Cities and Regions in the New Learning Economy

EDUCATION AND SKILLS

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Publié en français sous le titre :
LES VILLES ET LES RÉGIONS DANS LA NOUVELLE ÉCONOMIE APPRENANTE

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FOREWORD

Is there a "new learning economy"? Do regions and cities play new roles in terms of governance and intervention in order to promote learning, innovation, productivity and economic performance at the local level? Such questions are high on the political agenda everywhere. This publication, which views the debate from the perspective of a regional learning economy, clearly answers in the affirmative. The emergence of new forms of knowledge-based economic activity and learning and their differing impact on various regions indicate that the abundant evidence of a shift towards the globalisation of economic processes does not mean that differences among regions are disappearing. On the contrary, a key issue is how patterns of various types of learning are implicated in the complex interaction between global and local processes. Of central importance is the idea that "learning regions" and "learning cities", which are especially well attuned to the requirements of the new learning economy, may be fostered through the development of appropriate strategies of public governance and intervention.

This publication analyses the relationships between various forms of learning and economic performance at the regional level and provides rather strong evidence of the importance of individual and firm-level organisational learning for regions' economic performance. Case studies of five regions and cities indicate that social capital – in terms of social networks and social conventions and norms – affects both individual and organisational learning. In particular, they give many examples of the ways in which a low stock of social capital can impede learning. Furthermore, regions need to be able to respond positively to emerging economic and social conditions, especially where this involves the "unlearning" of inappropriate practices and bodies of knowledge left over from "old" regional institutions.

On the basis of the empirical analysis, the final chapter presents ten policy principles for creating and sustaining "learning regions and cities". These principles provide regional and urban policy makers with advice for helping their region or city to improve its economic performance in the new learning economy through the development of innovation-intensive activities.

The case studies of regions and cities presented here derive from five conferences held between June 1998 and April 2000, with participation from the private sector, local and government policy makers and academics. The conferences took place in Jena (Germany), the Vienne Region (France), the Øresund Region (Denmark/Sweden), Andalusia (Spain) and Kent Thames-side (United Kingdom). For each of the case studies, a background report describes how each region or city envisages its transition towards a "learning city" or region. Together with a collection of regional or urban statistics, the background reports served as a major input to the analysis in Chapter 5.

This publication is a collective effort by consultants and the OECD's Centre for Educational Research and Innovation. The project was sponsored in part by the Kent Thames-side Association, United Kingdom. Professor Charles Edquist of Linköping University, Professor Gareth Rees of Cardiff University, Assistant Professor Mark Lorenzen of the Copenhagen Business School and Research Fellow Stéphan Vincent-Lancrin of the London School of Economics drafted the publication, co-ordinated by Principal Administrator Kurt Larsen of the OECD/CERI Secretariat. The work was carried out in close collaboration with the OECD's Territorial Development Service (TDS). The book is published on the responsibility of the Secretary-General of the OECD.

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Chapter 1

INTRODUCTION

The general context for this study is set by the contemporary transition from an industrial to a knowledge-based or *learning* economy and society (OECD, 1996*a*). Whilst there remains considerable debate as to the precise nature of the restructuring which is taking place, there is widespread agreement that the production and distribution of knowledge are increasingly significant processes in the determination of economic development and competitiveness. The latter, in turn, are reflected in economic growth, employment change and levels of welfare. This has enormous implications for *organisations* – firms, educational organisations, R&D institutes, departments and agencies of the state, intermediate organisations – as well as for *individuals* within education and the labour market (and, indeed, beyond). In short, the capacity of both organisations and individuals to engage successfully in learning processes of a variety of kinds has come to be regarded as a crucial determinant of economic performance (for example, Lundvall and Johnson, 1994).

The development of the learning economy involves a complexity of economic and social processes. On the one hand, it holds the promise of increased productivity and an improved standard of living. On the other, it simultaneously implies that individuals and organisations face major challenges in adjusting to new circumstances. The emergent forms of economic activity affect the characteristic nature of work and the types and levels of skills required in the economy. As a result, these developments have raised concerns about the capacity of educational systems (broadly defined) to fulfil new requirements with respect to learning. Equally, the security and general quality of jobs are being radically altered, with profound implications for the welfare of individuals. At present, however, these transformations are only imperfectly understood.

Moreover, it is clear that these processes of economic restructuring are exerting impacts that are sharply differentiated between different places. Those cities and regions that were the heartlands of primary and manufacturing industry during the industrial epoch, have borne the brunt of adjustment to the new circumstances. Likewise, the emergent forms of economic activity have their own characteristic spatial patterns. Indeed, some analysts argue that the processes of learning which are central to the continuous innovation underpinning competitive advantage in the learning economy, themselves display an inherent spatial logic, which entails new forms of differentiation between regions. Geographical proximity between firms and other organisations, on this view, is essential to the exchanges of information and knowledge through which this form of learning is achieved (for example, Storper, 1995).

Accordingly, whilst there is abundant evidence of trends towards the globalisation of economic processes (in terms of investment flows, the circulation of goods and services and so forth), this does not imply that the differentiation between localities is disappearing. On the contrary, one of the key questions is how patterns of learning – in a variety of senses – are implicated in the complex interactions between global and local processes. The distinctive characteristics of cities and regions – their economic structures, patterns of social and political relations, cultural make-up – are themselves critical in shaping *future* patterns of development. Hence, for example, a crucial determinant of a locality's economic trajectory is how far its social institutions, which reflect, at least in part, the legacy of past patterns of economic and social development, permit effective responses to the pressures generated in the new competitive environment. Clearly, some places are better able than others to adapt to the new economic imperatives.

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Equally, cities and regions are not simply passive in the face of these new imperatives. There has been a general shift of certain policies from the national to sub-national levels of decision-making in many countries (as, for example, in the case of policies on innovation and labour markets).[1] In part, this reflects the necessary efforts of urban and regional authorities to develop initiatives – frequently in conjunction with the private sector – at least to ameliorate the adverse impacts of economic restructuring and to stimulate new forms of economic activity. A number of commentators have argued that it is the regional (or more local) level which offers the greatest prospect for devising governance structures able to facilitate and foster the transition to the new patterns of knowledge-based economic activity (for example, Cooke and Morgan, 1998).

For these reasons, therefore, increasing interest and debate have been generated about how the emergence of new forms of knowledge-based economic activity are impacting on different cities and regions. Several international collaborations of "learning cities" and regions have been established. For example, the International Association of Educating Cities has a membership of over 175 cities in 26 countries, mainly in South Europe and South America, but cities from Northern Europe, North America, Africa and Australia are also members. There are also several other networks of "learning cities" and regions in Europe, often co-funded by the European Commission, including the "learning city" network of the United Kingdom, with over 30 cities involved. Of central importance here has been the idea that "learning cities" and "learning regions", especially well attuned to the requirements of the learning economy, may be fostered through the development of appropriate public intervention strategies. Clearly, this implies a consideration of much more than narrowly economic issues. If "learning cities" and "learning regions" are to provide the basis for sustainable development, they need to be viewed in the widest economic, social and environmental terms.

It is important to note, however, that in previous discussions of these concepts, "learning" has been used in different senses. Hence, much of the literature on "learning cities" refers to "learning" as the acquisition of knowledge, understanding, skills, and so forth by *individual* people, through participation in some form of education, formal or informal (for example, OECD, 1992). Very often, what is involved here is the development of strategies which will increase the amount of "learning" taking place amongst the relevant population, usually indexed by increasing participation rates or qualifications levels. In particular, the aim is frequently to extend "learning" beyond initial schooling and training to "lifelong learning". More ambitiously, there is also a concern to change the nature of what is learned; for example, to accommodate the demands of new technologies and so forth (UK Department for Education and Employment, 1998).

Previous analysis of "learning regions", on the other hand, has adopted a more complex conceptualisation of learning processes. For example, Florida (1995), in perhaps the earliest discussion of the "learning region", emphasises the significance not simply of individual learning, but also of "learning" which takes place within and between *organisations* (firms, research institutes, economic development agencies, etc). Here, the emphasis is on continuous innovation (in products, processes and wider work organisation) as the key to competitiveness. Innovation, in turn, is argued to take place most effectively in an institutional environment where "learning" is fostered through intensive information exchange between organisations; and where there are stable, high-trust relationships between organisations. Moreover, successful "networking" of this kind between organisations depends upon effective information exchange and wider social interaction *inside* organisations too: to reap the benefits of external interaction, firms, public bodies and so on themselves need to be "learning organisations" (Morgan, 1997).

In the present study, analysis focuses on both "*individual learning*" and "*organisational learning*" in the senses which have been sketched out (and which are developed more systematically below). The interrelationships between the two forms also provides a central concern. We adopt the convention of using the term "learning region" throughout, whilst acknowledging that much of the analysis could be applied also at the urban scale (that is, to "learning cities"). More significantly, we adopt a conceptual framework

1. The determination of policies has also been partly shifted from the national to the supra-national level, as in the case of the European Union (EU).

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for the analysis of "learning regions" which is derived from the literature on "regional systems of innovation" (Cooke *et al.*, 1997; Edquist, 1997). As will be argued more fully later, this framework provides a basis for delineating the relationships between processes of individual and organisational learning and other forms of economic activity that provide the basis for sustainable economic growth. Ultimately, therefore, it provides a useful analytical foundation for the development of effective policy interventions too.

In what follows, an attempt is made to explore more fully than in previous research some of these issues and developments. In Chapter 2, we map out a conceptual framework for the "learning region" by using the systems of innovation approach. This focuses on the relationships between the development of regional systems of innovation and the processes of individual and organisational learning. The latter are embodied in learning processes that embrace formal educational organisations and sites of informal learning in families and communities; as well as firms and other workplaces, universities and R&D organisations. Chapter 3 presents, on this basis, a set of research questions to be addressed in the empirical analysis. Chapter 4 addresses some of these research questions through correlation analyses of learning and economic performance for all regions in the 15 member states of the European Union (EU). In Chapter 5, our empirical analysis is given greater depth by means of five case studies of actual regions which are attempting to respond positively to the challenges posed by the emergence of the new learning economy. These cases themselves display a wide variety of socio-economic circumstances and developmental strategies. What this diversity emphasises is that each area necessarily has to create its own strategy for economic and social growth, and this strategy must reflect the specificities of its past and current circumstances. The conclusions of the empirical work are summarised in Chapter 6. The empirical work is a necessary basis for identifying problems that could and should be solved or mitigated through public policy intervention. Such policy implications are presented in Chapter 7. A crucial policy issue is how far the embodied characteristics of actual regions permit policy initiatives which reflect the inevitably more general aims derived from the analyses associated with "learning regions". Chapter 7 ends with a list of ten policy principles for creating and sustaining "learning regions".

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Chapter 2

INNOVATION, LEARNING AND REGIONS IN THE KNOWLEDGE-BASED ECONOMY

In this chapter, we outline a conceptual framework for understanding and analysing "learning regions". This framework is derived in large measure from the literature on "regional systems of innovation", which offers a coherent theoretical basis for analysing the relationships between learning, innovation and regional economic development. We address the role of knowledge as a motor of growth in the new learning economy, focusing on the critical part played by innovations of different kinds. Individual and organisational categories of learning are the key processes through which innovations are achieved. We present an analysis of these within the framework provided by the systems of innovation approach. In particular, "learning regions" are best understood as virtuous regional systems of innovation. Clear policy implications derive from this perspective, including questions of labour markets and social inclusion. Our aim is to increase our understanding of the role of learning and innovation in ensuring economic growth and social cohesion and thereby also to provide a basis for the empirical analysis and the subsequent policy discussion.

Knowledge and economic growth

As the very names imply, knowledge is the central element of the emergent mode of production that has been called the "knowledge-based" or "learning economy". Viewed from this perspective, knowledge is a crucial *input* to competitive economic activity and the generation of economic growth. For example, as proponents of human capital theory have long argued, investment in education and training ensures that enterprises have appropriate levels and forms of *competences* available (for example, Becker, 1975). Whilst it may take a variety of forms (both initial and continuing education and training, for example), what is involved here, for the most part, is the diffusion of *existing* knowledge to individuals. Alternatively, knowledge may take the form of technological or organisational *advances*. Again, such advances in knowledge may be obtained in a variety of ways: by organised research carried out in universities and research institutes; by activities in the R&D divisions of firms; by individual researchers; and by simple experience and observation of the production process. In all cases, however, what is involved is the creation of *new* knowledge. In general terms, therefore, it has come to be increasingly recognised that long-term economic growth is dependent on investment in these types of knowledge production and diffusion, as well as in the more conventional forms of physical capital (for example, Barro, 1991).[1]

However, knowledge *in itself* does not contribute to economic growth. Crucially, it has to be incorporated into the production of goods and services. Hence, educated and skilled individuals not only have to be produced (via the education and training system), but also their knowledge and skills have to be used. They actually have to be recruited into employment within enterprises and other organisations; and their work needs to be organised in ways that ensure the real utilisation of their competences. Where these conditions are not fulfilled, investment in human capital by the state, or even by private firms and individuals, does not yield benefits in terms of productivity improvements or economic growth more generally (Crouch *et al.*, 1999). In short, then, the effectiveness of investment in human capital is dependent upon the operation of the labour market, as well as upon the organisation of production inside enterprises (Rees, 1997).

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Similarly, advances in technological and organisational knowledge have to be absorbed effectively by enterprises and applied within the production process and the organisation of work more widely. This is true irrespective of whether the new knowledge is generated externally (in universities or research institutes) or internally (in the R&D division of a firm); and whether the knowledge advances embody wholly new knowledge or the development of existing knowledge into "new combinations". Clearly, the "absorptive capacity" of organisations varies substantially and this, in turn, affects their ability to produce *innovations* (Cohen and Levinthal, 1990). Viewed from this perspective, therefore, knowledge in the form of innovations may be regarded as an *output* of learning and economic activities.

It is the innovative capability of organisations which, in turn, to a large extent determines their competitiveness within the new learning economy. Especially in areas where factor costs (and especially wage costs) are relatively high, long-term, sustainable competitiveness has come to be increasingly related to the ability of firms to improve their performance by means of a continuous process of innovation, utilising the most sophisticated knowledge base available. Achieving static efficiency – through, for example, cost minimisation and economies of scale – is no longer sufficient (for example, Porter, 1990). However, the nature of innovations and the impacts which they have on productivity, employment and, ultimately, economic growth and standards of living are highly complex.

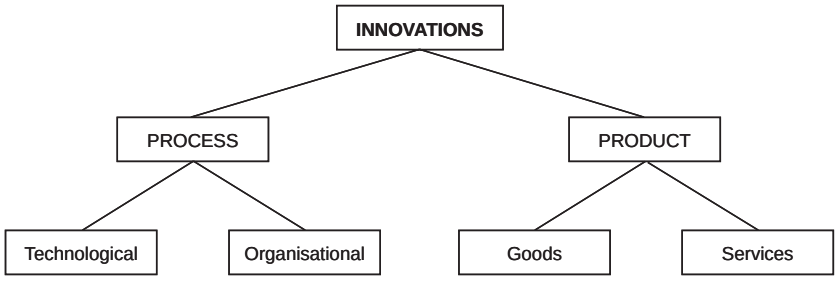
Innovations

Innovations are understood as new creations, which have economic significance by virtue of their adoption within organisations. In this sense, therefore, they embody knowledge that is *in demand*.[2] However, they do not constitute a homogeneous category. For example, different kinds of innovations can have contradictory effects on the number of jobs in organisations and on the skill requirements of the labour force. Innovations can both create jobs and destroy them; they can both increase skill requirements and decrease them (Edquist *et al.*, forthcoming 2000). Accordingly, at a meso level, the broad category of innovations may be divided into subcategories by means of the following taxonomy (see Figure 2.1).[3]

Process innovations are a matter of *how* things are produced; whilst product innovations are a matter of *what* is produced. Technological process innovations and product innovations in the form of goods generate material outcomes (and, in this regard, they conform to the widely held stereotype of innovations as inherently technical). Organisational process innovations and product innovations in services are intangibles. It is important to emphasise, however, that they are certainly no less important for this reason.

The relationships between the different kinds of innovation are complex. Firstly, there is a relationship between product and process innovations. Sometimes, the creation of a new product itself requires new process technologies. This is, for instance, the case with a new integrated circuit with a smaller line breadth, which requires new lithographic process technologies. In other cases, however, a new product can be produced with the old process technology. For example, a new mechanical pump can be produced in the same factory and perhaps even using the same machinery as an old one. In addition, the same artefact can be a product innovation initially and later be transformed into a process innovation. An industrial robot, for example, is firstly a product innovation when it is produced by ABB (Asea/BrownBovery) and then induces a process innovation when Volvo uses it. It has two "incarnations".

Figure 2.1. **A taxonomy of innovations**



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Secondly, there is a close relationship between technological and organisational process innovations. When a new technological process innovation is introduced, it is often also necessary to change the organisation of work. Organisational innovations are frequently necessary to reap the productivity benefits of technological process innovations. One of the best-known examples here is the so-called "Solow paradox"; that is, the fact that the productivity impact of the introduction of information technologies was, for a long time, smaller than expected. This has been widely understood to derive from the failure to adapt the organisational context effectively to the technological changes, that is, a shortfall in organisational process innovation (David, 1991). Only with the advent of the new economy in the mid-1990s has the organisational context begun to "catch-up" with the implications of these technological innovations. This is probably why there is more training and more employee participation in firms that implement new process technologies than in firms which do not (Weber, 2000).

Finally, there is obviously also a close relationship between new goods and new services. One example here is the relationship between a material mobile telephone system and the service of mobile phone calls. Whilst one innovation is entailed by the other, they remain analytically distinct. As we shall see later, it is important to maintain these kinds of analytical distinctions not only to facilitate understanding of the highly complex processes involved, but also to assist in the development of effective policy initiatives.

As we have mentioned earlier, innovative capability is not distributed evenly between organisations. Similarly, there are clear sectoral differences with regard to innovation processes. Pavitt (1984), for example, on the basis of an extensive analysis of technological process innovations and product innovations in goods for the UK, identifies four sectoral types. Firstly, he identifies supply-dominated sectors (such as traditional clothing and furniture), where firms generate few important innovations themselves, but rather import them from other firms. Secondly, there are scale-intensive sectors (such as food processing and cement) in which process innovations predominate. Thirdly, specialised suppliers (such as engineering, software, instruments) are characterised by frequent product innovations, often developed in collaboration with their customers. Finally, there are science-based producers (such as chemicals, biotechnology, and electronics) who develop both new products and processes, sometimes in close collaboration with universities and research institutes.

It is the latter sectoral pattern which has tended to dominate consideration of innovation processes; and which conforms most closely to the widely held, but actually incorrect view that innovation is confined to the "high-tech" industries (a point to which we return later). This has often been combined with a linear model of the innovation process itself, which envisages basic scientific research as the first step, followed by technological application, with the introduction of innovations as new products and processes constituting the final phase. As we have seen, the nature of innovations is far more heterogeneous than this suggests. Moreover, there is now a very substantial body of research which shows that the linear process of innovation is the exception rather than the rule (for example, Freeman, 1987; OECD, 2000*a*). On the contrary, the processes through which innovations emerge are extremely complex; they have to do with the emergence and diffusion of knowledge elements (that is, with scientific and technological possibilities), as well as the "translation" of these into new products and processes. They are characterised by complicated feedback mechanisms and interactive relations involving science, technology, production, policy and demand (Edquist, 1997). Perhaps most significantly, innovation processes embody complex forms of *learning*.

Learning and knowledge capital

As we have already begun to indicate, innovation processes embody different forms of knowledge and learning. Knowledge itself may be regarded as an asset or a commodity (albeit with rather peculiar characteristics). Knowledge is a "stock" concept. Learning is a "flow" concept or a process, the result of which is the dissemination of existing knowledge or the production of new knowledge. For the purposes of the present analysis, it is important to distinguish initially between *individual learning* and *organisational learning*.

I*ndividual learning* here refers to the acquisition of information, knowledge, understanding and skills by individual people, through participation in some form of education and training, whether formal (as, for example, within educational institutes) or informal (for example, "learning-by-doing" in the workplace). To

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a considerable extent, therefore, individual learning involves the dissemination of existing knowledge, even though it is new to the individual acquiring it. However, in certain circumstances, individual learning may also involve the creation of new knowledge; as, for example, where individuals create new knowledge through R&D. The result of individual learning is the stock of *human capital*, which, in turn, is a form of "knowledge capital". With the development of the new learning economy, it is likely that the value and importance of human capital – along with other forms of knowledge capital – is increasing.

In important respects, the individual exerts substantial controls over the application of human capital. The firm where the individual is employed can profit from the latter's human capital only as long as the employee continues in the firm's employment; and he or she may leave at any time. All firms live under the threat that the most skilled of their employees may leave for a competitor or create a competing firm, once they have accumulated experience and built up a contact network. Employee ownership programmes and stock option programmes to tie key employees to the firm are therefore becoming more common. The power balance between *some* employees, defined in terms of their significant human capital, and the owners of firms have changed because of the increased importance of human capital to production in the new learning economy.

There are some forms of "knowledge capital", however, which cannot easily leave the firm. These may be termed *structural capital*; that is, the knowledge capital that is retained by the firm independently of the presence of particular employees.[4] Structural capital includes the information and knowledge embodied in, for example, data bases, customer directories, trade marks, manuals and technical solutions. It also encompasses assets related to innovations, such as licences, patents, other kinds of intellectual property rights, copyrights, trade secrets and so forth. These are controlled by firms and other organisations and not by individuals; they belong to the firm independently of the individuals who are employed at any one time. Similarly, the knowledge and skills encapsulated in firm routines and work processes may, in certain circumstances, be retained by firms and, for example, transmitted to new employees when they join. Structural capital can be seen as providing a kind of infrastructure that supports human capital; the two forms of knowledge capital complement each other. Structural capital may also be regarded as human capital that has been appropriated by the firm, translated into routinised forms and thereby controlled by the firm. Of course, it is safer for a firm to have access to structural capital than to rely only on human capital; and this underpins firms' activities to transform human into structural capital (there are even software programmes designed to do exactly this). There are, however, limits with regard to the degree to which human capital can be transformed into structural capital in a market economy. In general, the production of the stock of structural capital is dependent upon the process of organisational learning.

O*rganisational learning* depends upon individual learning and builds upon it. As Nonaka and Takeuchi (1995) argue, organisational learning " (...) amplifies the knowledge created by individuals and crystallises it as part of the knowledge network of the organisation. This process takes place within an expanding "community of interaction' which crosses intra- and inter-organisational levels and boundaries". Firms (and other organisations) can appropriate *existing* knowledge from outside or create *new* knowledge either inside the firm or in interaction and collaboration with other organisations. Crucially, organisational learning involves the creation of new knowledge to a much greater extent than individual learning. It is precisely the *interactive nature* of organisational learning that permits this to occur.

It is perhaps helpful to summarise these initial definitions in the form of Figure 2.2, before proceeding to a more detailed discussion of the two forms of learning and their inter-relationships. As we shall see in greater detail later, there is an important sense in which the activities summarised in Boxes A and C of Figure 2.2 are a necessary precondition for those summarised in Boxes B and D. It is the latter which are necessary for the creation of innovations.

Individual learning

Individual learning itself takes a variety of forms. After initial socialisation within the family, it is conventionally associated with formal education in schools, colleges and universities and with formal

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Figure 2.2. **Categories of learning**

	Dissemination of existing knowledge	Creation of new knowledge
Individual learning (resulting in human capital)	**A** *e.g.* schooling; vocational training; "learning-by-doing" in the workplace	**B** *e.g.* university-based research by PhD student; "learning-by-doing" in the workplace
Organisational learning (resulting in structural capital)	**C** *e.g.* building data bases, creation of routines and manuals; appropriation of technological licences from other firms; recruitment of highly qualified staff by firms	**D** *e.g.* R&D in universities by research groups; R&D within firms; collaborative R&D between firms and research institutes

vocational preparation through apprenticeships and other forms of initial, work-related training. Each of these forms of individual learning is *primarily* concerned with the dissemination of existing knowledge (Box A in Figure 2.2). Moreover, it can be seen that the latter has specific characteristics. In particular, it is weighted towards the forms of knowledge which Lundvall and Johnson (1994) refer to as "know-what" and "know-why". "Know-what" refers to knowledge about "facts" and is thus close to what is conventionally called information and it may be codified and communicated relatively straightforwardly. "Know-why" refers to knowledge about principles and theories in relation to the organisation and functioning of the natural world, society and, indeed, the human mind. Again, albeit at varying levels of complexity and sophistication, this form of knowledge may be codified and communicated quite readily.[5]

Clearly, both these forms of knowledge – and hence the types of individual learning from which they characteristically derive – constitute necessary, although not, of course, sufficient, prerequisites for innovations of all kinds. Most obviously, the majority of technological process innovations and most product innovations, especially in Pavitt's (1984) "science-based" industries, such as chemicals, biotechnology and electronics, do not occur without access to rather sophisticated forms of scientific knowledge of these kinds. In this context, therefore, the role which universities and other higher education organisations play in producing graduates (including those with higher degrees) who have the requisite levels of scientific and technological knowledge, is crucial. Similarly, organisational process innovations may not occur without the availability of the higher level knowledge available to graduates in, for example, management studies or economics. Hence, acquiring human capital of these kinds constitutes an integral part of innovation processes of these types. This is ensured by the recruitment into organisations (firms, R&D institutes and so forth) of individuals with the appropriate levels of education and training. Certainly, effective arrangements to ensure the flow of graduates (with the appropriate specialist competences) from universities and other higher education organisations into firms and other organisations is a major element in securing the conditions for innovation to occur. Moreover, it is clear that these arrangements are by no means straightforward to establish, especially in respect of small and medium-sized firms (SMEs), with a consequent weakening of innovative capability (for example, Goddard, 1999).

This is not to suggest that it is *only* these higher levels of formal education and training which are relevant. It is well established, for example, that high-quality general education and the development of effective intermediate-level education and training have important effects on productivity and, consequently, competitiveness. Again, the nature of the inter-relationships between schools, colleges and training institutes, on the one hand, and firms, on the other, is crucial; and these vary widely between different national systems (even ones which are equally successful economically) (Ashton and Green, 1996). Even detailed issues of curriculum, for instance, have been argued to be of great significance (Prais, 1993). Moreover, it is clear that a substantial part of the contribution made to improved productivity by these levels of formal education and training derives from ensuring the more effective operation of *existing* technologies and work organisations, rather than from the processes of innovation themselves. It is true that proponents of the improvement of continuing training (a major

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element in the "lifelong learning" movement) frequently invoke the demands made on employees by new technologies and forms of work organisation to justify their proposals. However, even here, the emphasis is upon adapting to innovations effectively, rather than actually creating them (for example, Ryan, 1991). In short, therefore, individual learning through the various levels of formal education and training provides an essential basis for innovation processes, but it does not by any means ensure that innovations will in reality take place. This clearly has important implications for the development policies intended to foster innovative capabilities and economic growth more generally.

However, other forms of individual learning also play a significant part in innovation. In particular, "learning-by-doing" is a key process of knowledge production and dissemination. This type of learning falls outside of formal education and training and is generated in the course of normal economic activity (for example, Myers and Davids, 1993). Hence, for example, the experience of routinely participating in the production process allows individuals to acquire what Lundvall and Johnson (1994) refer to as "know-how" and Molander (1992) describes as "practical knowledge", in the form of skills and skilful performance: the ability to do things. "Know-how" is reflected in the skills and competences of production workers, but it also plays a key part in all types of employment-related activities, including those associated with professional, managerial and scientific occupations (for example, Eraut, 1994). Indeed, recent evidence suggests that, whilst the "practical knowledge" acquired through "learning-by-doing" may be especially important for individuals who have fared relatively badly within formal education and training (Gorard *et al.*, 1999), it also constitutes a major element of the knowledge which is applied to work across most occupations, including professional and managerial groups (Eraut *et al.*, 1998).

"Know-how" or "practical knowledge" constitutes a significant input into the innovation process. To a much greater extent than formal individual learning, "learning-by-doing" provides a basis for the generation of new knowledge (Box B in Figure 2.2). This is obviously the case when viewed from the perspective of the individual experiencing the learning. However, skilled and competent employees (that is, with high levels of "practical knowledge") can experiment and "try things out" in ways which can contribute significantly to both product and, perhaps in particular, process innovations. This may be especially the case within firms in traditional, low-tech sectors, where significant productivity gains can be achieved through innovations in respect of production organisation, logistics, marketing, industrial relations and so forth (Maskell, 1998). In appropriate circumstances, innovations of this kind may be highly significant. However, the extent to which "practical knowledge" actually informs innovation processes reflects the internal organisation and management style of the firm. Flexibility, the minimisation of hierarchy and employee involvement, for example, have long been argued to impact significantly on innovative capability (Burns and Stalker, 1961).

"Learning-by-doing" has a strongly experiential basis; and the "know-how" to which it gives rise is difficult to codify and communicate in the ways associated with the "know-what" and "know-why" forms of knowledge. Moreover, this relative tacitness is closely associated with the embedding of "practical knowledge" in particular social settings (for example, Lave, 1993). Hence, "know-how" is typically a form of knowledge that is specific to, for example, a particular firm or even a group of workers. This clearly poses problems for the development of strategies aimed at promoting "learning-by-doing" and increasing "practical knowledge". However, attempts have been made – especially in the UK, but also in Canada and elsewhere – to recognise such "know-how" through qualifications which reward the capacity to carry out specified, work-related tasks, rather than the successful completion of periods of formal education and training (Jessup, 1991). In some regards, too, the contemporary emphasis within some approaches to formal education and training on promoting the general capacity to learn – "learning to learn" – rather than more specific skills, reflects an acknowledgement of the significance of the "practical knowledge" which can only be acquired through the actual practice of carrying out a job (de Jong, 1997).

Most significantly, however, both the production and dissemination of "know-how" is facilitated by what has been termed "learning-by-interaction".[6] Quite simply, individuals are able to build significantly on what they learn through "learning-by-doing" by communication and exchange with others – colleagues both in the work-place and outside (for example, Rubenson and Schuetze, 1995). Recent evidence from the UK suggests, moreover, that individual "learning-by-interacting" is especially important where people

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perceive themselves to have exhausted the learning potential of "learning-by-doing" on their own account (Eraut *et al.*, 1998).

Moreover, of course, "learning-by-interacting" provides a means by which "practical knowledge" may be transmitted amongst a group of employees. As Eraut *et al.* (1998) put it: "For many people learning arose out of the challenges posed by their work – solving problems, improving quality and/or productivity, getting things done, coping with change – and out of social interactions in the workplace with colleagues and customers/clients. This learning was either facilitated or constrained by 1) the organisation and allocation of work and 2) the social climate of the work environment." The latter point, of course, is crucial. It is now widely acknowledged that firms and other organisations are able to exert substantial impacts on the rate of individual learning that takes place, not only through its strategies for formal education and training, but also through the fostering of "learning-by-interacting". In particular, the shortening of hierarchies, the decentralisation of responsibility to lower-level employees and flexibility in work organisation are regarded as key elements in creating an environment in which "learning-by-interacting" may prosper.

The so-called "learning organisation" is one which attaches major priority to all forms of individual learning (for instance, Senge, 1990). However, as we have shown earlier, formal education and training, primarily disseminating existing knowledge, contributes differently to innovation capability from "learning-by-doing" and "learning-by-interacting", where the creation of new knowledge is much more frequent. The former is certainly a necessary prerequisite of strong innovative capability, but it is the latter that is most directly related to it.

Organisational learning

"Learning-by-interaction" is also regarded as the key to moving beyond individual learning to achieve effective *organisational learning*. In particular, organisational learning depends not only on generating high rates of "learning-by-interaction" (as well as other forms of individual learning) *inside* the organisation, but also *between* organisations. Hence, as the amount and complexity of knowledge requirements increase with the development of the learning economy, so organisations need to co-operate in order to share the specific forms of knowledge available to them separately. In this context the "practical knowledge" available to particular organisations is especially important by virtue of its embeddedness in specific settings.

This sharing of knowledge takes a variety of forms. It may involve the acquisition of *existing* knowledge from other organisations (Box C in Figure 2.2), such as firms, universities, R&D institutes and so forth, through the purchase of technological licences or other less formal types of exchange which result from routine interaction with suppliers and customers. Once acquired, such existing knowledge may be integrated with other knowledge elements in new combinations to produce innovations of various kinds. Similarly, organisations collaborate with others in order to produce *new* knowledge – and thus potentially innovations – directly (Box D in Figure 2.2). For instance, firms and research institutes are increasingly forming R&D consortia with the objective of generating new knowledge as the basis for innovations. Likewise, universities and firms frequently work together to the same end.

Certainly, empirical analysis shows that these forms of organisational "learning-by-interaction" are crucial to the development of innovative capability. For example, a recent Swedish study shows that 70 per cent of the respondent firms, which had developed product innovations, did so in collaboration with other organisations. It remains the case, of course, that 30 per cent of firms that were involved in product innovation, did so in isolation. Moreover, the knowledge acquired from other firms was normally (in 70 per cent of cases) combined with that developed through learning inside the firm. Nevertheless, this analysis illustrates clearly the significance of high levels of organisational "learning-by-interaction" to successful innovation (Edquist *et al.*, 2000). Accordingly, a number of commentators have argued that the innovation process is much more complex and diverse than is suggested by the stereotype of linear progression from basic scientific research, to applied R&D, to the application of innovations in production. Rather, it should be seen as a process which embodies interactive learning for individuals and for organisations; and which thus produces both enhanced individual competences, as well as product and process innovations as outcomes (for example, Lundvall, 1992).

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Systems of innovation

Institutions and organisations

This emphasis upon patterns of interactive learning provides the foundation for systemic approaches to the analysis of innovation processes (for example, Freeman, 1987; Lundvall, 1992; Nelson, 1993; Edquist, 1997; Edquist and McKelvey, 2000). From this perspective, *systems of innovation* are conceptualised in terms of the organisations involved in the development, diffusion and use of innovations and their inter-relationships. The learning made possible by interaction is central. Firms do not innovate in isolation, but in interaction with other organisational actors. For example, the long-term innovative performance of firms in science-based industries is strongly dependent upon the interactions between these firms and universities and research institutes. This interactive learning between firms and between firms and other organisations is, in turn, shaped by (and shapes) market competition, as well as the framework of existing institutional rules.

The systems of innovation approach emphasises that innovation is an endogenous part of the economy, and, in fact, constitutes an important determinant of economic change. Innovations are thus seen as part of a wider process of the development of knowledge of economic relevance. Innovation processes involve evolutionary economic change over time and these processes are uncertain. Hence, an innovation system never achieves the kind of equilibrium associated with conventional economic analysis. It is *ex ante* not possible to specify an optimal system of innovation or whether a given trajectory is the best one to follow. For these reasons, the systems of innovation approach does not make use of the notion of optimality.

The *organisations* with which innovating firms interact include other firms (suppliers, customers and competitors) as well as R&D institutes and universities and organisations whose objectives are to facilitate learning processes – through, for example, providing education and training, venture capital or other forms of business services (Morgan *et al.*, 1999). Such organisations constitute the actors of the innovation system; although the nature of their interaction is necessarily constrained by the characteristics of the network(s) of organisations in which they are involved. Most obviously, strongly hierarchical or vertical networks between, for example, firms and their suppliers and sub-contractors, involve a radically different dynamic as compared to non-hierarchical or horizontal networks between, say, firms of equivalent standing involved in joint ventures or R&D consortia (Cooke and Morgan, 1993). Other networks may be based upon less formalised interaction between organisations. For example, firms may simply exchange employees or information on an *ad hoc* basis; or the interaction between firms may be based upon participation in civic associations, such as chambers of commerce, professional associations or even sporting clubs (Cooke and Morgan, 1998).

The interaction between the organisations comprising a network (or system) reflects not only market relationships, but also the wider social and cultural context. More specifically, the quality of the relations between organisations (and consequently the interactive learning that takes place) is profoundly shaped by what have been described as *institutions* (Edquist and Johnson, 1997). The latter comprise the social rules, cultural norms, routines and conventions through which interaction between organisations is regulated. They comprise the "rules of the game" which influence the behaviour of organisations by constituting constraints on or incentives for learning and innovation to take place. To take a critical example, where the inter-relationships between organisations are characterised by high levels of *trust* – that is, expectations of honest, non-opportunistic behaviour – then uncertainty in relation to knowledge exchange is reduced, stable and reciprocal interactions are developed and consequently innovative capability is greatly enhanced. Where such trust is absent, then organisational learning through interaction is correspondingly much more difficult and may be absent altogether (Maskell *et al.*, 1998). Accordingly, where institutions provide the basis for trustful relationships between organisations, the latter co-operate through interactive learning and lower the costs of doing so.

Some institutions are the product of conscious design (for example, legal regulations, such as patent laws and (some) technical standards); and may therefore constitute public policy instruments. Other institutions, however, are simply the residue of past social, cultural and economic development.

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They represent the involuntary outcomes of social change over extended periods of time and are constituted in informal social rules and conventions (and their origins may therefore be difficult to analyse). For example, the debates over the determining features of the Italian "industrial districts" demonstrate their rootedness in patterns of historical development in these areas (if little else) (Harrison, 1992). Institutions of this latter kind are, of course, much more difficult to affect by means of policy interventions.

Policy implications

More generally, it is important to emphasise that the systems of innovation approach has significant implications for policy. In the real economy, markets are always institutionally embedded; rules, norms, laws and regulations are necessary to make possible market exchanges of all kinds between individuals and organisations. In other words, "pure markets" do not exist; and, even if they did, they could not be relied upon to produce the circumstances necessary for effective learning and innovation (Lundvall, 1988, p. 350). As we have seen, these institutions, in turn, are in part the unpremeditated product of long-term processes of social and economic development. Equally, however, they also need to be sustained by means of active policy intervention; and public organisations have a key role to play in ensuring the conditions necessary to effective interaction between organisations (through, for example, the provision of high-quality educational opportunities, the provision of research facilities, securing intellectual property rights, and so forth). Accordingly, the crucial issue is not whether policy makers should intervene or not; but rather, what *forms* of intervention are likely to be most effective in actually existing situations. When (in which situations) is public intervention called for? Or, to put this in another way, given that policy interventions cannot and should not be pervasive, on what should policy concentrate? And what should policy makers *not* do? In the empirical analysis that follows, one of our objectives is to identify some of the more fruitful forms of policy intervention and the conditions under which they may be successful. However, initial answers to these questions can also be offered in general terms here.

At the most general level, two conditions need to be fulfilled for public intervention in a market economy to be justified at all.[7] Firstly, the market mechanism and capitalist actors must fail to achieve the objectives for economic and social development that are formulated within the political process. There is no justification for public intervention if these objectives are already being fulfilled simply through the operation of the market. Public intervention should be a complement to the market, not replace or duplicate it. In other words, there must be a "problem" whose resolution calls for public intervention. Such problems can be identified through analysis.[8] Secondly, the public authorities (national, regional, local) must have the *capability* to solve or mitigate the "problem". Clearly, if they do not do so, there should be no policy intervention, since the result would be failure. For example, it may not be possible to solve the problem by means of policy intervention at all. Alternatively, the public authorities may first need to develop their competences with respect to the problem, through, for example, more detailed analysis or the creation of new organisations and institutions (such as, for instance, a patent office or patent law).

More specifically, the systems of innovation approach permits the identification of policy implications that derive from the general characteristics of innovation systems.[9] Hence, given that much learning is interactive, it follows that innovation policy should not only focus on the elements of the system, but also – and perhaps primarily – on the *relations* among these elements. This includes not only the relations amongst different kinds of organisation, but also those between organisations and institutions. For example, as mentioned earlier, the long-term innovative performance of firms in science-based industries is strongly dependent upon the interactions of these firms with universities and research institutes. Hence, where these interactions are not spontaneously functioning smoothly, they should be facilitated by means of policy. The laws and rules governing the relations between universities and firms shape these interactions and it is therefore important that these institutions are appropriate for enhancing collaboration. In periods of structural change, a country may have to redesign many of its organisations and institutions. This has been the case recently in Eastern Europe, following the collapse of the Soviet system. The

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design of new organisations and institutions was also very important in the innovation policies and more general development strategies of Japan, South Korea, and other Asian economies. Such changes are important engines in the development of whole systems of innovation.

Large-scale and radical technological shifts – that is, shifts to new trajectories of development – have rarely taken place without public intervention.[10] In addition, a minor intervention at an early stage in the product cycle may have a tremendous impact, as in the case of the creation of the NMT 450 mobile telecommunications standard in the Nordic countries. Conversely, a major effort at a mature stage of the product cycle may have only a small impact. For example, the large-scale support to the ship-building industry in Sweden in the 1970s only marginally prolonged its life. These are obviously arguments for early policy intervention and for supporting the emergence of new sectors, which would facilitate transitions from dead-end trajectories for firms, industries and whole economies. The question remains, however, of how policy makers can contribute to the development of alternative patterns of learning and the nurture of emerging sectoral systems of innovation. A key issue here is the choice between supporting existing systems (with their historically accumulated knowledge bases) and supporting the development of radically new technologies and sectoral systems, founded on new knowledge bases.[11]

Another consequence of the interdependent and non-linear view that characterises the systems of innovation approach is that it is natural to bring in *demand* as an important determinant of innovation (Edquist and Hommen, 1999). This widens the traditional, supply-side view of innovation policy to include instruments working from the demand side. These include various laws, regulations and standards – that is, institutions – influencing suppliers with respect to the product that is developed and produced. They also include public technology procurement as an innovation policy instrument. Such procurement means that a public agency, as a sophisticated customer, places an order for a product or system that does not (yet) exist. It can thereby trigger innovation, create a market, lead to the fulfilment of previously unsatisfied needs, and solve previously "unsolvable" socio-economic problems (Edquist, Hommen and Tsipouri, 2000).

The systems of innovation approach also provides a framework for identifying the particular "problems" within a given innovation system that should be addressed by public intervention and for specifying the form that such intervention should take. Substantial analytical and methodological capabilities are needed to identify "problems", irrespective of whether policies are being made at the regional, national or supranational level. Such capabilities are also needed to design policies that can mitigate the problems. There is no way to identify these problems on the basis of theory alone, with sufficient specificity for purposes of policy making. No theory or approach can tell a politician or policy maker exactly how best to use a hundred million ECU to enhance learning processes.

Systems of innovation can be quite *different* from each other. This makes it not only natural, but also vital to *compare* different systems. Since problem identification cannot be based on comparisons between existing systems of innovation and an optimal one, it has to be based upon comparisons between different existing ones. Without such comparisons, it is impossible to argue that one system is specialised in one way or another; or that a system performs well or badly. System comparisons must be genuinely empirical and very detailed. They are therefore similar to what is often called "benchmarking" at the firm level. Such comparisons are crucial in identifying the "problems" within a given innovation system and that should be the object of policy intervention. They may thus also provide the initial basis for indicating to policy makers when, where and how to use financial resources for innovation purposes and for delineating specific policies with respect to new institutions and organisations, how to organise education and learning, and so forth. However, the identification of a "problem" by means of "benchmarking" is certainly not a sufficient basis for designing innovation policies; it is only a first step. To know that there is reason to consider public intervention is not enough. An identification and description of a "problem" only indicates *where* and *when* intervention is called for. It says nothing about *how* it should be pursued. In order to be able to design appropriate learning policy instruments, it is necessary also to know (at least the most important) causes behind the problem identified. A causal analysis may also reveal that public intervention is unlikely to solve the problem identified, due to lack of capability.

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In the empirical part of this study (which follows), we have gone some considerable way towards providing the kind of concrete, empirical analysis, set firmly within a comparative framework, which the systems of innovation approach demands (but which has only infrequently been provided). This permits not only the identification of "problems" in particular innovation systems, but also the delineation of fruitful policy interventions to address them. More specifically, as we have seen, the focus in this work is upon the regional level of analysis. In short, the comparative analysis of "regional systems of innovation" provides some guidance for those policy makers whose aim is to create a "learning region".

"Learning regions" as virtuous regional systems of innovation

Innovation systems were initially defined as national in scope, reflecting significant differences in national systems in terms of network characteristics and institutions. National systems of innovation can differ significantly from each other, with regard, for example, to specialisation of production, resources spent on R&D and organisational and institutional set-up. Industrial production in the United States, for instance, is much more specialised in the production of R&D intensive ("high-tech") products than is industrial production in the EU. Furthermore, within the EU, investments in R&D vary greatly between countries. In addition, organisations and institutions constituting elements of the systems may be quite different. For example, research institutes and company-based research departments may be important organisations in one country (such as Japan), while research universities may perform a similar function in another (such as the United States). Institutions such as legal systems, norms and values also differ between national systems. More recently, however, considerable attention has been focused on *regional systems of innovation*; and it is these that are of particular interest here (Cooke *et al.*, 1997; Braczyk *et al.*, 1998).[12]

At the most basic level, interest in regional innovation systems arises simply from the manifest differences in economic growth and levels of welfare between regions. More specifically, there are empirical grounds for the view that such regional differentials are becoming more significant, despite the wider context of the globalisation of economic activity. For example, recent research has shown that whilst there is a tendency towards long-term convergence in productivity and income at the national level within the EU, regional-level analysis reveals either little change in patterns of dispersion or a tendency towards actual divergence (Cappelen *et al.*, 1999). This obviously begs questions as to how far these regional economic trajectories are explicable in terms of significant differences in innovation capability and the processes of individual and organisational learning on which it is based.

Certainly, it is clear that the interactive learning which takes place within networks of organisations, is *to some extent* dependent upon their spatial proximity: it facilitates collaboration between firms and other organisations. For example, a recent Swedish study reveals that of the respondent firms which were involved in collaboration with other organisations related to product innovation, just over half had at least one partner organisation which was located within the same region (East Gothia). Moreover, a quarter nominated their most important partner organisation as located here (Edquist *et al.*, 1998). However, it is also possible that effective collaboration and interaction may take place within networks which are highly dispersed. Bellet *et al.* (1993) have developed the notion of "organisational proximity" to encapsulate the shared knowledge and understandings of the environment in which firms exist that are necessary to provide a basis for collaboration and interactive learning between firms (and, indeed, different units within a firm). "Organisational proximity" may or may not be dependent on spatial proximity; and the growing sophistication of information and communication technologies opens up new possibilities for the growth of effective networks of organisations based upon spatially dispersed interaction (for example, Castells, 1996).

Nevertheless, it remains the case that significant elements of organisational learning do take place within networks of organisations that are spatially proximate. Most obviously, spatial proximity may facilitate organisational learning through the *mechanics* of interaction; for example, by increasing the probabilities of encounters between agents within the innovation system. More fundamentally, however, it has been argued that at least elements of the *knowledge* which is produced and disseminated through interaction is *tacit and embedded in particular, local milieux*. Accordingly, it is not readily codified and

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communicated. Rather, access to such knowledge depends upon participation in the local social system within which it is produced. For example, knowledge about key aspects of the local production system or the organisation and functioning of the local labour market, is developed over long periods of time. It may be confined – at least in large part – to those who actually experience them (especially in respect of "know-how" knowledge forms). Hence, Storper (1995) argues that "(...) the region is a key, necessary element in the "supply architecture' for learning and innovation", where "untraded dependencies" between firms (and other organisations) play a crucial role. Accordingly, in analysing the interactions which take place between networks of firms both the traded and untraded elements need to be taken into account, with the latter, in particular, likely to take localised forms. Moreover, it has also been suggested that these forms of localised knowledge provide key competitive inputs, in a world in which the availability of many of the traditional foundations of local competitive advantage has become ubiquitous as a result of globalisation (Maskell and Malmberg, 1999).

These arguments about localised access to certain forms of knowledge are closely related, in turn, to analyses, which emphasise the significance of localised *institutions* (in the sense in which this term was used earlier). Of particular interest here are the recent developments with respect to the concept of *social capital*. There are several competing definitions of what is at the core of this concept. However, in broad terms, it encompasses the norms, values and beliefs which are shared in everyday interaction within social networks and which enable the co-ordination of action to achieve desired goals (for example, Woolcock, 1998). Social capital may, of course, be analysed in terms of the social structures of whole societies. However, there are also significant elements of differentiation between regions and, indeed, more local communities, in terms of their accumulated stock of social capital. And this, in turn, reflects the differences in localised paths or trajectories of economic, social and cultural development (for example, Putnam, 1993).

What is crucial for present purposes is that numerous commentators have argued that large stocks of social capital in a given community or region have benign consequences for economic development, with learning of various types providing the critical intermediary processes. For example, Coleman (1988) has argued that the generation of human capital – with consequent impacts on economic performance – may be enhanced where there are appropriate forms of social capital. In particular, he emphasises the effects of strong obligations and expectations as to educational performance in an environment characterised by high levels of trust. He also stresses the impact of norms of appropriate educational behaviour, supported by effective social sanctions. More recently, British research has built upon Coleman's analysis to account for the sharp divergences between school-based individual learning and participation in continuing education and training in Northern Ireland and Scotland (Field, 1999).

Organisational learning has also been strongly related to social capital. Putnam's (1993) seminal research concluded that regions with high levels of social capital derived manifold benefits, including superior economic performance. The prevalence in such regions, he argues, of strong social networks and normative structures – what may be termed "civic social capital" – provides the basis for trustful interaction between citizens, thereby facilitating collaboration and the co-ordination of social action. More specifically, individuals "(...) are able to find and keep good jobs, initiate projects serving public interests, costlessly monitor one another's behaviour, enforce contractual agreements, use existing resources more efficiently, resolve disputes more amicably, and respond to citizens' concerns more promptly (Woolcock, 1998)". This type of rather broad-brush approach has subsequently been elaborated substantially. For example, Woolcock (1998), in an analysis specifically concerned with the relationships between social capital and economic development, specifies a model of social capital along two dimensions: macro/micro (or societal/local community); and inward/outward connectivity. The constellation most conducive to economic development, he argues, is where, at the micro-level, local communities are both strongly *integrated*, with powerful intra-community ties, but also have effective *linkages* to the wider world (both through individuals, as well as organisations such as firms, universities and so forth). At the macro-level, optimal conditions are where the state has strong *synergy* with civil society, but remains *autonomous* and organisations exhibit high degrees of competence and capability to undertake effective action. Equally, of course, different combinations of these four dimensions of social capital can account for alternative outcomes in terms of economic development, which are *not* benign to the same extent.

