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Carlos José de Oliveira e Silva Rodrigues Universities and regional development: a new perspective on the second academic revolution

tese apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Doutor em Ciências Sociais, realizada sob a orientação científica do Dr. Artur da Rosa Pires, Professor Catedrático da Secção Autónoma de Ciências Sociais, Jurídicas e Políticas da Universidade de Aveiro, e co-orientação do Dr. Kevin Morgan, Professor Catedrático da School of City and Regional Planning, Cardiff University.

To Maria and Tatiana

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keywords

Universities, regional development, institutional capacity building.

abstract

This dissertation aims to contribute to the advancement of the knowledge on the role universities play in regional development processes. It draws on the argument according to which there is an ongoing revolution in academia, configured by the integration of economic development in the mission realm of universities, together with teaching and research. Taking into account the nature and challenges of the contemporary dynamics of societal change, it asserts that the changing academic mission is being taken by dominant scholar approaches in a narrow, incomplete fashion, because almost exclusively focused on the technology transferred between universities and their regions' productive fabric. In accordance, the dissertation proposes a broader perspective on the academic revolution, in order to introduce in the debate relevant regional development resources that universities can provide, which are left out of the mainstreamed picture. It does that by studying the part played by universities in the promotion of the regional capabilities needed to combine and mobilise the knowledge and relational resources that nourish the collective capacity for collective action, i.e., the resources and processes that build up regional institutional capacity.

The research work aims to search for answers to four major questions, which ground the guiding inquiry line. The first relates to the role of regional development agents assumed by universities and the extent to which their agency makes them institutional capacity builders. The second focuses on the ways universities are organising themselves in order to deal with the challenges inherent to third mission activities. The third mirrors the contextual and mutually reinforcing nature of the university-region nexus. The fourth and final question addresses the particularities that expectably characterise universities' regional engagement in less favoured regions.

The dissertation takes as point of departure the conceptualisation and reasoning of the challenges associated with contemporary societal change, which, under the dialectics between the idea of the University and the idea of the Society, is shaping academic change. Drawing on the resulting scenery of academic change, it details the nature and implications of the revolutionary move in academia, identifies the shortages of the mainstream approach and introduces a new, broader perspective on the second academic revolution. The case studies undertaken in three universities operating in different European regional contexts offer a picture of the second academic revolution, in its extended version, taken from the point of view of practice. This picture provides the empirical evidence that configures the answers to the major research questions and underpins the conclusive remarks on the role of universities in regional development and its revolutionary nature.

palavras-chave

Universidades, desenvolvimento regional, capacidade institucional

resumo

O presente trabalho visa contribuir para alargar o conhecimento sobre o papel que as universidades podem desempenhar nos processos de desenvolvimento regional. Esse papel é abordado com base no argumento de que as dinâmicas de mudança no mundo académico assumem contornos revolucionários, configurados pela inserção do desenvolvimento económico na missão das universidades, em paralelo com o ensino e a investigação. O trabalho defende que a perspectiva dominante sobre as mudanças na missão académica, centrada quase exclusivamente nos processos de transferência de tecnologia entre as universidades e os tecidos produtivos regionais, negligencia vertentes da relação universidade-região que, tendo em conta a natureza e os desafios da sociedade contemporânea, assumem grande relevância. Assim, a dissertação propõe uma perspectiva alargada sobre a revolução académica, por forma a introduzir no debate recursos de desenvolvimento que as universidades podem fornecer às suas regiões e que, no âmbito da abordagem tradicional, são menosprezados. Para o efeito, a investigação incide sobre o papel das universidades na promoção da capacidade institucional das regiões, ou seja a combinação e mobilização de recursos de conhecimento e de recursos relacionais que sustentam a acção colectiva.

O trabalho procura responder a quatro questões de investigação essenciais. A primeira refere-se ao papel que as universidades, como agentes de desenvolvimento económico, assumem nos processos de construção da capacidade institucional das regiões; a segunda prende-se com os arranjos organizacionais que estão a ser adoptados nas universidades como forma de enfrentar os desafios associados à nova missão académica; a terceira espelha a influência que as condições contextuais exercem sobre a intensidade e qualidade das relações universidade-região e explora a possibilidade da ocorrência de benefícios mútuos; a quarta questão aborda as particularidades que marcam o papel das universidades em regiões menos favorecidas.

