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Do Regional Systems of Innovation Matter?

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Contents

Abstract

The paper deals with the significant impact of location on innovation activity that has been found in many empirical studies. Main elements of such an explanation are the specific problems of a division of innovative labor. Based on an outline of these issues the concept of a regional innovation system is presented in some detail and an overview of results from recent research on regional innovation systems is given. The paper then discusses basic policy options and names a number of important questions for further research.

JEL-classification: D23, O19, O32, R12, R39.

Keywords: Innovation, regional innovation systems, division of innovative labor, clusters, technology policy.

Zusammenfassung

Der Beitrag behandelt den Einfluss regionaler Gegebenheiten auf Innovationsaktivitäten, wie er in diversen empirischen Studien nachgewiesen wurde. Ein wesentliches Element bei der Erklärung der Bedeutung von Standortgegebenheiten sind die besonderen Probleme der Arbeitsteiligkeit von Innovationsprozessen. Ausgehend von einem Abriss dieser Besonderheiten wird das Konzept des regionalen Innovationssystems erläutert und ein Überblick über neuere Forschungsergebnisse gegeben. Schließlich werden grundlegende innovationspolitische Strategien diskutiert und wesentliche Forschungsfragen benannt.

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Schlagworte: Innovation, regional innovation systems, division of innovative labor, clusters, technology policy.

1. The real questions

Scholars engaged in research in the field of regional economics or economic geography have little doubt that regions do matter for Research and Development (R&D). For these experts, the real questions are deeper and concern issues like the relative importance of the impact of location, the ways in which the influence of location comes into effect and how regional conditions for innovation activity can be improved. This paper deals with these questions. Its starting point is a brief overview of empirical findings about the spatial distribution of innovation activity (section 2). The following sections represent an attempt to explain this evidence based on the notion of labor division in the field of innovation. Section 3 outlines the main characteristics of such a division of innovative labor that have significant implications for the spatial organization of innovation activity as well as for the analysis. The concept of regional innovation systems and the role of different actors in such a regional system is explained in section 4. Section 5 gives an overview of results of recent research concerning regional innovation systems. Finally, an exposition of basic policy options is given (section 6), and some important issues for further research are specified (section 7).

2. Empirical evidence for the role of location for R&D

With regards to the 'death of distance' that is implied by ongoing improvements of telecommunication techniques, the clustering of economic activity found in many empirical studies may be regarded as surprising.[1] These results show clearly that location matters for production, particularly for innovation. Moreover, it seems that under the conditions of globalization, the regional environment is becoming even more relevant. A simple reason for this tendency towards 'glocalization' is that spatially-rooted factors gain in relative

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[1] For empirical evidence see Audretsch and Feldman (1996a), Cooke (2002, 130-156), Baptista and Swann (1998), Feldman (1994), Porter (1998), Prevezer (1998), Scott (1996), Shohet (1998), Swann (1998).

importance as the accessibility of other factors becomes easier or cheaper. Clustering suggests that there are agglomeration advantages at work that stimulate certain types of activity (Baptista, 1998; Porter, 1998). Among the most important of these agglomeration advantages are a relatively high potential for face-to-face contacts, the presence of positive external effects, easy access to research institutions as well as to differentiated input markets such as the labor market and the market for specialized innovation related services. All these factors may facilitate the generation and transfer of knowledge which constitutes a key element of innovation activity (cf. Antonelli, 2001, chapter 3).[2]

There are clear indications that the quality of regional innovation systems may differ considerably and that only some part of such differences can be attributed to the degree of agglomeration or clustering (Fritsch, 2000, 2001b, 2002). Agglomeration economies in clusters may stimulate the competitiveness of the firms involved. However, they explain only a fraction of the differences in the efficiency and the success of their R&D activity. Obviously, regional factors matter for innovation processes, but it is hard to make a more general judgment on the strength of the regional impact as compared to other causes like industry-specific factors or influences that are effective on the national level (Howells, 1999). At least in some regions the impact of location appears to be rather strong. In this regard one might ask, for example, if the U.S. computer industry would have gained the same strength and competitiveness if the Silicon Valley Cluster had not emerged. Obviously, regional factors have been rather important in this example, but is it not also true that the development of Silicon Valley was significantly stimulated by the characteristics of the industry and the national innovation system? Could the same phenomenon have occurred in other industries

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[2]There does not exist a standard definition of what is knowledge in the literature. Knowledge is more than just an information because it also comprises the ability to assess its usefulness as well as to interpret and to apply it. In contrast to information, knowledge is often context dependent. "Information is the medium in which knowledge is processed, stored, and communicated. Knowledge is the content." (Chichilinsky, 1999, 9).

or in other countries such as Germany, for instance? Apparently, the different levels are not discrete but instead are mutually dependent (cf. Scott, 1996).

3. Problems of a division of innovative labor

Numerous studies of the genesis and development of certain innovations have shown that there are usually diverse actors involved which contribute in one way or another (Jewkes, Sawers and Stillermann, 1969). Obviously, many innovation processes are characterized by a high degree of labor division, and there are indications that the intensity of labor division has increased considerably in the last few decades (Arora and Gambardella, 1994; Hagedoorn, 2002). Yet, if a division of innovative labor plays such a prominent role, it would be inappropriate to focus the analysis solely on a single actor thereby neglecting the contributions of other actors. To take all relevant relationships into account, a more comprehensive 'system of innovation' approach should be applied (see section 4). There are some characteristics of innovation activity that imply a number of specific problems that imply a number of specific problems of labor division as compared to 'normal' production processes. These special features, which are explained below, can considerably effect the organization and the spatial distribution of R&D.