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Of especial importance for the analysis presented here are those approaches to social capital that focus directly upon the relationships between *organisations*. Within this perspective, social capital encompasses the norms and other social conventions that influence the interaction that takes place within networks of firms and other organisations. This interaction may take traded forms, as, for example, in customer-supplier relationships or through employers' associations, or untraded ones, as in informal association through civic activities, sporting clubs and so on. Whilst this form of social capital may be enhanced by the presence of more general forms of civic social capital, it may also exist independently; equally, civic social capital is not automatically translated into social capital within networks of organisations.

More specifically, interactive learning between organisations is greatly facilitated where network relationships are characterised by high degrees of trust. It may be that such trustful relationships are developed through the process of interactive learning itself. Gradually, over time, organisations generate forms of interaction and knowledge exchange which are increasingly dependent upon high trust, as distinct from market or other bases of exchange (Maskell *et al.*, 1998). It may be too that this sort of process of developing trustful relationships between organisations may be facilitated by a conscious strategy on the part of state or other agencies, through, for instance, providing the information necessary to bring firms together in knowledge-exchange relationships (Morgan *et al.*, 1999). However, in circumstances where there is already an *accumulated stock* of appropriate social capital that provides the basis for an environment of mutual trust, establishing and sustaining interaction and knowledge exchange between organisations is much easier. More specifically, the costs associated with a high degree of innovative capability – and the organisational learning on which it is substantially based – are significantly reduced. Accordingly, those regions where there is a large stock of social capital enjoy significant competitive advantages within the new learning economy over those where trust has to be built *ab initio* through interaction (Maskell, 1999).

This discussion has so far concentrated upon the beneficial effects of large stocks of social capital on economic development. However, as we mentioned earlier, other sorts of effects are possible too (Woolcock, 1998). In particular, problems arise where the current stock of social capital in a region serves to constrain the action needed to meet effectively the demands which emerge from changing economic circumstances. Social capital (as with institutions more generally) is to a large extent the product, most frequently unintended, of past and current patterns of economic and social activity; the norms, values and beliefs which are sustained in social interaction reflect this past trajectory of development. Even where these norms and values have been beneficial for economic development (which is clearly not always the case), they may cease to be so where economic circumstances change significantly. Hence, to the extent that they are retained, they contribute little to economic growth and vitality and may actually come to constitute a barrier to successful adaptation to new conditions. Such "path-dependency" may thus confine regions to development trajectories leading to low growth, decreasing employment, declining income levels and so forth.

In very similar terms, Grabher (1993) has discussed at length how this kind of "path-dependency" may produce "lock-in" within a regional innovation system. He emphasises how the functional relationships that arose previously between actors within the regional innovation system, may act to prevent the development of new relationships with organisations able to bring new experience and knowledge to emergent economic circumstances. In consequence, interaction between organisations is restricted to existing knowledge bases, preventing the perception of new innovation opportunities and knowledge sources. Moreover, he suggests that, in this situation, the political and administrative agencies within the region are insufficiently reflexive to stimulate new initiatives, which would promote the breaking-out from conditions of stasis and ultimately decline. What is required in these circumstances, therefore, is a substantial process of "*un*learning", before new rounds of learning, adapted to emergent economic circumstances, can be undertaken.

These latter arguments pointedly raise the question of how to generate the conditions for effective processes of learning and innovation in those regions in which they are currently absent. It is in this context that the true significance of the "learning region" lies (Florida, 1995). It constitutes a *model*

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towards which actual regions need to progress in order to respond most effectively to the challenges posed by the ongoing transition to a "learning economy". This model can be specified in terms of the analytical apparatus of the regional systems of innovation approach (and the wider "systems of innovation" approach from which it is derived). Indeed, the "learning region" can be thought of as an especially "virtuous" and effective variant of regional innovation system. Accordingly, in "learning regions", firms – whether in manufacturing or services – are competitive and the basis of this competitiveness is the innovative capacity of firms and other organisations. This innovative capacity, in turn, depends upon highly effective individual learning, whether through formal education or learning-by-doing, which is tailored to the needs of the regional economy, but is sufficiently flexible to adapt as regional economic circumstances change. However, it is organisational learning – both within and between firms and other organisations – that provides the direct key to the high levels of innovative capacity which are characteristic of the "learning region". Again, however, the ability to be flexible and to sustain interaction and knowledge exchange between organisations in the face of changing economic circumstances is crucial to the "learning region". Hence, the "learning region" is characterised by regional institutions, which facilitate individual and organisational learning through the co-ordination of flexible networks of economic and political agents. In many cases, the policies adopted by state and other agencies are central to effecting appropriate forms of regional institutional change.

It is not possible to identify examples of actually existing "learning regions". Whilst some regions display more of the necessary characteristics than others, none fulfil all of the criteria in their entirety. Indeed, as we shall see in the empirical analyses that follow, even those regions which have explicitly adopted the "learning region" as a strategic policy objective, display widely diverging trajectories of development towards their goal. These trajectories reflect not only the policies which have been adopted in different regions, but also the significant differences in their existing social and economic circumstances. However, what is clear from our earlier arguments is that effecting changes in the *institutions* (or social capital, more specifically) which characterise regional innovation systems constitute a crucial element in the wider effort to develop "learning regions". Amin (1998) has stressed the same point more concretely, in the context of a discussion of development problems in less-favoured regions (LFRs).[13] He says: "The culture of command, hierarchy, and dependency that characterises so many LFRs has stifled the formation of a reflexive culture among the majority of its economic institutions, and consequently, prevented the encouragement of rationalities geared towards learning and adaptation. To correct this failing, considerable policy attention needs to be paid to the nature of organisational and management cultures and actor-rationalities which circulate within a region's dominant institutions. Only too often, policy action has sought to introduce new players and institutions in a region, without giving due regard to the dominant 'mind set' and its effects on innovation and adaptability." What is much more complex, of course, is to specify how such *regional institutional change* is to be achieved; and, more specifically, the roles to be played by both private- and public-sector organisations.

Public policy and the regional level

Closely related to questions of the most effective forms of public intervention is the issue of the *level* of government at which action should most appropriately be taken. Of crucial significance here are the varying competences of supra-national, national and sub-national levels of government within different governance systems (centralised, federal, etc.). Hence, for example, matters of macro-economic policy have universally been dealt with at the national level of government. However, with the growth in significance of supra-national governance, this is increasingly a matter of controversy (as is well illustrated in the debates in a number of EU member states over the desirability of entering "Euroland"). Much the same can be said of a number of other policy areas too, such as environmental regulation. More pertinently for present purposes, in many policy areas, there are wide variations in what can be done at the national and sub-national levels. This is illustrated, for instance, in educational policy, where some systems operate a *national* curriculum and *national* forms of assessment (as in Britain since 1988), whilst in others there is much greater discretion at the regional or even local level (as in Britain before 1988; or in Germany and the United States). Clearly, the impacts on individual learning of these kinds of differences are likely to be considerable and may exert real impacts on the capacity of

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sub-national governments to develop effective strategies for developing innovation-intensive forms of economic activity. Certainly, the facility with which sub-national governments may develop programmes of individual learning tailored specifically to the needs of the localised economy may be impaired where educational policies of these kinds are determined centrally, at the national level.

Despite these pragmatic *caveats*, a number of commentators have argued the general case that regional (or sub-national more generally) levels of governance are highly effective in generating the conditions for innovation and consequent economic growth (for example, Cooke and Morgan, 1998; Amin and Thrift, 1995; Lorenzen, forthcoming 2001). Historically, of course, during the last few decades many national governments have become less interventionist, by, for example, withdrawing from the kinds of intervention associated with Keynesianism. This, in turn, has encouraged sub-national authorities (where they exist) to develop innovative strategies, especially to cope with the problems of adjustment to new economic circumstances. In this, they have frequently been supported by *supra* national state organisations; most notably the EU, but also by the IMF, World Bank, and so on (for example, Jessop, 1994). Such support is significant not simply in financial terms, but also in facilitating the development of the analytical resources that are necessary to generating appropriate policies at the regional level. Indeed, as we have seen earlier, the systems of innovation approach to developing effective strategies for innovation and learning places a special emphasis on the benefits of detailed, empirical analysis within a comparative framework. Certainly, policy makers who aspire to transform their regional system of innovation into a "learning region" would do well to begin by "benchmarking" their system against others, in order to identify those "problems" that should be the object of policy intervention, as well as their causes.[14]

More fundamentally, the sort of analysis which has been elaborated earlier with respect to regional systems of innovation and "learning regions" provides an intellectual basis for the development of particular forms of sub-national intervention. Specifically, emphasis has been placed upon regional capabilities for innovation precisely because of the potential resources provided by territorially embedded knowledge and the shared norms and values which permit effective organisational (and individual) learning (Maskell and Malmberg, 1999). Hence, the geographical areas in which learning is most effectively organised are not national states, but rather regions. It should be noted, however, that this analysis creates a paradox for policy makers. On the one hand, it suggests that localised learning policies are required. On the other, it shows that such localised learning policies cannot readily be transposed from one region to another, because not only are regions located within different national systems, but also such learning policies derive their efficacy precisely from the specificities of their regional context. Equally, of course, an appropriate balance needs to be drawn between meeting needs defined in terms specific to the region and fulfilling wider obligations to achieve equity between individual citizens living in different regions. In short, then, effective *policy learning* in this context requires the judicious application of general policy principles to the particular social and economic circumstances that characterise individual regions.

It has also been suggested that the most effective strategies for realising the potential of localised learning policies are those based upon collaboration and consensus between organisations, including the state and its agencies (for example, Morgan *et al.*, 1999). The development of strategies based upon *partnerships* between the public and private sectors reflect this in concrete terms. More ambitiously, public-private *networks* of organisations, characterised by a greater intensity and higher quality of interaction (where good stocks of social capital may play a significant part), may provide a more effective framework within which to develop effective strategies. It has also been argued that such systems of "networked governance" require democratic legitimation through some form of electoral representation at the regional or more local level, thereby ensuring that the social exclusion of particular groups is minimised (Amin and Thrift, 1995).

Learning, labour markets and social inclusion

Issues of social inclusion and exclusion inevitably feature significantly in considerations of regional strategies for developing economic competitiveness and growth on the basis of learning and innovation. Unless such strategies are able to create jobs and secure incomes, not only are they unlikely to be

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sustainable in the longer term, but also they undermine the conditions necessary for their own implementation. Certainly, for example, the continued accumulation of social capital is likely to be endangered in conditions of high levels of unemployment or large income disparities.

However, it must be emphasised that the relationships between innovation and employment/unemployment are extremely complex and, given the current state of research, only partially understood. For example, a recent study has suggested that, in the terms of our earlier typology of innovations (see Figure 2.1), process innovations increase productivity, but they tend simultaneously to decrease the number of jobs per unit of output; and this remains the case when compensation effects are taken into account. On the other hand, product innovations are a major creator of new jobs, but they are associated to increased productivity too (Edquist, Hommen and McKelvey, forthcoming 2000). It follows from this analysis that, within a regional economy, firms may continuously produce more and more efficiently by introducing process innovations, both technological and organisational. However, the effects on employment levels in such circumstances are suggested to be generally much less benign than where firms are adjusting their product programmes to changes in markets and demand too. Accordingly, although the structures of production and employment are influenced by both process and product innovation in goods and services, it is product innovation that is the main vehicle behind structural change.

Crucially for the development of regional strategies, it has also been argued in a recent analysis that product innovations dominate in the "high-tech" and knowledge-based sectors (including knowledge-intensive business services – KIBS); and process innovations dominate in the less advanced and more mature sectors (Edquist, Hommen and McKelvey, forthcoming 2000). Moreover, those manufacturing sectors which grew most rapidly in the OECD area as a whole between 1975 and 1991 (the "growth sectors") were to a large extent the same as the "high-tech" (or R&D intensive) ones. Indeed, employment grew by 53 per cent in these "growth sectors" during this period; whilst elsewhere in manufacturing it *decreased* considerably. In short, then, the "high-tech" sectors are – on average – growing faster and creating more employment than other sectors (Edquist and Texier, 1996). If this analysis is accepted, therefore, what this means is that *production specialisation* has direct consequences for employment and associated levels of income and welfare more generally. Accordingly, those regions (and countries) which are *unable* gradually to change their production structure in the direction of more advanced and knowledge-based products are likely to experience problems with economic growth and employment in the long run. Change in the structure of production is clearly not the only determinant of growth and employment, but it is certainly an important one.

Perhaps the real significance of these arguments, however, is that they focus attention on the differential capabilities of regions to develop forms of innovation-intensive economic activity which will ensure employment and income levels. As we have emphasised, these capabilities are partly a matter of the pursuit of effective development strategies; but they also reflect the social and economic conditions generated in a region through past developments, including structure of production (that is, "path-dependency"). In this context, it is important to note that recent work by the OECD (2000*b*) shows that regional disparities in unemployment, for example, are significant *and persistent* within many countries (and are closely related to low labour market participation). In some, such as Italy and Germany, these disparities are most evident at the level of large geographical areas, reflecting major regional divides. In others, however, unemployment disparities are clearest at the level of smaller regions. This suggests, then, that in countries such as Austria, Portugal and the United Kingdom, for example, labour market disadvantage is relatively concentrated and hence reflects the specific features of these localised areas.

Accordingly, the question arises of whether *all* regions have the capacities necessary to sustain high levels of employment and incomes on the basis of innovation and learning. Certainly, it is clear that only very few regions are able to attain the highly innovative status that permits them to set the agenda within the sectors in which they are active; and, thereby, create significant amounts of new employment and new income sources (in the manner, say, of Silicon Valley). Other regions are only able to strive to meet the challenges set by these leading regions. Through effective learning and innovation, they may be able to outperform competitors and thus ensure that employment and incomes are maintained at

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higher levels than they otherwise would be. However, yet other regions may be unable to achieve even this latter status and are thus confined to persistently poor economic performance, reflected in high rates of unemployment (as indicated above) and low income levels.

Important issues also arise with respect to the *distribution* of the benefits that flow from economic growth between different social groups *within* a "learning region", where innovation and learning are effectively developed. As we have seen, individual learning is a necessary input into the innovation process. It may be argued, therefore, that increasing overall access to learning opportunities has the effect of improving people's employability and hence reducing social exclusion. Of course, it has frequently been pointed out that improved employability can only be translated into actual employment where economic activities are such as to enable the absorption of such upgraded human resources. Simply put, appropriate jobs need to be available for the individuals who have benefited from enhanced learning opportunities, or else they will move elsewhere. Accordingly, economic development needs to be closely integrated with individual learning for the full benefits in terms of social inclusion to be attained.

It is also important to note, however, that individual learning of this kind is more than a narrowly *technical* process, through which the stock of human capital is unproblematically increased. It is also a *social* process which differentiates between individuals in terms of their access to learning opportunities on the basis of a variety of ascribed characteristics (such as gender, family background, disability, age and so forth). This is clearly true of formal individual learning in initial and post-compulsory education; the inequalities in educational opportunities and outcomes in schools, colleges and universities between people from different social backgrounds are clearly established (for example, Halsey *et al.*, 1997). Equally, in both initial and continuing training, it is widely acknowledged that some groups within the workforce – most obviously, younger men who have professional, scientific and managerial jobs – have privileged access to learning opportunities. It is also true – although less widely acknowledged – of those forms of learning which depend upon being in employment, such as "learning-by-doing" and "learning-by-interaction". Quite simply, those social groups which are excluded from the workplace are thereby excluded from significant learning opportunities too.

To the extent, therefore, that individual learning – in all its forms – becomes increasingly important as the "learning region" develops, so these systematic inequalities in access to learning opportunities come to exert ever more powerful effects. Hence, for example, where scientific training and research become increasingly important to (certain forms of) innovation, women's relative exclusion from such opportunities becomes increasingly significant (Osborn *et al.*, 1999). Similarly, Castells (1996) – amongst others – has argued that as information and its associated technologies (IT) become increasingly important to economic competitiveness, so the divergence between the "information-rich" and the "information-poor" grow. Certainly, the emergence of a "digital divide" has been the object of widespread debate, both academically and in political circles. Crucially, even where access to learning opportunities is increasing *overall*, the disadvantages experienced by those who remain excluded from them become intensified. Hence, for example, where the proportion of the population reaching given levels of educational attainment is rising, the disadvantages experienced by those who do *not* attain those levels are more severe.

What is at stake here, therefore, is how the benefits – employment, income, standards of living – of developing a "learning region" can be *distributed* between different social groups on an equitable basis. As we have seen, the potential of creating an economy based upon effective innovation and learning is significant improvement in employment levels and standards of living. However, without systematic attention to these complex distributional issues, it is difficult to conclude that this potential will be fully achieved. Indeed, there is the distinct possibility that the new forms of innovation-intensive economic activity associated with the "learning region" will generate new patterns of social exclusion. Those groups who are denied proper access to the different forms of learning opportunities will experience an intensification of their exclusion, precisely as the social and economic significance of learning grows.

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NOTES

1. In the terminology of conventional growth accounting, productivity growth reflects investment in human capital and physical capital (in which knowledge may, of course, be embedded), but is to a larger extent explained by the so-called "residual", which embodies advances in knowledge, which, in turn, include technological and organisational learning.
2. This implies, of course, that an innovation is something more than an invention; someone has to realise its potential economic value by trying to use it economically. An invention becomes an innovation when it is introduced into the economy. As this terminology suggests, most innovations occur in firms. However, other types of organisations – such as those in the public sector – may also have significant learning capabilities, which can the basis for innovations. Innovations may also sometimes create new demand, as, for example, in the case of product innovations geared towards the satisfaction of previously unfulfilled needs and wants.
3. The taxonomy is further elaborated in Edquist, Hommen and McKelvey (forthcoming). There are also other useful taxonomies of innovation. One such distinguishes between: *a*) continuous, small incremental innovations; *b*) discontinuous radical innovations; and *c*) massive shifts in some pervasive or "general purpose technology" (GPT) (Edquist and Riddell, 2000). Examples of the latter include information and communication technologies, such as writing, printing, and the current ICTs; materials such as bronze, iron and steel, and made-to-order materials; and power delivery systems, such as the domestication of animals, the waterwheel, the steam engine, electricity and the internal combustion engine (Lipsey, 1996).
4. Hence, the knowledge capital of a firm is the human capital of the employees plus the structural capital of the firm (knowledge capital is sometimes also called intellectual capital).
5. This is not to suggest that the educational processes involved here are simple. However, the forms of knowledge relevant here involve fewer problems with regard to codification and communication than other knowledge forms (see below).
6. "Learning-by-interaction" may also facilitate the dissemination of other knowledge forms, such as "know-what" and "know-why".
7. These conditions are discussed in more detail in Edquist (forthcoming 2000).
8. Note that we are using the term "problem" and not "market failure" here. This is because the "market failure approach" assumes that an optimal system can be specified, which – as we have argued earlier – is not possible within the systems of innovation perspective because of the evolutionary characteristics of learning and innovation processes. Thereby, the notion of "market failure" loses its meaning and applicability. When we talk about a "problem" we do so on an empirical basis and in a pragmatic way, not within the framework of a strictly formalised model. The reason for this is that this approach is more useful as a basis for policy design in the field of learning and innovation.
9. This discussion is based upon Edquist (forthcoming 2000).
10. Lipsey and Carlaw (1998) have shown this for the case of the USA.
11. A general remark related to this issue is that radical innovation and the emergence of new sectoral systems of innovation seem to be more of a "problem" than the reproduction of and incremental innovation in established ones. There might be exceptions, though, particularly when established systems undergo profound technological shifts.
12. Innovation systems may also be defined in sectoral or technological terms and may be international or even global in their scope (Carlsson and Jacobsson, 1997; Breschi and Malerba, 1997; Nelson and Mowery, 1999). The various approaches mentioned here – national, regional, sectoral, etc. – complement rather than exclude each other; the choice between them depends on the object of study.
13. It is instructive that Grabher's (1993) analysis was empirically rooted in an analysis of the industrial restructuring of the Ruhr.
14. The indicators in the annex and the case studies presented in Chapter 5 can be seen as a start of such an endeavour. The indicators presented concern demography, employment, gross regional product, education, research, patents, labour market structures, and so on. In designing this set, we were, however, constrained by

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the availability of data. Many indicators would extend our capacity to evaluate the learning activities of regions, but they are not available at a regional level. Examples of such indicators include: proportion of production that is "high-tech" or knowledge-intensive, changes in production structure over time, innovation intensity, the importance of process versus product innovations, intensity of interactive learning between organisations, specialisation of higher education, the nature and extent of individual learning in the work-place, allocation of R&D investment between research areas, computer and internet connection intensity, availability of venture capital, and so forth. It would be extremely valuable to produce such a set of indicators. It could provide the foundation for the in-depth empirical and comparative analysis of regional systems of innovation that is so important as a basis for public policy making.

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Chapter 3

THE DESIGN OF THE EMPIRICAL ANALYSIS

Introduction

As we have seen, in order to develop further the analytical approach developed at length in Chapter 2, detailed, empirical analysis is necessary. In what follows, we present just such a study, based initially upon large-scale, quantitative analysis at the level of standard statistical regions within the EU. The results of this are then extended by means of a set of five case studies of cities and regions which have adopted development strategies which are explicitly intended to improve learning and innovation and thereby to shift towards becoming "learning regions". In this short chapter, we provide an account of the methodological framework within which the empirical analysis was carried out. The results are set out in subsequent chapters.

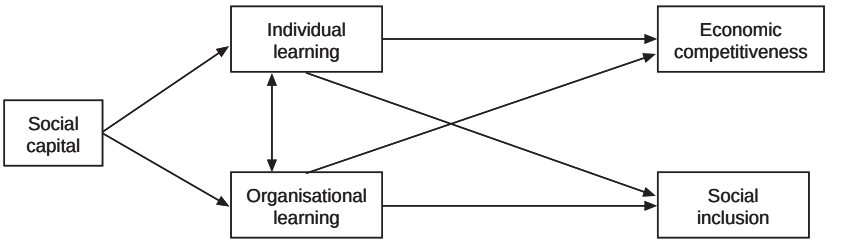
Aims

The most basic aim of the empirical study is to explore the relationships between learning (in its various forms) and economic performance at the regional level. As we have seen in Chapter 2, this encapsulates the essence of the "learning region" model. More specifically, however, this work seeks to provide an account of learning *processes*. We are concerned to discover: how learning takes place; in precisely which ways it influences economic performance; and how it may be facilitated by learning policies. For all these questions, the regional innovation system provides the essential context.

Addressing issues such as these is essential to "testing" the relationships that have been discussed at length in Chapter 2. These relationships are represented in a highly simplified form in Figure 3.1.

Individual learning and organisational learning are here viewed as the key "inputs" to the "learning region" model, underpinning the crucial processes of innovation. However, both are themselves to some extent dependent upon the level and nature of the institutions (or the form of social capital) which are historically constituted within a region or which may be produced by policies pursued by state agencies and other organisations. Economic competitiveness (and the growth it makes possible) is a key "output" of the system. Equally, however, social inclusion is necessary as a further "output", if the system is to be sustained in the longer term. Crucially, what is argued is that the "outputs" are determined (crudely put) by the "inputs", although – as we have seen – the relationships here are in reality extremely complex.

Figure 3.1. **A heuristic framework for the analysis of the conceptual relationships in the "learning region" model**



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Research questions

More concretely, the objectives of the empirical study can be summarised conveniently in the form of a series of research questions. On the one hand, these reflect some of the essential features of the conceptual discussion set out in full in Chapter 2 and summarised diagrammatically above. On the other, they provide a framework for designing the empirical study, and analysing and presenting the findings. These questions are listed below.

Question A: To *what extent can it be demonstrated that learning influences economic performance*?

As we have seen, this goes to the heart of the matter. Answering this question, however, demands more than simply correlating learning with performance. It necessitates an inquiry into the *processes* underpinning these two notions. In order to develop an operational approach to this task, we in turn address how *individual learning* and *organisational learning* influence economic performance.

In addition, it was suggested earlier that individual learning constitutes a necessary prerequisite of effective organisational learning; and that organisational learning significantly develops individual competences (although the latter are difficult to capture empirically). Therefore, a second major research question pertains to the relationships between these different forms of learning.

Question B: *What is the importance of individual learning for organisational learning*?

This part of the empirical work will be sufficiently specific to distinguish between the relationships between *tertiary-level* and *secondary-level* educational attainment, respectively, for organisational learning.

It was also argued in Chapter 2 that the processes of learning have important consequences for social inclusion/exclusion. Regions that are rich in the former may be expected to display high levels of social inclusion, reflected, for example, in the relatively low incidence of unemployment and other indicators of social disadvantage. As we have argued, however, there may equally be complexities in these relationships that upset such expectations. Accordingly, these arguments give rise to a third major question.

Question C: *What is the relationship between learning and social inclusion and exclusion*?

In addressing this research question, it is again important to distinguish analytically between *individual learning* and *organisational learning* in their relationships with social inclusion/exclusion.

Further questions relate to the social and economic environment in which learning takes place. Again as we have seen in Chapter 2, within the "learning region", the level and nature of individual and, in particular, organisational learning is shaped by its characteristic institutions. The concept of social capital, in turn, provides an especially fruitful vehicle for exploring these. This suggests, therefore, the following research question.

Question D: *What is the importance of social capital in determining the processes of learning*?

The importance of social capital for *individual learning* and for *organisational learning* will be addressed in turn.

Regional institutions are the product of long-term trajectories of economic and social development within regions. History and place matter for both individuals and organisations; and may have positive or negative implications for learning and economic performance. Whether learning is achieved by recombining already existing knowledge or encompasses *unlearning* and trajectory shifts may be difficult to investigate empirically in depth for individuals and firms in the present work. However, the degree of "path-dependency" of region-level change is the focus of the following research question.

Question E: *To what extent does "path-dependency" impede learning*?

"Path-dependency", and the degree to which it impedes learning processes, is analysed in terms of the "path-dependency" of *industry structures*, and the "path-dependency" of *institutions*.

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Finally, regional organisational agents may play a role not only in creating "path-dependency" of industry structures and institutions, but also in generating change. Indeed, institutional *change* – certainly over the short and medium term – within a region is likely to be most significantly shaped by such the activity of regional policymakers. Thus, policymaking is often central for initiating learning processes. Moreover, the regional level is where the policies pursued by the state and its agencies impact most. This gives rise to the last research question.

Question F: *What is the importance of regional policymaking for addressing "path-dependency" and initiating processes of learning and institutional change?*

This research question investigates the role of policymaking for *individual learning*, *organisational learning*, and *institutional change*, respectively.

Methodological issues

The empirical study is divided into two major parts.

Correlation analysis

The first comprises an analysis based upon quantitative indicators of our key concepts: individual learning; organisational learning; economic competitiveness; and social inclusion (see Chapter 4). A data set of these indicators was assembled for regions of the 15 member states of the EU. An investigation of the relationships between the indicators was then carried out by means of simple correlation analysis. This *extensive* part of the empirical study is particularly focused upon providing answers to research questions A, B and C (above).

Case studies

The second part of the empirical analyses consists of five detailed case studies of regions (see Chapter 5). These are: Jena (Germany); Vienne (France); Øresund (Denmark/Sweden); Andalucía (Spain); and Kent Thames-side (United Kingdom). Clearly, these cases were not selected with a view to conventional "representativeness". Rather, they were identified as places that exhibit a wide variety of economic and social conditions, reflecting strongly divergent trajectories of past development. They thus permit an *intensive* analysis of the relationships examined through the indicators study (above). The case studies thus provide additional empirical insights into the relationships between learning and economic performance, relating to research questions A, B and C. The material contained in the case studies also provide examples of the processes underpinning learning which are embedded in the special social environments of the case-study regions themselves. The case study based analysis of processes of social inclusion/exclusion and of "path-dependency" is aimed at providing answers to research questions D and E. Moreover, as each of the case regions has adopted strategies aimed at developing towards a "learning region", the case studies permit in-depth examination of the nature and impacts of regional-level policies of different kinds on learning and regional institutional change (research question F).

As with all empirical work, it is clear that a great deal more could be done. Indeed, the current study provides explicit indications of the kind of further research that could usefully be carried out. Equally, the empirical research that is reported here is not exempt from the limitations which are *endemic* to such work: imperfect availability of data; restricted capacity for data analysis (reflecting limited resources); problems of the reliability and validity of data; and so on. Nevertheless, we would argue that this study contributes not insignificantly to the debates about "learning regions". In particular, the use of extensive, quantitative analysis combined with intensive, qualitative analysis to subject the conceptual relationships, which comprise the "learning region" model to systematic empirical analysis, constitutes a significant step forward.

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Chapter 4

LEARNING, ECONOMIC GROWTH AND SOCIAL INCLUSION: A CORRELATION ANALYSIS

Introduction

This chapter presents the first part of the empirical study, an extensive analysis of learning at the regional level in the 15 member states of the EU. The correlation analysis is aimed at answering research questions A, B, and C as presented in Chapter 3. For this purpose, correlations have been made between selected indicators of individual and organisational learning; economic performance; and social inclusion. However, this chapter addresses only the most interesting results: the correlations between individual learning and economic performance; between organisational learning and economic performance; between individual learning and organisational learning; and between learning and social inclusion.

The individual indicators used in these four correlations, the reason for choosing them and the methodological problems of using them will be discussed in depth in connection to the presentation of the findings in the following and, more specifically in Appendix 4.1.

Individual learning and economic performance

The aim of this section is to explore the empirical evidence for a relationship between learning and economic performance. However, we have distinguished between two aspects of learning – individual and organisational – and it is the former with which we deal first.

Selected indicators

We adopt GDP *per capita* as the principal indicator of *regional economic performance*. Though sometimes criticised, it is commonly used as an indicator of economic performance. Since this study is concerned with regions with relatively similar economies, GDP per capita is an effective indicator to compare the relative performance of the regions.

It is difficult to measure *individual learning* in a broader perspective than formal learning. At an individual level, the best available indicator of learning remains the educational attainment of people. In each country and in each region, we know the percentage of the population who complete *primary, secondary and tertiary levels of education*.[1] Of course, as already noted, individual learning cannot be reduced to this sort of formal education alone. It also includes the development of skills and "know-how" through initial vocational preparation, some of which is captured in the above measures, but also through formal and informal learning in employment, which is omitted altogether. However, educational attainment is the sole available indicator of individual learning, and it remains an important, if partial, measure of the concept. Even if there are exceptions, in general, the higher the level of educational attainment, the more people can be assumed to have strong abilities to learn and to create new knowledge. Certainly, academic credentials are widely used by employers (and by individuals themselves) as a criterion for judging suitability for entering many occupations.

It follows from this that a region with a high percentage of people completing secondary and tertiary levels of education should be more of a "learning region" than one with low percentages (and hence a high percentage of those completing primary level only). As we have seen, in a more and more knowledge-driven economy, this individual learning (and the ability to learn) may be expected to

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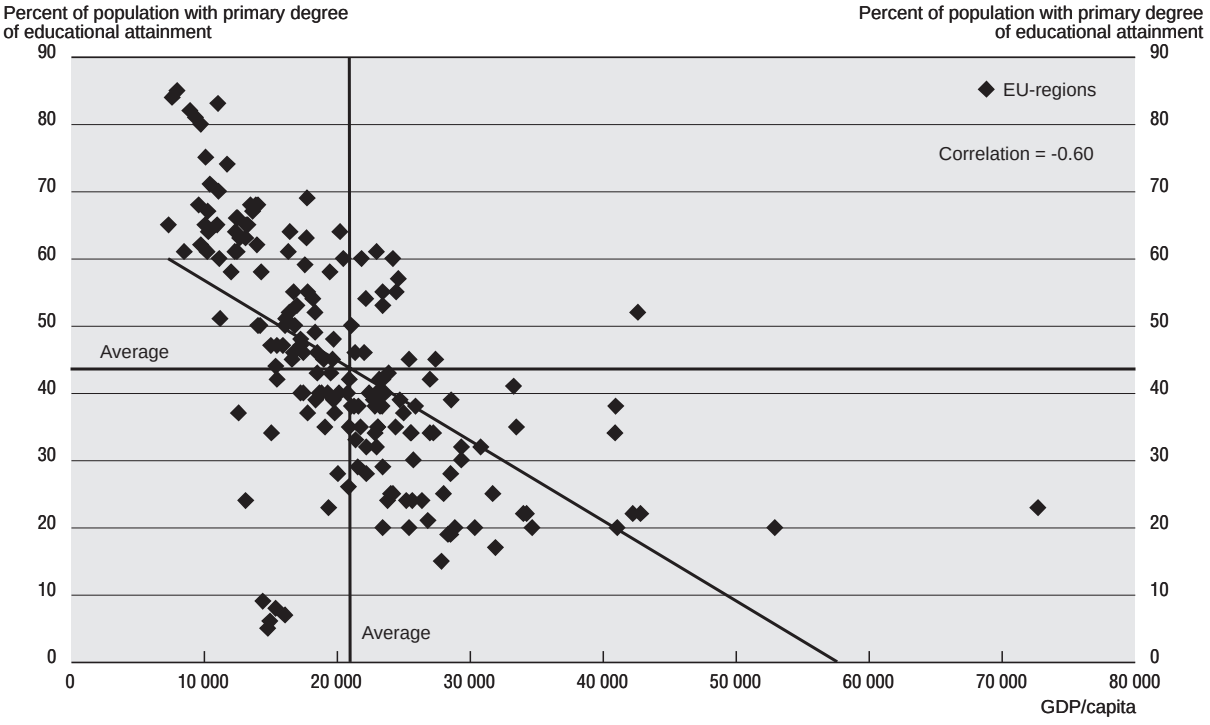
impact upon the economic performance of the firm, especially (although not exclusively) through contributing towards innovative capability. Moreover, firms may be expected to choose to locate in areas where the knowledge it needs is available, so that a region with good educational attainment is more attractive for some firms. Hence, the economic performance of a region should be correlated positively with its level of educational attainment.

However, can it be taken for granted that the direction of causality goes from educational attainment to economic performance, rather than the contrary? Hence, a rich region could naturally spend more money on education, and thereby obtain better educational attainment. Educational attainment would thus be the consequence rather than the cause of economic performance. We have no quantitative basis to refute this proposition, but it is probably less plausible than the contrary. If it were the case, for example, the well-established relationships between educational attainment, higher salaries in firms and better employment at the individual level would be much more difficult to explain (OECD, 1998). Accordingly, the interpretation that a positive correlation between high educational attainment and strong economic performance indicates the influence of individual learning on GDP per capita in the region appears quite plausible, if not demonstrated. It is, however, noteworthy that there might be a cumulative causation between the two variables.

Results of the correlation analysis

To test this proposition, we calculated the correlation between the three levels of educational attainment and GDP per capita for 180 EU regions.[2] At territorial level 2, there is a significant correlation between the percentage of the population with primary and secondary level educational attainment and GDP per capita. The correlation between the percentage of the adult population with a primary educational level and GDP per capita is –0.6 (see Figure 4.1). There is a strong negative relationship between the two variables: the lower the percentage of people with only primary degree, the higher the economic performance of the region in terms of GDP per capita. The correlation between the

Figure 4.1. **Primary educational attainment and economic performance**



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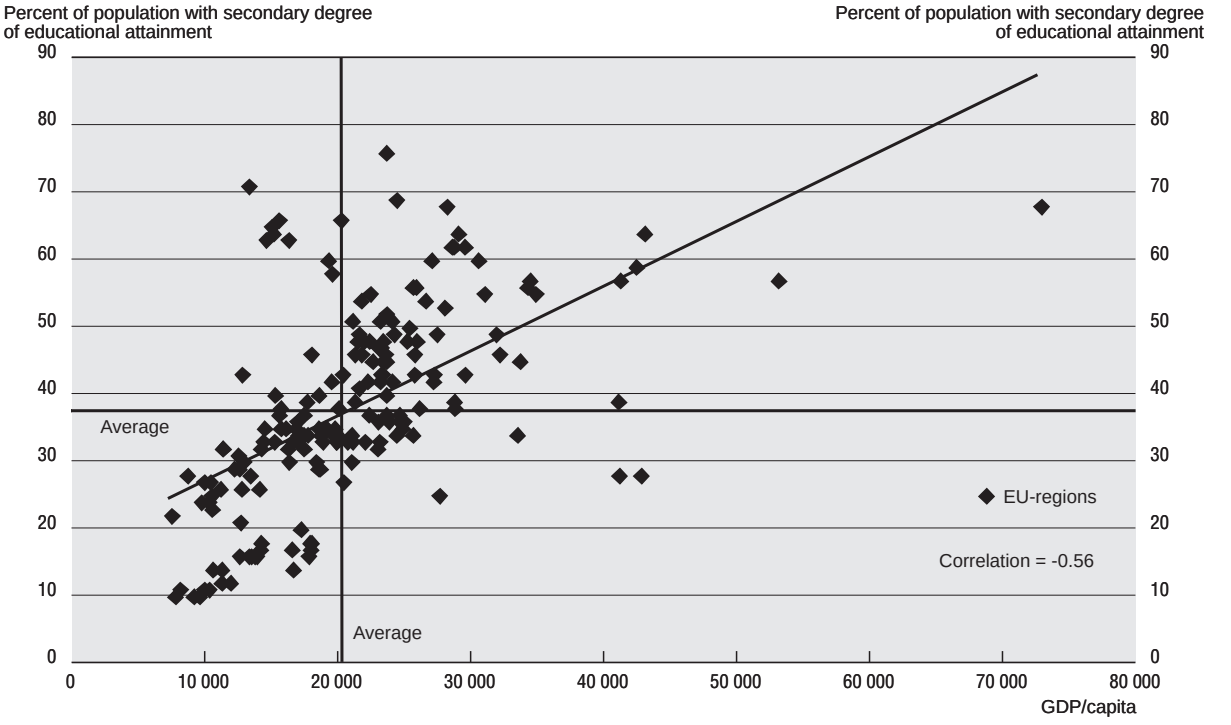
percentage of the adult population with secondary educational level and GDP per capita is almost the same size, but is positive, at 0.56 (see Figure 4.2). The more adult people who complete upper secondary level education, the higher the GDP per capita in the region. The same results are found at the national level: the correlation between primary education and GDP per capita is –0.6 and the correlation between secondary education is 0.54.

However, before inferring from these results that educational attainment (at least at primary and secondary levels) matters for economic performance, it is important to note that a number of different regions deviate from the general pattern. Firstly, although Luxembourg has the highest GDP per capita in the EU (US$42 526), it also has a high percentage of its adult population that completes only primary level education (52 per cent), and a correspondingly low percentage that completes secondary level (27 per cent). In reality, it is highly probable that that there is a strong size effect in this result. Secondly, five former East German regions have both the lowest percentages of population with only a primary level of educational attainment and the lowest GDP per capita: Brandenburg (7 per cent, US$16 005), Mecklenburg-Vorpommern (9 per cent, US$14 353), Sachsen (5 per cent US$14 740), Sachsen Anhalt (8 per cent, US$15 310), Thuringia (6 per cent, US$14 866). One interpretation here could be that primary and secondary education do not fit the requirements of the economy in these regions, but it would be difficult to explain why.[3] The opposite explanation is, however, more plausible: the firms may not use efficiently the potential knowledge at their disposal in the region. This, in turn, could be related to the transition from a planned economy to a market economy. The regions suffer from a poor economic infrastructure and perhaps also from the difficulty of changing towards a more incentive-driven economy. These figures show that educational attainment is by no means a sufficient condition for a high GDP per capita. It proves the paramount importance of institutions in creating a good environment for the use of knowledge. Nevertheless, these deviations from the general pattern do not question the existence of a link between good educational attainment (upper secondary level) and the GDP per capita.

Figure 4.2. **Secondary educational attainment and economic performance**



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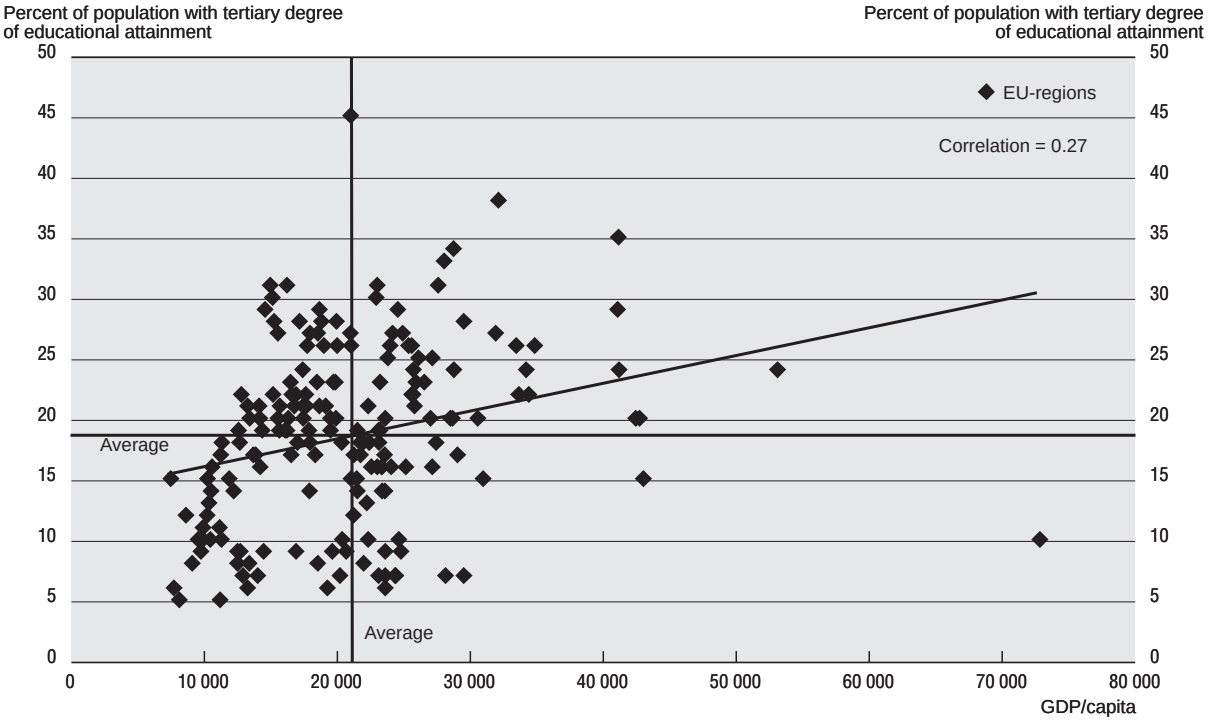
We could find no strong relationship between the percentage of the population completing *tertiary-level education* and GDP per capita (see Figure 4.3). This is a very surprising result, which suggests the need for a more precise picture of the forms of knowledge involved in the new knowledge-driven economies (in OECD countries). At the TL2 regional level, the correlation between the two variables is 0.27 (and 0.33 at the national level). This means that regional economic performance is only weakly related to the incidence of the most highly educated people in the population. One possible explanation here is that tertiary education is not sufficiently adapted for the needs of business; but it would be hard to explain why secondary education is well adapted, whereas tertiary is not.

Alternatively, the explanation could just be that tertiary education is less crucial for economic performance than secondary education. A number of factors are relevant here. Firstly, the difference between the lower end of tertiary attainment and the upper levels of secondary attainment may not be very large. We would thus produce different results if we could distinguish higher tertiary from lower tertiary levels of educational attainment. It may be, for example, that only a relatively small sub-set of individuals who complete tertiary level education have a direct impact on economic performance. Secondly, and in the same vein, it is clear that not all tertiary attainment affects economic performance to the same extent. People with engineering or science degrees, for instance, may create more knowledge with economic value (innovations) than do people with humanities or social sciences degrees. In short, the correlation between tertiary level educational attainment and GDP per capita is so weak because the subjects of study exert a key influence. The reverse interpretation may also be valid, however: the weak correlation is not due to the fact that people complete tertiary education in subjects that do not fit the regional economic necessities, but to the fact that the regional economic structure does not employ people with high-level education.

More fundamentally, however, tertiary education may not be the most relevant level of education for economic performance. Upper secondary education corresponds to a good level of literacy, numeracy and general culture, and is less specialised than most tertiary level programmes. It is this level

Figure 4.3. **Tertiary educational attainment and economic performance**



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which also corresponds most closely to intermediate skills, which have been widely identified as crucial to economic performance (for example, Ryan, 1991). Indeed, tertiary level educational attainment may be used as a criterion for rationing access to occupations, even where such attainment is not necessary actually to do the jobs. Certainly, examples of firms created and/or directed with success by people with relatively low educational attainment – but probably high levels of "know-how" from on-the-job learning – abound.

A second even more important factor here is that the economic performance of a firm is based upon its organisation of work, with all its co-ordination processes. As we have seen, product and process innovations are generally a necessary basis for competitiveness and sustainable economic growth. Even if these tasks are allocated to very skilled scientific and technical specialists, with high tertiary levels of educational attainment (as, for example, in the traditional, Taylorist vertical division of work) firms would still have to implement these innovations in an efficient way to maximise their benefits. The latter involves the whole organisation, including those individuals in less skill-intensive jobs. Primary level education may be too limited to ensure this, but secondary education may well be sufficient. Hence, tertiary educational attainment may assure a lowering of production costs and be necessary for the development of new products and processes (in certain circumstances). However, secondary level educ ational attainment enables firms to reduce the transaction costs within the firm (organisational costs), preventing production disruptions and enabling a smooth operation of the organisational routines. To the extent that the organisation of work is crucial to economic performance, and that it on the whole depends upon many general skills, one can explain the fact that secondary educational attainment is statistically more relevant for economic performance than tertiary educational attainment. Even in activities that clearly derive their economic value from highly educated people, like "high-tech" industries or professional services (hospitals, universities, consulting, etc.), highly educated people generally represent a small proportion of the personnel. The largest share is employed in supporting activities that are also crucial, but less demanding in terms of education. In addition, of course, again as we have seen, intermediate-level skills are themselves a powerful source of at least certain forms of innovation.

The relationship between tertiary level education and economic performance may be explored further by examining the situation within individual countries. Good data are available for four of the countries in which case-study regions are located: Germany, Spain, the UK and France.[4] In Germany, there is a wide discrepancy between the former West and East German regions. As already noted, the five former East German Länder, along with Berlin, which also has a former East German part, have a strong distorting impact on the correlation results. In the reunified Germany, the correlations between primary, secondary and tertiary levels of educational attainment and GDP per capita are, respectively, 0.82, –0.69 and –0.52. This result – according to which low educational attainment is very important for economic performance – derives from the fact that the eastern Länder have, on the whole, better educational attainment than the western ones, but lower GDP per capita. This strongly affects the correlation. When the former East German regions and Berlin are excluded, the correlations become respectively 0.2, –0.63 and 0.64. What this suggests is that for the former West German regions, primary educational attainment is not relevant for economic performance, and that the crucial impact is exerted by the upper levels of education. Tertiary educational attainment seems to play a crucial role in economic performance.

In Spain, where all the regions are below the European GDP per capita average, there is a strong correlation between secondary level educational attainment and economic performance; although it is the tertiary level that appears to be the most important. There is a strong negative relationship between primary educational attainment and GDP per capita (–0.7). Those between secondary and tertiary educational attainment and GDP per capita are, however, quite strongly positive (respectively 0.54 and 0.62). In fact, only two Spanish regions are not above both the national GDP per capita and tertiary educational attainment averages: Cataluna and Baleares. Cataluna falls below, but nevertheless remains very close to the Spanish tertiary educational attainment average. The case of Baleares can be explained by a tourism-driven economy, in which individual learning is less essential. Hence, in general terms, contrary to the European level findings, tertiary educational attainment appears as more relevant than secondary educational attainment for economic performance.

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In the United Kingdom, tertiary educational attainment is also the most relevant level for economic performance. The correlations between GDP per capita and primary, secondary and tertiary educational attainment are, respectively, –0.41, –0.25 and 0.66. In other words, economic performance is negatively correlated with both primary and secondary levels of educational attainment, although more strongly so with the former. The strongest relationship is that with tertiary level attainment, again deviating significantly from the European trend.

In France, the correlations between primary, secondary and tertiary educational attainment and GDP per capita are, respectively, –0.28, –0.12 and 0.75. Primary and secondary educational attainment thus seem to have no significant relevance for or against economic performance, but tertiary educational attainment seems of crucial importance. However, the scatter diagram shows the strong influence of the region surrounding Paris (Ile-de-France) on the analysis: when Ile-de-France is excluded, the correlations between primary, secondary and tertiary educational attainment and GDP per capita become respectively 0, 0.23, and 0.33. On this latter basis, there is little indication of any significant relationship between educational attainment and economic performance at regional level. Except for three regions (around Paris, Lyon and Marseilles, the three biggest French cities), French regions do not have very different profiles. This can be explained in terms of the centralised management of regions, aiming at balancing regional development and avoiding as much as possible large inter-regional differences. Thus, apart from those including the big metropolises, all regions have more or less the same educational attainments, which explains the weak correlation between educational attainment and GDP per capita.

How can these contradictions between the EU and national levels be explained? The answer to this question, of course, lies in the regional and national differences within the EU. In our sample of national analyses, economic performance seems to depend on tertiary education more than on secondary education, but in some of the other member states the opposite is the case. In consequence, at the EU level, secondary education appears as the most important level for regional economic performance. This highlights, of course, the significance of national institutional contexts. For Spain, the negative correlation between primary educational attainment and GDP per capita is very strong, as some Spanish regions have quite high levels of primary educational attainment (only). However, in France and the former West Germany, primary educational attainment is not relevant because the regions are very similar, with quite a low percentage of their populations with completing only primary education. In Spain, both secondary and tertiary educational attainment are very important for economic performance: what is crucial is to avoid too high a proportion of the population completing only the primary level.

