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Regional competitiveness, localised learning, and policy

Mark Lorenzen
Department of Industrial Economics and Strategy
Copenhagen Business School
mark@cbs.dk
ph +45 38152928
fax +45 38152540

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ABSTRACT:

The theoretical perspective of “localised learning” has been accused of not only being “fuzzy”, but also of being incapable of providing policy prescriptions. This paper sets out to discover whether deducting policy advice from the localised learning literature does in fact pose a problem, and if so, to contribute to its solution.

The paper reviews recent localised learning literature and finds its policy advice scarce indeed. The paper does not adopt the view, however, that the localised learning perspective *per se* is incapable of providing policy advice. On the contrary, the paper attempts a first step in this direction, as it deducts from the literature some general principles for formulating a localised learning policy, and points towards some policy means at hand for adhering to these principles. Central issues in need to be addressed when designing and implementing such a policy are also treated.

It is concluded that while the localised learning perspective is still in an early stage, it is well suited to inspire a much-needed new policy agenda for regional development.

KEYWORDS:

Localised learning, innovation, competitiveness, regional development, policy

JEL-CLASSIFICATION:

O18, O31, R58

Introduction

This paper summarises an argument about the relationships between regional competitiveness and localised learning (LL), and gives an assessment of a range of policy elements available to government for promoting regional economic growth through learning. Doing so, it reviews contemporary literature, roughly published in the period from 1995 onwards. It does not aim at providing an overview of the vast literature on localised technological development - by now, a growing theoretical literature, quantitative studies, as well as various case studies of regions within EU, OECD, or 3rd World countries. Rather, it concentrates on the literature in which *policy advice* is expressed or from which it can be extracted.

During the 1990s, the topics of *innovation* or *learning* became particularly conspicuous within the literature on regional development. This is, of course, closely related to the emergence of perspectives on innovation and learning within the organisational and business economics literature (notably literature on national economic issues (the *national innovation system*-approach (NSI)) as well as evolutionary economics and the *resource-based perspective* (RBP)). However, the regional variety of this literature often rests to a significantly higher degree on research and methods from *economic geography*. It itself, it somewhat represents a change of research paradigm within the geography field.

Localised learning should be viewed as co-localised and interconnected processes of technological development (*innovation*) and evolution of a range of social institutions (*institutional learning*). Many scholars see such processes as foundations for the competitiveness of regions. In an age of globalisation of production and codification of product and process knowledge, localised creation and utilisation of some non-ubiquitous product and process factors - most notably, tacit knowledge - is a valuable regional asset.

The growing acceptance that economic development has this important regional dimension has contributed to a shift in policy debates. After a period of legitimacy of central states and relative modest scope for regional learning policies (see e.g. Ciciotti et al 1990; Hilpert 1991), regions are, once again, at the heart of policymaking in EU as well as within many European nation states (Bianchi 1993; Lindström et al 1996; Koschatsky 1997b; Malecki, Oinas and Park 1999). Here, learning is of central concern. Significant confusion however persists as to how regional learning policy may be designed, and unfortunately, like the NSI literature, the literature on LL is so far of limited help in this respect. Only few attempts of explicating policy options are made in the existing studies, and proper policy papers are rare indeed.

Section I of this paper presents the most important contributions to the literature on LL, and the argument concerning the relationships between LL and regional competitiveness. Section II discusses the role of learning policy and the sparse recent literature containing policy advice on LL is outlined here. Section III systematically extracts elements of localised learning policy from the relatively narrow LL literature: Knowledge creation and transfer of

human capital through *education and attraction of labour* and through *linkages* between industry, non-local firms, and knowledge centres.

I. Localised learning and competitiveness

The general assumption underlying the localised learning argument is that with the increasing speed of globalisation (i.e. growing exports of both finished and semi-finished goods, and ubiquitification of production factors), differences in regions' learning capacities matter still more (Amin and Thrift 1994; Maskell et al 1998; Garnsey 1998; Amin and Wilkinson 1999). Unique, localised, and strongly differing knowledge bases and patterns of creating knowledge determine which regions achieve efficiency. Such efficiency rests in the *organisation* of local production systems made possible through the local knowledge base and patterns of knowledge-creation (Hudson et al 1997), and with efficient organisation, even traditional, low-tech industries may grow and give rise to local economic prosperity (Maskell et al 1998). Efficient organisation can be traced in continuous improvements of *processes* (local firms manage to produce products similar to those of firms elsewhere, but at higher speeds, greater flexibility, or lower cost). However, continuous innovation of *products* (broad and shifting ranges of products with cutting-edge quality) is often stressed as the main reason for regional competitiveness. Localised process and product innovation can be termed localised *technological* learning.

A significant turn within economics and economic geography in the 1990s is the more and more explicit coupling of economic performance with the existence of particular social institutions. Localised technological learning is seen as resting on localised *institutional* learning: Development of a range of formal and informal local institutions. Formal institutions encompass a variety of local associations, services, education, and policies. Informal institutions span from firm-level or network-level routines to community-level norms and conventions, propagating trust and economic coordination. Here rests a significant part of what some scholars call local bases of *tacit* knowledge (see e.g. Brusco 1996; Maskell et al 1998; Amin and Wilkinson 1999; Lorenzen 1999), growing in importance for competitiveness as more and more other knowledge is codified and hence imitable. In a learning perspective, particular institutional environments are seen to facilitate technological learning and economic growth¹. The literature on the importance of social institutions for technological learning and regional competitiveness is by nature eclectic and seeks to a differing degree to incorporate theory from *economic sociology* (on e.g. social capital, the nature of informal institutions and the importance of social relations (embeddedness)); the *resource-based perspective* on firm-level and network-level resources and capabilities; and *new trade and growth theory* (on firm linkages and local multiplier effects), as well as empirical insights from a richness of empirical *case studies* of regions with innovative firms (e.g. the importance of highly skilled labour, university-industry linkages, and different public services).

¹ Hence, well-developed local environments of formal and informal institutions may be understood as "social capital" or "learning capital".

Much of this work lies within regional studies or economic geography. Here, special issues have been published of various journals. NordREFO (1997/3, edited by Heikki Eskelinen) concentrates on *Regional specialisation and local environment: Learning and competitiveness*, and contains both a range of interesting case studies of Nordic regions, as well as attempts of conceptualisation of general localised learning dynamics. No policy advice is included. A special issue of European Urban and Regional Studies (6/1 1999, edited by Anders Malmberg and Peter Maskell) on *Localised learning and regional economic development* is a rather diverse collection of papers with varying scopes, one of which however discusses development policy (Glasmeier 1999). Regional Studies (33/4 1999, edited by David Keeble and Frank Wilkinson) is a special issue on *Regional networking, collective learning and innovation in high technology SMEs in Europe*, containing theoretical contributions on the nature of collective learning processes (Keeble and Wilkinson 1999b; Capello 1999) and regional competences (Lawson and Lorenz 1999) as well as a range of case studies, but no explicit policy advice. Other titles within regional studies or economic geography on localised learning encompass Lorenzen (1998; 1999a); and Malmberg and Maskell (1999), the latter providing an elaborated account for the processes of localised learning, illustrated by detailed case studies, and concluding with some brief considerations on policy. Steiner (1998) is an anthology on *Clusters and Regional Specialisation*, and, treating regional production systems and specialisation at a higher level of sophistication than e.g. Rosenfeld (1995), takes a broader scope than merely innovation. It contains an extensive policy section, where, in particular, Tichy (1998) is of interest. Ratti et al (1997) is an elaborated follow-up upon the GREMI approach to “innovative milieux” with both theoretical and case study based contributions, and chapters by Quévit and Doren (1997), and Kamann (1997) contain quite detailed policy advice.