One key problem that may severely impede a division of innovative labor is that, by its very nature, the result of an innovation process is unknown in advance and can not be predicted with certainty. Thus, it is not possible to completely specify a respective contract in advance. The resulting incomplete contracts leave room for opportunistic behavior by the contractual parties, i.e., self-serving interpretation of the terms of the contract to the disadvantage of other contract parties. Due to this danger of opportunistic behavior, economic actors may avoid contracting out certain tasks of the innovation process.

A second problem for a division of innovative labor may arise because R&D processes often require very special inputs that are not commonly traded in

large markets. This rareness of suitable inputs is in many cases a result of the novelty inherent in an innovation. Because of this novelty, markets for skills and resources that are important for an innovation process may not be readily available. In this case, the respective markets are rather 'thin' with only very few suppliers and transactions taking place rather infrequently. Because suppliers are rare, an immense amount of search costs to identify a suitable transaction partner may be required. Moreover, if only few transactions take place, a clear market price may not exist so that negotiations about the price and further conditions of an exchange tend to be rather costly.

A third problem for a division of innovative labor is asymmetric information that can severely hamper the trading of knowledge on markets. Because knowledge is the key input and output of innovation activity, a transfer of knowledge constitutes a necessary precondition for any labor division in the field of R&D. Asymmetric information with regard to trading of knowledge means that the supplier possesses better information about the subject to be traded than his counterpart, the demand side. As a reaction to the risk involved in having such incomplete information, rational customers will offer less than they would if they had been fully informed. For the supplier, describing the characteristics of the information offered may in many cases imply a more or less complete disclosure. Yet, once a potential customer possesses the information, he has no reason to purchase it. Therefore, information that is intended to be sold cannot be completely disclosed. Due to this asymmetry, the level of transactions on the market may be rather low and adverse selection processes may result in a poor quality of supply.

A fourth possible difficulty concerns the transfer of information or knowledge as such (for a comprehensive treatment of problems of information transfer see von Hippel, 1994). One obstacle to the transmission may be that the knowledge is 'tacit', i.e., not completely codified so that it can only be communicated face-to-face or by a transfer of the person that possesses that knowledge. Moreover, the identification and the use of relevant information

may require a certain 'absorptive capacity' (Cohen and Levinthal, 1989). This means that the recipient must already possess some knowledge (e.g., basic skills, a shared language) in order to be able to assess the economic value of new information, to assimilate it and to apply it to his own commercial ends. Another potential problem in regard to information transfer is the danger of uncontrolled knowledge flows, i.e., that the transaction partner comes into possession of valuable information without adequate compensation.

As a result of these problems, many contributions to innovation processes cannot be easily traded on anonymous 'spot markets'. A division of innovative labor between different organizations may, therefore, require incompletely specified, long-term agreements ('relational contracting') that imply a considerable degree of cooperative spirit and trust.[3] Thus, a cooperative relationship may be regarded as one of the main characteristics of labor division in innovation processes. In addition to the role of cooperative relationships in the division of innovative labor, the literature suggests some further potential benefits of cooperation on R&D. One of these issues is that, as far as cooperative relationships are characterized by relatively 'open' exchange of information, such flows of knowledge or information may be stimulating for innovation activity.[4] Many authors emphasize that not only formal cooperative relationships, such as joint ventures or contract research, are important for knowledge flows, but that informal relationships like 'information trading' (reciprocal exchanges of information between personnel of competing firms) may play a significant stimulating role for innovation activity (e.g., von Hippel, 1987; Saxenian, 1994).

In a division of innovative labor, spatial proximity can be conducive for at least two reasons. First, if the establishment and management of incomplete contracts as well as the transfer of knowledge require face-to-face contact, large

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[3] See MacNeil (1978) for a detailed characterization of the different types of agreements.

[4] See for example Axelsson (1992), Lundvall (1992b), and Powell (1990).

geographic distance between partners may act as a severe impediment. And second, spatial proximity to other establishments in the same industry can constitute a prerequisite for benefiting from certain resources in the region like the labor market, research institutes, infrastructure, and the presence of specialized suppliers. These issues may at least partly explain why innovation activity tends to be clustered in space and why flows of new knowledge are concentrated to the environment near the source (cf. section 4.3).

4. Regional systems of innovation in a globalizing economy

4.1 The concept

One great advantage of the 'system of innovation' approach is that the analysis can explicitly account for division of innovative labor between individuals and organizations (cf. Freeman, 1987; Lundvall, 1992a; Nelson, 1993; for an overview Edquist 1997). The very important issue of labor division is largely neglected when the focus of attention is more or less exclusively on the innovation activity of particular individuals or organizations. Innovation systems consist of innovative agents, the relationships between these agents, as well as the rules and institutions influencing the generation of innovation and the relevant selection mechanisms.[5]

With regard to the spatial definition of an innovation system, many authors deal with whole nations, thereby implicitly or explicitly assuming that the similarities of institutions, language and culture form a 'natural' geographical frontier (cf. Lundvall, 1992a, 3). However, there is no need to limit the innovation-system approach to nations. While for some issues (e.g., markets for

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[5] "A ... system of innovation is that set of distinct institutions which jointly and individually contributes to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artifacts which define new technologies." (Metcalfe, 1995, 462f.).