The UK, former West Germany and France have more contrasted situations. In each case, the tertiary educational level is the most significant for regional economic performance. This phenomenon is very clear in former West Germany, where there is a strong negative relationship between secondary educational attainment and regional economic performance and, in contrast, a strong positive relationship between tertiary educational attainment and economic performance. The threshold is really between these two levels of education: since the primary educational attainment levels are quite similar, any difference derives from the two other levels. In the UK, economic performance is related to the two extreme levels of educational attainment: economic performance has a significant negative relationship with primary educational attainment and a strong positive relationship with tertiary educational attainment. This can be explained by the differences of educational attainment between the different regions: the differences of primary educational attainment are bigger than in Germany and in France, which explains the higher relevance of this level. France has a particular situation: there is a strong positive relationship between regional economic performance and tertiary educational attainment, the two other levels being irrelevant. But when Ile-de-France is excluded, tertiary educational attainment does not seem to matter more than the two other levels. It reflects the effects of French political centralisation, which aimed at homogenising the regions as much as possible. All the regions have a similar structure of educational attainment, so that it is not very relevant to explain differences in economic performance. We might think that economic performance then depends on the different industry structures and business networks. But it also reflects the geographical clustering of the knowledge-intensive industries in Ile-de-France, where GDP per capita and tertiary educational

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attainment are far above the national averages. The region may also benefit from an efficient business network. These examples show the importance of national institutions and thus the important influence of policy makers on the different situations.

Summary

A relationship between educational attainment and economic performance at the regional level has clearly been established in this section. However, secondary educational attainment seems to be more important than tertiary educational attainment for economic performance (at the EU level). This reflects the fact that an important part of economic performance relies on the smooth operation of organisational routines. Tertiary level education remains, of course, very important, especially to certain forms of innovative capability. However, at this overall European level, it is less so than the secondary level. This conclusion, in turn, needs to be qualified in terms of the significance of national variations. In the UK or in the former West Germany, for example, it is tertiary education that clearly has the greatest impact on economic performance. Crucially, therefore, the impacts of the different levels of educational attainment are mediated by national economic structures, as well as national political and institut ional histories. At the regional level too, organisational structures and regional institutions are vital to mediating the relationship between educational attainment and economic performance. Hence, unless there is a "good fit" between the forms of educational attainment which are characteristic of a region and its industrial structure and patterns of work organisation, the impacts of the former on regional economic performance are highly constrained.

Organisational learning and economic performance

In this section, we examine whether a relationship between organisational learning and the economic performance at the regional level can be established. As in the previous section, this empirical investigation is based on a correlation analysis between indicators of economic performance and of organisational learning.

Selected indicators

Again as in the previous section, regional economic performance will be represented by GDP per capita. However, two indicators are used to approximate firms' organisational learning: R&D expenditure; and the number of patent applications per million inhabitants. The former is clearly a measure of inputs to the process of organisational learning. It is an indicator of investment in the development of new knowledge, new products and new processes, irrespective of the actual outcomes. Moreover, it is likely to capture particular aspects of the processes of knowledge production and organisational learning much better than others. Hence, it is better adapted to the measurement of specialised R&D activities, rather than the less formal dimensions of organisational learning which arise in the normal course of economic activities. Given that such specialist R&D is more significant in certain sectors – especially Pavitt's (1984) "science-based" sectors – there is also likely to be a sectoral bias too. In short, then, R&D expenditure is an indicator that is most effective in industries such as pharmaceuticals and electronics, but much less so in other profitable industries such as banking or large-scale distribution, where the nature of organisational learning and innovation processes is different.

Patent applications, in contrast, provide a measure of the *outputs* from organisational learning. In general, a patent application (which may or may not be granted) indicates that a firm believes it has produced an innovation that is sufficiently valuable to warrant protecting it by law from free appropriation by competitors (for up to twenty years).[5] The indicator therefore captures a very important dimension of organisational learning and innovation. However, it is clear that many important innovations do not lead to a patent application, because they are too small or protected by other means (secrecy, lead-time on the market, reputation). In particular, it is less likely that a process innovation will be patented than a product innovation; and organisational process innovations are the least likely of all to result in a patent application (see above). Again, there are sectoral biases generated here, as patenting is more significant in the "science-based" industries, for example, than in others. For these reasons, patent applications also represent a partial picture of the actual organisational learning that takes place within firms.[6]

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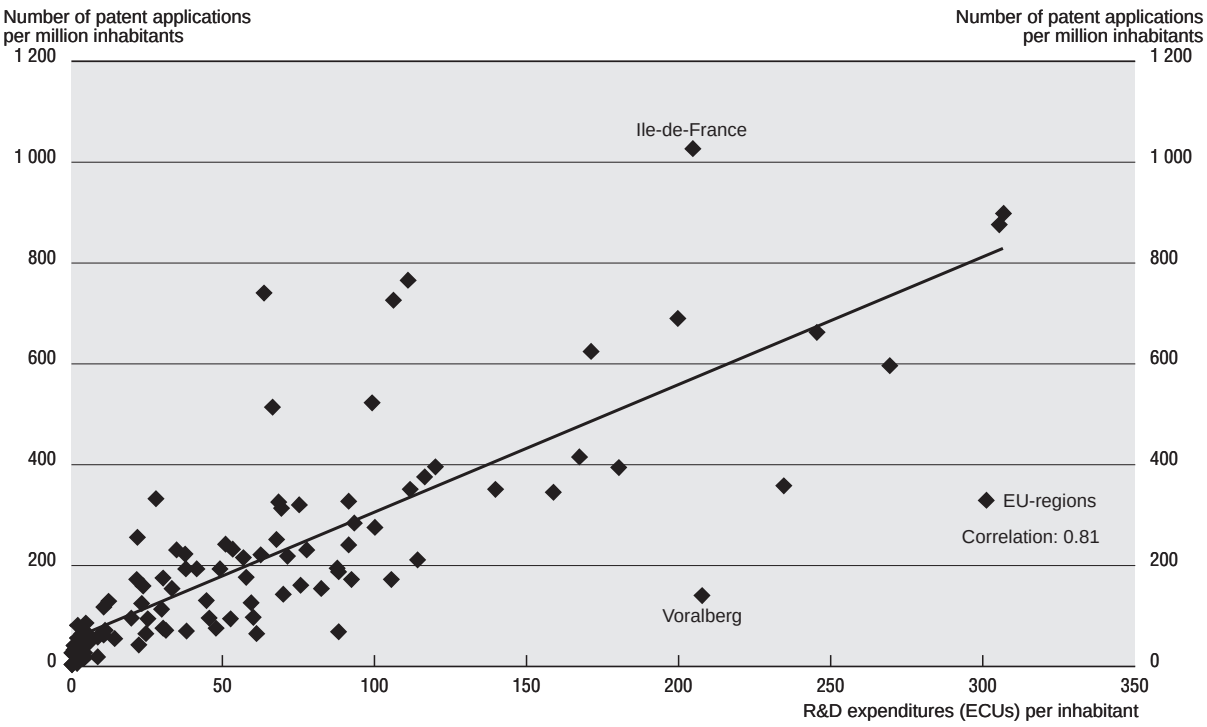
Clearly, the partial nature of both these indicators should be borne in mind in interpreting the analysis presented in what follows. They both reflect only particular aspects of organisational learning and are sectorally biased in consequence of this. Most fundamentally, they are weak in their representations of the less formal processes of knowledge production and innovation. In particular, only very indirectly do they measure the organisational learning which takes place through interaction between (rather than within) firms. Nevertheless, they do both capture major aspects of organisational learning and innovation and are also available on a systematic basis.[7]

Since R&D expenditure is a measure of the inputs devoted to innovation, and patent applications is one of outputs, *we should expect a high positive correlation the two variables*. Calculated for 105 European regions, the correlation analysis confirms this expectation, with a strong positive correlation of 0.81 between the two variables (see Figure 4.4).[8] Here, the causality undoubtedly goes from R&D to patent applications. The few deviations from the average trend may show either differences of performance in R&D or regions where patented innovations represent only a small share of the total innovations.

A region with a lot of organisational learning within and between its firms is closer to a "learning region" than one where little organisational learning takes place. If learning is important for economic performance, we can expect the existence of a strong positive correlation between organisational learning and economic performance. With our indicators, that means that *a high level of* R&D *expenditures and a high level of patent applications per million inhabitants should be correlated with a high* GDP *per capita*. Should there be such correlations between the variables, however, the question of the direction of causality would still remain. Moreover, the results may be heavily dependent on the economic structure of the region. For instance, a strong correlation between number of patent applications per million inhabitants and GDP per capita may simply show the presence of pharmaceutical or other "high-tech" industries in the region and the related production of economic wealth.

Figure 4.4. **Correlation between R&D expenditures and patent applications intensity (1995)**



Source: OECD and EUROSTAT.

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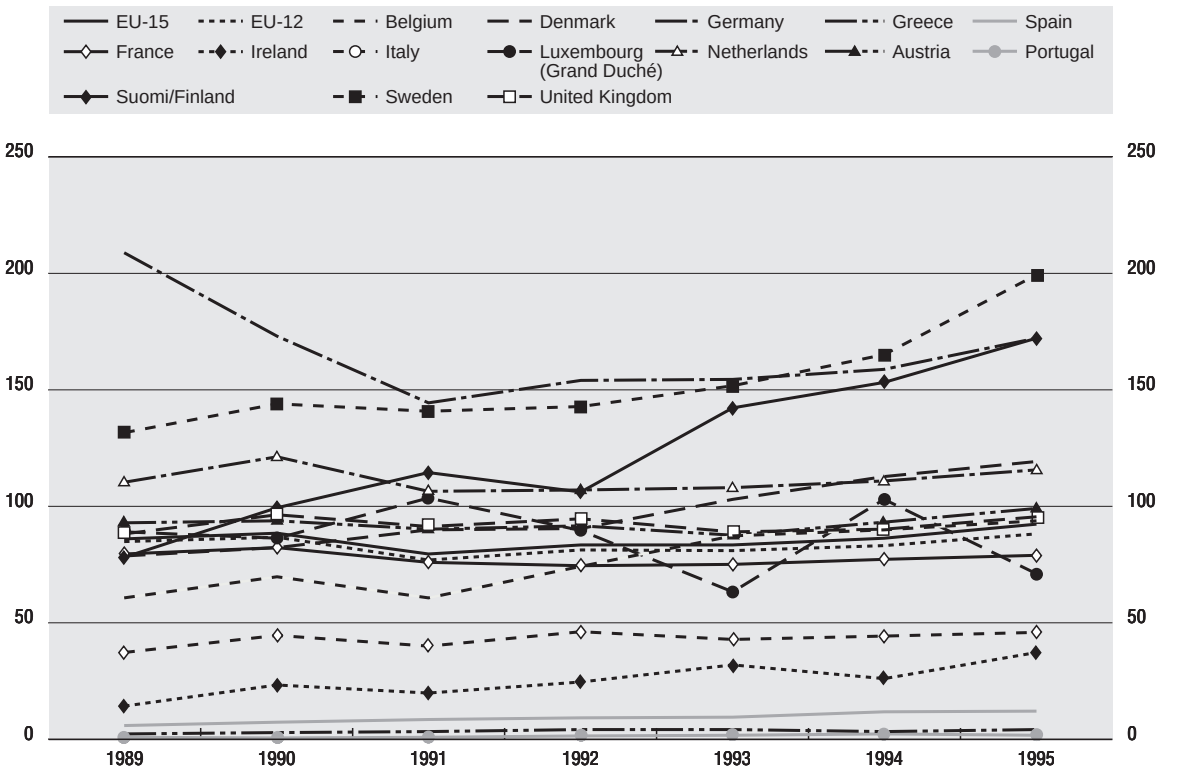
The correlation analysis between the number of patent applications and GDP per capita encompasses 168 EU regions at territorial level 2. As a matter of fact, because of missing data for at least one of the two variables, 13 regions could not be included.[9] Unless they have a high patent intensity, which is unlikely, these omissions should not significantly change the results of the analysis. The number of patent applications was not available at regional level for Denmark and Ireland, so that each of these two countries is represented as one large "region" in the correlation analysis. As noted in the preceding section, this is an acceptable approximation.

The correlation has been calculated for one of the two years with available data: namely, 1995. This may imply a problem of reliability, due to the business cycle and the changes in the number of patent applications over time. The number of patent applications does not vary very much in absolute numbers, but there seems to be a slight positive growth in all countries since 1991, and an important development in countries with formerly low patent intensity. For example, the number of patent applications has risen very sharply in Finland and in Sweden. After a drop, probably due to the reunification, the number of patent applications has been recovering in Germany for a few years. Except in Luxembourg, the patent application intensity has pretty much remained stable in all other European countries (see Figure 4.5). The same pattern is observable at the regional level. In these conditions, an analysis over several years should not imply very different results.

The correlation between R&D expenditures and GDP per capita has been calculated for 127 EU-regions for the year 1995. Data for R&D expenditures are not available at territorial level 2 for Belgium, Denmark, Ireland, Sweden and United Kingdom, and not available at all for Luxembourg. However, given their population sizes, Denmark, Ireland and Sweden have been included as three "regions" in the analysis. Moreover, again because of missing data, three regions have been excluded: Corsica and the overseas

Figure 4.5. **Number of patent applications per million inhabitants**



Source: OECD and EUROSTAT.

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Départements in France, and Ceuta y Melilla in Spain. This exclusion should not have any significant impact on the correlation. There was also some time consistency problems, since data are not available for all countries for 1995. Thus, data for R&D expenditures refer to 1994 for the Netherlands and to 1993 for Austria and Denmark. Since R&D expenditures are relatively stable over time as long as there is no major R&D policy change in the country or region, this should not distort the results too much.

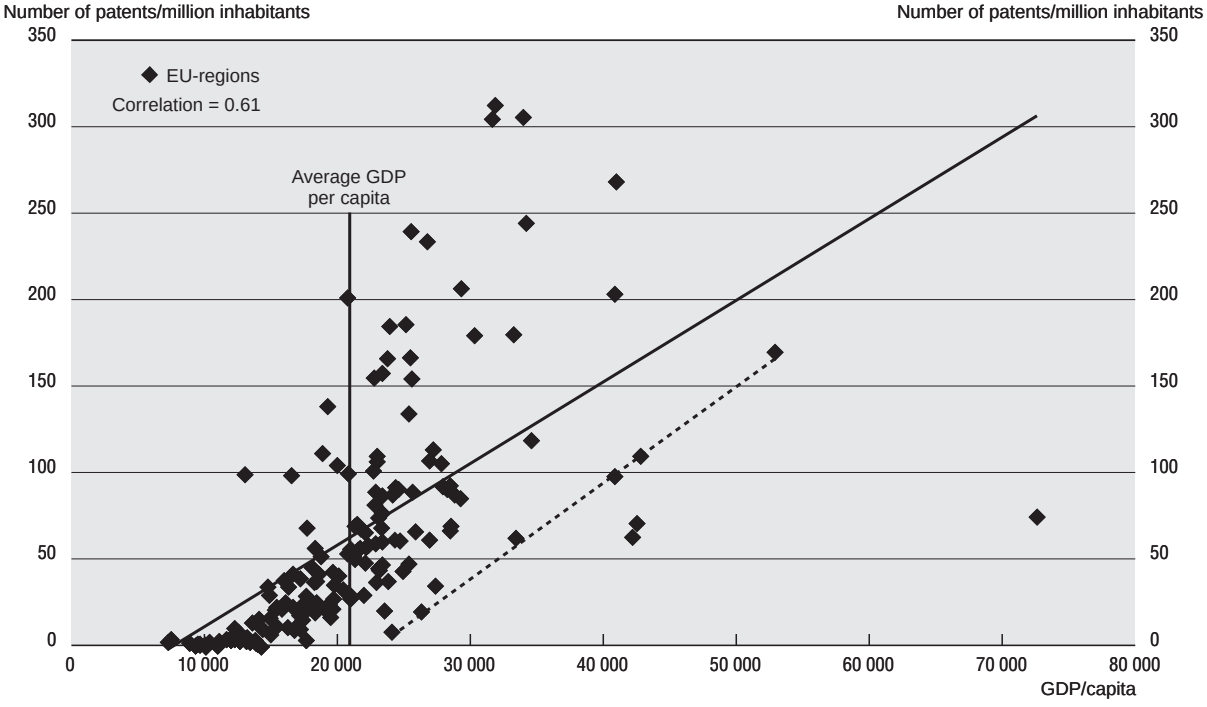
Results of the correlation analyses

At territorial level 2, there is a significant positive correlation between GDP per capita and number of patents per million inhabitants. The correlation is 0.61 (see Figure 4.6). That means that one can expect to find a high GDP per capita where there is a high number of patent applications per million inhabitants. This result was confirmed at the national level, where the correlation amounts to 0.8 (when Luxembourg is excluded and 0.59 when it is included).

Figure 4.6 therefore shows a convincing general relationship between GDP per capita and number of patent applications per million inhabitants. Up to a basic level (around US$15 000 per capita), GDP per capita appears to be independent of patent intensity; thereafter, however, the relationship strengthens. Many regions – especially those in Southern Europe (Greece, Italy, Portugal, Spain) – of course, are still at this basic level: that is, they display a low patent intensity and correspondingly low GDP per capita. However, the dotted line in Figure 4.6 indicates a group of regions, which follow a similar trend, but with a higher basic level of GDP per capita (around US$25 000).

Three regions deviate from the general pattern in a significant way, combining high GDP per capita and very low patent intensity. Salzburg has the highest GDP per capita in the sample (US$72 623) and only 75 patent applications per million inhabitants. Bremen and Luxembourg have, respectively, a GDP per capita of US$42 197 and US$42 526 and only 63 and 71 patent applications per million inhabitants. GDP is measured at place of work, but a large part of the workers may live outside the region. This

Figure 4.6. **Correlation between patent intensity and GDP per capita (1995)**



Source: OECD and EUROSTAT.

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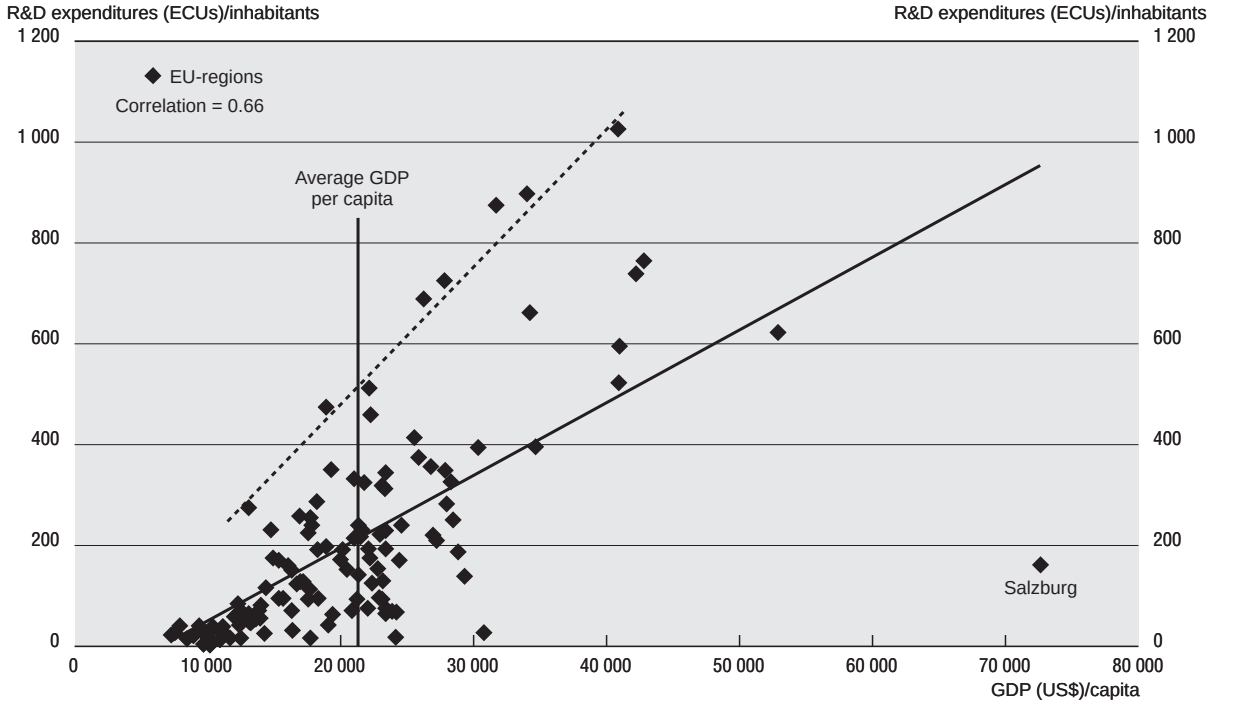
might be an important explanation for the high GDP per capita in Salzburg. Once again, that can probably be explained by "size effects" and by the presence of well-established and lucrative industries in these regions.

However, the majority of the regions that deviate from the general pattern do so because they have a strong patent intensity in relation to their GDP per capita. Stockholm, Baden-Würtemberg and Uusima, for example, have more than 300 patent applications per million inhabitants, but a GDP per capita less than US$35 000.[10] This could be interpreted as evidence that patent intensity does not directly induce a high GDP per capita, but rather both are influenced by a "hidden" third variable. More likely, however, it reflects the particular industrial structures and regional institutions in these areas, characterised by the strong presence of young and dynamic, patent-intensive industries. As was observed in the context of the relationships between individual learning and economic performance, here again the significance of national and regional differentiation in mediating the impacts of organisational learning on economic performance is highly significant.

At territorial level 2, there is also a significant positive correlation – of 0.66 – between R&D expenditures and GDP per capita (see Figure 4.7). Thus, high levels of R&D expenditure generally correspond to a high GDP per capita. Here too, a stronger relationship – of 0.78 – is observed at the national level.

It is interesting too that there are fewer deviations from the general relationship than for patent intensity (see Figure 4.7). Again, however, Salzburg is a marked outlier, with low investment in R&D per capita (ECU 161), but with very high GDP per capita (US$72 623). More significantly, the dotted line shows an alternative path of development that seems less efficient than the general trend. Here, relatively high levels of investment in R&D co-exist with relatively low GDP per capita. Moreover, moving up the scale of R&D expenditure is not matched by rising levels of GDP per capita. Once again, this could be interpreted as showing that organisational learning does not lead to better economic performance. However, given that most of these regions have higher than average GDP per capita, there

Figure 4.7. **Correlation between R&D expenditures and GDP per capita (1995)**



Source: OECD and EUROSTAT.

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is little cause to question the general, positive relationship between firms making substantial investments in R&D and superior regional economic performance. Nevertheless, these deviating regions show that some discrepancy in economic performance exists between R&D intensive regions. It would be necessary to have less aggregated data or to go to the case-study level to produce adequate explanations here. However, once again, the importance of the particular social and economic environments of different regions in mediating the general relationships between organisational learning and economic performance is highlighted.

Summary

In general terms, the correlation analysis demonstrates a relatively strong relationship between organisational learning (as measured by number of patent applications per million inhabitants and R&D expenditures per capita) and economic performance (GDP per capita). What is less clear, however, is whether this should be interpreted in terms of the impact of organisational learning (R&D and patents) on economic performance; or *vice versa* . It is especially difficult to determine the direction of causality, given that both interpretations are plausible. Hence, innovative firms may yield a better economic performance, and thus strong organisational learning at a regional level may produce improved economic performance. Alternatively, it may be that profitable firms invest more in R&D, since they have greater resources available to do so, and thus produce more patented innovations. This, in turn, could give rise to a virtuous circle: economic performance allows more R&D expenditures, which implies more patents, which lead to more economic performance, which allows more R&D expenditures, and so on. Here again, much more detailed evidence would be required to establish with confidence *exactly how* R&D expenditure and patented forms of innovation (as well as other aspects of organisational learning) are implicated in regional economic development. Nevertheless, whilst it is only proper that the limitations of our analysis are borne in mind, establishing that a relatively strong, positive relationship exists itself constitutes a significant step forward.

Individual learning and organisational learning

The analysis can be extended to explore the relationships between individual learning and organisational learning.

Selected indicators

Individual learning is again measured by the percentage of the adult population completing, respectively, *primary, secondary and tertiary levels of education*. *Organisational learning is represented by the number of patent applications per million inhabitants*, as it is this measure (of those which are available to this study) which reflects most clearly the outputs of organisational learning. Once more, however, it is important to bear in mind the partial representation provided by these indicators.

As was seen earlier, it has been argued that individual learning constitutes a necessary precondition of organisational learning and of innovation. In other words, an important aspect of the relationship between individual learning (and educational attainment, more specifically) and regional economic performance is its mediation through improved organisational learning within and between firms. Accordingly, *it is predicted that there is a significant positive relationship between our indicators of individual and organisational learning*. If this is not borne out, it does not necessarily follow that the relationship between individual learning and economic performance is weakened. It could simply be that those aspects of individual learning that are not captured in our measure, which is based exclusively on initial educational attainment, are the most significant. Most obviously, "learning-by-doing" and "learning-by-interacting" within the workplace may be more important than initial education. Alternatively, it could be that the principal impacts of initial education on economic performance operate through mechanisms other than processes of organisational learning and innovation (through, for example, the minimisation of co-ordination costs).

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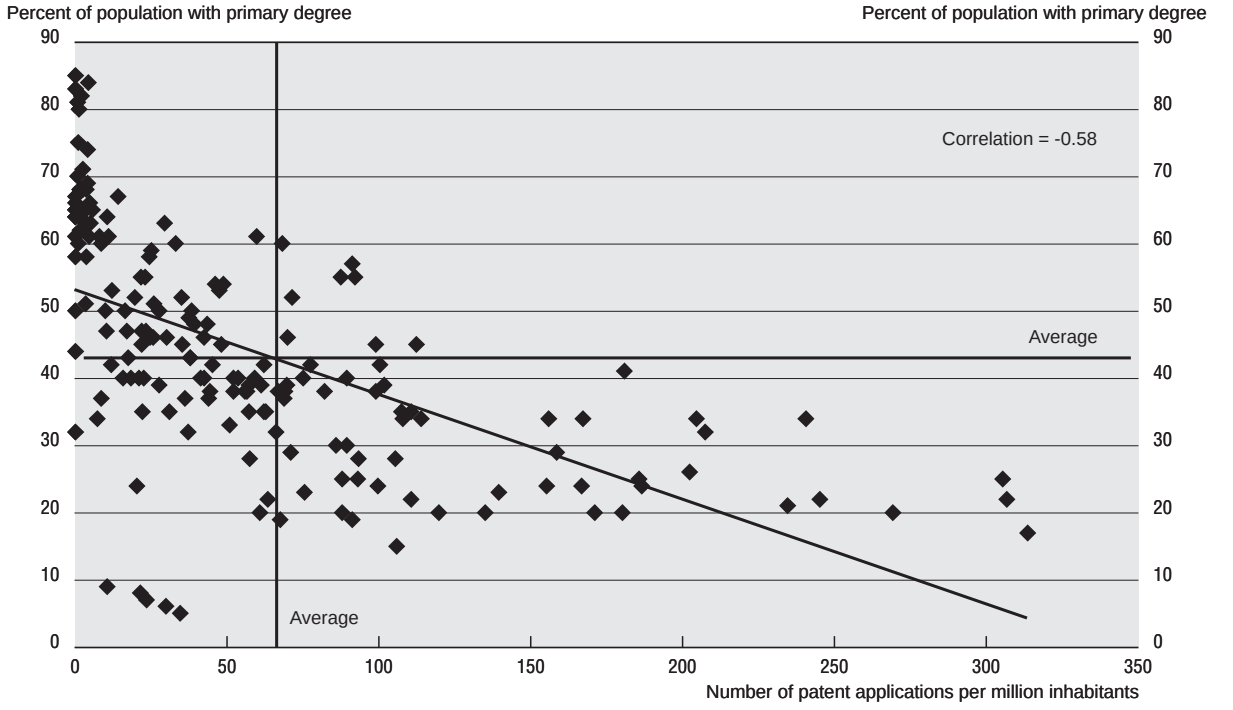
Moreover, for this relationship, the direction of causality is much clearer. Educational attainment can improve organisational learning, but it is much more difficult for the contrary to occur because of time consistency.[11] It is important to bear in mind, however, that educational attainment refers only to formal education. Certainly, organisational learning exerts impacts on other forms of individual learning, especially through the development of competences within the workplace. It may also impact on education in regions where educational organisations and their students have many links with the business world (through training, etc.). Moreover, the fact that the direction of the causality is relatively clear should not obscure the possibility that, in the case of a strong correlation, the two variables may be controlled by a third one.

Results of the correlation analysis

The correlation between the three levels of educational attainment and the number of patent applications per million inhabitants was calculated for 168 Level 2 EU regions. At this level, the correlation between the primary educational attainment and patent intensity is quite strongly negative, at –0.58 (see Figure 4.8). As might be expected, this approximates quite closely to that between primary educational attainment and GDP per capita (–0.6). The only significant deviations from this general relationship involve the former East German Länder, which combine a very low percentage of their population with only primary educational attainment with low patent intensity. On the other hand, there are only eight regions that have a higher than average percentage of population with only primary educational attainment and also a higher than average patent intensity. Most of the regions that are above the average for European patent intensity, also have a lower than average percentage of their population with only primary educational attainment. But within this group of regions, no general trend can be observed: for instance, six of the seven regions with 20 per cent (only) primary educational attainment are above the average patent intensity, but they range from 87 to 269 patent applications per million inhabitants, without showing any clear pattern.

Figure 4.8. **Number of patent applications and primary educational attainment**



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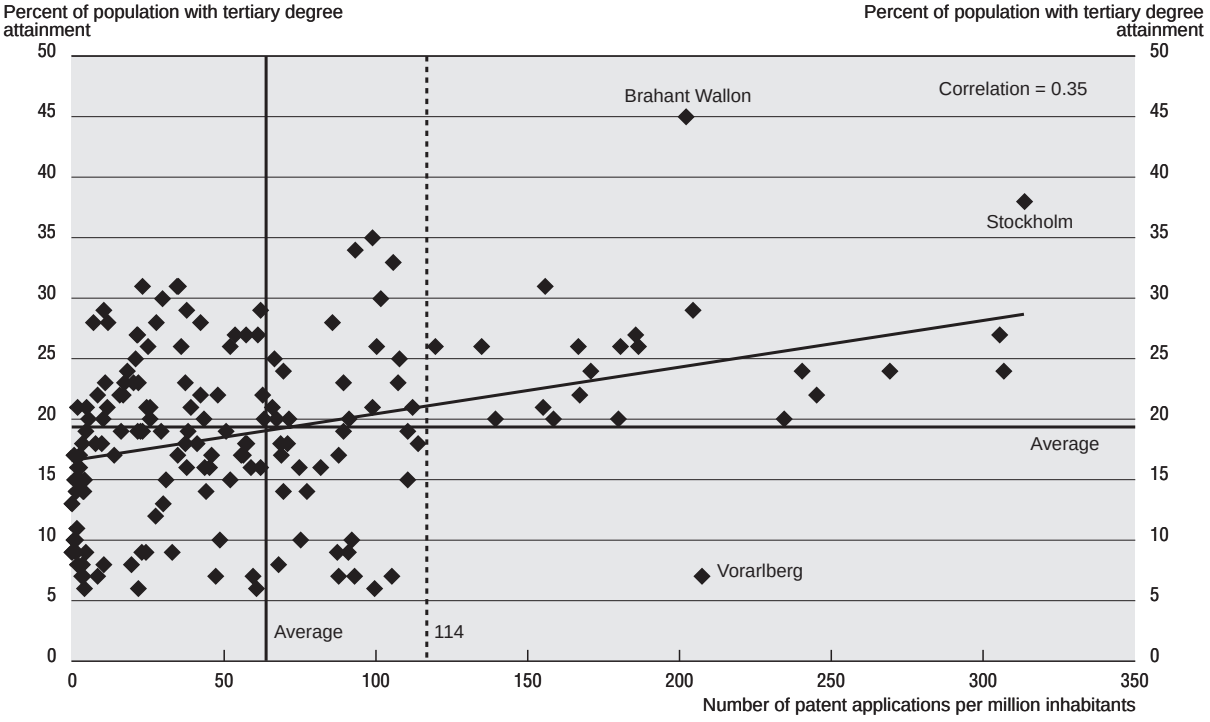
The correlation between the percentage of the adult population with (only) secondary level educational attainment and patent intensity is 0.5. It is difficult to interpret this correlation because of the ambiguity of secondary level educational attainment: a high percentage of the adult population with secondary educational attainment may be the counterpart of a low primary educational attainment, but equally of a low tertiary attainment. It reflects a good level of education in the first case, but a relatively low level in the second. Hence, to be below or above the average European level on this indicator cannot be readily interpreted, even though regions with high levels of tertiary educational attainment generally have high secondary levels too (and a correspondingly low level of primary educational attainment). 75 per cent of the regions that are above the average European patent intensity have higher than average secondary educational attainment. But there are only 60 per cent of the regions with a more than average secondary educational attainment that also have a more than average patent intensity.

The correlation between the percentage of the adult population with tertiary educational attainment and patent intensity is 0.35, representing a weak positive relationship (see Figure 4.9). Hence, regions where the patent intensity is above the European average generally have a high level of tertiary educational attainment too. However, the reciprocal statement is not true. Two thirds of the regions that are above the average European patent intensity have a more than average tertiary educational attainment. But only 45 per cent of the regions with a more than average tertiary educational attainment also have a more than average patent intensity. If we set the threshold at 114 patent applications per million inhabitants (see the dashed line in Figure 4.9), the results become quite clear. All but one of the regions that have more than 114 patent applications per million inhabitants also have a higher than average level of tertiary educational attainment. That means that, with the exception of Vorarlberg (in Austria), *all* very patent-intensive regions have a population with high levels of educational attainment. However, we must stress the fact that these regions are sometimes only slightly above the average for tertiary level attainment; and that they are not the regions with the best educational attainment levels. It helps to have good educational attainment, but it is not sufficient in itself.

Figure 4.9. **Number of patent applications and tertiary educational attainment**



Source: OECD and EUROSTAT.

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There are no really significant deviations from the general pattern. As we have already observed, the former East German Länder have quite a high level of educational attainment, and nonetheless a low patent intensity. This is the major deviation from the general correlation between primary educational attainment and patent intensity. The correlation between secondary educational attainment and patent intensity shows two groups of regions deviating from the general pattern, all coming from Austria and Germany. One of these groups (the five former East German Länder and Burgenland in Austria) has very high levels of secondary educational attainment (around 60 per cent of the adult population), but low patent intensity (ranging from 10 to 35 patent applications per million inhabitants). The other (six of the seven remaining Austrian regions and three German regions: Nierdersachsen, Saarland, Schleswig-Holstein) has higher than average patent intensity (from 60 to 110 patent applications per million inhabitants), but also a high level of secondary educational attainment in comparison to other regions.

With regard to the relationship between tertiary educational attainment and patent intensity, Vorarlberg is the only major deviation: only 7 per cent of its population has completed tertiary education, but it still has one of the highest patent intensity levels in Europe (with 207 patent applications per million inhabitants). It is clearly significant, however, that Vorarlberg nevertheless has quite a good level of education, with 61 per cent of its population completing the secondary level. The cases of Brabant Wallon and to some extent Stockholm also deviate from the general trend, but they do not undermine the idea that a good level of tertiary educational attainment contributes towards the achievement of a high level of patent intensity.

Summary

In broad terms, therefore, the empirical relationships between educational attainment and patent intensity confirm our initial expectations with respect to the impacts of individual learning on organisational learning. Perhaps of greatest interest here is the case of tertiary level attainment. The relatively weak, positive correlation provides some support for the idea that tertiary education can provide a necessary basis for organisational learning and innovation. However, again the divergent social and economic circumstances characteristic of different regions exerts a major impact in mediating this general relationship.

Learning and social inclusion

As we saw in Chapter 2, the relationships between learning, innovation and social inclusion are highly complex. Whilst highly innovative regional economies are highly likely to enjoy strong trends of economic growth, these are not *necessarily* translated into high levels of social inclusion. The latter depend not simply on the *extent* of economic growth, but also on the ways in which the latter's benefits are *distributed* amongst the regional population. Clearly, access to employment opportunities is a key factor here.

Selected indicators

Our indicators of learning have been extensively discussed earlier. However, *social inclusion/exclusion* is introduced here for the first time. The *unemployment rate* (the unemployed as a percentage of the workforce) is used as the measure of social exclusion. This an indicator for which data are generally available. Moreover, not only is engagement with the labour market a key dimension of social inclusion in its own right, but is also very closely related to other key aspects of the phenomenon such as poverty.

Strong economic growth, then, can co-exist – at least in the short term – with extensive unemployment. As we have argued, certain forms of innovation – especially process innovations – can serve to decrease the number of jobs in the production process. Moreover, it may be that the increasing importance of individual learning within the knowledge-based economy produces new forms of social inequalities, through the intensification of the disadvantages experienced by those denied access to learning opportunities. In short, therefore, to a much greater degree than with the other relationships explored in this section, *it is difficult to predict the results of the correlation analysis.*

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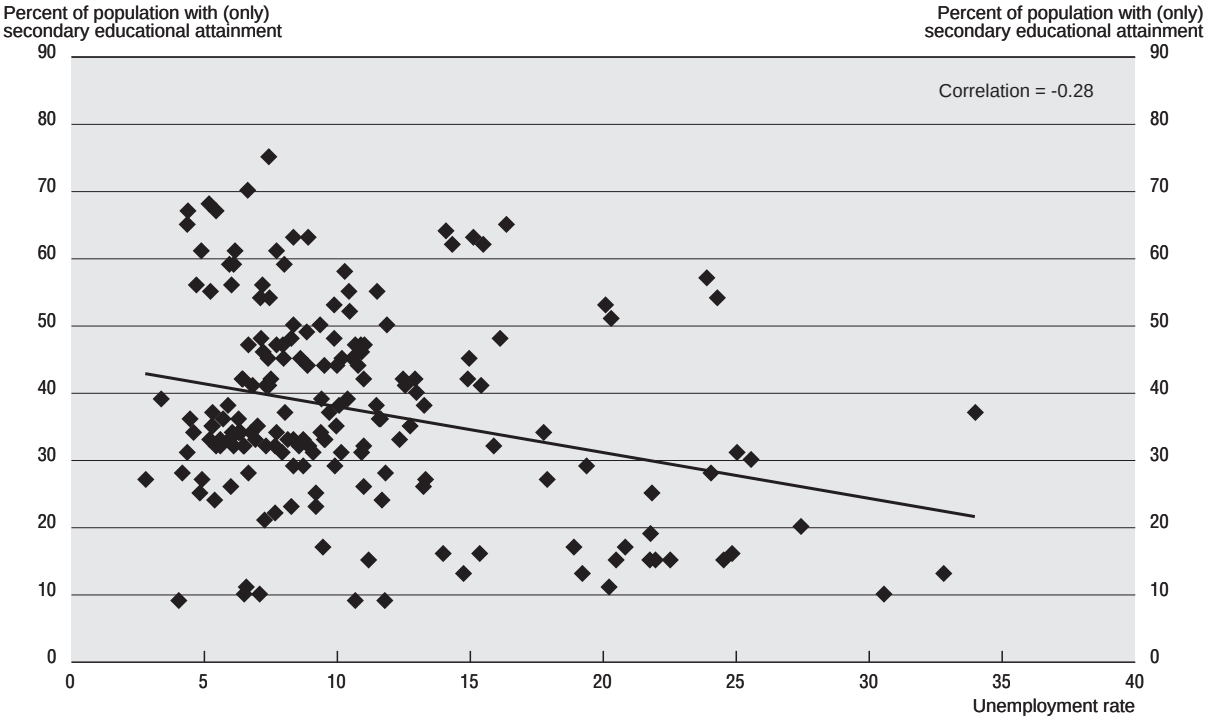
Results of the correlation analysis

Only a very partial exploration of these issues was possible through the correlation analysis. Initially, the latter issues were investigated by means of correlating our indicators of individual learning (percentage of the adult population completing primary, secondary and tertiary level education) with the unemployment rate. This analysis was conducted on the basis of 181 EU regions. There is a weak, positive relationship between (only) primary educational attainment and the unemployment rate (0.23). Similarly, the relationship with secondary educational attainment is also weak, but is negative (–0.28) (see Figure 4.10). The correlation between tertiary educational attainment and unemployment rate is very weak indeed. What this indicates, therefore, is that although it is well established that at the individual level people with low levels of educational attainment are more prone to be unemployed than those with higher levels, this relationship is much weaker at the more aggregated, regional level (OECD, 1996*b*). To put this another way, employability – as constituted through educational attainment – is not a guarantee of employment, as the latter depends on a range of other factors too. It is also clear that, in some regions, quite low levels of educational attainment co-exist with low levels of unemployment, indicating the persistence of a "low-skills equilibrium". Whether this will be sustainable as the learning economy develops remains to be seen.

As we have seen, then, individual learning may impact upon social inclusion through economic mechanisms, by improving individual wealth. Employed people are generally more integrated into society than the unemployed. If individual learning can lead to a better economic performance, we can assume that it induces a lower unemployment rate. In fact, this assumption is not correct: we have found no significant correlation between the unemployment rate and the GDP per capita at the EU regional level (–0.3).

This absence of a significant correlation is difficult to explain at this level of aggregation. It would be necessary to go into a more qualitative analysis to take into account the national and regional

Figure 4.10. **Unemployment rate and secondary educational attainment**



Source: OECD and EUROSTAT.

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institutional frameworks with all their singularities. Neo-classical theory would explain the absence of a significant correlation by governmental regulations such as social minima that prevent the attainment of full employment. However, a recent international comparative study has shown that these regulations have no effect on the level of global unemployment, but only on its demographic composition (OECD, 1999). Other explanations are, of course, possible. In particular, it at least remains possible that innovative and profitable industries produce high GDP per capita in a region, but do not thereby generate high levels of demand for labour. Moreover, the wealth of a region does not imply the individual wealth of people in this region: the unemployment rate may reveal the existence of sharp inequalities in the income distribution in the region. In this case, the unemployment rate could be seen as a threat to social inclusion in the long run.

Summary

The negative correlation between individual learning measured as secondary educational attainment and unemployment suggests that individual learning does lower social exclusion, but the correlation is weak. Hence, the correlation analysis of learning and social inclusion provides less clear results than the three previous correlations. Further empirical evidence is clearly needed on this difficult subject.

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Appendix 4.1

METHOD OF THE CORRELATION ANALYSIS

Correlation analysis of EU regions

The data analysis is based upon quantitative indicators of our key concepts from Chapter 3: individual learning; organisational learning; economic competitiveness; and social inclusion. A data set of the following indicators was assembled for regions of the 15 member states of the EU:

***a)* Indicators of regional economic performance**

- GDP/capita (1990 US$/person in 1995).
- Unemployment (as per cent of the workforce in 1995).
- Employment (as per cent of workforce in 1995).

***b)* Indicators of individual learning**

- Educational attainment (per cent of the population aged 25-59 years attaining educational Levels 1, 2 and 3 in 1995).

***c)* Indicators of organisational learning**

- R&D expenditures (ECU/person in 1995; and per cent of GDP in 1995).[12]
- Patent application (number per million inhabitants).[13]

***d)* Indicators on social inclusion/exclusion**

- Unemployment (as per cent of the workforce in 1995).

The correlations that were computed encompassed the following, although not all of these have been included in the discussion in the main text.

- The correlation between educational attainment and GDP/capita.
- The correlation between educational attainment and employment rate.
- The correlation between educational attainment and number of patent applications/million inhabitants.
- The correlation between number of patent applications/million inhabitants and GDP/capita.
- The correlation between number of patent applications/million inhabitants and unemployment rate.
- The correlation between total R&D expenditures and GDP/capita.
- The correlation between employment rate and GDP/capita.
- The correlation between unemployment rate and GDP/capita.
- The correlation between educational attainment and unemployment rate.

It is important to note some problematical issues in respect of the correlation analysis. Some of them reflect traditional statistical limitations. Firstly, determining the strength of a correlation is crucial to judging its significance. However, the size of correlation is itself dependent on the number of cases in the analysis. We attempt to overcome this difficulty by showing as far as possible the scatter diagrams of the correlation analyses. Nevertheless, interpretation remains a matter of judgement. Secondly, the existence of even a "strong" correlation does not prove that a relationship of causality exists between them: both can be controlled by a third variable. A classic example here is the strong correlation between people eating ice creams and people wearing sunglasses; both are in fact controlled by the sunny weather variable. Thirdly, the existence of a correlation gives no indication of the direction of "causality". This problem is especially acute in this study, as there are a lot of multiple interdependencies between the variables.

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Others, however, reflect specific difficulties. The first concerns the validity of the quantitative indicators. Quite simply, it is hard to find good indicators of the concepts, especially for social capital and social inclusion. Moreover, even where they exist, some good indicators may not be available, especially at the regional level. For this reason, each indicator is discussed when it is introduced in the main text. The second problem arises from the non-comparability of the European regions, which are very different in size. Some regions are small – such as Luxembourg which has only 420 000 inhabitants – whereas others are very large – Ile-de-France (France) or Bayern (Germany) have some 11 million inhabitants, for example. If a very specific trend exists in Luxembourg, it will strongly affect the correlation results; whereas a similar trend in a comparable area in Ile-de-France or Bayern may not be visible because of the "size effects". From the statistical viewpoint, it would have been more relevant to compare only regions of similar sizes. But clearly this would have been meaningless from the geographical, historical and political viewpoints.

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NOTES

1. Throughout, primary education refers to primary level and lower secondary level. Secondary education refers to upper secondary level. Tertiary education refers to post-secondary education, including both university and non-university programmes. These are based upon ISCED definitions.
2. We encountered two difficulties here. Firstly, data for this measure of educational attainment were not available at the regional level for Denmark and Ireland, so that both of these countries were considered as one large region in the correlation calculation. Denmark and Ireland have respectively three and nine regions (territorial level 2), but since their total population (5 and 3.5 million inhabitants, respectively) is less than the population of some TL2 regions in many European countries (for example, Lombardia and Campania in Italy, Rhône-Alpes in France, Hessen in Germany, Andalucia in Spain, Greater London in the United Kingdom, etc.), there is no large distortion of the results. In France, the overseas departments (FR90: Guadeloupe, Guyana, Martinique and Reunion) have been excluded from the calculation because of missing data. But this exclusion again should not have a significant influence on the results. Secondly, the dates for which the data are available are different for the two variables. Data for educational attainment at territorial level 2 are available only for 1997, whereas data for GDP per capita at territorial level 2 are available for 1990, 1991 and 1995. The consequence is that the two variables in the correlation refer to different years. Since educational attainment data are very stable over two years, the results of the correlation should be very close to the actual results for 1997.
3. It would be necessary to prove that formal education is very different in these regions than in the other European regions or that it is very poor. Since formal education in at primary and secondary levels remains quite general and, for its largest part, not vocational, this interpretation is hardly convincing.
4. Regional data for Denmark are missing. Having only eight regions, a satisfying correlation analysis is difficult for Sweden. In any case, Stockholm has too great an impact on the results: for instance, when Stockholm is excluded from the correlation analysis between tertiary educational attainment and GDP per capita, the correlation drops from 0.76 to –0.7.
5. In certain circumstances, patenting may be used strategically, simply to deter later entrants from a market.
6. In practical terms, the data correspond to the number of patent applications to the European Patent Organisation for the year 1995.
7. It would have been extremely helpful to have alternative indicators of organisational learning. For example, training expenditures provide a good measure of the distribution of both organisational and individual learning within the firm and are frequently closely related to product and process innovations. Unfortunately, data were not available.
8. Owing to missing data, the UK was excluded from the analysis. Regions generally correspond to TL2 regions, except for Belgium where data were only available for the 3 TL1 regions and for Denmark, Ireland, the Netherlands and Sweden, which were considered as three big regions. Ahvenanmaa/Aaland in Finland, Corse and Overseas Départements in France, Anatoliki Makedonia, Thraki, Voreio Aigaio, Notio Aigaio, Ionia Nisia, Sterea Ellada in Greece, Rioja And Ceuta y Melilla in Spain, and finally, Algarve and Madeira in Portugal were excluded from the analysis because of missing data.
9. The 13 regions are: Ahvenanmaa/Aaland (FI06), Corse (FR83), Départements d'Outre Mer (FR90), Anatoliki Makedonia, Thraki (GR11), Ionia Nisia (GR22), Sterea Ellada (GR24), Voreio Aigaio (GR41), Notio Aigaio (GR42), Algarve (PT15), Madeira (PT30), Rioja (ES23), Merseyside (UK84), Northern Ireland (UKB). Their GDP per capita ranges between US$7 886 and US$30 750.
10. The detailed figures are as follows. Stockholm: 313 patent applications per million inhabitants, GDP per capita US$31 886. Baden-Würtemberg: 307 patent applications per million inhabitants, US$33 974. Uusima: 305 patent applications per million inhabitants, US$31 669.
11. Firms could have an influence on school curricula, but not on individual educational attainment (unless one assumes that they also have a direct influence on the level of demand for gaining a degree).
12. Clearly, firms' expenditure on R&D is a measurement of inputs to organisational learning rather than outputs.
13. The number of patent applications is an output measurement, but only of particular forms of technological and mostly product innovations.

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Chapter 5

LEARNING AND INNOVATION IN THE REGIONS: A CASE-STUDY ANALYSIS

Introduction

The present chapter presents the second part of the empirical study: an intensive case-study analysis of learning at the regional level. Five case studies of regions and cities have been carried out in order to provide empirical insight as to the causal connections and processes underlying learning. Thus, the case studies facilitate the development of conclusions with respect to research questions A, B, and C that were not rendered possible by the correlation analysis alone (in Chapter 4). The cases are also aimed at providing answers to research questions that are very difficult indeed to address by statistical work, research questions D, E, and F, pertaining to social capital, "path-dependency", and policy making. The findings from the case studies, in combination with the results of the correlation analysis, hence constitute the empirical basis for providing more elaborated conclusions on the research questions, which will be presented in Chapter 6 A further purpose of the case studies is to provide *examples* of the role of regional policy for promoting learning, thus facilitating the development of heuristic guidelines for regional policy making. These insights, together with the other evidence from the case studies and the correlation analysis, will form the foundation for the policy principles on how to create a "learning region" or city that are outlined in Chapter 7.