Another significant body of literature is comprised by the theoretical and empirical work on innovation systems. National such systems are described by e.g. Lundvall (1992), Nelson (1993), and Edquist (1997). The NSI literature interweaves with economic geography in the studies of *regional* innovation systems (e.g. Asheim 1997; Asheim and Cooke 1999; Braczyk et al 1998). The latter is an edited volume, containing a richness of case studies of regions arranged according to a novel typology, and elaborated discussions of their dynamics. The concluding chapter (Braczyk and Heidenreich 1998) lists suggestions for related learning policy. Simmie’s (1997) and Malecki’s (1999) edited volumes on *Innovation, networks, and learning regions* and *Making connections: Technological learning and regional economic change*, respectively, also to a high extent deal with regional innovation systems, from a linkages perspective. The former is an edited volume in Ron Martin’s series on Regional Policy and Development, focusing on the role of local institutions as much as linkages themselves. It is very heterogeneous and has neither synthesis nor explicit policy advice, but chapters by Pratt (1997) and Komninos (1997) give an overview of recent technology transfer policies. Malecki (1999) is considerably more coherent and contains some attempts on synthesis, but contains no elaborated policy section.

The RBP has not been particularly well developed when it comes to regional competitive advantage. A theoretical discussion can be found in Foss (1996)², and where Kogut (1990) discusses national competitive advantage in a RBP, empirical applications at the regional level can be found in Maskell et al (1998), Lawson (1999), Lawson and Lorenz (1999), and Lorenzen (1999a).

Since 1995, the perspective of localised learning has further had quite some impact within heterodox economic literature. For example, a special issue has been published of Cambridge Journal of Economics (23/2 1999, edited by Ash Amin and Frank Wilkinson) on *Learning, proximity and industrial performance*. In this issue, a range of scholars from economics, business economics, and economics seek to give accounts for some basic properties of learning processes, and the connections between learning, localisation, and regional competitiveness. Even if the issue contains a richness of mainly theoretical contributions, no advice on policies is given. A special issue of Environment and Planning A (27 1995, edited by Edward Malecki) on *Flexibility and industrial districts* spends considerable space illustrating the regional level of economic evolution and regional institutional peculiarities, and argues for the organic nature of such developments, but contains no policy advice either.

II. The role of policy

If we accept that learning to an increasing degree forms the basis for competitiveness, development policy should not primarily aim at decreasing production costs. Competitiveness grounded in learning is primarily non-cost based, and a policy aimed at decreasing costs could even lessen the pressure on firms to learn³. Glasmeier (1999) thus points out that the role of policy is to move beyond correcting market failures (eliminating bottlenecks and providing access to information and technologies). Thus, a policy aiming at enhancing competitiveness and economic development through learning - a *learning policy* - is endemic.

Nation states continue to play a huge role for regional economic development, for example, through technology transfers, environmental policies and regulations of labour markets (Lundvall 1992: Hudson et al 1997). Nevertheless, there is consensus in the literature that, when learning is concerned, there is a growing scope (even a necessity) for regional policy - a *localised learning policy*⁴. However, localised learning policies cannot be copied

² For a discussion of the theoretical aspects of extending the RBP beyond the firm level - to networks, clusters, or production systems of firms -, see also Foss (1999).

³ Of course, if production costs rise too much, even learning firms lose competitiveness: High labour costs threaten learning regions, too (Braczyk and Heidenreich 1998).

⁴ Sadly, this does not mean that all regions are granted the political autonomy to design, fund, or implement such a policy.

from region to region, partly because regions are embedded in different national economies and national systems of innovation, partly because of the *endogenous* specificities of regions. Hence, even if e.g. Garnsey (1998) argues that localised learning systems⁵ have much to learn from each other, experiences with implementing clones of policies that have proved successful in other regions have been strongly discouraging. During the 1980s (and, some would argue, throughout the 1990s), policy debates were dominated by a certain high-tech fascination, and in many countries (but possibly most determinedly in France and Japan (Park 1997)), localised learning policy has consisted in bringing together high technology industry and R&D into entire regions (e.g. the Japanese “technopolis” project (Bass 1997; Park 1997; Sternberg 1997)), cities (“science cities”), or smaller locations (“science parks” or “technology parks”)(Bass 1997). Such ventures have often been aimed at creating altogether new localised learning systems, and have been highly costly and complex. The results have, however, been disappointing (Hassink 1996b; Sternberg 1997; Asheim and Cooke 1999). It may simply not be possible to plan high-tech innovation through a top-down approach at the regional level. For example, Bass (1997) suggests that a major problem is reaching a significant quality level of R&D within local science parks (there are Japanese examples of local research facilities that are vastly inferior to national-level universities). A more general problem with technopoles is that spin-offs to the majority of local firms are often absent, and systemic effects thus limited. However, experience from more modest and not necessarily interconnected policy measures - for example, *real services* in Italian industrial districts (see Brusco 1992; Bianchi 1993; Glasmeier 1999) or technology transfer agencies in German *länder* (Hassink 1996a; Koschatsky 1997b) - offers important alternative inspiration for localised learning policy. These more modest policies mostly support present economic activities within regions and hence sustain their present functioning, while stimulating bottom-up learning through offering local firms inspiration to change behaviour and innovate incrementally.

No matter what the empirical sources of inspiration for localised learning policy may be, in general, it should of course be designed aided by our present knowledge of learning processes (in the words of Maskell et al 1998: 189 (emphasis in original), “... successful public policy *must conform to the market processes*, not try to work against them.”). As Glasmeier (1999) points out, instead of focusing on what regions can and cannot supply firms with (and try and compensate some regions for being “peripheral”, geographically or resource-wise (Maskell et al 1998)), learning policy should take account of what goes on at the “bottom”: Recognise firms as experimenting, learning organisations, and deal with their cognitive, behavioural, and strategic aspects of learning. Three major points can be made.

The first point has to do with *learning vs. unlearning* (Johnson 1992; Lundvall and Johnson 1994). A relevant question that must be addressed when designing localised learning policy is how the region in question presently looks like, and how it may change. Societal

⁵ Garnsey uses the term “innovative milieux”.

and economical development (i.e. of nations, regions, and firms) is cumulative, and scholars frequently see this path dependence of both firms and regions as provider of competitiveness (see e.g. Garnsey 1998; Maskell et al 1998). When a cumulation of unique endowments of human capital and tacit knowledge provides a region with competitiveness, the logical role of policy would seem to be to *sustain* the localised learning system in existence. However, regions change, or so do their environments. Economic organisation and learning systems may become obsolete relative to the nature of international market developments, and path dependence may result in technological lock-in and ultimately loss of competitiveness (as some Italian or German industrial districts now show signs of). When regional dynamics or external market environments thus shift, it is necessary to make firms learn as well as unlearn (i.e. shift their routines and technologies). This means that localised learning policies should be able to shift from supporting firm behaviour and supporting a learning system to *changing* it. In the case of some peripheral regions, localised learning policy should even be able to *build* a localised learning system from a very low level, “creating” localised learning. At any rate, this means that being able to learn as well as unlearn is essential not only to firms, but to policymakers. A central role of localised learning policy is to help regional production systems preserve the positive results of a cumulative economic and institutional development while avoiding technological *and* institutional lock-in. Avoiding firm-level technological lock-in through inspiring firms to learn and unlearn means that the different local policymakers should also be willing to learn and unlearn - to combine concrete knowledge of the sectors in which the region is specialised with considerable flexibility and willingness to coordinate efforts (Koschatzky 1997b; Glasmeier 1999).