goods in global technological competition) it may be more suitable to choose a higher level of aggregation and to investigate the international division of innovative labor on a world-wide scale (cf. Lundvall, 1992a, 3f.), other questions may be analyzed more appropriately on a lower aggregation level, e.g., regions within nations. Such a regional focus is particularly appropriate when the local environment is important and short-distance interaction plays a significant role (cf. Cooke, Gomez, and Etxebarria, 1997, 488f.; Cooke, 1998; Howells, 1999; Lagendijk, 2001). In this context, the regional system should not only be regarded as a down-scaled sub-category of the national innovation system where certain characteristics deviate from the national average. Such a top-down perspective may be quite inappropriate when the regional dimension is dominant and location-specific factors are of much more importance than issues at the national level. Empirical research has indeed provided considerable evidence for the significance of face-to-face contact, localized patterns of communication, knowledge sharing and searching, etc. that may well result in diverging innovation performance (for an overview see Howells, 1999, 77-84). Therefore, the national innovation system can also be regarded as the aggregate of quite different regional systems in the sense of a bottom-up approach. According to this view, the region-specific factors have a stronger impact than in a top-down approach. In any case, the different dimensions of the innovation system – region, nation, world, industry – are connected and interact (cf. Scott, 1996).

4.2 A role model of regional innovation systems

Our knowledge about how regional innovation systems work is still rather limited. A simple role model illustrated in Figure 1 may be helpful as a conceptual framework for assessing the main issues of our current understanding. This model includes three types of actors in a region:

- *Public institutions for research, education and other forms of knowledge transfer* generate, accumulate, and distribute information. Included under this heading are mainly universities, other public research institutions as well as transfer agencies. One of the main tasks of these institutions is to absorb

and store the relevant knowledge that has been generated elsewhere in order to be able to spread it to other actors in the region. In this sense, the public research institutes take on the role of an 'antenna' for innovation activity in a region (cf. Fritsch and Schwirten, 1999, 2002). Particularly in providing education and in collaborating with private sector firms they supply important inputs for innovation activity into the regional system (cf. Varga, 2000).

- *Manufacturing establishments* act as a final producer in the regional innovation system. Their role is to commercialize the available knowledge by incorporating it into marketable goods and then selling these goods to customers inside and outside the region. In fulfilling this role they need to absorb the relevant knowledge, and this will in most cases require them to perform some own R&D activity as well (cf. Cohen and Levinthal, 1989). The competitiveness of the manufacturing establishments in an innovation system is of crucial importance for its economic success. If the manufacturing establishments do not perform well and are not competitive on a world-wide scale, the public institutions for research, education and other forms of knowledge transfer may remain largely ineffective. This is, for example, a problem in many eastern European regions that were until recently under a socialist regime, such as the new (since 1990) German states.

- *Suppliers of business-oriented services* support innovation activities in public research institutions and manufacturing establishments. Business-oriented services include support in the fields of engineering and planning, tax preparation and legal services, market research, advertising, engineering and planning as well as business consulting and financial services, such as the provision of venture capital.[6] The presence of high-quality specialized services may allow for a relatively high degree of labor division that results in a high efficiency of regional innovation activity.

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[6] These kinds of activities are often summarized as '*k*nowledge *i*ntensive *b*usiness *s*ervices' (kibs).

The *regional workforce* with its qualification and knowledge constitutes a further main element of a regional innovation system. In particular, it is an important source for all kinds of *entrepreneurship* in long established as well as in newly founded firms.

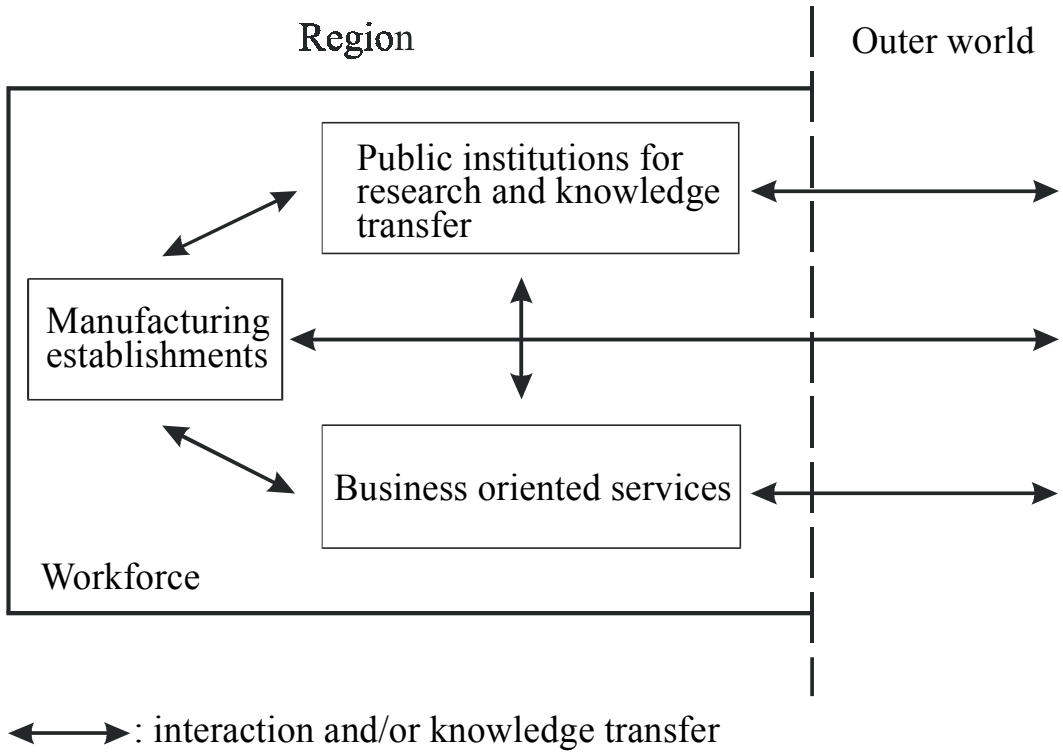

Figure 1: Main actors in a regional innovation system

It is important to recognize that these elements constitute only a framework for regional innovation activity. Because of the dynamic character of innovation processes, the elements of the innovation system are subject to permanent change. Innovation systems are 'learning systems' in which communication among agents is one of the main sources of the creation of new knowledge (Antonelli, 2001, chaper 3). Accordingly, diverse empirical examples show that the interaction of the elements in a regional innovation system and their relationships to the outer world are of key importance for the system's performance. This is a