The case studies all address issues of individual and organisational learning, economic performance, social inclusion, social capital, "path-dependency", and policy making. As spelled out below, the case regions are very different, but for the purpose of analysis it is helpful to present the studies in a similar manner. An extensive statistical profile has been developed for the case regions, seeking to provide comparable data for the year 1995 and the changes in the period 1980-95. The profiles can be found in the annex at the end of the book.

Further, qualitative accounts for certain key dimensions have also been produced. The case-study presentations all feature a brief introduction on the basic characteristics and historical and geographical context of the regions. An account for the economic development of the region is provided next, showing, for example, GDP and unemployment development, and discussing the reasons for this. The cases also feature a section on organisational learning, discussing industry structure and the part of the regional innovation system comprised by firms, firm networks, and firm-level process and product innovations. For all the cases, a section is provided discussing regional policy – the political autonomy of the case region, the strategy of regional policymakers, as well as the concrete efforts carried out aiming at enhancing learning. Some of these efforts, as well as their success, are discussed in sections concerned with individual learning, focusing upon educational attainment, educational needs and education policy efforts, and with public R&D and industry services, focusing upon the other roles played by the public sector in supporting business and enhancing learning, through, for example, university research, research centres, technology services, entrepreneurial services, inward investment agencies and so forth.

A discussion is also provided of the role of social capital for learning and related processes. This section seeks to address social capital at the level of the local society as a whole (in terms of *civic* social capital), as well as social capital confined to particular groups of agents (for example, a local business community of managers, or a local scientific community of researchers). To the extent possible, this

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section gives an account for the role of social networks – both *traded* (formalised, with an economic component, such as sub-contracting relations between firms) and *untraded* (personal networks between agents, including managers), as well as the conventions and norms related to these networks.

The qualitative accounts try to undertake the difficult task of providing as much evidence as possible for the complex *interplay* between these dimensions, thus demonstrating the causal connections and processes underlying learning in the five cases.

The selected cases

The case studies encompass the regions of Vienne in France, Øresund in Denmark and Sweden, Andalucía in Spain, Kent Thames-side in United Kingdom, and the city of Jena in Germany. All these cases have adopted a vision of becoming "learning regions" or a "learning city", and are implementing policy accordingly. Although all are located within the EU, the case regions display a very wide range of socio-economic conditions. Figure 5.1 summarises some of the socio-economic characteristics of the case regions. Full details are provided in Appendix 5.1.

Figure 5.1. **Overview of the five cases**

	Area sq. km	Population in 1995	Population density (person/sq. km in 1995)	Rural population (per cent in 1995)	GDP per capita 1995 (US$ per capita in 1990)	Unemployment (per cent in 1995)	Population change (per cent 1980-95)
JENA	114 (0.03)	101 061 (0.1)	885 (386)	0 (0)	–	14 (122)	–5.8 (national: 4.4) 1992-96
VIENNE	6 990 (1)	391 500 (1)	56 (52)	65 (176)	14 062 (79)	10 (91)	6.4 (81)
ØRESUND	16 827 (3.7)	3 006 300 (21.4)	179 (577)	19 (43)	18 691 (106)	8.3 (99)	3.0 (65)
ANDALUCÍA	87 653 (17)	7 151 00 (18) 1996	82 (105) 1996	41 (137) 1996	9 216 (72)	33 (143)	10.7 (255) 1981-96
KENT THAMES-SIDE	172 (0.07)	176 000 (0.3)	1 023 (430)	13 (100)	15 553 (88)	8.2 (100)	–0.4 (national: 4.0) 1981-95

Per cent of national total or average is showed in (parenthesis).
Øresund calculated as weighted average of the Greater Copenhagen and Scania areas.
Source: OECD Territorial Database and data from the case studies.

As a consequence of the different socio-economic conditions and political history of the case studies, the regional "learning" policies applied have been very different indeed. Hence, in terms of heuristic guidelines for policy, the cases are a rich source of inspiration. Concerning the research questions, as we have mentioned, the differences between the cases make it possible to investigate the processes of learning under different conditions, and at different regional scales.

Jena, Germany

Jena is a city of 101 061 inhabitants (1995) in the Saale valley in southern Thuringia, one of the *Länder* of the former East Germany. The administrative area of Jena covers a mere 114 square kilometres, with a 1995 population density of 885 persons per square kilometre. In spite of its modest size, however, Jena is one of the most important cities in Thuringia; and a major part of Thuringia's "high-tech" industry, higher education facilities, and public R&D capacity is located in Jena. The general population decline of the former East Germany following reunification has not been quite so significant in Jena. This is a sign that, even if Jena in common with other former East German cities has to fight severe economic problems, it has been relatively effective in making a range of social and economic activities grow anew.

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Economic development

Jena is experiencing a major economic crisis and restructuring. Until 1989, owing to state protection of East German industry, a very low level of productivity coexisted with high employment. It is estimated that the productivity of East German firms was at a lower level than their wages, making their production costs significantly higher than those of West German firms. The 1989 reunification of Germany did not only mean that the former East German firms lost their protection and were exposed to international competition, it also brought demands to equalise wages and social standards to the West German level. This was a difficult task, given the fact that the 1990 GDP per capita of Thuringia was US$6 838 per capita, only 39 per cent of the national average. A dramatic drop in competitiveness and employment followed. In Thuringia, employment fell from 1.4 million to 1.08 million in the period 1991-96. The 1996 unemployment rate of Thuringia was 16.9 per cent (compared with a national average rate – raised considerably by the inclusion of East Germany – of 12.2 per cent). In Jena, employment also dropped drastically. For example, 16 000 workers were laid off by Zeiss, the city's hitherto all-dominating industrial employer. Jena's 1996 unemployment rate was 13.7 per cent. After reunification, the Thuringian birth rate also saw a huge decline, more than halving from 32 000 births in 1989 to around 12 000 in 1997. Only recently has there been a slight increase (16 000 births are estimated for the year 2000). Unemployment and social insecurity also spurred a significant emigration. In Thuringia, the net migration between 1980 and 1995 was –4.8 per cent, and in Jena, the figure was –78 per cent.

However, in Thuringia, productivity has doubled since reunification, and GDP per capita has increased to 59 per cent of the national average by 1995. Jena's economic performance has also improved. The improvement of economic performance in Jena is partly due to the start-up and inflow of new firms. During the last nine years, some 200 firms have started up or have located activities in Jena. Thus, much of the current economic development of Jena is underpinned by external investments. These investments are brought about mainly due to the aspirations of Jena of becoming a "learning city", a centre of "high-tech" industry and organisational learning. As will be demonstrated below, the exposure to international competition and the economic crisis has not in itself brought about this positive change in Jena. It is closely connected to a political learning process and hands-on policies applied by the regional and local governments.

Organisational learning

Since the unification of Germany, Jena and Thuringia more widely have witnessed a long awaited shift in production structure. The Thuringian service sector surpassed the industrial sector in terms of employment around 1991, 15 years later than in the former West Germany. Employment in the service sector is presently at a higher level in Jena than the Thuringian average. The city had a 1996 production structure of 0 per cent employed in agriculture (Thuringia: 3 per cent), 28 per cent in industry (Thuringia: 38 per cent) and 72 per cent in services (Thuringia: 59 per cent). Even if the present proportion of service employment is partly due to major cutbacks within the industrial sector, it is also a sign that Jena is an important urban agglomeration with a substantial part of Thuringian R&D and services. Jena's 1995 level of service industry is in fact 122 per cent of the German average (which itself, it should be remembered, was reduced considerably by reunification).

Compared with the rest of Thuringia, Jena is leading when it comes to organisational learning measured by patents, now having the highest patent rate (1992-94) of the new German *Länder*. In 1995, the number was 1 016 patent applications per million inhabitants – six times the German average. Jena's GDP growth may seem less impressive considering the high number of patent applications. A central analytical and political concern is thus to reveal the reason that a high level of firm-level, organisational learning does not contribute to economic growth to a higher degree.

A possible reason that a high number of patents is not (yet) reflected in economic growth is that the economic system of Jena is highly centralised, and the scope for spin-offs and economic multiplier effects limited. Up to reunification, Carl Zeiss, a major East German industrial conglomerate, completely dominated Jena with its 23 000 local employees (around a third of its total East German workforce).

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Another important local firm, Jenaer Glaswerk, was closely associated with Zeiss. Most of Jena's industrial activities were internalised in or orientated towards Carl Zeiss, and Jena was dominated by this one production and innovation system, marred by low productivity and efficiency problems.

Even after reunification, the successors to Carl Zeiss, Jenoptik and Carl Zeiss Jena, are still the dominant local firms. However, since 1991, a major restructuring of the industrial structure has been underway, as a whole new system with much larger numbers of more specialised firms emerges. There was a huge lay-off of workers by Jenoptik and Carl Zeiss Jena (some 16 000 by Jenoptik alone), which took place in connection with a strong focusing of the firms' activities and product areas. Whereas Carl Zeiss had internalised production of a range of products in addition to the core optical ones (such as industrial devices and packaging), Jenoptik and Carl Zeiss Jena now focus exclusively on optics, lasers, optoelectronics, precision engineering, and, to a growing degree, biotech. These are the product areas within which Jenoptik and Carl Zeiss Jena have the greatest competitive advantage on international markets, and the firms have gained production efficiency and closer market couplings by this focusing. Further, the firms have relocated most of their production and administration infrastructure out of the central city area, and achieved productivity gains by establishing new production facilities.

In connection to this focus upon core competences by the successors to Carl Zeiss, a range of independent sub-contractors has sprung up. There have been a number of start-ups and relocations to Jena not only of such sub-contractors, but also of firms that are specialised in areas related to the activities of Jenoptik and Carl Zeiss Jena, predominantly with new knowledge, different product lines, and international market orientation. In total, 200 new firms have been attracted since 1991, and 5 700 new jobs have been created in these new areas. In biotech alone, over 1 000 jobs have been created.

This represents a major change in Jena's industry structure, from the dominance of traditional industry to a larger significance of services; from low productivity to high productivity; from a huge degree of vertical integration to a network-based organisation; an increased specialisation of single firms; and a greater product focus within the system as a whole. This change has been brought about by a policy designed according to the assets of Zeiss and the interests of its two successors. The process is ongoing, and there is, of course, a time lag before results in terms of economic growth become evident. A longer-term result of the larger number of firms, as well as the more pronounced division of labour between firms, could be a larger scope for interactive learning in many aspects of the local economy, including better co-ordination of individual learning to firm level learning. There is a strong political focus both on promoting interactive learning at the firm level, as well as co-ordinating educational activities better to industry demands. The political process that lies at the heart of the industrial restructuring, the efforts to co-ordinate educational activities, as well as the offer of industrial services to promote interactive learning, will be spelled out in the following sections.

Regional policy

Jena is subject to national German law and planning. However, the German political system ascribes a large degree of freedom to the individual Länder for policy making. At this regional level, Jena is included in the Thuringian government's development plan for Erfurt, Weimar and Jena. In particular, the development of education in Jena is closely co-ordinated through Thuringia's general policy. However, Jena's city council – n its new, post-reunification form – has had considerable freedom to implement a local strategy for the restructuring of Jena's economic system. The city council has done so in close partnership with the dominant industrial agents, notably the management of Jenoptik and Carl Zeiss Jena. In fact, Jenoptik and Carl Zeiss Jena have managed not only to negotiate a privatisation agreement allowing the firm to lay-off workers on a large scale, but to design an entire economic policy for Jena encompassing not only industry services and public R&D, but also city planning (in connection to the construction of the new production facilities of Jenoptik and Carl Zeiss Jena). This public-private partnership is not due to a particular political tradition (quite the contrary, given Jena's recent socialist past), rather, it is a necessity given the powerful role of these local firms.

After reunification, the state-owned firms of the former East Germany were privatised in co-operation with the Treuhand (the German Public Trust Agency). In general, privatisations sought to modernise firms with a minimum loss of jobs. In Jena, there has been a policy focus upon collective and

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location-specific competences rather than firm-specific jobs. Contrary to some other regions or cities that experience a severe loss of competitiveness, it is a central element for the city council in Jena that learning policies should not primarily create new local resources. Rather, they should aim at enhancing the efficiency of the utilisation of the existing resources, notably the market value of the existing knowledge contained in local industry and the workforce. Such a knowledge-orientated strategy implies a focus and specialisation on the areas in which Jena's dominant firms (particularly Jenoptik, Carl Zeiss Jena, Jenaer Glaswerk and Jenapharm), universities, and non-university research institutes possess specialised knowledge. The pooling, building, and utilisation of knowledge in these areas is to be strengthened.

Concerning education, the general improvement in quality, as well as the upgrading of the natural sciences, that took place as a part of Thuringia's education policies have been useful to Jena. In particular, the strengthening of Friedrich-Schiller University and the Technical University has been of relevance.

However, Jena's ambition to become a "learning city" demands more than educational efforts. To overcome "path-dependence", building new institutions and organisations is necessary. For Jena, creating a local innovation system with an abundance of "high-tech" SMEs implies attracting investments from outside through building an image of Jena as an emerging "high-tech" city and offering attractive construction sites, as well as offering financial support for new firms. This is supplemented with the creation of a host of traded networks to pool the resources of small firms (for example, to design and market new products), as well as disseminate the knowledge created in universities and research institutes.

Jenoptik has been a central agent not only in the design but also the implementation of such efforts. The firm has played an active role in helping start-up firms and inviting outside firms to Jena, as well as helping them with finance, building sites, and some consultancy services (improving on their specialisation, market orientation, and export skills). To the benefit of both Jenoptik and the new firms, technological competence circles have been initiated to achieve mutual sharing of knowledge. The regional authorities have closely co-ordinated their investments in public R&D and their offer of industrial services to the efforts of Jenoptik.

To change Jena's industrial system that has been so centralised hitherto, it seems that centrally co-ordinated policies – formulated by a few, powerful agents – are necessary. Clearly, notwithstanding the democratic problems it may cause, the centralisation of local policies around a few issues and agents improves on its implementation. However, such a policy design also has some negative potential implications for innovation. Regional and local specialisation within a few product areas may be highly beneficial to local firms if a balance is struck between competition and co-operation. This implies that SMEs experience constant competitive pressure to improve on products and processes, while collectively building the means to do so (by pooling resources and sharing knowledge). However, political favouring of particular specialisations and product areas lessens the scope for experimentation in other market areas, while it may lower the degree of competition within the focus areas. The policy makers of Jena risk replacing one type of "path-dependence" with another, and it may be that they should be willing to allow for a greater breadth of policies after an initial period. If they are not ready to learn from the local market and depend on their own policies for local market dynamics, the scope for future mistakes may be high.

Individual learning

Thuringia has a generally impressive level of educational attainment. In 1995, 63 per cent of the population aged 25-59 had attained a medium education level and 30 per cent a higher level – a total of 93 per cent at an upper level. This corresponds to 107 per cent, 130 per cent, and 113 per cent of the national average, respectively. However, this high level of individual learning up until now has played only a limited role in shaping economic performance, as Thuringia's 1995 GDP per capita was only 59 per cent of the national average. The reasons for this are that, despite the progress made since reunification, the industrial structure remains problematic; in addition, even more remains to be done to co-ordinate individual learning to industrial demands effectively. Thus, Thuringia faces a large

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problem of breaking the path-dependence of inherited structures and educational practices. However, there are signs that the city of Jena, in particular, is succeeding in placing education centre-stage for industrial and economic development.

The industrial restructuring currently being promoted in Jena demands a major investment in human capital. The necessary increase of productivity in firms implies a significantly larger degree of employee participation, along with the introduction of new technology and processes. There also needs to be an upgrading of shop-floor learning (particularly important for the growing number of specialised and "high-tech" suppliers), which demands an activation of the knowledge of individual employees, as well as their active experimentation. In general, Jena's firms are becoming able to compete on international markets, largely retaining their original staff. This increase of the value of human capital is partly a feat accomplished by the management of the firms themselves. However, only a few of Jena's firms have on their own been able to reorganise work processes, as well as change the social norms and conventions of the labourforce. Further, new SMEs – with less resources for internal training – are replacing older and larger firms in the industrial system, at the same time as the remaining larger firms are cutting down on their internal training activities due to the economic crisis. For example, Jenapharm took only two trainees in 1998.

The emerging success of upgrading human capital should thus partly be ascribed to the growing role of public education. Ongoing changes within the education system mean that individual learning is to an increasing degree being co-ordinated to the requirements of firm-level learning. In particular, improvements of management and marketing skills must be viewed as a crucial improvement. This process has encompassed higher level education and vocational training. In addition, investments for future generations of citizens and employees are being made in the elementary schools.

One of the central goals of the new Thuringian government concerning education was to change those of its characteristics that were adapted to the former East German socio-political system, but also to upgrade education considerably in order to bring it up to the level of the West German Länder. The elementary schooling system has been made less rigid, as different types of schools (including private ones) have been permitted. There has also been investment in technical and physical facilities. In Jena, the number of state grammar schools has risen from three in 1991 to the present eight. The result is that today educational attainment to primary level corresponds to the German average, and substantial quality improvements have been brought about, bringing some of Jena's elementary schools into the national elite. The number of students continuing into high schools now also lies at the German average, and six new high schools have been built in Jena to meet the increased demand. Vocational schools are also being upgraded and they are being made more flexible. There is no doubt that in order to increase the participation of those already employed and to change their social norms and conventions, training, continuing education and in-service courses have a central role to play.

Reforms have also been carried out in the higher education establishments in Thuringia. Jena's dominant higher education institute is the 450-year-old Friedrich-Schiller University. Generally, the German university system is highly decentralised, and many even medium-sized cities have universities. In many cases, the local universities offer a broad range of traditional university courses, with only limited specialisation to the demands of local industry. Friedrich-Schiller University is the only full-scale university in Thuringia, attracting students from all over the region, as well as students from the rest of Germany. After the lay-offs by Jenoptik and Carl Zeiss, Friedrich-Schiller University is now the biggest employer in Jena, with around 6 000 employees, including the medical services of the university. Thus, this university has been put centre-stage in the development plan for Jena. The educational activities of the university are presently not particularly aimed at supporting local industry, as it offers a full range of disciplines and has its strengths within humanities and medicine. However, the university is currently undergoing a restructuring of its research and links to local industry, as well as education activities. The basic strategy has been a restructuring of resources (implying the closure of some departments) and a general upgrading of competences, in particular of technical sciences at the expense of humanities. Included in the strategy has been a layoff of about one-third of the teaching staff following a (politically induced) quality assessment, in combination with more flexible employment contracts and

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efforts to attract highly qualified lecturers and researchers from the former West Germany. The number of students has doubled from 5 862 in 1991 to 12 665 in 1998, and students from all over Germany, as well as international students are now welcomed.

The result of the upgrading of Friedrich-Schiller University, along with the development of other higher education establishments in Thuringia (for example, the Technical University in Ilmenau), is a growth by 120 per cent of university students during the period 1991-98, to the present level of around 30 000 students. A larger proportion of these is now aiming at industrial employment. This change of educational activities has been carried out to accommodate the changing structure of industrial production. As this change of education has been introduced simultaneously with industrial restructuring, as well as a general policy shift, it is as yet too early to trace any influence of individual learning on organisational learning at the firm level. However, it is important to note that new industries are already playing a role – for example, biotech which already employs over 1 000 people – and most firms are still able to find qualified workers locally. Of the former East Germany, Jena now has the highest rate of employees with tertiary education attainment, and the highest share of technical professions.

Public R&D *and industry services*

The core of Jena's learning and industrial restructuring policy consists of the promotion of a local innovation system of SMEs within "high-tech" areas. This means restructuring existing firms, attracting new firms, as well as bringing firm-level innovation up to a high level. However, the socialist past of Jena means that the necessary organisational and institutional preconditions for such a system have been virtually absent, and public policies have to aim at building them from scratch.

To attract new firms, the city council is creating an image of Jena as a business environment of "high-tech" firms supported by high-level public R&D. Of a more practical nature, Jena offers attractive industrial sites and financial arrangements for firms moving to the city. Further, financial and consultancy services are offered to local entrepreneurs, aiming at focusing their business ideas and market orientations. A local technology park aimed at supporting new firms has also been established, Jena Technology and Business Founders' Park, providing industrial sites, service facilities, information and financial services. The park has a distinct "high-tech" orientation, and 40 firms are now located there. Jenoptik plays a large role in the implementation of these services, in many cases acting as a negotiator between the government and the incoming firms, and offering joint ventures to selected firms. The Friedrich-Schiller University also takes an active role in creating new firms, offering assistance to entrepreneurs who want to apply university research results for commercial purposes.

Jena is characterised by a common East German trait. Because of the absence of organisations and institutions underpinning knowledge creation (such as abundant venture capital and traded networks), the universities – and, in particular, polytechnics or technical universities – have to play a relatively large role in firm-level innovation (patents and firm start-ups). The importance of Jena's public R&D has become even greater after the collapse of Carl Zeiss and the R&D facilities there. In the former East Germany, outside universities, R&D was almost exclusively undertaken by such large firms. In Jena, Carl Zeiss possessed the bulk of R&D facilities, but Jenaer Glaswerk, developed from Zeiss, established its own glass technology laboratory as early as 1884. Jenapharm grew from the Friedrich-Schiller University in 1938, but has its own research facilities now. Even if these firms have some co-operation with local research institutes, the Technical University, or the Friedrich-Schiller University, their knowledge has traditionally been kept within their organisations. The SMEs that currently start up or move to Jena possess new knowledge and business ideas, but do not hold a large R&D capacity. Several observers, amongst these the unions, express concern that the emerging structure of SMEs will not have sufficient potential for bringing firm-level innovation up to a competitive level. A lack of qualified and specialised suppliers locally would impede the emergence of the "high-tech" local production system hoped for by local planners and industrialists.

Jena's city council is very aware of the necessity for public R&D, as well as policies aiming at improving the knowledge-building capacity of new industrial firms. Clearly, the latter capacity depends on co-operative relations amongst SMEs and with public research facilities. In fact, the heart of Jena's learning

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and industrial policy is drawing upon and strengthening the public R&D capacity and promoting extensive traded networking amongst SMEs and amongst research and education institutes and SMEs.

Jena is well endowed with public research facilities. The Thuringian government views Jena as one of the major R&D centres for the entire region, and channels further research funds into the city. A substantial part of Thuringia's university, as well as non-university research is geographically concentrated in Jena, with around 9 300 employees in public R&D in total. Seven major research institutes, with an emphasis on optics, precision engineering, biotech and physics, are located in Jena. After reunification, Jena's Friedrich-Schiller University became the major research facility in Thuringia, with a range of research collaborations with the local research institutes. Its emphasis is not on natural sciences, but it has research within biology and physics, and glass chemistry and materials science have recently been strengthened. With its ongoing growth, the Technical University in Ilmenau is also becoming a major public R&D facility. The abundance of public R&D in Jena means that most of the EU research funds that are allocated to Thuringia are in fact flowing into this city (3.3 million DEM out of Thuringia's 4.3 million DEM in 1997).

However, even though high level research goes on within Jena's public research facilities, the tradition for applying it in local firms is not strong. In fact, although local industrialists Carl Zeiss and Ernst Abbe were trained at Friedrich-Schiller University, and co-operation between the university and Carl Zeiss as well as Jenaer Glaswerk goes back 150 years, these are exceptions to the general situation. Similarly, whilst co-operation between the university and Jenapharm has since been established, in general, the university does not supply firms with knowledge of direct relevance for their production. Similarly, the Technical University has had severe difficulties in establishing research collaborations with local firms. As a consequence, most of Jena's product and process knowledge has been pooled in old firms rather than being publicly accessible. This holds true particularly for glass technology, optics, and precision instruments, while biotech, being a newer knowledge field, is created in an environment of greater co-operation between different agents.

Thus, public policy efforts are now aiming at providing local firms access to these types of knowledge through relations with other firms and public R&D providers. As mentioned, Jenoptik is playing a central role, co-ordinating a host of traded horizontal networks, such as technological competence circles with the participation of firms, universities and research institutes. Within such networks, knowledge is shared, and some such networks even have a focus on joint product development. Another central player in promoting traded networks is BioRegio, a major collective asset of Jena, helping to attract new firms and inward investments, and promoting knowledge sharing amongst biotech firms. BioRegio involves a collaboration between firms, universities, research institutes and public service providers (technology transfer organisations), aiming at financing new firms, and helping existing firms with joint product development. BioRegio was initiated through a national competition of regional competences of manufacturing biotech products, followed by government aid. An example of an inter-firm network that has been promoted by BioRegio is BioInstruments Jena, a range of local firms aiming at becoming a joint producer of medical and biotechnology products. As a part of the policies of Jena's city council, local universities are also being pushed into establishing more joint projects with local firms, as well as focusing their research. At the Friedrich-Schiller University, research within natural sciences is being upgraded, and the university has received around 56 million DEM in public funds since 1995 in connection with ongoing research collaborations with Thuringian industry. It currently runs 34 joint R&D projects with local firms, and participates in BioRegio. The Technical University in Ilmenau has striven to receive more feedback from local industry concerning education, plus implementing more joint research projects with local firms.

Social capital

Not only does Jena have to build new organisations that can support firm-level learning, there is also a need to improve on the institutional environment in the guise of social conventions that allow firms to learn externally, as well as internally. Research intensive firms and local education and research facilities have created and utilised formalised knowledge, attracted workers, students, and tourists, and

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influenced the cultural life, housing, and local policies of Jena for hundreds of years. Owing to the early presence of research intensive large firms and the long history of local universities, Jena possesses a distinct "scientific culture" in the guise of social conventions of how to conduct research and apply formalised knowledge. In spite of such a culture, dominating social conventions amongst the professional population in Jena may still be prohibitive to firm level learning, in two main ways.

Firstly, there may be a problem of social capital amongst managers and other local key agents. To achieve a high level of interactive firm learning, conventions of maintaining the boundaries of firms and of research institutes have to be unlearned. The traditional attitude of university researchers impeding co-operation with industry needs to be addressed. Furthermore, even if Jena is well known for strong entrepreneurial traditions, traditional management styles of internalisation and strict protection of firm boundaries, as well as knowledge stocks, dominate. For organisational learning to be upgraded, social capital amongst managers needs to be built, through unlearning earlier management styles and introducing more co-operative conventions, and initiating untraded as well as traded networks amongst managers. Jena's distinct policy focus upon improving networking, as well as the present large inflow of managers and researchers from the West, gives grounds for optimism.

Secondly, social capital at the level of labour may also pose a problem. The socialist governance mechanisms within firms – a strong ideological and ethical content to working life – are now being replaced by Western methods, notably formalised control measures and hierarchy. In the successful Western firms, such governance mechanisms are supplemented by high participation by workers in experimentation and learning processes, allowing for quality improvements and other innovations. Without such active participation of workers, the firms in Jena may end up trying to compete in an emerging learning economy with quasi-Taylorist organisations. If workers accept centralisation of planning and initiative and have few incentives to make profitable use of their knowledge and skills, a gap may be maintained between the stock of knowledge contained in individuals and the firm in which they work. This would mean that there are few opportunities for parallel organic learning and processes such as trial-and-error and "learning-by-doing" are underplayed. Much knowledge may simply not be utilised.

However, in Western countries, participation is based upon social conventions that have been learned over centuries, deeply rooted in many aspects of economic as well as civic life. Even if the former East Germany has the same cultural roots as the West, the recent socialist history of Jena – the dominance of central planning and of single large firms – has influenced the conventions of the city's present population, creating conventions of dependency rather than of participation. For example, the present planning paradigm is not free from echoes of the former system, and this type of "top-down" planning is largely unquestioned by the population, still ascribing political leaders and dominating industrial agents power to plan. Until recently, Jena has not been endowed with structures that promote participation. Under socialism, elementary schools were devoid of the general education in philosophical, religious, and civic traditions that are common in other EU countries, and civic associations and activities are few. The drop of the birth rate and the growth of political extremism in the wake of the present economic crisis are signs that parts of the population feel rootless and insecure as to their future. There is a lack of untraded networks to promote social security and create a feeling of belonging.

Thuringian participation has, however, been on the rise in the later years. The number of civic cultural associations, youth services, youth clubs, and sports clubs has risen steeply following reunification. Jena is leading this development, now having achieved the highest participation rate in Thuringia. Further, elementary schools are, as mentioned, undergoing radical changes. The large civic initiative and participation in the work of the elementary schools bears witness not only to the growing participation rate in Jena, but also to an awareness that investing in social capital at all levels of local society is of paramount importance for future learning and economic growth.

Summary

Jena is an interesting example of a profound change of industry structure, spurred by political learning processes and a broad range of efforts within the fields of education, university research, R&D, and industry services.

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The challenge for Jena's policymakers has been and still is great, and understandably, efforts are concentrated within a few areas. This has led to some local criticism of policies being one-tracked, industry structure being too little diversified, and organic, bottom-up learning processes being politically ignored. Low levels of labour participation and social capital may aggravate the latter problem. However, policies promoting inter-firm networking are gradually being introduced, and decentralised efforts go on, slowly raising Jena's social capital. If the local industrial system thus succeeds in preserving its important knowledge assets and entrepreneurial culture while changing industry structure and investing in social capital, the learning capacities of Jena may continue to grow.

Vienne, France

The French Département of Vienne is part of the region of Poitou-Charentes, along with three other Départements (Charente, Charente Maritime and Deux-Sèvres). Poitou Charentes is located in the west centre of France, with one of its parts (Charente Maritime) having a coast on the Atlantic. Covering an area of 6 990 square kilometres, Vienne has 391 500 inhabitants and a population density of 56 inhabitants/square kilometre (that is to say, almost half of the national average). Its two principal urban centres are Poitiers, its capital and the location of the regional administration, and Châtellerault. 65 per cent of the département's population is nonetheless rural. Vienne's location within Poitou Charentes means that it has the disadvantage of being more distant from the coast and its related tourism than the rest of the region. However, it equally has the advantage of being closer to Paris and Ile-de-France, which remains the major centre of decision-making and of economic activity in France. Hence, Poitiers is only 1.5 hours from Paris by TGV train.

Since the introduction of French decentralisation policy in 1982, Vienne has developed considerably economically, with an increase in employment over the past 15 years higher than the national average. Vienne has also attempted to implement a kind of industrial revolution within its territory. This has involved an enormously ambitious attempt – inspired by the regional authorities – to shift from a predominantly agricultural economy to a knowledge-based economy, relying on ICT and digital imagery technologies. This regional policy has been focused upon Futuroscope, a huge leisure park containing a technological park as well as educational and research activities, all with an ICT focus. The accomplishment of Futuroscope is that it seeks to bring together individual and organisational learning, plus public R&D and industry services. Futuroscope's activities within these different fields will be described in greater detail below.

The regional policy evolving around Futuroscope has had huge impacts upon individual learning, and some impact upon organisational learning, but so far it is difficult to asses its impact upon economic performance.

Economic development

With 79 per cent in 1995 of the average French GDP per capita of US$17 800 (1990), Vienne has a medium GDP, at a level below the EU GDP average of US$15 660 (1990). The Département displays a positive dynamic, with a higher than average positive migration, a higher than average employment increase between 1980 and 1995, and a slightly less than average unemployment rate in 1995. Its share of the French GDP per capita has slightly dropped between 1980 and 1995, whereas the share of Poitou-Charentes as a whole rose slightly. Vienne's GDP per capita rose, but more slowly than the rest of France and the rest of Poitou-Charentes (apart from Charente).

The rate of increase of population in the Vienne area has been higher than that of the Poitou-Charentes region and just below the rate for France as a whole over the period 1990-96. Over this six year period, the population of the Vienne rose by 0.8 per cent, slightly less than the rise of 1 per cent in France's population, but far more than Poitou-Charentes, whose population actually declined by 0.9 per cent. Vienne thus appears as more dynamic than the surrounding region in this regard. The area has, however, an ageing population, with fewer people below 20 years of age than the rest of France. In 1990, an estimated 24.8 per cent of the population were below the age of 20 in the Vienne compared with 26.27 per cent of the population of France as a whole. At this time, 22.8 per cent of Vienne's population

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were 60 years old and above, compared with 24.35 per cent for Poitou-Charentes and just 20 per cent for France as a whole.

Between 1980 and 1995, Vienne has also had a positive employment change of 4.5 per cent. This was substantially higher than the national increase of 2.3 per cent and that of Poitou-Charentes at 3.8 per cent. It was the second largest increase in the region, after Charente Maritime. With an increase of 7.3 per cent of employment in the private sector, Vienne is the sixth most dynamic Département in France. The unemployment rate of 9 per cent in 1995 was two points below the national average of 11 per cent (and that of Poitou-Charentes as a whole which was also 11 per cent).

Vienne has a good transport infrastructure, in particular, a link to Roissy and the one and a half-hour journey to Paris. As a matter of fact, Vienne's economic activity still depends heavily on Ile-de-France, where 50.2 per cent of senior professional and managerial jobs ("emplois de décision") are located (as compared with just 27.5 per cent of total French employment). By comparison, only 1.4 per cent of such jobs are located in Poitou-Charentes (as compared with 2.1 per cent of French total employment).

Organisational learning

Approximately 270 companies are created every year in Poitou-Charentes, of which half are start-ups in consumer goods. Vienne represents 24.5 per cent of the Poitou-Charentes' total stock of businesses, second after Charente Maritime where 32.2 per cent of the businesses are located. In terms of industry structure, about 9.5 per cent of the population of Poitou-Charentes are involved in agriculture, as opposed to 6.7 per cent in the Vienne as a whole in 1997. Nationally in France, just 6 per cent are engaged in agriculture. Though agriculture is a traditional sector of activity, Vienne has always been the least agricultural département of Poitou-Charentes. Agriculture's share of employment in the Département has continuously decreased during the last 15 years, following the national trend. The decline actually amounts to 39 per cent between 1988 and 1997, compared with 33 per cent for Poitou-Charentes. In the same period, Vienne's exploited agricultural area increased by 3 per cent. Milk production is the major agricultural activity. In fact, there is no high-value agricultural production in Vienne that could be compared with Cognac in Charente (which represents a big share of its relatively high GDP).

The share of industrial exports at 15.3 per cent for the Vienne is about half the total for the whole of France, which stands at 29 per cent. In terms of overall industrial investment, the percentage for the Vienne at 13.4 per cent in 1997 is close to where it was in 1994, when it stood at 14.4 per cent, having peaked at 18.1 per cent in 1995. Investment in industry in the Vienne region is nevertheless significantly higher than the average figure for France as a whole. Though slightly decreasing over the years, industry still represents 20 per cent of the jobs in the region. Vienne has clearly moved beyond the caricature of its dependence on farming, but it has not yet transformed into a "high-tech" area either. We have no data on the detailed employment structure of the industrial sector. However, it is clear that Vienne's few "high-tech" firms – including those located in Futuroscope (see below) – are relatively few and generally small in employment terms. Unlike some of the other French regions, there are no very large or dominant industrial firms in Vienne. The two biggest are agencies of Cégétel and France Télécom, two important French communications providers. What this suggests, therefore, is that, up until now, the impact of the technological park at Futuroscope in changing regional organisational learning has been limited.

More than on ICT and new technologies, Vienne's economic evolution has been supported by tourism in the last ten years, thanks to the Futuroscope leisure park. In fact, more than on industry, Vienne heavily relies on the tertiary sector, which represented 66.8 per cent of its employment in 1997. 95 per cent of the 13,000 jobs created in Vienne during 1985 and 1995 were in the services sector. Here, the impacts of Futuroscope have been much greater. Thanks to the leisure park, tourism has rocketed, giving the region a new economic face.

Vienne has witnessed a very substantial increase in organisational learning as measured by patented innovations. The number of patent application per million inhabitants of 99 is almost three times higher in 1995 than in 1990, representing twice the Poitou-Charentes' average and slightly more than the French average of 95. Vienne is very innovative compared with its neighbouring Départements.

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Even though its number of patent applications per million inhabitants remains lower than the leading regions' average (114), it is substantially higher than the low-income regions' average (68). Of course, it is also inferior to the high-income regions' average (159), but we must bear in mind that Vienne remains a low-income Département. This suggests that the Futuroscope project has really boosted the processes of innovation in the region, at least as far as these are captured by patent applications. Since this trend is very recent, it may be too early to observe a significant impact on the economic performance of the Département.

Regional policy

The development of Vienne's regional policy has to be understood in the context of French decentralisation policy, which started in 1982 to modify French regional development. France has been well known for its traditionally high level of administrative and economic centralisation, with a prominent role for the State and the paramount economic importance of Paris and its surrounding region, Ile-de-France. The 1982 Decentralisation Acts provided for the delegation of power from the central State to the General Councils of the Départements and to the newly created Regional Councils. This implied a significant devolution of state power away from Paris to the regions.

Vienne utilised this new political environment to develop an innovative regional strategy. Concerned that it was lagging behind other Départements, René Monory, President of the General Council of Vienne, took the lead in devising and initiating a programme of local economic development. The principal objective of the new strategy was to diversify away from an economic base consisting mainly of agriculture, farming and food processing industries. More specifically, efforts to change the image of the region and to enhance its competitiveness have been focused on the development of tourism and the improvement of education and ICT skills. At the heart of the development strategy is the Futuroscope project, which seeks to bring together within an ICT theme education, training and research, as well as leisure activities.

In the most general terms, it was intended that Futuroscope would provide a local environment that would "prepare people for the future". In particular, it would train people in new technologies and make the latter available to firms and other organisations. Moreover, people's leisure time was also to be transformed by providing an ICT-based "theme park". It would thus become a key resource within the region, impacting directly upon tourism, but also stimulating the development of new, technologically sophisticated industries and providing appropriately skilled people to take up the employment opportunities which would be generated.

Futuroscope Park was opened in 1987. It is located in the heart of Vienne, some 8 kilometres from Poitiers, on the Paris-Bordeaux axis. It brings together a variety of new audio-visual technologies on to a 53 hectares site. It is important to emphasise that the Futuroscope initiative was devised and funded wholly by the public sector (right from the initial purchase of the land on which the park was built). The first budget was prepared in 1985. Tight management was imposed due to the need to maintain local taxes at a reasonable level and to avoid a large increase in local government debt. However, it is now a profitable undertaking, with a US$110 million annual turnover, for a relatively moderate investment (US$630 millions over ten years). Futuroscope attracted only 225 000 visitors in 1987, but ten years later this had jumped to 2.9 million visitors.[1] Futuroscope also attracted 720 000 bed nights in 1992, but by last year this had risen to 1.6 million. In addition to the entertainment activities, Futuroscope also offers technological park services, including a teleport platform and access to multi-media services and networks. The park is now the home of 70 firms, providing some 1 500 jobs.

Individual learning

Regional educational attainment profiles in France are relatively homogeneous; in fact, only Ile-de-France (Paris), Rhônes-Alpes (Lyon) and Provence-Alpes-Côte-d'Azur – PACA (Marseille) deviate significantly from the general pattern. Poitou-Charente has a slightly lower than average proportion of its adult population with only primary education (37 per cent compared with 38 per cent at national level); but a markedly less than average level of tertiary education (15 per cent compared with 19 per

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cent at the national level) in 1995. Accordingly, it also has a higher proportion of its population who complete secondary education (47 per cent compared with 43 per cent). What this means, then, is that the region has a proportion of its population completing upper levels of education (upper secondary and tertiary combined) which is the same as the national average (of 62 per cent). Certainly, there is little evidence here of significant educational disadvantage.[2]

However, this average level of individual learning seemingly generates a GDP per capita that is only 83 per cent of the national figure. Here again, Ile-de-France, Rhônes-Alpes and PACA deviate strongly from the general pattern and raise the national average. In fact, as for its educational attainment, Poitou-Charentes' GDP per capita is close to most French regions. Moreover, recent developments in Vienne's education policy could improve the adaptation of individual skills to local economic needs.

In this context, it is important to recall that the scope of regional education policy is institutionally very limited in France. Local authorities are responsible for school buildings, but neither for the content of the curriculum nor for the management of personnel. Local town councils are responsible for primary school buildings, whereas regional and departmental authorities are responsible for secondary school buildings. The central state is responsible for tertiary education. This means that a regional educational policy can only consist of investments. For instance, local authorities cannot modify the pupil-teacher ratio nor impose new pedagogy. They can simply motivate and convince teachers and principals, as well as education officers, of the desirability of giving more weight to a specific direction, but only insofar as it remains consistent with the national constraints. Accordingly, should there be, for example, ineffective co-ordination between industry and tertiary education at the local level, it would be unfair to blame the local and regional authorities.

Within these institutional limits, Vienne has in fact intervened significantly by promoting access and use of information and communication technologies (ICT) in education, an orientation also supported by the French Ministry of Education. This educational policy reflects a comprehensive vision of regional strategy and an effort to make skills development and economic development consistent. To attract ICT-based industries into the Département without developing ICT skills in the (potential) future workforce of the region would be ineffective in terms of the regional economy. It would also raise a political problem: electors might wonder why policy makers use the region's money to develop "high-tech" industry that is not accessible to the region's inhabitants. The lack of co-ordination between education and economic development would be problematic because of the specific skills required by ICT-based industries. Vienne's political authorities have thus been aware of the necessity to develop ICT skills through children's education both to fit the needs of the knowledge-based economy of tomorrow, and to fit the skills required by the new local labour market.

Despite the fact that nurseries and primary schools (serving 14 000 and 23 000 pupils respectively) fall outside of the Département's jurisdiction, it pumped US$17.2 million into them between 1987 and 1996. This took the form of grants to town councils for renovation (US$5.9 million) and for special projects, including an IT programme of computer equipment and teacher training (US$5.5 million). The Département Council also spent US$60.4 million from 1986 to 1999 in the 45 secondary schools (and its 20 000 pupils). The major part of this (US$56.3 million) was devoted to renovation or building investments, but there was also significant investment (US$4 million) in the development of access to ICT.

This programme targeted and achieved a ratio of 10 pupils per computer in both primary and secondary schools by 1999. For secondary schools, this brought the region up to the national average of computers per pupil, but significantly exceeded it for primary schools (in which the national average was 31 pupils per computer). Vienne also connected all its primary and secondary schools to the Internet, compared with national levels of 63 per cent for secondary and only 11 per cent for primary schools. Vienne is thus characterised by a more balanced ICT-intensity between primary and secondary education. In addition, it created and funded a network of specialist staff, based in six different resource centres across the Département, in order to train and support teachers in ICT. Since the efficient access and use of ICT in education relies largely on teachers, this initiative definitely makes Vienne one of the leading French Départements in terms of ICT in education.

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Poitiers University is an important regional asset. The number of students has increased significantly in recent years. Current numbers stand at 26 700, down from a peak of 28 000 in 1994/95. The growth of the university is undoubtedly one of the main driving forces behind the *Département*'s economic development and, in consequence, the creation of new jobs and businesses. Alongside its long-standing secular tradition, the most distinguishing academic feature of the university is the range of subject areas it offers for study. Though there is a predominance of humanities and social science departments, the university also includes pure and applied sciences, as well as communication and new technologies departments. There are also other tertiary education establishments: the Poitiers National College of Engineering (*École d'ingénieurs de Poitiers*), the Institute of Business Administration (*Institut d'administration des entreprises*), the Institute for Civil Servants (*Institut de préparation à l'administration générale*) and two technical universities (IUT – *Institut universitaire de technologie*), one in Poitiers and the other in Angoulême.

Relative to average expenditure by other Départements in France, Vienne has invested heavily in its university at Poitiers, and in particular, in the Futuroscope project. To gauge the magnitude of this policy, it is important to remember that the Départements have absolutely no formal responsibilities for tertiary education. Whilst most Département Councils, Town Councils and Regional Councils contribute to the equipment investments of the universities, they are not obliged to do so. The fact that Vienne has often spent almost as much as (and sometimes more than) the central state on tertiary education underlines its pioneering role in this context.

1991 saw the first agreement relating to the development of higher education in Poitou-Charentes between the central state, the Region, the four Départements (Deux-Sèvres, Charente, Charente-Maritime, Vienne), and the main towns in the region (Niort, Angoulême, La Rochelle, Poitiers and Châtellerault). Since then, numerous university sites within the Département (Campus, Poitiers Town Centre, Futuroscope and the Châtellerault Technical University) have received funding as part of an ongoing investment programme amounting to US$195 million. This programme is aimed at stimulating the growth of higher education and research in Vienne and has been funded for the most part by the Département Council (US$63 million) and the central state (US$68 million), although the other authorities have also contributed.

Besides the upgrading of university training, after one of the eight institutes of the National Centre for Distance Learning (CNED) was relocated at Futuroscope, the CNED's national headquarters and registered office followed on to the site. The National Education Department's Management College (ESPEMEN) was also relocated to the Futuroscope site in 1997. It provides training courses for head teachers and principals working in state schools and colleges (60 members of staff, 500 outside contributors and 6 000 students throughout the year). These two institutions are under the responsibility of the National Education Ministry. Whilst these relocations are the result of a national policy of decentralisation and do not have an enormous economic impact on the region as a whole, it remains significant that these organisations were attracted by the new communication facilities at Futuroscope, as well as its dynamic image.

Vienne has also supported vocational education and training. For example, a Centre for the National Association for Adult Vocational Training (AFPA) has been constructed on the Futuroscope site and was opened in 1998. Vienne and the Regional Council each funded 25 per cent of the building. The Association offers courses in the fields of tourism, hotel management, catering, general management, business, retail sales and communication, and thus conforms very well to the current major economic activities of the region.

Vienne thus clearly provides a clear example of the importance of regional authorities for individual learning. It is too early to evaluate the outcomes of this policy. So far, the investments have shown few results in terms of GDP growth. As we noted in Chapter 4, France generally shows very little correlation between regional individual educational attainment and economic performance (except in the three leading regions, especially Ile-de-France, where both educational attainment and economic performance are very high). One must recall that French education policy is based on the idea of geographical egalitarianism, and this strongly limits the range of the educational differences between French regions. As for now, Vienne has certainly used all the new political autonomy that the French institutional changes made available.

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Public R&D *and industry services*

Vienne has high ambitions of making Futuroscope a dynamic research environment. Its tertiary education policy aims at bringing the "high-tech" academic and industrial worlds closer together, chiefly by moving them on to one site. It is hoped that the creation of a centre of excellence in the field of engineering sciences on the Futuroscope site will spawn new educational and research activities, which, in turn, will enable the university to develop a closer working relationship with the private sector. As a result of this reorganisation, the university has centralised research and development in the fields of mechanical engineering, materials science, electronics and chemical kinetics. Several laboratories from both Poitiers and Paris now use a new purpose-built building on the Futuroscope site to research in engineering sciences, called *Regroupement des Sciences Physiques pour l'Ingénieur* (SPI), which receives about 38 per cent of its funding from Vienne. ENSMA (National College of Mechanical and Aerotechnical Engineering), with its six research laboratories, was transferred into a brand new building on the Futuroscope site in 1993. In addition, new premises for the Science Faculty of the University are currently being constructed on the Futuroscope site. The Département of Vienne is funding this work, at a total cost of US$1.3 million.

Hence, large investments in public R&D are undertaken in connection with the Futuroscope project. However, industry services that are incorporated into organisational learning policies in other regions, such as networking programmes, entrepreneurial services, and establishment of public-private partnerships to promote technology diffusion, are not emphasised as a part of Vienne's learning policy. This omission may prove to constitute a problem, as such policy efforts seem necessary for promoting inter-firm organisational learning in Vienne. Given a low stock of local social capital, such learning is unlikely to arise organically.

Social capital

Vienne shares some problems concerning local social capital with other French Départements. The characteristic French division of political power between the central state and local authorities explains to some extent some difficulties in university-industry co-operation in Vienne. The fact that the university is funded and administered by the central state gives little incentive to the academic world to establish links with other local organisations. Conversely, the private sector does not traditionally seek co-operation with the universities. Social capital in terms of traded and untraded networks between firms and universities is thus low, and the local policy makers have a limited influence here.

Perhaps because of Monory's national political experience, Vienne has to a significant degree reproduced at a local scale the traditional top-down French public action pattern. The top-down nature of local policy making enjoys quite some legitimacy. This can be ascribed to recognition of the need to address Vienne's future economic prospects, in combination with a low local stock of social capital. First, the stock of social capital amongst managers in the guise of inter-firm and inter-manager networking is low, and introduction of initiatives from the private sector to change the industry structure or otherwise promote organisational learning are few. Second, civic social capital, in the guise of participation by public stakeholders in political processes is also low. Consequently, the initiative to change the dominant agricultural economy of the Département into a knowledge-based economy could hardly have come from the bottom up.

To a degree, Futuroscope is presently succeeding in influencing civic social capital positively through providing a common and more positive regional identity, not least amongst Vienne's own inhabitants. There is evidence suggesting a much greater identification with the region than was the case before the implementation of the new regional strategy. However, as mentioned, the problem with the low stock of social capital amongst researchers and managers has not been directly addressed politically.

Summary

The Vienne case study provides insights into a regional economy that has undergone dramatic transformation during the last 15 years. This development has been driven by a top-down regional

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policy, concentrated on one project, but nonetheless highly consistent. On the one hand, the Futuroscope leisure park gives a positive image to the region, while attracting tourists and thus contributing to the development of a new service economy. On the other, the Département has tried to bring together academic and industrial research, to enhance the overall facilities of individual learning and increase the general "technological literacy". If local policy makers initially expected the second element to be the most important for regional development, the first one has instead proved to be far the most successful. Today, Futuroscope is a "tourism expander" more than a technopolis. It may be that Vienne's biggest risk now is that its policy makers forget their initial long-term ambitions and become satisfied with their short-term achievement, namely the new tourist attraction.

Thus, Vienne also illustrates the risk in concentrating regional learning policy on a single project. Futuroscope remains quite isolated in the Département. Its technological park has not yet generated much traded networking in the region nor attracted large firms in the ICT sector. Formation of inter-firm networks might be impeded by the absence of a clear regional sector specialisation (apart from tourism) and the absence of social capital in the guise of manager conventions of inter-firm co-ordination. The few traded networks coming out of the Futuroscope initiative may also simply be due to the short time Futuroscope has existed. In this respect, the sector focus of Vienne's policy has not helped to establish links within the region. It would have been different, for example, if biotech industries had been encouraged instead of ICT industries, as a regional innovation system with links between biotech firms and the local agricultural sector might have been feasible. Paradoxically, the absence of any major "high-tech" firm in Vienne that could attract other firms or strongly impact upon the regional economic performance of the Département may in fact be a result of Vienne's proximity to the dominant technological cluster in Ile-de-France.

