Paper no. 2005/05

Contextualizing Regional Innovation Systems in a Globalizing Learning Economy: On Knowledge Bases and Institutional Frameworks

Asheim, Bjørn (bjorn.asheim@circle.lu.se)
CIRCLE, Lund University

Coenen, Lars (lars.coenen@circle.lu.se)
CIRCLE, Lund University

Centre for Innovation, Research and Competence in the Learning Economy (CIRCLE)
Lund University
P.O. Box 117, Sölvegatan 16, S-221 00 Lund, SWEDEN
http://www.circle.lu.se/publications
ISSN 1654-3149

WP 2005/05

Contextualizing Regional Innovation Systems in a Globalizing Learning Economy: On Knowledge Bases and Institutional Frameworks

Asheim, Bjørn; Coenen, Lars

Abstract

In order to advance the understanding of which types of regional innovation system represent effective innovation support for what kinds of industry in different regions analyses must be contextualised by reference to the actual knowledge base of various industries as well as to the regional and national institutional framework, which strongly shape the innovation processes of firms. Of special importance is the linkage between the larger institutional frameworks of the national innovation and business systems, and the character of regional innovation systems. In making the arguments about a general correspondence between the macro-institutional characteristics of the economy and the dominant form and character of its regional innovation systems a link is provided to the literature on 'varieties of capitalism' and national business systems.

I Introduction: Knowledge-based versus learning economies – what is the difference?

In this article the role and function of regional innovation systems in a globalising learning economy will be discussed. In a learning economy, which indeed also is a knowledge-based economy[1] competitive advantage is based on exploitation of unique competencies and resources, i.e. a firm or a region/nation competes on the basis of what they have which is unique in relation to their competitors. A strategic perspective in the contemporary global economy is, thus, how to develop such unique competencies and resources in order to foster competitiveness based on competitive advantage (Porter, 1990).

The above point that competitiveness in the globalising learning economy is based on competitive and not on comparative advantage is an important one. It is generally recognised that the theory of comparative advantage is static while the theory of competitive advantage is dynamic, and, thus, can be influenced by innovation policies and supporting regulatory and institutional frameworks. In this way innovation plays a central role in attaining and sustaining competitive advantage. This means that the distinction between competitiveness and innovativeness is less relevant in a theory of competitive advantage.

In a learning economy innovation is basically understood as an interactive learning process, which is socially and territorially embedded and culturally and institutionally contextualized (Lundvall, 1992). This view on innovation means an extension of the range of branches, firm-sizes and regions that can be viewed as innovative, also to include traditional, non R&D-intensive branches, small firms and peripheral regions. The basic critique of the linear model is precisely the equation of innovative capacity with R&D-intensity. One further, important implication of this view is that it makes the distinction between high-tech and low-tech branches and sectors irrelevant as it maintains that all branches and sectors can be innovative

in this broader sense (e.g. the importance of design in making furniture manufactures competitive and moving them up the value-added chain). When emphasizing that the creation and reproduction of competitive advantage requires continual learning and innovation, productive and innovative firms enjoying competitive advantages on the global markets can be found in all branches and sectors. An important implication of this broad perspective on innovation is also to re-establish the focus on the "enormous untapped growth potential that could be mobilized" in traditional sectors, if the necessary "institutional reforms and organizational change that promote learning processes" were implemented (Lundvall, 2004, 1). This implies that the introduction of advanced technologies has to be accompanied by (internal) organizational change and competence-building among employees in order to become successful. "Learning to cope with and use the full potential of the new technologies is, in a sense, to transform them from being new to being old" (Lundvall, 2004, 1).

Furthermore, the (external) organizational change of the production process from vertical integration to disintegration within production systems, which characterizes post-Fordist learning economies, is accompanied by a transition from an internal knowledge base of firms to a distributed knowledge base of value systems of firms or value chains of products In a distributed knowledge base much of the knowledge intensity enters as embodied knowledge incorporated into machinery and equipment, or as intermediate inputs (components and materials) into production processes. More importantly, knowledge flows within a distributed knowledge base can take place between industries with very different degrees of R&D-intensity, e.g. when food and beverage firms produce functional food based on inputs from biotech firms. This also weakens the analytical and substantial distinction between high-tech and low-tech industries and demonstrates that "the relevant knowledge base for many

industries is not internal to the industry, but is distributed across a range of technologies, actors and industries" (Smith, 2000, 19).

In order to advance the understanding of which types of regional innovation systems represent effective innovation support for what kinds of industry in different regions analyses must be contextualised by reference to the actual knowledge base of various industries (section II) as well as to the supporting regional and national institutional and regulatory framework (section III), which taken together strongly influence and shape the innovation processes of firms. While section IV provides a general overview of the regional innovation system concept as such, section V synthesizes the previous sections by linking the concept to knowledge bases and institutional frameworks. The conclusions in section VI address some implications for an innovation based regional policy.