principal hypothesis in the literature on industrial districts (cf. Porter, 1998 and the contributions in Pyke, Beccatini and Sengenberger, 1990), of the network approach to the analysis of innovation activity (cf. Camagni, 1991; Saxenian, 1994) as well as of the concept of 'innovative milieux' (Aydalot and Keeble, 1988; Crevoisier and Maillat, 1991). This emphasis on the interaction of the elements of an innovation system corresponds to a basic hypothesis in economic science, which states that division of labor will result in efficiency gains. One may therefore expect a relatively high level of interaction on R&D in a region to lead to correspondingly high productivity in innovation processes. These relationships, particularly if they are cooperative in nature, are also frequently regarded as an important medium for transferring relevant knowledge.

Because a significant part of the knowledge that is relevant for innovation processes is not codified but tacit, it sticks with the respective individuals and is, therefore, localized. Moreover, this knowledge may be specific to the conditions in a particular market, establishment or region. Path-dependencies, indivisibilities and external effects (e.g., agglomeration economies) in the creation of knowledge lead to a regional embeddedness of innovation activity. For this reason, each regional innovation systems is characterized by a specific knowledge stock that makes the system unique and distinguishes it from other regions (Antonelli, 2001, chapter 3; Maskell and Malmberg, 1999).

In many well-functioning regional innovation systems, new innovative firms and entrepreneurship play an important role.[7] The regional dimension is of considerable relevance for new firm formation processes because most founders of new businesses are regionally embedded and come from the same region in which they start their businesses (Johnson and Cathcart, 1979). Entrepreneurs tend to 'spin-off' from the regional firms and research institutions. Their entry into the

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[7] Examples are the Silicon Valley (Saxenian, 1994), the US Capitol region (Feldman, 2001), Munich (Sternberg and Tamasy, 1999), Cambridge (Segal Quince Wicksteed, 1985) and many others. For an overview see Bresnahan, Gambardella and Saxenian (2001).

market means a challenge to the incumbent firms, which may induce them to change their product program and their general economic behavior. This is particularly true for innovative entry. The example of the 'new economy' shows that new innovative firms can be important agents of change. To set up a new firm can be understood as a means for the founder to commercialize his knowledge (cf. Audretsch, 1995, 47-55). One main reason for this is that innovative ideas as such can hardly be traded on a market, be it because of their vagueness, because of market imperfections (cf. section 3) or because incumbent firms are focused on drawing profits from their established product program and are not interested in implementing new ideas that may require radical changes. Moreover, in quite a number of cases starting a firm may represent the one and only chance of putting an idea into practice (cf. Audretsch, 1995, 54f.).

As has already been explained above (section 3), a division of innovative labor requires transfer of knowledge between the parties involved. Such transfers of knowledge are termed 'spillovers' (cf. Breschi and Lissoni, 2001; Feldman, 1999; Karlsson and Manduchi, 2001). There are diverse ways in which such knowledge spillovers may become effective, for example, as market transactions, cooperative relationship, publication of R&D results, flow of innovative goods, or mobility of personnel including spin-offs from private sector firms and public research institutions. Independent of the specific means of such knowledge transfers, one can expect that intensive division of labor and interaction is associated with a correspondingly high level of spillovers. Thus, due to the efficiency gains of labor division, pronounced spillovers should be one of the chief characteristics of an efficiently functioning innovation system.

5. How regional innovation systems work: evidence from recent research

Reviewing the recent empirical research on the regional dimension of innovation activity, four main topics can be identified. The four topics are:

- regional differences in the extent of R&D activity and innovation performance
- the significance of regional knowledge spillovers, their role in innovation processes and the way in which these spillovers become effective
- the role of R&D cooperation in regional innovation systems
- the formation of new innovative firms in a regional context.

With regard to the first question, there can be no doubt that innovation activity is not spread evenly but instead is clustered in space (cf. section 2). However, attempts to empirically detect a clear impact of location on the innovation behavior of economic actors have been largely unsuccessful (see Fritsch, 2000, for a brief review of the evidence). Recent empirical analyses of innovation activity in a number of European regions (for the project design, see Sternberg, 2000) have been successful in identifying such interregional differences of innovation behavior (Fritsch, 2000). Taking the efficiency of R&D expenditure as a measure of the quality of a regional innovation system (Fritsch, 2002), there is significant variation showing some correspondence to a center-periphery hypothesis that suggests better conditions for innovation activity in the center as compared to more remote areas or regions characterized by a relatively low degree of agglomeration (the periphery). An analysis of the German regions in the sample has found that the interregional differences in the efficiency of their respective innovation activity can be explained to a considerable degree by differences in the amount of regional knowledge spillovers (Fritsch and Franke, 2000). This result supports the hypothesis that the interaction of the elements of a regional innovation system is of crucial importance for its performance.