It may be that the strengthened regional identity springing from the Futuroscope project will improve on local social capital and hence improve upon organisational learning and innovation in the future. In the meanwhile, Vienne appears to occupy a transitional position. It has broken decisively and successfully with its previous pattern of economic activity, but – as yet – has not fully developed a new one.

Øresund, Denmark/Sweden

The region of Øresund is an emerging, cross-border political construct, encompassing Eastern Denmark (East Zealand) and South Sweden. These two lowland coastal areas that are separated by the Øresund strait, became connected physically – as well as symbolically – in July 2000 by means of a bridge 16 kilometres in length. The areas have a long common history, but have been divided by national borders since 1658. During the twentieth century, the Danish part of the region has become well connected to European (notably German) and international markets. After a long period when the Swedish part of the region traded almost exclusively with the rest of Sweden, Scandinavia, and, lately, the Baltic, it is in the process of reorientating itself towards Denmark and the European continent. Today, the major task for the areas is not simply to achieve economic prosperity, but to integrate and become a region.

The political debate around Øresund is advanced, but the process of agreeing upon its spatial delimitation or its organisations is lagging behind. The "core" region in the debate was originally Copenhagen in Denmark and the Malmö municipalities in Sweden. However, it has recently been extended to cover the Greater Copenhagen and Scania areas (and it is these areas that are used for statistical purposes in the present work). Defined in this way, Øresund is 16 827 square kilometres in size; and has 3 006 300 inhabitants (1995). The region only makes up 4 per cent of the joint Danish/Swedish area (mainly due to Sweden's vast size), but 21 per cent of the joint Danish/Swedish population lives here, leading to a population density almost six times the Swedish/Danish average. This is mainly due to the population agglomeration in the Greater Copenhagen area, with 33 per cent of the Danish population (14 per cent of the Swedish population lives in Scania).

Economic development

Øresund is a very prosperous EU region (by far the most prosperous of the five cases examined in this study). Its 1995 GDP per capita was US$18 691 (1990) per capita, 106 per cent of the Danish-Swedish

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average. The 1995 unemployment was fairly low at 8.3 per cent (closely resembling the Danish-Swedish average). However, these figures hide differences between Copenhagen and Scania. The former is significantly richer, with a 1995 GDP per capita of US$21 090 (1990) per capita (111 per cent of the Danish average), while the latter has a 1995 GDP per capita of US$15 379 (1990) per capita (91 per cent of the Swedish average). The prosperity of the areas notwithstanding, they have both experienced economic downturns. After a period of structural problems, Greater Copenhagen is in the process of regaining its economic dynamism. However, it has recently experienced a small deceleration in growth compared with the rest of the country, as its GDP per capita dropped from 116 per cent of the Danish average in 1990 to 111 per cent in 1995. The 1995 unemployment in Greater Copenhagen was 7.8 per cent (slightly higher than the Danish average). Scania has been afflicted by the general Swedish economic crisis of the 1990s (its GDP decreasing from US$15 980 per capita in 1990), but has also dropped from 94 per cent of the Swedish average in 1990 to 91 per cent in 1995. In Scania unemployment in 1995 was 9 per cent (the same as the Swedish average). Both areas have positive migration balances; Scania having the largest 1980-95 surplus of 6.6 per cent, while Greater Copenhagen had a modest population increase of 1.2 per cent.

Øresund has excellent transport and communication infrastructures, and a considerable local market. However, infrastructures and agglomeration effects are not sufficient drivers of economic performance. As sketched out below, the reasons behind the prosperity of Øresund should be sought – at least in part – in the valuable *knowledge assets* of the Greater Copenhagen and the Scania areas, respectively.

Organisational learning

The valuable knowledge assets of the Greater Copenhagen and the Scania areas are located in individuals and firms. There is no doubt that, of the of the five case studies, the Øresund region is the one that has most innovative and high-growth firms, and it has a huge potential to increase its economic performance through individual and organisational learning.[3]

Nordic pharmaceutical firms have for some time been highly innovative and are world leaders in some niche markets; and 60 per cent of the Nordic firms within this industry are located in the Øresund region. However, apart from these firms and a few others with large R&D investments and good collaboration with universities, Øresund firms are not very "high-tech". Denmark, in particular, being a small and open economy, has historically been dominated by SMEs in "low-tech" industries, and their exports of such products are high. 94 per cent of Øresund's manufacturing firms are R&D-extensive or intermediate (as measured by employees), and KIBS only account for 22 per cent of services. "Low-tech" SMEs do not posses the resources nor incentives to invest much in R&D, and the inputs to learning of the Øresund firms are generally not university collaboration, university graduates, nor flows of trained personnel from R&D-intensive firms. The firms are, however, not knowledge-extensive either, as they function in another manner than "low-tech" industries in countries with lower wages. The "low-tech" and "medium-tech" firms have succeeded in utilising the skilled labourforce (at all educational levels), incorporating new manufacturing technologies, and establishing co-operative relations with other firms. In this manner, they achieve incremental learning and high flexibility, making them able to compete even when exposed to increased internationalisation and cost-competition.

Despite the similarities of the nature of learning on each side of the strait, there are large differences in industrial structures. Generally, Sweden has more large firms than Denmark, although few of these are located in Scania. In 1995, 78 per cent of Scania firms and 82 per cent of firms in Greater Copenhagen had less than 10 employees. Even if firms in Greater Copenhagen are only marginally less integrated than Scania firms, there are indications that they do interact more. Most Danish growth of industrial production has taken place in Jutland, and Copenhagen is a national capital carrying out marketing and export functions for firms from the entire country. Thus, Greater Copenhagen is dominated by services (over manufacturing) to a much greater extent than the rest of Denmark, and Scania. Whereas in the Scania region, 44 per cent were employed in services and 20 per cent in manufacturing in 1996, Greater Copenhagen has 52 per cent in services and 12 per cent in manufacturing. Agriculture also plays a larger role in Scania (3 per cent of employment) than in heavily urbanised Greater

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Copenhagen (1 per cent of employment). Attempts at replacing lost industry (for example, shipbuilding, textiles and clothing) with, for example, automobile production, have failed and further contributed to the lower level of growth in Scania. The private sector also plays a larger role in Greater Copenhagen than in Scania (34 per cent of Scania's 1996 employment was in public services and administration, as compared with Greater Copenhagen's 26 per cent (excluding universities). Some statistical evidence suggests that private firms also outsource more work in the region (the Greater Copenhagen level of skills is lower within manufacturing and higher in services). The ability of Danish firms to establish traded networks is widespread and has both national and local institutional preconditions.

There is a very low level of interaction between Danish and Swedish firms. Hence, there is no integrated Øresund production nor innovation system. A 1978 study showed between 10 and 20 times more interaction between firms in Malmö and firms in Stockholm, than with firms in Greater Copenhagen; and there is no indication that the level of interaction has gone up since. Exporting Øresund firms generally approach other markets than that on the other side of the strait; and service providers concentrate on local firms. Further, horizontal co-operation between firms on, for example, exports or R&D is absent.

As will be demonstrated below, there is also a lack of interaction between the Greater Copenhagen and the Scania systems of research and education, as well as labour markets. Thus, if the region's education and innovation potential is to be enhanced, the largest challenge is integration. Presently, there is a paradox of cross-border networking: politicians, planners, high-level industrialists, unionists, and university directors make policy and network actively across the strait; while firms, workers, and students stay at home. Cross-border political change has advanced far more rapidly than cross-border inter-firm learning, but some barriers to integration may persist in the guise of a lack of regional organisations as well as institutions. In a region that possesses most other types of capital, investing in social capital is crucial.

Regional policy

The histories of the Nordic countries are interwoven, with shifting borders and periods of joint rule. After the last Danish-Swedish wars in the seventeenth century, there has been a tradition of interdependence and co-operation between the two countries. In the twentieth century, co-operation persisted in, for example, the Nordic Council and Nordic Council of Ministers (together with Norway, Finland and Iceland). Since 1977, there have been specific agreements about border controls, the environment, health, transport, tourism, and cultural exchange. Some aspects of the co-operation have been complicated by the fact that Sweden has not until recently been a member of the EU, nor of NATO.

The relationship between Greater Copenhagen and the rest of Denmark is very different from the relationship between Scania and the rest of Sweden. This affects the scope for regional policies. Partly as a consequence, the reasons for the two areas to promote an Øresund region are not the same. Greater Copenhagen is the administrative centre of Denmark and functions as the country's point of contact to world markets and governments. The Øresund regional strategy is thus partly agreed upon by the Danish government, following a growth pole logic: revitalising the national capital will improve Denmark's overall competitiveness. In the Danish political debate, scale economies have been the central aspect. Sweden is more centralised and has little tradition of regional policy (leading to some degree of rivalry between administrative areas). The Scania area is a peripheral region to Stockholm, but its administration and business policy have nevertheless been more orientated towards Stockholm than neighbouring Greater Copenhagen. The establishment of the Scania Län is a recognition of the local sense of independence and the need to be more connected to its close geographical neighbours, allowing Scania firms to access EU markets. It is also a Swedish experiment in joining more administrative areas, hopefully lessening the degree of regional political rivalry. During the birth of the Scania project, political agitation about common Scania and Danish history and culture has been a central aspect. It should be noted that in spite of this seeming mismatch between the national and the regional level, the Swedish government has also supported the Øresund project in order to allow Swedish firms in general to reorientate towards EU.

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The overall political strategy aims to achieve economies of scale and scope through the integration of the Danish and Swedish parts of the Øresund region. Concerning economies of scale, integration of the goods and labour markets, as well as public services (for example, the marketing of the region in order to attract inward investments) are hoped to create increased funds and increased efficiency. Furthermore, integration is hoped to spur competition amongst Swedish and Danish firms, increasing innovation. Concerning economies of scope, a larger market for firms, universities and other organisations is hoped to allow them to specialise, achieving a division of labour, instead of duplicating services, education and research. Specialisation is also intended to promote a deepening of learning within firms and other organisations, but also through an increased interaction between them. Scale and scope economies are hoped to strengthen all sectors. However, some interest groups repeatedly recommend that special attention be paid to growth sectors, such as pharmaceuticals and environmental technologies (due to the existing strength in the former, and the alleged Danish/Swedish environmental consciousness as a foundation for the latter).

However, scale and scope put huge demands on integration. Not only do the various organisations need to be co-ordinated to such a degree that they can really pool their resources, but transactions and communication should be made so easy between firms and universities that a division of labour can really come about. In many respects, the Øresund region project is an organic and ongoing political learning experience. A major association has been created politically, the Øresund Committee, with politicians and administrative personnel from the municipal and regional authorities from each side (Scania, Copenhagen), as well as observers from both national administrations. Its function is to promote integration between the two sides. Rather than creating a host of top-down regional political and administrative organisations and promoting industry and civic associations, policymakers aim at providing a general infrastructure. The most notable initiative here is the Øresund bridge, which is central to the development of integration through the general transport infrastructure. However, some funding has also been provided, for example, for co-operation between universities in the region (see below). The principal hope is that integration will happen organically and from the bottom up. Investing in civic social capital – creating a regional culture – is viewed as an important policy task, because this may serve as a basis for social and economic integration (the emergence of various traded as well as untraded networks). However, only a few projects – aimed at, for example, cultural exchange or promoting a regional culture in the mass media – have been specified.

This incremental nature of the project is due to Scandinavian political culture and the delicate – at times almost deadlocked – political situation of promoting a cross-border region. The scale of the investments in the Øresund bridge meant that it took many years to establish the legitimacy of the project. An alliance of politicians and industrialists was finally established, with participants on both sides of the strait, and political decisions were made. This is, particularly for Danish policy, a fairly new situation, and in itself an example of a remarkable political learning process (which has been heavily criticised for abandoning the Danish democratic tradition of planning).

The Swedish planning tradition aims at looking beyond the short term, and thus *ceteris paribus* the Øresund region could possess scope for breaking economic and structural "path-dependency" through political action, if necessary. However, even if policymakers recognise a "lock-in", they may not be able to influence significantly the relevant regional economic or social structures or social conventions. Further, this planning tradition also encompasses the risk of a "lock-in" into long-term political goals. To ensure that Øresund is able to learn *and unlearn* at a political level, it needs also to continue to draw upon the Danish planning tradition, with its emphasis upon the process of learning and stimulating bottom-up development. There may be some advantages in not imposing a top-down policy of, for example, promoting particular industries. It could be sensible that the ambitions to become a "high-tech" region have not been followed by large public investments in R&D and education. Even if the integration of the region is achieved, it will remain relatively small, with inevitably limited markets and learning resources. Furthermore, given the strong knowledge base within the existing firms and the long tradition of creating growth based on existing skills, the potential of these to contribute to "medium-tech" SMEs remains an important part of regional strategy.

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Individual learning

Øresund's educational structure is regarded as a major asset for the future of the region as a "learning region". Given the high degree of labour participation in innovation processes, education and training are seen as important for firm-level innovations. Educational establishments are also seen as a major asset in achieving lifelong learning for the population of Øresund, as well as a means of systematising the alleged environmental consciousness of the population into a capability in the workforce. The present level of education is high. Of the Øresund population aged 25-59, 43 per cent had attained a medium-, 26 per cent a high-, and 69 per cent an upper-level education in 1995.

In particular, it is the educational and research activities of the higher education establishments that are focused upon. There is a range of these in Øresund, the largest being the universities in Copenhagen (with 30 000 students) and Roskilde (with 6 000 students), the Copenhagen Business School (with 14 000 students) and Lund University (with 38 000 students). The output of graduates is high, and both Scania and Greater Copenhagen also have a net inflow of university graduates. Scania has the highest level of university graduates. Here, 75 per cent of the population aged 25-59 had attained an upper level education compared with 65 per cent in Greater Copenhagen in 1995. With 39 per cent of population and 40 per cent of employees, Scania employs 48 per cent of university graduates (however, 57 per cent of graduates are employed in the public sector in Scania, and only 29 per cent in Greater Copenhagen). Scania's firms employ more university graduates within manufacturing (10 per cent of graduates work here) than Greater Copenhagen firms (7 per cent). Whereas Greater Copenhagen services firms (minus KIBS) employ more graduates (26 per cent) than Scania services firms (12 per cent). As mentioned, this could indicate that firms in Greater Copenhagen outsource more functions than their Swedish competitors.

The policy for universities is, as mentioned, to achieve a larger degree of integration. It is hoped that relevant educational fields will develop bottom-up, as a response to regional specialisation. Integration of the universities is also coupled to a hope of the integration of labour markets in the region, to achieve lower costs for their operation, and more resources in strategic fields. The strategy is to provide an infrastructure for integration. So far, a formal collaboration, Øresund University, between 11 higher education establishments in Øresund, is in the making, designing student exchange programs (as well as a pricing system for train transport across the bridge).

There are two factors limiting the scope for utilising universities for future growth. Firstly, even if the education level is high in Øresund, university graduates are not the major input to firm-level innovation. For example, even if a quarter of the firms in Greater Copenhagen employ university graduates – compared with a Danish average of 15 per cent – this still lags behind the level of use of university graduates in "high-tech", R&D-intensive regions. Øresund's industries are generally "low-tech", and, as Maskell and Törnquist (1999) express it, universities are disconnected from entrepreneurial activity.

Secondly, not only are there differences in the industrial and labour market structures of the two parts of Øresund, but also problems in realising the integrative synergies of education markets. Certainly, the rather low level of student exchange seems hard to increase. Labour markets are also little integrated. There is very limited commuting of labour between Sweden and Denmark: approximately 3 000 annually in the mid 1990s (as compared with the internal commuting within Denmark of approximately 300 000 annually).

Public R&D *and industry services*

Like other small countries with modest resources, small markets, and small labour markets, neither private firms nor the public sector of Denmark and Sweden invest much in R&D intensive industries. A closer analysis of the industrial structure in the Øresund region shows that R&D-intensive industry occupies a modest part, 1 per cent of total employment. R&D-extensive manufacturing employs 10 times more. Most of the R&D intensive production lies in Copenhagen, which has 52 per cent of Øresund's total manufacturing, but 71 per cent of its R&D-intensive manufacturing.

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An integration of the universities in the region is also hoped to bring about an increased research capacity and a specialisation in strategic fields (health technologies and ICT are typically mentioned as potentially strong public research areas) of benefit to firm-level learning. The universities participating in Øresund University presently set up computer networks connecting the libraries and databases, and a number of joint research projects – many supported by government or private funds in order to promote integration – are underway. However, there is still a low level of research co-operation across the strait. More importantly, the level of co-operation between universities and industry on each side of the strait is very limited. Øresund universities do not play the same role for local industry as universities in "high-tech" regions of the world. This is a problem, because even if integration between universities is achieved, if specialisation and investments into strategic research fields are to take place as a result of bottom-up learning processes at universities, a much higher level of industry-university co-operation is needed.

In Scandinavia, not only universities, but also public demand arising from the high level of public health care, has helped in spurring the medical industry. In order to systematise this relationship, and promote the development of regional industrial clusters, Medicon Valley Academy has been established, which enables co-operation between large medical firms, six universities and public health care organisations. The Øresund Council hopes to inspire other similar examples, such as a "Foodfarm" co-operation between universities, food, and packaging industries.

By far the largest public investment in Øresund deserves special mention: the Øresund bridge. The rationale for the bridge is provided by the scale and scope economies it will bring about, as well as its value as a regional symbol and marketing asset. However, there are many counter-arguments. Particular criticism has been aimed at the scale economy argument. Scale economies are simply not what drive regional competitiveness in a learning economy. The most important point of critique is, of course, that the bridge may lead to *less* integration – and hence scale and scope economies – than expected. The bridge may not change managers' conceptions of co-operation possibilities across the Øresund strait. It may not be sufficient to break the "path-dependence" of existing traded networks of firms. Some manufacturing firms will probably benefit less from the increased accessibility of the other side of the strait, whereas service firms may find new markets. It is thus likely to be individual citizens that provide an essential element in integration, but it may take some time before they cross the bridge for purposes other than tourism. Concerning integration of the markets for students and labour generally, increased interaction may come about because wages are higher in Denmark and housing is cheaper in Sweden. However, the full effects remain to be seen as yet. As will be seen below, there may be problems concerning social capital. It again remains to be seen how effectively the bridge will contribute to a regional identity. Observers have, however, criticised the political as well as practical debate over the Øresund region project for overemphasising the bridge at the expense of other, more targeted projects of integration.

The construction of the Øresund bridge is only a first and modest step towards integrating two different systems on each side of the Øresund strait. Integration does not come about through huge infrastructural projects, it happens through networking at all levels of society and the regional economy, including individuals, firms, associations, public agencies, and so on in the process. Unfortunately, networking is not an area into which public investments have been channelled. This is regrettable, because there may be a low level of regional social capital in Øresund as a whole, despite the large stocks in the areas on either side of the strait.

Social capital

The Danish and Swedish areas of the emerging Øresund region possess a large stock of social capital on each side. They are socially coherent and posses a range of both traded and untraded networks. The theoretical concept of the "innovation system" was based on the Scandinavian experience, and the Scandinavian tradition for a high level of traded networking between firms – vertically as well as horizontally – can be found in the Greater Copenhagen and Scania areas. As mentioned, Greater Copenhagen, however, seems to have more firm networks than Scania. Such traded firm networks are to

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a very large extent based on various professional networks (employers' associations, chambers of commerce, boards – even trade unions and exchange of labour between firms) as well as untraded civic networks (ranging from political movements to sports clubs).

However, the *regional* stock of social capital is low. Firstly, there are few cross-border networks. Even if professional and untraded civic networking crosses industries, it presently does not cross the strait. Amongst policymakers, planners, and high-level industrialists, cross-border networking and co-operation are increasing, but at the individual and firm levels, little happens. Very few subcontracting arrangements are made between Swedish and Danish firms, few associations have both Swedish and Danish members, few workers live on one side of the strait and work on the other, and few students are exchanged between educational institutes. As mentioned, those politicians and planners who have already established their cross-border co-operation see very clearly that promoting various cross-border networks at the individual and firm levels is a major task.

Secondly, there are few social conventions promoting cross-border co-operation. The abundance of traded networking in Sweden and Denmark rests upon social conventions within the business communities about the benefits of specialisation and co-operation, as well as a high level of trust amongst managers. This trust and the closely knit untraded networks amongst managers facilitates social regulation and sanctions against malfeasance, as well as the spread of social conventions promoting trust-based co-operation. Thus, social capital in the guise of the general co-operative conventions of Swedish and Danish managers clearly facilitates much firm level innovation on the respective sides of the strait. However, concerning co-operation across the strait, the value of this social capital is decreased significantly by another social convention. It is perceived to be troublesome to co-operate across the strait due to alleged cultural differences between Swedes and Danes. Furthermore, Swedish managers have so far largely had a perception of Denmark as a gateway to the EU markets, more than an export market and market for subcontracting or horizontal agreements. Social conventions about the alleged difficulties of crossing the Øresund strait also apply to the labour market, as workers and students are generally reluctant to benefit from offers on the other side, and this impedes the much wished for synergies of integrating the Øresund labour markets.

At the political level, a central social convention in the Scandinavian political model is that there should be consensus between political, professional and civic interests. Concerning the Øresund region, this convention has clearly facilitated organisational learning at the political level, and if there has been a convention that cross-border co-operation is difficult, it certainly seems to have been conquered. This means that, at present, there is a paradox of cross-Øresund networking. Politicians, planners, high-level industrialists, unionists, and university directors make policy and network actively across Øresund, while firms, workers, and students do not. Thus, a central political focus is to change the social convention about the difficulty of cross-border co-operation. If a common Øresund culture (both resting on historical roots and the recent development of the Copenhagen and Scania areas) can be created, it is hoped that a resulting shared perception of community amongst managers, workers, and students will make the Scandinavian disposition towards co-operation valuable for the Øresund region as a cross-national entity.

It should be noted that even if the value of Øresund civic social capital for integration is presently low, it has a high value for other areas. Quite paradoxically, the prolonged resistance on both sides of Øresund against the construction of the bridge is a sign of very valuable social capital for a possibly emerging environmental technology sector. The environmental consciousness of consumers, managers, and politicians is crucial here (even if Swedish practices differ from Danish, by, for example, having environmental impact assessments integrated into planning). As mentioned, to be put into use in firm level product development and marketing, this consciousness needs to be enforced and professionalised through education at all levels. Further, the Scandinavian "welfare culture", encompassing social conventions that economic growth and planning should be in compliance with social development, may mean a larger scope for commitment to lifelong learning. This may be true both at the political level (will to invest in education), at the firm level (commitment to training and in-service training), and individual level (proneness to participate in ongoing education and training).

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Summary

Øresund is a prosperous regional system of innovation comprising both innovative "high-tech" and "low-tech" sectors. It is an important case for the benefits in terms of organisational learning and economic performance of efficient co-ordination between individual learning (both tertiary and secondary education), university research, and regional industry structure.

An ongoing regional project more than an existing region, Øresund also provides many insights into the difficult processes of region building and integration. Here, the Øresund case is an outstanding example of the importance of civic social capital for political learning processes, but also an example of the necessity of investing in both such capital as well as social capital amongst managers if integration and the following economic benefits are to be achieved. Promotion of civic, professional and inter-firm networks across the Øresund strait has proved to be a difficult political task, because existing networks and conventions are antagonistic and very "path-dependent". As networking is a social process and hence dependent upon social capital as well as infrastructure, large, top-down infrastructural investments have so far not been enough to promote integration. For the emergent region, a central aspect of future policymaking may thus be taking into consideration the roles of both education and the mass media for investments in social capital.

Andalucía, Spain

Andalucía, the southernmost region of Spain – and of the EU – is one of the EU's largest regions, with an area of 87 653 square kilometres and a 1998 population of 7 236 459. It is a region with mountain ranges in the north, central plains, and a long southern coastline with a Mediterranean climate. The average 1995 population density was 82 persons/square kilometre, with 41 per cent of the population still rural (compared with the Spanish average of 30 per cent). The modest industrial activities are concentrated in the major cities in the south and along the coast (such as Seville, Málaga, Cadiz, Granada, Cordoba, and Jaén), with few such activities in the plains or mountains. The many tourism activities are concentrated along the coast. There is migration into the Seville and Malaga provinces, where population growth is positive. However, the small province of Almería, where traditional manufacturing (of, for example, marble) is currently achieving export success, is experiencing a higher population growth.

Economic development

Andalucía has moved from being an economically dynamic and culturally central region up until the nineteenth century, to becoming peripheral to the European (and later Spanish) economic development of the twentieth century. Its GDP per capita has dropped from 79 per cent of Spain's in 1980 (1990 US$7 189 per capita) to 72 per cent in 1995 (1990 US$9 216 per capita). In 1996, Andalucía had 57.4 per cent of the EU GDP per capita average. The relatively low ability of Andalucía to adapt to the restructuring of the world economy can be traced in the 1995 unemployment rate of 33 per cent (143 per cent of the Spanish average). In 1997, Andalucía had the second highest regional unemployment in EU. The high unemployment exists despite the relatively low participation of women in the labour market: 36 per cent in 1995 (88 per cent of the Spanish average). Nevertheless, the population is relatively young, due to a high birth rate. The population change 1981-96 was 10.7 per cent (two and a half times the Spanish average).

During the last twenty years, and particularly since 1994, Andalucía has witnessed an economic catch-up process. In the period 1980-98, GDP grew by 70.2 per cent (compared with the Spanish average of 58.1 per cent and the EU average of 48.9 per cent); in 1998, the GDP annual growth was 4.3 per cent. Employment growth 1980-98 has been 24 per cent (compared with the Spanish average of 12 per cent and the EU average of 3.2 per cent) and exports are growing (by 105.6 per cent in the period 1992-96), although they are still relatively low (only 8.5 per cent of Spain's total exports in the 1990s). Much of the growth has been due to the booming tourist industry, but during the 1990s, new industries have emerged, including "high-tech"sectors, such as electronics. However, as for the boom within the tourism industry, the newer growth is very unevenly distributed across the vast region.

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Many investments in Andalucía are foreign in origin, in the guise of EU structural funds or greenfield investments by multi-national corporations (MNCs). Moreover, most of the technologies that underlie the new sectors stem from R&D outside Andalucía.

Organisational learning

In Andalucía, agriculture still plays a large role within the economic structure, representing 7-9 per cent of GDP (in Spain, it represents 3-4 per cent) and 12 per cent of 1995 employment (150 per cent of the average Spanish level). In fact, most of the region consists of agricultural hinterland to the major cities. With 23 per cent of 1995 employment, Andalucía has experienced relatively modest industrialisation (79 per cent of the Spanish average), and the industrial structure is dominated by traditional industries with a medium or low knowledge-content. Activities in the early processing stages dominate, with few brands, little marketing, and relatively low-value added: for example, food production and packaging, handicrafts, chemicals, and minerals. Industrial exports and employment are now growing (a 4.5 per cent GVA growth and 25 000 new jobs in 1998), with the majority of growth within the knowledge-extensive industries. In the tertiary sector (66 per cent of 1995 employment, slightly above the Spanish average), tourism is predominant and growing (including indirect effects accounting for 14.6 per cent of Andalusian GDP, having 124 100 employees in 1998 – and with double the Spanish average growth rate). Spurred by tourism, the construction industry also plays a large role. Most Andalusian firms are very small; 96.1 per cent have fewer than 10 employees.

Firm-level learning accounts for relatively little of the regional economic growth. Innovation is currently at a low level in Andalusian firms, and is concentrated in a few firms. A 1998 survey, for example, showed that only 11 per cent of expanding firms rely on innovation. As few as 31.7 per cent have made recent product innovations. The patent rate is indeed low: in 1990, two patent applications/million inhabitants, and three in 1995. Finance for experimentation and new technologies is a problem for all firms, and, in addition, the dominating small and traditionally managed firms are very reluctant to try new technologies. Within agriculture, some larger-scale farms are now undertaking modernisation, aiming at increasing exports, and more processing activities are being carried out locally. However, finance still limits such process innovation for most traditional agriculture and food firms. Within industry, firms in traditional industries have undertaken their recent growth without entering into major organisational restructuring. Some change has taken place within industry, as higher-tech sectors are emerging (electronics growing from 1.88 per cent of GVA in 1985 to 5.72 per cent; machinery from 1.82 to 5.65; transport technologies from 3.06 to 9.79). Very little R&D, however, is carried out in these firms, as many are branch plants of, for example, MNCs. Within services, most growth is in tourism, as business services play a limited role.

The low degree of firm-level learning is connected to the relatively few spin-off effects in the major parts of the Andalusian economic system. Firms and sectors are weakly inter-connected, with only tourism as an exception. Most firms stand alone. Large industrial firms are typically specialised within process technologies that impede outsourcing, or are branch plants of foreign companies, with co-operation relations outside of Andalucía rather than locally. Even small firms within sectors with scope for specialisation and outsourcing, integrate many parts of production, at the expense of productivity. As will be demonstrated below, this lack of interconnectedness of the elements of the Andalusian economic system is partly due to an inherited industry specialisation and structure – the few industry services and the many large, stand-alone plants. However, it is also closely connected to a lack of social capital amongst managers. A substantial task continues to lie ahead for policymakers to create a more integrated industrial system, with more effective learning.

Regional policy

Along with the other Spanish provinces, Andalucía has recently experienced a dramatic increase in political autonomy. It established a regional government in 1982, which has had the autonomy to conduct, for example, education policy since 1993. However, Andalucía's limited funds mean that some regional initiatives, including many aimed at promoting learning, are in fact regional varieties of nationally implemented R&D policies, or of EU R&D policies. In fact, a huge part of recent industrial development is dependent on external funding (foreign direct investments and EU funds).

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Andalusian political attention is now devoted to understanding whether the recent growth process has an indigenous component that can be sustained, and to what degree this demands a change of inherited industrial and institutional structures. Because Andalucía is a vast region with numerous provinces and political bodies, it is difficult to speak about an *overall* political learning policy, and political learning processes are diverse. However, a general vision promoted by the regional government and by, for example, the Institute for Regional Development is that it is too risky to continue to base economic development on industries with a low knowledge-content. To promote growth, and to ensure that it is not jobless, a strategy is emerging on shifting to sectors with a greater job creation potential than agriculture and traditional industries; plus increasing the importance of learning to regional economic performance and the general knowledge-content of local industry.

This is partly achieved through shifting from promoting mass tourism to quality enhancement of tourism and environmental protection, as well as developing a range of new and related industries. There is an emerging focus upon "high-tech" industries that are new to Andalucía, such as consumer electronics, transport technologies, and renewable energy. The aim here currently is to attract knowledge from outside the region, rather than build it locally. Owing to limited funds, initiatives are concentrated on a limited number of high-profile projects; although some efforts are also being devoted to improving educational attainment and investing in university research. Programmes of building regional organisations that may transfer technologies developed elsewhere to new local "high-tech" firms have been implemented, and specialised services have been pooled in, for example, two technology parks. Schemes to attract inward investments have also been implemented, and provinces such as Málaga and Seville have been successful in attracting foreign branch plants. However, there is little evidence that the foreign firms investing in Andalucía have transferred R&D activities to the region, and the Andalusian authorities face major problems in making it attractive for MNCs to do so.

There is also growing political attention on the concepts of learning and the importance of social capital. In particular, the rich Andalusian cultural heritage has inspired the authorities to promote economic growth through "cultural capital". This involves an upgrading of environmental protection and preservation of cultural monuments, aimed at enhancing the quality of tourism. It also entails a rather more diffuse notion of using regional cohesion and social capital to raise the general level of co-operation within the economic system. As will be argued in greater detail later, however, there remain many problems in translating the traditional values of the region into forms of social capital which are wholly conducive to innovation intensive forms of economic activity.

It remains the case currently that a large part of Andalusian economic activity is not characterised by effective learning (in its various forms). It is clear that Andalucía suffers from strong "path-dependence" due to its industrial and institutional structure. Moreover, some of the learning and industrial policies that are being implemented, aiming at breaking this "path-dependence", are constrained by a relative lack of resources. In terms of the policy focus upon particular strategic sectors, the existing industrial system and skill base of Andalucía seems to provide a good basis for adding a higher knowledge-content and value to agribusiness and tourism. In addition, the rapidly growing public demand for environmental protection in order to upgrade tourism may create local demand for an emerging environmental technology sector. However, at the moment, there seem to be fewer Andalusian resources available for sectors such as renewable energy, audiovisuals, and KIBS.

Individual learning

Individual learning through the formal educational system is as yet co-ordinated with economic activities at the firm level to a rather limited extent. There thus remains the potential to strengthen such links and thereby increase the contribution of educational provision to regional economic growth. In fact, attainment has been relatively low at all education levels in Andalucía for many years; and this is reflected in a very high illiteracy rate and a low proportion of both managers and employees in industry with formal training. The regional government has spent quite some effort since 1993 on improvements to individual learning, especially through construction of elementary schools, and the result has been a remarkable 50 per cent decrease in the illiteracy rate between 1993 to 1998 (falling from 11.3 per cent to a level now approaching the Spanish average).

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Recently, the Andalusian government has aimed at improving the technology transfer infrastructure in order to stimulate firm level learning. Part of this strategy has involved the creation of technology services (which are discussed in the following section). Another element, however, has recognised the importance of educated people for technology transfer and consequently aimed at improving secondary schools and the now 10 Andalusian universities (increasing the number of employees from 18 685 to 20 154), as well as the range of courses. Furthermore, increased investment in professional education and vocational training has been aimed at making firms more receptive to new process technologies. The result has been an increase of attainment in secondary schools and universities by 20 per cent during the period. For universities alone, the participation of those aged 18-25 years has risen from 10 per cent to 25 per cent in the period 1988-98. This means that, for example, the number of those employed in industry with a university degree has doubled during the period 1986-98, and in services it has grown by 53 per cent. During the same period, the numbers of those having completed higher technical studies have quadrupled in industry and increased almost six-fold in services.

Nevertheless, educational attainment at all levels remains low. Andalucía had the lowest 1995 levels of educational attainment of the five case-study regions: 13 per cent of the population aged 25-59 years having attained a medium, 16 per cent a high, and 29 per cent an upper education level (corresponding to 87 per cent, 80 per cent, and 83 per cent of the relatively low Spanish average, respectively). In the workforce, the 1998 level of those with university degrees is 7.5 per cent in industry and 23 per cent in services. The low education level applies to managers too: only 25 per cent have a university degree, and these are mostly employed in the large companies. These figures reveal that even if university students have increased in number, they are still relatively little utilised in industry. This may be due to the fact that only 18 per cent of them study in technical universities or faculties, and there is little emphasis on applied knowledge within the physical and technical sciences. In particular, the emerging "high-tech" sectors, such as electronics and environmental technology, which enjoy so much political attention, are not supported by policies for individual learning that create the skills they demand.

In firms, the generally low educational attainment of employees and managers is, of course, to a degree remedied by a stock of knowledge acquired through "learning-by-doing". However, the Andalusian Institute for Regional Development emphasises that there is an increasing lack of knowledge relevant to management, marketing and R&D, even for traditional firms.

Public R&D *and industrial services*

The aims of Andalusian regional industrial policies have from the beginning been fairly traditional: improving the regional endowment of resources such as transport, telecommunications, and energy infrastructures. Lately, even Andalucía's culture and history have been recognised as local resources, and plans are being developed for investing in palaces, monuments, and in the natural environment for the benefit of the local tourism industry.

However, the importance of learning to economic performance is increasingly being taken into account in public policy. Public R&D policies and the offer of public services to industry have a relatively large role to play, because the level of private investment in Andalucía is low (which is also why finance is a persistent problem to many firms). Hence, firm-level R&D investments in 1998 amount to only 4.8 per cent of the Spanish average. Today, most of the efforts in promoting R&D in the region come from the public sector. However, even including public investments, R&D still plays rather a limited role in Andalusian economic development. The total R&D expenditure amounts to only 0.5 per cent of 1995 GDP (compared with the Spanish average of 0.8 per cent). This corresponds to a 1995 R&D expenditure per capita of 39 ECU (45 per cent of the low Spanish average) – the lowest of the case-study regions.

Two categories of industrial policies aimed at enhancing firm level learning through public R&D and industry services have emerged. For both types of policies, however, a major role for the public authorities has been to attract and channel external investments to Andalucía. A first category is focused around the universities and technological parks. The First and Second Andalusian Research Plans of

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the 1990s have channelled funds to university R&D, and there is a strongly growing number of research projects and Ph.D. students at Andalusian universities. However, despite the efforts of the Research Result Transfer Offices and Technology Transfer Offices, there is limited interaction between universities and the major industrial and services sectors. This means that the research is not carried out wholly in co-ordination with the demands of local industry, and the results are most frequently not applied here. The paradox here is that, in some respects, research is at a high level in universities, but linkages to local industry are insufficiently developed to ensure that the results are fully utilised locally. In fact, in some cases, firms in other regions use the results of research by Andalusian universities. A pragmatic response to these problems has been a focus upon adopting technologies developed outside Andalucía (see below). Universities are thus regarded as important components in a regional technology transfer structure. However, there is also a limited interaction between universities and the principal sectors of the regional economy.

In addition to public investments in universities, a policy of actively creating "high-tech" clusters from the bottom has been implemented during the 1990s, as has occurred in many other European peripheral regions. Malaga Technological Park, established in 1992, by 1998 offered a range of services from infrastructure to commercial counselling for the 101 firms located there (with a total of 1 705 employees), mainly within the electronics and telecommunications sectors. Technopolis of Seville was established after the 1992 World Exhibition in Seville. By 1998, it contained 147 companies and 7 492 employees. As is the case with most technological parks, their industrial profiles – and the R&D conducted – differs substantially from the industrial profile of the rest of the region. They also suffer from the same problems of creating sufficient local linkages and spin-off effects. An aggravating problem here is that most potential "high-tech" partner firms located outside the Andalusian technological parks are in fact branch plants of MNCs.

A second category comprises public R&D and industrial services that are decentralised. Various entrepreneurial and technological support services exist. Almost all these services have been created with external funds, and are very much aimed at facilitating technology transfer from the outside to Andalusian firms. For example, the Business and Innovation Centre Networks (BIC), offering decentralised technological services and commercial counselling, as well as finance, are funded by the EU structural funds and linked to the EU BIC network. Likewise, the EU initiated the Innovation Linkage Centres (IRCs) and the Enterprises Skills Network Programme and their primary aim is technology transfer to local firms from the outside. The 1989 Spanish R&D plan has promoted so-called Research Result Transfer Offices, established by local universities and on a consultant basis offering research results and services to local firms. There are now 10 such offices in Andalucía. The Andalusian authorities have encouraged them to form an IRC – the Southern Europe-Andalucía Linkage Centre – together with other public agents involved in promoting technology transfer, the Andalusian Institute of Technology, the Institute for Regional Development, and the Institute for Promotion of Andalucía. A network with some firm participation, the Andalucía Innovation Network, also exists, through which a range of major industrial players exchange experiences.

In spite of these initiatives, it remains the case that a larger part of Andalusian industry is relatively unaffected by the public R&D investments. Indeed, the general degree of active involvement by firms with industrial services is limited. The major reason for this is, of course, the inherited structure of local industry. However, other, more intangible reasons will be touched upon in the following section.

Social capital

There is much political praise for the cultural heritage of Andalucía. Andalusian society today is socially heterogeneous, with a large component of the population living in traditional villages in combination with a major urban population in the major cities. These recent cultural differences are bound to influence the social capital of the region; and differences in policies of the provinces also complicate the picture. However, there is a general common history of Andalucía, which has an important impact today. Andalucía has traditionally been highly exposed to other, particularly Maghreb, cultures, and, in general, local politicians and managers orientate themselves towards, for example, North African export

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markets to a higher degree than agents in other EU regions. The rich and cosmopolitan Andalusian culture, with an abundance of internationally acclaimed arts and artists performing traditional music, dance, and visual arts, along with the natural environment and historical monuments, has for long been a major tourist attraction. Clearly, this heritage is a strong regional economic asset. However, its contribution to Andalusian stocks of social capital may be lower than expected.

Andalusian participation in elections is similar to the Spanish average (approximately 64.5 per cent), and the civic Andalusian communities are strong. However, the stock of civic social capital has little positive effect on social capital amongst managers. Most Andalusian entrepreneurs seem reluctant to enter into co-operative linkages with other firms, and involvement in economic communities is generally low. One reason is the typical management style and the personal norms of the managers, as well as a lack of social conventions conducive to inter-firm co-operation. Most firms are small and 70 per cent are manager-owned and managed as traditional autonomous units. Personal norms that hinder co-operation and the strategic planning of managers are especially resilient amongst managers with little or no formal training. Certainly, so far, for example, external counselling has had little luck in inspiring new management practices or creating social conventions that may override the personal norms of managers.

The result is that despite the small size of the average Andalusian firm, it has very limited traded networks. In the mid-1990s, only 25 per cent of firms had a co-operation agreement with other firms. As we mentioned earlier, the existing networks aiming at promoting firm level learning, such as the Southern Europe-Andalucía Linkage Centre, are in fact public technology services, rather than horizontal networks between participating firms. The vertical co-operation efforts that are often reported are designed as top-down partnerships, with a high degree of public sector involvement, and are generally limited to a few partners, such as "high-tech" ventures in technological parks. This is symptomatic of the generally modest degree of horizontal (as well as vertical) traded networking amongst Andalusian firms. There also appears to be a rather low level of trust between entrepreneurs and universities. Certainly, many industrialists do now view universities as relevant to their activities, but the co-ordination of university research and education with industry demands remains to be developed to its full effect.

Norms and social conventions also influence the viability of the emerging strategic sector of environmental technologies. Politically, it is hoped that through initiating environmental protection programmes (for example, a path-breaking 1989 natural protection programme that has left 18 per cent of Andalucía's area protected) a resource of much importance for the tourism industry will be sustained. In addition, however, a general awareness of the environment will also be fostered that may be utilised in an environmental technology industry (much like the aspirations for the Øresund region). However, the social conventions embracing environmental protection are only spreading slowly outside political circles and are particularly sparse amongst the agricultural population.

Summary

Andalucía's industrial sectors and firms are relatively isolated from each other, and there are few public, private or civic organisations to bind them together. For example, the Andalucía Innovation Network seeks to promote social conventions of co-operation amongst the major industrial players who participate. However, there still seems to be an organisational gap between Andalusian regional institutions and such exclusive partnerships. In terms of institutions, the social conventions that are conducive to inter-firm co-operation and learning are rather little developed currently.

Promoting learning in Andalucía clearly demands upgrading individual learning, as well as offering a range of public services. Recent political efforts and a general opening of the region to external influences have paved the way for greater general attention to learning and change in Andalusian society, but many organisational and institutional foundations still need to be nurtured. A greater co-ordination of educational efforts and public R&D and industry services to existing industrial structures and knowledge bases seems necessary. Concerning institutions and social capital, a much needed increase in traded networks amongst firms necessitates some institutional unlearning of social conventions; and a public policy of nurturing both new and existing traded networks may also be

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crucial. Clearly, the challenge for policy that takes both Andalucía's industrial structure and culture into account is how to create social conventions conducive to co-operation through new untraded and traded networks, without eroding the regional identity and the cultural assets for the tourism industry encompassed in the present culture.

Kent Thames-side, United Kingdom

Kent Thames-side is not an administrative region; it is a local area in south-east England and Kent County, which is defined in terms of an ongoing large-scale regeneration project. Kent Thames-side (the Boroughs of Dartford and Gravesham) covers 172 square kilometres, with a population of 177 200 in 1997 (a population density of 1 023 person/square kilometre). Only 13 per cent of its population is rural; the area's (and indeed Kent County's) highest population density is found in the urbanised areas bordering the River Thames, notably in the towns of Dartford and Gravesend, which are surrounded by areas of post-industrial land. Kent Thames-side has experienced a collapse of its historical manufacturing base and an economic downturn, and like Jena, the area is now seeking to recover, although by exploring entirely new fields of economic activity.

The area west of London (mainly the Heathrow "corridor" along the M4 motorway) long accounted for a substantial part of urban growth in the London periphery and has thus enjoyed much political and academic attention. Recently, however, there has been a political shift towards stimulating growth in the eastern part of the south-east region. Today, this is the richest and most value-creating UK region, albeit one with great internal differences. Large areas have either been peripheral to post-war economic development or have experienced more recent industrial decline.

Two major regeneration projects are taking place in the Thames Gateway area (around the estuary of the River Thames). One encompasses the Kent Thames-side area, which has a strategic geographical position owing to the opening of the Channel Tunnel to the Continent and the planned Channel Tunnel railway station. This project constitutes one of Europe's largest investment programmes for revitalising an old industrial area, with a budget of up to GBP 4 billion over a period of 20-30 years and the creation of new job opportunities, housing and infrastructure. Local public-private partnerships have been particularly successful in raising resources. However, both private and public investors realise that the return on their investment depends crucially on the local stock of human and social capital. Thus, efforts are being made to stimulate individual and organisational learning in Kent Thames-side.

Economic development

A range of high-growth industries is located in the South-East and much economic value is created there. In 1995, the region's GDP per capita was US$18 204, or 102.5 per cent of the UK average. However, that of Kent County was significantly lower at US$16 397, or 92 per cent of the UK average.[4] That of Kent Thames-side was even lower, at US$15 553, or 87.5 per cent of the UK average. In an economic forecast for 2001-2011, GDP per capita of Kent Thames-side is expected to exceed slightly that of Kent County.

The South-East region generally looks towards London for jobs, education and cultural life. Owing to its loss of industry and jobs, Kent Thames-side is even more dependent on London. Today, 19 500 skilled workers from Kent Thames-side commute to London daily. With the construction of high-priced houses and better transport infrastructure (see below), the number of commuters from Kent Thames-side to London may increase, if high-quality jobs are not available locally. The regeneration project has aimed at creating jobs, and the unemployment rate of Kent Thames-side has declined significantly from 10.7 per cent in 1993 to 3.5 per cent in 1999. Much of this development is in line with the Kent County average. However, Kent Thames-side has performed better than Kent, as unemployment had been slightly above the Kent average since 1991, but has converged to the average today. This relative improvement can mainly be ascribed to regeneration initiatives (notably Bluewater and Crossways, see below). However, most of the new jobs are in retailing or construction and may not help create significant long-term growth or cut down on the number of skilled workers commuting out of Kent Thames-side.

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Although Kent Thames-side has experienced some positive economic development, it stands relatively high on the UK scale of social disadvantage (as measured by the Index of Local Deprivation, which is based on measures of poverty and other indicators of social exclusion, such as unemployment). Kent Thames-side's social and poverty problems can be ascribed to the collapse of its economic base. Most of this consisted of traditional industries (in particular, cement), which experienced a major downturn in the United Kingdom and other industrialised countries from the early 1970s and throughout the 1980s. A significant minority of the Kent Thames-side population experiences social problems. Deprivation is concentrated along the River Thames, in areas with social housing and old town centres, which are at some distance from the recent land development projects. Parts of Dartford Borough are old industrial land, dominated by heavy industry. Deprivation in Dartford is rated at 154 out of 310 English districts, the "worst deprivation district" being rated 1. Parts of Gravesham Borough are also located in an old industrial area and are rated as more deprived at 138 out of 310 districts.

This measure masks internal differences, however, as Gravesham also possesses some of Kent Thames-side's newer housing and recreation areas, which are well placed to attract a higher skilled workforce. Owing to the relative lack of knowledge-intensive and high-growth industries in Kent Thames-side, however, much of this workforce commutes to London to work. The Boroughs in Kent Thames-side receive national funds for upskilling, environmental improvements and housing programmes,[5] but the geographical differentiation has made it difficult for planners to target regeneration and learning efforts. This causes some problems for local cohesion and democracy.

As described below, it may be a huge task to create long-term growth and high-level jobs, owing to the current composition of the local industry and knowledge base.

Organisational learning

The industry structure of Kent Thames-side is being transformed. The primary sector's importance remains low (3.1 per cent of employment1997). The service sector is advancing, rising from 70.5 per cent in 1991 to 73.6 per cent in 1997. The growth of this sector – and modest growth in the construction sector – are partly a sign of the decline in manufacturing. In 1991, Kent Thames-side's manufacturing sector, with 20.1 per cent of employment, was much larger than that of Kent as a whole (14.8 per cent), but it declined to 17.7 per cent in 1997, while employment in Kent remained stable. In part, the growth of the Kent Thames-side service sector can be viewed as an outcome of the ongoing huge investments in land development activities and retailing. For example, investments in retailing (mainly Bluewater, see below) have created between 8 000 and 10 000 jobs. These service sector activities are quite knowledge-extensive and have little export potential. Moreover, there is not much export potential in most of Kent Thames-side's secondary sector; the traditional industrial base is generally in decline, and the area still awaits renewed industrialisation based on local knowledge. Kent Thames-side's new industrial activities are poorly connected to a local knowledge base, their systemic nature is modest, and overall firm-level learning is low.

The manufacturing focus is shifting away from cement and paper-making, and firms in other industries have either sprung up or relocated (some) activities to Kent Thames-side. Many firms have relocated to take advantage of the accessibility or strategic location of land, rather than of the local knowledge and skills base. For example, many serve Greater London, through logistical activities connected to the London Orbital Motorway (M25) that cuts across Kent Thames-side and Europort, a fast-growing port on the Thames that is also located there.

Kent County possesses a growing knowledge base in pharmaceuticals and biotechnology. The Kent Bioscience Network, which links firms and universities, encompasses over 60 firms (with around 12 000 employees). North Kent has a small cluster of about 30 pharmaceutical and biotechnology firms, which draws on the education and research of University of Greenwich's School of Chemical and Life Sciences; and university-industry co-operation is supported by the Regional Development Agency for South-East England (for example, through the BioPharm project aimed at training initiatives). However, most of this activity takes place outside Kent Thames-side, and the local educational organisations (for

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example, the Kent Thames-side campus of the University of Greenwich) do not play a role in the pharmaceutical and biotechnology industries. However, one of the largest firms, Glaxo Wellcome, is located in Kent Thames-side.