The second point is that more and more technologies (and innovations) are complex and socially embedded - i.e., systemic (Langlois and Robertson 1995; Braczyk and Heidenreich 1998). The division of labour between research and application is breaking down, and firms simply cannot undertake neither production nor innovation isolated from their customers and suppliers. In other words, learning - technological as well as institutional - is to a wide extent is an *interactive* process, strongly dependent on transfer of people, information and knowledge between a variety of agents (firms, customers, associations, universities, agencies, etc.) - a case first strongly made by e.g. Eric von Hippel (1988) and Bengt-Åke Lundvall (1988; 1992). Knowledge transfer may take place with personnel, and hiring (or in-service training) and flows of people to new, spun-off, firms are important channels for this type of learning. Knowledge transfer may also take place independent of the movement of people, and here, trade and other interactions between firms and between firms and other agents are central. Much literature has hence focused upon the ability of *linkages* amongst firms and other agents to function as sources of information and/or knowledge transfer amongst firms and other agents - and hence to promote learning⁶. A collection of conceptual papers and case

⁶ Another important function of inter-firm linkages for learning is that they give firms opportunities to specialise and hence upskill their labour force.

studies presented at an IGU conference and edited by Edward Malecki (1999) describes the role of “connections” between firms and actors for knowledge transfer and technological learning. The collection is heterogeneous and presents different research streams without seeking a synthesis, but in general, connections between local firms are viewed as crucial for the general level of technological learning within regions. Several contributors (e.g. Asheim and Cooke 1999; Malecki, Oinas and Park 1999) also stress the need for cross-region linkages (vertical linkages to external customers or suppliers, horizontal linkages to external partner firms, linkages to external parent corporations or to external universities or research institutions) for obtaining new technological knowledge. A general policy theme in this respect is stimulating linkages of various kinds, to particular types of other firms (for example, knowledge-intensive business services (KIBS) such as consultants) and knowledge centres (for example, technological service centres, universities, or R&D facilities). However, decentralised interactions between less knowledge-intensive firms - specialised users and producers - are also central for product development. The communication taking place between all these actors is dependent on the frequency of interactions as well as cognitive “code keys” that are present only after long periods of interaction, which is why some scholars have stressed that geographical proximity is conducive to interactive learning and viewed culturally homogenous regions as particularly capable of learning (see e.g. Lorenzen 1999).

The in many cases decentralised nature of interactive learning is related to the third point that can be made about localised learning policy from a theoretical viewpoint, namely that learning has both *planned and organic* elements. At the firm level, deliberate “search” for information and rules and procedures for innovating and testing procedures and products represent the planned elements of learning, while organic learning has a range of a range of non-planned origins (for example, trial-and-error learning in interaction with suppliers or customers). At the network level, much organic learning thus stems from unplanned overall patterns of interaction between firms. At the regional level, some institutions and policies are planned and designed, but industrial and learning policies in a range of industrial districts – spanning from Italian low-tech districts to the high tech Silicon Valley - have co-evolved organically with dynamic localised learning systems as a result of a multiplicity of interactions between local economic and political agents. A range of scholars (e.g. Asheim and Cooke 1999; Braczyk and Heidenreich 1998) emphasise that localised learning, albeit resting organic growth, local embeddedness and unplanned linkages, may now be sustained only aided by planned, systemic elements and interconnected, coordinated policy measures. For example, not only regional identities and regional economic systems (like in the cases of Italian Emilia-Romagna or German Baden-Württemberg⁷) can be formed aided by policy, learning systems within regions may also - *should* also - be formed aided by policy. This

⁷ These regions were formed by merging former quite differing regions, in 1974 and 1952, respectively, and have since experienced substantial economic growth.

means moving beyond real services. Given the nature of present and future competition, such non-coordinated policy measures are simply not enough for ensuring regional competitiveness: More *proactive* measures, directly aiming in propagating localised learning, are necessary. However, an important consideration for policymakers is to recognise just when formalisation of an institutional base for localised learning is beneficial and when it is *not*. Conventions, norms, know-how, co-operative behaviour, and other organically developed structures and institutions may lose their functioning if they are sought codified and incorporated into formal institutions. Their tacitness and their spontaneous order may be the very reason for the dynamism they cause. At any rate, aiming at creating *institutional thickness* in Amin's and Thrift's (1994) perspective may result in *institutional overkill*: Too many isolated - and, in many cases, unnecessary - institutions (MacLeod 1997; Malecki, Oinas and Park 1999). Amin and Thrift themselves, however, argue with Grabher (1993) in favour of a broad variety of local institutions - even if there may be some redundancy - because of the potential for flexibility and institutional learning variety encompasses.

The decision of whether the sources of inspiration for a localised learning policy should be high-tech ventures or real services, whether it should aim at create a system, change it, or sustain it, in which way the interactive nature of learning should be taken into account, and to which degree policy should aim at planned learning, must surely be taken depending on the industrial structure, institutional environment and other characteristics of the region in question. In short, a localised learning policy should be *tailored*. The literature, however, provides us with remarkably little help in tailoring policies. There have been very few attempts of bringing the diverse sources of inspiration and theoretical knowledge of learning processes together to learning policies - most contributions concentrate on single possible policy elements (for example, finance or technology transfer agencies). Rosenfeld (1995), Koschatzky (1997) and Archibugi et al (1999) are some of the few publications on policy altogether, but whereas the former two take practical and eclectic views upon regional policy - Rosenfeld (1995) aiming at strengthening clusters of different types, Koschatzky (1997) concentrating on high-tech SMEs -, the latter moves solely at a national level (but see the contribution from Howells (1999)). Concerning journals, many contributions related to localised learning policies can generally be found in European Planning Studies (see e.g. Bräunling 1995; Cooke 1996; Huggins 1996), European Urban and Regional Studies (see e.g. Hassink 1996a), or Regional Studies (see e.g. Ashcroft et al 1995; Bass 1997; Huggins 1997a; Henderson 1998; Longhi 1999), but typically, they present evidence on particular cases of regional or national planning rather than seeking to explicate general policy advice. A few, brief, attempts at giving general advice have, however, been put forward. For example, Hassink (1996b) gives general advice concerning technology transfer agencies on the basis of a broad range of literature. Hudson et al (1997) base a very broad discussion - concentrating on the scope for policy rather than its content - on comparisons of "successful" European regions. Glasmeier (1999) bases her general - but not very explicit - policy advice on case studies and a survey, and suggests how to narrow the gap between information-using and

non-using local firms, through exposing the less self-conscious and reflexive firms to the learning methods of more successful local firms.

The following section discusses the possible content of localised learning policies. Due to the sparse and scattered policy advice in the literature, the section does not present single contributions to the literature, rather, it extracts *policy elements* from it.