Empirical research has found that the spread of new knowledge tends to be heavily concentrated around its source.[8] Obviously, spatial proximity is of significant importance for such information flows. However, the relative importance of the different spillover channels is unclear. A quite popular hypothesis suggests that R&D cooperation may play an important role in this respect, particularly for the flow of 'tacit' knowledge, which is not completely codified. Analyses of R&D cooperation in the European regions mentioned above have shown that R&D-cooperation is a quite widespread phenomenon (Fritsch and Schwirten, 1999, 2002; Fritsch, 2001a, 2003). A particular regional focus could be found for R&D cooperation between manufacturing establishments and public research institutes, for horizontal cooperation among manufacturing establishment in the same industry as well as for relationships with providers of business services. This highlights the importance of spatial proximity for these types of interaction. The spatial pattern of the R&D cooperation with suppliers and customers seems to correspond largely to the regional dimension of the respective markets. Cooperative relationships between research institutes tended to be interregional on a world-wide scale (Fritsch and Schwirten, 2002). The analysis of this data also revealed significant differences in cooperation behavior between regions (Fritsch, 2001a, 2001b, 2003). Quite surprisingly, establishments located in highly urbanized areas with a rich supply of cooperation partners showed a below average propensity to cooperate on R&D. Contrary to the popular assumption, R&D cooperation was not found to be a strong medium for knowledge spillovers, and there was also no significant positive relationship between the propensity for R&D cooperation and the efficiency of regional innovation activity.

A number of examples clearly demonstrated that new firms and entrepreneurship can constitute a powerful driving force for the regional

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[8] Cf. Acs, Audretsch and Feldman (1992), Jaffe, Trajtenberg and Henderson (1993), Anselin, Varga and Acs (1998). For an overview see Karlsson and Manduchi (2001).

innovation system (Bresnahan, Gambardella and Saxenian, 2001; Feldman, 2001). They are particularly an important factor for explaining cluster formation (Klepper, 2001; Cooke, 2002). The empirical evidence suggests that once new firm formation processes in a cluster have taken off and passed a certain threshold, the development of the cluster benefits from self-reinforcing effects. Therefore, studying well-developed clusters with a rich supply of supporting services and institutions may not tell us how such processes of cluster building by new firm formation get started. Thus, one important question to be answered is: 'What are the important factors in the initial stage of cluster formation?' The answer to this question is particularly relevant for a policy designed to stimulate the development of regional innovation systems.

6. Policy options

As has been emphasized here, innovation processes are characterized by an intensive division of labor that has a pronounced spatial dimension. The available empirical evidence clearly demonstrates that regional conditions are highly relevant for innovation processes, and there is good reason to assume that the quality of the regional innovation system is of particular importance for relatively new industries like the 'new economy' (Audretsch and Feldman, 1996b; Cooke, 2002, chapter 6). If the current trend continues, we should expect a further increase in labor division, regional specialization, and clustering of innovation activity in the future. The emerging spatial pattern will then be characterized by only a few regional centers of excellence throughout the world for each technological field in which the main market players have to be present in order to monitor technological developments and absorb relevant knowledge (cf. Patel and Vega, 1999; Pearce, 1999). There are two general conclusions that can be drawn from the recognition that regions matter for R&D activity. First, innovation policy should take the spatial dimension of innovation processes and the importance of regional conditions into account. This implies that regional institutions should at least participate in the design and operation of technology policy measures, bringing their expertise about local conditions. And second, the local level

could be an appropriate starting point for a policy designed to initiate and stimulate innovation activity. In many cases, innovation policy at the regional level may well prove to be more promising than on a nationwide scale.

When outlining possible strategies of a regional innovation policy, it is helpful to distinguish between different types of regions. One category comprises regions where the innovation system is underdeveloped or largely missing as is the case in many peripheral, sparsely-populated areas or in less-developed countries. Under these conditions, the main task for innovation policy is to create the basic prerequisites for R&D and initiate innovation processes. A second category comprises regions that possess a well-developed innovation system that is equipped with public research institutions, a supply of innovation-related services and qualified labor. If the innovation system in such a region is well functioning, policy may try to safeguard this development and keep the system intact. In case the regional innovation system is not working satisfactorily, the problem is how to revitalize it.

The regional endowment with public institutions for research and education is obviously a well suited means for building up a new innovation system because it is subject to direct political control. The existence of public research facilities may constitute an important source and necessary precondition for private-sector R&D. However, while the lack of public research institutions can be a severe impediment for regional innovation activity, the presence of appropriate public institutions as such constitutes only a necessary condition of a well-functioning regional innovation system. With regards to complementary private sector activity, experience shows that attempts to directly create certain technological clusters or to steer innovation activity in a certain field are quite likely to fail which means that policy should abstain from such endeavors (cf. Cooke, 2002). To promote interaction among the actors within and outside the regional innovation system and to stimulate the emergence of an ‘innovation culture’ is also quite a difficult task. Empirical examples show that many of the well-functioning high-tech innovation systems benefited from massive external

impulses during their early stages and that development required considerable time, often several decades (Bresnahan, Gambardella and Saxenian, 2001; Sternberg, 1996).

Theoretical concepts as well as empirical evidence suggest that once the development of an innovation system has 'taken off', the main bottleneck for the system's performance tends to be deficient interaction, a lack of absorptive capacity and the absence of a productive innovation culture. This may particularly hold true for 'older' innovation systems with a well-developed institutional infrastructure. There are a number of well-documented examples in which the performance of such mature innovation systems is severely blocked by the 'lock-in' effects of long-established ties as well as by inadequate institutions (cf. Grabher, 1993).[9] In these cases, the main task for policy is to re-launch the system, in order to overcome the existing impediments and spur new development.