Most Kent Thames-side firms are SMEs (83.7 per cent had fewer than 10 employees in 1997, about the same figure as Kent County) and generally have a low level of local vertical or horizontal traded networking. Incoming firms, not primarily attracted by the local knowledge base, do not seem to change this pattern much, as their co-operation activities are directed outside the area. Many firms are in supply networks with firms in London. With the improved transport infrastructure (see below), this outward networking is likely to increase. Evidence from a 1998 survey on innovation activity in the area is somewhat equivocal, but does not suggest that innovation involves a significant element of "high-tech" R&D. With the exception of large establishments, use of specialist research facilities did not appear to be a strong feature of the businesses surveyed, with only 31 per cent reporting use of such a facility. The types of research centres used were identified as further education colleges (12 per cent), trade associations (12 per cent) and universities (9 per cent). It remains to be seen whether recent economic initiatives in Kent Thames-side will change this overall picture of little networking between firms and research organisations.

Local policy makers hope that the greater accessibility of Kent Thames-side to London and Europe may attract much more inward investment to the local manufacturing base. What is needed to create growth that is not largely based on links to London is high-growth firms that utilise and add to Kent Thames-side's knowledge base by interacting with local firms and educational and research organisations. Attracting such firms depends, however, on a well-developed local skill base, a strong challenge for local policy makers.

Regional policy

Kent Thames-side's economic regeneration necessitates substantial efforts in terms of education and social policy, but also, in a longer-term perspective, the creation of a new industrial base capable of using local skills and knowledge to become competitive. It is a huge task for policy makers to create such an industrial base by attracting firms from outside Kent Thames-side and by stimulating a new type of local entrepreneurship and industrial growth.

Many policy makers have been involved in planning for Kent Thames-side. Transferring growth from London has long been an objective of planning; the 1980s initiative to regenerate Docklands, east of London, was taken by the national government. Recently, however, regeneration initiatives are being transferred to the regional level. Several political authorities influence the development and regeneration of the Thames Gateway area, including Kent Thames-side. The national government co-ordinates regional policies in government offices, promoting strategic regional partnerships, regional associations and Regional Development Agencies (RDAs). The (then) national Department for the Environment published in 1994 a regional planning guide and a regional economic strategy for the South-East region and in 1995 a guide for the Thames Gateway (touching upon three regions). It set a broad framework for regional development, giving Thames Gateway, and in particular Kent Thames-side and Royal Docks/Stratford, "priority" status and a huge future development potential. The guides emphasise learning in co-operation between educational organisations, labour and business, ICTs and sustainable, high-quality housing and transport infrastructure. The South-East England Economic Development Agency (the RDA for South-East England) co-ordinates the Thames Gateway actions for the three RDAs influenced by the Thames Gateway guide. Apart from such regional development strategies, the Agency also undertakes strategy formulation for lifelong learning and ICTs, through, for example, the Wired Region project.

In Kent Thames-side, a range of local agents co-operate within this overall framework to stimulate local economic regeneration. The key strategies for Kent Thames-side – which, as noted, is not an administrative entity in its own right – are designed and co-ordinated by the Kent Thames-side Association. Members of the Association are major stakeholders in local development: the Kent County Council, Dartford and Gravesham Boroughs, the University of Greenwich, London and Continental

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Railways and a development agency, Whitecliff Properties. The Association has produced its visions, *Looking to the Future* and *Future Place*, has integrated local strategies for environment, transport and other infrastructure, initiated Learning Partnerships, represented Kent Thames-side in relation to the rest of the Thames Gateway project and North Kent and worked on setting up a local transport forum. Owing to its limited funds, the Association has mustered a broad range of public and private partners. Its success in creating partnerships has added to the political as well as academic attention it attracts, nationally and internationally.

The goal of Kent Thames-side regeneration is first and foremost the creation of local jobs, in combination with the necessary physical regeneration of post-industrial land. One of its ambitions, to become a transport-driven region (a "front door" to the United Kingdom on the way from the rest of Europe, as well as a transport hub for the south-east), seems realistic for several reasons. First, the M25 cuts through Kent Thames-side and includes the Dartford river crossing and the A2. Second, the Europort is located there. Third, the coming high-speed Channel Tunnel Rail Link is to have an international passenger station in Ebbsfleet, near Gravesend, in 2007 (drastically reducing transport times to the continent and to London). Political negotiations over how the design of the station may provide Kent Thames-side with the most advantages are going on (for example, park-and-ride facilities benefiting the South-East versus a station near the housing and business district benefiting Kent Thames-side). Fourth, improvements are planned on the North Kent Railway line. Fifth, Kent Thames-side is being included in the proposed Fastrack transit port system (to reduce car use).

The efforts of the Kent Thames-side Association represent one of the largest regeneration projects in Europe. It aims to create 50 000 jobs and stimulate a huge growth in population. A central part of the strategy is a plan for the physical development of 72 square kilometres. Given the scarcity of land around London (possibilities for development along the M4 are all but exhausted), the abundance of brownfield sites (old industrial sites and quarries) in Kent Thames-side may be a major asset.

A range of construction projects aimed at creating jobs have been carried out. One important project is Crossways, a business and distribution park, established in the 1980s on an old cement industry site, which now includes a university campus. In 1999, Crossways had some 4 200 employees. A second, very conspicuous project is Bluewater, Europe's largest shopping and leisure centre. Construction began in 1996, and in 1999, it opened with 320 shops and a range of leisure facilities. It recorded some 24 million visitors during the first year, and today employs 6 700 people. Bluewater developers worked with the local employment service from the construction phase (a novel hiring practice in the construction industry) and channelled 2 289 unemployed people (1 350 from Kent Thames-side) into construction work. Many of these have since remained employed in construction work elsewhere or in service jobs in Bluewater. The Employment Service, which developed a range of new services and practices in connection with the partnership, continues to work with Bluewater retailers. With a construction budget of GBP 1.2 billion and a great deal of political and public attention, Bluewater has come to be perceived as a symbol of successful regeneration in Kent Thames-side. Apart from its ability to create jobs, it also functions as a transport hub for Kent Thames-side bus services.

The Kent Thames-side regeneration strategy also involves urban renewal (for example, the Town-centric project in Gravesend), but emphasises construction of new houses. In view of the jobs created, the Association expects a major population increase. Given the slowly declining size of the average UK household, this means a huge demand for new houses, and the Association plans to construct 30 000 new homes over the next 30 years. Whitecliff Properties Ltd. holds up to 80 per cent of the available land in Kent Thames-side and co-ordinates new housing projects. Counting on the development of a more growth-oriented local industry, Whitecliff Properties constructs both expensive houses for managers and highly skilled labour and cheaper houses for other categories of labour.

The realisation of a community working and living locally, instead of commuting, and attracting highly skilled labour or managers depends not only on developing local industry, but also on providing a range of public services. For example, public transport is central, as most of the new houses are located outside the socially deprived city centres. Currently, public bus transport is being thoroughly upgraded and is heavily subsidised. This is an example of the co-ordination of public and private

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investments needed if private investors are to reap profits and the public is to gain from its investments by selling to private investors. Many of the housing projects currently have a negative market value, and investment gains depend on rising land prices. For example, the expected payoff of the development of Eastern Quarry is too small to merit investment, but if the payoff for neighbouring Bluewater is taken into account, it balances.

Hence, the Kent Thames-side regeneration project depends on co-ordination, not only of investment activities, but also of the actions of local organisations and individuals. First, endogenous long-term industrial growth requires public services and eventually public R&D targeted to industrial needs. Second, attracting outside firms hinges on the presence of a skilled local labour force; the currently low local skill level is a major obstacle to attracting high-growth, knowledge-intensive firms. Thus, the huge physical investments in housing, Bluewater and business parks are only an initial step towards regeneration. Education and training policy should be linked to the needs of incoming firms in order to infuse longer-term economic value into the physical infrastructure being established. Third, for education and training policy to succeed, and for social inclusion in the long run, a high degree of local participation – a stock of civic social capital – is needed. These crucial problem areas are addressed in the following sections.

Public R&D *and industry services*

The Kent Thames-side regeneration strategy is broad in scope and is not focused on particular economic drivers or industrial sectors. Investments have been concentrated in large-scale construction projects like Bluewater and housing, and public policies have focused on job creation. Thus, as public funds are limited, there has been little investment in public R&D and industry services.

However, like many other regions, Kent Thames-side gives priority to attracting inward investment. As part of activities, the Kent County Council's agency, Locate in Kent, promotes inward investment to Kent Thames-side. Owing to the regeneration activities, most of Locate in Kent's activities currently concern Kent Thames-side. Locate in Kent seeks to attract 20 international firms a year to Kent. It fulfilled this goal in 1999, mostly with US firms, representing 2 000 jobs and accounting for 10 per cent of the United Kingdom's total inward investment. Eight of these firms located in Kent Thames-side. When competing with other UK regions to attract foreign firms that do not want merely to establish warehouses or assembly plants, the presence of specialised and highly skilled labour is crucial. As we noted earlier, this currently constitutes a bottleneck. Other important factors are abundant sites, buildings and physical infrastructure, and Kent Thames-side is well endowed with these.

One industrial site that attracts a lot of inward investment and has a well-developed physical infrastructure is the Crossways Business Park. It is advantageously situated next to the M25's Dartford River Crossing and the Thames Europort. Crossways today has 40 businesses (warehouses connected to Bluewater, manufacturing plants, call centres, logistics connected to the Europort or M25) which employ approximately 4 200. Despite its growth, Crossways is still dominated by firms that have moved within Kent Thames-side to a better location under favourable conditions.

Increased firm-level innovation has lower priority than attracting inward investment. However, the Kent Thames-side Association has founded the Telematics Partnership, which benefits cross-sector public and private interests by promoting the use of ICT in education, training and firms, linking this with local social and cultural activities. The partnership teaches firms e-business capabilities and has set up a telecentre cum business incubator, with IT and videoconference facilities. Its objective is to offer firms at a very low level of competence a means to improve their basic ICT capabilities.

Promotion of inter-firm co-operation and interactive learning is a somewhat neglected area. Some policies at regional level undertaken by the RDA spur co-operative innovation and learning (for example, the BioPharm project), but there have been few efforts targeted at Kent Thames-side.

Owing to the limited use by local firms of external research facilities and universities, there is a large scope for policies to upgrade the local university and increase its interaction with local firms. Currently, the local university – the Kent Thames-side campuses of the University of Greenwich – is not orientated towards performing R&D of benefit to local industry. The University of Greenwich, one of two

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universities in Kent, but the only one with campuses in Kent Thames-side, is the only local provider of higher education. It was formed in 1898 as a polytechnic, expanded during the 1980s to six colleges in south-east London and Kent and gained university status in 1992. It focuses on teaching and is not yet a full-scale research university. It is strong in several technical fields, and is gradually increasing its research in environmental technologies and biotechnology. However, this is taking place on campuses located outside Kent Thames-side.

The Kent Thames-side campuses have schools of architecture and construction. Much of the research carried out on the construction industry is currently done in firms, so that the Kent Thames-side campuses have little research content (and fewer research funds) compared to other universities. The focus on teaching and the modest research carried out correspond to what the expanding Kent Thames-side construction industry demands. The low local demand for university research needs to be complemented by public policy efforts to encourage more research and to create a higher level of local expertise in the construction sector. Even if the Kent Thames-side campuses do not develop fully fledged research departments (including high technology), there is presently an evident lack of effort to develop new, related research areas, possibly in partnership with other universities or campuses. In the absence of local demand for knowledge, investment in public R&D and promoting knowledge creation are crucial to a successful shift towards a more innovative local industrial base with larger growth potential. However, this requires ongoing adjustment, depending on the development and needs of local and incoming firms, and possibly partnerships with private firms to obtain funding for novel research areas. The current low level of networking between firms and the Kent Thames-side Greenwich campuses is a great obstacle in this respect. So far, there has been some public support for university outreach activities, but with limited results. Unfortunately, there are also few attempts to encourage firms to contact universities and other external research facilities.

Individual learning

In an industrial region in decline, the move to a new industrial base requires new learning. Kent Thames-side is actively marketing its recent development projects as ensuring a transition from a traditional industrial to a "knowledge-based" economy. But both attracting new industry – in fierce competition with other EU regions – and developing endogenous industry hinge on providing a sufficient supply of skilled labour. Housing policy may encourage the arrival of new and more qualified labour, but improving local education and training is an urgent and huge task.

Basic skills in Kent Thames-side are slightly below those of other UK areas. Gravesham Borough accounts for the largest number of people with low numeracy and literacy. In 1999, a sample of the 57 primary schools in Kent Thames-side revealed a large number of pupils with learning difficulties. In general, Kent Thames-side primary schools are located in areas that score above average for both England and Kent on the deprivation scale and have lower assessment results. It is the schools in the regeneration area along the river that contribute most to the low average performance of Kent Thames-side's schools. Their results are poor, owing to the performance of some ethnic minorities and others with learning difficulties. A very large proportion of the ethnic minority population of Kent Thames-side trace their origins in India. This community has in general a higher educational attainment than for the UK population generally and the Indians are often quite successfully in education and employment. As part of the need to develop social capital, there is a need to recognise the growing economic importance of the ethnic minority communities. Thus, Kent Thames-side has a problem at the level of primary schooling. The expected 30 000 new homes will require at least 20 new primary schools over the next 30 years.

Kent Thames-side adults have levels of post-compulsory education and training below the national average. Paradoxically, it has several high-level grammar schools, with General Certificate of Secondary Education results above the English average and slightly above the Kent average, yet overall results for the 16-18 age groups are below the English and Kent averages. Northwest Kent College serves Kent Thames-side, and the high deprivation level of some of the areas from which it draws its students can be traced in the performance of its full-time and part-time students; 83 per cent and 79 per cent,

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respectively, completed their course of study in 1997 (the average for England was 85 per cent for both types of students). Northwest Kent College generally provides a mixture of intermediate vocational skills, some academic courses and basic skills for adults.

In terms of university education, while South-East England generally has a very high education level (for example, 20.7 per cent of the population in Surrey had higher education qualifications in 1991), Kent has a low level and that of Kent Thames-side is even lower. In England overall, 13.5 per cent had a higher qualification in 1991, while the figures for Kent and Kent Thames-side were 12 per cent and 11.7 per cent, respectively. The percentage was much lower in the deprived areas along the river (in some, less than half the Kent average). Although these figures are somewhat dated, the inward investment agency Locate in Kent complains that knowledge-intensive firms refrain from locating in Kent Thames-side because its labour force lacks skills in strategic fields, such as IT, software programming, management and marketing. Kent Thames-side is – after south-east London – the main recruitment area for students for the University of Greenwich. Out of its 15 000 students, 678 are from Kent Thames-side (1995-99 average). The university has only recently begun to offer courses in Kent Thames-side in a narrow range of fields. The School of Architecture and Landscape offers a BA in Architecture (329 students), and the school of Land and Construction Management offers a BSc in Quantity Surveying (132 students). This supports the construction projects in Kent Thames-side, but adds little to the local export base or long-term growth potential.

The ambition of the Kent Thames-side Association is to represent a new phase in UK regeneration policy, focusing not only on construction but also on human capital and upskilling. The aim is to use learning to fight social exclusion and to stimulate long-term growth. There are many national and regional stakeholders in the area's education policy with different concerns (primary, secondary, university, on-the-job training, and so on). For example, Kent, like other regions, complies with the government's new policies on lifelong learning and the upgrading of the regional political level, for example, by forming a Lifelong Learning Partnership and a Learning and Skill Council (together with Medway).

Kent Thames-side is trying to co-ordinate learning efforts through partnerships and its Learning Charter (which refers to government White Papers on learning and the role of the family in lifelong learning, ICT, the need to address the needs of school-leavers and to improve work-related training). Furthermore, it intends to establish a Learning Company to link business, learning institutions and the community. The aim is not to replace existing national or regional initiatives, but to link them coherently at the local level, clarify issues that are confusing for many and engage those who are uninvolved in lifelong learning. The Learning Company will be located at a new Kent Thames-side Community Learning Centre and will deal specifically with pupils who have not succeeded in the traditional school system and who need extra support.

These local initiatives, supplemented by the establishment of regional Learning Partnerships and the Learning and Skill Council, are of great potential benefit to Kent Thames-side. They may help to channel regional funds to the needier areas and facilitate direct contact with individuals, thus improving their participation. The initiatives are still in their infancy and their effects cannot yet be evaluated. In the educational sphere, the Telematics Partnership promotes the use of ICT, offers seminars, research projects (for example, on the Internet), Internet-based family learning, on-line ICT for schools and learning centres. The partnership also supports ICT in training, linking Kent Thames-side training efforts to the national University for Industry programme (a UK initiative to promote lifelong learning). It also promotes use of ICT in Kent Thames-side libraries and supports local IT-based cultural activities.

The Kent Thames-side Association's Learning Charter identifies a broad range of efforts needed to stimulate individual learning in both children and adults, and to improve motivation and participation all the way from primary school level to university education and work-related training. Family learning programmes are aimed at providing more people with basic skills. The initiatives currently under way are limited, however, by the modest level of funding.

Kent County Council, in co-operation with Dartford and Gravesham Boroughs, is planning to improve primary level as well as adult learning. Current initiatives include integration of ethnic minorities in primary schools, family learning centres with day/weekend courses and upgrading libraries in

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Dartford and Gravesend. Initiatives for improving work-related training in Kent Thames-side include identifying target areas, some of which qualify for external funds under the University for Industry or the BioPharm training programmes. In a partnership between Bluewater, Northwest Kent College and the Employment Service, job creation and adult training efforts are combined in the Bluewater Learning Shop, where University for Industry programmes are represented, mainly among present and new Bluewater employees. Tailored Northwest Kent College courses are also offered with employment services (mostly for jobs in Bluewater). The Learning Shop has a significant turnover. However, even if the Shop's activities extend beyond Bluewater staff, the initiative clearly focuses on distribution and the retail trade, offering upgrading and recruitment services for Bluewater (with a predicted annual staff turnover of 1 200 employees).

In terms of university education, the location of University of Greenwich campuses in Kent Thames-side is viewed as a major step, but few efforts are being made to broaden the range of courses offered. In theory, the University of Greenwich is able to offer some of the high-level IT skills in demand by firms considering locating in Kent Thames-side, through short courses or on-the-job training. However, there is as yet no supply of workers having completed such courses nor a programme to set up such courses and target them to meet the needs of incoming firms.

Participation by firms is crucial for public upskilling efforts, because on-the-job training demands dedication from managers and because partnerships between firms and educational organisations are an important way to design and fund targeted university and on-the-job training courses. The Learning and Skill Council will provide funds to firms to get them to participate in on-the-job training programmes, but the high proportion of SMEs lacking a tradition of co-operating with other firms or organisations severely limits the participation rate. Further, firms complain of a lack of relevant and accessible courses at non-university level. The Kent Thames-side Business Education Partnership currently organises contacts between almost 1 000 local firms and educational organisations. However, given the huge demand for upskilling and the modest level of public funds, much more participation by firms is necessary if these efforts are to succeed.

In sum, changing Kent Thames-side's industrial base requires allying educational and training efforts with the regeneration project as a whole. With respect to education, the Kent Thames-side Association and the Learning and Skill Council face a major challenge. If Kent Thames-side is to succeed in its experimental educational efforts and develop a distinct educational profile (putting learning "at the heart of the community", in the terms of the Association's Learning Charter), much more is needed than a partnership between public authorities and large private businesses. Learning cannot take place only as a top-down, planned effort. To fund targeted courses, adjust the supply of knowledge to demand and ensure a high degree of participation in educational efforts by both managers and individual learners requires the dedication of many small entrepreneurs, as well as the labour force. In other words, the Kent Thames-side partnerships need to be supplemented by social capital amongst managers as well as civic social capital.

Social capital

The Kent Thames-side regeneration project hinges on externalities. Individual investments and projects may only yield a profit if there is synergy with other projects. To create economic growth, co-ordination of construction, public R&D, industry services and education is essential. Co-ordination is also needed to ensure that growth has positive, long-term effects on the local economy as a whole. If the investments spur growth, significant efforts are needed to make the poorest areas – and the poorest people (the long-term unemployed) – benefit by participating in education and training activities. Social infrastructure – cheap housing (even if land prices go up), libraries, hospitals (one is currently under construction in Darenth Park), cultural activities – is important, but unless the general skill level is raised and the present Kent Thames-side population has better job opportunities, there is likely to be further exclusion.

The Kent Thames-side Association and its partnerships of local agents are a good example of co-ordination. The United Kingdom has a policy of promoting public outsourcing and public-private partnerships, but the Kent Thames-side partnerships and the amount of funds raised clearly surpass

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other UK regeneration projects. Justifiably, Kent Thames-side is showcased as an impressive example of the power of co-ordinating public and private stakeholders, and it is viewed by many as a signpost for a new role for regional and local policy making.

The partnerships' achievements are considerable, with large job creation effects and significant symbolic value. Large-scale developers, business people and local policy makers come together to take advantage of Kent Thames-side's strategic possibilities. There are joint expectations of high payoff, and payoff structures can be formalised in agreements and contracts. The partnerships mark a fresh start in local policy making and private investment.

The question remains, however, as to how the co-ordination achieved in top-level partnerships can be translated into civic social capital and social capital of local managers, which is needed to achieve social inclusion, upskilling, attraction of more knowledge-intensive firms and endogenous industrial change. Kent Thames-side has a high level of civic networking in the form of local volunteering for social work. However, when it comes to traded networking, or civic participation in political work or educational organisations, the level is low. Participation in elections in Kent Thames-side is similar to the national average (as evidenced by data up to 1997), but there is low public involvement in political work and little feedback from individuals to local authorities. This poses a problem for Kent Thames-side's ambition to be a regeneration project for and with the local population.

Traded networking is also modest among local managers, as there is little co-operation with external partners, for example, for innovation purposes. The low level of SME involvement in on-the-job training programmes is also a problem. These are signs in part of a lack of confidence in the future on the part of managers. It may be that the grand expectations nurtured by the Kent Thames-side Association and partners do not inspire confidence in small-time entrepreneurs, hence their reluctance to invest in the Kent Thames-side regeneration project. SMEs express significant uncertainty about the goals and outcomes of the ongoing investment scheme and the industrial restructuring of Kent Thames-side.

The labour situation may be the single largest problem for Kent Thames-side, as the lack of civic social capital leads to a lack of involvement in education and training activities. Currently, adult workers show little flexibility in their job orientation. The unemployed tend to seek jobs in traditional fields instead of accepting retraining for new tasks or new industries. There is also generally little willingness among adults to re-enter education, for example, to obtain a university degree. Some become parents very young, and in 1999 in Wilmington East and Swanscombe, 10 per cent and 8 per cent of girls aged 16 and 17, respectively, were married. The Kent average is less than 1 per cent. In addition, many of the ethnic minorities in Kent Thames-side are poorly integrated, further worsening participation in education.

A lack of confidence in the future, low participation and absence of both traded and untraded networking are due in great part to social attitudes which developed during the industrial past and the economic downturn. Few workers or managers in Kent Thames-side possess any feeling for the new project. Many still view their locality as industrial, relying on traditions, skills, and attitudes drawn from traditional manufacturing, such as the cement industry. Knowledge-intensive activities, higher skills (and, indeed, retraining) and higher-quality housing and public services are still seen as alien. With the economic decline of Kent Thames-side and the local experience of bankruptcies, job loss, unemployment and poverty, to its "low-quality" culture has been added a "crisis" culture, with local people seeing the area as a post-industrial, crisis-ridden land, "London's back door". Such attitudes have engendered the present lack of a career culture, the low participation in adult education by the workforce, the low investment rate and the low level of networking among managers.

As mentioned earlier, there are currently no local policy programmes aiming at raising social capital and networking amongst managers. Concerning civic social capital, the partners in the Kent Thames-side Association seek to invest in this asset, through a range of community projects. Funds are, however, limited, and most projects are very small-scale. However, the issue of introducing a local sense of quality has high priority. The houses, retail centres, business parks, and public services currently being created are deliberately of high quality. Building a local sense of quality and more confidence in the future is complemented by the wish to establish a Kent Thames-side identity. Explicitly addressing the identity issue, the architecture of Bluewater aimed, at great expense, at expressing the

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local "ethos" in order to nurture an emerging local culture. In its campaigns, Locate in Kent seeks to market a local identity. But, as the chief executive puts it, it is expensive and very difficult to create an image of a dynamic Kent Thames-side "region", if the only perception of the area's common history is that of post-industrial crisis.

Summary

Compared to the other four case studies, Kent Thames-side is a particularly recent venture, not yet a region but a somewhat economically backward area under regeneration since the 1980s. Today, Kent Thames-side makes a strong case for the importance of political action and large-scale projects in setting change in motion and for that of public-private partnerships in raising the necessary capital. History will show whether Kent Thames-side can also infuse a local identity into a heterogeneous area comprising towns and communities with little common history and create – almost from scratch – a region of abundant individual and organisational learning. At any rate, the success of the Kent Thames-side experiment depends on significant co-ordination at every level of the emerging local economy and continuous and strong political attention to issues of education and training, social inclusion and participation and social capital.

NOTES

1. It is the second most visited entertainment park in France after Euro Disney, where the investments have been 25 billions FF.
2. Detailed figures for Vienne itself are not available. However, they are unlikely to deviate significantly from the regional picture.
3. Unfortunately, analysis of organisational learning is restricted by the fact that data on the patent rate of Øresund is not available.
4. However an improvement relative to 1980, when Kent's GDP/capita was only 87 per cent of the national average.
5. Even so, Kent Thames-side's deprivation level does not render it amongst the 50 most deprived English districts receiving largest national funds to combat social exclusion.

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Appendix 5.1

CASE STUDIES : METHODOLOGICAL ISSUES

Case studies

The five case studies rest upon an analysis of a wide variety of data. The empirical sources for the work are: OECD data from TDS and Eurostat databases; presentations and discussions at the five high-level seminars held in Jena (25-26 June 1998, "Economic and Cultural Transition towards a learning city: the case of Jena, Germany"), Vienne (19-20 October 1998, "The Learning Region and Information and Communication Technology – the Case of the Vienne Region, France"), Øresund (17-18 June 1999, "The Learning Region and Sustainable Development – the Case of the Øresund Region", Denmark/Sweden), Andalucía (30 September-1 October 1999, "The Impact of Cultural Capital and Learning on Social and Economic Development"), and Kent-Thames-side (17-18 April 2000, "The Power of Partnerships: When Learning and Regeneration together create Sustainable Development"); and in-depth accounts of the regions provided by a range of expert observers and regional authorities. These accounts were structured around a number of themes. These included: the trajectory of economic development; changes in economic structure and firm-level innovation; the development of regional policies; the degree of "path-dependence"; the development of education and training systems; firm-level and public R&D and industry services; and the role of cultural and social capital for their development. The written sources include: Christmann (1999); della Chiesa (1998); Fauser (1999); Forrester, Roberts and Watson (2000); Irmen (1999); Maskell and Tornquist (1999); Roman *et al.* (1999); Rohlinger (1999); Schuchardt (1999); Spath (1999); Machnik (1999); Rohlinger (1999); Schmidt (1999); Treptow (1999); Wohlgemuth (1999). In addition, statistical data were provided for each case (see "Statistical profiles of the case studies" in the annex at the end of the book).

Methodological issues

Even if qualitative empirical work offers better possibilities of accounting for processes and establishing causal connections, working with case studies at such an aggregated level (regions) implies greater problems of interpretation (an hence validity) than when conducting case studies at the agent or organisation level. Further, our conclusions about causal connections are, of course, based upon interpretations of the available material (which, in many cases, consists of the interpretations made by the regional experts). Taking a very strict methodological stance, one may argue that conclusions about causal connections based on second or third hand data cannot be valid. However, the analytical work has been carried out in close co-operation with the regional experts, who have been given the opportunity to comment on the conclusions. Thus, the highest possible degree of validity of the work is aimed at.

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Chapter 6

EMPIRICAL CONCLUSIONS: TOWARDS THE "LEARNING REGION"

Conclusions on the methodology

A major accomplishment of the present empirical work is that it explores new territory. It does this in the sense that until now, few attempts have been made to test theoretical claims about the importance of learning for economic performance and the alleged importance of the regional level for learning processes. The correlation analysis of all EU regions addresses the general question of the importance of learning and aims at a general answer.

This study breaks new ground in exploring regional-level links between learning and economic success…

The work is also exploratory in the sense that we lack methods for understanding the social dynamics of learning and its regional development and for addressing the question of how policy can help to promote learning. The evidence from the correlation analysis covers a large population, but necessarily gives us little knowledge about learning processes and how they relate to regional organisations and institutions and thus provides insufficient grounds for suggesting policies. The evidence of the five case studies, on the other hand, is qualitative and cannot be said to be representative in a conventional sense. However, interpretation of the case-study evidence gives insights into how learning processes function and thus suggests how to explain the EU correlation results. The case studies are also a rich source of inspiration and of heuristic guidelines for policy development.

… combining quantitative and qualitative methods in ways which, though exploratory, start yielding useful insights…

In terms of conclusions about learning processes in regional systems, the method of combining a correlation analysis of all EU regions with a qualitative investigation into five cases is thus highly fruitful. The conclusions drawn from the empirical findings are presented below.

… and leading to the following empirical findings.

Conclusions on Question A: To what extent can it be demonstrated that learning influences economic performance?

The general answer to Question A is that it clearly does. Both the EU regional correlations and the case studies show that individual and organisational learning are important for regional economic performance. However, the conclusions contain some surprising findings pertaining to the role of university training and "high-tech" industries. Individual and organisational learning will be discussed in turn.

Learning does influence performance, but universities' influence is not quite as expected.

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Individual learning

Regions with better-educated individuals have stronger economies; high completion of secondary education makes more difference than high university graduation…

The correlation analysis and the case studies focus on education as an indicator of individual learning, but the analysis neglects individual learning that takes place outside the education system (for example, in firms or via untraded networks). Nevertheless, there is *quite strong evidence for the importance of individual learning for economic performance*. The analysis shows a positive correlation between secondary and tertiary educational attainment and economic performance as measured by GDP per capita in EU regions (primary-level education alone is negatively correlated with performance, indicating that it is insufficient for firms). At EU regional level, the correlation is significantly stronger for secondary education than for tertiary education, an indication that university training makes a relatively modest contribution to economic performance.

… because secondary education is most directly relevant to firms, and because they draw from a national rather than regional pool of university-educated labour…

This must be interpreted as a sign that upper educational levels are important to economic performance, but that secondary education is the most relevant to firms. At national level, however, tertiary levels are sometimes most important, owing to national differences within the EU in terms of education policies and economic activities. For the regions, the positive economic results of university training do not always affect the region in which the relevant skills are registered. This is because universities are usually well connected outside the region in which they are located. This may have positive effects in terms of linkages to knowledge sources beyond the region. The fact that students and labour are mobile – universities receive students from outside the region and university graduates find jobs outside the region – blurs the correlation between university training and regional economic development.

… but this varies with local industrial and educational conditions, with less-educated workers able to make stronger contributions in some circumstances…

The case studies demonstrate that the extent to which tertiary education matters for a region's economic performance depends on the industry structure, the curriculum of its universities and the degree of co-ordination between education and industry. First, some regional economies may be less based on formal skills. For Andalucía, whose industrial structure is dominated by tourism services and agricultural production, secondary and tertiary education is less relevant because the region currently functions at a relatively low skill base. Its GDP per capita, while relatively low, is higher than would be predicted from its relatively low educational attainment, because it profits above the average from workers with only primary educational attainment.

… and higher-educated workers being relatively unproductive in others. This can be influenced by industrial organisation, educational content and the strength of education-industry co-ordination.

Second, regions with a high level of educational attainment differ in their ability to profit from individual learning. Jena has the highest level of secondary and tertiary education, but very low GDP per capita (the GDP per capita of Andalucía, which has the lowest level of secondary education and the second lowest tertiary education, is not lower than Jena's to a comparable extent). The poor profitability and market position of Jena's firms can, of course, be explained by the poor organisation and market orientation carried over from the policies and regulations of the former DDR. However, local educational content also plays a part. In particular, little emphasis is placed on providing local firms with managerial or marketing competences. Vienne has an average level of education, ensured to some extent by the French national curriculum, but it has itself made huge investments in the local university and in ICT skills; however, it still has below-average GDP per capita. On the other hand, the Øresund region profits from its high educational level and seems to create useful resources for industry through individual learning. Its secondary

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and tertiary levels of educational attainment are slightly lower than Jena's, but it has the highest GDP per capita. The region has some knowledge-intensive business services and some "high-tech" and biochemical industries, which are able to turn individual learning in universities into profits. Similarly, universities there, more than in Jena, have orientated research and education towards industry. In sum, this is a case of *good co-ordination* between local industry and individual learning.

Organisational learning

To make a difference, individual skills must be harnessed in firms, to create organisational learning…

The positive influence of individual learning on GDP per capita is an indication that skilled and highly skilled labour contribute to the performance and growth of firms in terms of turnover and employment, and hence to economic regional growth. I*t is not individual learning* per se *that matters for regional performance; the use made of individual skills in firms through organisational learning creates growth.*

… of which patent applications and R&D *spending are indicators – however imperfect – which appear to show that innovation by firms is the cornerstone of regional growth…*

The correlation analysis concentrates on patents and R&D expenditure as measures of organisational learning and thus neglects important elements of unpatented firm-level processes and product innovations. However, the evidence of measures of patent applications and R&D expenditure clearly indicates that *firm-level organisational learning is important for economic performance*. The analysis shows, for instance, a significant correlation between the number of patent applications per million inhabitants and GDP per capita. This would indicate that firm-level innovations – as measured by patents – are the foundation of firm growth and regional economic prosperity. However, it may also be argued that well-off regions invest more in R&D and that firms located in them therefore file on average more applications for patents (the analysis of R&D expenditure and patent numbers shows an even stronger correlation). It seems reasonable to conclude that there is, in fact, a correlation at regional level between R&D, patents, economic growth and increased investment in R&D.

… but new knowledge is not just created in high-tech industries or through patented inventions…

The case studies also suggest that *wealth may be created in many ways, "high-tech" industry being only one of them*. First, formal R&D resulting in patented firm-level innovations is only one possibility, and it does not always create economic growth. Vienne, for example, has medium-high GDP per capita compared with the other regions studied and, despite recent growth in the number of its patent applications, the number is still fairly low. Relative to the EU average, it seems to profit more from its few patents than other regions or to profit from non-patented knowledge. Even if the region has relatively high investment in R&D compared with the other regions, its wealth-creating industrial activities – even if they are learning activities – take place outside R&D departments and are based on non-university skills.

… while high-tech innovation does not always create high regional growth due to its vulnerability to competition from elsewhere.

Second, firms within a region may apply for many patents and still not be much better off than firms in regions with less patenting. This is the case of the Øresund region, which has some "high-tech" firms, the type of industrial activity that at world scale creates the most growth. However, certain "high-tech" activities may become extremely vulnerable to world market developments, and many firms' profits are low owing to high R&D costs (unfortunately, data on R&D expenditure in the region are not available). "High-tech" growth is often concentrated in a few firms, and in many EU regions, including Øresund, "low-tech" industries contribute more to growth.

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Conclusions on Question B: What is the importance of individual learning for organisational learning?

High individual qualifications are associated with high firm-level innovation; oddly, this association is stronger for secondary than for tertiary qualifications.

The correlation analysis casts some light on the importance of education for the number of patent applications per million inhabitants. Positive correlations suggest that *both secondary and tertiary level education positively influences the number of patent applications*. The positive correlations are stronger for secondary education than for tertiary (however, there are fewer deviations for tertiary education), which seems to imply that *university skills matter less for the creation of formalised knowledge in firms*. This is a somewhat counter-intuitive finding, as university-trained personnel are usually in the majority in R&D departments. These conclusions on tertiary and secondary education are discussed below.

Tertiary education attainment

Even without inter-regional "brain drains", high university graduation rates are linked less strongly than expected with regional prosperity, probably because much university knowledge is not commercially applicable…

The correlation between tertiary education and economic performance is slightly higher at national than at regional level. The effect of tertiary education may not be reflected in regional economic performance, because highly skilled workers are relatively mobile and may work outside the region. However, an explanation is still needed of the relatively low importance of tertiary education for the type of organisational learning measured by the number of patents in regions without significant labour inflows and outflows. A reasonable interpretation would be that not all university education is relevant for organisational learning in firms. Many graduates go into administration and services, or, if employed in industry, are involved in administrative rather than learning activities. Jena, with its huge pool of university-trained workers who do not contribute to organisational learning or regional economic growth, is an example. Andalucía, with a higher level of tertiary education than Vienne, but with significantly fewer patent applications per million inhabitants, is another.

… while the Øresund experience indicates that the marginal utility of extra graduates eventually drops.

Øresund has a high number of patent applications owing to its "high-tech" firms. Learning in these firms benefits from the high quality of local universities and a degree of co-operation with universities in the areas of applied research and demand for training programmes. However, Øresund's high proportion of people with tertiary education contributes less than the EU average to this high level of patenting. This can be seen partly as a sign that a regional innovation system exists where secondary level education matters for firm-level innovation (see below), and partly as an indication that, even for "high-tech" firms, when the number of university-trained employees reaches a certain level, the marginal utility of hiring another drops. Internal R&D investments – and access to international research networks – are then likely to be more important for innovation.

Secondary education attainment

Some firms need workers with intermediate skills, but competitiveness is affected by the cost of hiring them…

In connection with Question A, it was concluded that secondary education is strongly correlated with GDP per capita. Obviously, some firms that create economic prosperity thrive on intermediate rather than high-level skills. The performance of firms – their export competitiveness and growth – may depend on low-skilled labour which allows them to produce cheaply relative to competitors. This depends in turn on the cost of labour with secondary education, which again depends on regional labour markets. Further, the positive correlation of secondary education with GDP per capita

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means – assuming that the rise in GDP is in part distributed to workers – that using workers with secondary education would not necessarily be a cost advantage for firms.

… and while secondary education seems to be more closely correlated with patents and R&D *than has been thought, the link must be qualified…*

Another explanation of the positive influence of secondary education on economic performance may simply be that secondary education matters more for organisational learning than has been recognised in the literature and in policy making. As mentioned, there is a positive correlation between this level of education and the number of patent applications. Firms may prosper owing to patented products, and many patents may come about through "learning-by-doing" rather than R&D. In less formal learning, skilled workers experiment and invent new products and processes. However, secondary education may matter less for patents than the analysis first suggests, because the correlation weakens if regions with virtually no patent applications and low levels of secondary education are excluded. Andalucía may provide some insight here. The view that its low level of patent applications is due to its low level of secondary educational attainment seems unreasonable, because very few firms in the region undertake R&D. The industry structure is dominated by agriculture and tourism, and most of its few "high-tech" firms are branches of multinationals with little local R&D. The number of patents would be low, whatever the level of secondary education.

… but the correlation is stronger with GDP *per capita, suggesting that these skills contribute to non-patented knowledge.*

Here, it should be added that secondary education is more strongly correlated with GDP per capita than with number of patents. Thus, secondary education is likely also to contribute to another type of organisational learning, *non-patented* knowledge. If such knowledge is to constitute a competitive advantage, it needs to be added to and developed constantly. "Learning-by-doing", with the participation of workers with secondary education, can add incrementally to the firm's unpatented knowledge base.

Conclusions on Question C: What is the relationship between learning and social inclusion and exclusion?

It is hard to measure social exclusion, but unemployment is a useful proxy.

It is difficult to draw rigorous conclusions about the relationship between social inclusion or exclusion and learning, partly because it is difficult to measure social inclusion, and partly because empirical findings on its relation to learning are ambiguous. GDP figures are of limited use, because they say little about the degree and nature of social inclusion and exclusion. The unemployment rate, on the other hand, may be a proxy for social exclusion. The correlation between unemployment and organisational learning (as measured by the patent rate) is discussed below. In addition, the case studies provide examples of the effect of social exclusion on individual learning and of the role of organisational learning for social inclusion and exclusion.

Individual learning

Lower educational levels are (weakly) associated with unemployment; they tend to reinforce each other.

There is a weak positive correlation between unemployment and individual learning at the primary education level, a weak negative correlation with secondary education and a very weak negative correlation with tertiary education. The first correlation can be taken to indicate that regions in which the population has low skill levels are not competitive, have low growth rates and may suffer from social exclusion in terms of high unemployment. The fact that regions with low levels of secondary and tertiary education suffer to a degree from higher unemployment may be interpreted in the same way. However, the case studies add some perspective. Kent Thames-side suggests

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that the link between unemployment and individual learning may also work the other way. In its deprived areas, the long-term unemployed simply do not believe in the payoff of educational efforts and adult education and training are consequently very low. Thus, it may be suggested that *social exclusion – in the form of unemployment – constitutes a barrier to individual learning*.

Organisational learning

Thriving, innovative regional economies do not automatically abolish unemployment or exclusion…

The conclusion to Question B was that organisational learning positively influences economic performance. However, the correlation analysis demonstrates that there is only a weak negative correlation between GDP per capita and the unemployment rate, suggesting that even if organisational learning may improve a region's economic performance, it does not necessarily involve – or ultimately benefit – all participants in the regional economy. Indeed, some innovative regions show relatively good performance with relatively high unemployment. This suggests that *there is not a simple and positive link between organisational learning and social inclusion*. This suggestion is supported by the correlation analysis of the number of patent applications and the unemployment rate, with a weak negative correlation.

… and measures to improve productivity can cause job losses…

For some people, organisational learning may cause social exclusion rather than relieve it through growth and job creation. In addition, even if organisational learning creates job possibilities, all of the region's citizens may not benefit. In Jena, growth has been the result of many process innovations, but the huge productivity increase of Zeiss (Jenoptik) has been a major cause. A necessary component of the productivity increase has been the lay-off of 16 000 local workers. Some 5 700 new jobs have since been created in Jena, but for people with significantly different skills. In Kent Thames-side, the regeneration project introduces new opportunities for economic activity in the region, but has not yet raised the general skill level significantly and consequently provided better job opportunities for local labour on a large scale. As a result, much of the present Kent Thames-side population is threatened by further exclusion.

… while both individuals and organisations can be locked in a vicious circle if necessary skills are absent.

Unfortunately, the ability to participate in organisational learning – for workers and for firms – depends on their skill and competency levels, *that is*, on their economic and social inclusion. Thus, just as some workers may find themselves in a vicious circle of low skills and inferior employment, some firms may find themselves in a self-reinforcing relationship of low competences and a low level of organisational learning. Such "path-dependency" will be discussed in greater detail in connection with the conclusions on Question E.

Conclusions on Question D: What is the importance of social capital in determining the processes of learning?

A lack of social capital impedes learning and economic success.

Despite the lack of statistical data on social capital in the present work, the case studies offer some unambiguous conclusions. *Social capital – in terms of social networks and social conventions and norms – affects both individual and organisational learning*. In particular, there are many examples of how a low stock of social capital can impede learning. In several cases, a lack of untraded networks and traditions of knowledge-sharing significantly reduces the scope for traded networks and interactive organisational learning. The conclusions on the importance of social capital on individual and organisational learning are given below.

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Individual learning

There is no available data on the importance of untraded civic networks for individual learning. When it comes to civic norms and conventions, however, it is obvious from observations on individual learning and social exclusion that some norms may impede educational attainment. This is exemplified in the lack of a tradition of adult education in deprived areas of Kent Thames-side, as in instances where unemployed or otherwise socially excluded parents do not help their children to obtain post-compulsory education. Tertiary education, in particular, may suffer. Thus, *a low stock of civic social capital may lower individual learning*.

Individuals' engagement in learning is influenced by civic and family norms…

There is also some data suggesting that *a low stock of social capital among managers may have a negative impact upon individual learning*. First, if there are few traded networks between firms and local universities (for example, for R&D), there may be a problem of exchanging information. For example, SMEs in Kent Thames-side or Andalucía generally have little interaction with other bodies, including low participation in designing local vocational training programmes. Second, Kent Thames-side, but also Jena and Andalucía, show that managers with traditional management styles and high emphasis on economic risk may be reluctant to invest in on-the-job training.

… while at work, their opportunities are influenced by the social capital of managers.

Organisational learning

Social capital can help create valuable regional knowledge other than by supporting individual learning. Øresund is a special case, where the growing environmental technology sector is aided by the environmental awareness promoted in civic networks, which spurs both individual and organisational learning about environmental technology and waste management skills and competences and inspires regulations which encourage green innovations by firms.

More broadly, regional networks can improve competence e.g. in adopting green technology…

On the other hand, *a lack of social capital may impede interactive organisational learning and the spread of knowledge*. First, in terms of the transfer of knowledge between firms and universities (or other regional research organisations), a lack of networks may lower organisational learning, and their absence may be related to managers' norms. In Kent Thames-side, managers do not have a tradition of using external research facilities, even where there is a scope for it. Andalucía shows how norms may impede traded networks, as the lack of networks between firms and universities is due not only to sectoral structure (low relevance of university research) and predominantly traditional management, it is also caused by firm managers' widespread distrust of universities. University-industry interaction may also be impeded by a lack of social capital among university researchers. Until recently, Jena's researchers not only continued research topics held over from the communist era, but also lacked a tradition of free interaction with stakeholders in local industry. So strong was this tradition within the university that a major lay-off of research personnel was carried out to remedy it. In Vienne, firms interact little with universities, because the latter are controlled at national level and only address local issues to a limited extent.

… while the absence of strong traditions and networks, for example linking industry with universities, may impede development…

Second, with respect to interactive organisational learning between firms, case studies as different as Andalucía, Jena, Kent Thames-side and Vienne clearly show that a lack of traded networks lowers the scope for interactive learning. Further, the lack may be partly caused by a lack of untraded civic networks and networks of managers in combination with defensive

… and similarly in inter-firm linkages, different traditions in each region make a big difference…

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management practices. The case of Øresund is instructive in another sense. In both the Danish and Swedish areas of this prosperous region, there are long-standing traditions of untraded networking, and the many traded networks between firms are partly based on trust built in both civic untraded networks and untraded networks among managers. However, such networks are still few in number across the Øresund strait, so that cross-border traded firm networks are therefore also few. There is also evidence that social norms may play a large role in impeding both untraded and traded networking across the strait.

… as do the traditions of civic participation to the success of policy initiatives.

A last empirical conclusion is that *civic social capital also matters for efficient policy making*, because the latter necessitates feedback not only from local industry but also from civic society. If there are few untraded civic networks and hence little bottom-up participation in political planning processes, political learning and unlearning is difficult. In Øresund, there is a long tradition of bottom-up participation, with good results for political learning. At the other extreme, low civic participation in local policy in Kent Thames-side is accused of posing a problem for the regeneration project.

Conclusions on Question E: To how large an extent does "path-dependency" impede learning?

The regions in the study cannot hope to become world leaders in technological change, but political intervention can help put them on a path to become successful adapters of innovation…

The economic fortunes of regions change. Whereas economic decline often happens organically and sometimes rapidly, owing to external markets or political change (as illustrated by the decline of Andalucía and Jena), regaining economic growth through internal regional change can require much political intervention. Some of the regions studied have experienced economic decline, others have not, but all are in need of political intervention. None has an abundance of "first-mover" firms in their respective industries (Novo Nordisk in Øresund, Glaxo Wellcome in Kent Thames-side and Jenoptik in Jena are among the few). Irrespective of the changes in these regions, none – neither those whose innovation rate and productivity are improving, nor the Øresund region, where innovation and productivity has been relatively high for a long period – outperform other regional systems on world markets. The industries in the regions studied are not specialised, interconnected or co-ordinated like the industrial districts of northern Italy or south-west Germany, nor do their organisations, networks and institutions constitute innovative milieux like those of Silicon Valley or Route 128. Political intervention in these regions should therefore be concerned with learning *as adaptation* to the "first-mover" learning regions of the world economy. Even if it is not realistic for them to hope to become leading regions, regional learning as adaptation to the knowledge-based economy is necessary for them, as for any region, to maintain economy prosperity.

… but regions lack control of some elements, such as transport links, that influence their destiny…

However, changing a region's path may be difficult. Certain *physical infrastructures* may affect a region's economic performance and be difficult for regional agents to address. For example, transport links may favour economic activity (for example, Vienne's proximity and TGV connection to Paris; Kent Thames-side's location at the Thames Gateway close to London) or they may not (Andalucía; Jena). Only rarely can local policy makers affect transport infrastructure (paradoxically, the major policy agents in the construction of the Øresund bridge are national).

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When it comes to a region's *industry structure*, on the other hand, we would expect a larger scope for change. Jena shows that investment in change can pay off through increased economic performance. Over a ten-year period, a changing industry structure, new firms and new co-operative efforts between firms and universities have led to a doubling of productivity, to the highest patent rate in the new German Länder and to high GDP and employment growth. However, regions' industry structures are generally path-dependent and difficult to change. Such path-dependent industry structures may impede the improvement of regional economic performance, as when a region continues to be dominated by firms in industries that are declining internationally. More broadly, they may inhibit a general shift towards a more "learning region", particularly when combined with particular "path-dependent" institutional structures that create barriers for individual and organisational learning.

… and industrial structure, while changeable in some situations, can also be intractable…

Empirical conclusions on what may cause "path-dependency" and the ways in which it can impede learning, as regards regional industrial and institutional structures, respectively, are presented below.

… as discussed below.

The "path-dependency" of industry structures

Industry structures – economic sectors and organisational features such as firm size – are major sources of regional "path-dependency". This affects the potential for learning. In Andalucía, the dominance of traditional industries with low knowledge content and no tradition of specialisation and co-operation makes interactive organisational learning between firms difficult. In Kent Thames-side, large local construction and transport industries mean that there is little local demand for research in co-operation with universities.

