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UNDERSTANDING THE REGIONAL CONTRIBUTION OF HIGHER EDUCATION INSTITUTIONS: A LITERATURE REVIEW

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This is a research report prepared for the OECD-IMHE project "Supporting the Contribution of Higher Education Institutions to Regional Development"

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FOREWORD

This literature review has been commissioned by the OECD and is written as part of the project (Supporting the Contribution of Higher Education Institutions to Regional Development", which is conducted by the OECD's Programme on Institutional Management in Higher Education (IMHE) in collaboration with the OECD Territorial Development and Public Governance Directorate. The principle objective of the project is to strengthen partnerships between the higher education institutions and their regional stakeholders by reviewing patterns of interaction, highlighting experiences and disseminating good practices.

The project includes 14 regions in the following countries: Australia, Brazil, Canada, Denmark, England, Finland, Korea, Mexico, the Netherlands, Norway, Spain and Sweden. The regions have been selected through a dialogue between the OECD and interested regions, relevant public authorities and higher education institutions, based on the criteria of regional engagement and the willingness to devote the necessary resources to the accomplishment of the project. In this way, the project has not been set up as a rigorous research project, but is aiming at policy development and mutual learning.

The written outcomes of the project will be a series of self-evaluation reports prepared by the participating regions, peer review reports prepared by teams of international experts who undertake regional review visits and a final report summarising the main findings and giving recommendations for all regions, higher education institutions and national governments.

This literature review is meant to supplement the regional reports and serve as an additional source for the preparation of the final report. Hence, the paper goes beyond the particular regions of the OECD project and takes an overall view on the development of universities in a regional context. It focuses on the evolution and discourses of higher education and research, the regional aspects of higher education policies, the various functions and roles that the institutions play, measures taken to link the universities with their regional partners and the conditions that seem to favour or hamper a stronger regional engagement.

The report does not claim to cover all relevant literature. We have omitted studies of national systems of education, higher education management and the inner life of higher education, as well as econometric studies of the impact of higher education and academic research. Furthermore, the literature review is mainly based on a selection of European and North American publications. This is, of course, an obvious limitation, but a necessary one due to language barriers and the restricted time and resources available for conducting the study.

The work has been divided between the two of us. The first part has been the responsibility of Peter Arbo, while Paul Benneworth has written the second part.

We would like to acknowledge the contribution of Professor Peter Roberts, Leanne Benneworth (nee Conroy) and Professor Steve Garlick to the chapter *Universities and the Environment: Embedding Sustainable Development*, which draws heavily on work undertaken within the framework of the Fourth Framework programme UNIREG (Universities and Regional Development) and a Centre for Urban and Regional Development Studies (CURDS) small research project grant. We would also like to acknowledge the guiding hand of the academic leader of the OECD/IMHE review project in this literature review,

Professor John Goddard, Newcastle University, particularly for the structure of the regional sections. Any mistakes and omissions remain of course the responsibility of the authors. The report solely expresses the views of the authors and does not necessarily represent the position of the OECD.

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ABSTRACT

The contribution of higher education institutions to regional development is a theme that has attracted growing attention in recent years. Knowledge institutions are increasingly expected not only to conduct education and research, but also to play an active role in the economic, social and cultural development of their regions. The extent to which higher education institutions are able to play this role depends on a number of circumstances: the characteristics of the institutions, the regions in which they are located and the policy frameworks are all significant. At the same time, there are signs of more fundamental conceptual and strategic confusion. The discussions in this domain are frequently characterised by slogans and popular metaphors.

This literature review was prepared to support the OECD project entitled "Supporting the Contribution of Higher Education Institutions to Regional Development", which was conducted by the OECD Programme on Institutional Management in Higher Education (IMHE) in collaboration with the Directorate of Public Governance and Territorial Development. Drawing mainly from a selection of European and North American publications, the report takes an overall view on the development of higher education institutions in the regional context. It focuses on the evolution and discourses of higher education and research, the regional aspects of higher education policies, the various functions and roles that the institutions play, measures taken to link the universities with their regional partners, and the conditions which favour or hamper stronger regional engagement.

RESUME

La contribution de l'enseignement supérieur au développement régional suscite depuis plusieurs années un intérêt toujours croissant. De plus en plus, on attend des institutions en charge du savoir non seulement qu'elles mènent les activités liées à l'enseignement et à la recherche, mais aussi qu'elles prennent une part active au développement économique, social et culturel de leur région. La marge de manœuvre dont disposent les établissements d'enseignement supérieur pour remplir ce rôle varie selon certains facteurs : les caractéristiques de l'établissement, la région et le cadre politique dans lesquels il s'inscrit sont autant de critères significatifs. Par ailleurs, on identifie également les signes d'une confusion conceptuelle et stratégique plus profonde, les débats sur ce sujet étant souvent caractérisés par les slogans et les métaphores populaires.

Cette analyse bibliographique a été préparée en soutien au projet de l'OCDE intitulé « Appuyer la contribution des institutions d'enseignement supérieur au développement régional », mené par le Programme de l'OCDE sur la gestion des établissements d'enseignement supérieur (IMHE) en coopération avec la Direction de la gouvernance publique et du développement territorial. À partir d'une sélection de publications principalement européennes et nord-américaines, ce rapport adopte une vue d'ensemble sur le développement des établissements d'enseignement supérieur dans le contexte régional. Il cible notamment l'évolution et les débats dans l'enseignement supérieur et la recherche, le volet régional des politiques d'enseignement supérieur, les divers fonctions et rôles que remplissent les établissements, les mesures prises pour relier les universités à leurs partenaires régionaux, ainsi que les conditions qui favorisent ou freinent un engagement régional plus marqué.

INTRODUCTION

The contribution of higher education institutions to regional development is a theme that has attracted increasing attention in recent years. Currently, it is expected that the knowledge institutions not only conduct education and research, but also play an active role in the development of their economic, social and cultural surroundings. In other words, they are entrusted with a regional mission. The extent to which institutions of higher education are able to take on this role will depend on a number of circumstances. Characteristic of the individual institutions, the various regions in which they are located and the national policy frameworks will obviously be of substantial significance. At the same time, there are signs of a more fundamental conceptual and strategic confusion. In spite of the fact that the regional contribution of higher education is on the policy agenda, it remains far from clear how the institutions actually function and what their new responsibilities will entail. Nor is there consensus as to what standing collaboration with industry and community should have in their overall operation and which priorities are relevant. The discussions are frequently characterised by a few slogans and popular metaphors.

Perhaps this is not so surprising. Lakoff and Johnson (1980) showed how our perceptions and ways of understanding are, to a high degree, textured through the medium of metaphors. Morgan (1986) introduced the concept of organisational images and pointed out how important such intellectual devices are to our understanding of organisations. Similarly, some central metaphors seem to recur when higher education and regional development are under discussion. To begin with we have machine metaphors: Higher education acts as an "engine", "powerhouse", "driver", "dynamo", "booster", "accelerator" or "lever" for regional growth and prosperity. The wording suggests that this is where the pace is set for the region's progress. The other type of metaphor is the biological: Higher education represents a "hothouse", "seedbed", "breeding ground", "spawning place", "catalyst", or "fermenter" for regional development. These concepts engender associations with something that sprouts then blossoms. This is the place for innovation and reinvigoration. The third set of metaphors centre on networks: Higher education constitutes a "node", "hub", "bridgehead", "mediator", "coupling unit", "transfer point", "transmission centre", etc. Here, access to and dissemination of information and knowledge are emphasised. The final type is the time metaphor, which suggests that the institutions of higher education take the lead in a transformation process. They herald and symbolise a new era. Terms like "spearhead", "vanguard", "lighthouse" and "signpost" are used. All the metaphors thus provide definitions of reality and tell us something about the character and role of the higher education institutions.

In this paper we want to get behind these metaphors and take a closer look at how higher education contributes to regional development. By higher education we mean universities, university colleges and other institutions that provide a post-secondary education and which normally involve an element of research and development work. The terms university and higher education institution will partly be used synonymously, unless otherwise clarified. The concept of the region can be defined in many ways. Here we are primarily alluding to a territory or level of authority in between the local and the national level, although reference may also be made to units which cut across national boundaries. But before we go into the regional significance of the higher education institutions, we shall start by summing up how higher education and regional development became linked in the first place. This combination is by no means self-evident. The idea of higher education institutions having a regional mission is relatively new. First we shall take a look at the place higher education has occupied in the regional development discourse and then look at how the regional theme was introduced in connection with the discourse on higher education.

HIGHER EDUCATION IN THE CONTEXT OF REGIONAL POLICY AND THEORY

The transition from the agricultural to the industrial society in the second half of the nineteenth century brought about tremendous economic, social and demographic upheaval. Among the new tasks assumed by central governments were social protection, territorial planning and development of the physical infrastructure. The first attempts at regional policy came about during the years of crisis in the interwar period. The best known of these is United States president Roosevelt's New Deal programme, which aimed to relieve unemployment, introduce welfare for the poor and to spur reform in banking, agriculture, industry and labour. Similar measures were also implemented in many other countries. Physical planning was thus given an economic supplement, the aim of which was to create employment and economic development in designated problem areas. In most industrial countries, this was continued and expanded after the Second World War as part of a more comprehensive modernisation policy. The institutionalisation of regional policy is therefore mainly a post-war phenomenon.

What was the basis of this new regional policy? Unequal economic development is nothing new, neither between different countries nor within the same country. There are prospering and wealthy regions, where the economy is under dynamic development and where the population has work and earns good money. There are also structurally weak regions, where people have difficulty finding both work and income, and development opportunities are not as good. This is the way it has been throughout the history of capitalism. The new element introduced was that spatial inequality was now perceived as a problem. It represented a breach of an implicit equality norm – a divergence from an imaginary equal reference distribution of resources within the territory of the state (Kilper, 2004). Moreover, finding a solution to the problem was made the responsibility of the central government. It was assumed that the central government was in a position to intervene and rectify the inequalities and that this potential should be exploited. The growth of regional policy is thus closely bound up with the establishment of the modern welfare state (Flora and Heidenheimer, 1981). Marshall (1950) saw this as an extension of the idea of citizenship, from civil rights via political rights, to include social rights, covering basic living standards. The new policy reflected the class compromises of the interwar period, the advance of Keynesianism, the experiences of war and a deeper national spirit of community and common fate.

The rationale of regional policy

Higher education had no place in the regional policy that took shape in the 1950s. Science, though, played an important role. Trust in central government planning, regulation and redistribution, rested on widespread scientific optimism. It was science – in the form of statistics, economic models and devised measures – that paved the way for a rational and efficient government steering. Besides, it was science that eventually provided the theoretical rationale for a distinct policy with a view to promoting inter-regional convergence. The premises were given by Myrdal, Hirschman, Kaldor and others. What they had in common was a departure from the neoclassical economic tradition and the assumptions of mobile factors of production, atomistic agents, homogeneity across firms, and no economies of scale. Instead of assuming that regional differences would be offset by the equilibrating forces of the market, they pointed out that a cumulative logic of agglomeration usually ensues once it is set in motion.

Myrdal introduced "the principle of circular and cumulative causation" (1957), while Hirschman pointed to the cumulative effects created by dynamic sectors through "forward and backward linkages" (1958). According to Kaldor this was

> ...nothing else but the existence of increasing returns to scale – using that term in the broadest sense – in processing activities. These are not just the economies of large-scale production,

> commonly considered, but the cumulative advantages accruing from the growth of industry itself – the development of skill and know-how; the opportunities for easy communication of ideas and experience; the opportunity for ever-increasing differentiation of processes and of specialization in human activities. (Kaldor, 1970, p. 340)

Kaldor believed that as far as industrial activities were concerned, exogenous growth in demand would lead to growth in the scale of activities and an associated growth of productivity and efficiency. The authors pointed out that the growth processes would produce both concentration effects and diffusion effects - termed "backwash effects" and "spread effects" by Myrdal – but that the former would usually dominate. As soon as a region developed an initial growth advantage, it would tend to keep it. This resulted in increased polarisation.

Similar thoughts on vicious and virtuous circles were formulated by Perroux (1970 [1955]). His concept of "growth poles" and "propulsive industries" formed part of an attempt to create an integrated theory of economic inequalities, power exercised in space and irreversible economic influences. A growth pole refers to the grouping of industries around a central core of other industries and firms whose actions act as a catalyst to growth. Different areas will be either dominated by, or dependent on, the growth poles. Kaldor's conclusion was that "if left to market processes alone, tendencies to regional concentration of industrial activities will proceed farther than they would have done if 'private costs' were equal to 'social cost'" (Kaldor, 1970, p. 344). To Myrdal, the issue was ultimately a moral one: If the object is to distribute economic wealth and social welfare, it should be made a political task.

Industry-oriented modernisation

Regional policy in Europe developed in a period characterised by reconstruction and economic expansion, accompanied by trade liberalisation and economic integration. In both political and professional circles, attention was directed at the level of industrial development. Regional inequality was linked to a centre/periphery distinction, where region became synonymous with rural areas. There were therefore many parallels between the regional policy pursued in relation to the national periphery and the foreign aid policy conducted in relation to the Third World. The chief concern was to help underdeveloped areas catch up with developed areas. The key to development was to rationalise primary industries and to promote growth among manufacturing industries. Fostering the export sector was given precedence. Industrialisation was seen as the road to enduring and profitable employment, notably for the male breadwinner.

The vehicles of industrialisation were regionally targeted investments in transport systems, energy, and public services together with financial incentives to private industry. Schemes were set up for the relocation of centre-based industries and for achieving larger return to scale in existing companies by means of investment in machinery, factories, etc. The concept of growth poles became a core planning doctrine, adopted with enthusiasm by regional planners in the 1960s and until the mid-1970s. Whereas Perroux dealt with abstract economic space, linkages, flows, and growth that could be generated far away from the growth pole, concentrating on growth centres was seen as a simple prescription for development where the corresponding synergy and multiplier effects would also benefit the surrounding geographic areas. After an initial investment, growth would radiate outward and become self-sustaining.

The usual indicators of regional disparity were employment (working and unemployed), regional GDP per capita, growth rates, settlement structure, population density per square kilometre, and access to technical, social and infrastructure facilities. The concept of regional disparity was, however, open in principle to other characteristics. More and more amenities were eventually considered relevant when it came to securing equal living conditions. As standards of living and the level of basic education improved, this also came to include an equal right to higher education and a better distribution of qualified

professionals among the regions. Education was defined to an increasing extent as a public good that should be made available to all citizens, just like health and culture. Many areas of politics were thus given a stronger regional dimension. However, for the government departments and development agencies that were set up to run sector-specific regional policy, the focus was still on industrial planning in the periphery.

This changed during the 1970s, with the oil crisis and the economic slump in most of the developed world. Unemployment increased and even core industries were hit. Mining, the steel industry, shipbuilding, the motor industry and numerous other industries wound up in crisis. The great United States manufacturing belt became known as the Rust Belt. The structural crisis created downward spirals, which dragged down many other facets of society with them. New geographic problem areas therefore came to light that could not be neatly arranged along the usual centre/periphery axis. At the same time, confidence in central government control and redistribution flagged. Keynesianism had given legitimacy to the active nation state, which was to replace the anarchy of the market with planning and order. It had been assumed that central government had the tools to guarantee stable growth. However, the combination of inflation and economic stagnation threw doubt on this. The entire underlying perception of development was thus shaken. The prevailing perception in the Western world was that there was one single universal route of development – from the traditional pre-industrial society to the modern industrial mass consumption society (Nedersveen Pieterse, 2003). As far as production and consumption were concerned, it was the United States – as the most advanced nation – which was the yardstick towards which the rest of the world leaned. Now it was the turn of modern society itself to be modernised (Offe, 1986).

There were many indications of a reconfiguration of the pattern of economic development. In Asia, new competitor nations appeared on the scene, apparently operating on the basis of an obscure logic. Competition suddenly arrived from new quarters and comprised more dimensions than previously – price, design, quality, and rapid launch and delivery of new products. The "Japanese miracle" aroused both fear and fascination. In addition to this, new technical innovations in fields like microelectronics and data processing heralded more far-reaching industrial changes. Tomorrow's growth industries seemed to be characterised by far closer links between science, technology and industrial development. Explanations and possible answers were sought in many directions.

Knowledge-oriented modernisation

The turning point came at the beginning of the 1980s. Two main directions became apparent: one of them conveyed the neo-liberal solution promoted by the political right. Public sector intervention, taxes, monopolies and the power of the trade unions were here considered to be the most important reasons for the reduction in economic growth. From being the solution to the problem, central government was, on the contrary, defined as the problem itself. Rolling back central government and reducing market-disruptive intervention thus became a central task (Self, 1993). This would be achieved through deregulation and privatisation, so that the markets were set free and private initiative stimulated anew. The other answer was more inspired by Schumpeter. The economic recession was here explained in terms of the theory of long waves (Freeman, *et al*., 1982), product life-cycle theory (Vernon, 1966; Abernathy and Utterback, 1978) and the development of a new international division of labour (Fröbel, *et al*., 1980). Another source of interpretation was the theories of the post-industrial society and the information society (Bell, 1973; Porat, 1977; Machlup, 1980), which proclaimed that a new historic epoch had arrived. Within this compound school of thought, an enthusiasm for technology stood out which made more space for governmental politics in the promotion of new techno-economic paradigms (Dosi, 1982; Perez, 1983; Freeman and Perez, 1988).

Neither the neo-liberal nor the neo-Schumpeterian direction met with full approval in every country. As such, they have been implemented in a variety of combinations. One chief concern for both schools of

thought, however, was to regenerate growth and competitiveness. Another common denominator was their orientation towards supply-side economics and a preoccupation with technological innovation. In this connection the knowledge infrastructure won renewed attention. The contribution of small and medium-sized enterprises (SMEs) to the overall vitality of the economy was also reassessed. As shown by Rothwell and Zegveld (1982), Birch (1987) and others, small businesses were responsible for the major share of new job creation.

Against this background, the higher education and research institutions made their entry into regional policy in the 1980s. They had long played an important role in political consultancy, but now there was also a focus on research as a source of innovation and realignment. In the new generation of regional policies, entrepreneurship constituted a central element. In addition to activating the unemployed, the young and other selected groups, an effort was made in preparing for budding talent and the commercialisation of research results. This resulted, among other things, in changes in legislation, such as the Bayh-Dole Act in the United States, passed in 1980. The intention was to encourage the utilisation of research by permitting universities and small businesses to elect ownership of inventions made under government funding and to become directly involved in the commercialisation process. Many institutions established patent and technology transfer offices. There was also an emphasis on creating closer ties between knowledge institutions and trade and industry in the regions. In order to strengthen these relations, outreach functions, intermediaries and joint research and development programmes were established. In addition, investments were often made in putting small and medium-sized businesses in a better position to make efficient use of new knowledge and technology. Their absorptive capacity and ability to seek the services of the research institutions was to be increased. Technology diffusion programs were implemented, as were strategic business development schemes and new forms of technical assistance and advice.

Another new facet of regional policy in the 1980s was that service industries generally – and producer and cultural services in particular – were given a more prominent place. Instead of being seen as second-rate activities derived from the manufacturing "export base", service and information businesses were increasingly treated as a new growth area in their own right and as being of great significance to the dynamics of economy as a whole. Some people envisioned that the diffusion of information technology would lead to the demise of geographical distance and promote a dispersal of economic activity from central cities toward peripheral areas. In many countries, there was an increase in the decentralisation of regional policy. The old top-down approach was partially replaced by a more bottom-up oriented approach, as more bodies and institutions joined the mobilisation for innovation. Furthermore, policy was more often implemented in the form of temporary programmes and projects, which, at the same time, were subjected to evaluation. This created a new contract market for research institutions and consultancies, which propelled the spread of new concepts and ideas, both at home and abroad.

Sources of inspiration

In the hunt for examples and prescriptions for success, it was above all Silicon Valley, Route 128 and other high technology centres that led the way. These were examples of organised research being transformed into commercial products and new thriving industries. Typically, the companies were not located on the basis of transport costs, access to markets or access to raw materials and energy, but on the basis of knowledge. The new centres mainly grew up outside the old industrial areas. Therefore, it was also assumed that the successes were more footloose and easy to copy. Everybody wanted to create their own Silicon Valleys and ride the emerging cycles of high-tech industry. When the experiences were summed up, a specific set of factors usually had to be present: a distinguished research centre, access to venture capital, a skilled labour force, a nearby international airport, cultural and natural amenities and a high quality of life. If these ingredients were in place, expansion would ensue, almost like a soufflé in the oven (Saxenian, 1989). The same could be expressed in a number of c's: competence, capital, communication,

creativity, and culture (Andersson and Strömquist, 1988). This resulted in a Technopolis concept, which policy-makers sought to implement – from Tokyo to Paris and Helsinki (Castells and Hall, 1994). The idea of growth centres had thus been reborn, with a university or a university-affiliated research institute as the fulcrum.