II Industrial knowledge bases: A sector-specific approach

In recent years innovation processes have become increasingly complex: there is a larger variety of knowledge sources and inputs to be used by organisations and firms and there is more interdependence and division of labour among actors (individuals, companies, and other organisations). Nonaka and Takeuchi (1995) as well as Lundvall and Borrás (1997) have pointed out that the process of knowledge generation and exploitation requires a dynamic interplay and transformation of tacit and codified forms of knowledge as well as a strong interaction of people within organisations and among them. The relationship between the codified and tacit elements of disembodied knowledge is often both complex and dynamic. Even if codified knowledge can be transferred almost frictionless over time and distance, it relies on tacit knowledge embedded in people and organisations to be understood and applied (Nightingale, 1998). Lam (2000) also points out that the skills required for knowledge

interfacing within and between collective learning processes tend to be highly time-space specific. Interactive, collective learning is based on intra- or inter-organisational institutions (routines, norms and conventions) regulating collective action as well as on tacit mechanisms for the absorption of codified knowledge. This requires that the actors in question have tight connections to the 'local codes', on which collective tacit as well as disembodied codified knowledge is based. Thus, depending on the actual architecture of a productive knowledge base, the ability to interpret local codes will be critical for the integration of the operations of a firm within an inter-firm network or production system.

Despite the generic trend towards increased diversity and interdependence in the knowledge process, we argue that the innovation process of firms and industries is also depending on their specific knowledge base (Asheim and Gertler, 2004). Here we will distinguish between two types of knowledge base: 'analytical' (science based) and 'synthetic' (engineering based) (Laestadius, 1998)[2]. These types indicate different mixes of tacit and codified knowledge, codification possibilities and limits, qualifications and skills, required organisations and institutions involved, as well as specific innovation challenges and pressures from the globalising economy.

An analytical knowledge base refers to industrial settings, where scientific knowledge is highly important, and where knowledge creation is often based on cognitive and rational processes, or on formal models. Examples are genetics, biotechnology and information technology. Both basic and applied research, as well as systematic development of products and processes, are relevant activities. Companies typically have their own R&D departments but they rely also on the research results of universities and other research organisations in

their innovation process. University-industry links and respective networks, thus, are important and more frequent than in the other type of knowledge base.

Knowledge inputs and outputs are in this type of knowledge base more often codified than in the other type. This does not imply that tacit knowledge is irrelevant, since there are always both kinds of knowledge involved and needed in the process of knowledge creation and innovation (Nonaka et al. 2000, Johnson et al., 2002). The fact that codification is more frequent is due to several reasons: knowledge inputs are often based on reviews of existing studies, knowledge generation is based on the application of scientific principles and methods, knowledge processes are more formally organised (e.g. in R&D departments) and outcomes tend to be documented in reports, electronic files or patent descriptions. Knowledge application is in the form of new products or processes, and there are more radical innovations than in the other knowledge type. An important route of knowledge application is new firms and spin-off companies which are occasionally formed on the basis of radically new inventions or products.

A synthetic knowledge base refers to industrial settings, where innovation takes place mainly through the application of existing knowledge or through new combinations of knowledge. Often this occurs in response to the need to solve specific problems coming up in the interaction with clients and suppliers. Industry examples include plant engineering, specialised advanced industrial machinery, and shipbuilding. Products are often 'one-off' or produced in small series. R&D is in general less important than in the first type. If so, it takes the form of applied research, but more often it is in the form of product or process development. University-industry links are relevant, but they are clearly more in the field of applied research and development than in basic research. Knowledge is created less in a

deductive process or through abstraction, but more often in an inductive process of testing, experimentation, computer-based simulation or through practical work. Knowledge embodied in the respective technical solution or engineering work is at least partially codified. However, tacit knowledge seems to be more important than in the first type, in particular due to the fact that knowledge often results from experience gained at the workplace, and through learning by doing, using and interacting. Compared to the first knowledge type, there is more concrete know-how, craft and practical skill required in the knowledge production and circulation process. These are often provided by professional and polytechnic schools, or by on-the-job training.

The innovation process is often oriented towards the efficiency and reliability of new solutions, or the practical utility and user-friendliness of products from the perspective of the customers. Overall, this leads to a rather incremental way of innovation, dominated by the modification of existing products and processes. Since these types of innovation are less disruptive to existing routines and organisations, most of them take place in existing firms, whereas spin-offs are relatively less frequent.

III 'Varieties of capitalism' and national differences in institutional frameworks

Lam (2000) underlines that learning and innovation cannot be separated from broader societal contexts when analysing the links between knowledge types, organisational forms and societal institutions in order to meet the needs of specific industries in particular with respect to learning and the creation of knowledge in support of innovations. Soskice (1999) argues that different national institutional frameworks support different forms of economic activity, i.e. that coordinated market economies (e.g. the Nordic and (continental) West-European welfare states) have their competitive advantage in ´diversified quality production´ (Streeck,

1992), based on problem solving, engineering based knowledge developed through interactive learning and accumulated collectively in the workforce (e.g. the machine tool industry), while liberal market economies (e.g. the US and UK) are most competitive in production relying on scientific based knowledge, i.e. industries characterised by a high rate of change through radical innovations (e.g. IT, defence technology and advanced producer services). Following Soskice, the main determinants of coordinated market economies are the degree of non-market coordination and cooperation which exists inside the business sphere and between private and public actors, the degree to which labour remains 'incorporated' as well as the ability of the financial system to supply long term finance (Soskice, 1999). This represents a situation in direct conflict with a preference for unilateral control over work processes, generated by certain finance and governance systems found in liberal market economies, where competitive strength is based on the institutional freedom as well as financial incentives to continuously restructure production systems in light of new market opportunities (Gilpin, 1996). While coordinated market economies on the macro level support co-operative, long-term and consensus-based relations between private as well as public actors, liberal market economies inhibit the development of these relations but instead offer the opportunity to quickly adjust the formal structure to new requirements using temporary organisations frequently.