III. Elements of localised learning policies

The elements that are listed below all pertain to regional achievement of knowledge. To achieve knowledge, some localised learning systems - e.g. systems of firms within high-tech industries - need numerous connections to *external* sources (i.e. national and transnational innovation systems), providing the newest (codified) knowledge, while other - typically, systems of SMEs within traditional industries - may continue to rest mainly on *local* linkages and local (tacit) knowledge. Thus, the policy elements listed below to different degrees promote indigenous *creation* of knowledge vs. knowledge *inflow* from sources outside the region in question.

First of all, *education and training* must be seen as important policy measures. Typically, views on education have been coupled to discussions of its impact on the flexibility of local labour markets. While there is no doubt that in many regions, a high general flexibility of the local labour force and a high level of cooperation in local industrial relations are important preconditions for economic success (Hudson et al 1997), education and training should also be analysed in terms of how it increases the local stock of knowledge in the guise of human capital. This view on education as a means to enhancing localised learning applies both to sustaining existing systems and creating new ones (a means to a development policy for peripheral regions). Different types of labour have different influences on learning. As Bradley and Taylor (1996) note, skilled workers are central to many process innovations, while highly educated workers (for example, with an university degree) matter for many product innovations (see also Edquist 1997). A certain high-tech fascination has however made its way into the discussions of the role of education for localised learning, and most empirical work seems to have been done on the presence of highly qualified labour in high-tech regional learning systems (see e.g. Bradley and Taylor 1996; Simmie 1997b). The policy implications of such studies are clear: Enhance the quality of local universities and the utilisation by local firms of highly educated workers and in-service university courses (see e.g. Edquist 1997), or attract highly educated labour from *outside*. Due to the role of highly educated labour, Malecki, Oinas and Park (1999: 269) blur the distinction between learning policies and general welfare policies, stressing "... investment and promotion of quality-of-life areas or amenities such as arts or culture to attract workers in knowledge-based activities". However, not only highly educated labour is of importance for localised learning. For example, Danish, German, or Italian experiences demonstrate the importance of skilled labour for product innovation. The picture is however complex given the widely differing

know-how and competencies of what is termed “highly educated” and “skilled” labour and the variety of in-house training and in-service courses offered in different countries. As a basis for learning policy, it seems more fruitful to investigate the use of different knowledge bases within particular industrial and learning activities, rather than maintaining the problematic distinctions between high-tech and low-tech industries and highly skilled, skilled, and non-skilled labour. As Rosenfeld (1995: 128-129) notes: “the ... challenge is to build an education system that will be flexible enough to sustain the core competencies of a region’s clusters and not focus narrowly on occupations”. Furthermore, the role of training of *management* is little explored, even if the design and implementation of it typically differs from other education. The participation of managers to in-service training often depends upon close cooperation between educational institutions and firms, and courses aimed at enhancing firms’ capacity for innovation are often most fruitfully provided along with other industry services - what Asheim and Cooke (1999: 172) term “soft infrastructure of enterprise support for business development and management training for technology growth and support”. In conclusion, even if there is general agreement in the literature that education and training matter enormously for the learning capacity of regions, there is little policy advice of which types of education to promote, and how to design regional educational systems. This may be due to the focus often applied in the literature on highly skilled labour and high-tech innovations, which has left little space for a discussion of which types of education that should be promoted in order to enhance different types of learning.

Other important policy elements - aimed at creating knowledge within the region - is *promoting experimentation and innovation within single firms*. As mentioned in section II, government policies should not only aim at enhancing learning, it should also aim at enhance relevant unlearning of routines at the firm level. Rosenfeld (1995) notes that because managers are risk averse, it may be necessary to stimulate firm-level experimentation with new technologies and training by *grants*. At any rate, easy access to *finance* of experiments (e.g. new process technology) is crucial for indigenous knowledge creation in the guise of firm level experimentation. For example, Huggins (1996) points out that in the case of New South Wales, funding and means of finance for projects related to technological innovation was a missing crucial factor. *Spin-offs* (the formation of new firms) are another important form of experimentation - typically in terms of both products and processes -, and financial support for entrepreneurial activity and other services (mainly, information and technology advice) offered by e.g. *incubator centres* (Plezchak 1997) should be stressed as a crucial element of a localised learning policy aiming at enhancing indigenous knowledge creation. The need for finance for entrepreneurs does not only apply to low-tech regions. Sternberg and Tamásy (1999) lean on the case of high-tech Munich when recommending support for spin-offs (helping employees with capital to start up own businesses), and Longhi (1999) stress that the success of ambiguous high-tech projects necessitates the coordination by local authorities of a broad range of services, including finance. For example, a science park in French Sophia-Antipolis clearly illustrates how the creation of a localised high-tech learning system where smaller firms (and more industries) also participate was preconditioned by

policy measures aiming at creating research facilities and qualified labour (in this case, through creating a local university), *plus* provision of supporting services for local SMEs (in particular, finance). Some additional *information services* may also be required to promote both firm-level experimentation and spin-offs, partly because they may provide information of new technological possibilities or market developments, partly because they may enhance managers' knowledge of sources of financial aid and government support.

The general rate of learning at the firm level (and hence, indigenous knowledge creation in the region) can also be enhanced by *stimulating the interactive, organic, learning between local firms*. A bottom-up policy approach that acknowledges the interactive dimension of knowledge creation and dissemination encompasses furthering a general high level of linkages between local agents. Some successful localised learning systems like Silicon Valley or more traditional industrial districts seem to possess an abundance of linkages between local firms. However, for some systems that are very specialised or are dominated by a few large firms, there may be some idea in stimulating the richness and diversity of local firms by encouraging entrepreneurship. A critical mass of specialised suppliers is a necessity for learning dynamics of production systems (Maskell et al 1998). For example, knowledge-intensive business service providers (KIBS), often having a great impact on interactive learning but being absent in many localised learning systems, could be promoted. Relevant policy measures for entrepreneurial support can be provision of start-up capital, *brokering* arrangements for joint ventures (e.g. though employing professional and knowledgeable mediators or facilitators, "animateurs" (Cooke 1998) or "impannitores"⁸), and technical assistance (Rosenfeld 1995). Information services may again play a crucial role, partly in informing managers of the economic scope of vertical or horizontal cooperation, partly to inform them of possible local partners (catalogues of suppliers, customers, or partners for horizontal joint ventures), also allowing firms to *shift* partners when necessary. Again, some scholars warn against institutional "overkill", which may hamper entrepreneurship rather than promote it (MacLeod 1997; Malecki, Oinas and Park 1999). There has however been quite some success of policymakers in enhancing the scope for specialisation and co-operation between local firms through propagating *industry standards* or *quality certification* systems. Enhancing the quality consciousness of local customers - creating local critical customers in a Porterian (1990) perspective - has e.g. been on the agenda in the regional learning policy of some German länder (Bräunling 1995). Sternberg and Tamásy (1999) stress the need for local formal institutions like supplier certification networks and *supply chain associations* for the successful relationships between large firms and SMEs of high-tech Munich. A general concern of learning policy aimed at local linkages should be creating a prosperous balance between (qualitative) competition *and* (vertical and horizontal)

⁸ Such brokers should be knowledgeable, meaning with experience from industry, but be *neutral*. Thus, they should be employed by government, or be different industrialists that are empowered in turn. This mechanism - giving *shifting* stakeholders responsibility and power - may also be used in solving other problems of social order, if social conventions alone cannot do so.