Whatever the circumstance, a productive innovation culture constitutes an important ingredient of a successful regional innovation system. There are, however, no simple recipes for the creation of such a culture leading to guaranteed success. One can, however, provide some guidelines. Generally, a policy of stimulating interaction and division of innovative labor should provide sufficient opportunities and incentives for contact and information exchange in a region. Publicly providing information about potential partners for R&D cooperation and management advice with regard to organizing such cooperative relationship may also be helpful and promising. In order to ensure appropriate interaction between public research and private-sector firms, the institutional setting should provide incentives for public research institutions pay attention to the needs of the private economy of the region. Also, policy should not hamper labor mobility between

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[9] Examples can be found in many old-industrialized regions of North America and Western Europe as well as in many parts of the former socialist countries of Eastern Europe (cf. the contributions in Fritsch and Brezinski, 1999).

institutions because this is obviously an important medium for knowledge transfer. This pertains particularly to spin-offs from public research institutions and private-sector firms. Stimulating entrepreneurship can be an effective means for promoting further development and overcoming blockages. As has already been stated, the connection of a regional innovation system to the outer world is of immense importance for its performance. Policy should, therefore, avoid everything that might hinder this connection, and seek instead to stimulate external contact.[10] Because a large part of relevant new knowledge is tacit and can only be communicated face-to-face, the exchange of personnel with outside institutions is of particular importance. Promoting such exchanges may be an important line of action for regional innovation policy. Policy could also safeguard a sufficient level of absorptive capacity for external knowledge in the region. This may be a matter of providing basic skills or the creation and support of institutions which monitor technological developments and make the results available for the actors in the innovation system.

7. The main issues for further research

This paper has discussed how regions matter for R&D and the opportunities for policy to improve the quality of the regional innovation system. There are, however, numerous open questions that deserve further investigation. The following three areas of research about regional innovation systems proceed more or less directly from the analysis:

- One set of questions concerns the ways in which knowledge spillovers become effective (cf. Breschi and Lissoni, 2001). What is the role of cooperation, labor mobility, trade of goods and other forms of interaction for the transfer of knowledge, and how could and should policy stimulate such

[10] This concerns for example any rules (e.g. in public policy programs) that discriminate against cooperation with partners are located outside the region or abroad.

spillovers? If absorptive capacity is a bottleneck for knowledge spillovers, in what way can policy lead to improved capabilities?

- Little is also known about the early development stages of regional innovation systems (cf. Bresnahan, Gambardella and Saxenian, 2001). Why do some regions experience a quick acceleration that leads to rapid development while others remain static? Which factors spur self-enforcing growth processes and what are the main impediments for such a development? What is the role of public research institutions in initiating self-reinforced development?

- Furthermore, we should know more about promising policy options, in particular, what policy could be used to stimulate the division of innovative labor and the emergence of a productive innovation culture? What instruments could help to build up productive innovation networks? In which way could the regional system be appropriately linked to the outer world? How can obstacles in old systems be overcome?

For all three research areas, new firm formation processes and entrepreneurship may play an important role.

Given the large contribution of R&D to economic growth, regional innovation policy may be a highly effective strategy for promoting development. It is therefore of great importance to learn more about the regional dimension of innovation activity and the possibilities for improving the efficiency of regional innovation systems. One should, however, not forget that regions are embedded in national systems and that nation-wide regulations and conditions may have severe implications for regional innovation activity. The relationship between the regional and the national system as a appropriate starting point for policy measures may also constitute the subject of important further research.

References

Acs, Zoltan J., David B. Audretsch and Maryann P. Feldman (1992): The Real Effects of Academic Research: Comment, *American Economic Review*, 82, 363-367.

Anselin, Luc, Attila Varga and Zoltan J. Acs (1997): Local geographic spillovers between university research and high technology innovation, *Journal of Urban Economics*, 42, 422-448.

Antonelli, Christiano (2001): *The Microeconomics of Technological Systems*, Oxford: Oxford University Press.

Audretsch, David. B. (1995): *Innovation and Industry Evolution*, Cambridge (Mass.): MIT Press.

Audretsch, David B. and Maryann Feldman (1996a): Knowledge spillovers and the geography of innovation and production, *American Economic Review*, 86, 630-640.

Audretsch, David B. and Maryann Feldman (1996b): Innovative Clusters and the Industry Life Cycle, *Review of Industrial Organization*, 11, 253-273.

Arora, Ashish and Alfonso Gambardella (1994): The Changing Technology of Technological Change: General and Abstract Knowledge and the Division of Innovative Labour, *Research Policy*, 23, 523-532.

Axelsson, Björn (1992): Corporate Strategy Models and Networks - Diverging Perspectives, in Björn Axelsson (ed.), *Industrial Networks: A New View of Reality*, London: Routhledge, 184-204.

Aydalot, Philippe und David Keeble (1988) (eds.), *High Technology and Innovative Environments: The European Experience*. London: Routledge.

Baptista, Rui (1998), Clusters, Innovation, and Growth: A Survey of the Literature, in G. M. Peter Swann, Martha Prevezer and David Stout (eds.), 13-51.

Baptista, Rui and G. M. Peter Swann (1998): Clustering Dynamics in the UK Computer Industries: A Comparison with the USA, in G. M. Peter Swann, Martha Prevezer and David Stout (eds.), 106-123.

Breschi, Stefano und Francesco Lissoni (2001): Knowledge Spillovers and Local Innovation Systems: A Critical Survey, *Industrial and Corporate Change*, 10, 975-1005.