Such differences - due to the impact of the specific modes of organisation of important societal institutions such as the market, the education system, the labour market, the financial system, and the role of the state - both contribute to the formation of divergent 'business systems'(Whitley, 1999), and constitute the institutional context within which different organisational forms with different mechanisms for learning, knowledge creation and knowledge appropriation have evolved. Through its emphasis on institutional

complementarities the varieties of capitalism approach focuses on dynamic ensembles of mutually reinforcing sets of institutions rather than isolating individual forms and their impact. As such it pieces together consistent configurations of institutions and the implications for innovative performance (Nooteboom, 2000). However, despite the emphasis on institutional complementarities, it takes predominantly institutions at the national level into consideration leaving "the multi-scaled set of institutional forms" (Martin, 2000, 89) relatively unaddressed.

IV Regional innovation systems – origin, formation and use of the concept

The concept of regional innovation system (RIS) is a relatively new one, which appeared in the early 1990s (Cooke, 2001), a few years after Chris Freeman first used the innovation system concept – originally developed by Bengt-Åke Lundvall - in his analysis of Japan's blooming economy (Freeman, 1987), and approximately at the same time as the idea of the national innovation system was becoming more widespread, thanks to the books by Lundvall (1992) and Nelson (1993). Characteristic for a systems approach to innovation is the acknowledgement that innovations are carried out through a network of various actors underpinned by an institutional framework. This dynamic and complex interaction constitutes what is commonly labelled systems of innovation (Edquist, 1997), i.e. systems understood as interaction networks[3] (Kaufmann and Tödtling, 2001). A set of variations on this approach have been developed over time, either taking territories as their point of departure (national and regional) or specific sectors or technologies (Fagerberg et al., 2004).

The National Innovation Systems approach highlights the importance of interactive learning and the role of nation-based institutions in explaining the difference in innovation performance and hence, economic growth, across various countries. To a large extent the

'system' dimension in RIS was inspired by this literature, and the rationale of having territorially based innovation systems (national and regional) is the same, i.e. either the existence of historical technological trajectories based on 'sticky' knowledge and localised learning that can become more innovative and competitive by promoting systemic relationships between the production structure and knowledge infrastructure in the form of national or regional innovation systems (a policy of 'localised change' (Boschma, 2004)), or the presence of knowledge creation organisations whose knowledge could be exploited for economic useful purposes through supporting new emerging economic activity (a policy of 'structural change' (Boschma, 2004)[4]). The formation of regional innovation systems must be understood in this context of creating a policy framework aiming at a systemic promotion of localised learning processes in order to secure the innovativeness and competitive advantage of regional economies (Freeman, 1995; Cooke et al., 2000). In addition, the idea of regional innovation systems was inspired by agglomeration theories within regional science and economic geography (e.g. growth pole theory (Perroux, 1970)) as well as the success of regional clusters and industrial districts in the post-Fordist economy.

A regional innovation system can be conceptualised as regional clusters surrounded by supporting knowledge organisations (Asheim and Isaksen, 2002). Regions are seen as important bases of economic coordination and governance at the meso-level between the national and the local (cluster or firms): "the region is increasingly the level at which innovation is produced through regional networks of innovators, local clusters and the cross-fertilising effects of research institutions" (Lundvall and Borrás, 1997, 39). To varying degrees, regional governance is expressed in both private representative organisations such as branches of industry associations and chambers of commerce, and public organisations such as universities, polytechnics and regional ministries with devolved powers concerning

enterprise and innovation support. The regional innovation system approach does not only exist as a framework for studying economic and innovative performance but it is also in use as a concrete tool for policy-makers to systemically enhance localised learning processes (particularly in SMEs) to secure regional innovativeness in practice (Asheim et al., 2003). As a result of empirical studies which have emphasized the significance of the regional level in economic development (in addition to - and sometimes over - the national level), a strong case has been made for an approach geared to region-specific innovation activities. The core of the argument is that close proximity between actors and organisations strongly facilitates the creation, acquisition, accumulation and utilisation of knowledge rooted in inter-firm networking, inter-personal relationships, local learning processes and 'sticky' knowledge grounded in social interaction (Asheim and Isaksen, 2002). Thus, we strongly disagree with Bathelt (2003), who argues that "it seems questionable that region-specific innovation and production processes are typically associated with the existence of regional innovation systems. To assume that such small-scale systems exist bears the risk of underestimating the importance of those institutions which are negotiated and defined at the level of the nation state. In reality, however, regional and national innovation contexts are fundamentally different. Regional production configurations are often dependent on structures and developments which are shaped and take place outside the region" (Bathelt, 2003, 797).

The key to the disagreement lies in the application by Bathelt of social systems theory, which replaces the element/relation dichotomy of the innovation systems approach with a system/environment dichotomy (Kaufmann and Tödtling, 2003). This leads Bathelt to believe that one of the core problems of the regional innovation system is "that it portrays the region as an entity which hosts a large part of an economic value chain and has a governance structure of its own, independent from its environment" (Bathelt, 2003, 796). Aside from the

formal systems theoretical arguments there is no substantial theory to corroborate this statement. Empirically it may be shown that regions can in fact contain large parts of a value chain (e.g. Italian industrial districts) as well as having a relative autonomous government structure (e.g. some Spanish regions such as the Basque country). Furthermore, in a globalising economy characterised by vertical disintegration and distributed knowledge bases, the important perspective ought to be the *interdependences* between regions and nations, where the deciding criteria must be the location of core activities (and not the whole value chain as such) and the relative importance of their connections to regional knowledge infrastructures. For most countries, with the possibly (only) exception of the US, the argument that "production configurations are often dependent on structures and developments which are shaped and take place outside" of the actual territory could as easily apply to most small and mediuim-sized countries as to regions, especially if being members of supra-national organisations such as the EU.[5] Also from an institutional perspective it is essential to recognize the interlocked character of a region in a wider geographical context (Howells, 1999). This interlocking acknowledges the importance of institutions negotiated and designed at the supra-regional level. At the same time it also allows for differentiation in terms of the impact of overarching institutions on the regional level as well as for differing degrees of regional institutional agency.