cooperation (Hudson et al 1997), like in the Italian industrial districts (see e.g. Brusco 1992). For the purpose of achieving a balance between competition and cooperation, Enright (1995) proposes to identify which particular *activities* about which firms may cooperate. If carefully planned, there may be great innovative potential in promoting cooperation across traditional industry boundaries, integrating various service providers and manufacturers into particular projects that have to rely on firms from different industries (e.g. as seen in Baden-Wuerttemberg, a multimedia project)(Braczyk and Heidenreich 1998). Sternberg and Tamásy (1999: 375) point out that a local balance between cooperation and competition within such clusters of firms is crucial in order to avoid oligopolies and technological lock-in⁹. In the case of Munich, local policy measures aiming at ensuring "... that rivalry permeates the cluster [...]" was necessary. However, it is clear that excessive cooperation and too little competition is not the dominant problem within many regions. Quite the opposite, simply trying to create a diversity of local firms through financial and informational services may not be sufficient policy to stimulate localised learning through linkages. Many SMEs may not be willing to initiate new cooperations, because the entrepreneurial visions of their managers are less directed towards specialisation and co-operation as such, and they may rest on routines that do not allow them to respond to the specialisation and interaction possibilities offered by the local production system (Glasmeier et al 1998). Hence, different "network programmes" have become common policy in many regions. One aspect of these is to enhance the *information content* of interactions between independent firms. In general, it is broadly recognised that small and large firms achieve information differently (with different cognitive capabilities and through different channels)(see e.g. Fuellhart 1999; Lorenzen 1999), and learn differently, and policy aiming at improving networks should take that into consideration. Information exchange between large firms has been little explored empirically, as has the general problems of cognition and communication when interacting, and thus, there is limited policy advice in the literature on this (but see March Chorda 1995; Autio 1998). Concerning SMEs, Rosenfeld (1995) points to positive Scandinavian policy experiences with formalised "knowledge groups" of a few firms that exchange experiences and advice and thus stimulate interactive learning. This, mostly horizontal, interactive learning is qualitatively different from the day-to-day learning between users and producers, and is open to promotion by policy. Another important aspect of network policy is enhancing an institutional environment supporting inter-firm *trust*. The policy message within a growing body of literature is that we should look at informal social institutions (conventions, norms, or in another, less clear, term "social capital"), because they enhance economic coordination through facilitating trust. An important point in this respect is that when trust is interorganisational (i.e. built step-by-step between two partners), it may lock a firm into a cooperation even when it is inefficient, whereas *social* trust (i.e. common within a whole group of firms, not all having experience with each other) provides firms with possibilities to shift cooperative relations within the

⁹ This is in the spirit of Nelson (1991), who argues that a multiplicity of firms within a system helps avoiding excessive rents and stimulates innovation.

group, maintain flexibility, and learn. Common conventions and norms may also improve inter-firm communication, because they function as common cognitive “code keys” (see e.g. Storper 1997; Salais and Storper 1997; Lundvall and Maskell 1998; Lorenzen 1999b). Localised social trust, cooperation, and efficient communication facilitates localised networking and efficient economic organisation - making growth possible even in traditional industries that experience decline in other regions (Hudson et al 1997). The anthology edited by Ash Amin and Nigel Thrift (1994) contains comments by the editors on regional “thickness” of both formal and informal institutions. Their brief policy discussion concentrates on the schism between globalisation and the scope for regional policy, but contains no explicit advice on localised learning. Philip Cooke and Kevin Morgan have been participating actively to the debate on localised learning for a decade, and have largely based their policy arguments on studies of famous growth regions like Emilia-Romagna, Baden-Württemberg. Much of the policy advice contained in e.g. Cooke and Morgan (1994; 1998), Cooke (1996), Morgan and Nauwelaers (1999) - as well as others with direct experience with industrial districts (e.g. Brusco 1996) - concerns creating supportive regional environments of informal institutions. Social conventions and norms may arise organically through daily life within the region (enhanced by geographical proximity and hence scope for frequent interactions between agents), but some informal institutions can be promoted by policy. For example, Cooke, Morgan, and others make clear that informal institutions are often grounded in quite formal structures like civic associations. Rosenfeld (1995) gives specific policy advice of how to create social capital on the basis of formal institutions: Government should support managers in creating other civic associations than chambers of commerce, because the latter often are dominated by consumer services. More focused, alternative associations of managers can function as “...settings for interacting on a professional basis and thereby building trust” (Rosenfeld 1995: 125). Further, he notes that social conventions that associate business failure with personal failure may make potential entrepreneurs too risk adverse to start up own business. Surely, it is difficult for regional policy to alter such collective conventions, let alone organisational cultures within single firms. It may, however, be possible in a longer run to change cultures through offering education and courses at both management and employee levels¹⁰, and through information services. A last observation concerning the promotion of cooperation and linkages between independent firms is that it is not always fruitful. Henderson (1998) stipulates that deliberate attempts in stimulating inter-firm networks must take into account that in some cases, managers are right when they do not see any economic scope for further partnerships, and policy that haphazardly promotes new partnerships may be harmful, or, at best, a waste of effort. The networks that firms are already engaged in are mostly organically developed, more specialised than those created through political efforts, and may actually have a greater learning content. Thus, policymakers should, first, be

¹⁰ Huggins (1997) illustrates the severe difficulties of UK local Training and Enterprise Councils in creating learning networks, while Henderson (1998) describes the experiences of the Welsh Development Agency in stimulating inter-firm learning through network building.

modest in their expectations regarding the effects of planned networks (networking is a long and cumulative process), and moreover, decide carefully vis a vis existing networking activities which new activities should be supported. This is consistent with the experiences from the Danish Network Programme (Gelsing and Nielsen 1997; Lorenzen 1999a).

While some firms thus create and disseminate knowledge interactively through a broad range of collaborations, others depend more on *linear* flows of knowledge from *knowledge centres* (universities, research centres, or large firms). Asheim and Cooke (1999) argue that organic development and dissemination of (mainly tacit) knowledge amongst SMEs, supported by real services is no longer sufficient in today's competitive environments. Thus, together with ensuring a local advanced *telecommunications* infrastructure, they prescribe building regional formal institutions that propagate transfer to SMEs of (codified) knowledge from knowledge centres, such as "partnerships between large, private firms, government, universities, intermediate agencies, research institutes, and small firms", and "technology centres to supply expert services for technology transfer from knowledge centres such as universities and research institutes ..." (Asheim and Cooke 1999: 172). *Technological support services* or technology transfer infrastructure (intermediary structures between higher education institutions, public research institutions, and SMEs - for example, university liaison officers or consultants (Maskell et al 1998), and technological centres) are also mentioned by Hassink (1996a) as a major field within regional policy aimed at stimulating technological innovation (other fields being technological aid schemes to support the innovativeness of firms financially; and technology centres for business start-ups). The services provided by the Steinbis Foundation in Baden-Württemberg are often mentioned as an object lesson (e.g. Grabher 1993; Cooke and Morgan 1994; Hassink 1996a). Huggins (1996) however gives the example of New South Wales, where the fact that firms were not sufficiently *aware* of the technological support services available may partly explain their low level of technological innovation. Clearly, in cases like this, technological services in combination with information services would improve on this - plus, it would *ceteris paribus* increase the utilisation of particularly knowledgeable local firms providing services (KIBS). Hassink (1996a; 1996b), Huggins (1996; 1997b), and Pleschak (1997) provide some advice on technology centres. While Pleschak (1997) lists the accomplishments of German technology and incubator centres, Hassink (1996a&b) notes that the successes of technology policies are surprisingly limited in many European regions: "... Particularly, studies that reveal the lack of links between SMEs and technology transfer agencies cast doubt on the effectiveness of technology transfer infrastructures" (Hassink 1996a: 287). This means that substantial effort should be devoted to understanding the institutional preconditions for communication between firms (particularly SMEs) and service providers. There is also a growing literature concentrating on the role of *large* local firms for learning and knowledge dissemination. Often, such large firms actually function as coordinators of localised learning systems, and e.g. Patchell, Hayter and Rees (1999a&b) point out that connections between large and small local firms should be analysed more thoroughly when making policy. An empirical contribution on the role of large firms for localised learning is Sternberg and Tamásy (1999), stressing that in the case of