A investigação parte da conceptualização dos desafios inerentes aos processos de mudança da sociedade, os quais, no âmbito da dialéctica entre a ideia de sociedade e a ideia de universidade, formatam a transformação da academia. De seguida, detalham-se a natureza e as implicações das mudanças na academia, identificam-se os problemas da abordagem tradicional a essas mudanças e sugere-se uma perspectiva mais abrangente sobre a segunda revolução académica. Os estudos de caso realizados em três universidades que operam em contextos territoriais diferenciados sustentam, do ponto de vista da *praxis*, as respostas às questões acima referidas e a formulação de conclusões sobre o papel que as universidades podem desempenhar nos processos de desenvolvimento regional e a sua natureza revolucionária.

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Tampere



University of Tampere



Cardiff



Aristotle University of Thessaloniki



Thessaloniki



Cardiff University



Tampere



Tampere University of Technology



Thessaloniki



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Introduction

1.1

The problem, the objective and the thesis

“As a conservative institution of medieval origins the university is always fearful of change [...]”.

“Today, universities are undergoing a ‘second revolution’”.

ETZKOWITZ and WEBSTER, 1998, p. 21

The two opening statements, transcribed from the same book, chapter, and page, if taken in isolation, enclose a contradiction between the tendency of an institution, - the University -, to resist change and the possibility of being simultaneously affected by the disruptive effects of a revolution. Is this contradiction real or, instead, apparent and veiled by plenty of historical signs of stability presented by the University, which, with its origins back in the Medieval Ages, continues today deserving the status of institutional cornerstone in the development of human societies?

The temporal stability of such societal prominence throughout the centuries relies heavily on the firmness of the pursuit of knowledge and its dissemination via higher learning as the core goals of academia. This institutional steadiness, however, does not imply to look at the University as something unchangeable and unchallengeable. Again, history shows that the social, cultural and technological evolutions and revolutions that transformed society over time, namely because shaping the value and purposes of knowledge, have constantly challenged academia and compelled it to change. This dialectical relationship between *the idea of the society* and *the idea of the university*

brought about a succession of transformative events mirroring the capacity of an institution, though resilient, to change and adapt to the *spirit* of times. Yet, the extent to which academic change and adaptation can be regarded as revolutionary, - i.e., the possibility of academic revolutions to occur -, remains unsubstantiated. Arming the search for substance with an attentive (and selective) look into the historical insights of the prolific literature on academic change, one can find the illuminating and soundly sustained argument that the transformation of the University across the centuries has been the combined outcome of continuous, smooth evolutionary changes and a few sporadic, highly disruptive, thus revolutionary, changes. The revolutionary shifts, drawing on the same pieces of literature, brought about dramatic shifts in the *social contract* binding universities and the rest of society, vigorously influencing the nature and reach of the academic *mission* and *ethos*.

The addition, in the early 19th century, of the generation of new knowledge through research to the mission realm of academia, hitherto confined to the dissemination of existing knowledge through teaching, set off the first academic revolution. The resulting academic paradigm, and subsequent (evolutionary) developments that gradually put aside the principles of the early revolutionary period proclaiming the production of knowledge for its own sake, gave rise to new societal perceptions and expectations *vis à vis* the role of universities. These culminated in an increase of the connection between science and technology and attributed to academic knowledge the character of a public good serving as input for nations' wealth and welfare creation in the industrial society. This state of affairs would confer to the University, nuclear *loci* of knowledge production and dissemination, a core and instrumental position in the post-war welfare state.

Advancing in the timescale and looking for a simple definition of the University in the 21st century, the answer can take the following form (as in the Oxford Advanced Learner's Dictionary): "*an institution at the highest level of education where you can study for a degree or do research*". In other words, teaching and research continue to be perceived as the two sided mission realm of academia today. Accordingly, this definition, though simplistic, turns pertinent the question whether there was room for a second academic revolution, - i.e., a vigorous shift in the mission and ethos of academia -, to occur in such a short period of time. A number of authors (e.g., ETZKOWITZ, 1994; ETZKOWITZ AND WEBSTER, 1998) answer positively to the question and argue that a second academic

revolution was set off when research results started to be translated into intellectual property, a marketable commodity and economic development (ETZKOWITZ and WEBSTER, 1998). The argument is that the corresponding new *social contract* between academia and society has added to teaching and research a third University's mission, the one of agent of economic development. At the core of this third mission, it is argued, lay the capitalisation of university knowledge (id.) and, inherently, the squandering of the public good character of knowledge, let alone the production of knowledge for its own sake.