V Knowledge base and institutional framework: Connecting clusters and regional innovation systems

An explicit conceptual clarification of the linkage between on the one hand clusters and on the other regional innovation systems has so far received relatively little attention in the literature. Notwithstanding Porter's (2000) extension of the cluster concept which more or less eliminates the differences between clusters and regional innovation systems, by distinguishing

between the cluster's knowledge base and the extent of loose/tight linkage with the regional innovation system, the different industrial development paths of 'pure' clusters where regional innovation systems are build in order to support innovation in already established industries, and the existence of relations between clusters and regional innovation system from the emergence of the cluster, could be explained in a more systematic way. In traditional cluster-regional innovation system relations, based on industries with a synthetic knowledge base, the logic behind building regional innovation system is to support and strengthen localised learning of an existing industrial specialisation, i.e. to promote historical technological trajectories based on 'sticky' knowledge. In contexts of a regional innovation system as a necessary part of the development of the emerging clusters, it is a question of promoting new economic activity based on industries with an analytical knowledge base, requiring close and systemic industry-university cooperation and interaction in the context of e.g. science parks, located in proximity of knowledge creating organisations (e.g. (technical) universities). In this case a narrow definition of regional innovation systems will normally be applied (i.e. incorporating relationships between R&D functions of universities, public and private research institutes and corporations), while in the first case it is more often a question of exploiting the resources and capabilities of a regional innovation system broadly defined, including "all parts and aspects of the economic structure and the institutional set-up affecting learning as well as searching and exploring" (Lundvall, 1992, 12). In both of these cases it is a question of regional clusters exploiting localisation economies (e.g. industrially specialised clusters).

Regional innovation systems are also found in regions exploiting urbanisation economies. In such regions, which by definition, are constituted by an urban agglomeration, the regional innovation system resembles much more a national innovation system as it normally is

characterised by a diversified industrial base in contrast to the specialised base of typical regional clusters (e.g. industrial districts), and where different historical and emerging technological trajectories co-exist. Thus, within such urban agglomerations it is possible to identify the existence of relations between clusters and regional innovation systems as a necessary condition for cluster development as well as traditional clusters which established links with regional innovation systems at a later stage in their life cycle. It could, however, be argued that the diversity of urbanisation economies is especially important in the promotion of radical innovations, and, consequently, of great significance for industries based on an analytical knowledge base. The co-existence of many intra-regional clusters with various knowledge bases and different relations to the regional innovation system will require more developed governance structures in order to secure a planned and systematic co-ordination between industry and knowledge creating and diffusing organisations, which, consequently, may imply an innovation system of a 'triple-helix' character resembling national innovation systems.

Moreover, in order to further deepen the understanding of the role and workings of different types of regional innovation systems in a globalising economy the question of governance structures and supporting regulatory and institutional frameworks regionally as well as nationally has to be explored. Of especial importance is the linkage between the larger institutional frameworks of the national innovation and business systems, and the character of regional innovation systems. In making these arguments about a general correspondence between the macro-institutional characteristics of the economy and the dominant form and character of its regional innovation systems a link is provided to the theoretical approaches of 'varieties of capitalism' and national business systems (Asheim and Gertler, 2004; Hall and Soskice, 2001; Lundvall and Maskell, 2000; Whitley, 1999).

This question has recently (indirectly) been addressed by Cooke (2004), who, based on studies of the biotechnology industry in the UK, the US and Germany, has introduced a distinction between the traditional regional innovation system (which he refers to as the institutional regional innovation system – IRIS) and the new economy system (NEIS), which he also calls an entrepreneurial regional innovation system (ERIS). The traditional IRIS (more typical of German regions or regions in the Nordic countries whose leading industries draw primarily from synthetic knowledge bases) is characterised by the positive effects of systemic relationships between the production structure and the knowledge infrastructure embedded in networking governance structures regionally and supporting regulatory and institutional frameworks on the national level. In contrast NEIS or ERIS (found in the US, UK and other Anglo-American economies) lacks these strong systemic elements, and instead gets its dynamism from local venture capital, entrepreneurs, scientists, market demand and incubators to support innovation that draws primarily from an analytical knowledge base. Thus, Cooke calls this a 'venture capital driven' system. Such a system will of course be more flexible and adjustable and, thus, will not run the same risk of ending up in 'lock-in' situations as traditional regional innovation systems caught in path-dependency on old technological trajectories. On the other hand, new economy innovation systems do not seem to have the same long-term stability and systemic support for historical technological trajectories, raising important questions about their long-term economic sustainability (Asheim and Gerlter, 2004).