The more thorough studies carried out of the various high-tech centres showed the importance of contingent factors such as military spending, regulatory frameworks, business culture, deliberate policies, the actions of key persons, and fortunate conjunctures (see, for example, Rogers and Larsen, 1984; Markusen, *et al.*, 1986; Saxenian, 1994; Massey *et al.*, 1992). Each place had its own peculiar constellation of prerequisites that were difficult to reproduce in another context. However, interest had been aroused in networks and in what kind of environment was conducive to innovation.

Another important source of inspiration was the so-called "Third Italy" and the theory of post-Fordism (Piore and Sabel, 1984; Brusco, 1986; Pyke *et al.*, 1990). Marshall's concept of "industrial district" and previous research on external economies and agglomeration advantages were exploited. Likewise, ideas from the French regulation school were adopted (Aglietta, 1976; Lipietz, 1986). On the basis of examples from several countries, a general transition from standardised mass production to flexible specialisation was postulated. This involved a change of both regime of accumulation (the main technology system, dominant way of organising the production process, main form of consumption, labour-capital nexus, etc.) and mode of social regulation (the ensemble of institutions and conventions that reproduce the regime of accumulation through specific laws, agreements, state policies, political practices, industrial codes, culture of consumption, etc.). Flexible specialisation was characterised by dense, complex relations between firms and individuals. The new industrial districts resembled the high technology industrial complexes in the sense that a number of small and medium-sized companies specialised in different fields or stages of production processes, exploited flexible multipurpose technology, benefited from a pool of skilled workers and co-ordinated their companies' activities on the basis of mutual trust and informal systems of sanctions. The co-operation was also facilitated by specialised training institutions and common services. This was perceived as a new, more innovative method of organising production systems, which was adapted to a situation with a more heterogeneous, rapidly changing market demand. Large companies would, in future, undergo vertical disintegration, was the prediction (Scott, 1988).

The theories of industrial districts and flexible specialisation gave legitimacy to regional-political ventures that circumvented the core metropolitan regions. They confirmed the significance of network initiatives aimed at small and medium-sized companies and the establishment of technology and competence centres, marketing agencies, etc. On the other hand, they indicated that local history and culture might be decisive factors when it comes to explaining success. There was good reason to question the possibilities of generalising experiences from the craft- and design-based system of production and the special circumstances that characterised the Third Italy. The geography of innovation nonetheless appeared to be an important theme. The image that emerged was that economic activities are socially and culturally embedded (Granovetter, 1985).

Systems of innovation

After the fall of the Berlin Wall, the collapse of communism and the economic boom in the newly industrialised countries in Asia and Latin America, a new scene was set. The concepts of "the globalising learning economy" and "the knowledge-driven economy" came to epitomise the prevailing diagnosis of our time (Lundvall and Borrás, 1997; Archibugi and Lundvall, 2001). Globalisation is a metaphor that suggests that the world is shrinking. Cross-border connections are being intensified at all levels, and the economies are being woven ever closer together. This development is being driven by new information and communication technologies, cheaper transport, political liberalisation and deregulation measures and an

opening up of previously centrally-planned economies. Important directors also include the transnational companies, which have exploited new possibilities of managing and coordinating global operations.

At the same time, the perception of knowledge as a key condition of economic growth and wealth creation has progressively spread out. It is assumed that the performance of individuals, firms, regions and countries is increasingly determined by the capacity to learn and adapt to new conditions. The current dominant understanding is that innovation is linked to interactive learning processes involving many organisations and institutions. Innovation is not a linear movement in discrete steps from discovery and invention to commercialisation and diffusion, but an iterative process with many feedback loops, as illustrated in the Kline and Rosenberg chain-link model of technological change (Kline and Rosenberg, 1986). The focus is, therefore, on the internal organisation of companies and the linkages they have with their customers, suppliers, competitors, finance institutions, specialist consultancy services, etc. and on the interplay between trade and industry, public authorities and education and research institutions. In the Aalborg group version, the crux is the user-producer relations (Lundvall, 1988). Furthermore, it is emphasised that innovation has systemic and evolutionary characteristics (Edquist, 1997). The processes are given form by the existing production structure, knowledge infrastructure, institutional set-up, consumer demand structure, and policies at various levels. While innovation generates variation, yesterday's choices constantly impose restraints and contribute to a selection (Nelson and Winter, 1982; Dosi, 1988). The cognitive, normative, organisational and material settings developed create technological trajectories, dominant designs and path dependency. The OECD's major Technology and Economy programme (TEP) helped to spread and consolidate this understanding (OECD, 1992).

The new ideas about innovation left their mark on regional policy in the 1990s. Regional policy was defined as innovation policy and innovation was perceived on the basis of a systems approach. One main point, however, was the effect of globalisation on innovation systems. When the concept of innovation systems came into being it was primarily associated with national innovation systems. The point of departure was an attempt to understand the peculiarities of the Japanese growth model (Freeman, 1987), but it was soon realised that every country makes up an innovation system embracing a special pattern of industrial specialisation and its own research and education system, financial system, labour market institutions, etc. (Lundvall, 1992; Nelson, 1993). One way of understanding globalisation is that national boundaries and jurisdictions are becoming less and less important. Globalisation involves deterritorialisation – a borderless world (Ohmae, 1990). The "space of places" is replaced by the "space of flows" (Castells, 1996). Firms break away from previous ties and obligations and the local and regional production systems disintegrate. According to Saskia Sassen, the assemblage points of this new economy are networked global cities (Sassen, 1991). Another way of understanding globalisation is that it is taking place at many levels, where different initiatives and coping strategies are developed simultaneously. Globalisation is in itself a learning process for all types of players. The disembedding of social relations is constantly met with new attempts at re-embedding (Giddens, 1990). In line with Robertson's concept of "glocalisation" (Robertson, 1992), it has, therefore, been argued that globalisation is accompanied by a regionalisation process. The regions will become more and more important innovation arenas. This interpretation has given direction to the formulation of regional policy.

The region as a nexus

The literature provides many reasons for innovation having a territorial dimension (*cf.* Moulaert and Sekia, 2003; Doloreux, 2002; Simmie, 2005). Porter (1990, p. 19) argues that "competitive advantage is created and sustained through a highly localised process". The enduring competitive advantages lie increasingly in non-mobile and soft factors that distant rivals cannot acquire or match. According to Scott (1988) it is the multiplication of critical linkages in the networked form of production and the need to reduce transaction costs that make proximity an asset. The GREMI group chooses as its point of departure the uncertainty related to innovation and synthesises the localised advantages in the concept of the

"innovative milieu", where frequent personal interchanges and common understanding lay the foundations of collaboration and co-operative learning (Aydalot and Keeble, 1988). The network aspects are followed up in theories of social capital (Coleman, 1990; Putnam, 1993; Woolcock, 1998). Central to these theories is that social networks, trust and norms of reciprocity constitute a public good, which provides for better exchange of information, increased access to resources and a greater ability to address problems collectively. Others describe the social and cultural embeddedness in terms of concepts like "relational assets", "untraded interdependencies", "institutional thickness", etc. (Amin and Thrift, 1994; Storper, 1995). In the new endogenous growth theory, the watchword is "knowledge spillover". This is a sort of positive externality that, because of limited geographical reach, can be a source of sustained regional economic growth (Audretsch, 1998; Döring and Schnellenbach, 2004). The knowledge aspects are developed further in the theories of the "learning region" (Malmberg and Maskell, 1997; Morgan 1997), which grasp the dividing line between tacit and codifiable knowledge. While codified knowledge is formalised and disembodied, and can be stored, copied and transmitted easily, tacit knowledge is not formalised and is accumulated through personal experience, learning-by-doing, social relations and so on. Here it is the importance of tacit knowledge attached to face-to-face relationships and communities of practice that means that space and proximity *do* matter, not least in the early stages of innovation (Audretsch and Feldman, 1996).

In regional politics, different variants of these arguments have been used to substantiate the stake in regional innovation. When it comes to the difficult question of what constitutes relevant regional demarcation, this has, in practice, been determined by predefined political and administrative boundaries. Two concepts in particular have enjoyed high political affinity: one is the concept of "industrial clusters", and the other the concept of "regional innovation systems". These give education and research institutions a somewhat different place. Cluster theory (Porter, 1990, 1998, 2003) highlights the complex system of value chains linking together the different steps in the economic process, so that each step adds new value to the whole process. Porter's diamond of advantage concentrates on the linkages between industries and businesses and the intensity of inter-firm rivalry and co-operation, which lead to an upgrading of clusters through the pressure to innovate, complementarities and knowledge spillovers. Although many of the regional policy cluster initiatives have been aimed at information and communications technology, biotechnology and other fields involving higher education institutions, the perspective is undoubtedly that it is the companies that create value. Focus is on the companies and their connections, and the same basic policy model is treated as applicable everywhere (for a critical discussion, see Martin and Sunley, 2003).

In the theory of regional innovation systems (Braczyk, *et al*., 1998), which can be seen as a scaled-down version of the national innovation system to detect regional variations, the knowledge institutions are more clearly involved. Universities and research institutes are usually seen as core components of the regional innovation systems. In addition to the formal and informal institutions, the emphasis is on knowledge bases, their carriers, communications channels and mechanisms for learning and sharing of knowledge. Distinction is also made between different types of regions – for example peripheral regions, old industrial regions, and metropolitan regions – with different implications for policy (Tödling and Trippl, 2005).

Equality and diversity

The regional policy that has developed during the past ten years is definitely different from the policy that evolved after the end of the Second World War. The original regional policy was a government policy of equalisation within the nation's boundaries. It was self-reinforcing growth processes in central areas that created a need for a compensatory effort in the lagging regions. The policy was aimed at "the others" – the backward and disadvantaged. These days, the territorial frame of reference and player focus have changed. Regional policy has, to a high degree, become a regionalised innovation policy; a turn that has been underpinned by devolution processes in many countries. The individual regions are now involved in a race

for innovation to be competitive and attractive in the global marketplace. Central government has partially bowed out. Each individual region has assumed responsibility for its own development. In order to construct regional knowledge-based advantages, the geographical clustering of activities in city regions is generally supported. The policy deliberately aims to promote diversity.

The link between innovation and region was clearly reinforced by the escalation of EU regional policy of the late 1980s. After the Single European Act was signed in 1986, the Structural Funds were reformed in 1988 and their size doubled between 1987 and 1993. The strengthening of EU regional policy was intended to counterbalance the geographical inequalities that were expected to follow in the wake of economic integration. The aim of the inter-regional transfers was to accelerate the long-term restructuring of less-developed areas. At the same time, the programmes were part of the political construction of Europe. They were an attempt to circumvent the nation states by means of a new alliance between the EU Commission and the regions, built around tangible and visible projects with a European dimension. "Subsidiarity" and "Europe of Regions" became the new buzz words, something that led to regional mobilisation throughout Europe.

How far regional innovation policy is pursued varies from one country to another. In a few countries, the government gives first priority to maintaining macroeconomic stability, promoting competition, developing the right incentive structures and reducing the administrative burden on trade and industry. Little remains of a government regional policy. In other countries, regional considerations are, to a greater extent, built into different forms of central government policy. The government also attempts to boost the economic performance of cities and regions in order to build the regional foundation of national competitiveness. In this respect it usually remains an objective to close the gap between the prosperous and non-prosperous parts of the country. We see that in many instances, the regions are invited to join in competitions for the assignment of "growth areas", innovation environments", "centres of expertise", and other government designed programmes. The use of performance indicators and rankings is becoming ever more common, both in and between countries. In addition, benchmarking exercises that aim to generalise "best practice" are proliferating. A common feature is that stakes are made in expanding the infrastructure, spreading new information and communications technology, supporting small and medium-sized companies, promoting venture business, stepping up research, development and innovation, as well as improving cooperation between the research sector and the business sector.

New trends

An interesting tendency that clearly can be observed in Europe is how innovation policy is becoming ever more comprehensive. New topics and layers are being added to the notion of "innovation systems". This has come about in the wake of the increased focus on Europe's competitiveness *vis-à-vis* the United States and Japan and the new objectives of making the EU, by 2010, "the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion". The perspective has been expanded, both horizontally and vertically. Along the horizontal axis we see more and more fields of policy being included as relevant in an innovation context. Increased emphasis is being put on education and training, employability, the quality and skills of the labour force and lifelong learning. People and human resources are being brought into focus. Similarly, social cohesion (the reduction of spatial socio-economic inequalities) is an integral component of policy. The policies related to innovation and competitiveness must address the challenges of unemployment, poverty and exclusion and ensure social security and full participation in society. They must also contribute to sustainability and environmentally sound development. Another area of priority is place development. This means establishing creative and enterprising places in which both people and companies want to locate and invest. Many towns and cities have in recent years been inspired by Richard Florida's reflections on the new "creative class" and the global competition for talent (Florida, 2002),

which have led to an increased stake on place marketing and the branding of cities as nice places to live (see *e.g*. Hospers, 2004a; Peck, 2005).

Along the vertical axis, a multi-level governance system has evolved (Hooghe and Marks, 2001). The EU's programme planning and partnership models, which first were introduced in the regional policy domain, have paved the way for a development that now characterises an increasing number of policy areas. Policy planning and implementation are no longer the concern of nation states alone, nor for the regions, but are conducted in an interplay between authorities at European, national and regional level in close co-operation with their most important partners and stakeholders. As such, regional policy demonstrates certain paradoxical traits: having first been redefined and narrowed down to an innovation policy aimed at regional competitive advantage, it is now in the process of becoming ever broader, as other fields of policy are gradually given an innovation policy signature and more agents and levels are drawn into the process of building innovative capabilities.

This horizontal and vertical extension is also reflected in the current theories of innovation and regional development. Among the issues much discussed are the relationship between territorial and sectoral systems of innovation (*e.g.* Malerba, 2004; Geels, 2004), the embedding of innovation in various territorialised processes, and the meaning and significance of proximity and belonging for co-ordination and transfer of knowledge (see Boschma, 2005; Torre and Rallet, 2005; Lorenzen, 2005; Håkanson, 2005). The innovation environment stands out more and more as a vast landscape with fuzzy boundaries and heterogeneous aggregations. From a rather narrow focus on technological innovations, manufacturing industries and the private sector, attention has been widened to include social and organisational innovations, service industries and the public sector. Innovation is more closely linked to issues of organisation, governance and accompanying innovation paradoxes, such as the observation that the regions most in need of innovation also tend to have the weakest capacity to absorb public funds earmarked for the promotion of innovation and to invest in innovation related activities (Oughton *et al*., 2002). It is no easy task to deduct clear political guidelines from the theories. Apparently, they reach rather ambiguous conclusions: experimentation and exploration of new choices are seen as important, but so, too, are efficient routines and exploitation of existing competencies (March, 1991); collaboration is seen as important, but so is rivalry (Porter, 1998); close ties are important, but the same holds for global networks (Bathelt *et al*., 2004); non-hierarchical and open structures are said to promote innovation, but they need to operate in the shadow of authoritative hierarchies (Scharpf, 1997).

The redefinition and broadening of regional policy has, at the same time, implications for the playing field of the higher education institutions and the expectations they have to live up to. These days they are expected to participate in public-private partnerships and to be involved in balanced region-building. Whereas, previously, attention was concentrated around the higher education and research institutions as sources of high-tech innovation and new knowledge-based industries, they are now regarded in a broader perspective, encompassing the whole social fabric of which they are a part. The higher education institutions stand out as interesting partners because they are resourceful actors located in the region, because they operate on all scales, and because they link up with so many realms of society and strands of activity. More and more aspects of the academic enterprise are thus perceived as being significant to the regeneration and transformation of the regions.

THE REGION IN THE CONTEXT OF HIGHER EDUCATION

Unlike the policies and theories of regional development, higher education can trace its roots back to ancient times. The predecessor of the modern university evolved from the cathedral and monastic schools of late medieval Europe. New places of study, known as *studium generale,* grew up to provide further training in law, medicine and theology. Their nuclei seem to have been famous learned men to whom students flocked from all over Europe to receive instruction. The decisive step was the organisation of masters and students into guild-like corporations (*Universitas Magistrorum et Scholarium*) and the granting of papal charters. This entitled them to award generally recognised degrees and gave them a certain degree of independence and right to self-government, provided they shunned heresy and atheism. The first two institutions normally acknowledged as universities are the University of Bologna, established in the late eleventh century, and the University of Paris, founded in the twelfth century. These pioneers served as models for the new universities, which soon followed in many other parts of Europe – in Oxford, Cambridge, Salamanca, Montpellier, Padua, Rome, Florence, Prague, Vienna, Heidelberg, etc. By the end of the fifteenth century, more than one hundred universities had sprung up.

The history of the university is often told as an unfolding of certain core values and principles to which the institutions have always adhered. It is claimed that the university, next to the Roman Catholic Church, is the oldest institution in the Western world with a continuous and unbroken history. The element of institutional stability, tradition and cultural inheritance is emphasised. As Clark Kerr noted, "[t]hey have experienced wars, revolutions, depressions and industrial transformations, and have come out less changed than almost any other segment of their societies" (Kerr, 1980, p. 9). He rightly pointed out that many of the institutions "are still in the same locations with some of the same buildings, with professors and students doing much the same things, and with governance carried on in much the same way" (Kerr, 1982, p. 115). On the other hand, there is a great leap from the medieval universities and to the mega universities and complex systems of higher education of our time. The enduring structures notwithstanding, the development of higher education is also characterised by a series of adaptive responses to new environmental demands. This is a history of institutional innovations and realignments that, at the same time, have altered the external connections, allegiances and mental spaces of the institutions.

The Latin world

The early European universities came into being in an age of growth of cities and towns, flourishing trade and commerce and a vast intellectual revival associated with the rediscovery of Greek and Graeco-Roman learning. This ventilated medieval society and introduced a new order of freedom (Bender, 1988). Compared to the cathedral schools and monasteries, the universities were more open and diverse institutions. The concept of *studium generale* alluded to the wide spatial reach of the entitlements acquired, the variety of intellectual subjects taught and the fact that access was not restricted to a particular social state (Stichweh, 2003). Both teachers and students normally travelled around between different universities, and they soon formed a network of local marketplaces for learning, involved in a Europe-wide exchange of ideas and documents. Latin was the common language of this new Republic of Letters. The relative autonomy of the institutions rested upon protection from pope or emperor, but also on the active support from their cities. Hence, the balance of power between these three forces was important for the development of the new intellectual culture: scholasticism.

The universities introduced a new organisation of higher education, with curricula, examinations, degrees and faculties. They elected their own rectors and operated their own administration of justice. The early institutions predominantly provided education for the church. In addition, they graduated men

destined for a career in the public life of the cities as lawyers, notaries and physicians. In Oxford and Cambridge a more liberal education was provided for the aristocracy and gentry.

The relationship between the universities and their local surroundings could be strained. The university "was in the city, but not of it" (Brockliss, 2000, p. 164). On the one hand, renowned scholars would lend lustre to the city or town in which they operated. The universities attracted talented people, injected new ideas, enriched cultural life and strengthened the local economy. Masters and students had to be lodged, fed and clothed, and medical professors ran their extra-university practices. The combination of vibrant cities and the trans-local networks brought in by the universities made cross-fertilisation possible. On the other hand, the new pluralism of intellectual life and the gathering of many foreign men with disparate backgrounds created tensions. The conflicts between "gown" and "town" are well-known. There were riots and confrontations between students and townspeople and between scholars and local authorities.

When rulers attempted to reduce the influence and legal privileges of the universities, the universities sometimes reacted by closing down their activities and moving to another city. Movements could also be triggered off by internal disputes. Without substantial fixed buildings and libraries, all parts of the universities were potentially mobile. This happened, for instance, in 1209 in Oxford, when 3 000 students and teachers left for Cambridge, Reading and other places. In 1204 the students of Bologna moved to Vicenza and in 1215 to Arezzo (Ferruolo, 1988). In this way new universities were founded both by imitation and migration. The complete withdrawal from urban centres and the temptations of city life was a rare exemption. The model of Oxford and Cambridge, which has nurtured the Anglo-American tradition of rural campuses, must be seen as a major deviation (Bender, 1988, p. 3).

