capabilities as well. In his terms, such “higher-order capabilities” are what makes the region competitively unique and they consist of “(productive) knowledge that resides in regions and emerge in a historical process from the systemic interaction among firms” (Foss 1996, p. 3). As mentioned above, knowledge because of its tacit components is often “sticky” (von Hippel 1998), which means that knowledge is embedded in the person who holds it, constituting part of what may be called human resources. People are furthermore often quite place-bound, or less mobile than traditional neo-classic economics assumes them to be<sup>5</sup>, which contributes to the institutionalisation of localised learning patterns. This makes the industrial region a relatively stable and immobile pool of human and socio-institutional resources, or location specific higher-order capabilities, which are firms can access only by locating and integrating economic activity in the region. Hence, in Foss’ terms Storper’s

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<sup>5</sup> Neo-classical economics assumes perfect mobility of both labour and capital.

untraded interdependencies are better called higher-order capabilities because of their crucial role of determining the competitiveness, or attractiveness of a region.

#### **4.2 Globalisation, international division of labour and regional change**

As mentioned above, it is a general feature of the modern economy is that it is becoming gradually more globalised. Albeit international business transactions in terms trade between nations have been going on for centuries, what we in general refer to as globalisation represent something quite new and different from that. The globalisation doctrine is among others based on the observation that there is a tendency towards increased frequency of firms to engage in an extended international division of labour, than it used to be. These are cross-border activities that reach beyond the long-standing practice of trade as well as the more recent phenomenon of offshore manufacturing (Rosenberg and Birdzell 1986). Dicken (1998) distinguishes between the two processes of internationalisation and globalisation where the former merely represent a quantitative account of economic activity across national borders, independent on the nature of these activities. Globalisation on the other hand is a qualitative process and signifies “the functional integration of such internationally dispersed activities” (Dicken 1998, p5). In a knowledge-based economy perspective, one can argue that since globalisation has come to be an ever more characteristic feature of the present economy, a growing network of firms worldwide thus shares the same generic knowledge base. This has fuelled the motivation for, and importance of foreign direct investment (FDI) activities since getting access to interaction with the “right” kind of knowledge is vital to stay competitive in a global context.

The process of globalisation is based on the interaction between two basic institutions. The first is the multinational corporation (MNCs). MNCs are in addition to utilising location-specific tangible resources on a global basis, constantly searching new areas for pools of knowledge, in which to take a swim for the exercise of keeping competitively fit. As a result, most industries are experiencing a growing share of inter-firm and cross-national alliance building activity has occurred over the past decades (Narula and Hagedoorn 1999). Of course, not all of these activities are undertaken purely for knowledge enhancing purposes. Nevertheless, MNC related FDI activities, or technological collaboration such as strategically motivated joint ventures or joint R&D agreements represents increasingly important processes in the current globalising learning economy.

The second foundation for the process of globalisation is the region, or the location where MNCs and other economic agents may or may not locate their activities for various reasons, including the presence or absence of higher-order capabilities. In that respect, many regions may represent the institutionalised impact of MNC activities. Moreover, there are undoubtedly several complex forces at play which determine the extent and the location of economic activity by MNCs, which will not be pursued any further here. The literature on FDI has traditionally emphasised a dichotomy between asset-augmenting R&D activities and asset-exploiting R&D activities. These activities, if carried out in an integrated global manner, would certainly wield very different impacts on the foreign location in terms of contributing to the development there. However, recent research demonstrates that firms have a higher propensity to globalise asset-exploiting activities than they have with asset-augmenting activities (Patel and Vega 1999). This would imply that even if increased globalisation has made it easier for firms to locate in higher-order regions, and the considerable extent to which firms already have internationalised other value adding activities, firms are relatively reluctant to internationalise certain aspects of their R&D activities. Still, other research has over the last two decades has demonstrated the increasing globalisation of technology in general, and of R&D in particular (Niosi 1999, Patel and Pavitt 2000, Archibugi and Iammarino 2000, Kumar 2001). This indicates that firms, in addition to engage in resource seeking economic activities overseas are actively searching for knowledge on a global scale as a strategy to be internationally competitive, and thus that global integration is taking place on an increasing scale.

The concurrent presence of both these phenomena seems contradictory at first glance. However, at a second thought it seems quite logic, taken into consideration that the degree of higher-order capabilities present in regions may determine the attractiveness of the region for MNC asset-augmenting R&D investments. Hence, depending on a whole range of factors, certain regions have evolved into success locations of economic activity, like for instance the Silicon Valley in California. And in absence of locational competitors, these regions will stay successes for as long as its genuine higher-order capabilities allow them to.

## **5 CONCLUDING REMARKS**

Having reviewed some of the literature on knowledge-based approaches to globalisation and the role of the region, there seems to be one area that calls for further research. Ostensibly, most of the theoretical approaches examined here are based on extensive empirical research on successful regions, in Central Europe and the US. Thus, as far as the literature consulted for this essay, other areas, like the more peripheral European regions and many third world regions, which have not been able to follow the course of development, does not seem to be equally popular objects of study.

However, based on the theoretical issues examined in this essay, what can one say about the prognosis for the undeveloped regions to become prospering learning regions? Are these regions doomed because they do not have the critical mass of economic agents necessary to produce high quality higher-order capabilities?

There are of course no straightforward answers to such questions, because unlike theoretical physics, economic geography is not an exact science and is therefore not able to provide the same degree of predictability to its conclusions. Nevertheless, according to the evolutionary principles which are assumed to constitute the basis for regional development, anything can happen. An evolutionary structure is characterised by the ability to constantly redefine itself through the interactions, by which it is constituted.

Thus, one needs only to look to Ireland, to the urban area around Dublin, where they painstakingly have managed to turn a negative development trend into success. Thus, over the last two decades the situation in Ireland has dramatically changed from this region being among the world's developing regions, to be the fastest growing nation in the world (OECD 2001). Another issue is however, what were the exact mechanisms that make this change happen. But that will have to be the topic for another essay.

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