Placed within this framework the traditional institutional regional innovation system (IRIS) typified by a region such as Germany's Baden-Württemberg is most compatible with the institutional frameworks of a coordinated market economy, while the new economy innovation system (ERIS) (e.g. Silicon Valley) reflects the institutional framework of a liberal

market economy (Asheim and Gertler, 2004). However, even if there are tendencies of differentiated economic performance between various types of market economies (i.e. coordinated market economies are strongest in diversified quality production, while the strength of liberal market economies lies in industries characterised by radical innovative activities), both types of innovation system can sustain, support and promote a knowledge-based economy, if such an economy is understood as something more than a science-based economy.[6] Thus, it could lead to unnecessary misunderstandings with respect to policy recommendation if ERIS is associated with a knowledge-based innovation system and IRIS with a 'normatively stylised' innovation system, as suggested by Heidenreich (2004). He maintains that "in normatively coupled innovation systems, calculability and stability is much more important as the revision of disappointed expectations. This refers to a dominance of normatively stylised subsystems" (Heidenrich, 509), while in knowledge-based innovation systems (ERIS) "the innovation strategies of firms are restricted less by legal, political, ethical, and social considerations; they are more closely coupled with economic, scientific, and technical perspectives" (Heidenrich, 2004, 510). While this is not in itself a total incorrect description of the differences between coordinated and liberal market economies, it carries with it an implicit normative view of the superiority of the ERIS system and the liberal market economy, which clearly could be contested if broader societal consequences of economic growth were taken into consideration.

However, questions have lately been raised whether the spatial embeddedness of learning and knowledge creation might be challenged by alternative organisational forms – in particular, temporary organisations – which some see as becoming more prevalent in the global economy (Asheim 2002; Grabher 2002). For example, Gann and Salter (2000) suggest that firms in the construction and engineering sector now rely on projects to organise the production of

knowledge-intensive and complex products and systems. Moreover, the distributed knowledge bases of firms also allows for the increasing importance of temporary forms of organisations as a mode of knowledge governance on an intra- and inter-firm level in order for firms to meet the challenges of the globalising economy.

Placing the question of the importance of project organization in a 'varieties of capitalism' perspective, Christopherson (2002) maintains that an American-style 'market governance model' dominated by the drive to maximize short-term investment returns has promoted the emergence of US strengths in a set of 'project-oriented' industries including electronic media and entertainment, advertising, management consulting, public relations, engineering and industrial design, computer services, and research and development related to computing and telecommunications (Christopherson, 2002).

Liberal market economies as represented by the US and the UK seem, thus, to have advantages in industries characterised by project organisation and an analytical knowledge base. The elite universities and education institutions, often privately organised, provide strengths in R&D, the generation of formalised knowledge, inventions, and radical innovations. Other institutional features such as close university-industry links, academic spin-offs and an active scientific labour market all operate to promote the transfer and application of scientific knowledge. Within the university and science sector projects as a temporary form of organising research have always been and still are important. Projects are usually aimed at specific research tasks, which should be achieved within a restricted time frame and budget.

In coordinated market economies, close user-producer interaction between partners, which characterises industries with a synthetic knowledge base, is common. Closeness is achieved not by ownership links, but as a result of common location and a long, stable history of interaction. This closeness is further underpinned by institutional commonalities between participants, which encourage shared conventions, norms, attitudes, values and expectations. Given the consensual nature of decision-making, temporary organisations are used less frequent and tend to draw on a wider range of stakeholder types than in liberal market economies, including skilled workers and collective representatives of labour such as works councils or unions. At the same time, there is likely to be a much higher degree of stability in team membership from project to project, owing to far more stable workplace and inter-firm relations. The positive impact of this on innovation is confirmed by a study by Michie and Sheehan who reports that "'low road' practices – the use of short-term and temporary contracts, a lack of employer commitment to job security, low levels of training, and so on – are *negatively* correlated with innovation. In contrast, it is found that 'high road' work practices – 'high commitment' organisations or 'transformed' workplaces – are *positively* correlated with innovation" (Michie and Sheehan, 2003, 138).

Thus, even if it may be argued that there is a tendency towards more frequent use of temporary organisations in knowledge creation and innovative activities due to a general increased knowledge intensity in the globalising learning economy, which is strengthened by the move towards distributed knowledge bases, it can also be shown that this tendency is stronger in some industries (e.g. with an analytical knowledge base) and in some countries (e.g. liberal market economies) than in others. If this turns out to be the case, it will be possible to argue that the observed increased importance of temporary organisations is not necessarily a universal trend, and that alternative development paths (i.e. the continuous

importance of spatial embeddedness of learning and knowledge creation in clusters and RIS) can be both possible and viable in a globalising economy depending on the knowledge base of industries and institutional framework of countries in question (Asheim, 2002; Lam, 2000).

VI Conclusions: Implications for an innovation based regional policy

Research on regional innovation systems has revealed that the regional level is neither always nor even normally sufficient for firms to stay innovative and competitive (Isaksen, 1999). The learning process becomes increasingly inserted into various forms of networks and innovation systems (at regional, national and international levels). However, the continuous importance of the regional level is confirmed by results from a European comparative cluster survey (Isaksen, 2004), which shows that regional resources and collaboration are of major importance in stimulating economic activity in the clusters. In this study it was found that in many clusters, firms increasingly find relevant research activities and other supporting services inside the cluster boundaries (Isaksen, 2004). Isaksen found that this was supported by formal organisations and local institutions, which helped to co-ordinate activities and manage transactions in the clusters. Specialised suppliers often benefit from co-location with customers in regional clusters, while capacity subcontractors in vertically disintegrated supply chains are increasingly sourced globally. Based on this reasoning, Isaksen (2004) argues that specialised suppliers involved in production and producer services that depend on tacit knowledge, face-to-face interaction and trustful relations normally remain in the clusters. He did not find evidence pointing at cluster firms becoming more placeless and spatially disembedded (Isaksen, 2004).