Munich, local formal institutions may play a large role for maintaining the innovative dynamics of the relationships between large firms and SMEs.

Many scholars stress that within most industries, *inflow of knowledge from external sources* is necessary to maintain a high level of learning. Even if a localised learning system is highly dynamic, local knowledge is simply not enough (in many cases, exactly the ability of localised learning systems for utilising knowledge from external sources in combination with local knowledge is what provides them with competitiveness). Empirical findings even suggest that the broader the range of linkages a firm uses as information and knowledge sources, the more it learns (Glasmeier 1999). Thus, *information services* should providing firms with information, including that of “trends unfolding outside the immediate local area” (Glasmeier 1999: 82). *Multinational corporations* (MNCs) are often seen as other important sources of knowledge inflow to regions, due to their direct investments or their utilisation of local subcontractors. Longhi (1999) provides an empirical example of French Sophia-Antipolis of how high-tech knowledge can flow into a localised learning system through the presence of influential and knowledge-intensive French and MNC branches in a local science park¹¹. Young et al (1994) provide a policy framework for attracting investments from MNCs, “territorial marketing” or “inward investment attraction”. Their basic point is that because MNC investments are broadening their scope to more components of the value chain, and changing their form away from greenfield projects towards joint ventures, acquisitions and alliances, inward investment policies should be coupled to other regional policies, in order to capture the potential benefits from the investments. Formulating a policy aimed at providing a region with up-to-date knowledge is not a question of either attracting MNC branch plants or promoting indigenous development of SMEs - it is a question of efficiently *coupling* these approaches. Such a policy may encompass “... supplier development, skills enhancement to support reinvestment programme, possibly even export promotion” (Young et al 1994: 157) - for most regions implying a coordination between the investment agencies and other policy bodies. Again, the role of *large* local firms is stressed by some. Patchell, Hayter and Rees (1999a&b) point to the potential of large local firms for connecting local SMEs to MNCs and other external sources of technological knowledge, due to the fact that they are coupled to international markets, powerful in virtue of their size (and thus have a large potential strategic action vis a vis e.g. MNCs), and innovative *while* being embedded in a local production system. Local policy aimed at enhancing knowledge inflows from MNC should thus be designed with an eye on the large local firms as much as the SMEs. Similar to SME policy, policy aiming at improving on knowledge inflows with the aid of MNCs and/or large local firms should pay attention to communication and coordination problems. Some regional projects of creating technopoles or attracting MNCs have failed to create localised learning due to lack of linkages between the high-tech ventures and the regional system of

¹¹ However, there were no local targeted policy of attracting these firms in the region, and thus the paper concentrates on ex-post policies aiming at providing supportive facilities and including SMEs and related industries into the emerging innovation system.

firms, and communication problems stemming from cognitive or “cultural” differences between technocrats and practitioners (Hassink 1996b; Sternberg 1997;Asheim and Cooke 1999). Similarly, Simmie (1997b) notes that many “peripheral” regions have poor access to information due to their few linkages to external firms and other sources of information. However, some regions with abundant linkages to e.g. MNCs still have limited potential for absorbing technological knowledge due to a low level of education and lack of capital and physical infrastructure¹². Again, the role of local institutions for providing the basic infrastructure for absorbing new knowledge must be viewed as crucial. Policy should seek solve such problems through education, and through creating a local institutional environment that propagates trust and aids communication.

Concluding remarks

There is quite some consistency in the literature that localised learning policy should not be aimed at adopting models of development from other regions. What matters is to create an indigenous – those inspired by the RBP would even maintain “unique” – mode of economic development in terms of both product specialisation, industrial structure, and institutional environment. In short, what provides regional competitiveness is a unique local stock of knowledge and way of employing it.

The diversity of the dynamics of the existing localised learning systems and the structures and institutions that support them means that it is difficult to give general policy advice. Further, learning processes are essentially closely related to many aspects of both economic and social life, and *learning* policies thus closely intertwined with other policies. Many scholars list transport and communication infrastructure as necessary for learning and some (e.g. Malecki, Oinas and Park 1999) even include policies aimed at art and culture. Such areas of social life are seen as related to learning, both directly in cognitive terms and indirectly in attracting highly educated labour. Furthermore, a variety of policies aiming at maintaining general social order (collective agreements and law on wages, working conditions, contracts, copyrights, etc.) can be said to promote cooperation and economic coordination, and hence interactive learning. Hence, many analyses of learning regions conclude with policy sections resembling a catalogue of ideas. In the present paper, upgrading a local stock of knowledge, stimulating technological experimentation, new ventures and spin-offs, promoting inter-firm interaction and co-operation and transfer of knowledge from external sources has been seen as central aspects of localised learning, and the catalogue of policy elements it has contained education, training, various means of financial aid, attraction of investments and MNC branch plants, information and technology

¹² It should also be noted that a reason for the limited spin off in terms of knowledge transfer to local firms may be that the activities undertaken locally by the MNC are more aimed at utilising cheap local labour than hooking up with local suppliers or partners. This is a classic theme within the MNC literature.

transfer services, and the building of public institutions and civic associations. Some suggested policy is aimed at large firms, some at SMEs, some at local firms, some at MNCs. Some of this policy may be undertaken by privates, some only by government.

As mentioned, localised learning policy should be tailored to each region through finding the right combination of policy elements. However, the *process* through which the policy is designed may be problematic. In the literature, there is significant agreement that in order to succeed, the process of designing and implementing localised learning policies has to be close cooperation between public and private associations, and between policy bodies and both local firms and labour (Rosenfeld 1995; Glasmeier 1999). This has been the lesson learned from a range of successful regions, spanning from Italian low-tech industrial districts to Japanese high-tech regions. Further, the *application* of policy may be less or more efficient. For example, Rosenfeld (1995) points out that there are great advantages if various public services are concentrated in “one-stop centres”, offering services, information, and government programs. The concentration of services in such centres would decrease costs of particular SMEs in acquiring information. He adds that if centres are arranged around the structure of the regional cluster of firms (offering a range of different services for the narrow range of firms present) rather than around a mission (offering a narrow range of services, like training or R&D functions, for all types of firms) it would improve their efficiency substantially. Glasmeier (1999) concurs that local service providers should offer a range of both practical and more complex services. Firms must be “lured” by the first into participating to complex, collective learning mechanisms.