The structure of industry influences regional development greatly…

The case studies indicate that *at regional level, it is sometimes beneficial to move away from existing sectoral knowledge bases*. In Kent Thames-side, the export potential of the cement and paper industries is gone. Consequently, policy makers are seeking to attract and create new firms in new industries. This necessitates the retraining of workers. The case studies show that industry structures can be changed and that it is particularly feasible to influence the service sector. This has been done to a particularly high degree in Kent Thames-side and Vienne, where more service jobs have been created than would be expected, given the general shift within most regional economies. The case studies also indicate that the manufacturing sector is much more path-dependent than the service sector. Creating manufacturing jobs – particularly knowledge-intensive ones – is more difficult than creating jobs in tourism or retailing. However, the splitting up of dominant firms and the inflow of new firms to Jena demonstrates that it is possible to change the sectoral structure. Concerning sectoral change, many regional policy makers focus on "high-tech" industries, and some –Andalucía, Jena, Vienne – try to use technological parks to stimulate the emergence of new sectors. However, in these three cases, the new "high-tech" firms have been SMEs with small local effect in terms of employment or systemic traded networking. In the case of Vienne, the Futuroscope has so far added more to tourism development than to local "high-tech" industry.

… but where old industries have declined, new roles can be developed; tourism and services, not necessarily high-tech industries, have been a source of growth…

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… however, in most cases regions do best to build on existing strengths, and to be cautious about high-tech strategies where a critical mass cannot be achieved…

However, *in most regions, individual and organisational learning need not be aimed at moving away from a sector, but at upgrading it.* There is huge export and growth potential in many sectors, including traditional and "low-tech" sectors, if firms' competences and production technologies are brought up to date. This is what is being attempted in Jena, where existing sectors are being reorganised and its knowledge base retained and upgraded. The fact that the region is small and very specialised in terms of its sectoral structure has facilitated very targeted policies. Andalucía, on the other hand, applies a general strategy of introducing new knowledge into the region by attracting new firms and investing in technology parks and technology transfer programmes. The strategy has so far failed, because there is too little interaction between the enclaves of new knowledge and the rest of this huge region. This has also partly to do with the fact that it is mainly branch plants of multinationals and knowledge which is relevant to "high-tech" firms, of which Andalucía possesses few, that have been introduced. In fact, the cases may suggest that it is a questionable political strategy to seek to introduce knowledge or promote sectors that are politically more conspicuous (for example, "high-tech" knowledge and sectors) but which contribute to regional growth only marginally or at the expense of existing industries with growth potential. The Øresund region, for example, is often marketed as "Medicon Valley", although most of its wealth is created by R&D-extensive firms. Andalucía's ambition to promote electronics and environmental technology industries is not supported by its industry structure and university research, and in fact diverts attention from the growth of exports and turnover of existing industries.

… but in building on strengths, regions can afford to specialise in inverse proportion to their size. Even in larger regions, though, there is a synergy between sectors.

The case studies offer a regional analogy to a notion that is increasingly accepted in the economic theory of the firm, that *it may be advantageous to focus on core competences.* Of course, a large region cannot specialise to the same extent as a small one. The degree to which a particular sector can come to dominate a regional economy (in terms of exports and employment) depends on a combination of the regional economy's size and the growth potential and investment demands of different sectors. For example, a relatively large region such as Øresund, even with a higher endowment of public research and education, cannot make pharmaceuticals the region's dominant sector. Large regions may, however, realise economies of scope with a diversified industry structure and (sometimes unexpected) synergy between sectors. To this end, co-ordination and interaction between sectors and firms is necessary. Andalucía is dominated by agriculture and traditional industries, and even if it was sufficiently prosperous to undertake large-scale public R&D, it would still have a range of very different activities. Its diversity constitutes a problem because the various sectors are little related and the low level of firm specialisation is part of the reason for the region's low general productivity. A smaller region, on the other hand, may specialise in a few related sectors, and thus – if there are market opportunities – achieve considerable economies of scale. Jena's regional focus on electro-optical products and firm-level specialisation and outsourcing demonstrates how huge productivity gains can be achieved. Public resources, such as education and public R&D, create high value for specialised regional economies, because many regional firms have similar resource demands. Of course, such regional specialisation can represent a danger, if world markets for particular industry sectors change.

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With regard to firm size, the presence of many SMEs can be an obstacle to co-ordinated change. The dominance of SMEs with limited R&D budgets maintains Øresund's overall R&D investments at a low level. This hinders it from becoming a "high-tech" region. In Kent Thames-side, the abundance of SMEs lowers firms' rate of investment in training and makes it difficult for policy makers to build partnerships with other than the few largest firms. On the other hand, the dominance of large firms can also create "path-dependency". For example, raising the level of organisational learning in Jena required supplementing the very large local firms with flexible SMEs.

Large firms play an important role in change, especially in training and R&D, while smaller ones contribute flexibility and dynamism…

A final remark concerns the internal level of firms. If new work practices are introduced, they may have a basis in factors that are external to the firm and need to be addressed not only by managers, but also by unions and policy makers. For example, the introduction of western or Japanese work practices in some Jena firms may not raise productivity as much as expected, because their success hinges on high levels of labour participation and opennes to experimentation, characteristics still relatively lacking in Jena.

… and new, alien work cultures can fail to take hold if they do not engage all actors.

The "path-dependency" of institutions

In prosperous regions, institutions support economic performance and learning. Here, however, conclusions will be drawn from the cases where institutions constitute a barrier to learning. Conclusions first drawn from Question D, but worth repeating in this respect, are that *a regional low-skill, low-growth path may be created by norms institutionalised within the labour force that work against education*, and that *attitudes of managers may impede traded networking, thus lowering the scope for organisational learning*.

Institutionalised norms can work against learning in some regions…

Some norms are thus antagonistic to traded networking. This observation, in combination with findings from Andalucía and Øresund, leads to another conclusion: *cultural homogeneity (or at least common history) is not in itself an advantage as far as learning is concerned*. A culture's artefacts, for example its art and architecture, may be an economic good, but the myths, religions and conventions that are also part of a culture do not necessarily create a large stock of social capital that can be used by business. In other words, a society's social capital does not always promote among managers the social capital required for business. Andalucía's rich cultural history inhibits rather than promotes inter-firm specialisation and co-operation, and the common history of the East Zealand and Scania areas of the Øresund region may provide policy makers with a sense of a common mission, but has not led to much traded networking between managers.

… while a strongly shared common culture may weaken the scope for collaborative networks…

Thus, *even when social capital exists, it may not be invested in all economic purposes*. First, this is because social capital is network-specific. The large stocks of social capital on the Danish and Swedish sides of the Øresund region may prove a barrier to creating a joint stock of social capital. Civic and managerial networks are kept within national borders and are so tightly knit on each side that they remain relatively closed to new entrants. Second, the complex norms and conventions of social capital may support economic rationality, but may in some cases work against it. For example, even if there are Danish and Swedish conventions according to which traded networking pays, other conventions indicating that networking across the Øresund strait does not – whether this is true or not – presently override them.

… since social capital can divide rather than unite a region, where there is rivalry instead of co-operation between different networks.

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Conclusions on Question F: What is the importance of regional policy making for addressing "path-dependency" and initiating processes of learning and institutional change?

Policy at regional level can address the collective need to learn to do things differently…

The overall conclusion on Question F is that *regional policies are indeed crucial for stimulating individual and organisational learning*, because policy makers can address issues of "path-dependency" that are beyond the attention, economic interest or ability of single agents and firms. Both changing the industrial structure and institutional "unlearning" (changing the practices and knowledge bases of individuals and organisations in the region) are issues that can fruitfully be addressed by efforts at a relatively high and strategic level.

… but development of such policy will be influenced by how the "region" is constructed/defined…

Before discussing what regional policies can offer, it may be worth noting that the case studies remind us that regions are themselves constructs. Regional administrative areas are defined and regional authorities are created through the decentralisation of political power from the national level, owing to a combination of political pressure from the top and support from the bottom. The latter may take different forms. Vienne is an old region that struggles with the central government to obtain more autonomy. In Jena and Andalucía, existing administrative units have only recently obtained political autonomy (although Jena has to co-ordinate with Thuringia), as a result of national and even international factors. In Kent Thames-side, the construction of the region combines national policies for the South-East and Thames Gateway areas and a local bottom-up process of creating a regional identity. Øresund is also a new construct, integrating – with some difficulty – two existing regions plus their hinterland into one new region. Paradoxically, while the creation of the new Øresund region ultimately must take place from the bottom up, the bridge, the major investment in the region so far, is a national top-down initiative.

… with new regions requiring a conscious effort simply to be created.

In the last two cases, building regional partnerships and investing in physical and economic structures precedes the establishment of regional authorities proper. Until such authorities are designated, the relevant sub- or supra-regional authorities are the leading policy makers. Because of the continuing lack of regional authorities for some of the regions studied and the interplay between regional and national policy makers in all cases, the conclusions on the importance of various policies do not always specify which regional policy makers designed or carried out the strategies in question. Rather, the emphasis is on their potential for learning propagation and institutional change.

Individual learning

Regional level attention to higher learning can help attract knowledge-intensive firms…

One of the conclusions to Question A was that high standards of individual learning do not automatically spill over into regional economic growth. The Kent Thames-side case points, however, to the conclusion that even in regions where university skills are of limited importance for regional organisational learning, the *signal value* of a high level of university attainment can help to attract knowledge-intensive firms to the region. The case studies also clearly show that if changes in patterns of individual learning are to take place, regional policies are necessary.

... with public support at this level an essential ingredient of strong university-industry links…

In terms of regional educational offerings, while many universities and schools are (at least partly) nationally funded, *large regional public investment may be necessary to provide education tailored to the demands of regional industry*. For example, when university education does not fit the local industry structure

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or new focus areas of industry (as in the dominance of humanities in Jena), a local policy for educational focus is needed. Vienne has had to invest much more than other French regions in education and general ICT skills (with relatively modest targeting of university education to local industry needs, however; see Questions A and B). Creating traded networks between universities to obtain economies of scale and scope may be a relatively cheap way to raise the standard of the regional educational offerings (albeit with great potential problems of co-ordination, as Øresund shows).

... and of training provision and incentives...

For on-the-job training, public authorities must often provide not only targeted courses but also significant incentives to achieve upgrading. In Jena, the public sector has had to fund training and generally upgrade public education, as firms in crisis tend to cut down on on-the-job training (and large firms with significant in-house training are disappearing as a consequence of organisational learning processes). The need for public policy in this area is also increasingly recognised in Kent Thames-side.

... which must co-ordinate learning with economic development.

To boost individual learning, policy makers not only have to provide education but also encourage people to seek it. A co-ordinated effort is needed. Kent Thames-side shows that investments in education and training in the absence of social policy are not very fruitful. With an average educational level, but below-average GDP, Vienne also shows that it is not education itself, but its co-ordination with local economic activity that matters. As mentioned, Vienne has little autonomy to tailor its educational curriculum.

Organisational learning

Public involvement is needed to pull together the strands...

A general conclusion is that policy makers are the only regional agents able to co-ordinate several policy areas and thus increase organisational learning by matching regional education and public R&D to industry, while providing supporting investment in transport and communications infrastructure, welfare and culture. In Kent Thames-side, the strong "path-dependency" of industry structure as well as social problems, education and social participation, necessitate a great deal of public involvement and co-ordination.

... large-scale initiatives can play a particular role, but are not the whole story...

In some cases, focused, top-down initiatives designed by a partnership of a few central agents have a strong potential for changing industry structure. To move towards smaller firm sizes, public intervention may play a particular role. The necessary split-up of Zeiss in Jena was politically induced and, paradoxically, a partnership between the local authorities and the management of Zeiss led to the beginning of its (or rather, Jenoptik's) lessening of dominance. Jena, like Kent Thames-side, exemplifies the fact that the attraction of inward investment is a central policy area for changing industry structure. However, Jena shows that centralised planning creates the risk of replacing one "path-dependency" with another. In Jena, competition and the scope for experimentation and organisational learning are relatively low, as policy makers prioritise particular sectors and industrial structures. Large-scale projects may lead to less change in sectors or to changes of a type other than hoped for. So far, Bluewater in Kent Thames-side and Futuroscope in Vienne have spurred retailing and tourism, rather than knowledge-intensive jobs; and the Øresund bridge may boost tourism rather than the region's economic integration. Such projects should not divert investment from other, more targeted learning projects. However, the symbolic value of such projects may be large.

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... nor should the value of technological parks be exaggerated...

Technological parks may stimulate the emergence of new "high-tech" sectors, by functioning as incubators for new firms or attracting firms from outside (Kent Thames-side, Andalucía, Jena). It is important to note that such parks are often of limited value for economic growth and exports (as demonstrated by situations as different as those of Andalucia and Øresund). To the extent that technology parks encourage interaction and innovation (for example, in some emerging sectors), some public involvement in their operation is central, as is the case for technological parks in all the regions studied. By relocating university research to Futuroscope, the Vienne authorities have been particularly proactive and have considerably raised the innovation rate of firms located there.

... particularly where they do not relate to local industry...

However, Futuroscope has had little impact on network relations between technology park firms and outside firms. All the case studies show *broad scope for policies that stimulate traded and untraded networks between firms*. Vienne suffers from France's lack of a tradition of addressing local industry through local policy and does not initiate such policies. However, it may learn from examples from the other regions, such as BioInstruments in Jena.

... but universities have a key public role, not just in research production but also in its dissemination...

Universities prove to be a crucial area for policies related to organisational learning, by virtue of their provision of public R&D rather than their educational offerings. As mentioned in connection with Question A, there is a strong positive correlation between regional R&D expenditure and organisational learning as measured by patents. Unfortunately, there are no data on the public share of R&D. Regional universities may enjoy economies of scale and scope in their research efforts if they co-operate, but such traded networks often require policy attention. In Andalucía, the huge potential benefits of co-operation between the different regional universities have not been realised through networking. In Øresund, attempts to create a joint university have run into difficulties and success now hinges on public intervention (probably at national level). More importantly, policies may be needed to encourage local universities to address the research needs of local industry. Whereas public grants are a recognised measure for stimulating basic university research, Jena demonstrates the gains from adjusting applied research to meet the needs of local firms, as, for example, in the BioRegio network. Here, information flows back and forth between firms and university, and the growing emphasis on technical topics at the university, are closely co-ordinated with public efforts to attract new firms in the areas of biotechnology and precision engineering. Øresund's Medicon Valley Academy also indicates that a policy to spread research results via industry-university linkages may be beneficial. Andalucía, on the other hand, shows how difficult it is to make university-industry linkages beneficial for both parties.

... although technology transfer can take many forms.

Policies for technology transfer other than from universities to firms, together with provision of entrepreneurial support and other industry services, also deserve a mention. Tailored regional policies, or regional versions of a national policy, may often be beneficial. For example, to be effective in Andalucía, EU technology transfer policies or Spanish R&D policies have to be implemented by local agencies.

Institutional change

Social capital is critical, but hard to manage...

The empirical work clearly supports the view that regional institutions and social capital play a central role in individual and organisational learning, but also provides examples of how regional institutions may be very "path-dependent" and how social capital is a regional asset that is difficult to manage.

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... a policy of change by bringing in new people must be reconciled with the need for a distinctive regional identity...

A first conclusion on the role of policy makers for general institutional change is that changes in norms and conventions – even in untraded networks – may be speeded up simply by *introducing new people to the system*. Jena deliberately attracts students and business managers from outside so as to introduce new conventions and practices among local managers and workers. Of course, by pursuing such a course of action, policy makers have little control over the types of conventions and networks that are introduced. More seriously, attracting new people to a region may be at odds with the political ambition to *strengthen a regional identity* that may function partly as a basis of social capital. At least for a time, a large inflow of new people tends to cause some institutional disruptions, particularly if there is no strong regional identity in place. Most regions, and indeed all the regions studied, market themselves to potential external investors with a particular regional image. However, to make the citizens subscribe to that regional identity may take decades of applied welfare policies, cultural policies and civic "information services", in particular in young or heterogeneous regions. Such policies are being implemented in the young regions of Øresund and Kent-Thames-side, but it is too early to have data on their success.

... flagship projects are useful focal points but risk distorting investment...

A second conclusion on general institutional change is that *politically provided "focal points"* may be needed to co-ordinate institutional (as well as economic) change. For example, Bluewater and Crossways in Kent Thames-side and Futuroscope in Vienne have greatly helped to co-ordinate public and private investments. These projects, like the bridge in Øresund, also function as strong symbols that change both local and external perceptions of the region and become part of a regional identity. The architecture of Bluewater was designed for that very purpose. However, these projects have also been accused of attracting too much investment and attention at the expense of projects with larger economic multiplier effects or learning externalities.

... basic education can help strengthen civic participation...

With respect to the question of civic social capital, *civic social capital can be changed, albeit in the long run*. An elementary effort is public investment in primary education. In Jena, given problems of low participation by citizens and political extremism, much attention is given to upgrading elementary schools. Jena's investments in welfare programmes, which have resulted in greater citizen participation, can be said to improve social capital in terms of citizens' networks and norms. In Øresund, environmental awareness is partly developed in the education system, starting in elementary schools, and has become an economic asset by leading to innovation and exporting of green products.

... and the right incentives can change managers' behaviour relatively quickly.

There may be more scope for changing the social capital of managers even in the shorter term. Accounts of organisational change, as in Jena, suggest that networking among managers can be stimulated, despite an initially low stock of social capital. One reason may be that it is easier to use targeted policy (for example, in the guise of network programmes for information services and funds) to act on managers, as they respond better to economic incentives than people in general. If they have sufficient incentives, managers may develop traded networks based on law or contracts rather than on untraded networks and trust and in due course build a stock of social capital in the form of untraded networks and norms of co-operation.

But policy makers too must learn to adapt to changing conditions...

In sum, there is significant scope for stimulating regional learning through policy efforts. However, *policy itself is subject to "path-dependency"*, as goals and measures may become irrelevant to a regional structure or world market

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conditions or obsolete. Examples are policies to spur "high-tech" industry in regions with more potential for growth in other sectors, such as Andalucía and Øresund, or those of Jena in the period when eastern European markets plummeted and East German firms were first exposed to global competition. Hence, in an emerging knowledge-based economy, successful organisational and institutional learning and unlearning are best supported by ongoing policy learning and unlearning (continuous policy review).

... and are most likely to do so in response to crisis rather than to opportunity...

A "push factor", such as a pending economic recession, may be a highly effective means of mobilising local interest in regional learning. In Kent Thames-side and Jena, such a situation mobilised local politicians and private investors. In Jena, political and economic push factors have been strong, and, aided by the relatively small size of the region and its specialised sectoral structure, have contributed to its profound transformation. "Pull factors", on the other hand, may be surprisingly inefficient, as illustrated by the Danish side of the Øresund region. The area is prosperous and socially coherent, and it is difficult to convince its people of the need to change the nature of local learning radically. The ambition to create a rapidly growing, "high-tech" Øresund region is primarily a national one, and the Øresund project, and in particular the bridge, has been heavily criticised for abandoning a tradition of bottom-up policy processes.

Summary of conclusions

The empirical conclusions can be summarised as follows:

- It is not individual learning *per se*, but the use of that learning in firms that matters for regional performance. Growth-inducing firms are not always "high-tech", and the skills that contribute to organisational learning are often those obtained through secondary-level rather than tertiary-level education. Organisational learning may have economically beneficial results other than those gained from patents. Processes and products may be "learned by doing", and incremental change rather than patent laws may protect competitiveness.
- Learning is an interactive, organic process, too complex to be completely designed by firm managers or policy makers. In fact, a central role for regional policy makers seems to be to remedy "path-dependency": unlearning particular practices and bodies of knowledge that prevent other learning processes from spreading through the region.

- Attempts to focus learning on particular areas or levels of a regional economy may be beneficial, but may neglect needed co-ordination with other areas or levels. If regional economic performance is to be based on learning, co-ordination at individual, firm and regional levels is crucial. If improvements in individual learning or changes in public research or industry services are to have a positive impact on organisational learning in firms, they need to be closely co-ordinated with the regional industry structure.
- Co-ordination can take place only through a host of traded and untraded regional networks of various economic and social agents. Some of these networks may be politically designed, others not. Some are public and their role in fostering interactive learning should be politically acknowledged. Non-public networks comprise civic networks, networks of individuals (including business managers) or traded networks of firms. Their various preconditions in terms of institutional support (from laws, standards and services to social conventions) need to be nurtured by policy makers. Further, partnerships linking public and private networks may not only be a means of fund raising, but an important way of co-ordinating elements of a regional economy.
- For policy makers, developing a regional learning policy demands a fine balance between focused, interventionist, organisational and institutional design and support and more general infrastructure policy, in order to facilitate bottom-up learning processes between networks of regional economic and social agents. Bottom-up learning should also support the policy level, by facilitating unlearning of political goals and practices that become inefficient.

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... policy learning is strengthened by feedback from the grassroots...

Bottom-up policy processes may be an efficient means of avoiding political "path-dependency" in the long run, through local feedback and participation in policy planning. Jena has suffered from a lack of such feedback, and regional policy still has a ring of central planning to it. The new goals set by Jena's main partnerships may eventually become obsolete, so that policy making in Jena needs to heed the feedback from the local economy by facilitating the creation of networks at all levels that facilitate bottom-up political learning.

... and is essential for social capital development.

In sum, the conclusions on regional policy making suggest that social capital is of central importance for policy learning at the regional level, as it is for individual and organisational learning.

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Chapter 7

POLICY PRINCIPLES: CREATING LEARNING CITIES AND REGIONS

Introduction

Solutions must be tailored to the varying circumstances of each region...

It is not the purpose of this chapter to present a detailed blueprint or set of prescriptions for regions to follow as they attempt to meet the challenges posed by the transition to a knowledge-based economy. As has been emphasised in earlier discussion, it is necessary for each region to develop its strategies within the parameters that are set by the specificities of its local economic and social conditions. As the empirical analysis presented in this study demonstrates, regions vary widely in the actual circumstances that they currently confront, as a result of their past trajectories of economic and social change. Moreover, there are differential regional resources to draw upon – in terms of production structure, educational provision, social capital and so forth – in developing strategies for the promotion of effective learning and innovation. Clearly, therefore, policy interventions need to reflect this diversity.

... but a framework of policy principles is apt in the context of important common trends...

However, on the basis of reviewing the research evidence and the primary empirical investigations that were presented earlier, it is possible to identify what we have termed "policy principles"; and it is these that are elaborated below. These policy principles provide a general framework within which those responsible for the development of strategies for learning and innovation at the regional level should most fruitfully operate. They reflect the fact that the contemporary transition to new forms of economic activity does exhibit *general* characteristics, to which regions must necessarily respond. Accordingly, the process of strategic development at the regional level should be conceived as one where actual policies are the product of the *interaction* between general policy principles and the specificities of local circumstance.

... which is not to understate the distinctiveness of delicate political change processes...

In focusing here on the level of more general policy principles, there is no intention to understate the importance of policy processes at the regional level. These involve the resolution of complex analytical issues, as well as the creation of sophisticated political mechanisms through which strategies can be devised and implemented. The latter frequently necessitates the sensitive negotiation of relationships between the regional and other levels of government. Moreover, there are further complexities which arise from the fact that there are no "quick fixes". Strategies of this kind require considerable time – most often to be measured in decades, rather than years – before their impacts are felt (in economic growth, employment change and so forth). Clearly, this may generate considerable stress within the political system, where short time-horizons are the norm. However, these remain issues which each region must address in the light of its own circumstances.

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... but everywhere, learning needs to be fostered to support innovation.

As we have seen earlier, the essence of the "learning region" model is that with the transition to a knowledge-based economy at the global level, the competitiveness of firms (and units of firms) and, by extension, the regions within which they are located, depends upon the fostering of high levels of innovative capacity. The latter, in turn, is created and sustained by effective processes of individual and organisational learning. Accordingly, where such learning is not already taking place, policy makers at the regional level need to develop strategies which at least move their regions in the direction of fulfilling these criteria, if they are to sustain employment levels and general standards of well-being. It is with these objectives in mind that the following policy principles are presented.

Inputs to the learning process

Individual learning

The key educational ingredient is successful secondary education; universities have greatest regional impact through research...

There is abundant evidence from the empirical analyses presented earlier that individual learning is strongly related to a region's economic performance. At the most basic level, therefore, it follows from this that *regions seeking to improve their economic performance through the development of innovation-intensive activities should ensure that effective and well-resourced educational provision is in place*. More specifically, however, it is the provision of high-quality, general education to the upper-secondary level which emerges as of critical significance. Universities clearly have a role to play too, but it seems likely that this is most significant in terms of research and its regional spin-offs (see below). Graduates frequently enter what are essentially national (or even international) labour markets and their contribution to the development of a regional economy may well be achieved through recruitment from outside the region. This is not to deny, of course, that the local availability of graduates in specialist areas (especially where there are overall supply shortages) may be extremely useful in supporting particular forms of new economic development, such as inward investment.

... but to succeed, secondary education needs to teach students to go on learning outside school...

The contribution of high-quality secondary level education should be understood in relation to other forms of individual learning. In particular, work-place learning – whether through formal training programmes or as part of routine economic activity ("learning-by-doing" and "learning-by-interacting") – depends for its efficacy on participants having the prerequisite levels of knowledge and skills. *Given the salience of work-place (and other forms of lifelong) learning to innovation-intensive economic activities, this indicates that policy makers at the regional level should be concerned to ensure that the linkages between the different forms of individual learning are as effective as possible*. This has implications not only for levels of participation and attainment at the secondary level, but also for curriculum issues. Most clearly, for example, the balance within the school curriculum between imparting existing knowledge and developing the skills necessary to contribute to the development of new knowledge requires constant review. Certainly, where the wider regional economic strategy is concerned to meet the demands of the new learning economy, the kinds of skills which enable adult workers to be effective lifelong learners ("learning to learn") constitute a necessary part of this curriculum.

... and policy makers must address the economic usage of learning, not just its production...

These latter arguments also serve to highlight that it is not individual learning *per se* that matters for regional economic performance. Crucially, *there needs to be careful co-ordination between the supply of skilled and knowledgeable individuals through education and training and the demand for them within the regional economy*. The empirical analysis presented earlier, for example, reveals a number of instances where

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high levels of educational participation and attainment have not been translated into economic growth because of a mismatch with labour market requirements. Where regional development strategy is explicitly orientated towards creating effective learning and innovation, these co-ordination problems become especially acute. In these circumstances, policy makers responsible for individual learning are required not simply to fulfil the demands for knowledge/skills of *existing* production of goods and services, but also the significantly different demands of *future* production. Policy makers are thus confronted with difficult analytical issues in respect of predicting these future demands in the context of the region's relationships with the shifting conditions of the national and, indeed, global economy. Moreover, they need to address pressing practical issues of facilitating the movement of individuals into what is inevitably a rapidly changing labour market (through, for instance, careers guidance and counselling).

... which requires individual learning to be applied through organisational learning.

It is also clear that co-ordinating the supply of knowledge and skills with the demands of the production of goods and services is not simply a matter to be addressed within the planning of the education and training systems associated with individual learning. Part of what is at stake here involves the transformation of production itself towards more knowledge-based and innovation-intensive forms. It is here that the highest rates of growth and employment creation are recorded at the level of the global economy. Achieving this involves developments within the sphere of *organisational learning*. Accordingly, *policy makers need to be clear that it is insufficient simply to raise levels of individual learning, as the latter can only be translated into significant economic growth benefits through its effects in organisational learning*. As the empirical analysis clearly suggests, effective individual learning is a necessary condition of attaining innovation-intensive forms of economic activity, but requires mediation via organisational learning for the full impacts to be achieved.

Organisational learning

Policy makers must aim to facilitate, but not to direct, organisational learning...

As we have seen, therefore, it is organisational learning which relates most directly to the key processes of innovation; and again, the empirical analysis presented earlier provides strong support for the positive effects of innovation on regional economic performance. However, for policy makers at the regional level who seek to promote organisational learning, there are major issues which need to be confronted. The scope of policy intervention needs to be clearly defined in terms of a clear set of issues to be addressed: it is as important to recognise what should *not* be attempted, as what should. In particular, to a much greater extent than for individual learning, organisational learning lies outside of the direct control of the policy maker, as it is undertaken primarily by the firms through which innovations are carried out. T*o a considerable extent, therefore, the role for policy makers is one of establishing appropriate framework conditions and the incentives necessary for firms to engage in organisational learning, rather than intervening directly*. The aims of policy interventions are thus best understood as creating an environment which firms and other organisations find conducive to organisational learning and hence innovation-intensive forms of economic activity. Whilst this can necessitate the creation of new organisations – to provide more effective business support services or to transfer new knowledge from universities and research institutes to firms – it remains essentially a strategy of *facilitating* learning and innovation.

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… first, by directly stimulating learning within firms of all kinds…

Most obviously, this involves promoting organisational learning *within* firms. As the empirical analyses demonstrate, left to their own devices, the bulk of firms engage to only a limited extent in experimentation and new development with respect to process and, in particular, product innovations. Accordingly, a key task for policy makers is to try to ensure that these kinds of learning are undertaken, through, for example, making grants available to support innovation or providing more effective information services. Moreover, *stimulating within-firm learning of this kind is important not simply for a pre-selected set of conventionally defined* "high-tech" *sectors, but has potential significance across the industries and services of the regional economy as a whole*. However, in this context, it is important to bear in mind the complex relationships between process and product innovation and employment creation. Certainly, it has been argued by many commentators, for example, that a strategy that focuses on process innovation *alone* may actually decrease employment.

… but also helping indirectly by stimulating learning networks…

What has been less well recognised by policy makers up until now, but emerges very clearly from the empirical evidence presented earlier, is that the effective promotion of organisational learning is dependent upon systematic interaction within networks of firms and other organisations. Again, it is clear that, *in many regional contexts, only a low level of this kind of network interaction emerges spontaneously and therefore some form of policy intervention is required*. This may involve acting upon the relationships between firms themselves. It is clear that significant improvements can be made to organisational learning through, for example, promoting effective supply chains or ensuring the provision of adequate information about the scope for inter-firm interaction. In addition, however, policy intervention is required to facilitate active exchange between firms and organisations that specialise in knowledge production (universities, research institutes, etc.). These latter organisations are themselves to a large extent within the public sector and hence may be dependent upon support at the regional level (but elsewhere may operate within an exclusively national system). Crucially, however, what needs to be done by regional policy makers is to ensure that effective knowledge exchange mechanisms are in place: that universities and research institutions are induced to produce forms of knowledge appropriate to regional economic circumstances; and that firms – and especially SMEs – are aware of them and recognise their significance and value.

… which can require basic change both in conditions and in attitudes within institutions.

The latter may well involve quite fundamental changes in the *institutions* (in the sense used earlier) through which organisational activities are regulated. Clearly, these include formal institutions, such as laws and regulations governing the relations between universities and firms. However, a number of the case studies also illustrated the significance of attitudes, values and norms produced through everyday social interaction. For example, deep-seated, traditional attitudes – both within universities and firms – constituted major obstacles to the development of organisational learning. In many ways, therefore, *the most significant task facing policy makers seeking to shift their region towards more effective learning and innovation is to bring about changes in these regional institutions*.

Regional institutional change

Policy makers must stimulate a rethinking of what worked for their region in the past…

One of the clearest implications of the empirical analyses reported earlier is that a central role for policy makers is to promote what has been termed "*un*learning". It has been emphasised that the current economic and social circumstances of a region reflect the outcomes of past trajectories of development: the present-day production structure, configuration of educational provision, and so forth are the residue of historical changes. Equally, current arrangements for

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promoting regional economic development (organisations, practices, etc.) can also reflect the requirements of past patterns. Perhaps most fundamentally of all, the ways in which regional economic development is understood and ideas about what is required to promote or at least sustain economic growth and prosperity are also frequently rooted in past circumstances, rather than the realities of the present (and future). Such "path-dependency" can constitute major obstacles to the development of effective learning and innovation, as in the situations of "lock-in" that were discussed earlier. Clearly, therefore, *a fundamental task of policy makers at the regional level is to "unlearn" the practices and bodies of knowledge left over from previous eras*. Only by doing so can the appropriate conditions for the development of effective learning and innovation for the future be created.

... and must be willing to re-learn themselves, and manage complex transformational processes...

It is important to note here that policy makers themselves are not immune to these processes. *Policy learning (and unlearning) is a key element in the overall process of regional institutional change*. Policy makers need to adopt attitudes which are positive about the possibilities of change and new practices. Most basically, this implies a commitment to systematic analysis of the region's developmental trajectory in the context of wider patterns of restructuring and change at national and, indeed, global levels; and the continuous "benchmarking" of the region's circumstances against that of other areas. Equally, however, it entails a willingness to engage in complex processes of political transformation. The conventional practices and ideas derived from previous historical periods frequently develop their political advocates, whose perceived interests are bound up in maintaining the *status quo*. Hence, the creation of new regional development strategies often involves the reconciliation of conflicting ideas, represented within policy making processes by different individuals and groupings.

... but regions should not discard their past for their present: they should make best use of it.

This emphasis upon the necessity of policy makers being responsive to experimentation, change and the development of new ideas and practices is not intended to suggest that regional development strategies can wholly divorce future trajectories from those of the past and the present. Certainly, attempts to transpose development strategies from other "successful" regions without due attention to the particular characteristics of the local area (as, for example, in attempts simply to "clone" high-growth, "high-tech" industries) do not have a realistic chance of success. Indeed, put more positively, *policy makers need to identify very carefully how the resources currently available to the region (existing industries, educational provision, research facilities, positive social capital and so forth) may usefully contribute in developing innovative strategies for the future*. For example, a rich historical heritage can constitute a major resource in future developmental strategy. "path-dependency" is not something which can simply be eradicated, certainly not in the short term; nor *should* it be. The positive resources which can be derived from it need to be utilised imaginatively.

Participants in the learning process

Organisational networks

In encouraging firms to participate in networks, regional policy makers need to demonstrate their benefits...

As has been strongly argued in the foregoing analysis, effective learning and innovation is best produced in functioning networks of firms and other organisations. Moreover, such networks need to encompass a variety of firms, producing a range of goods and services; organisations wholly or partially within the public sector, which provide research and educational services,

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business support and other means of facilitating innovative economic activity; trades unions; as well as civic organisations, such as chambers of commerce and trade associations. As the commitment of this range of different types of organisation – sustained over a significant period – is viewed as crucial, it is important to acknowledge that the incentives to participate in networking activities vary substantially between them; as can be illustrated by contrasting firms and public-sector organisations. Hence, simply put, for public organisations, once the regional development strategy is agreed (which, as we have seen, in itself involves complex political processes), implementing it effectively defines at least their short-term objectives, with the longer-term goal being the achievement of regional growth based upon innovation-intensive forms of economic activity. For firms, however, the benefits to them – in terms of their competitiveness, profitability, growth, and so forth – of participating in networks and undertaking organisational learning are by no means self-evident. Firms need to be actively persuaded of such benefits, most directly through their active demonstration. Accordingly, it is clear that *a central task for the regional policy maker is to ensure the participation of firms and other organisations in active networks of interaction by demonstrating their beneficial effects*. Indeed, this constitutes a major element in effecting regional institutional change.

... and similarly, to demonstrate the benefits of learning to individuals, while ensuring that the labour market does deliver such benefits.

Much the same argument applies, moreover, to the employees who are required to participate in continuing processes of individual learning in order to sustain learning and innovation at the organisational level. They too need to be convinced that participation is beneficial to them. Hence, for example, where improvements in people's employability through individual learning is translated directly into benefits in terms of actual employment (retaining a job or getting a new one, for instance), this results in the positive valuation of individual learning. However, this kind of virtuous relationship between employability and employment is highly dependent upon the effects of a shift towards innovation-intensive economic activity on overall employment levels and these are highly complex. Clearly, where innovation – and the individual and organisational learning on which it depends – leads to job losses (as has been suggested frequently to be the case following process innovations), workers are much less likely to be willing to participate. Indeed, the relationships between individual learning, access to employment opportunities and wider social exclusion also affect the ways in which people evaluate participation in innovative learning initiatives. For example, where individuals perceive themselves to be excluded from employment on non-meritocratic criteria, again willingness to participate in individual learning is depressed. Accordingly, *policy makers at the regional level need to evaluate continuously the relationships between participation in individual learning, innovation and wider labour market changes*.

"Top-down" and "bottom-up" regional strategies

The regional population needs to be engaged in devising a strategy; large, visible projects can help ordinary people identify with the change.

More generally, as some of the case study investigations begin to demonstrate, an effective regional strategy for learning and innovation requires a careful balance to be drawn between the necessity of introducing new ideas and practices and ensuring that the latter are accorded legitimacy by the population of the region to be transformed. Simply imposing a "top-down" strategy limits the effectiveness of the learning processes which result. Securing the widespread identification of the region's populace with the strategy not only facilitates its implementation (as is probably the case with all types of policy), but also contributes directly to the achievement of the very processes of learning (individual and organisational) which the strategy aims to bring about. In

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this context, it is important to note that large-scale projects of a highly visible kind – a bridge, a leisure park, a retail centre – can have a major symbolic significance in engaging the wider population with a regional development strategy. Whilst such projects clearly do not guarantee popular legitimacy, they can function to trigger and co-ordinate the myriad decisions which have to be made within firms and by individuals in order to set in motion effective processes of learning and innovation within a region.

Mechanisms of the learning process

Co-ordination strategies

It is more important than hitherto assumed to join up various policy strands at regional level...

The development of effective learning and innovation requires that what have often been treated previously as separate policy areas (industrial policy, science and technology policy, education policy, and so forth) are brought together within a coherent framework of integration. Accordingly, *policy makers seeking to promote a strategy of shifting towards a "learning region" are required to pay much greater attention to mechanisms for co-ordinating policies than has generally been the case hitherto.* This is most obviously true inside the region which is seeking to develop more effective processes of learning. Whilst this may appear trivial because it is so obvious, as the earlier case-study analyses confirm, it is remarkable how *infrequently* co-ordination and coherence across policy areas is actually achieved. Clearly, consciously adopting a learning strategy for regional development may itself assist in overcoming the barriers which manifestly continue to exist between what are often departmental responsibilities for different policy areas.

... and also to bring together the many strands of government operating in the region.

It is also clear that co-ordination is required not only across policy areas within the region, but also between different levels of government. As we have seen, there are strong arguments in support of the view that the regional level is particularly appropriate for policy intervention to promote more effective learning and innovation. However, in reality, responsibilities for relevant areas of intervention are most frequently split between regional and national authorities; and, moreover, considerations of equity between citizens in different regions provide significant justifications in principle for such a division of powers. Accordingly, it follows that effective strategies for promoting a "learning region" cannot be confined to the single region alone. *Policy makers at the regional level need to be concerned with how their region is located within the wider framework of national (and, indeed, supra-national) governance.*

The role of social capital

The difficult task of developing social capital where it is weak is best approached in a focused way, especially by strengthening existing networks.

Considerable attention has been paid in the empirical analyses presented earlier to the role of social capital. In particular, as a number of the case studies indicate, effective organisational learning is extremely difficult to achieve where stable interaction between firms and other organisations, based on norms of trust and free exchange of information, are absent. Clearly, therefore, *policy makers at the regional level need to develop strategies to foster appropriate forms of social capital as a key mechanism in promoting more effective organisational learning and innovation.* As we have seen, however, there are regions where appropriate forms of social capital already exist as the result of long-term, historical processes of social and economic development. Such regions, of course, are very fortunate in this special endowment and may be expected to reap significant benefits from it. Where this is not the case, however, regional

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Below are ten resulting policy principles, but remember how crucial it is to apply them in ways that suit different regional circumstances.

policy makers need to adopt a *focused* strategy for developing social capital. Hence, it is extremely difficult for policy interventions to affect the attitudes, values and norms of the population at large, as the latter characteristically depend upon long-term processes of interaction for their development. It is possible that strategic interventions in basic education may produce impacts here, but again only in the very long term. Accordingly, regional policy interventions have a greater chance of successful outcomes where the objective is to foster the development of appropriate forms of social capital *within* the networks where organisational learning takes place. It is much more realistic (although by no means straightforward) to promote norms of high-trust exchange and interaction within networks of firms and other organisations than to bring about much wider social

Ten policy principles for creating learning cities and region

Cities and regions seeking to improve their economic performance within a knowledge-based economy through the development of innovation-intensive activities are advised to:

Inputs to the learning process

- Ensure that high-quality and well-resourced educational provision is in place, on which effective individual learning throughout people's lives can be developed.
- Co-ordinate carefully the supply of skilled and knowledgeable individuals through education and training and the demand for them within the regional economy, so that the full benefits of individual learning may be reaped through its effects on organisational learning.
- Establish appropriate framework conditions for the improvement of organisational learning, both within firms and between firms and other organisations in networks of interaction, and demonstrate to firms the benefits of these forms of learning.
- Facilitate effective organisational learning not simply for a pre-selected set of conventionally defined "high-tech" sectors, but across all those industries and services within the regional economy that have the potential to develop high levels of innovative capacity.
- Identify very carefully the extent to which the resources currently available to the region (existing industries, educational provision, research facilities, positive social capital and so forth) constitute an impediment to economic development ("lock-in") or may usefully contribute in developing innovative strategies for the future.
- Respond positively to emergent economic and social conditions, especially where this involves the "unlearning" of inappropriate practices and bodies of knowledge (including policy makers' own) left over from the regional institutions of previous eras.

Mechanisms of the learning process

- Pay close attention to mechanisms for co-ordinating policies across what have generally been separate departmental responsibilities (for industrial development, R&D, science and technology, education and training and so forth) and between different levels of governance (regional, national and supra-national).
- Develop strategies to foster appropriate forms of social capital as a key mechanism in promoting more effective organisational learning and innovation.
- Evaluate continuously the relationships between participation in individual learning, innovation and wider labour market changes, especially with respect to the social exclusion of groups within the regional population.
- Ensure that the regional strategy for learning and innovation is accorded legitimacy by the population of the region to be transformed.

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change. Moreover, once effective interaction is established, this is likely to have the effect of reinforcing these norms, thereby strengthening organisational learning cumulatively.

Conclusion

In conclusion, it is worth reiterating that these policy principles are not intended to provide a straightforward "formula" for creating a "learning region". As a number of the case studies indicate, simplistic attempts to import ready-made development strategies from other "successful" regions (as, for example, in growing "high-tech" industries; or investing heavily in vocational education and training without attention to labour demand) have more often than not failed to deliver on their objectives. Clearly, the imperatives of global economic changes cannot be ignored. Policy makers at the regional level are certainly required to apply policy principles derived from the *general* characteristics of the transition to the knowledge-based economy. These general policy principles are highlighted below. However, what their highly complex task involves is determining the ways in which such principles should be applied, with explicit regard to the specific circumstances and available resources in their own region.

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Annex

Statistical Profiles of the Case-study Areas

Statistical profiles of the following case-study areas are presented:

1. Germany, Thüringen, Jena 124
2. France, Poitou-Charentes, Vienne 127
3. Sweden, Scania 130
4. Denmark, Greater Copenhagen (the Øresund region) 133
5. Spain, Andalusia 136
6. United Kingdom, Kent, Kent Thames-side 140

The following statistical data were provided for each case:

a) General, contextual data:
- Area size (square kilometres).
- Population density (inhabitants/square kilometre in 1995).
- Percentage of rural population in 1995.

b) Regional economic performance:
- GDP per capita (1990 US$/person in 1995; change during the period 1980-95).
- Unemployment (per cent of workforce in 1995; change during the period 1980-95).
- Employment (per cent of workforce in 1995).
- Sector structure (per cent of primary, secondary, tertiary sectors in 1995; change during the period 1980-95).
- Population change (per cent1980-95; net migration per cent during the period 1980-95).
- Participation of women in the labour force (per cent in 1995).
- Dependency ratio (per cent of population aged 0-14 and over 64 to per cent aged 15-64 in 1995).

c) Indicators of individual learning:
- Educational attainment (per cent of the population aged 25-59 years obtaining educational Levels 1, 2 and 3 in 1995).

d) Indicators of firm level organisational learning:
- R&D expenditures (ECU/person in 1995; and per cent of GDP in 1995).
- Patent application (number per million inhabitants).
- Total R&D expenditure (ECU).

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Territorial Indicators of Demography, Employment and Gross Domestic Product

Regional units : Regierungsbezirke modified	Number of Regierungsbezirke	Area km^2 regional shares	Population density inh./km^2	Percent of rural population	Population, 1995 inhabitants regional shares
National	**47**	**357 010**	**229**	**20%**	**81 661 000**
THUERINGEN	**3**	**16 170**	**155**	**36%**	**2 503 800**
Mittel- und Nordthüringen	1	7 393	156	37%	1 156 700
Ostthüringen	1	4 685	172	41%	806 300
Südthüringen	1	4 092	132	50%	540 700
JENA	0	114	885	0%	101 061
Rural regierungsbezirke	*9*	*19%*	*93*	*68%*	*8%*
Intermediate regierungsbezirke	*18*	*38%*	*156*	*34%*	*26%*
Urban regierungsbezirke	*20*	*43%*	*352*	*10%*	*66%*

	Population change % 1980-95	Natural balance [1] % 1980-95	Net migration [2] % 1980-95	Dependency ratio [3] 1995 Total	Youth	Ederly
National	**4,4**	**-1,5**	**5,8**	**47**	**24**	**23**
THUERINGEN	**-8,3**	**-3,5**	**-4,8**	**46**	**24**	**22**
Mittel- und Nordthüringen	-7,0	-2,5	-4,6	45	24	21
Ostthüringen	-11,1	-4,6	-6,5	46	23	23
Südthüringen	-6,6	-3,9	-2,7	46	24	22
JENA	-5,8	2,0	-7,8	39	21	18
Rural regierungsbezirke	*3,9*	*-0,1*	*3,9*	*47*	*26*	*22*
Intermediate regierungsbezirke	*3,0*	*-1,3*	*4,3*	*48*	*25*	*23*
Urban regierungsbezirke	*5,0*	*-1,7*	*6,7*	*46*	*23*	*23*

	Labour Force, 1996 Participation rate [4] Total	Female	Labour Market Pressure [5]	Unemployment, 1996 Unemployment rate [6] Total	Female	Youth
National	**57**	**51**	**0,9**	**12,2**	**13,2**	**5,8**
THUERINGEN	**61**	**61**	**1,0**	**16,9**	**20,8**	**8,3**
Mittel- und Nordthüringen	63	63	1,0	17,0	20,8	8,4
Ostthüringen	60	61	1,0	17,5	21,6	8,1
Südthüringen	57	58	1,0	15,9	19,6	8,3
JENA	52	53	1,3	13,7	13,9	10,1
Rural regierungsbezirke	*54*	*51*	*1,0*	*12,7*	*15,2*	*5,4*
Intermediate regierungsbezirke	*56*	*51*	*0,9*	*13,3*	*15,0*	*6,3*
Urban regierungsbezirke	*57*	*51*	*0,8*	*11,7*	*12,3*	*5,6*

	* GDP per capita, in US$ using PPP's of 1990 National = 100 1980	1990	1995	* Gross Domestic Product change, 1980=100 1990	1995	Employment change, 1980=100 1996
National	**14 140**	**17 533**	**18 683**	**124**	**130**	**95**
THUERINGEN	**..**		**59**	**..**		**96**
Mittel- und Nordthüringen	..	..	..	..	..	99
Ostthüringen	..	..	..	..	..	93
Südthüringen	..	..	..	..	..	93
JENA	..	..	..	..	..	91
Rural regierungsbezirke	*80*	*80*	*82*	*100*	*103*	*98*
Intermediate regierungsbezirke	*89*	*90*	*87*	*101*	*98*	*95*
Urban regierungsbezirke	*107*	*107*	*109*	*100*	*102*	*94*

Notes:

* Former länders only.

1. Natural balance: Birth rate less Death rate.
2. Net migration: Population change over 1981-1995 less Natural balance.
3. Dependency ratio: Population aged 0-14 and over 64 to Population aged 15-64.
4. Participation rate: Labour Force in percent of Population aged 15-64.
5. Labour Market Pressure ratio: Population aged 5-14 to Population aged 55-64.
6. Unemployment rate: Unemployed in percent of Labour Force.

Source: OECD Territorial Data Base.

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GERMANY
Territorial Indicators of Education, Research and Innovation

Regional units : **Länder**	**Education** Educational attainment of the population aged 25-59 by region in 1995			
	Low (<ISCED 3)	Medium (ISCED 3)	High (ISCED 5,6,7)	Upper (ISCED 3 to 7)
National	**18**	**59**	**23**	**82**
THUERINGEN	**6**	**63**	**30**	**93**
Mittel- und Nordthüringen	..	..	..	..
Ostthüringen	..	..	..	..
Südthüringen	..	..	..	..
JENA	..	..	..	..
Leading länders	19	59	22	81
Lagging länders	17	58	24	83
High income länders	20	58	22	80
Low income länders	12	60	27	88

	Research		
	R&D expenditure in % of GDP 1995	R&D expenditure ECU per inhabitant 1995	Working population in % of total employment 1990
National	**2,6**	**493**	**2,3**
THUERINGEN	**..**	**48**	**..**
Mittel- und Nordthüringen	..	..	..
Ostthüringen	..	..	..
Südthüringen	..	..	..
JENA	..	..	..
Leading länders			
Lagging länders			
High income länders			
Low income länders			

	Innovation Number of patent applications per million inhabitants	
	1990	1995
National	**173**	**172**
THUERINGEN	**95**	**30**
Mittel- und Nordthüringen	..	
Ostthüringen	..	
Südthüringen	..	
JENA	..	1016
Leading länders	170	171
Lagging länders	169	169
High income länders	198	200
Low income länders	91	83

Source: OECD Territorial Data Base.