Although the Black Death and the ensuing economic recession seriously disrupted the major institutions of medieval society, the number of universities continued to grow. In many cases, kings and dukes set up new universities and granted them privileges in order to expand their royal power. The coming of the Protestant Reformation and the rise of territorial states led to a new demand for an educated clergy and for university-educated lawyers. At the same time the universities were turned into places of vehement battles, following confessional and political cleavages. The states made the old academic peregrinations more difficult by levying duties and imposing restrictions, and the new art of printing strengthened the role of the vernaculars. A new mental space was emerging (Sörlin, 1994). While some universities took up practical instruction associated with efficient state administration, most universities remained resistant to the new interest in experimental natural philosophy that had begun sweeping through Europe. Important exceptions were Leiden, Geneva and Edinburgh, where fresh initiatives were taken to redefine the orientation and identity of the universities (Grafton, 1988; Heyd, 1988; Phillipson, 1988). Here a new civic and humanistic spirit was introduced, strongly supported by enlightened cities and municipalities that undertook to rescue the universities. The development of new knowledge was given priority over the reproduction of authorised knowledge, which had been the scholastic mode of teaching. The *orbis latinum* was crumbling.

The rise of the modern university

By the end of the eighteenth century, the universities had generally fallen in disrepute. They were associated with the ancient pre-Enlightenment regime. The new natural sciences mainly thrived in learned societies and academies outside the universities, such as the Royal Society of London, the French *Académie des Sciences* and the Prussian Academy of Sciences. Scientific journals were fast becoming the new medium of scientific communication, and scientific work, which now was called research, increasingly evoked curiosity and prompted general expectations of novelty. The foundation of technical colleges, military academies and other vocational schools to support state planning and military and industrial needs also enlarged the number of rival institutions. It was not given that the age-old university

should be able to adapt to an environment characterised by growing secularisation, an evolving industrial economy, urbanisation, and rising nation states. After the French revolution, however, governments started to reorganise and secularise the administration and curricula of the universities. Of the many attempts to reorganise the universities, the Humboldtian reforms at the new University of Berlin, created in 1810, were epoch-making and soon came to serve as a model for university reformers all over Europe and even in America and Japan (Wittrock, 1993).

The new idea of the university was to foster *Bildung* – the cultivation of man. This implied the enlightenment and progressive formation of personal character through general liberal education, which involved a search for knowledge, freedom of learning and teaching, and an institutional infrastructure conducive to such activities. This new social organisation of knowledge led to the emergence of the research university in the late 19th century. The empirical exploration of the world, which initially was carried out by "amateurs" in the context of academies and salons, now became the task of professionally educated experts. The universities underwent a gradual specialisation in the form of new disciplines, departments and bureaucratic administration, and they were equipped with appropriate facilities. Thus, a range of laboratories, observatories, museums, botanical gardens, etc. became linked to the universities. The unity of scientific research and scientifically based education was stressed. Slowly women also obtained admission.

The Humboldtian reforms were not envisaged as a salvage operation for the antiquated universities. What triggered the reforms was an attempt to restore and modernise Prussia after the upheavals of the Napoleonic Wars and the defeat Prussia had suffered. What had been lost on the battlefield should be recaptured by intellectual excellence (McClelland, 1988). The initiatives marked a special blend of philosophical idealism and practical *raison d'état*. However, the reforms resurrected the universities as prestigious places of learning and a new conception of scholarship and scientific work was introduced. Modern science, based on rational investigation, empirical observation and experimental methods, found a home in the university.

The rise of the research university has been described as "a denial of place" (Bender, 1998, p. 8). This is because the ideal of scientific enquiry is to strive for universalism. According to the ethos of the academic institutions, they are part of a cosmopolitan community of scholars seeking knowledge for knowledge's own sake. In principle, scientific communication addresses all human beings. Since claims to truth are irrespective of time and place, each university has a mission that transcends its actual location. This notion of the university as a detached site for critical inquiry, exchange of ideas and advancement of knowledge has been of vital importance to the credibility and legitimacy of the institutions. The parallel process, on the other hand, was an increasing nationalisation of science and education (Crawford, *et al*., 1993). The universities became more detached from their cities and local surroundings, but more closely bound up with the state. They no longer relied on the patronage of the church, town councils or local elites. Instead they received their core funding from national government. In return, they trained the cadres for the civil services and contributed to the new national identity and cultural spirit that underpinned the nation-building processes. Thus, the university combined political regulation by the state and professional self-control by the "academic oligarchy" (Clark, 1983).

These new links left imprints on the universities in several ways: The universities became part of hierarchical, national systems of education. This implied a homogenisation of education in each country and a greater heterogeneity across national boundaries. National scientific communities and associations were created, operating in the vernacular. This nationalisation process, however, provided for the further inclusion of new participants in scientific communication and the extension of potential fields of application, which resulted in a stronger interpenetration of science and other social systems (Stichweh, 1996, 2003). A typical example is medical education and research. As the activities became increasingly centred on the urban hospital, "the city became a vast laboratory" and the scientists "found the population

on their doorstep as suitable case for study and treatment" (Brockliss, 2000, pp. 160, 161). More and more the universities were approached from a utilitarian point of view. The nation states became preoccupied with how the universities, as national institutions, could be mobilised for practical endeavours in matters concerning health, agriculture, industry and public administration. The universities, for their part, affirmed their commitment to the practical use of natural knowledge. Another effect of the nationalisation of science was that it spurred the mutual observation between countries and the concomitant imitation of solutions deemed to be successful. Such efforts were not at least triggered in periods of war and reconstruction.

The evolution of the modern university is thus imbued with paradoxes: what made the university really useful to the issuant industrial society and the nation state were the steps taken towards autonomy, the unity of teaching and research, and the development of an institutional structure in which roles, norms and incentives were geared to the incessant generation, transmission and validation of secular knowledge (Veblen, 1919; Weingart 2001). Its privileged position and social distance were prerequisites, too, for science to act a source of legitimacy for the state. In addition, the expansionist drive built into the academic system implied a progressive internal differentiation, which turned the university into something quite different from the early 19th century humanistic and encyclopaedic visions. The research university evolved as a set of disciplinary communities; a loose collection of decomposed and fragmented specialties.

Science and industry

The prime influence of modern science was to alter world-views and to foster an aptitude of observation, classification, enumeration, and calculation. What had previously been regarded as dangers, determined by nature and fate, now became risks, contingent on decision making and the state of knowledge (Luhmann, 1993). Science was applied by the absolute monarchs for making inventories of their subjects and resources. The collection and codification of information from many places in the form of maps, statistical tables and written reports rendered centralised government and the enforcement of rules and ideas across large distances possible (Latour, 1987). From the late 18th century substantial efforts were made to fix the standards of weights and measures (Alder, 2002). The systematic application to industrial techniques started in the dying and chemical industries in the early 19th century. At the same time technology evolved as a specialised field of study, defined as the area of knowledge which provided the basis for arts and crafts and manufacturing. Technology was perceived as science with a practical purpose. In parallel with this, new polytechnic colleges, technical high schools and technological institutes were established, both inside and outside the universities.

From the 1860s onwards, the large chemical and electric companies, such as BASF, Bayer, Hoechst and General Electric, also began to set up their own in-house research and development laboratories. They invented the method of invention (Mowery and Rosenberg, 1998). This emerged as a new labour market for engineers and university-educated researchers, and closer ties were forged between the different institutions. Co-operation was mainly informal and took place via individual professors who received support for their research and in return provided graduates and acted as advisers to the companies. The typical pattern was that basic research was performed in the university laboratories while applied research and, notably, development was carried out in the industrial laboratories. In the United States, however, some companies soon turned to basic research, with DuPont or AT&T's Bell Laboratories leading the way. In the early 20th century a number of specialised technical-industrial research institutions were also erected in the leading industrialised countries. Some were initiated by government, such as the *Centre national de la recherche scientifique* (CNRS) in France, and others were founded under private initiatives, such as the Kaiser Wilhelm Institutes in Germany, which, after 1945, were re-organised and renamed as Max Planck Institutes. After the consolidation of the universities as the leading scientific institutions in the 19th century, the organisational infrastructure of the system of science was thus successively broadened.

The growth and spread of higher education

Whereas German universities served as the model institutions in the 19th century, during the mid-war period, and especially after the Second World War, American universities took over the leading international position. Some of them were entirely new institutions, although many had developed from liberal arts colleges that had expanded their facilities to include graduate training, research and professional schools. Unlike most of their European counterparts, the leading United States universities were private or tax-supported state institutions. Another peculiarity of the American system was the land-grant colleges. They were established through The Morill Act in 1862, which granted federal lands to the states for the establishment and support of agricultural and mechanical colleges and universities. The land-grant institutions established experiment stations and extension services, and later obtained regular appropriations, including money for research. This model implied that different kinds of education, which in many other countries were taken care of by separate agricultural colleges, polytechs, business schools, etc., were united in one multipurpose institution.

The post-war period has seen a tremendous growth and proliferation of all types of higher education. The number of students enrolled, staff, and money spent on higher education has multiplied, especially since the 1960s. What used to be an education for the elite has gradually become available to the masses. This process can only partially be explained by underlying techno-industrial transformations and increased demand for highly skilled labour. The expansion has followed from demographic changes; a general desire for more education; a strengthening of primary and secondary education with subsequent pressure upwards; strategies of closure by occupational groups seeking control over their specialist knowledge and expertise by limiting access to holders of formal credentials (Perkin, 1989); the character of education as a positional good (Hirsch, 1977); and accommodating governments believing in the benefits of higher education for their nations and people. Higher education has been inextricably linked to the notion of progress, both at an individual level and a societal level. According the Stehr (2001), the rise of the knowledge society must generally be regarded as the outcome of such deliberate efforts to enlarge the role of education and research and to raise the level of competence.

During the same period, higher education became a truly world-wide phenomenon. Higher education has spread both between countries and within them. Universities were established outside Europe as early as the 16th century. The first was the University of Saint Thomas Aquinas, founded in 1538 in Santa Domingo in what today is the Dominican Republic. The universities followed missions and trade to the colonies. From being organisations for the colonising and immigrating population, they gradually became instruments for the formation of local elites. With the independence of the former colonies and the establishment of new states in the twenty-first century, the build-up of the university sector was given top priority. The universities served as important vehicles in their nation-building and strive for international recognition (Riddle, 1996).

Similar processes have taken place within the developed countries, where higher education has been seen as a lever for modernisation and full recognition of regions. The spread of higher education within different counties can be accredited to several factors: First, new institutions have been built to relieve the old ones following the tremendous influx of new students. Second, they have been established to circumvent the old institutions, which have been regarded as too old-fashioned and resistant to change. Third, the spread of higher education has been part of a government policy for developing the regions and a response to regional demands for better educational provisions. And fourth, the decentralisation process has been the result of a policy of upgrading previous upper-secondary schools to give them higher education status. Many fields of professional and vocational training have experienced “academisation”, and a common feature of most non-university educational organisations has been that they have aspired to the insignias of rank associated with the universities; usually referred to as an “academic drift”.

The growth and spread of higher education has created a highly diversified international system. Today, there are several thousand institutions of higher education all over the world, of which the universities are only a sub-group. In each country the structure and division of labour has been moulded by institutional legacies, intellectual traditions and political circumstances. The various countries also apply different definitions and criteria to what counts as higher education. Accordingly, there is a great variety of institutions. They are both small and mega-sized; research-based and teaching-only; professional and liberal arts type; specialised and comprehensive; campus-based and radio-, TV- and online-based; public and private; non-profit and for-profit; national and international. Similarly, when it comes to the co-ordination of the higher education systems, some are clearly state-oriented while others are more typically market-oriented (Clark, 1983). In short, the term higher education defines an amalgam of different educational ideals and practices.

The net entry rates and the levels of educational attainment still vary considerably across nations (OECD, 2005). They also vary across different socioeconomic, regional and ethnic groups. But in most developed countries a transition is now taking place from mass education to what has been called universal access, implying that more than 50% of the population will be entering higher education at some time during their lives (Trow, 2006). A number of European countries have recently adopted precise numerical targets for higher education participation in the coming years. A growing number of students are also studying abroad. In the Anglo-American countries in particular, which are the largest net receivers of foreign students, tuition fees have become a significant source of revenue for the universities, which has, in turn, intensified the competition for international students. Hence, higher education is not only an important contributor to the national economies; it has become a significant industry in its own right.

International conformity and regional anchoring

The growth and expansion of higher education after the Second World War enhanced the national regulation of the education systems. However, educational policy also got a stronger international dimension. There was an upsurge in international organisations dealing with education policy. The OECD, notably, became an important premise supplier during the 1960s. The Organisation developed statistics, provided background analyses, performed country reviews, made comparisons, and gave policy recommendations (Marcussen, 2002; Woodward, 2004). As pointed out by DiMaggio and Powell (1983), international organisations can bring about an institutional isomorphism. They mention three mechanisms leading to similarities across units: coercive, mimetic, and normative. “Coercive isomorphism results from both formal and informal pressures exerted on organisations by other organisations upon which they are dependent and by cultural expectations in the society” (p. 150). Mimetic isomorphism is due to uncertainty. DiMaggio and Powell contend that when organisational technologies are poorly understood, goals are ambiguous or environments create symbolic uncertainty, organisations tend to model themselves on others in their field that they perceive as more legitimate and successful. Such models can be diffused through employee migration or by consulting firms. The third mechanism leading to isomorphism is normative pressures, which primarily derive from professionalisation. Universities and professional training institutions develop cognitive frameworks and norms, which are further diffused by professional associations and participation in inter-organisational networks. The EU Barcelona reform process, with the establishment of a European Higher Education Area and the introduction of two-cycle degree structures and new systems of recognition and quality assurance, testifies to the increasing role of international organisations in higher education policy making (Robertson, 2003; Amaral and Magalhães, 2004; Engvall, 2004; Teichler, 2004; Zervakis, 2004).

Higher education has, on the other hand, become more deeply entrenched in the regions. Today, the institutions are represented in many more places. They have become more salient employers and rallying points. In every region a growing proportion of the population, both male and female, has spent years within the walls of the higher education institutions. They have become familiar with them and partly see

them as an element of their identity. This has been reinforced by the development of adult education and outreach programmes. Both industry and government also put a higher premium on access to qualified labour and the contribution of research to problem solving and innovation. Knowledge-intensive industries are making up a growing share of the economy. Another feature is the rising competition between regions, which regional authorities are expected to handle. Left with a limited repertoire of plausible instruments, politicians look to higher education as an available tool for delivering prosperity. Taken together, this has enhanced the centrality of higher education in the regions. Higher education has come to the regions and the regions have come to higher education. Individuals and organisations increasingly have a stake in higher education and want to have their say. In this sense, the institutions are becoming more socially embedded and are facing a growing multitude of expectations. As knowledge is sought for as the solution to everything, the demands of the environment are penetrating higher education. Typically, the institutions respond by additive solutions. They are appending new layers of academic specialties, study programmes, services and administrative units to the organisation in order to meet the challenges.

Science and technology policy

The rapid growth and diversification of higher education and research has been paralleled by a rise in society's expectations of economic return. The first attempts to formulate a science policy emerged by the time of the First World War, but it was not until the end of the Second World War that an ambitious science policy agenda took form (Audretsch, *et al*., 2002). The war demonstrated the potentials of a concentrated and coordinated effort of scientific research and engineering and after the war this model was to be elaborated and implemented for a broader set of purposes. The post-war development can roughly be subdivided into three phases (Gibbons, *et al.*, 1994).

The first, which has been designated as the "policy for science" period, had its tone set by the report "Science, The Endless Frontier", delivered in 1945 to President Truman by Vannevar Bush. The report made a strong case for federal government funding of scientific research. The message was that knowledge in the laws of nature is only obtainable through basic scientific research, which should be left in the hands of scientists. Yet, by promoting and applying that knowledge to practical purposes the nation would be blessed in the form of better health care, a more vigorous economy, improved welfare and a stronger national defence. The report proposed, among other things, creating a new federal agency to administer this effort, and both in the United States and in many other countries research councils, science foundations or equivalent institutions were set up to fund and manage research. The main emphasis was on the "supply side" and on building a research and development capability, i.e. the growth of science *per se*. During this period a number of public research laboratories and autonomous state-sponsored institutes were established. Together with the in-house laboratories of private and public sector firms they were the main beneficiaries of public support. The efforts did not involve the universities to any large extent. The development of a new infrastructure of research facilities outside higher education might be regarded as a neglect of the universities. However, the universities received their ordinary appropriations and by these arrangements the scientific disciplines were protected by remaining outside the confines of mission-oriented research.

In the innovation literature, this science policy model is frequently characterised as the linear "science push" model of innovation. Innovation is here assumed to be carried out in a succession of stages, running from basic research through applied research and technology development to marketable products and services. Each stage involves a distinct set of operations performed by a separate institution. In practice, the new research infrastructures were generally built around the closely knit personal networks that had been established between top-level representatives of science, industry and military during the war. The advent of the Cold War justified this alliance.

In 1957, the Soviet Union launched Sputnik, the first man made satellite. This created anxiety in the United States and amongst allied countries, which feared that they were losing out not only in the race for space, but in key areas of science. This led to a reappraisal of their education systems and their scientific, technical, and industrial strength. At the same time, new econometric studies, headed by Moses Abramovitz and Robert Solow, showed that the growth of the Western economies was not owing to an augmentation of the traditional factors of production, but was attributable to a residual factor, labelled technical progress (Abramovitz, 1956; Solow, 1957). The same message could be derived from the new human capital theory of Theordore Schultz and Gary Becker, who rejected the neo-classical notion of labour as a perfectly homogeneous and flexible factor of production. According to their theory, productivity was a function of skills investments in the form of education and training (Becker, 1962; Schultz, 1963). In all, this laid a strong case for investment in scientific research and improving the system of education. During the 1960s, there was a wave of educational reform in all Western countries and an increase in public funding of university research.

The second phase, which has been referred to as "science in policy", marked a shift of emphasis to policy for the use of science in the pursuit of a broader set of national goals. The "demand side" got more attention. The Brooks Report to the OECD (OECD, 1971) is one example of the new perspective that arose in the late 1960s. The strong concentration on defence, nuclear energy, aeronautics and space that, besides medicine and health, had seized the lion's share of the research funds, now received criticism. It was called for civilian relevance. Publicly supported research should benefit a larger segment of national industry and help in solving social problems. The competitiveness of national industry was thus made a more salient issue. Government intervention and fostering of national champions were in season. The urging of issues related to class, race, gender, welfare and environment was another characteristic feature.

During this period, government support of science came to include new topics and areas. Focus was on applied research and dissemination and application of scientific results, and new research institutes were established. At the same time there was an upsurge in government funding of university research, graduate study, buildings and laboratories. Money was also dispersed among a larger group of higher education institutions. Moreover, new advisory committees were set up in and around government, which in turn brought university scientists closer to power. While this gave the universities a more central position in the national research systems, the parallel trend was a strengthening of the immaculate ivory-tower conception of the university (Geiger, 1997). The students' movement and the political radicalism characterising higher education further severed contacts with business. Hence, the universities remained "…'upstream' contributors of basic research, expertise, instrumentation, and training…" (Owen-Smith, 2005, p. 91).

The economic downturn of the 1970s meant that emphasis was put on rescuing crisis-ridden industry. Government support for academic research levelled out. This was a period of selective industrial interventions and firefighting, mixed with new attempts at redefining science and technology policy. The failing economic performance was attributed to a decline in the rate of technological innovation. Strengthening the technology base and creating higher value-added products and services were seen as paramount to regaining industrial competitiveness *vis-à-vis* Japan. Two features of Japanese technology policy were now adopted: "a stronger emphasis on collaborative research and government support for early-stage, generic technologies in targeted areas" (Poyago-Theotoky, *et al.*, 2002). A core element of the new approach was to remove barriers and bottlenecks between the scientific enterprise and industrial innovation. The institutional division of labour, which implied that research was carried out in isolation from the context of application, was thus perceived as a problem. In the early 1980s this translated into the third stage, "policy for technology innovation", with a growing technology race between the leading industrialised countries (Roobeek, 1990).

The salient feature of this phase was a strong preoccupation with cutting-edge knowledge, high technology and innovation. In addition, bridge building and extended communication between science and

industry was emphasised. A number of strategic research and technology development programmes were launched, concentrating on information technology, biotechnology, materials science and other more country-specific areas of perceived advantage. The European Community also launched its First Framework Programme in 1984. The approach chosen was comprehensive multi-year programmes involving both research and industry. Government and corporate research laboratories still played a major role, but university research was much more actively addressed. Measures were taken to promote technology transfer, to create new meeting-places and to enhance mobility.