However, the survey found an increased presence of MNCs in many clusters, and also that firms in the clusters increasingly source major components and perform assembly

manufacturing outside of the clusters (Isaksen, 2004). Also Tödtling et al. (2004) found support for clustering, because of the importance of social interaction, trust and local institutions. Yet they also note that both local and distant networks are often needed for successful cooperative projects, in particular for projects of process and product innovations when it is usually necessary to combine both local and non-local skills and competences in order to go beyond the limits of the region (Asheim and Herstad, 2003; Bathelt et al. 2004; Cooke et al. 2000; Tödtling et al., 2004).

The problematic addressed in this article also has an inter-regional, centre-periphery dimension (e.g. within the EU). If cities are the centres of the knowledge-based economy attracting and retaining most of a nation's talent (Florida, 2002), then the development of the knowledge-based economy will be geographically uneven and knowledge poverty will become a new kind of locational disadvantage (Cooke and De Laurentis, 2002). In policy terms, therefore, the focus must be on how, without destroying what makes cities attractive places to be in, the less knowledge-based and peripheral regions can make themselves better capable of retaining and attracting industry that is likely to offer qualified, higher value-adding, more knowledge-intensive jobs for their own educated youth and attract other talents in as well. In upgrading peripheral regional economies to knowledge-based (learning) economies the formation of regional innovation systems could play a strategic role either defined narrowly by using local universities as motors and agencies for change (Cooke and De Laurentis, 2002), or through a learning region approach based on broad social participation in a bottom-up perspective (implying a broad definition of an innovation system) (Asheim, 2002).

Notes:

[1] Lundvall (1992) argues that in the globalising learning economy knowledge is the critical resource and learning the most important process. However, in academic as well as policy oriented discourses these two concepts have from time to time taken on different meanings with potential importance for the theoretical understanding of the contemporary economy as well as for policy implications. Lundvall has always preferred to talk about the contemporary global economy (or the 'new economy') as a 'learning economy' instead of a knowledge-based economy:"What is at stake is the capacity of people, organizations, networks and regions to learn" (Lundvall, 2004, 1). The same is done by various agencies within the EU, while OECD (at least the economic sections), being strongly influenced by the US, has instead more often used 'the knowledge-based' economy with reference to the science-based Silicon Valley type of high-tech economies.

[2] Types of knowledge base could also be extended to include e.g. a 'symbolic' knowledge base to cater for such growing activities in the 'new economy' as new media (advertisement etc. (Grabher 2002)). This was done in a research proposal for EU's 5th and 6th Frame Programs.

[3] According to Lundvall (1992) a system of innovation is "constituted by elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge" (Lundvall, 1992, 2), while Edquist (1997) in an innovation system includes "all important economic, social, political organizational, institutional, and other factors that influence the development, diffusion, and use of innovations" (Edquist, 1997, 14). Their use of 'systems' is, thus, a pragmatic one, and should not be understood in a systems theoretical way as done by Bathelt (2003).

[4] According to Boschma (2004), "regional policy may be more successful in stimulating localized change when it accounts for the institutional context (at local and national level)", while "in the case of structural change, … regional policy should focus on restructuring the institutional framework" (Boschma, 2004, 15).

[5] In a recent study Carlsson (2004) shows that the majority of theoretical as well as empirical analyses of innovation systems have a regional focus.

[6] A good illustration from a typically coordinated market economy of the efficiency of a systemic innovation policy with a very strong science and technology orientation based on close university-industry links, promoting high-tech sectors, is the success story of Finland's industrial restructuring in the 1990s.

References:

Asheim, B. T., 2002, "Temporary Organisations and Spatial Embeddedness of Learning and Knowledge Creation," Geografiska Annaler, Series B, Human Geography 84 B (2), 111-124.

Asheim, B. T. and M. S. Gertler, 2004, "The Geography of Innovation: Regional Innovation Systems," in J. Fagerberg et al. (eds.), The Oxford Handbook of Innovation, Oxford: Oxford University Press (forthcoming).

Asheim, B. T. and A. Isaksen, 2002, "Regional Innovation Systems: The Integration Of Local 'Sticky' And Global 'Ubiquitous' Knowledge," Journal of Technology Transfer 27, 77-86.

Asheim, B. T. et al. (eds.), 2003, Regional Innovation Policy for Small-Medium Enterprises, Cheltenham: Edward Elgar.

Bathelt, H., 2003, "Geographies of Production: Growth Regimes in Spatial Perspectives 1 – Innovation, Institutions and Social Systems," Progress in Human Geography (27) 6, 789-804.

Bathelt, H. et al., 2004, "Clusters and Knowledge: Local Buzz, Global Pipelines and the Process of Knowledge Creation," Progress in Human Geography (forthcoming).

Boschma, R., 2004, "Rethinking Regional Innovation Policy: The Making and Breaking of Regional History," in G. Fuchs and P. Shapira (eds.), Rethinking Regional Innovation and Change: Path Dependency or Regional Breakthroughs? Dordrecht, Kluwer International Publishers.