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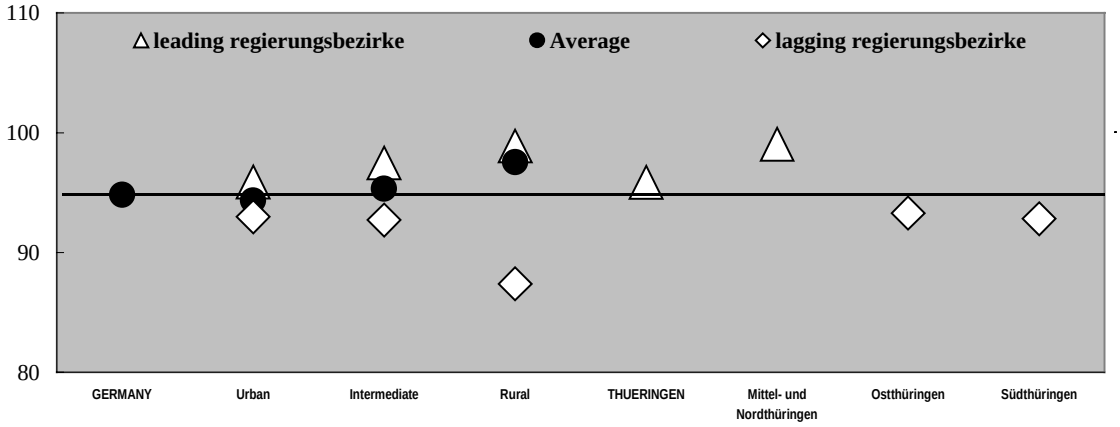
GERMANY
Territorial disparities in Labour market structures and dynamics

Regional units : Regierungsbezirke modified	Employment 1996 regional shares	Employment structure, 1996 In percent of total employment				Employment change, 1992-1996 1992=100		
		Female	Agriculture	Industry	Services	Agriculture	Industry	Services
National	**27 739 000**	**44**	**1**	**40**	**59**	**79**	**87**	**102**
THUERINGEN	**868 300**	**47**	**3**	**38**	**59**	**72**	**91**	**102**
Mittel- und Nordthüringen	415 800	47	3	35	62	66	95	105
Ostthüringen	275 400	47	3	39	57	71	87	100
Südthüringen	177 100	48	4	41	54	89	90	96
JENA	45 217	53	0	28	72	56	63	110
Rural regierungsbezirke	*7%*	*45*	*3*	*42*	*55*	*65*	*94*	*103*
Intermediate regierungsbe.	*25%*	*44*	*2*	*42*	*56*	*75*	*89*	*102*
Urban regierungsbezirke	*68%*	*44*	*1*	*39*	*60*	*87*	*85*	*101*

Employment change, 1992-1996



	Number of Regierungsbezirke	Employment 1996 regional shares	Employment change, 1992-96 Total 1992=100	Difference to national
National	**47**	**27 739 000**	**95**	
THUERINGEN, leading	**3**	**868 300**	**96**	**1**
Mittel- und Nordthüringen, interm. leading	1	415 800	99	4
Ostthüringen, intermediate lagging	1	275 400	93	-2
Südthüringen, intermediate lagging	1	177 100	93	-2
Rural regierungsbezirke	***9***	***7 %***	***98***	***3***
leading regierungsbezirke	*8*	*6 %*	*99*	*4*
lagging regierungsbezirke	*1*	*1 %*	*87*	*-7*
Intermediate regierungsbezirke	***18***	***25 %***	***95***	***1***
leading regierungsbezirke	*9*	*14%*	*97*	*3*
lagging regierungsbezirke	*9*	*11 %*	*93*	*-2*
Urban regierungsbezirke	***20***	***68 %***	***94***	***0***
leading regierungsbezirke	*11*	*32 %*	*96*	*1*
lagging regierungsbezirke	*9*	*36 %*	*93*	*-2*

Source: OECD Territorial Data Base.

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Territorial Indicators of Demography, Employment and Gross Domestic Product

Regional units : **Départements**	Number of Départements	Area km² Regional shares	Population density inh./km²	Percent of rural population	Population, 1995 inhabitants Regional shares
National	**96**	**543 965**	**107**	**37**	**58 143 000**
Région Poitou-Charentes	**4**	**25 810**	**63**	**66**	**1 620 500**
Charente	1	5 956	57	60	340 800
Charente-Maritime	1	6 864	79	62	541 600
Deux-Sèvres	1	5 999	58	78	346 600
Vienne	1	6 990	56	65	391 500
Rural départements	*54*	*61%*	*52*	*68*	*30%*
Intermediate départements	*31*	*34%*	*128*	*36*	*41%*
Urban départements	*11*	*4%*	*685*	*5*	*29%*

	Population change % 1980-95	Natural balance[1] % 1980-95	Net migration[2] % 1980-95	Dependency ratio[3] 1995 Total	Youth	Ederly
National	**7,9**	**4,9**	**3,0**	**50**	**29**	**21**
Région Poitou-Charentes	**2,8**	**1,0**	**1,8**	**55**	**27**	**28**
Charente	0,3	0,4	-0,2	55	27	28
Charente-Maritime	6,3	0,0	6,3	58	27	30
Deux-Sèvres	1,6	2,1	-0,5	55	28	27
Vienne	6,4	1,8	4,6	53	27	26
Rural départements	*4,4*	*1,4*	*3,1*	*55*	*29*	*26*
Intermediate départements	*11,4*	*5,2*	*6,3*	*49*	*29*	*20*
Urban départements	*6,9*	*8,2*	*-1,3*	*47*	*28*	*19*

	Labour Force, 1990 Participation rate[4] Total	Female	Labour Market Pressure[5]	Unemployment, 1995 Unemployment rate[6] Total	Female	Youth
National	**64**	**59**	**1,3**	**11**	**14**	**25**
Région Poitou-Charentes	**58**	**50**	**1,1**	**11**	**14**	**31**
Charente	60	52	1,1	11	13	30
Charente-Maritime	56	47	1,0	13	16	34
Deux-Sèvres	60	52	1,2	9	12	27
Vienne	57	49	1,2	10	13	31
Rural départements	*64*	*56*	*1,2*	*11*	*14*	*26*
Intermediate départements	*62*	*54*	*1,3*	*12*	*14*	*26*
Urban départements	*67*	*60*	*1,3*	*12*	*13*	*22*

	GDP per capita, in US$ using PPP's of 1990 National = 100			Gross Domestic Product change, 1980=100		Employment change, 1980=100	
	1980	1990	1995	1990	1995	1990	1995
National	**14 700**	**17 300**	**17 800**	**124**	**131**	**104**	**103**
Rég. Poitou-Charentes	**82**	**83**	**83**	**121**	**125**	**101**	**104**
Charente	96	92	94	114	119	98	102
Charente-Maritime	74	73	72	121	126	102	106
Deux-Sèvres	76	82	83	129	134	100	103
Vienne	82	80	79	118	123	102	105
Rural départements	*82*	*81*	*80*	*120*	*124*	*101*	*101*
Intermediate départements	*94*	*90*	*89*	*121*	*127*	*106*	*105*
Urban départements	*127*	*134*	*137*	*129*	*139*	*104*	*101*

Notes:

1. Natural balance: Birth rate less Death rate.
2. Net migration: Population change over 1981-1995 less Natural balance.
3. Dependency ratio: Population aged 0-14 and over 64 to Population aged 15-64.
4. Participation rate: Labour Force in percent of Population aged 15-64.
5. Labour Market Pressure ratio: Population aged 5-14 to Population aged 55-64.
6. Unemployment rate: Unemployed in percent of Labour Force.

Source: OECD Territorial Data Base.

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Territorial Indicators of Education, Research and Innovation

Regional units : **Régions**	**Education** Educational attainment of the population aged 25-59 by region in 1995			
	Low (<ISCED 3)	Medium (ISCED 3)	High (ISCED 5,6,7)	Upper (ISCED 3 to 7)
National	**37**	**43**	**19**	**62**
Région Poitou-Charentes	**38**	**47**	**15**	**62**
Leading regions	*35*	*44*	*21*	*65*
Lagging regions	*42*	*43*	*15*	*58*
High income regions	*35*	*40*	*26*	*66*
Low income regions	*38*	*45*	*17*	*62*

	Research		
	R&D expenditure in % of GDP 1995	R&D expenditure ECU per inhabitant 1995	Working population in % of total employment 1995
National	**2,3**	**446**	**1,2**
Région Poitou-Charentes	**0,6**	**93**	**0,4**
Charente	..	..	..
Charente-Maritime	..	..	..
Deux-Sèvres	..	..	..
Vienne	..	..	..
Leading regions	2,3	487	1,4
Lagging regions	0,8	141	0,6
High income regions	2,9	748	2,2
Low income regions	1,3	227	0,8

	Innovation Number of patent applications per million inhabitants	
	1990	1995
National	**96**	**95**
Région Poitou-Charentes	**29**	**52**
Charente	54	40
Charente-Maritime	7	37
Deux-Sèvres	31	33
Vienne	36	99
Leading regions	115	114
Lagging regions	54	54
High income regions	167	159
Low income regions	66	68

Source: OECD Territorial Data Base.

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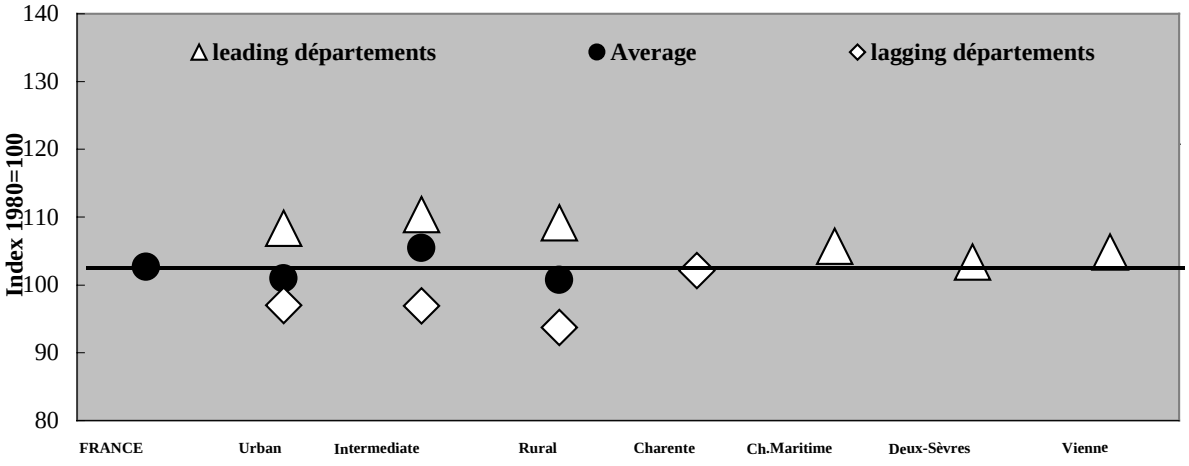
Territorial disparities in Labour market structures and dynamics

Regional units : **Départements**	Employment 1995 Regional shares	Employment structure, 1990 In percent of total employment Female	Agriculture	Industry	Services	Employment change, 1980-1990 1980=100 Agriculture	Industry	Services
National	**22 056 200**	**44**	**6**	**30**	**64**	**72**	**91**	**115**
Rég. Poitou-Charentes	**618 300**	**47**	**12**	**29**	**60**	**72**	**91**	**115**
Charente	137 200	46	12	36	53	69	93	113
Charente-Maritime	194 400	47	13	24	64	78	90	115
Deux-Sèvres	138 500	46	13	29	58	70	90	118
Vienne	148 200	48	9	28	62	71	91	115
Rural départements	*30%*	*44*	*11*	*32*	*57*	*71*	*93*	*115*
Intermediate départements	*40%*	*44*	*6*	*32*	*63*	*73*	*93*	*118*
Urban départements	*30%*	*46*	*1*	*27*	*72*	*75*	*87*	*113*

Employment change, 1980-1995



	Number of départements	Employment 1995 Regional shares	Employment change, 1980-95 Total 1980=100	Difference to national
National	**96**	**22 056 200**	**102,7**	
Poitou-Charentes - leading region	**4**	**618 300**	**104,2**	**1,5**
Charente -lagging département	1	137 200	102,1	-0,5
Charente-Maritime - leading département	1	194 400	105,7	3,0
Deux-Sèvres - leading département	1	138 500	103,4	0,7
Vienne - leading département	1	148 200	104,9	2,2
Rural départements	***54***	***30 %***	***100,8***	***-1,9***
leading départements	*23*	*15 %*	*109,2*	*6,5*
lagging départements	*31*	*15 %*	*93,7*	*-9,0*
Intermediate départements	***31***	***40 %***	***105,5***	***2,8***
leading départements	*18*	*27%*	*110,4*	*7,7*
lagging départements	*13*	*13 %*	*96,9*	*-5,7*
Urban départements	***11***	***30 %***	***101,0***	***-1,7***
leading départements	*5*	*11 %*	*108,4*	*5,7*
lagging départements	*6*	*19 %*	*97,0*	*-5,7*

Source: OECD Territorial Data Base.

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SWEDEN
Territorial Indicators of Demography, Employment and Gross Domestic Product

Regional units : Län	Number of Län	Area km² regional shares	Population density inh./km²	Percent of rural population	Population, 1995 inhabitants regional shares
National	**24**	**410 929**	**21**	**43%**	**8 834 000**
SYDSVERIGE	**3**	**13 968**	**90**	**36%**	**1 262 700**
BLEKINGE LAEN	1	2 941	52	63%	153 000
KRISTIANSTAD LAEN	1	6 089	48	65%	294 800
MALMOEHUS LAEN	1	4 938	165	21%	814 900
Rural län	*17*	*89%*	*12*	*65%*	*49%*
Intermediate län	*6*	*10%*	*70*	*28%*	*32%*
Urban län	*1*	*2%*	*265*	*9%*	*19%*

	Population change % 1980-95	Natural balance[1] % 1980-95	Net migration[2] % 1980-95	Dependency ratio[3] 1995 Total	Youth	Ederly
National	**6,1**	**1,5**	**4,6**	**56**	**28**	**28**
SYDSVERIGE	**7,2**	**0,6**	**6,6**	**57**	**28**	**29**
BLEKINGE LAEN	-0,4	-0,9	0,5	59	28	30
KRISTIANSTAD LAEN	5,1	0,3	4,9	61	30	31
MALMOEHUS LAEN	9,5	1,0	8,5	55	27	28
Rural län	*2,8*	*0,3*	*2,5*	*59*	*29*	*30*
Intermediate län	*7,8*	*1,8*	*6,0*	*55*	*27*	*27*
Urban län	*12,4*	*4,0*	*8,3*	*49*	*26*	*23*

	Labour Force, 1990 Participation rate[4] Total	Female	Labour Market Pressure[5]	Unemployment, 1995 Unemployment rate[6] Total	Female	Youth
National	**81**	**79**	**1,2**	**9**	**8**	**20**
SYDSVERIGE	**80**	**77**	**1**	**9**	**8**	**19**
BLEKINGE LAEN	79	76	1	9	9	22
KRISTIANSTAD LAEN	81	78	1	7	7	17
MALMOEHUS LAEN	79	77	1	9	8	19
Rural län	*82*	*79*	*1,2*	*9*	*8*	*21*
Intermediate län	*80*	*78*	*1,2*	*9*	*8*	*20*
Urban län	*83*	*82*	*1,2*	*7*	*6*	*15*

	GDP per capita, in US$ using PPP's of 1990 National = 100 1990	1995	Gross Domestic Product change, 1990=100 1995	Employment change, 1980=100 1990	1995
National	**17 000**	**16 900**	**102**	**112**	**102**
SYDSVERIGE	**94**	**91**	**100**	**110**	**99**
BLEKINGE LAEN	152	149	99	107	97
KRISTIANSTAD LAEN	17	17	100	111	100
MALMOEHUS LAEN	18	18	107	110	100
Rural län	*109*	*110*	*102*	*111*	*98*
Intermediate län	*73*	*72*	*101*	*112*	*101*
Urban län	*120*	*122*	*105*	*114*	*111*

Notes:
1. Natural balance: Birth rate less Death rate.
2. Net migration: Population change over 1981-1995 less Natural balance.
3. Dependency ratio: Population aged 0-14 and over 64 to Population aged 15-64.
4. Participation rate: Labour Force in percent of Population aged 15-64.
5. Labour Market Pressure ratio: Population aged 5-14 to Population aged 55-64.
6. Unemployment rate: Unemployed in percent of Labour Force.

Source: OECD Territorial Data Base.

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SWEDEN
Territorial Indicators of Education, Research and Innovation

Regional units : **Riksomraden**	**Education** Educational attainment of the population aged 25-59 by region in 1995			
	Low (<ISCED 3)	Medium (ISCED 3)	High (ISCED 5,6,7)	Upper (ISCED 3 to 7)
National	**23**	**49**	**28**	**77**
SYDSVERIGE	**25**	**48**	**27**	**75**
BLEKINGE LAEN *				
SKANE LAEN				
Leading riksomraden	17	45	38	83
Lagging riksomraden	24	51	25	76
High income riksomraden	18	46	35	82
Low income riksomraden	24	51	25	76

	Research		
	R&D expenditure in % of GDP 1995	R&D expenditure ECU per inhabitant 1995	Working population in % of total employment 1995
National	**3,42**	**689**	**2,0**
SYDSVERIGE	**..**	**..**	**1,7**
BLEKINGE LAEN	..	..	..
SKANE LAEN	..	..	..
Leading riksomraden			2,1
Lagging riksomraden			1,7
High income riksomraden			2,5
Low income riksomraden			1,7

	Innovation Number of patent applications per million inhabitants	
	1990	1995
National	**144**	**199**
SYDSVERIGE	**69**	**186**
KRISTIANSTAD LAEN	17	33
MALMOEHUS LAEN	66	186
VAESTSVERIGE	198	329
Leading riksomraden	131	219
Lagging riksomraden	72	153
High income riksomraden	150	258
Low income riksomraden	85	162

** Problems in the data (consistency of total and details)*

Source: OECD Territorial Data Base.

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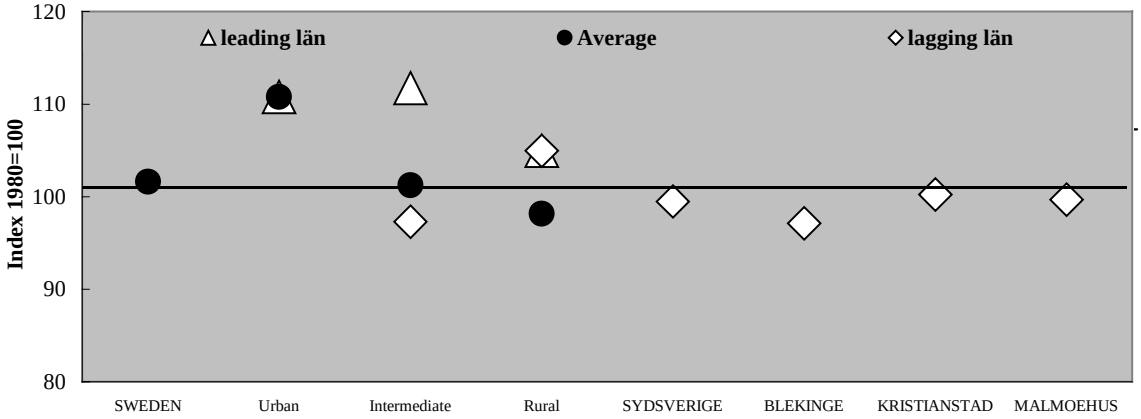
SWEDEN
Territorial disparities in Labour market structures and dynamics

Regional units : Län	Employment 1995 regional shares	Employment structure, 1995 In percent of total employment				Employment change, 1980-1995 1980=100		
		Female	Agriculture	Industry	Services	Agriculture	Industry	Services
National	**4 076 600**	**48**	**4**	**25**	**70**	**66**	**79**	**114**
SYDSVERIGE	**560 600**	**49**	**5**	**26**	**69**	**69**	**79**	**112**
BLEKINGE LAEN	68 700	46	5	31	64	66	75	115
KRISTIANSTAD LAEN	131 200	47	8	29	63	71	85	113
MALMOEHUS LAEN	360 700	50	4	23	73	67	77	111
Rural län	*47%*	*47*	*5*	*29*	*64*	*65*	*79*	*113*
Intermediate län	*31%*	*48*	*3*	*25*	*70*	*68*	*78*	*113*
Urban län	*22%*	*48*	*1*	*17*	*81*	*67*	*85*	*116*

Employment change, 1980-1995



	Number of Län	Employment 1995 regional shares	Employment change, 1980-95 Total 1980=100	Difference to national
National	**24**	**4 076 600**	**102**	
SYDSVERIGE	**3**	**560 600**	**99**	**-2**
BLEKINGE LAEN, rural lagging	1	68 700	97	-4
KRISTIANSTAD LAEN, rural lagging	1	131 200	100	-1
MALMOEHUS LAEN, intermediate lagging	1	360 700	100	-2
Rural län	***17***	***47 %***	***98***	***-3***
leading län	*4*	*8 %*	*105*	*3*
lagging län	*13*	*39 %*	*97*	*-5*
Intermediate län	***6***	***31 %***	***101***	***0***
leading län	*1*	*9%*	*112*	*10*
lagging län	*5*	*22 %*	*97*	*-4*
Urban län	***1***	***22 %***	***111***	***9***
leading län	*1*	*22 %*	*111*	*9*
lagging län	*0*	-	-	-

Source: OECD Territorial Data Base.

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DENMARK

Territorial Indicators of Demography, Employment and Gross Domestic Product

Regional units : Amter	Number of Amter	Area km² regional shares	Population density inh./km²	Percent of rural population	Population, 1995 inhabitants regional shares
National	**15**	**43 085**	**121**	**42%**	**5 228 000**
HOVEDSTADSREGIONEN	**4**	**2 859**	**610**	**6%**	**1 743 600**
KOEBENHAVN OG FREDERIKS.KOM	1	96	5 844	0%	561 000
KOEBENHAVNS AMTSKOMMUNE	1	525	1 154	0%	605 800
FREDERIKSBORG AMTSKOMMUNE	1	1 347	261	16%	351 900
ROSKILDE AMTSKOMMUNE	1	891	252	25%	224 900
Rural amter	*8*	*68%*	*71*	*75%*	*39%*
Intermediate amter	*5*	*31%*	*151*	*34%*	*38%*
Urban amter	*2*	*1%*	*1 879*	*0%*	*22%*

	Population change % 1980-95	Natural balance[1] % 1980-95	Net migration[2] % 1980-95	Dependency ratio[3] Total	Youth	Ederly
National	**2,1**	**0,3**	**1,8**	**48**	**26**	**23**
HOVEDSTADSREGIONEN	**-0,1**	**-1,3**	**1,2**	**45**	**23**	**22**
KOEBENHAVN OG FREDERIKS.KOM	-4,4	-9,9	5,5	44	17	26
KOEBENHAVNS AMTSKOMMUNE	-3,4	1,7	-5,0	49	26	23
FREDERIKSBORG AMTSKOMMUNE	7,0	3,7	3,2	44	30	18
ROSKILDE AMTSKOMMUNE	11,3	4,5	6,8	40	25	15
Rural amter	*1,7*	*0,7*	*1,0*	*2*	..	..
Intermediate amter	*6,3*	*2,3*	*4,1*	..	..	..
Urban amter	*-3,9*	*-3,9*	*0,0*	..	..	..

	Labour Force, 1995 Participation rate[4] Total	Female	Labour Market Pressure[5]	Unemployment, 1995 Unemployment rate[6] Total	Female	Youth
National	**80**	**75**	**1,8**	**7,4**	**8,9**	**10,8**
HOVEDSTADSREGIONEN	**80**	**77**	**1,6**	**7,8**	**8,3**	**11,3**
KOEBENHAVN OG FREDERIKS.KOM	77	75	1,6	12,7	12,8	16,0
KOEBENHAVNS AMTSKOMMUNE	81	77	1,6	6,0	6,5	9,1
FREDERIKSBORG AMTSKOMMUNE	82	78	1,7	5,7	6,6	8,0
ROSKILDE AMTSKOMMUNE	83	80	1,7	6,6	7,8	10,9
Rural amter	..	..	..	*7,0*	*9,1*	*10,4*
Intermediate amter	..	..	..	*7,1*	*8,7*	*10,5*
Urban amter	..	..	..	*8,8*	*9,1*	*12,4*

	GDP per capita, in US$ using PPP's of 1990 National = 100 1985	1990	1995	Gross Domestic Product change, 1985=100 1990	1995	Employment change, 1985=100 1990	1995
National	**14 100**	**17 100**	**19 000**	**122**	**137**	**100**	**102**
HOVEDSTADSREGIONEN	**118**	**116**	**111**	**117**	**126**	**99**	**101**
KOEBENHAVN OG FREDER	123	124	119	113	117	97	99
KOEBENHAVNS AMTSKOM	89	88	93	115	125	98	99
FREDERIKSBORG AMTSKO	67	63	63	115	129	102	105
ROSKILDE AMTSKOMMUN	100	96	101	115	135	104	107
Rural amter	*88*	*91*	*93*	*126*	*145*	*99*	*98*
Intermediate amter	*90*	*89*	*91*	*125*	*145*	*104*	*92*
Urban amter	*136*	*135*	*127*	*114*	*121*	*98*	*110*

Notes:

1. Natural balance: Birth rate less Death rate.
2. Net migration: Population change over 1981-1995 less Natural balance.
3. Dependency ratio: Population aged 0-14 and over 64 to Population aged 15-64.
4. Participation rate: Labour Force in percent of Population aged 15-64.
5. Labour Market Pressure ratio: Population aged 5-14 to Population aged 55-64.
6. Unemployment rate: Unemployed in percent of Labour Force.

Source: OECD Territorial Data Base.

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DENMARK

Territorial Indicators of Education, Research and Innovation

Regional units : **Regions**	**Education** Educational attainment of the population aged 25-66 by region in 1995			
	Low (<ISCED 3)	Medium (ISCED 3)	High (ISCED 5,6,7)	Upper (ISCED 3 to 7)
National	**40**	**40**	**20**	**60**
HOVEDSTADSREGIONEN	**35**	**40**	**25**	**65**
KOEBENHAVN OG FREDERIKS.KOM	39	35	26	61
KOEBENHAVNS AMTSKOMMUNE	34	42	24	66
FREDERIKSBORG AMTSKOMMUNE	32	41	27	68
ROSKILDE AMTSKOMMUNE	34	46	20	66
Leading regions				
Lagging regions				
High income regions				
Low income regions				

	Research		
	R&D expenditure in % of GDP 1995	R&D expenditure ECU per inhabitant 1995	Working population in % of total employment 1995
National	**1,7**	**322**	**1,6**
HOVEDSTADSREGIONEN	**..**	**..**	**..**
KOEBENHAVN OG FREDERIKS.KOM	..	..	..
KOEBENHAVNS AMTSKOMMUNE	..	..	..
FREDERIKSBORG AMTSKOMMUNE	..	..	..
ROSKILDE AMTSKOMMUNE	..	..	..
Leading regions			
Lagging regions			
High income regions			
Low income regions			

	Innovation Number of patent applications per million inhabitants	
	1990	1995
National	**82**	**119**
HOVEDSTADSREGIONEN	**..**	**..**
KOEBENHAVN OG FREDERIKS.KOM	..	..
KOEBENHAVNS AMTSKOMMUNE	..	..
FREDERIKSBORG AMTSKOMMUNE	..	..
ROSKILDE AMTSKOMMUNE	..	..
Leading regions		
Lagging regions		
High income regions		
Low income regions		

Source: OECD Territorial Data Base.

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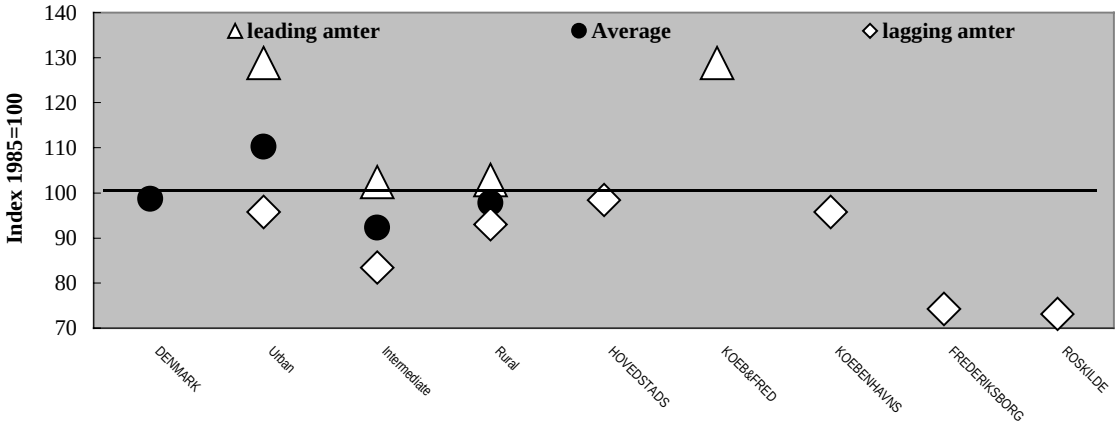
DENMARK
Territorial disparities in Labour market structures and dynamics

Regional units : Amter	Employment 1995 regional shares	Employment structure, 1995 In percent of total employment				Employment change, 1985-1995 1985=100		
		Female	Agriculture	Industry	Services	Agriculture	Industry	Services
National	**2 507 700**	**46**	**5**	**27**	**68**	**..**	**..**	**..**
HOVEDSTADSREGIONEN	**887 100**	**44**	**1**	**19**	**80**	**..**	**..**	**..**
KOEBENHAVN OG FREDERIKS.K(	344 100	29	0	13	87	..	..	..
KOEBENHAVNS AMTSKOMMUNE	326 100	47	0	21	78	..	..	..
FREDERIKSBORG AMTSKOMMUN	133 800	65	2	24	74	..	..	..
ROSKILDE AMTSKOMMUNE	83 100	69	3	24	72	..	..	..
Rural amter	*38%*	*47*	*8*	*32*	*60*	..	..	..
Intermediate amter	*35%*	*52*	*5*	*28*	*67*	..	..	..
Urban amter	*27%*	*37*	*0*	*17*	*83*	..	..	..

Employment change, 1985-1995



	Number of Amter	Employment 1995 regional shares	Employment change, 1985-95 Total 1985=100	Difference to national
National	**15**	**2 507 700**	**99**	
HOVEDSTADSREGIONEN	**4**	**887 100**	**98**	**-0,3**
KOEBENHAVN OG FREDERIKS.KOM	1	344 100	129	30
KOEBENHAVNS AMTSKOMMUNE	1	326 100	96	-3
FREDERIKSBORG AMTSKOMMUNE	1	133 800	74	-24
ROSKILDE AMTSKOMMUNE	1	83 100	73	-26
Rural amter	***8***	***38 %***	***98***	***-1***
leading amter	*4*	*20 %*	*103*	*4*
lagging amter	*4*	*19 %*	*93*	*-6*
Intermediate amter	***5***	***35 %***	***92***	***-6***
leading amter	*2*	*18%*	*102*	*4*
lagging amter	*3*	*17 %*	*83*	*-15*
Urban amter	***2***	***27 %***	***110***	***12***
leading amter	*1*	*14 %*	*129*	*30*
lagging amter	*1*	*13 %*	*96*	*-3*

Source: OECD Territorial Data Base.

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SPAIN
Territorial differences in demography, employment and gross domestic product

Regional units : Provincias + Ceuta y Melilla	Number of Provincias & CM	Area km² regional shares	Population density inh./km²	Percent of rural population	Population, 1996 inhabitants regional shares
National	**52**	**504 734**	**78**	**30%**	**39 270 000**
ANDALUCIA	**8**	**87 653**	**82**	**41%**	**7 151 100**
ALMERIA	1	8 814	54	40%	473 700
CADIZ	1	7 441	149	38%	1 105 000
CORDOBA	1	13 770	56	51%	768 100
GRANADA	1	12 618	64	42%	813 100
HUELVA	1	10 149	44	54%	448 100
JAEN	1	13 499	48	74%	647 200
MALAGA	1	7 301	164	24%	1 199 200
SEVILLA	1	14 061	119	31%	1 673 800
Rural provincias	*19*	*49%*	*27*	*74%*	*17%*
Intermediate provincias	*25*	*44%*	*82*	*32%*	*46%*
Urban provincias	*8*	*7%*	*416*	*6%*	*37%*

	Population change % 1981-96	Natural balance[1] % 1981-96	Net migration[2] % 1981-96	Dependency ratio[3] 1995 Total	Youth	Ederly
National	**4,2**	**5,4**	**-1,2**	**50**	**29**	**21**
ANDALUCIA	**10,7**	**10,9**	**-0,3**	**53**	**35**	**18**
ALMERIA	15,3	15,2	0,1	54	34	20
CADIZ	11,8	11,7	0,1	52	38	14
CORDOBA	6,6	6,5	0,1	56	36	20
GRANADA	7,2	7,1	0,1	53	33	20
HUELVA	7,1	7,0	0,1	56	36	20
JAEN	1,1	1,0	0,1	56	33	22
MALAGA	16,9	16,8	0,1	52	34	17
SEVILLA	13,2	13,1	0,1	53	36	17
Rural provincias	*-1,0*	*2,6*	*-3,6*	*57*	*30*	*27*
Intermediate provincias	*7,3*	*5,9*	*1,4*	*51*	*30*	*21*
Urban provincias	*3,0*	*6,0*	*-3,1*	*46*	*27*	*18*

Notes:
1. Natural balance: Birth rate less death rate.
2. Net migration: Population change over 1981-1996 less natural balance.
3. Dependency ratio: Population aged 0-14 and over 64 to population aged 15-64.

Source: OECD Territorial Database.

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SPAIN
Territorial differences in demography, employment and gross domestic product

Regional units : Provincias + Ceuta y Melilla	Labour force, 1991 Participation rate[4] Total	Female	Labour Force Pressure[5]	Unemployment, 1996 Unemployment rate[6] Total	Female	Youth, 1991
National	**58**	**41**	**1,3**	**23**	**30**	**39**
ANDALUCIA	**46**	**36**	**1,6**	**33**	**41**	**42**
ALMERIA	57	40	1,4	21	27	30
CADIZ	53	31	2,1	39	53	44
CORDOBA	54	35	1,5	36	46	45
GRANADA	49	32	1,4	33	39	45
HUELVA	55	35	1,6	29	38	44
JAEN	55	36	1,2	38	53	31
MALAGA	58	44	1,6	31	36	36
SEVILLA	54	34	1,8	31	38	51
Rural provincias	*57*	*39*	*1,1*	*24*	*33*	*40*
Intermediate provincias	*58*	*42*	*1,3*	*23*	*31*	*39*
Urban provincias	*58*	*41*	*1,3*	*22*	*28*	*39*

	GDP per capita, in US$ using PPP's of 1990 National = 100			Gross Domestic Product change, 1981=100		Employment change, 1986=100	
	1981	1991	1996	1991	1996	1991	1996
National	**9 100**	**12 000**	**12 800**	**136**	**146**	**117**	**115**
ANDALUCIA	**79**	**75**	**72**	**136**	**143**	**121**	**116**
ALMERIA	78	90	88	167	180	118	120
CADIZ	86	79	73	130	132	116	110
CORDOBA	71	68	68	133	143	127	121
GRANADA	68	68	70	136	152	113	116
HUELVA	96	89	81	129	128	125	116
JAEN	74	73	72	133	139	106	100
MALAGA	78	74	73	147	152	124	121
SEVILLA	76	79	74	144	154	129	122
Rural provincias	*82*	*79*	*80*	*129*	*136*	*110*	*104*
Intermediate provincias	*98*	*95*	*94*	*136*	*145*	*116*	*113*
Urban provincias	*111*	*116*	*117*	*140*	*151*	*121*	*122*

Notes:

4. Participation rate: Labour force in percent of population aged 15-64. 5. Rate of pressure on the labour market. Population aged 5 to 14 compared with population aged 55 to 64. 6. Unemployment rate: Unemployed in percent of labour force.

Source: OECD Territorial Database.

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SPAIN

Territorial indicators of education, research and innovation

Regional units : **Comunidades autonomas**	**Education** Educational attainment of the population aged 25-59 by region in 1995			
	Low (<ISCED 3)	Medium (ISCED 3)	High (ISCED 5,6,7)	Upper (ISCED 3 to 7)
National	**65**	**15**	**20**	**35**
ANDALUCIA	**71**	**13**	**16**	**29**
ALMERIA	71	16	13	29
CADIZ	69	19	12	31
CORDOBA	70	17	13	30
GRANADA	64	18	18	36
HUELVA	74	14	12	26
JAEN	73	15	12	27
MALAGA	68	19	13	32
SEVILLA	68	17	15	32
Leading regions	65	15	19	35
Lagging regions	65	14	20	35
High income regions	59	17	23	40
Low income regions	69	14	17	31

	Research					
	R&D expenditure in % of GDP		R&D expenditure ECU per inhabitant		Working population in % of total employment	
	1990	1995	1990	1995	1990	1995
National	**0,84**	**0,80**	**85**	**87**	**0,87**	**0,87**
ANDALUCIA	**0,46**	**0,49**	**35**	**39**	**0,57**	**0,59**
ALMERIA	..	..	..	..	..	..
CADIZ	..	..	..	..	..	..
CORDOBA	..	..	..	..	..	..
GRANADA	..	..	..	..	..	..
HUELVA	..	..	..	..	..	..
JAEN	..	..	..	..	..	..
MALAGA	..	..	..	..	..	..
SEVILLA	..	..	..	..	..	..
Leading regions	0,98	0,90	102	101	1,0	0,9
Lagging regions	0,53	0,56	50	57	0,5	0,6
High income regions	1,31	1,12	159	150	1,2	1,2
Low income regions	0,38	0,47	33	43	0,5	0,5

	Innovation Number of patent applications per million inhabitants	
	1990	1995
National	**7**	**12**
ANDALUCIA	**2**	**3**
ALMERIA	..	3
CADIZ	..	2
CORDOBA	1	2
GRANADA	2	1
HUELVA	3	1
JAEN	..	1
MALAGA	..	4
SEVILLA	5	5
Leading regions	..	15
Lagging regions	2	5
High income regions	13	21
Low income regions	2	5

Source: OECD Territorial Database.

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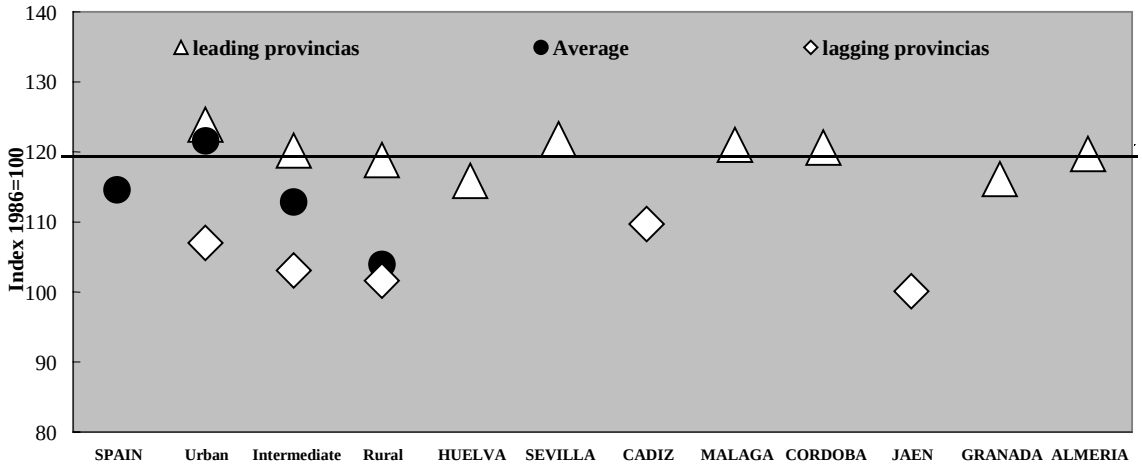
SPAIN

Territorial differences in labour market structures and dynamics

Regional units : Provincias + Ceuta y Melilla	Employment 1996 regional shares	Employment structure 1996 In percent of total employment				Employment change, 1986-96 1986=100		
		Female	Agriculture	Industry	Services	Agriculture	Industry	Services
National	**12 937 600**	**..**	**8**	**29**	**62**	**66**	**109**	**131**
ANDALUCIA	**1 831 500**	**..**	**12**	**23**	**66**	**77**	**112**	**130**
ALMERIA	146 900	..	24	16	60	82	113	150
CADIZ	269 300	..	9	25	66	76	103	121
CORDOBA	198 200	..	16	23	60	99	120	129
GRANADA	207 500	..	12	20	68	75	116	128
HUELVA	116 900	..	14	26	61	87	107	130
JAEN	164 300	..	18	26	56	67	105	116
MALAGA	302 300	..	7	21	72	76	113	131
SEVILLA	426 100	..	8	23	69	67	117	136
Rural provincias	*16%*	..	*18*	*26*	*56*	*64*	*113*	*125*
Intermediate provincias	*45%*	..	*10*	*28*	*61*	*66*	*109*	*131*
Urban provincias	*40%*	..	*2*	*32*	*66*	*72*	*108*	*132*

Employment change, 1986-96



	Number of Provincias & CM	Employment 1996 regional shares	Employment change, 1986-96 Total 1986=100	Difference to national
National	**52**	**12 937 600**	**115**	
ANDALUCIA	**8**	**1 831 500**	**116**	**1,7**
ALMERIA	1	146 900	120	5,1
CADIZ	1	269 300	110	-4,9
CORDOBA	1	198 200	121	6,1
GRANADA	1	207 500	116	1,5
HUELVA	1	116 900	116	1,3
JAEN	1	164 300	100	-14,5
MALAGA	1	302 300	121	6,4
SEVILLA	1	426 100	122	7,3
Rural provincias	***19***	***16 %***	***104***	***-10,6***
leading provincias	*2*	*2 %*	*119*	*4,2*
lagging provincias	*17*	*13 %*	*102*	*-13,0*
Intermediate provincias	***25***	***45 %***	***113***	***-1,7***
leading provincias	*14*	*27%*	*120*	*5,6*
lagging provincias	*11*	*17 %*	*103*	*-11,5*
Urban provincias	***8***	***40 %***	***122***	***7,0***
leading provincias	*6*	*35 %*	*124*	*9,3*
lagging provincias	*2*	*5 %*	*107*	*-7,6*

Source: OECD Territorial Database.

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UNITED KINGDOM
Territorial indicators of demography, employment and gross domestic product

Regional units : Counties/LAR	Number of counties/LAR	Area km^2 regional shares	Population density inh./km^2	Percent of rural population	Population, 1995 inhabitants regional shares
National	**65**	**245 826**	**238**	**13%**	**58 605 800**
London	1	1 585	4 420	0%	7 007 100
Kent	1	3 909	397	13%	1 551 300
KENT THAMES-SIDE	0	172	1 023	13%	176 000
Rural counties	*5*	*19%*	*14*	*82%*	*1%*
Intermediate counties	*27*	*52%*	*126*	*29%*	*27%*
Urban counties	*33*	*29%*	*586*	*5%*	*72%*

	Population change % 1980-95	Natural balance[1] % 1980-95	Net migration[2] % 1980-95	Dependency ratio[3] 1995 Total	Youth	Ederly
National	**4,0**	**2,8**	**1,2**	**61**	**30**	**31**
London	3,0	6,1	-3,1	55	29	26
Kent	4,5	2,1	2,4	63	30	33
KENT THAMES-SIDE	-0,4[7]	..	..	52	30	22
Rural counties	*4,1*	*-0,9*	*5,0*	*65*	*30*	*36*
Intermediate counties	*8,4*	*1,8*	*6,6*	*63*	*30*	*33*
Urban counties	*2,4*	*3,2*	*-0,8*	*61*	*30*	*31*

	Labour force, 1995 Participation rate[4] Total	Female	Labour market pressure[5]	Unemployment, 1995 Unemployment rate[6] Total	Female	Youth
National	**74**	**67**	**1,3**	**8,2**	**6,3**	**15,0**
London	73	67	1,4	11,7	9,1	20,0
Kent	77	70	1,3	6,9	6,1	12,1
KENT THAMES-SIDE	78[8]	65[8]	1,3	8,2	4,2	..
Rural counties	*75*	*70*	*1,2*	*7,4*	*5,6*	*11,3*
Intermediate counties	*75*	*68*	*1,3*	*7,4*	*5,6*	*12,9*
Urban counties	*73*	*67*	*1,3*	*8,6*	*6,6*	*15,8*

	GDP per capita, in US$ using PPPs of 1990 National = 100 1980	1990	1995	Gross Domestic Product change, 1980=100 1990	1995	Employment change, 1980=100 1990	1995
National	**13 172**	**16 541**	**17 754**	**129**	**140**	**106**	**106**
London	154	147	145	122	131	129	126
Kent	87	92	92	137	149	107	105
KENT THAMES-SIDE	..	..	88	..	..	100	96
Rural counties	*93*	*85*	*83*	*118*	*126*	*108*	*107*
Intermediate counties	*90*	*93*	*94*	*139*	*153*	*111*	*113*
Urban counties	*104*	*103*	*103*	*126*	*136*	*105*	*104*

Notes:
1. Natural balance: Birth rate less death rate.
2. Net migration: Population change over 1981-1995 less natural balance.
3. Dependency ratio: Population aged 0-14 and over 64 to population aged 15-64.
4. Participation rate: Labour Force in percent of population aged 15-64.
5. Labour market pressure ratio: Population aged 5-14 to population aged 55-64.
6. Unemployment rate: Unemployed in percent of labour force.
7. 1981-1995.
8. 1991 Census data.

Source: OECD Territorial Database.

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UNITED KINGDOM
Territorial Indicators of Education, Research and Innovation

Regional units : **Group of counties**	**Education** Educational attainment of the population aged 25-59 by region in 1995			
	Low (<ISCED 3)	Medium (ISCED 3)	High (ISCED 5,6,7)	Upper (ISCED 3 to 7)
National	**45**	**32**	**23**	**55**
SOUTH EAST	**44**	**29**	**27**	**56**
Kent	46	33	21	54
Leading regions	43	32	24	57
Lagging regions	46	33	22	54
High income regions	44	29	27	56
Low income regions	45	33	22	55

	Research		
	R&D expenditure in % of GDP 1995	R&D expenditure ECU per inhabitant 1995	Working population in % of total employment 1990
National	**2,0**	295	1,6
SOUTH EAST	**2,7**	460	2,2
Kent	..	..	..
Leading regions	2,6	407	2,0
Lagging regions	1,5	195	1,2
High income regions	2,7	460	2,2
Low income regions	1,6	217	1,2

	Innovation Number of patent applications per million inhabitants	
	1990	1995
National	**82**	**79**
SOUTH EAST	**43**	**43**
Kent	34	38
Leading regions	43	47
Lagging regions	28	35
High income regions	43	43
Low income regions	30	39

Source: OECD Territorial Data Base.

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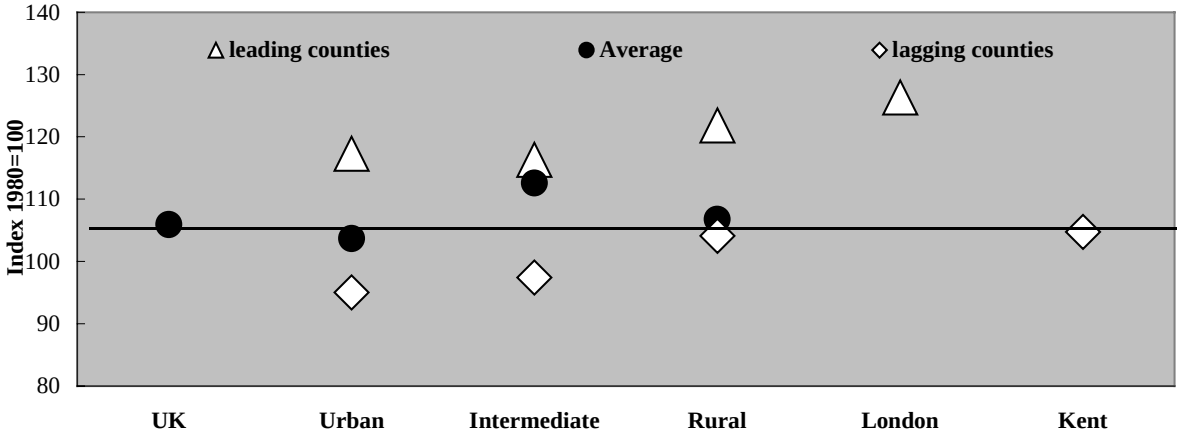
UNITED KINGDOM
Territorial disparities in Labour market structures and dynamics

Regional units : Counties/LAR	Employment 1995 regional shares	Employment structure, 1995 In percent of total employment				Employment change, 1980-1995 1980=100		
		Female	Agriculture	Industry	Services	Agriculture	Industry	Services
National	**22 012 600**	**49**	**1**	**23**	**75**	**76**	**63**	**124**
London	3 192 500	48	0	3	97	167	10	106
Kent	518 000	50	3	11	85	85	33	127
KENT THAMES-SIDE	55 800	49	2	24	74	61	88	123
Rural counties	*1%*	*52*	*7*	*65*	*69*	*93*	*217*	*124*
Intermediate counties	*26%*	*49*	*3*	*39*	*72*	*73*	*125*	*134*
Urban counties	*73%*	*49*	*1*	*16*	*77*	*80*	*43*	*120*

Employment change, 1980-1995



	Number of Counties/LAR	Employment 1995 regional shares	Employment change, 1980-95 Total 1980=100	Difference to national
National	**65**	**22 012 600**	**106**	
London, leading county	1	3 192 500	126	20
Kent, lagging county	1	518 000	105	-1
KENT THAMES-SIDE		55 800	96	-10
Rural counties	***5***	***1 %***	***107***	***1***
leading counties	*1*	*0 %*	*122*	*16*
lagging counties	*4*	*1 %*	*104*	*-2*
Intermediate counties	***27***	***26 %***	***113***	***7***
leading counties	*19*	*22%*	*116*	*10*
lagging counties	*8*	*5 %*	*97*	*-8*
Urban counties	***33***	***73 %***	***104***	***-2***
leading counties	*11*	*32 %*	*117*	*11*
lagging counties	*22*	*41 %*	*95*	*-11*

Source: OECD Territorial Data Base.

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OECD PUBLICATIONS, 2, rue André-Pascal, 75775 PARIS CEDEX 16
PRINTED IN FRANCE
(96 2001 02 1 P) ISBN 92-64-18621-2 – No. 51547 2001