Bresnahan, Timothy, Alfonso Gambardella and Annalee Saxenian (2001): 'Old Economy' Inputs for 'New Economy' Outcomes: Cluster Formation in the New Silicon Valleys, *Corporate and Industrial Change*, 10, 835-860.

Camagni, Roberto (1991): Local 'milieu', uncertainty and innovation networks: toward a new dynamic theory of economic space, in Roberto Camagni (ed.) (1991), 121-144.

Camagni, Roberto (ed.) (1991), *Innovation Networks: Spatial Perspectives*, London: Belhaven.

Chichilnisky, Graciella (1999): Introduction, in Graciella Chichilnisky (ed.), *Markets, information, and uncertainty*, Cambridge: Cambridge University Press, 3-18.

Cohen, Wesley and Daniel A. Levinthal (1989): Innovation and learning: The two faces of R&D - implications for the analysis of R&D investment, *Economic Journal*, 99, 569-596.

Cooke, Phillip, Mikel Gomez Uranga and Goio Etxebarria (1997): Regional innovation systems: Institutional and organisational dimensions, *Research Policy*, 26, 475-491.

Cooke, Phillip (1998): Global clustering and regional innovation – Systemic integration in Wales, in Hans-Joachim Braczyk, Phillip Cooke and Martin Heidenreich (eds), *Regional Innovation Systems - The role of governances in a globalised world*, London: UCL Press, 245-272.

Cooke, Philip (2002): *Knowledge Economies – Clusters, learning and cooperative advantage*, London: Routledge.

Crevoisier, Olivier and Dennis Maillat (1991): Milieu, Industrial Organization and Territorial Production System – Towards a New Theory of Spatial Development, in Roberto Camagni (ed.) (1991), 13-34.

Edquist, Charles (1997): Systems of Innovation Approaches – Their Emergence and Characteristics, in Charles Edquist (ed), *Systems of Innovation – Technologies, Institutions and Organizations*, London: Pinter 1-40.

Feldman, Maryann P. (1994): *The Geography of Innovation*, Boston: Kluwer.

Feldman, Maryann P. (1999): The new economics of innovation, spillovers and agglomeration,: a review of empirical studies, *Economics of Innovation and New Technology*, 8, 5-25.

Feldman, Maryann P. (2001), The Entrepreneurial Event Revisited: Firm Formation in a Regional Context, *Industrial and Corporate Change*, 10, 861-891.

Freeman, Christopher (1987): *Technology Policy and Economic Performance: Lessons from Japan*, London: Pinter.

Fritsch, Michael and Horst Brezinski (eds.) (1999): *Innovation and Technological Change in Eastern Europe – Pathways to Industrial Recovery*, Cheltenham: Edward Elgar Publishers.

Fritsch, Michael and Christian Schwirten (1999): Enterprise-university co-operation and the role of public research institutions in regional innovation systems, *Industry and Innovation*, 6, 69-83.

Fritsch, Michael (2000): Interregional differences in R&D activities – an empirical investigation, *European Planning Studies*, 8, 409-427.

Fritsch, Michael and Grit Franke (2000): *Innovation, Regional Knowledge Spillovers and R&D*, Working Paper 2000/25, Faculty of Economics and Business Administration, Technical University Bergakademie Freiberg.

Fritsch, Michael (2001a): Cooperation in regional innovation systems, *Regional Studies*, 35, 297-307.

Fritsch, Michael (2001b): *R&D-Cooperation and the Efficiency of Regional Innovation Activities*, Working Paper 2001/4, Faculty of Economics and Business Administration, Technical University Bergakademie Freiberg.

Fritsch, Michael (2002): Measuring the Quality of Regional Innovation Systems – A Knowledge Production Function Approach, *International Regional Science Review*, 25, 86-101.

Fritsch, Michael and Christian Schwirten (2002): R&D cooperation between public research institutions – magnitude, motives and spatial dimension, in Ludwig Schätzl and Javier Revilla Diez (eds.), *Technological Change and Regional Development in Europe*, Heidelberg: Physica, 199-210.

Fritsch, Michael (2003): Does Cooperation Behavior Differ between Regions? *Industry and Innovation*, 10, 22-39.

Grabher, Gernot (1993): The weakness of strong ties: the lock-in of regional developments in the Ruhr area, in Gernot Grabher (ed.), *The embedded firm – On the socioeconomics of industrial networks*, London: Routledge, 255-277.

Hagedoorn, John (2002): Inter-firm R&D partnerships: an overview of major trends and patterns since 1960, *Research Policy*, 31, 477-492.

Howells, Jeremy (1999): Regional systems of innovation?, in Daniele Archibugi, Jeremy Howells and Jonathan Michie (eds.): *Innovation Policy in a Global Economy*, Cambridge: Cambridge University Press, 67-93.

Jaffe, Adam B., Manuel Trajtenberg and Rebecca Henderson (1993): Geographic localization of knowledge spillovers as evidenced by patent citations, *Quarterly Journal of Economics*, 108, 576-598.

Jewkes, J., Sawers, D. and R. Stillermann (1969): *The Sources of Invention*, 2nd revised and enlarged edition, London: Macmillan.

Johnson, P.S. and D.G. Cathcart (1979): New Manufacturing Firms and Regional Development: Some Evidence from the Northern Region, *Regional Studies*, 13, 269-280.

Karlsson, Charlie and Agostino Manduchi (2001): Knowledge Spillovers in a Spatial Context – A Critical Review, in Manfred M. Fischer and Josef Fröhlich (eds.): *Knowledge, Complexity and Innovation Systems*, Heidelberg: Springer, 101-123.