What kind of powerful transformative events have occurred? The analysis of contemporary societal change, as made in the specialised literature, is pervaded by the use of the prefix *post-* to label the “*new*” society, as in *post-industrial* or *post-Fordist*. The assessment of the impact of change on academia, likewise, brings about, for instance, the *post-modern* University. What do these analyses have in common? In a way or another, the explanations of the unprecedented dynamics of change that, timidly in the 1960s and stoutly since the late 1970s, conveyed a new *idea of the society* and, thus, of *the University*, tend to converge (in terms of theme for debating, not of opinion) on the globalisation of human activities, the emergence of new techno-economic paradigms based on the development of communication and transport technologies, the rapid pace of social and technological change, and the disfigurement of the welfare state ideology by the spreading of the so-called neoliberal ideology. All these societal trends would be placed under the enveloping and somewhat fuzzy conceptualisation according to which contemporary society is a *knowledge-based society*. The basic idea, simply taken, is that, in a rapidly changing globalised society, the ability to adapt and innovate in order to stay competitive depends on the capacity to swiftly produce, disseminate and use new knowledge. The basic metaphor is the one of a *globalised society, motored by innovation, fuelled by knowledge and lubricated by learning*.

Universities, as major centres of knowledge and learning, in this *sea of change*, were confirmed as an institutional cornerstone of society, but perceived as a kind of engine of innovation, crucial to sustain the economic competitiveness of countries in the global economy, rather than the democratising principles of the welfare state. Somehow paradoxically, - the paradox becomes apparent if recalled the increasingly dominant ideological paradigm -, while challenged to be a supplier of competitive inputs to economies, universities were faced with cut backs in state funding and forced to enter

themselves an increasingly competitive game to find alternative sources to complement public budget monies and avoid ill-financed teaching and research. The commercialisation of university knowledge, regarded as a commodity, stood firmly as a most important complementary source of funding. University-industry links, taking the form of intellectual property rights, licensing, technology transfer or spin-off firms arise as the *medium* for knowledge commercialisation and for universities to assume their new mission of economic development agent. Basically, this sums up the original thesis of the second academic revolution.

These introductory notes, so far, left aside geography, as if the mighty power of globalising forces, underpinned by space compressing communication technologies, had originated the end of it. To what extent does the second academic revolution enclose a geographical dimension? Or, similarly, is geography relevant to understand the role and impact of universities as agents of innovation and economic development operating in a globalised society? The reasoning that allows for anticipating a positive answer is borne out by, on the one hand, the argument that there is a global-local nexus establishing a mutually influential connection and attributing increased relevance to territories in the context of globalisation, and, on the other hand, the very nature of the innovation process, which, because implying interaction between a multiplicity of learning agents, is socially embedded and thus context-specific. By making the global-local nexus and the social embeddedness of innovation to converge, a burgeoning scholar effort, while contradicting the thesis of the death of geography, has firmly affirmed it in the economic development debate, and, in fact, has percolated through the policy-making arenas. The proponents of the second academic revolution thesis did not stay immune to this trend. In fact, they have found the empirical grounds for academia's revolutionary move in experiences where university-industry links have created globally competitive industrial agglomerations, thus spatially bounded, of which territories as the Silicon Valley and the Boston area, in the US, are paradigmatic examples. Hence, the second academic revolution thesis has an inherent geographical dimension, which, in the end, attaches regional economic development to the third mission of universities. Accordingly, the flow of technical and technological knowledge and skills between universities and their regions' industry is expected to support, on the one hand, the innovative and thus competitive capacity of existing firms,

and, on the other hand, the emergence of new high-technology companies, which, taken together, will improve the regions' position in the global competition game.

Why is there the need for a new perspective on the second academic revolution? This interrogation is the bottom line of the present research work, as mirrored by its title. It means that this dissertation brings into question the aptitude of the propositions associated with the original second academic revolution thesis, - exclusively focused on technology transfer and spin-off firms creation -, to provide a complete picture of the role that universities can play as agents of regional development. In accordance, it compels to look at university development resources that, arguably, are neglected when sticking to the technology-focused approach.