This new interest in commercialisation of academic research was caused by a general belief in science as an engine for growth, rising demands for returns on public investments, a growing outsourcing of corporate R&D, and universities looking for alternative sources of revenue. In addition, it reflected the fact that the new technologies, and notably biotechnology, were more intimately linked to the research base of the universities. As noticed by Geiger, "[b]iotechnology was ultimately irresistible. One might oppose academic involvement with industry, but academics could not oppose molecular biology – and molecular biology was biotechnology. After 1982, the realisation that university research was a key to lucrative commercial products – the biotechnology paradigm – became the ascendant dogma among research universities…" (Geiger, 1997, p. 366). The general image of the universities was also greatly improved by the success stories of Silicon Valley and other high tech centres, which were taken as templates to emulate. Another aspect was the reduction of military R&D expenditures after the end of the Cold War. This meant a general reorientation towards civil research, favouring the universities as opposed to many of the research labs that lost their privileged access to government funding. To all this a regional dimension should be added: while the big national research institutes were few and mainly centrally located, education policy had accommodated a decentralised network of higher education institutions that now stood out as possible supporters of regional innovation.

Since the 1990s, industrial policy, science and technology policy, and regional policy have, to an increasing extent, converged towards a common innovation policy. In many countries the boundaries between different ministries have thus been altered. Education and research policy has, in several cases, been transferred to new ministries of science, technology and innovation. Regional authorities have also been entrusted with greater responsibilities. The policies pursued have, on the one hand, aimed at increasing private investments in research and development by means of, for example, tax incentives. On the other hand, they have aimed at establishing new alliances so that the private and public sector can be partners in undertaking innovative activity. Consequently, the institutions of higher education have entered the scene as key players for the creation of a knowledge-based economy. Science parks, research parks, university-industry co-operative research centres and consortia have popped up everywhere, followed by business incubators, seed funds, venture capital schemes, management assistance, etc. Even though the universities are involved as major shareholders in these new facilities, they are mainly established outside the universities. In this sense, history is repeated. The higher educational institutions are now surrounded by separate, special purpose organisations established for the encouragement of close co-operation with industry. In practice; the intermediary infrastructure has often turned out to buffer the institutions from external pressures (Krücken, 2003a). Instead of facilitating contact, they have operated as filters or merely served as "display windows" towards the universities' political environment.

Higher education is now expected to take the lead and to rearrange the structures so that entrepreneurship, technology interchanges and interactive learning can be facilitated and involve the core of their functions. This is demonstrated in what has been called their "third task", "third mission", "third leg" or "third stream activities", which revolve around their interplay with regional industry and society (Brulin, 1998). Originally, this was conceived of as an addendum to their primary tasks of teaching and research, but today it is, more and more, expected to be an integral part of their mission and operation. The new ideal is epitomised in the concept of the "entrepreneurial university". According to Clark (1998), successful transformation to an entrepreneurial university requires a strengthened steering core, a

diversified funding base, a stimulated academic heartland, an enhanced developmental periphery, and a general entrepreneurial belief.

Cognitive capitalism

In the Humboldtian concept of the university, the university was "an autonomous body of self-governing professionals, accountable to and monitored by itself" (Baert and Shipman, 2005, p. 159). It was a place where knowledge was sought for its own sake, and where lecturers and professors had a stable identity embedded in a specific discipline and tradition. The university adhered to the long-term in preference to the short-term; the theoretical above the practical; the disinterested before the useful. If the academic endeavours led to practical improvements, these were mainly non-intended results. The issue of application was left to subsequent initiatives by others. Academic life should be carried out in isolation from social and economic interests.

When Daniel Bell (1973) wrote about the coming of the post-industrial knowledge society, he emphasised the increasing economic and social significance of science. Theoretical knowledge was envisaged as the "axial principle" of society. Academics and technical experts would constitute the central professional groups and the universities and research institutes would be the core social institutions to which all other spheres of society would be directed. The university would shape society in its own image. Bell thus basically thought in terms of a quantitative growth that would leave the principal character and boundaries of the elite university unchanged. However, what has characterised later studies is a preoccupation with the qualitative changes, *i.e.* the repercussions on higher education of its increasing societal significance and tremendous expansion. Despite their remarkable persistence and success, the integrity and authority of the institutions are now widely questioned.

If the "scientification" of society is one side of the coin, the flipside is mass higher education and an increasing control of science by society. Today, higher education is faced with a much broader and more diverse student clientele than ever before. The students are not oriented towards socialisation into a cultural elite, but are chiefly oriented towards obtaining useful skills and knowledge for a patchwork of jobs. A growing proportion is adult, working and part-time students, and they increasingly act as demanding customers. At the same time, the escalating costs of higher education and research have led to underfunding of the institutions, as most governments have not let appropriations keep up with enrolment. There is also a growing sense of public unease with academic autonomy, which is regarded as a pretext for avoiding social responsibility. Doubt is raised whether the institutions manage their resources properly (Schimank, 2005; Baert and Shipman, 2005). Most countries are, therefore, currently reforming their higher education systems and governance arrangements to enhance efficiency and accountability. To get more "value for money" and assure that the institutions are able to "deliver the goods", they are decentralising responsibilities while monitoring results. New criteria of relevance, such as widening access, retention rates, student mobility, employability, etc., are built into the operation of the institutions by the introduction of quasi-market mechanisms and funding according to performance indicators.

The institutions of higher education are, for their part, involved in an ever fiercer competition for bright students, high-quality staff and research funding. The competition is enhanced by many factors: increasing consumer sovereignty; new information and communication technology, which provides an abundance of information and is changing the modes of delivery; the entrance of for-profit providers of education; the rising costs of big science and instrumentation; the increasing element of competitive and performance-based funding; international standardisation of study programmes and degrees; the higher transferability of credit points; international student exchange programmes, the spread of accreditation, league tables and international comparisons, etc. The race is further escalating as each institution responds by concentrating efforts, profiling and branding studies, developing alliances, franchising operations, hiring faculty stars, running fund raising campaigns, extending student amenities and so on. Hence,

education is turning into a global business. The same happens with research, where the research universities put high stakes on the production and sale of intellectual property, contract research and capturing of research grants.

Some see this as a sign of a crisis of higher education in Western society. The declining faith in the "university idea" marks the advent of "academic capitalism" (Slaughter and Leslie, 1997). The university has surrendered to the market. They foresee "the university in ruins" (Readings, 1996). Some see this as the price that higher education necessarily has to pay for becoming – in Kerr's terms – a "multiversity", performing a great variety of new functions and receiving large amounts of public money. They are calling for a new "social contract" between higher education and the larger society (*cf.* Vavakova, 1998). And some see this as a transformation to a new social organisation of knowledge, based on the assumption of a co-production of science and social order (Rammert, 2003; Jasanoff, 2004). The changes have been summarised in concepts like "Cognitive Capitalism" (Høstaker og Vabø, 2005) and the "Mode 2 society" (Nowotny, *et al*., 2001).

The most famous diagnosis has been delivered by Gibbons, *et al*. (1994), who assert that the universities, to some extent, have been victims of their own success: People are now more highly educated and mobile than before; science has become "demystified"; information and communication technology is rapidly spreading; non-university centres of knowledge production are multiplying; and the value of creative and tacit knowledge is increasing. Accordingly, the universities have lost their "knowledge monopoly" and must adapt to a context of socially distributed knowledge and networked innovation, where users play an increasingly important role in innovation processes and where societal acceptance is vital to success. This implies a shift from Mode 1 knowledge production, which is governed by the academic community and its peer review mechanisms, to Mode 2 knowledge production, which is carried out in the context of application. Whereas Mode 1 is seen to be disciplinary, homogenous, hierarchical and stable, Mode 2 is seen to be transdisciplinary, heterogeneous, heterarchical and transient. In this latter mode, utility, sustainability and social acceptability are central criteria in the evaluation of quality. Under Mode 1 it was the academic communities that "spoke" to society. Under Mode 2, society "speaks back" to the academic communities. Thus, the traditional academic model of "open science" and disciplinary based research driven by internal considerations is challenged. Science is "contextualised". Boundaries are blurring. The relationship between teaching, learning and work is mixed up in new ways, there is a hybridisation between forms of knowledge and forms of organisations, and previously separated realms of society are becoming more and more intertwined.

This diagnosis can be criticised on many grounds. It has been pointed out that the distinction between Mode 1 and Mode 2 is too simplistic and exaggerated. Mode 2 knowledge production has always characterised some parts of higher education. University-industry partnerships have a long tradition (Martin and Etzkowitz, 2000). There are also huge variations across countries, types of institutions, tiers of institutions, and between departments of natural sciences versus arts, humanities and social sciences (Brint, 2005; Geiger and Sá, 2005; Trow, 2006). It is impossible to generalise. Furthermore, there is a very strong element of inertia and path dependency in academic institutions (Krücken, 2003b). Collaboration with industry still mainly takes place between individual professors and individual companies, and most of the institutions are clearly more concerned with scientific eminence and academic prestige than with extramural considerations. This implies that they are chiefly operating according to the system of science's basic logic and codes of communication, centring on merit and reputation. The global competition between the institutions of higher education, which is headed by the most wealthy and prestigious United States research universities, will probably strengthen this tendency (Vught, 2006). Thus, the proclaimed transition to a new mode of knowledge production may be more of a rhetorical nature than institutional reality.

Nevertheless, all commentators seem to agree that we are witnessing a period of profound changes. They are not only embracing recruitment, funding and new technologies, but the institutional environments

that govern research and education efforts and the identities of the higher education institutions. In this new context it will be more up to each institution to create its own future. Their destiny will, to a larger extent, depend upon their strategic choices and the local abilities to upgrade curricula, develop new areas of research and to build alliances. The institutions have to be entrepreneurial. On the other hand, this also makes government and leadership notoriously more difficult. As Clark Kerr noted already in 1963, an institution with a multitude of stakeholders "must, of necessity, be partially at war with itself" (Kerr, 1963, p. 9). Developing entrepreneurial institutions has to do with creating more dynamic multi-actor arenas and managing interfaces (Smits and Kuhlman, 2004). It means that potentially contradictory objectives, fluid activities and diverse identities are to be combined and integrated into an overall mission (Owen-Smith, 2005). The right balance must also be struck between change and continuity, variation and stability. Leading such an institution implies "less control with more things". But as Kerr added: "Universities have a unique capacity for riding off in all directions and still staying in the same place" (Kerr, 1963, p. 17).

Government patronage of higher education may be declining. However, it is hard to see that any modern government can disregard the knowledge infrastructures upon which national wealth, prosperity and social peace are resting. Knowledge is wanted and demanded by ever more people and institutions. As the old state-owned infrastructure companies have been privatised and corporate research and development increasingly takes place on a global scale to tap into local pockets of relevant knowledge, the institutions of higher education will probably be allotted an even more pivotal role (Larédo, 2003; Larédo and Mustar, 2004; Smith, 2005). All governments today seem to be bent on creating "elite universities" with "world-class" research. They want to concentrate resources on a few "centres of excellence" or "centres of outstanding innovation" to harness their "knowledge capital" for economic competitiveness. Such all-out efforts might lead to a heavy centralisation of research activities and imply a huge set-back for all non-metropolitan institutions of higher education. Vught (2006) asserts that the current higher education scene is characterised by cost explosions, new institutional hierarchies and an amplified social stratification of the student body. This implies a widening gap between a small group of wealthy research oriented universities and a large group of mainly teaching oriented institutions (Geuna, 1999; see also Altbach, 2004). Another possible effect of the increasing reputation race might be that the different institutions develop patterns of specialisation that are, to a very slight extent, attuned to the real competence needs of their regions.

Again, this underlines the need for all institutions to join with their regional partners and to develop comprehensive strategies that take into account that the future of the higher education institutions, and the future of the region, is linked together. The great challenge is to square excellence with relevance and to create a productive combination of the local and the global (Rip, 2002). By a thoughtful nurturing of such opposing impulses, new insights can, hopefully, be gained and new solutions found. At this point, it is time for to take a closer look at the regional roles of higher education.

HIGHER EDUCATION AND INNOVATION SYSTEMS: KEY ACTORS IN REGIONAL SYSTEMS?

One key area where universities have been observed contributing to economic performance is in their contribution to promoting innovation. This is by no means a new mission for the higher education sector. Many American universities were created from the 1830s onwards to provide agricultural extension services to raise the levels of rural productivity across America. The Massachusetts Institute of Technology was created with its technological focus as a temporary measure to meet the needs of local industry, with its founders expecting that it would converge towards an Ivy League liberal arts norm as it matured institutionally. The Technical University of Delft was created by King Willem I of the Netherlands in response to the relative technical backwardness of Dutch industry and to create the basis for a new period of Dutch growth.

This emphasis has increased in recent years not least with the increasing importance of knowledge to production (Stehr, 1994). There is a general consensus that "knowledge capital" is becoming increasingly important to economic production (see Temple, 1999 for a review). This has been based on a number of independent studies that have noted that national aggregate productivity growth has become independent from investments in land, labour and machinery, the traditional forms of capital (Romer, 1994; Solow, 1994). Further studies have demonstrated that this not insignificant, but unexplained residual (accounting for around half of the United States' total economic growth 1945-85) is a result of learning within economic systems. It is therefore not surprising that universities, whose core missions are the production, retention, dissemination and extension of knowledge, are seen important to economic success. However, in much of the analysis, universities are regarded in a passive way, as a source of intermediate assets that move into the real economy, like graduates, and then make their impact.

This view of universities as sources of particular intermediary goods is problematic because it relegates their role to a passive provider of resources, whilst it is now widely accepted that innovation is an interactive process between businesses, universities, and governments (Gibbons, *et al*., 1994; Etzkowitz and Leydesdorff, 2000). The problem with a straightforward knowledge capital analysis is that it is a macro-scale analysis and it is much harder to link particular knowledge of capital investments with aggregate productivity growth. At a meso-scale, recent thinking around competitiveness has linked the emergence of national clusters with an increasing emphasis on competition by increasing innovation (Porter, 1990). Micro-level studies have also highlighted the importance of innovation to the competitiveness and economic success of particular businesses. There are roles for universities at all of these different levels, within national innovation systems, within particular sectoral filières and in technology transfer with competitive businesses. Examining the literature at these different scales provides an insight into how universities systematically contribute to the economic competitiveness of their territories.

The innovation system approach to understanding economic development

If the notion is accepted that economic development and productivity growth are dependent upon innovation, then this has important territorial consequences, namely that the economic success of particular places is, to some degree, dependent on their capacity to perform innovation. This idea of innovation capacity is complex when taken from the perspective of a business, because it is hard to disentangle how particular places support innovative practices. Innovation is increasingly an interactive process, with ideas

progressing between a range of different actors all of whom stand to benefit from successfully innovating – this idea lies at the heart of the notion of a shift to a Mode 2 of capitalism or the emergence of a Triple Helix (*cf.* Etzkowitz and Leydesdorff, 2000). Thus, territorial factors that help to determine or structure these interactions can be seen as determining or structuring the territorial innovative capacity of those particular places. Indeed, Lundvall (1988) made this conceptual step, in his seminal article, *From User: Producer Interaction to National Systems of Innovation*, to argue that systemic regularities built up at a national scale influenced the way that national economies developed over time.

Lundvall used the notion of the national innovation system (NIS) to describe the way particular national institutional frameworks conditioned the technological evolutionary dynamics of the national economy. In particular, this was through the signals and incentives that national level regulation and policy implementation provided for the pursuit of innovative activity. Patel and Pavitt (1994) described the national innovation system as "[t]he national institutions, their incentive structures and their competencies that determine the rate and direction of technological learning (or the volume and composition of change generating activities) in a country" (p. 11-12). The NIS literature deals with the historical effects of national level regulation and institutions in the broader sense on economic decisions made by firms. The regulations and institutions produce particular regularities and these regularities help to promote innovation by removing uncertainties and allowing firms to best benefit from market and hierarchy forms of economic organisation (Williamson, 1975), avoiding both bureaucracy and priceless information. Thus, the nation was the appropriate scale at which to consider these arrangements because there were considerable national differences in the institutional arrangements that then shaped the innovation process into national trajectories and produced a variety of differing national economic outcomes (Freeman, 1994).

In the case of the United Kingdom, Elbaum and Lazonick (1986) ascribed the continual decline in the performance of the United Kingdom economy to the dominance of mercantile capitalism that systematically encouraged under-investment over corporate forms of organisation of production. This was underpinned by a banking system which was organised to the benefit of financial over industrial interests at a national level. This contrasted with Japan, the United States and Germany. Germany, during the same period, integrated research, investment and manufacture through the autocratic state (Keck, 1993; Giesecke, 2000). Japan had, in the post-war period, a co-operative and collaborative innovation/manufacturing complex centrally directed by the Ministry of Trade and Industry and based on the *zaibatsu* form of corporate capitalism, whilst the United States has a strong tradition of collaboration between universities and businesses (Freeman, 1988; Nelson, 1988). Walker (1993) argued that this favouring of finance in the United Kingdom has latterly encouraged productivity increases through the closure of inefficient plants rather than through investment, training and research. Another, perhaps, more dramatic comparison was made by Freeman (1995) who compared the United States and Soviet innovation systems. He noted that the absence of incentives for collaboration in the Soviet system undermined the widespread transfer of technology outside flagship prestige sectors, such as aerospace. These weaknesses contributed to the ultimate failure of the Akademgorodok "technopolis", created in imitation of Silicon Valley (Hospers, 2006).

Universities were key players in national innovation systems and, indeed, the contexts within which those universities existed were key determinants of particular NISs. Lundvall noted in 1988 that, despite a supposed academic isolationism in the university sector, there was a diffusion of ideas outwards from universities, often in ways that privileged commercial over academic norms, highlighting the protecting of university Intellectual Property already prevalent then (1988) in the biotechnology industry. Shaw (1994) noted that universities played a variety of roles in innovation systems, not always in upstream roles, but also – for example in medical instruments – as users whose needs shaped innovation and whose demands affected competition. Etzkowitz (2005) noted the importance of the national regulatory frameworks for commercialisation on the external orientation and economic impacts of universities. He noted that in

America, with the passing of the Bayh-Dole act permitting universities to benefit from federally-funded research, many universities created technology transfer offices in their institutions.

National systems of innovation do shape regional economic trajectories and there are uneven outcomes even within relatively homogenous national systems. This raises issues for the applicability of national innovation systems concepts directly to the regional level. It is clear that universities' contributions to regional economies have been shaped by the economic structure underlying particular national innovation systems, and they have been markedly uneven (*cf.* Keeble and Nachum, 2002 for a United Kingdom example). Concentrations of higher education in primate cities in the United Kingdom and France are intimately connected with the global competitiveness of London and Paris respectively, as well as being the consequence of a high degree of centralisation in the NIS (Gordon and McCann, 2000). However, they contribute to promoting the innovativeness and competitiveness of firms across the United Kingdom and France as a whole and, hence, to raising the effectiveness of the overall economic system. There are arguments for concentration of investment in R&D in particular globally competitive locations, but it is clear that not all regions are well positioned to absorb the competitive strengths of national champion universities (Fontes and Coombs, 2001). Regions outside what Armstrong (2001) calls the totemic sites of the new economy do not always have the firms able to absorb external knowledge inputs and appear to be systematically disconnected from otherwise well-functioning NISs.

The rise of the regional innovation system concept

These problems with the NIS concept in understanding the territorially differentiated outcomes that arise within NISs has led to the extension of the concept articulated around the notion of the regional innovation system (RIS) (Cooke, *et al*., 1998). The RIS approach uses NISs as a departing point, but then also notes the increasing importance of regions as economic spaces in the knowledge economy. Cooke, *et al*. argue that the increasing importance of untraded interdependencies (Storper, 1995) and localisation economies mean that a different perspective needs to be developed to conceptualise universities' impacts on the innovation performance. Their argument is that institutions – formal and informal – coalesce into sub-national/regional systems, and these differing regional systems help to shape and produce uneven innovation outcomes inside particular NISs. Particular regions can therefore be seen as institutionally thick and this institutional thickness provides an asset upon which innovating firms can draw to support their own innovation activities.

The RIS literature was developed as a synthetic analysis of a number of regions that had already proven their economic success. Cooke (1997) argued that a key element of their economic success was that firms in those regions were active participants in a networked form of learning that transcended traditional organisational boundaries (Johnson and Gregersen, 1995; Edquist and Johnson, 1997). A successful regional innovation system was one that encouraged learning activities at all levels of economic behaviour (Cooke, 1998). An alternative conceptualisation of the learning region is as a set of institutions that underpin a context of social relations which encourage learning activities and innovative behaviour (Pratt, 1997). However, Simmie (1997) notes that this definition obscures an explanation for the poor performance of regions, which is that rather than the absence of institutions, the:

> …[e]xisting relations are often those that have generated uneven economic development in the first place. The development of local supply networks needs to beware of re-inventing these relationships with respect to new industries. (p. 236).