Carlsson, B., 2004, “Innovation Systems: A Survey of the Literature from a Schumpeterian Perspective,” in A. Pyka, (ed.), The Companion to Neo-Schumpeterian Economics, Cheltenham: Edward Elgar (forthcoming).

Christopherson, S., 2002, “Why Do National Labor Market Practices Continue to Diverge in the Global Economy? The ‘Missing Link’ of Investment Rules,” Economic Geography (78) 1, 1-20.

Cooke, P., 2001, “Regional Innovation Systems, Clusters, and the Knowledge Economy,” Industrial and Corporate Change (10) 4, 945-974.

Cooke, P., 2004, “Integrating Global Knowledge Flows for Generative Growth in Scotland: Life Sciences as a Knowledge Economy Exemplar,” in J. Potter (ed.), Inward Investment, Entrepreneurship and Knowledge Flows in Scotland – International Comparisons, Paris: OECD (forthcoming).

Cooke, P. et al., 2000, The Governance of Innovation in Europe. Regional Perspectives on Global Competitiveness, London: Pinter.

Cooke, P. and C. De Laurentis, 2002, “The Index of Knowledge Economies in the European Union : Performance Rankings of Cities and Regions,” Regional Industrial Research Report 41, Cardiff: Centre for Advanced Studies, Cardiff University.

Edquist, C. (ed.), 1997, Systems of Innovation: Technologies, Institutions and Organisations, London: Printer.

Fagerberg, J. et al. (eds.), 2004, The Oxford Handbook of Innovation, Oxford: Oxford University Press.

Florida, R., 2002, The Rise of the Creative Class, New York: Basic Books.

Freeman, C., 1987, Technology Policy and Economic Performance: Lessons From Japan, London: Pinter.

Freeman, C., 1995, "The 'National System of Innovation' In Historical Perspective," Cambridge Journal of Economics 19, 5-24.

Gann, D. M. and A.J. Salter, 2000, "Innovation in Project-Based, Service Enhanced Firms: The Construction of Complex Products and Systems," Research Policy 29, 955-972.

Gilpin, R., 1996, "Economic Evolution of National Systems," International Studies Quarterly 40, 411-43.

Grabher, G., 2002, "Cool Projects, Boring Institutions: Temporary Collaboration in Social Context," Regional Studies 36, 205-214.

Hall, P. and D. Soskice (eds.), 2001, Varieties of Capitalism: The Institutional Foundations of Comparative Advantage, Oxford: OUP.

Heidenreich, M., 2004, "The Dilemmas of Regional Innovation Systems," in P. Cooke et al. (eds.), Regional Innovation Systems, London: Routledge, pp. 497-538.

Howells, J., 1999, “Regional Systems of Innovation?,“ in D. Archibugi et al. (eds.), Innovation Policy in a Global Economy, Cambridge: Cambridge University Press.

Isaksen, A. (ed.), 1999, ”Regionale Innovasjonssystemer. Innovasjon og Læring i 10 Regionale Næringsmiljøer,” STEP-report R-02, Oslo: The STEP-group.

Isaksen, A., 2004, “Regional Clusters Between Local and Non-Local Relations: A Comparative European Study,” in A. Lagendijk and P. Oinas (eds.), Proximity, Distance and Diversity: Issues on Economic Interaction and Local Development, Aldershot: Ashgate (forthcoming).

Johnson, B. et al., 2002, “Why All This Fuss About Codified and Tacit Knowledge?,” Industrial and Corporate Change 11, 245-62.

Kaufmann, A. and F. Tödtling, 2001, “Science-Industry Interaction in the Process of Innovation: The Importance of Boundary-Crossing Between Systems,” Research Policy 30, 791-804.

Laestadius, S., 1998, “Technology Level, Knowledge Formation and Industrial Competence in Paper Manufacturing,” in G. Eliasson and C. Green (eds.), The Micro Foundations of Economic Growth, Ann Arbour: The University of Michigan Press, pp. 212-226.

Lam, A., 2000, “Tacit Knowledge, Organizational Learning and Societal Institutions: An Integrated Framework,” Organization Studies (21) 3, 487-513.

Lundvall, B-Å. (ed.), 1992, National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning, London: Printer.

Lundvall, B.-Å., 2004 "Why the New Economy is a Learning Economy," DRUID Working Paper 04-01, Aalborg: Aalborg University.

Lundvall, B-Å. and S. Borras, 1997, The Globalising Learning Economy: Implications for Innovation Policy, Luxembourg, European Communities.

Lundvall, B-Å. and P. Maskell, 2000, "Nation States and Economic Development," in G.L. Clark et al. (eds.), The Oxford Handbook of Economic Geography, Oxford: Oxford University Press, pp. 353-372.

Martin, R., 2000, "Institutional Approaches in Economic Geography," in E. Sheppard and T. Barnes (eds.), A Companion to Economic Geography, Oxford: Basil Blackwell, pp. 77-94.

Mitchie, J. and M. Sheehan, 2003, "Labour Market Deregulation, 'Flexibility' and Innovation," Cambridge Journal of Economics 27, 123-43.

Nelson R. (ed.), 1993, National Innovation Systems: A Comparative Analysis, Oxford: Oxford University Press.

Nightingale, P., 1998, "A Cognitive Model of Innovation," Research Policy 27, 689-709.

Nonaka, I. and H. Takeuchi, 1995, The Knowledge Creating Company, Oxford – New York: Oxford University Press.