The present strong policy focus on regions and learning tends to disguise the fact that regional competitiveness through localised learning is a sort of modern Krugmanian variety of Ricardian specialisation, and that localised learning policy as a means to regional development cannot make all regions prosper at the same time. Because what drives regional development is competition between regions, there are losers when some regions prosper (Hudson et al 1997; Hudson 1999). Further, even within those regions that seem economically successful, localities may be depressed (which may render a local rather than a regional scale more useful when applying policies).

The present paper has been practical and has tried to represent some of the breadth of development policy - and, not the least, to inspire where to look in the literature for elements of it. Hence, it has not aimed at contributing to the controversies about regionalisation and marginalisation.

References

Amin, A and N Thrift (1994): *Globalisation, institutions, and regional development in Europe*, London: Oxford University Press.

Amin, Ash and F Wilkinson (eds.)(1999): Learning, proximity and industrial performance, *Cambridge Journal of Economics* 23/2, Special issue.

- Archibugi, D et al (eds.)(1999): *Innovation policy in a global economy*, Cambridge: Cambridge University Press.
- Ashcroft, B et al (1995): UK innovation policy: A critique, *Regional Studies* 29/3: 307-311.
- Asheim, B (1997): "Learning regions" in a globalised world economy: Towards a new competitive advantage of industrial districts?, in *Interdependent and uneven development: Global-local perspectives*, Conti, S and M Taylor (eds.), Aldershot: Ashgate.
- Asheim, B and P Cooke (1999): Local learning and interactive innovation networks in a global economy, in *Making connections: Technological learning and regional economic change*, Malecki, E J (ed.), Aldershot: Ashgate.
- Autio, E (1998): Evaluation of RTD in regional systems of innovation, *European Planning Studies* 6: 131-140.
- Bass, S J (1997): Japanese research parks: National policy and local development, *Regional Studies* 32/5: 391-403.
- Bianchi, P (1993): Industrial districts and industrial policy: The new European perspective, *Journal of Industry Studies* 1/1: 16-29.
- Braczyk, H-J et al (eds.)(1998): *Regional innovation systems*, London: UCL Press.
- Braczyk, H-J and M Heidenreich (1998): Regional governance structures in a globalized world, in *Regional innovation systems*, Braczyk, H-J et al (eds.), London: UCL Press.
- Bradley, S and J Taylor (1996): Human capital formation and local economic performance, *Regional Studies* 30/1: 1-14.
- Brusco, S (1992): Small firms and the provision of real services, in *Industrial districts and local economic regeneration*, Pyke, F and W Sengenberger (eds.), Geneva: ILO.
- Brusco, S (1996): Global systems and local systems, in *Local and regional response to global pressure: The case of Italy and its industrial districts*, Pyke, F and W Sengenberger (eds.), Geneva: ILO.
- Bräunling, G (1995): An innovation-based industrial strategy for the new German Länder, *European Planning Studies* 3/4: 511-529.
- Capello, R (1999): Spatial transfer of knowledge in high technology milieux: Learning versus collective learning processes, *Regional Studies* 33/4: 353-366.
- Ciciotti, E et al (eds.)(1990): *Technological change in a spatial context: Theory, empirical evidence and policy*, Berlin: Springer-Verlag.
- Cooke, P (1996): Building a twenty-first century regional economy in Emilia-Romagna, *European Planning Studies* 4/1: 53-62.
- Cooke, P (1998): Introduction: Origins of the concept, in *Regional innovation systems*, Braczyk, H-J et al (eds.), London: UCL Press.
- Cooke, P and K Morgan (1994): Growth regions under duress: Renewal strategies in Baden-Württemberg and Emilia-Romagna, in *Globalisation, institutions, and regional development in Europe*, Amin and Thrift (eds.), London: Oxford University Press.
- Cooke, P and Morgan (1998): *The associational economy: Firms, regions and innovation*, Oxford: Oxford University Press.
- Cooke, P and C Nauwelaers (1999): *Regional innovation strategies: The challenge for less favoured regions*, London: Jessica Kingsley Publishers.
- Edquist, C (ed.)(1997): *Systems of innovation: Technologies, institutions, and organizations*, London: Pinter.

- Enright, M (1995): Regional clusters and economic development: A research agenda, in *Business networks: Prospects for regional development*, Staber, U et al (eds.), Berlin: De Gruyter.
- Eskelinen, H (ed.)(1997): Regional specialisation and local environment: Learning and competitiveness, *NordREFO 1997/3, Special issue*.
- Foss, N J (1996): Higher-order industrial capabilities and competitive advantage, *Journal of Industry Studies*, 3/1: 1-20.
- Foss, N J (1999): Networks, capabilities, and competitive advantage, *Scandinavian Journal of Management* 155: 1-15.
- Fuellhart, K (1999): Localization and the use of information sources: The case of the carpet industry, *European Urban and Regional Studies* 6/1: 39-58.
- Garnsey, E (1998): The genesis of the high technology mileu: A study in complexity, *International Journal of Urban and Regional Research* 22/3: 361-377.
- Gelsing, L and K Nielsen (1997): Promoting inter-firm networks in industrial policy: Danish evidence, Unpublished working paper, Aalborg: Department of Business Studies, Aalborg University.
- Glasmeier, A K et al (1998): The relevance of firm-learning theories to the design and evaluation of manufacturing modernization programs, *Economic Development Quarterly* 12: 107-124.
- Glasmeier, A K (1999): Territory-based regional development policy and planning in a learning economy: The case of "real service centers" in industrial districts, *European Urban and Regional Studies* 6/1: 1999.
- Grabher, G (1993): *In praise of waste: Redundancy in regional development*, Berlin: Edition Sigma.
- Hassink, R (1996a): Regional technology policies in the old and new länder of Germany: Case-studies from Baden-Württemberg and Thuringia, *European Urban and Regional Studies* 3/4: 287-303.
- Hassink, R (1996b): Technology transfer agencies and regional economic development, *European Planning Studies* 4/2: 1996.
- Henderson, D (1998): Building interactive learning networks: Lessons from the Welsh medical technology forum, *Regional Studies* 32/8: 783-787.
- Hilpert, U (ed.)(1991): *Regional innovation and decentralization: High tech industry and government policy*, London: Routledge.
- von Hippel, E (1988): *The sources of innovation*, Oxford: Oxford University Press.
- Howells, J (1999): Regional systems of innovation?, in *Innovation policy in a global economy*, Archibugi, D et al (eds.), Cambridge: Cambridge University Press.
- Hudson, R et al (1997): Developing regional strategies for economic success: Lessons from Europe's economically successful regions?, *European Urban and Regional Studies* 4/4: 365-373.
- Hudson, R (1999): The learning economy, the learning firms, and the learning region: A sympathetic critique of the limits to learning, *European Urban and Regional Studies* 6/1: 59-72.
- Huggins, R (1996): Innovation, technology support and networking in South Wales, *European Planning Studies* 4/6: 757-768.
- Huggins, R (1997a): Local business co-operation and training and enterprise councils: The development of inter-firm networks, *Regional Studies* 32/9: 813-826.
- Huggins, R (1997b): Competitiveness and the global region: The role of networking, in *Innovation, networks, and learning regions?*, J Simmie (ed.), London: Jessica Kingsley Publishers.