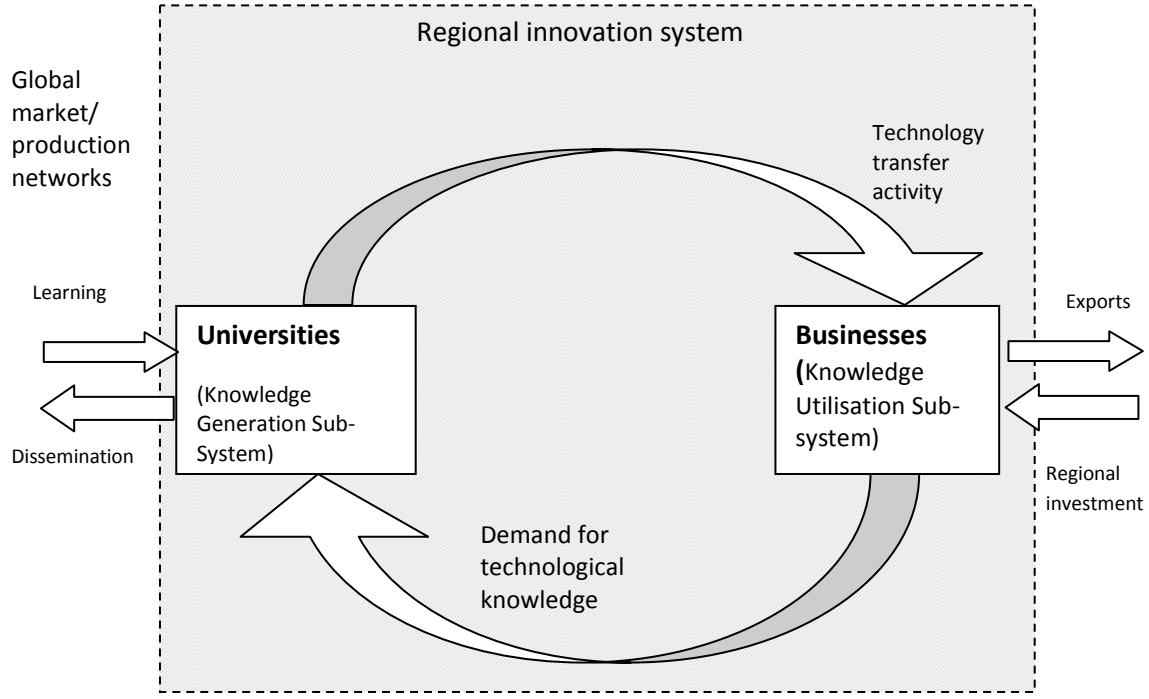
Within an RIS perspective, universities can be regarded as more active actors, able to shape regional outcomes and network topologies rather than merely being pathways linking other actors and recipients of systems determined within national level/sectoral governance networks. Cooke and Piccaluga (2004) highlight the importance of RISs' contextualisation within wider systems. They note that the RIS can be

subdivided into two key elements, the knowledge production sector (universities, research laboratories and commercial research facilities) and the knowledge using sector (high technology firms and commercial development facilities). Both those sectors are articulated within their own global networks of production and, to some extent, their position and strength within those networks is dependent on their own capacities. Universities, for example, are positioned within global networks of prestige that are largely dependent on the capacity of the academic staff to undertake globally recognised and validated work. Firms generate profits by exploiting knowledges in the innovation process and, by adding value within a region, help to ensure the long-term competitiveness of the business, as well as the contribution that it makes to the local economy.

The idea of the regional knowledge laboratory has been developed by Cooke and Piccaluga to explore how those two sectors actually relate to each other in practice, and the territorial consequences of those inter-relations. In a traditional linear model of the innovation process, it is argued that technology is transferred seamlessly from knowledge producers to knowledge users. However, using more reflective and interactive understandings of the innovation process, it is clear that the ability of the two sectors to interact is a clear determinant of the innovative capacity of those actors in a particular place. Thus, it is conceivable that the economic advantage of particular places is, in turn, dependent on the networks and capacities that build up between knowledge producers and knowledge users in particular localities. These capacities do not just have a territorial significance, but they help to position each sector better within its own global networks; thus, by undertaking regional engagement work, universities receive more core funding that can be invested in improving their own international reputation and esteem. Likewise, by working with regionally engaged universities, businesses are able to innovate more effectively, learn more quickly, and help produce better and more competitive products improving their own competitive strength.

Cooke and Picaluga's argument is that this co-ordination arrangement is similar to that which happens in a corporate R&D laboratory where blue skies research has to match up with market driven development work; just as with businesses that can produce effective "R" AND "D" laboratories, the best regions are those that can produce regional knowledge laboratories with effective connections between local actors; consequently, new entrants to the innovation market, be they young academics or new innovative firms, can access academic and corporate knowledge capital more easily than in other places, and can, therefore, receive advantages in terms of their own competitive performance. These arrangements, and the relationship between the two externally oriented regional partners, are shown in Figure 1 below.

Figure 1. **The regional innovation system as a local circulation between globally-connected regional innovators**



Source: after Cooke, P. (2004), "Systemic innovation: Triple Helix, Scalar Envelope, or Knowledge Spirals: an overview", paper presented to Regionalization of Innovation Policy – Options and Experiences, German Institute for Economic Research (DIW Berlin), Berlin, 4-5 June; in Benneworth, P. (2004), "Fire historier om klyngepolitikk", in P. Arbo and H. Gammelsæter (eds.), *Innovasjonspolitikkens scenografi. Nye perspektiver på næringsutvikling*, Tapir Akademisk Forlag, Trondheim.

Higher education in NIS and RIS – many contributions to regional development

It is clear that universities have important roles to play in supporting these regional knowledge laboratories. In what might be considered as first wave regional innovation system approaches, universities were seen to perform straightforward roles, responding to the demands of key regional actors and identifying useful knowledge for networks of regional producers (Morgan, 1997). However, that model was critiqued as being excessively simplistic and for failing to acknowledge the reality that the types of knowledge exchanged in such networks were far more frequently routine compliance and standards knowledge than blue-skies academic thinking written into the literature (Lagendijk, 1999; Lovering, 1999). More recent models, which could perhaps be classed as the second-wave, universities are seen as bringing in external resources to regions, which combine with others' external resources (*e.g*. government funding, venture finance), to create a "local buzz" in such places, which is far more transformatory in its effects than the dissemination of knowledge through local production networks (*e.g*. Bathelt, *et al*. 2004).

The idea of the regional knowledge laboratory outlined above should not be taken to mean that universities play no roles in national innovation systems. Clearly, universities continue to be important in shaping the way that particular nations' technological production systems evolve, although their role in strategic national projects has somewhat been undermined by the shift to a mode 2 form of knowledge production and increasing marketisation and student mobility within the higher education system. However, where universities are well-positioned within national innovation systems, they make strong contributions to their regional economies. Indeed, many of the universities that are identified as making strong regional contributions occupy privileged positions within national innovation systems; the success of the east and west coast technology complexes in the United States are best understood in terms of the

unfolding geography of science/military technology investment from the Second World War to the present day (Etzkowitz, 2005). Likewise, Oxford and Cambridge in the United Kingdom, Leuven in Belgian Flanders, Oslo in Norway and Krakow in Poland all have positive localised economic benefits because of the extent to which general taxation is channelled towards those particular institutions.

Conversely, there are many examples of where "ordinary" or "second-tier" universities contribute effectively to regional innovation systems; Dahlstrand and Jakobsen (2003) highlights the role that spin-offs play in the Göteborg economy, Van der Sijde, *et al*. (2002) highlight the role of Twente in performing similar roles, Goddard highlights the importance of Turku University to its regional economy whilst Potts (1997) and Charles and Benneworth (2001a) note the variety of ways in which Newcastle University influences its regional economy. It is, of course, important to emphasise that privileged institutions tend to have preferential regional benefits even where they are explicitly discouraged from regional engagement; Feldman and Desrochers (2003) highlight the impacts of the almost inadvertent impacts of Johns Hopkins University on Baltimore, and part of the competitive advantage of London as a world city lies in the strength of its higher education base (Hall, 2001).

One of the interesting issues that this raises is the fact that such exceptional outcomes may, in turn, help to reposition the particular university within their national innovation system, attracting increasing volumes of one-off funding which, in turn, strengthens the regional innovation system within which that university is positioned. This **process of change** is often underdeveloped in the literature that distinguishes between "large" national scale outcomes on the one hand and "small" regional scale outcomes on the other. The cases of the creation of new universities is a good example where regional lobbyists arguing for universities can help to reshape national innovation spaces and place particular regions or localities "on the map" of the knowledge economy. For example, the University of Twente in the Netherlands was created in 1964 as the result of fifteen years of lobbying of the national government by a local foundation, led by leading industrialists, and involving local municipalities demanding a higher education presence in the east of the Netherlands (Sorgdrager, 1981). Since then, the region's once-dominant textiles industry has all but disappeared, whilst the Twente has been placed on the Dutch "map" as a place where knowledge concentrations are brought to life.

Many of the outcomes alluded to in the previous section are "small" changes (*e.g.* spin-off companies) and are susceptible to the Lovering critique that they do not produce a wider change. However, because universities can change the investment flows in knowledge capital, this can help with positioning particular regions more preferentially themselves in terms of this new knowledge economy, making them magnets for investment and centres of critical mass, making the investment in universities and the regional development contribution of HEIs more than the "sum of the parts".

HIGHER EDUCATION AND LIFELONG LEARNING: UNBLOCKING HUMAN CAPITAL PATHWAYS

Universities are intimately associated with education, teaching and latterly the accumulation of human capital; the medieval origins of the idea of a university was as a cloister where junior scholars could study under the tutelage of experienced staff whose otherworldliness was made possible through (often religious) endowments and regulatory privileges. Therefore, universities, as seats of learning, historically occupied privileged positions within particular nation-state systems and the process of European state-building that followed the Westphalian peace of 1648 was accompanied by the expansion of higher education provisions to meet the burgeoning aspirations of emergent nation-states, something which accelerated after the collapse of the Napoleonic Empire (Harvie, 1994). It is, perhaps, not then surprising that very recent efforts to build a new Euro-region across the Öresund in Scandinavia involved attempts to create a regional university that aims not only to increase student mobility between the two countries involved in that region, but also to build Öresund's image as the Human Capital Region (Maskell and Törnqvist, 1999; Jensen and Richardson, 2004). An important part of the "European project" has, likewise, been territorial mobility programmes in higher education, like Erasmus, Socrates and Marie Curie programmes, building a shared Europe through educational interchange (DG Education, 2002).

One consequence of this is that the contribution of universities to their human capital systems tends to be highly politicised in its nature and control over the direction and function of that system to relate to the underlying governance structure. In federal systems like Germany and the United States, there is a concern with how universities contribute to the economy at the state level, whilst in more unitary states, such as the United Kingdom and France, there is much more of an emphasis on the national contributions of higher education (*e.g.* HEFCE 2005, but note that the nation in this case is England [population 50 million] not the United Kingdom [population 60 million]). It is, in addition, noteworthy that universities have also become intertwined within struggles over nationhood and independence, not always to their own benefit. The recent history of Leuven/Louvain University in Belgium took a curious detour as a result of the language communities struggle; the university was separated by language in 1968, with the French-speaking chairs moving tens of miles southwards to a greenfield campus at Louvain-la-Neuve. Despite the fact that the production of a Dutch-speaking intelligentsia was important for the institutionalisation of Flemish devolution, it is also clear that internationalisation has been undermined by the separation of its two parts, as each has a separate focus, French and English respectively and a mixed-language system would have had a greater critical mass for the attraction of overseas students (*cf.* Bellefroid and Elen, 2000; Benneworth, 2005;). The key message here is that universities tend to be conceived of as drivers within education systems that have political and politicised boundaries and that can have the effect of overlooking the contribution that universities make to the functional economic systems within which they are positioned. In this chapter, we consider how universities contribute to the development of human capital in politically-defined systems, and then consider the roles universities and other HEIs play within localised economies, to consider the regional contribution that universities can make to improving economic systems by solving human capital problems on the supply and the demand side.

Universities and HEIs within national education systems

When the efficacy and value of universities is considered, undoubtedly one manner in which their value is gauged is the contribution they make to education systems. Although, in earlier times, such a contribution may have been at an elite level, helping to produce a bureaucratic cadre with common norms and values, this situation has changed somewhat. It is commonly accepted that we are increasingly living in what has been dubbed in the vernacular a "knowledge economy". The rise of the knowledge economy has been signalled by the fact that in the post-war period, the long period of growth from the late 1940s to

the early 1970s could not be accounted for purely by levels of investment in land, labour and capital (Romer, 1986). Rather, at least half of the productivity growth in advanced economies was a result of what has become known as total factor productivity ("TFP", Romer, 1994, Solow, 1994). Although, in some senses, this can be regarded literally as a residual, what cannot be explained in terms of the other concrete variables, much work has been done within economics to try to understand, define and operationalise the ideas of TFP (*cf.* Temple, 1998 for a review of the evidence).

A considerable amount of work has been done producing international analyses of economic growth, in which productivity growth is regarded as an intrinsic component (*cf*. Mahoney and de Boer, 2002). Indeed, an OECD report notes that "the pace of accumulation of physical and human capital plays a major role in the [economic] growth process" (OECD, 2003a, p. 17). However, the OECD also argue that most important for growth are those macro-economic fundamentals that provide a solid basis for the necessary investment in skills and plant necessary to raise productivity, namely low, stable inflation, low taxes, high R&D and high levels of trade (OECD, 2003b).

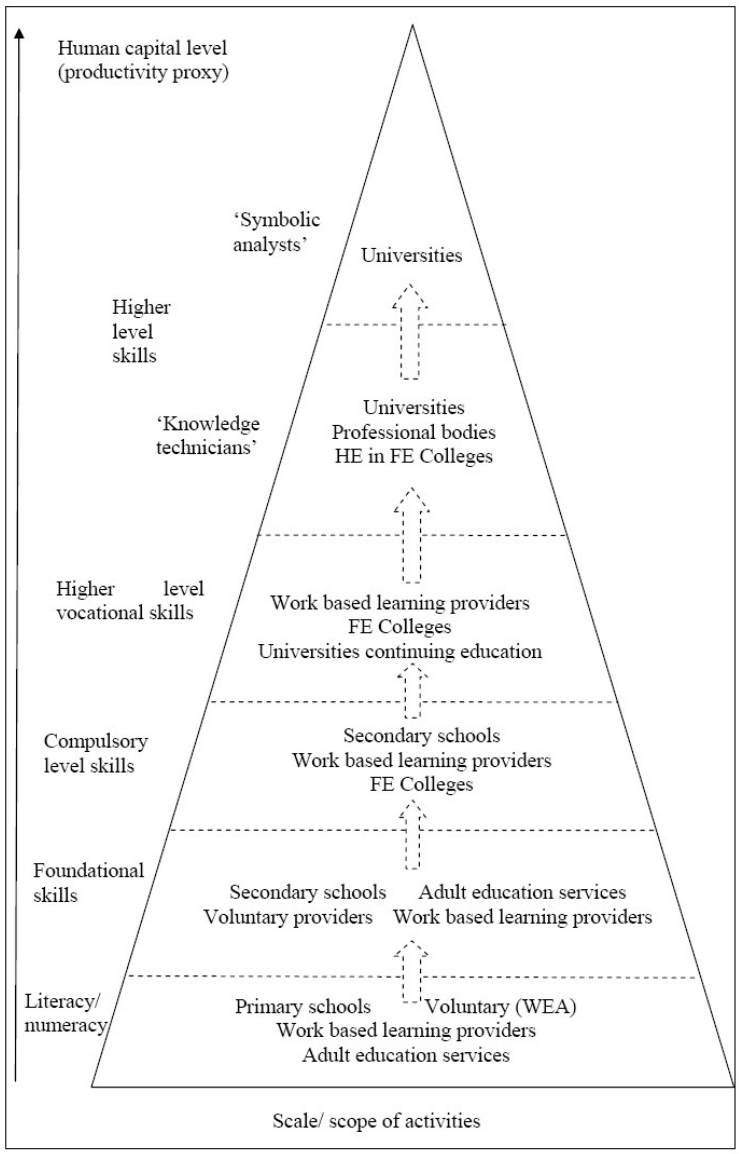
Notwithstanding these issues, it is clear that education is considerably involved in the accumulation of human capital; where human capital differs from "labour power" is neatly encapsulated by Reich's (1991) idea of symbolic analysis; human capital is the learned capacity to create added value from an existing system whilst labour power is an input to an existing system that *in toto* adds value. Of course, this definition is not necessarily dependent upon current economic conditions; Söderberg (1995) indicates how increased levels of learning and the disciplinisation associated with the rise of the mechanical engineering industry meant that its productivity growth in Sweden in the 19th century was dependent on rising skills levels and more efficient use of self-managing skilled labour. However, it is currently accepted that this human capital or knowledge capital is increasingly important for productivity growth and, given the particularities of contemporary economic product, for national competitiveness.

Human capital is regularly acquainted with educational level of employees in the workforce, although in reality it is an abstract concept that does not fit particularly well with concrete actions. For this and a variety of other reasons, universities are seen as key institutions in helping their countries come to terms with the current conditions of economic competition. Universities' purposes are intimately related to knowledge, learning and innovating – universities create new knowledge, challenging existing knowledge, diffuse and circulate that knowledge, exchange it with other academics, transfer it to businesses and teach it to students. However, universities are operating in a very different environment to that which hitherto operated (De Boer, *et al*., 2002), and those trends are having profound consequences on the impacts that higher education institutions can and are having on human capital. De Boer, *et al*. highlight that ICTs, marketisation, globalisation/regionalisation, the rise of the network society and shifting underlying social fundamentals are changing the ways in which universities perform this core function of raising human capital.

As with universities' other roles as experts and sources of technical knowledge, the privileged positions of universities as providers of education are being challenged. A proliferation of providers, from the private (for-profit) sector, as well as higher level education offered by other sectors and hybrid, modular and credit based learning pathways, have eroded the idea of the single institution, multi-annual full-time student as the typical "customer" for higher education. There is increasing emphasis on providing access to previously excluded groups, widening access to higher-level educational experiences that do not necessarily produce a formal degree qualification. At the same time, the pressures of globalisation and regionalisation are encouraging a degree of harmonisation within the sector; the rationale behind the Bologna process is that mobility between institutions is an effective way of encouraging greater human mobility within Europe. Within this, there is an implicit acknowledgement that the system functions through upgrading human capital, providing the opportunity for individuals to move upwards and to improve themselves.

One effect of thinking about the universities' role in the human capital system is that it becomes possible to see universities' role in human capital as performing two functions; firstly, it is **supplying** highest level skills for the national economies: graduates, post-graduates, doctoral graduates, who play an important economic role as symbolic analysts adding value to economic systems in their own right. Secondly, universities also play a role on the **demand** side of human capital – if universities become better at opening pathways downwards to access non-traditional higher education students, they can increase the upwards drive within the general population for a process of upskilling that will help produce economic growth. In this way, universities are seen as a critical connection in the human capital pyramid that, in turn, helps to determine the competitiveness and economic growth in particular places. An attempt to represent this graphically is given in Figure 2.

Figure 2. **The human capital process as a series of pathways to higher human capital levels**



Source: Benneworth, P. (2006), "The 'Rise' of the Region: The English Context to the Raging Academic Debates", in I. Hardill, *et al.* (eds.), *The Rise of the English Regions?* Routledge, London.

Universities are often significant recipients of public funding, although the nature of that funding relationship does vary between countries. This has meant, as we alluded to in the introduction to this chapter, that many governments fund universities and other HEIs functionally as a key component of improving their own human capital arrangements. A number of countries have sought to provide "fairer access" to higher education opportunities as part of a genuine commitment to ensuring all regions have access to the prerequisites of knowledge-based development. Norway and Australia are examples of two countries that have funded, on a national scale, higher education institutions in remote and outlying regions in order to ensure a place for those remote regions in the modern economy. However, the net effect of this can be to produce a myopia within the system, namely to the ways in which the individual institutions contribute to the economic sub-systems through which particular states and countries function.

Regional skills market failures and regional education systems

One note-worthy problem with the above analysis is that it fails to take account of differences between regions within national or other political systems. This means that, despite education is being operated through a single system with clear pathways, localised particularities in uptake and demand for higher education emerge, nevertheless. A national educational system approach takes the assumption that the critical issue is to ensure that the system has sufficient capacity to meet the aggregate needs of the society. However, it is clear that, beneath the macro-scale, not every region performs to its potential. The issue is that whilst, some regions might find themselves supporting national demands adequately, the region might be trapped in a low human capital equilibrium, which universities could themselves challenge. The policy challenges of such an approach are quite intense, because they involve finding levers through which new demand can be stimulated in such regions.