Nonaka et al., 2000, "SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation," Long Range Planning 33, 5-34.

Nooteboom, B., 2000, "Institutions and Forms of Co-ordination in Innovation Systems," Organization Studies 21 (5), 915-939.

Perroux, F., 1970, "Note on the Concept of Growth Poles," in D. McKee et al. (eds.), Regional Economics: Theory and Practice, New York: The Free Press, pp. 93-103.

Porter, M. E., 1990, The Competitive Advantage of Nations, Worchester: Billing and Sons Ltd.

Porter M. E., 2000, "Locations, Clusters and Company Strategy," in G. L. Clark et al. (eds.) The Oxford Handbook of Economic Geography, Oxford: Oxford University Press, pp. 253-274.

Smith, K., 2000, "What is 'The Knowledge Economy'? Knowledge-Intensive Industries and Distributed Knowledge Bases," Paper presented at the DRUID Summer Conference on 'The Learning Economy – Firms, Regions and Nation Specific Institutions', Aalborg, Denmark, June 2000.

Soskice, D., 1999, “Divergent Production Regimes: Coordinated and Uncoordinated Market Economies in the 1980s And 1990s,” in H. Kitschelt et al. (eds.), Continuity and Change in Contemporary Capitalism, Cambridge: Cambridge University Press, pp. 101-34.

Streeck, W., 1992, Social Institutions and Economic Performance – Studies of Industrial Relations in Advanced Capitalist Economies, New York: Sage Publications.

Tödtling, F. et al., 2004, “Networking and Project Organisation in the Automotive Industry: The Case of Styria,” in A. Lagendijk, and P. Oinas (eds.), Proximity, Distance and Diversity: Issues on Economic Interaction and Local Development, Aldershot: Ashgate (forthcoming).

Whitley, R., 1999, Divergent Capitalism – the Social Structuring and Change of Business Systems, Oxford: Oxford University Press.

CIRCLE ELECTRONIC WORKING PAPERS SERIES (EWP)

CIRCLE (Centre for Innovation, Research and Competence in the Learning Economy) is a multidisciplinary research centre set off by several faculties at Lund University and Blekinge Institute of Technology. The founding fathers of CIRCLE include Lund Institute of Technology, Administrative, Economic and Social Sciences, Department of Business Administration, and Research Center for Urban Management and Regional Development.

The CIRCLE Electronic Working Paper Series are intended to be an instrument for early dissemination of the research undertaken by CIRCLE researchers, associates and visiting scholars and stimulate discussion and critical comment.

The working papers present research results that in whole or in part are suitable for submission to a refereed journal or to the editor of a book or have already been submitted and/or accepted for publication.

CIRCLE EWPs are available on-line at: http://www.circle.lu.se/publications

Available papers:

WP 2005/1
Constructing Regional Advantage at the Northern Edge
Coenen, Lars; Asheim, Bjørn

WP 2005/02
From Theory to Practice: The Use of the Systems of Innovation Approach for Innovation Policy
Chaminade, Cristina; Edquist, Charles

WP 2005/03
The Role of Regional Innovation Systems in a Globalising Economy: Comparing Knowledge Bases and Institutional Frameworks in Nordic Clusters
Asheim, Bjørn; Coenen, Lars

WP 2005/04
How does Accessibility to Knowledge Sources Affect the Innovativeness of Corporations? Evidence from Sweden
Andersson, Martin; Ejermo, Olof

WP 2005/05
Contextualizing Regional Innovation Systems in a Globalizing Learning Economy: On Knowledge Bases and Institutional Frameworks
Asheim, Bjørn; Coenen, Lars

WP 2005/06
Innovation Policies for Asian SMEs: An Innovation Systems Perspective
Chaminade, Cristina; Vang, Jan

WP 2005/07
Re-norming the Science-Society Relation
Jacob, Merle

WP 2005/08
Corporate innovation and competitive environment
Huse, Morten; Neubaum, Donald O.; Gabrielsson, Jonas

WP 2005/09
Knowledge and accountability: Outside directors' contribution in the corporate value chain
Huse, Morten, Gabrielsson, Jonas; Minichilli, Alessandro

WP 2005/10
Rethinking the Spatial Organization of Creative Industries
Vang, Jan

WP 2005/11
Interregional Inventor Networks as Studied by Patent Co-inventorships
Ejermo, Olof; Karlsson, Charlie

WP 2005/12
Knowledge Bases and Spatial Patterns of Collaboration: Comparing the Pharma and Agro-Food Bioregions Scania and Saskatoon
Coenen, Lars; Moodysson, Jerker; Ryan, Camille; Asheim, Bjørn; Phillips, Peter

WP 2005/13
Regional Innovation System Policy: a Knowledge-based Approach
Asheim, Bjørn; Coenen, Lars; Moodysson, Jerker; Vang, Jan

WP 2005/14
Talents and Innovative Regions: Exploring the Importance of Face-to-Face Communication and Buzz
Asheim, Bjørn; Vang, Jan

WP 2005/15
The Creative Class and Regional Growth: Towards a Knowledge Based Approach
Kalsø Hansen, Høgni; Vang, Jan; Bjørn T. Asheim

WP 2005/16
Emergence and Growth of Mjärdevi Science Park in Linköping, Sweden
Hommen, Leif; Doloreux, David; Larsson, Emma

WP 2005/17
Trademark Statistics as Innovation Indicators? – A Micro Study
Malmberg, Claes