Klepper, Steven (2001): The Evolution of the U.S. Automobile Industry and Detroit as its 'Capital', Carnegie Mellon University (mimeo).

Lagendijk, Arnoud (2001): Scaling Knowledge Production: How Significant is the Region? in Manfred M. Fischer and Josef Fröhlich (eds.): *Knowledge, Complexity and Innovation Systems*, Heidelberg: Springer, 79-100.

Lundvall, Bengt-Ake (1992a): Introduction, in Bengt-Ake Lundvall (ed.), *National Systems of Innovation and Interactive Learning*, London, New York: Pinter Publishers, 3-19.

Lundvall, Bengt-Ake (1992b): User-Producer Relationships, National Systems of Innovation and Internationalisation, in Bengt-Ake Lundvall (ed.) *National Systems of Innovation and Interactive Learning*, London, New York: Pinter Publishers, 46-67.

MacNeil, Ian R. (1978): Contracts: Adjustment of Long-term Economic Relations under Classical, Neoclassical and Relational Contract Law, *Northwestern University Law Review*, 72, 854-905.

Maskell, Peter and Anders Malmberg (1999): Localized learning and industrial competitiveness, *Cambridge Journal of Economics*, 23, 167-185.

Metcalfe, J. Stanley (1995): The Economic Foundations of Technology Policy: Equilibrium and Evolutionary Perspectives, in Paul Stoneman (ed.) *Handbook of the Economics of Innovation and Technological Change,* Oxford: Blackwell, 409-512.

Nelson, Richard R. (ed.) (1993): *National Innovation Systems - A Comparative Analysis*, New York: Oxford University Press.

Patel, Pari und Modesto Vega (1999): Pattern of internationalisation of corporate technology: location vs. home country advantages, *Research Policy*, 28, 145-155.

Pearce, Robert D. (1999): Decentralized R&D and strategic competitiveness: globalised approaches to generation and use of technology in multinational enterprises, *Research Policy*, 28, 157-178.

Porter, Michael (1998): Clusters and the new economics of competition, *Harvard Business Review*, November-December, 77-90.

Powell, Walter. W. (1990): Neither Market Nor Hierarchy: Network Forms of Organization, *Research in Organizational Behavior*, 12, 295-336.

Prevezer, Martha (1998): Clustering and UK Biotechnology, in G. M. Peter Swann, Martha Prevezer and David Stout (eds.), 124-193.

Pyke, Frank, Giacomo Becattini and Werner Sengenberger (eds.) (1990): *Industrial districts and inter-firm cooperation in Italy*. Geneva: International Institute for Labor Studies.

Saxenian, Annalee (1994): *Regional Advantage*. Cambridge (MA): Harvard University Press.

Scott, Allen J. (1996): Regional Motors of the Global Economy, *Futures*, 28, 391-411.

Segal Quince Wicksteed (1985): *The Cambridge Phenomenon – The Growth of High Technology Industry in a University Town*, London: Segal Quince Wicksteed.

Shohet, Simon (1998): Clustering and UK Biotechnology, in G. M. Peter Swann, Martha Prevezer and David Stout (eds.), 194-224.

Sternberg, Rolf (1996): Technology policies and the growth of regions: evidence from four countries, *Small Business Economics*, 8, 75-86.

Sternberg, Rolf und Christine Tamasy (1999): Munich as Germany's No. 1 high technology region: empirical evidence, *Regional Studies*, 33, 367-377.

Sternberg, Rolf (2000): Innovation Networks and Regional Development – Evidence from the European Regional Innovation Survey (ERIS): Theoretical Concepts, Methodological Approach, Empirical Basis and Introduction to the Theme Issue, *European Planning Studies*, 8, 389-407.

Swann, G. M. Peter (1998): Clusters in the US Computing Industry, in G. M. Peter Swann, Martha Prevezer and David Stout (eds.), 77-105.

Swann, G. M. Peter, Martha Prevezer and David Stout (1998) (eds.): *The Dynamics of Industrial Clustering – International Comparisons in Computing and Biotechnology*, Oxford: Oxford University Press,

Varga, Attila (2000): Universities in Local Innovation Systems, in Zoltan J. Acs (ed): *Regional Innovation, Knowledge and Global Change*, London: Pinter, 139-152.

von Hippel, Erik (1987): Cooperation between Rivals: Informal Know how Trading, *Research Policy*, 16, 291-302.

von Hippel, Erik (1994): "Sticky information" and the locus of problem solving: implications for innovations, *Management Science*, 40, 429-439.

List of Working Papers of the Faculty of Economics and Business Administration,
Technische Universität Bergakademie Freiberg.

2000

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00/4 Jan Körnert, Unternehmensgeschichtliche Aspekte der Krisen des Bankhauses Barings 1890 und 1995, in: *Zeitschrift für Unternehmensgeschichte*, München, 45 (2000), 205 – 224.

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00/12 Diana Grosse, Eine Diskussion der Mitbestimmungsgesetze unter den Aspekten der Effizienz und der Gerechtigkeit, März.

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00/22 Michael Nippa, Kerstin Petzold, Gestaltungsansätze zur Optimierung der Mitarbeiter-Bindung in der IT-Industrie - eine differenzierende betriebswirtschaftliche Betrachtung -, September.

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2001

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01/6 Egon Franck, Christian Opitz, Karriereverläufe von Topmanagern in den USA, Frankreich und Deutschland – Elitenbildung und die Filterleistung von Hochschulsystemen, in: *Schmalenbachs Zeitschrift für betriebswirtschaftliche Forschung (zfbf),* (2002).

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2002

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2003

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