An early example of a negative, territorially-nuanced education policy was exhibited in Germany from the time of its industrial revolution onwards; despite a population in the Ruhr exceeding that of many emerging European states, successive German governments of diverse political hues resisted creating a university in the *Ruhrgebiet* until 1965 out of a concern that such institutions were not relevant for the prevailing local economic conditions (Cooke, 1995). An important part of rebuilding the Ruhr region after deindustrialisation has been challenging this assumption that there was no need for such highly educated people in that region (Hospers, 2004). Indeed, breaking the region's path-dependency on low-skills equilibrium has been a critical element of the region's modernisation. This has taken place despite the fact that the Ruhr is a functional economic rather than a political space, an association of local authorities within a single German state.

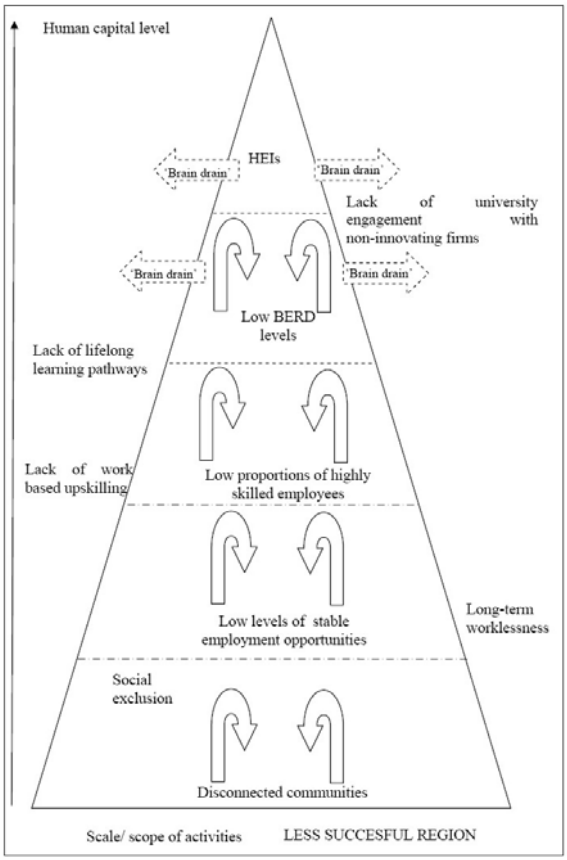
As with any market-based system, there can be systemic failures that require government intervention to address, and there are indeed market failures in various national and federal human capital systems, and many of these failures are localised in their scope. Although there are, regularly, national labour markets for graduates and higher level skills, at lower skill levels, labour markets are much more regionalised and localised. This means that the rewards and incentives do not always exist in some less favoured communities for individuals to undertake training. This is because there are barriers in the pathway; the loss of skilled manual jobs in many places has meant that there are no rewards for rising between the lower skill levels.

Market failures can also emerge at higher skills levels. We highlight the distinction in figure 2 between routine higher level skills and creative higher level skills, what Reich calls "symbolic analysts". Some knowledge skills are required in all businesses in advanced economies, but if those skills are used innovatively, that drives productivity growth. In those regions with particularly large productivity gaps, skills market failures at this high level are important – such regions have settled into low-human capital equilibrium situations, and can find it difficult to retain sources of growth because that growth tends increasingly to agglomerate in core urban areas, where returns are highest (Parr, 2002). There are low

levels of research and innovation activities in these regions, low demand for supporting knowledge-based services and less generation of new high skilled jobs. Consequently, this undermines middle level skills development, as there are no immediate incentives for routine technical personnel to develop innovative and creative skills. In some regions, barriers may exist at all of these levels simultaneously. The overall effect is that there is not a general upskilling of human capital in the regional economy. In some cases, localities and regions can be seen to have settled at a low skills equilibrium – the lack of demand for higher-level skills reduces training incentives, but the lack of supply prevents knowledge-intensive activities emerging.

This general picture is represented in Figure 3, which presents a heuristic of such a low skills region at which barriers at every level of skills upgrading prevent human capital formation. It highlights an additional problem that this brings, namely the "brain drain" that highly skilled people are mobile and will tend to leave in the absence of jobs, whilst less skilled individuals often do not. The problem with such situations is that systemic failure can mean that individual government interventions do not succeed. If an instrument is targeted on one particular barrier, then this may lead to a mismatch of supply and demand; individuals may progress up one level, but may fail to see the reward in terms of a better-paid, more secure job. Alternatively, there may not be immediately clear further steps to be taken. Both of these together limit the government's capacity to address such problems of low skill equilibrium. The question becomes then how to address the barriers simultaneously at every level and how to stitch these interventions back into coherent progression pathways.

Figure 3. **Barriers faced to human capital pathways in ordinary regions**



Source: Benneworth, P. (2006), "The 'Rise' of the Region: The English Context to the Raging Academic Debates", in I. Hardill, *et al.* (eds.), *The Rise of the English Regions?* Routledge, London.

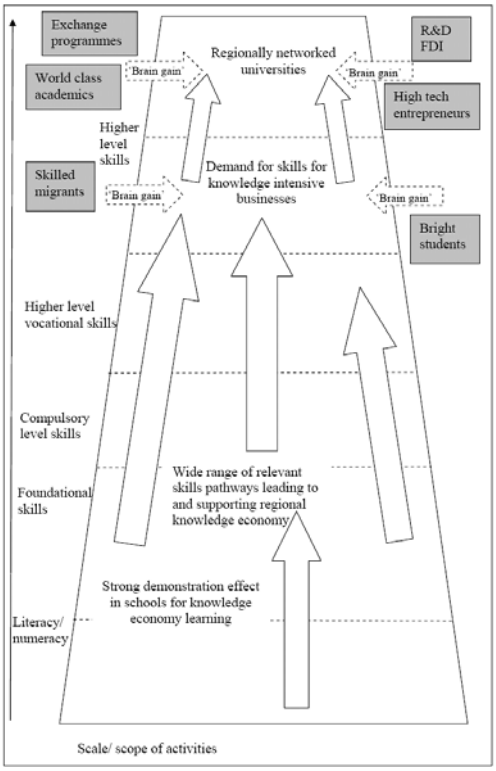
Universities as constructive actors in underperforming education systems

It is important not to downplay the role that higher education plays in national education systems by contributing to human capital. However, it is clear from the review above that another equally important element is the capacity provided by higher education institutions to undertake fundamental structural changes within particular under-performing parts of the system. Although the new Öresund university has not necessarily succeeded in repositioning the Öresund region as a new knowledge centre for Europe, universities have been key actors in the peripheral Skåne region of Sweden.

Universities have been to the fore of efforts to reposition themselves in order to address particular localised educational engagement projects in ways that in turn better position themselves in terms of their own global competitiveness. Universities have the opportunity of providing a bridging function between different skill levels, to ensure that diverse types of projects can produce general upskilling effects. Universities in Europe have been greatly engaged with the European Structural Funds, providing discrete training packages in ways that exploit their knowledge bases in areas such as supporting non-traditional learners to encourage education in emerging fields, *e.g.* ICTs, entrepreneurship and promoting female and minority emancipation. What is interesting is the extent to which cross-border and training programmes have been colonised by universities because of their capacities to deliver in these particular fields.

In Figure 4, we present a figurative outline of how HEIs might contribute to addressing specific human capital market failures that exist in particular localities and regions within otherwise well functioning national higher education systems. The model is relatively straightforward, and represents the optimal outcome if the university and other regional partners can work effectively.

Figure 4. **Universities at the heart of the human capital upgrading process**



Source: Benneworth, P. (2006), "The 'Rise' of the Region: The English Context to the Raging Academic Debates", in I. Hardill, *et al.* (eds.), *The Rise of the English Regions?* Routledge, London.

This model, of course, raises a number of questions about how universities deliver effectively for their regions. It is clear that two of these are particularly salient for this research project and hence need to be addressed in this literature review. The first is that national policies and systems represent a very important constraint on what can be achieved by universities in their regions. Universities produce their benefits by undertaking a core task, teaching, and when they produce the best regional impacts, they configure their teaching in ways attuned to local needs; it is vital to return to the point raised above concerning supply and demand of skills; universities can contribute to perpetuating low skills equilibria and human capital market failures if they match employers' needs in low skills environments. Yet universities can find themselves pressurised to take on a functional rather than transformative role as a consequence of new regional governance arrangements that emphasise regionalisation of mission. Such localisation can have the negative effect of reducing the attractiveness of the university to external students.

National governments can also restrict universities' freedom for action in a variety of ways that also undermine pursuing the regional mission. National admission criteria might undermine attempts to produce novel accreditation forms that promote widening participation and funding systems that penalise drop-out rates will disproportionately fall on institutions working with difficult-to-reach students in regions where there are few economic returns to be yielded for completing a degree (starter graduate wages roughly equal to non-graduate wages at same lifetime). Whilst national regulations might be appropriate for the well-functioning system for which they have been designed, they can produce costs of foregone opportunity by failing to shift particular under-performing regions out of the low human capital equilibria within which they find themselves.

The second problem or question is, of course, in whose interest education is performed and what is the nature of the regional problem to be addressed. If promoting a model of structural systemic change, then it is likely that in the short run there will be a divergence of regional need from what the universities are providing. If there are not, as highlighted above, graduate employment opportunities for individuals, then one effect of higher education might be to increase out-migration of educated individuals. It is therefore necessary to decide whether in circumstances of low human capital equilibrium the intention is to break that equilibrium and provide more opportunities for training, and hence to plan for the negative consequences that will arise. However, as we demonstrate later, universities are also "places of shelter" for various communities, of entrepreneurs, of creative class and can provide a growth promoting "buzz" even in those places.

HIGHER EDUCATION AND GOVERNANCE: WIDENING REGIONAL PARTNERS' PERSPECTIVES

The recent thinking about the changing nature of university/business/state interaction has brought along implicit changes in the relationship between universities and political/administrative partners. Although the Mode 1/2 model has been criticised for oversimplification, there is some truth in the prescription that universities have become more interactive, but at the same time have found their positions as unique purveyors of truth under fire from increasing quarters (Benneworth, 2004). The traditional ivory tower model of a university was precisely that, a model that was never fully realised, but nevertheless formed an important influence on the way that policy-makers conceptualised universities' contributions to society. Within Mode 1, although the government was regarded as the dominant actor, academics were archetypically unchallenged repositories of particular forms of privileged information. Academics had responsibility for developing basic technologies and conceptualisations that could then be applied for general social benefit (Swyngedouw, 1999). In the social sciences, for example, academics produce basic theories of social development. Academics are also responsible for creating a policy/bureaucratic cadre, educating policy-makers and service providers to give coherence to a national community of practice with common understandings of social purpose and approaches to problem-solving (Swyngedouw, 1999). Within this linear model, academics also provide an expertise resource, to present evidence to governmental inquiries and to undertake impartial reviews.

The occupation of "academic" and its communal norms were established within this Mode 1 paradigm. The first is that of objectivity, predicated upon transparency and rationality of argument, reproducibility of results and the opening of those results to independent scrutiny and review. The second feature is that of progression, continually pushing back the scientific state-of-the-art, disseminating results, using this progression to inform teaching programmes and socialising students into norms of critical learning (Barnes, 2001). The third feature is the social function served by academics, articulating the interests of poorer sections within society and challenging vested interests. These three features – all apparently threatened by the implications of Mode 2 knowledge production – are central to the way that academics define and situate themselves. However, as Maskell and Törnqvist (1999) argue, although the new regional mission can be interpreted narrowly purely as commercialisation, the "third task involving regional [governance] partnerships has gained in importance and been extended to cover an increasing number of roles in society … naturally not without controversy" (p. 26).

The shift to new forms of knowledge production is changing the relationships between academics and knowledge users, and even the distinctiveness of these categories. These changes are particularly notable for social scientists working with governments as research partners, in which their policy relevance is a significant justification for their research. At the same time as collaboration is becoming the norm (Mode 1 → Mode 2), governments are involving more diverse knowledge providers in policy formulation (government → governance), creating competition for academics wishing to "catch the ear" of policy makers. In summary, this shift to the "new knowledge economy" has posed three challenges for academics wishing to engage with policy-makers whilst retaining the independence and rigour of academic knowledge production:

- competing with other knowledge communities for governmental favour;
- managing the demands of government for interpretation of data;

- coping with the "rules of evidence" imposed by evidence-based policy making.

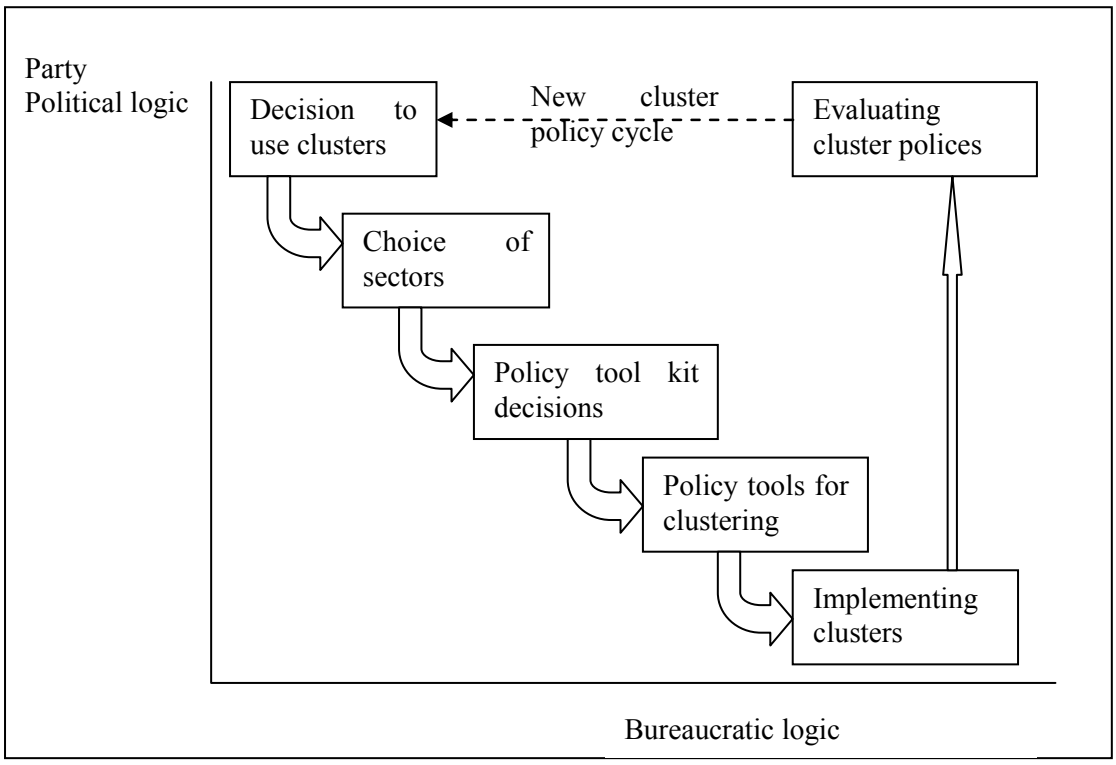
HEIs as actors within national governance systems

It is clear that universities play a variety of roles in national governance systems. Tsipouri (2001) distinguishes that universities are involved at three levels, the individual, the institutional and the collective. Each of the three different levels involves different types of governance arrangements, and the relationship back to the university and its institutional mission vary widely in this regard. These different dynamics have consequences for the impacts that the universities can have on the system. There is some evidence that universities are acting as policy laboratories for particular experimental types of policy, but this is not a particularly new situation. With Land Grant universities, technology institutes and regional colleges were created as new types of HEIs by particular forms of governments to react to changing situations (Rutten, *et al*., 2003). Universities have remained important sites of experimentation, and concepts of science parks developed around universities are now being extended more generally to produce new theories of urban and regional development (Benneworth and Timmerman, 2005; Hansson *et al*., 2005)

At an individual level, universities have seen their roles as privileged providers of certain types of knowledge evolve and face challenge from an increasingly competitive global "marketplace of ideas". Within the Mode 1 archetype, the role of the university was as the performer of certain kinds of basic research that were then translated through other organisations into outcomes; in the case of physical and engineering sciences, the translators were corporations, whilst in the humanities and social sciences, the translators were seen to be the government. Just as a linear model of innovation dominated the commercial visions of knowledge exploitation, this model conceptualised academic input as a precursor to policy development, with universities also supporting policy-makers by training the elite cadres who entered policy development. A policy process can be understood in terms of a linear model that translates ideologies into concrete policies, linked back by *post hoc* evaluations that influence subsequent rounds of policy (Hogwood, 1987).

A version of this policy cycle is presented below in Figure 5, dealing with a single policy cycle, in this case a "clusters policy" (Benneworth and Charles, 2001). Whilst in Mode 1, academics might influence the intellectual framework and administrative paradigm, the case of clusters neatly exemplified the changing nature of academic involvement in policy-making. With "clusters", a new type of industrial policy, academics have been involved at every stage of its development, translation and rescaling (Lagendijk and Cornford, 2000; Benneworth and Henry, 2004). However, as Bryson (2000) notes, academics are in an increasingly competitive marketplace for their services and compete with management consultants and commercial firms who have various adopted trappings of academics, such as publishing, the MBA and conference attendance to validate their own approaches to knowledge production. Individuals are also involved in a range of governance networks, with many executives and legislatures using academic experts to guide and support the exercise of their functions within modern governance arrangements.

Figure 5. **The policy cycle for "cluster policies"**



Source: Benneworth, P. S. and D. R. Charles (2001), "Bridging Cluster Theory and Practice: Learning from the Cluster Policy Cycle", in E. M. Bergman, *et al.* (eds.), *Innovative Clusters: Drivers of National Innovation Systems*, OECD, Paris.

At the institutional level, the shift from Mode 1 to Mode 2 or the triple helix has challenged the basic relationship between the state and the university sector. Under Mode 1, as exemplified by Bush's (1945) *Endless Frontier*, the societal relevance for universities was argued in that social returns were highest if universities were free to pursue their basic interests. However, recent changes have also changed the nature of societal relevance towards universities proving their claims on public taxation through direct outputs and outcomes. In many countries, this has seen a changing nature in the state/institutional relationship away from block grants and autonomy towards what can be termed "the new public management", a much tighter level of control exerted over particular institutions in return for continued state support (Hackman, 2001). Thus, universities have, in many contexts, shifted to being recipients of outcomes of planning decisions taken elsewhere, sometimes with quite perverse outcomes; a number of HEIs in England in the early 1980s faced dramatic budget cuts (around 20%) as the result of changes to formula funding arrangements. This seems to reduce the power of universities as institutional actors within governance arrangements, although, as Hackman indicates, in other cases, governments have devolved decision-making processes to networks of experts and "the Wise", which are then subsequently ratified by government. Indeed, as Van der Meulen (1998) notes, the introduction of such new organisational systems can carry heavy compliance costs for HEIs, which further relegates their position to that of decision-taker rather than decision-maker.

At the collective level, Tsipouri notes that universities are increasingly organising collectively to shape science policy, given their reduced capacity to influence funding and policy. Likewise, as Caswill (2001) notes, an increasing number of governments have created intermediate science policy bodies, such as science councils, who relate on a one-to-one basis with university and HEI collective bodies to determine science "policy" within a framework and financial envelope determined largely externally. The

framework and envelope are established inside broader policy networks within which university representations may be heard, but are not always a prime consideration. Moreover, there is an increasing tendency for universities to be regarded as one amongst many self-interested parties, which can, in turn, reduce their capacities to develop arguments for additional support from the state sector. Thus, although collective bodies can exercise considerable power within clearly delimited domains, recent developments have reduced the capacity of HEIs to control their own environmental situation, much less to shape the broader policy agendas around government.

The superficial message from this is that the role of universities and colleges of higher education in supporting and encouraging effective governance is decreasing in terms of an increasingly competitive "marketplace of ideas". Certainly, institutionally and collectively, universities and the higher education sector appear to be increasingly determined and controlled by the central state and to have far fewer powers of initiative than was previously the case. However, the obverse of the "marketplace of ideas" is the marketisation of universities as institutions. Universities are important economic sectors in all OECD countries, accounting for around 0.7% of GDP, and increasing government deference to international businesses has provided universities with a new privileged role, as high technology industry in its own right. EU governments have themselves been set the target of hitting 3% GERD in GDP within the Lisbon protocol, and universities are a key means for them to fulfil their collective obligations, increasing governments' reliance on universities in this area. Thus, the change has complicated the involvement of universities in governance and policy networks, although potentially also increasing the scope for universities to influence such arrangements.