- Johnson, B (1992): Institutional learning, in *National systems of innovation: Towards a theory of innovation and interactive learning*, Lundvall, B-Å (ed.), London: Pinter.
- Kamann, D-J (1997): Policies for dynamic innovative networks in innovative milieux, in *The dynamics of innovative regions: The GREMI approach*, Ratti, R et al (eds.), Aldershot: Ashgate.
- Keeble, D and F Wilkinson (eds.)(1999a): Regional networking, collective learning and innovation in high technology SMEs in Europe, *Regional Studies 33/4, Special issue*.
- Keeble, D and F Wilkinson (1999b): Collective learning and knowledge development in the evolution of regional clusters of high technology SMEs in Europe, *Regional Studies 33/4: 295-304*.
- Kogut, B (1990): The permeability of borders and the speed of learning among countries, in *Globalization of firms and the competitiveness of nations*, Dunning J H et al (eds.), Lund: Lund University.
- Komninos, N (1997): After technopoles: Diffused strategies for innovation and technology transfer, in *Innovation, networks, and learning regions?*, Simmie, J (ed.), London: Jessica Kingsley Publishers.
- Koschatzky, K (ed.)(1997a): *Technology-based firms in the innovation process: Management, Financing, and regional networks*, Heidelberg: Physica-Verlag.
- Koschatzky, K (1997b): Innovative regional development concepts and technology-based firms, in *Technology-based firms in the innovation process: Management, Financing, and regional networks*, Koschatzky, K (ed.), Heidelberg: Physica-Verlag.
- Langlois, R N and P L Robertson (1995): *Firms, markets, and economic change: A dynamic theory of business institutions*, London: Routledge.
- Lawson, C (1999): Towards a competence theory of the region, *Cambridge Journal of Economics 23: 151-166*.
- Lawson, C and E H Lorenz (1999): Collective learning, tacit knowledge, and regional innovative capacity, *Regional Studies 33/4: 305-318*.
- Lindström, B et al (1996): Regional policy and territorial supremacy, *NordREFO 1996/2*.
- Lorenzen, M (ed.)(1998): *Specialisation and localised learning: Six studies on the European furniture industry*, Copenhagen: CBS Press.
- Lorenzen, M (1999a): *Localised learning and community capabilities: On the organisation of knowledge in markets, firms, and communities*, Copenhagen: Samfundslitteratur.
- Lorenzen, M (1999b): Social capital, coordination, and industrial districts, Unpublished working paper, Department of Industrial Economics and Strategy, Copenhagen: Copenhagen Business School.
- Lundvall, B-Å (1988): Innovation as an interactive process: From user-producer interaction to the national system of innovation, in *Technical change and economic theory*, G Dosi et al (eds.), London: Pinter.
- Lundvall, B-Å (ed.)(1992): *National systems of innovation: Towards a theory of innovation and interactive learning*, London: Pinter.
- Lundvall, B-Å (1994): [The learning economy](#), *Journal of Industry Studies 1: 23-42*.
- Lundvall, B-Å and P Maskell (1998): Nation states and economic development: From national systems of production to national systems of knowledge creation and learning, in *Handbook of Economic Geography*, Clark, G L et al (eds.), London: Oxford University Press.
- MacLeod, G (1997): "Institutional thickness" and institutional governance in Lowland Scotland, *Area 29: 299-311*.

- Malecki, E J (ed.)(1999): *Making connections: Technological learning and regional economic change*, Aldershot: Ashgate.
- Malecki, E J, Oinas, P and S O Park (1999): On technology and development, in *Making connections: Technological learning and regional economic change*, Malecki, E J (ed.), Aldershot: Ashgate.
- Malmberg, A and P Maskell (1999): Localised learning and industrial competitiveness, *Cambridge Journal of Economics* 23/2: 167-186.
- Malmberg, A and P Maskell (eds.)(1999): Localised learning and regional economic development, *European Urban and Regional Studies* 6/1, Special issue.
- March Chorda, I (1995): Technopolian strategies: At the edge of an innovation-driven territorial approach, *International Journal of Technology Management* 10: 894-906.
- Maskell, P et al (1998): *Competitiveness, localised learning, and regional development: Specialisation and prosperity in small open economies*, London: Routledge.
- Nelson, R R (1991): Why do firms differ, and how does it matter? *Strategic Management Journal* 12: 61-74.
- Nelson, R R (ed.)(1993): *National innovation systems: A comparative analysis*, Oxford: Oxford University Press.
- Park, S-C (1997): The Japanese technopolis strategy, in *Innovation, networks, and learning regions?*, Simmie, J (ed.), London: Jessica Kingsley Publishers.
- Patchell, J, Hayter, R and K Rees (1999a): Innovation and local development: The neglected role of large firms, in *Making connections: Technological learning and regional economic change*, Malecki, E J (ed.), Aldershot: Ashgate.
- Patchell, J, Hayter, R and K Rees (1999b): Business segmentation and location revisited: Innovation and the terra incognita of large firms, *Regional Studies* 33/5: 425-442.
- Pleschak, F (1997): Technology and incubator centres as an instrument of regional economic promotion, in *Technology-based firms in the innovation process: Management, Financing, and regional networks*, Koschatzky, K (ed.), Heidelberg: Physica-Verlag.
- Porter, M E (1990): *The competitive advantage of nations*, New York: The Free Press.
- Pratt, A (1997): The emerging shape and form of innovation networks and institutions, in *Innovation, networks, and learning regions?*, Simmie, J (ed.), London: Jessica Kingsley Publishers.
- Ratti, R et al (eds.)(1997): *The dynamics of innovative regions: The GREMI approach*, Aldershot: Ashgate.
- Rosenfeld, S A (1995): *Industrial-strength strategies: Regional business clusters and public policy*, Washington: The Aspen Institute.
- Salais, R and M Storper (1997): *Worlds of production*, Cambridge: Harvard University Press.
- Simmie, J (ed.)(1997): *Innovation, networks, and learning regions?*, London: Jessica Kingsley Publishers.
- Simmie, J (1997b): The origins and characteristics of innovation in highly innovative areas: The case of Hertfordshire, in *Innovation, networks, and learning regions?*, J Simmie (ed.), London: Jessica Kingsley Publishers.
- Sternberg, R (1997): New industrial spaces and national technology strategies: The case of Kyushu and the Japanese "Technopolis strategy", in *Innovation, networks, and learning regions?*, Simmie, J (ed.), London: Jessica Kingsley Publishers.
- Sternberg, R and C Tamásy (1999): Munich as Germany's no. 1 high technology region: Empirical evidence, theoretical explanations and the role of small firm/large firm relationships, *Regional Studies* 33/4: 367-378.

Quévit, M and P V Doren (1997): The problem of innovative milieux and territorial structural adjustment policies, in *The dynamics of innovative regions: The GREMI approach*, Ratti, R et al (eds.), Aldershot: Ashgate.

Steiner, M (ed.)(1998): *Clusters and regional specialisation: On geography, technology, and networks*, London: Pion.

Storper, M (1997): *The regional world*, New York: Guilford.

Tichy, G (1998): Clusters: Less dispensable and more risky than ever, in *Clusters and regional specialisation: On Geography, technology and networks*, Steiner, M (ed.), London: Pion.

Young et al (1994): Targeting policy as a competitive strategy for European inward investment agencies, *European Urban and Regional Studies* 1/2: 143-159.