HEIs as regional governance actors

A second field where there has been growing interest in the role of universities is in the role of regional governance networks. In the section on regional innovation and universities we noted that there had been something of a "rise of the regions" in recent years (Benneworth, 2006), with many writers observing the increasing salience of the regional scale to production. At the same time, these economic changes have been mirrored by political changes in which state actors have sought to create appropriate scale political spaces to manage these regional economic bases. This has come about at the same time as the widely observed shift from government-by-command to governance-through-networks, and it has been observed that universities are involved in these regional networks. It is of course important to emphasise that this is – as with so many of these purported changes – more an issue of tendency and degree rather than an absolute shift; universities have been intimately involved with production, retention and evolution of national and regional identities in a range of different states for at least two hundred years (Harvie, 1994; Keating, *et al*., 2003).

There has been a tendency within OECD countries in recent years for increasing regionalisation of state activity, devolving administrative and sometimes political decisions to sub-national levels. That necessarily involves building or extending institutional capacity at a regional level and creating suitably scaled sub-national policy networks given the increasing tendency for governance through such networks. An interesting example is offered by the devolution process within London in the United Kingdom, when a municipal authority was created covering 7 million people. As preparations were made involving assembling stakeholder networks, it was conspicuous that the higher education sector were systematically omitted from the way those networks were represented, although universities were involved, for example, through their active membership in a business lobbying organisation (Charles and Benneworth, 2001c). Across England, higher education institutions have been important in driving processes of regionalisation and in the north of the country, the universities have taken an active role in articulating a spatial growth strategy, the so-called Northern Way. Likewise, in Twente in the East of the Netherlands, factional disputes between municipal authorities have hindered the development of a meso-layer of city-regional governance. However the authorities have latched onto developments coming out of the university as

developments of regional significance to which they can subscribe, helping to populate the Netwerkstad Twente organisation with projects of real regional significance, and this has, in turn, facilitated producing, for the first time, a regional economic development strategy (Benneworth and Timmerman, 2005).

Charles and Benneworth (2001b) identify four areas in which universities directly contribute to the operational of regional governance systems:

- **Representing own interests**: universities have their own interests and need to achieve things from the local governance arrangements; a critical issue is around planning, where land use practises can decisively shape universities' latitudes to pursue core missions (Benneworth and Timmermans, 2005).

- **Selling governance support services**: as identified in the shift from Mode 1 to Mode 2, universities are moving into new areas including consultancy services and many universities provide knowledge and expertise to support regional governance networks in competition with other consultants and universities (*cf.* Bryson, 2000; Muller and Zenker, 2001).

- **Managing own business**: universities undertake activities that impact on local environments (such as students) and the way that the universities plan their activities, and their transparency in external relationships, in turn affects the capacity of local actors to use universities' presence as a positive advantage.

- **Supporting communities of "good citizens"**: the highly skilled people employed by universities have a propensity to "join up" personal and professional contact networks so personal/social activities involving people with a connection to the university benefit from spill-over economies (*cf.* Vaessen en Van der Velde, 2003).

An alternative way to distinguish this is between the level at which the interaction takes place; at the top level, the university as an organisation is increasingly engaging with other regional governance structures. At a meso-level, knowledge groupings are engaging with governance structures on a commercial basis. At a micro-level, university employees are directly building the kinds of civil society in which effective governance structures can operate. Although there appears to be a scalar hierarchy between the three levels, it is clear that the relationships are more or less deterministic than this might suggest.

Universities, governance networks and regional development

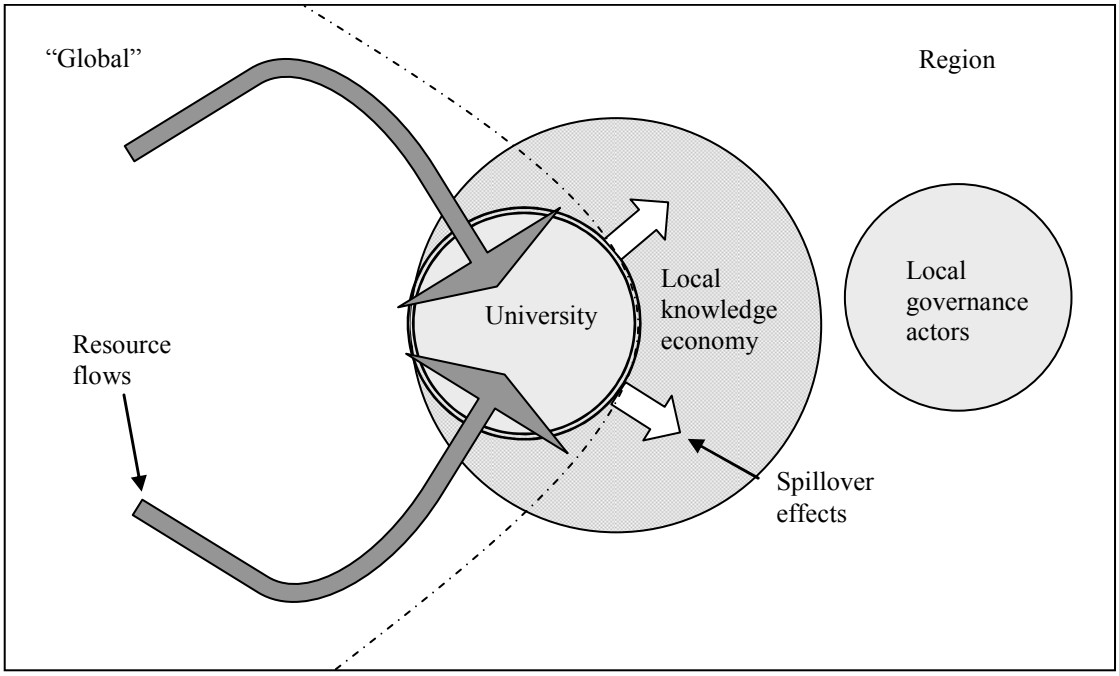
What has, perhaps, been unusual in much writing is the relatively underdeveloped, thin and functionalist roles ascribed to universities in such narratives. In part this arises from "new regionalist" literature, where universities are part of a "laundry list" of success factors rather than being identified as definitive positive contributors to regional governance networks. Universities are demanded by nationalist/regionalist movements, universities serve the support of regional culture, and support the development of a regional political culture (MacLeod, 1996; Charles and Benneworth, 2001b; Keating, *et al*., 2003). However, there is increasing evidence that universities can play a range of roles in regional governance networks along a variety of dimensions. Universities in that sense join up between the different roles in places where there are not strong existing actors able to perform that joining up role.

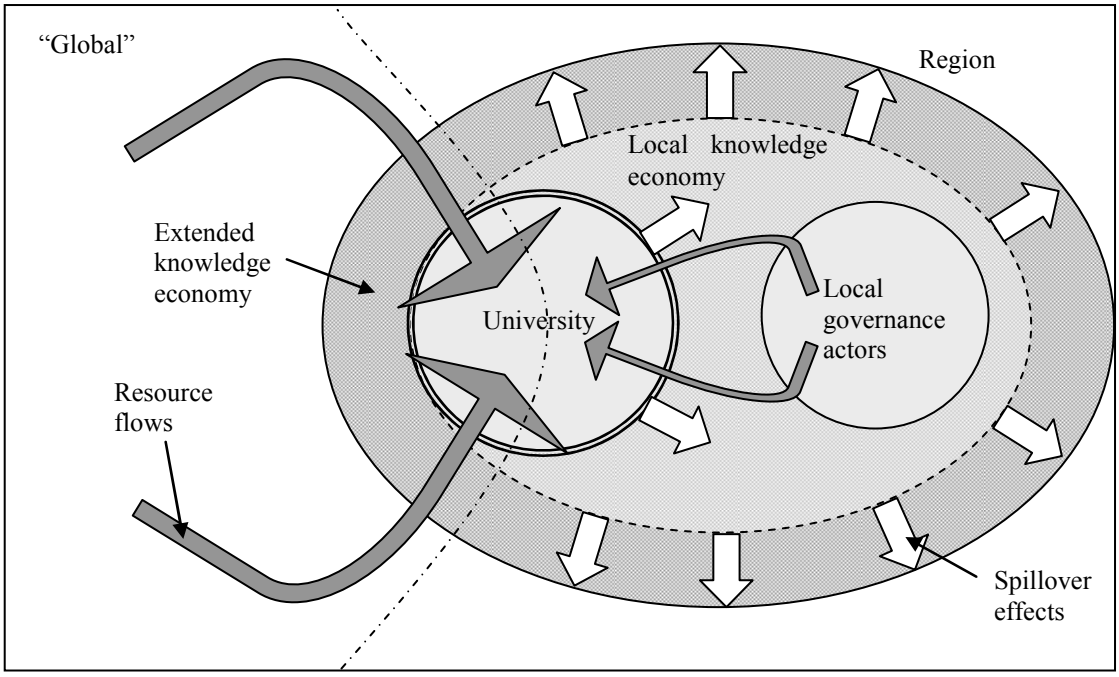
This can be important where there is not a good fit between existing governance arrangements and the functional spaces within which particular economies operate. An example of this is the role of universities in supporting cross-border governance arrangements. In part this is a quirk of the availability of INTERREG funding (European Union cross-border) to all "cross-border" regions creating that kind of activity, with universities developing cross border arrangements to access funding. However, it is clear that

cross-border university activities can be at least partly successful, and can help to give meaning to what that particular cross-border region might mean in practise. Moreover, they can help to build functional economic linkages that, in turn, have the potential to help less successful regions attach themselves to more successful regions. There are a plethora of these cross-border regions where universities are key drivers behind them, such as Vienna-Bratislava, Frankfurt an der Oder-Slubice, Öresund, Lille/Kortrijk, Leuven-Aachen-Eindhoven. It is, therefore, important not to discount the role that universities can play in helping to build up new (regional) governance spaces that can materially reposition regions in economic terms. One underresearched area is how this can happen within national systems, building critical mass between institutions in different regions without hollowing out either; the Federal Technical University experiment in the Netherlands, and the Northern Way N8 experiment in the United Kingdom are two examples that might yet provide some stimulating insight into the consequence of these changes.

The second field where universities and HEIs have increasing importance is in terms of levering advantage into the competitiveness of their locations, which is increasingly dependent on the possession of higher-order urban functions which are knowledge intensive (Beaverstock, *et al*., 2003). As competitiveness is dependent on knowledge production, many local and regional authorities are pursuing similar strategies of knowledge-based development (Hospers, 2006). However, there is increasing recognition that successful strategies require the attraction and retention of global investments, and universities provide a variety of mechanisms to help local authorities attract such investments. High profile universities contribute to the urban competitiveness of particular places, and the relationship is interdependent; if local strategies augment universities' competitive strengths, this can increase the contribution that universities make to their local and regional economies. This situation is shown in Figure 6; if universities and local/regional authorities can find a way to work together complementarily, then they can produce a global/local knowledge economy which represents an improvement in the economic situation of the wider territory. However, an important limitation on universities potential impacts is the **absorptive capacity** of local governance partners, just as fit to local industrial structure is one constraint on universities' impacts on local innovation systems.

Figure 6. **The role of the university and local governance actors in building an extended competitive regional innovation system in a less successful region.**





Source: Benneworth, P. S. and G. J. Hospers (2006), *Urban Competitiveness in the Knowledge Economy: Universities as New Planning Animateurs, Cambridge to Consett, Working Paper*, CURDS, Newcastle upon Tyne.

HEIs and the environment: embedding regional sustainable development

The recent growth of interest in sustainable development (SD) can be traced back to the publication in the late 1960s and early 1970s of disparate range of documents that highlighted the environmental and economic tensions created by the post war boom (*inter alia* Carson, 1963; Meadows, 1972). The direct policy influence of these works tended to be tangential at best, due to their origins in a range of environmental advocacy movements one step removed from policy-making communities. A critical step was the appointment of a multi-lateral World Commission on Environment and Development (WCED). This Commission, synonymous with its Chair, Dr Gro Harlem Brundtland, produced the report, *Our Common Future*.

This report established an agreed agenda for change which was taken at the United Nations, culminating in the UN Conference on Environment and Development at Rio de Janeiro (the "Earth Summit"). The main achievement of Rio was the publication of Agenda 21, which committed its signatory governments to placing environmental and social justice at the heart of their policy-making process (Rao, 1999). In Europe, the Fifth Environmental Action Programme has meant that the objectives of sustainable development permeate most areas of public policy. Furthermore, through the introduction and enforcement over the operation of business, it is also evident that the sustainable development agenda has gained a more general socialised acceptance.

Beginning with *Our Common Future* (or the Brundtland Report of 1987), the UN Earth Summit Conference on Environment and Development in Rio (Agenda 21, 1992) and the more recent 1997 Kyoto conference on climate change and global warming, these principles have become clear. It is recognised that the ideal of SD is "development which meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987). There is also general agreement that, to achieve this, an integrated approach in the pursuit of economic, social, spiritual, quality of life and environmental objectives is required.

Traditional perspectives on universities' and sustainable development

There is great potential for higher education sector to play a role in the achieving sustainable development in the knowledge economy because of the rise of the trans-disciplinary, practice based knowledge generation (Gibbons, *et al.*, 1994). Universities offer the chance for an interplay between institutional management and infrastructure development, active research into the technologies and techniques of sustainable development (particularly from effectively socially-contextualised engineering, architecture and planning activities), and the provision of community leadership and support.

There are four ways in which universities contribute to sustainable development in their local areas, reflecting the diverse roles of universities as large institutions, sources of expertise, and providers of common educational experiences. These largely follow the categories established above for classifying the regional impact of universities, but recognise that, besides contributing discrete elements of sustainable development, universities are critical in the sustainability process because of their capacity to join divergent aspects of research, practice and management outside the binding financial constraints of organisations in which all three elements are not internalised.

Universities' own institutional management practices

The first is in the universities' own institutional management practices; following from the Talloire declaration and the Copernicus Charter, a number of institutions have their own sustainable development policies, statements and visions, often supported by a Sustainability or Environmental Policy Group within the universities' own governance system. From this, many universities have developed sustainable policies. Some of the more innovative approaches taken have embodied a sustainable systems approach to estates management.

New buildings have used the latest technologies and techniques (often developed by the university themselves – typically engineering and architecture) to minimise energy use, suppliers have been audited for their own sustainable credentials, and the practices of the universities have been redesigned to minimise energy and resource use. One of the greatest impacts of universities on their environment is their travel footprint, particularly for campus universities in rural locations, and many have attempted to reduce travel by staff and students by levying parking charges whilst subsidising public transport, car sharing and home working arrangements.

Universities as sources of technical expertise

Universities themselves are sources of much expertise in the technical and holistic aspects of sustainable development, both in the technical generation of knowledge, but also in recognising the requirement for what Gibbons, *et al.* term "enhanced social accountability"; in effect, social scientists and philosophers contextualising those techniques within civic and moral space (1994, p. 100). There is also an opportunity for universities to demonstrate genuine cross-disciplinarity. Universities that have drawn on their own expertise in site development implicitly recognise this asset, and many universities have sought to commercialise on this expertise. Many firms are now currently introducing environmental management systems (EMSs), and a range of universities offer consultancy services to facilitate and embed the introduction of these systems to maximise business competitiveness.

Research activities are extremely diverse, from the commercially sensitive development of new EMS techniques (including a new set of environmentally aware European standards for construction and business practice), to much more socially-embedded research projects. Sea level rise and flooding have profound social implications at a local level, and a number of universities have used their softer social science expertise to explicate the economy underpinning land use and flood defence issues at a local level.

Use of the idea of a Mode 2 of knowledge production illuminates universities' own roles in the processes. Just as an issue might be making a political decision about coastal defence management with broader social implications, universities' own research can embody the conflicts inherent in any decision-making process between technical solutions, loss of land to the sea, and the needs of the wider community (*cf.* O'Riordan and Ward, 1997).

Universities' cultural mission and sustainability

Because of their mission to provide a liberal education, since the time of Newman, universities have an important cultural role in providing a common educational experience for students, enculturating a set of social beliefs through academic practice. In the 19th Century, the creation of a university system was an important part of nation-building in Germany and France, although in its geopolitical context it is easy to reduce their creation to the technology transfer and industrialisation dimensions (Harvie, 1994; Landes, 1997). Chapter 31 of Agenda 21, *Promoting education, public awareness and training*, focuses on the role of education in environmental decision making. The chapter states:

> …education is critical for promoting sustainable development and improving the capacity of people to address environmental and development issues. It is also critical for achieving environmental and ethical awareness, values and attitudes, skills and behaviour consistent with sustainable development and for effective participation in decision-making.

In this sense the idea of education reaches beyond a focus upon those skills for employability, and with "constituting avenues for social advancement for the socially disadvantaged" (Langslow, 1999, p. 183). Kane (2000) notes that, in Latin America from the 1960s onwards, the idea of popular education was sufficiently strong to become a social movement in its own right. Education and social action became inextricably interlinked, effectively producing people's universities in which teacher training, business studies and legal studies took place in an informal context, but with huge social consequences. He argues that such education in Europe is not limited to formal higher education institutions, but if those institutions are to fulfil a social, as well as a state service-delivery mission, then HEIs need to find ways to engage with these informal social learning movements. Although both Kane and indeed Elliot (2000) question the transferability of Latin American derived findings to a United Kingdom setting, Elliott notes that "many people in Britain experience poverty and other forms of exclusion" to which education may offer a means of social and economic liberation (p. 13).

The university learning experience is the promotion of meritocratic ideals and the critical thinking skills necessary for a well functioning democracy (Smith and Webster, 1997) and to socially validate particular communities, creating knowledge of those communities, but also representing those communities to the wider public sphere.

Klich (1999) observes the inter-communal interplay; by providing education for Aboriginal and Torres Straits Island communities, the local university builds up knowledge about those communities which can be embodied into the wider curriculum.

The principles and the practices of sustainability (encompassing social justice, environmental protection, and economic efficiency) are increasingly being formally incorporated into curricula. Many institutions are taking steps to ensure that all their students at least deal with and have an awareness of the subject as a prerequisite of graduation, much as graduation currently has independent self-directed study as an award prerequisite. Although much of the literature deals with greening the curriculum, it is clear that such changes are necessary but not sufficient to achieve universities' potential; there is a need for a deep engagement with students (Ashmole, 1996) so that students actively engage with and shape sustainable education. The educational process is also being actively consumed by a range of socially excluded

individuals and groups and, through individuals' own learning and research, universities contribute to the social justice aims of sustainable development by supporting the development of a cadre of community leaders able to articulate and justify the needs of their own communities in the broader context of the sustainable development of their own society.

Universities as leaders – the new sustainability agenda

Finally, universities have involved themselves with institutions and activities directed towards local and regional sustainability. A number of universities work very closely with local authorities' own sustainability groups and officers, to ensure that their plans and policies are contributing to wider social and physical regeneration efforts. Although universities have been enrolled into sustainability projects where they have been led by regional government, in other countries, universities have also become involved in a number of regional-scale activities seeking to design sustainability into regional planning and business competitiveness activities (Goddard, 1999).

Jackoby (1997) argues that there has been a decline in the independent radical tradition, with the proliferation of sources driving individuals to generate *élan* through institutional affiliation, which has resulted in an institutionalisation of radical political activists. Although the thread of Jackoby's argument is that the integrity of radical praxis is compromised by the security of institutionalised tenure, Elliott suggests that the educational experience becomes a foundry for the transformation of the assumptions of the public sphere and consequently allows these communities to redefine citizenship in their own terms. Universities also have a strong symbolic dimension through the convocation of degrees, honours, and titles based upon the contributions of individuals to the overall mission of the university.

Universities and the regional environmental dimension

Universities have important roles to play in promoting regional sustainable development in their localities; what is, perhaps, more interesting from the sustainable development example is the way that it demonstrates how universities have a special kind of capacity. There are many similarities with the roles played by HEIs in the field of governance, across a spectrum ranging from a strategic, high-level institutional role to the individual roles played by key *animateurs* in making sustainable development a priority for the university and for its own region. What the archetypal sustainable university has, in effect, done is to designate sustainable development as a priority and devoted its own resources to building up expertise. That archetype has then stimulated regional partners to use the university's capacities to make themselves more sustainable; universities have worked with firms on helping them to ISO 14000 standards with local and regional authorities in implementing serious sustainability strategies, and producing a cadre of students with a sound understanding of the issues, who can go forth into the region and reconfigure it towards a more sustainable future.

In such cases, universities and HEIs in general can represent relatively large actors involved in at least two core businesses (teaching and research) with relatively large discretionary budgets, often granted special privileges by national governments in return for delivering particular services. Universities can bring together these resources, thereby building up internal capacities that, together, deliver these two activities (academics doing teaching and research), and so the essence of a university is of an integrative institution that is continually striving to make single assets work repeatedly and to share costs between assets in ways that produce public benefits. The case of sustainable development shows how this can be done in a field where there is an indisputable public benefit (promoting environmental protection) and no necessary reason for universities to become involved in that field. Involvement in sustainable development has been entirely voluntary from the universities mentioned above. However, from that position, universities have been able to assemble quite formidable capacities that have produced "large" and significant regional changes.

When writers taxonomise the benefits produced at a regional scale by universities there is a tendency to list a number of main benefits linked to core activities, innovation/research/technology transfer, and teaching, and then to have a category representing "all the other benefits", from the significant to the very small. For example, Charles and Benneworth (2001) highlight health and wellbeing, culture and sport, sustainable development and regeneration as falling in this residual category. Boucher, *et al*. (2003) highlight entrepreneurship promotion, building consortia, cultural networks, telematics networks, regional promotion and city regeneration as other types of residual categories of impacts that universities have. The problem with such residual categories is that at first glance they can appear insignificant when set up against the regional scale with which this study is concerned. Certainly universities' core activities can involve producing tens of thousands of highly skilled students and employing thousands of R&D professionals, which clearly have real impacts on regional labour markets and knowledge economies. Conversely, it is hard to see how small activities in the field of culture, infrastructure provision or regional promotion can have a comparable large scale impact.

However, this becomes clearer with reference to the sustainable development example; such "residual activities" are, in fact, nothing of the sort, and indeed represent – from a university perspective – assets that both contribute to core missions and that also benefit from critical mass built through "core spending". Thus, if universities are able to place the promotion of such activities at the core of their mission – as the exemplar universities cited above have managed to do with respect to sustainable regional development – then it is not unreasonable to expect that such "Cinderella" activities may produce wider regional impacts and benefits. However, prioritising these activities will not automatically produce the success. This seems to exemplify the potential of the university as a "multi-scalar multi functional institution" bridging between scales and actors interests to produce more general regional benefits that draw on many scales at once.

CONCLUDING DISCUSSION: HIGHER EDUCATION AS OR AT THE CROSSROADS?

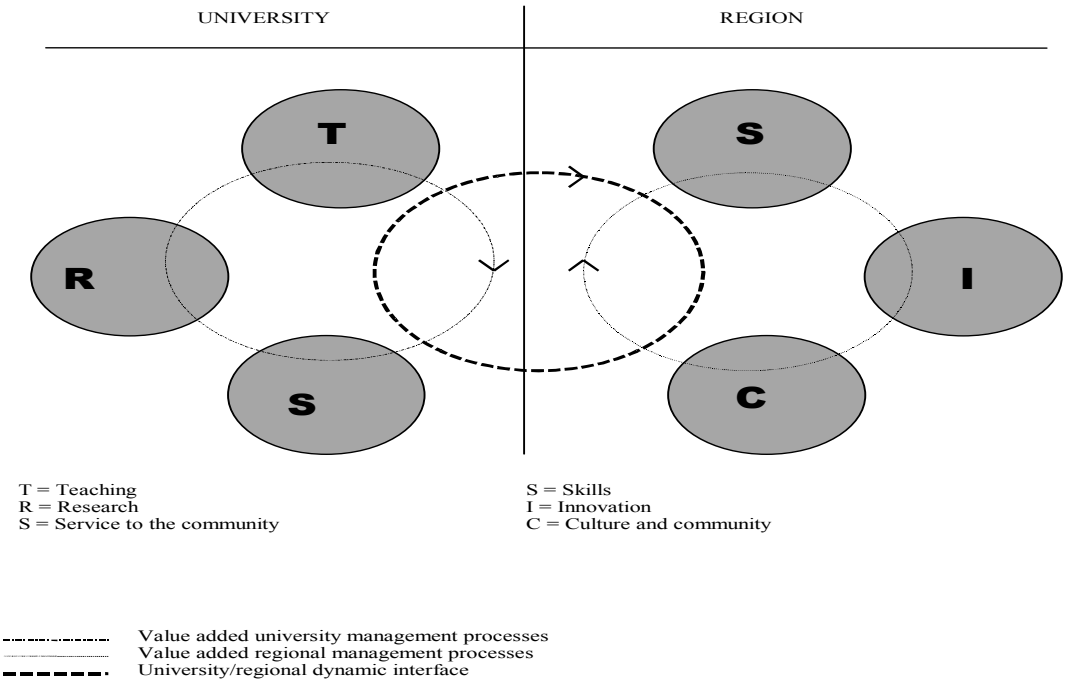
In each of the four preceding chapters, we reached the point that the issue of the "regional contribution" is not as simple as universities having impact on some element of their regional system, be it the regional innovation system, regional education, regional governance or any of the other sectors perhaps incorrectly regarded as a "residual" from core university activities. In each chapter, we have seen that there is an interplay between activities at a variety of different levels mediated through the university, which affects the impacts that the universities can and do have on their regions. In that sense, higher education institutions in the 21st century find themselves as something of a crossroads; they are spaces through which global, national and local actors pass in seeking to realise their goals. Universities are often large strategic actors with the opportunities to build linkages between these different actors, their intentions and resources. And this places universities at a crossroads, raising the question of how they will consolidate this situation. In this final chapter, we turn very briefly to look at the role of universities at the crossroads to highlight some of the interesting issues raised in this paper.

Universities as a multi-scalar crossroads: universities "joining it up"

One of the key messages emerging from this paper is the extent to which there is interaction between the various sectoral impacts of universities. There are clear relationships between innovation and teaching, teaching and governance, sustainable development and research/teaching. Universities have long been predicated on bringing together different activities and joining up across them; early religious-based institutions used religious orders' resources as a means of providing an opportunity for scholarly work that, in turn, was transmitted through teaching. Wilhelminian universities aimed to produce a transformative industrial impact precisely by mixing teaching and research with a strong focus on industrial applicability. To some extent, the greater awareness of the value of universities is a consequence of an increase in the scale of those activities; whilst higher education in the 1960s might have been an elite activity, it is now a sector that is closely connected to much of society. The increasing importance of knowledge and the problems for those that are excluded from knowledge societies has meant that universities, and access to them, is a key social issue.

Goddard and Chatterton (2003) have made the point that one of the most significant contributions to regional development comes about through universities' capacities to join things up regionally. In Figure 6, we noted that universities can make a significant contribution to addressing human capital market failures, and that as many of the contributions were made through the "research" as through the teaching elements. Goddard and Chatterton argue for an ideal type of regionally engaged university where there are two virtuous cycles. **Within** the university, there are productive synergies between teaching, research and service to the community; in the **region**, there are connections between skills, innovation and community. If the interface between these two elements can be managed effectively, then each cycle can positively reinforce the other, with the university and region mutually benefiting. This is similar to the governance argument in Figure 8, and is represented in Figure 7, below.

Figure 7. **Universities as a means of cross-fertilising between different thematic areas**



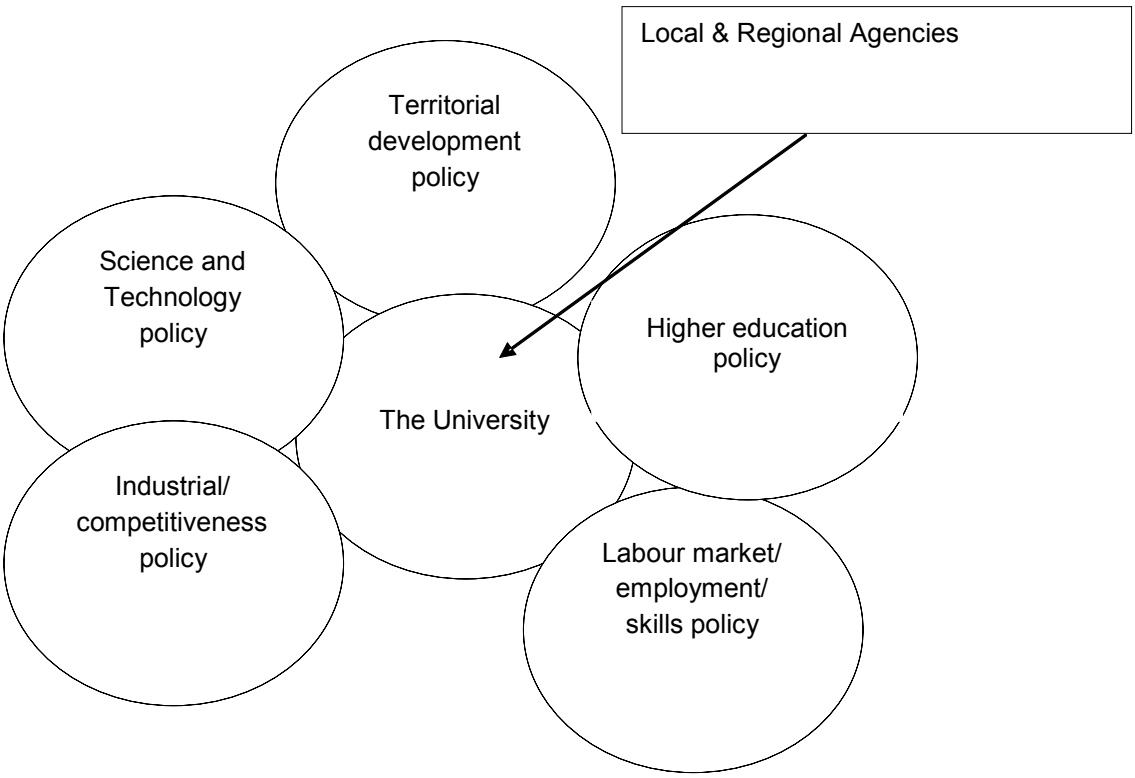
Source: Goddard, J. B. and P. Chatterton (2003), "The Response of Universities to Regional Needs", in F. Boekema, E. Kuypers, R. Rutten (eds.), *Economic Geography of Higher Education: Knowledge, Infrastructure and Learning Regions*, Routledge, London.

However, we have already seen that it is not just at the regional scale that universities are active in joining things up. In each of the four regional chapters, we have seen that universities – despite their regional contributions – are, nevertheless, nested within national policy frameworks that have strong influences on their overall regional capacity. Goddard (2005) has argued that there is a second dimension to universities' integrative capacities and that is the capacity that they have to integrate national policies within particular places (Figure 8). There are universities that are at the peak of several policy areas and so funding flows to them in mutually reinforcing manners; this is partly the story of Boston, or Cambridge in the United Kingdom, where health, science, education and innovation policies all fund leading organisations which have strong positive interactions.

However, there are examples from outside these so-called totemic sites and best practice regions where universities have had the capacity to integrate productively across policy strands. In many large, sparsely populated countries, universities and HEIs are key players in territorial development policy and provide a hub around which delivery of all manner of social services can be arranged. In the United States, heath care research and innovation support within universities have been used as a *sotto voce* subsidy for public health and small businesses. As Goddard highlights, these national resources are important for regional impact and local and regional partners can try to align themselves behind particular large projects

and provide further support to improve their regional impact (and also increase the slice of the national "pie" that such institutions are able to achieve).

Figure 8. The University as a local integrator of national policy streams for regional benefit

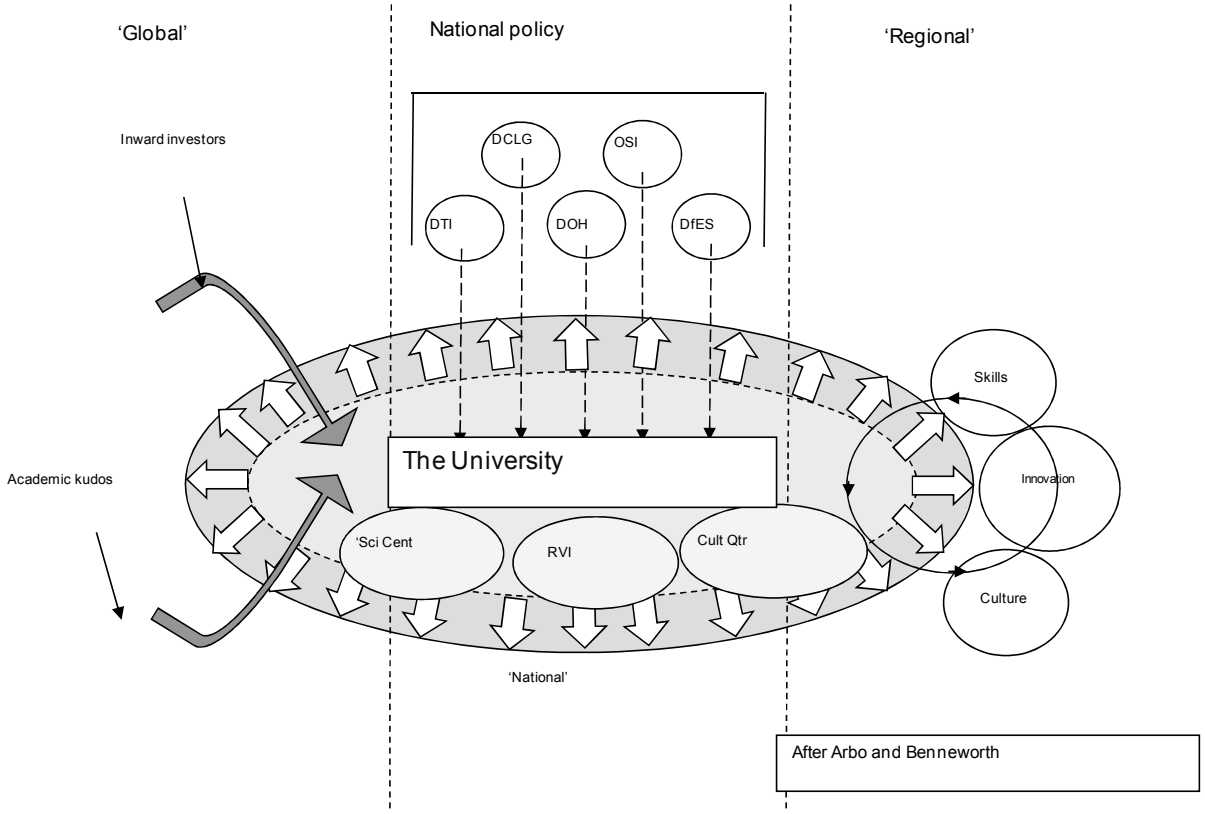


Source: Goddard, J. B. (2005), "Supporting the Contribution of HEIs to Regional Development: Project Overview", paper presented to OECD IMHE Supporting the Contribution Conference, 6-7 January, Paris.

A third issue relates to universities' roles as attractors of **external capital and investment**, and their capacity to translate between different forms of capital. The attraction of international and overseas students means that higher education is an export industry or traded service and this can make higher education a powerful sector within particular regional contexts. Universities can be large businesses and have a variety of partnerships with a range of institutions to achieve their goals. Universities in some countries can enter into complex financial arrangements to raise external capital for development projects; in commercialisation through things like seed capital funds, through to mortgages and bond issues to fund estate development and campus reorganisation. California recently attracted attention when it raised USD 1 billion in a state bond issue to invest in stem cell research. Universities are sought-after parties with unique facilities of their own and external partners may invest alongside them in particular development projects to access those facilities, the skills of their employees and to recruit their graduates. Thus, projects assembled by universities can integrate and lever in considerable volumes of external productive investment into their regions, from both public and private sources, and these investments can produce local benefits and returns by building up critical mass.

Each of these roles performed by universities is important, with universities performing an integrative function at the regional, national and international level. However, it is somewhat artificial to make this distinction between global projects, national activities and regional consequences. Just as there are **connections between the teaching, research and community** elements of university regional engagement, there are **connections between the global, national and regional flows** and integration performed by universities. Teaching hospitals are a good illustration of this point – universities receive national funds to train medical staff for national healthcare systems, but undertake research that may be funded by foreign companies or even healthcare providers (*e.g.* the United States National Institutes of Health) and in both training and research provide high quality medical facilities at a regional scale, or even to hard to reach communities. In Figure 9, we begin to try to sketch an ideal type of a multi-scalar integrative university.

Figure 9. Regionally engaged multi-modal, multi-scalar HEI



This figure helps to illustrate some of the key themes arising from the literature review. Firstly, there is a tendency to think of universities as existing solely within national systems that dictate, in a functional way, universities' responses. The national policy arrangements provide resources and can help to make universities powerful regional actors. A significant part of HEIs' regional potential lies in the fact that they are often not purely regional bodies. However, these relationships are not functional, in that universities integrate and join up between policy streams to produce real capacities; because knowledge capital has increasing returns to scale, this can be conceptualised as universities integrating resources and achieving a "policy windfall". Bringing more resources together increases the scope of what can be achieved with each set of resources individually.

The second key issue is that there is a tendency, when considering the regional impacts of higher education, to consider only the regional scale. Taking a wider view, as with Figure 9, makes it clear, for example, that the international dimension is important to both the national and regional elements of the system. If a university can attract external investment, then this can rework the way that national governments regard that place and hence reshape the national investment flows to that place. This additional national investment may potentially be more regionally significant than the external investment, but the international investment has unlocked the system and enabled the overall outcomes to be produced.

Key issues, debates and limitations

In this literature review, we have taken as broad a perspective as possible on universities and their impacts on their regional economies. The reason for this has been to try to understand the depth and the scope of contributions that universities can make to their regions. In Figure 9 above, we present the ideal type of the regionally engaged multi-scalar university, joining together resources, systems and processes at the global, national and regional level, integrating between teaching, research and civic missions and producing a profitable, virtuous cycle of growth. We would stress that this is an ideal and optimised type, synthesised from all the different connections that universities have made between sectors and scales in the course of the review. It is useful because it provides a framework for understanding what universities are really doing and the variety of networks within which HEIs prosecute their missions. However, the literature also suggests a number of tensions and limitations inherent in such a model, and to conclude the review, and to suggest fruitful lines of inquiry for the main study, we set out, below, our reflections on this regionally engaged multi-scalar university model.

The first question is whether universities should really be setting themselves up to perform such a broad range of tasks. Universities have survived and evolved because of relatively limited missions, and a tight focus has ensured that funding has been assured through articulation of a clear public interest. There is the risk that a rapid expansion into a range of fields will dilute the clarity of that public interest and hence undermine *in toto* public support for universities. Universities have had some successes in mobilising effective cross-sectoral projects, but this is quite different to suggesting that the new model for university organisation is that universities become system integrators with the capacity to deliver large public interest projects integrating teaching, research and a wide range of socially useful activities. More thought and reflection is needed on how to retain a tight institutional focus on core missions, whilst, nevertheless, harnessing HEIs' undoubted capacities to deliver social value and play a transformatory role within society.

The second issue is the extent to which the universities are the driving actors behind these processes of change. The earliest universities were, to some extent, self-motivating, individual scholars attracting their own students and institutions, to some extent, co-evolving around the wishes of the scholars and the desires of the sponsors. In a project conducted under the rubric Institutional Management in Higher Education, there is clearly a need to reflect on the extent to which institutional management is responsible for mobilising the large scale and transformatory projects that can have an impact on their regional systems. How should universities respond to offers from others to become involved in projects that might not solely be oriented to meeting universities' goals, thereby possibly diffusing the impacts of scarce university resources? How can institutional management allow universities to engage on a broad front, letting "one thousand flowers bloom", whilst encouraging a tighter strategic management of regional connections to ensure their fit with national policy instruments and external investors' desires? The ideal type downplays, to a certain extent, their significance, but they are nevertheless important issues worthy of consideration if universities are to realise their potential to significantly support regional systems.

A third issue, which we have not really been able to treat properly, is the role of universities as autonomous actors, and situations where there are tensions between prescribed national and regional roles.

There can be problems where disciplinary mixes within universities do not fit the needs of local employers; national governments may prescribe the subject balance or limit overall national provision in some areas. In this report we have, to some extent, finessed this question, but it is clear that if HEIs do not have a good fit with their regional capacity, then this is a significant barrier to further purposive engagement. In figure 6a, we noted that, if local governance partners did not work effectively with universities, then there was a foregone opportunity cost. Likewise, if universities do not work well with local businesses, schools, government and other stakeholders, there will be, potentially, losses. How can universities engage meaningfully in situations where they do not necessarily have the capacity to mobilise actions and projects that directly meet the needs of local and regional communities? This is indeed a hard question to answer, but without it there will never be a comprehensive understanding of the regional contribution of higher education institutions.

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