The argument in favour of the widening of the second academic revolution conceptual framework gains substance by recalling the nature and requirements of innovation. Innovative processes develop with basis on a social architecture that supports interactive learning, implying a dense web of relations between a diversity of regional agents, through which knowledge is generated, disseminated and utilised. The innovative region, in this sense, acquires a systemic dimension, in which the fundamentals are not only the various components of the system but also the intensity and quality of the relationships between them, as well as the attributes determining their capacity to learn and change. The higher the systemic potential of a region, the better the region is equipped to face the development challenges of the contemporary society, because more able to access and combine a range of knowledge and relational resources that feed the capacity of regional innovation agents to act collectively.

The ability to mesh together knowledge and relational resources and translate the mix into capacities for collective action, in the context of this dissertation, is termed as institutional capacity, drawing on planning theory (e.g., HEALEY et al, 1999). Institutional capacity varies from region to region, impacting directly on the regional socio-economic development levels, that is, designing the map of territorial inequality. Most importantly, it cannot be taken as given or driven by *invisible hands*, but rather it has to be continuously and socially constructed. Universities, due to their very nature, are well placed to have an important part in this construction, meaning that the academic third mission can exceed the provision of innovation technological inputs to industry. Revolutionary change, in this context, is likely to bring not only different but augmented challenges to academia, as well

as to convey benefits to the academic endeavour other than those accrued by the capitalisation of knowledge embedded in technology.

The last argumentative line configures the major objective of the present research work: to put together a new perspective on the second academic revolution that explores the role universities can play in regional development as providers of the variety of resources that nourish regions' institutional capacity and tackles the challenges raised by that role. The new and extended perspective, looking at universities as institutional capacity builders that help their regions to construct the social architecture that supports systemic innovation and socio-economic development, goes far beyond the narrow focus of the traditional, technology-biased, approach to contemporary academic change.

Taking the picture together, the resulting inquiry line to be pursued further on can be structured according to four interwoven statements:

- Universities are increasingly assuming the role of agents of regional development, and their agency is being configured not only by the transfer of technological inputs to the world of production, but also by the provision of resources that enhance the processes of regional institutional capacity building;
- Universities are organising themselves in new or renewed fashions, aiming to deal with the challenges raised by the assumption of the role of regional development agents and regional institutional capacity builders;
- The interaction between universities and their regions depends on the characteristics and attitudes of the academic settings, but also on the contextual framework conditions, and, in addition, it can underpin a win-win game, i.e., the university-region nexus can assume a mutually reinforcing nature;
- Universities, as institutional capacity builders, gain particular importance, and indeed can play a fundamental role, in the context of institutionally weaker, less developed regions.

1.2

Reasons for a choice...

The firm belief that universities are a major driving-force of regional development in a context marked by globalisation and rapid change, particularly in institutionally weaker less favoured regions, taken together with the growing policy and scholar debate about the developmental role of academia, can be regarded as the thrust that has nourished the level of scientific curiosity necessary to set off this research journey. An additional motivation came along with the perception that there was room, and even need, for producing new knowledge on such an intellectually controversial subject.

Obviously, the belief and the curiosity did not emerge from a void. In fact, the author's research experience acquired at the University of Aveiro during the last 12 years has provided substantial knowledge, acquaintances, as well as further interrogation marks, which were decisive for choosing a theme. A handful of research and service provision events are worthy to be noticed: firstly, the participation in a number of European funded research projects, such as the two TSER¹ projects, *UNITTS- Universities, Technology Transfer and Spin-off Activities*, and *REGIS- Regional Innovation Systems: Designing for the Future*, and the project *COHERA- Universities as Knowledge Drivers in Less Favoured Regions*, developed in the framework of the EU Regions of Knowledge Pilot Action; secondly, the work undertaken with and for the regional authorities of Centro, such as, for instance, the elaboration of a number of research reports on the theme and action programmes to foster the interaction between higher education and regional innovation agents, and the author's appointment as representative of the University of Aveiro in the Steering Committee of the Centro region ERDF Innovative Actions Programme; thirdly, the participation in several moments of the internal debate about the role and impact of the University of Aveiro in the regions' development, as well as in the design of strategies and programmes directed at fostering third mission activities.

The results stemming from the evolving research work on the university-region nexus have been presented in many international conferences, such as, for example, the Triple Helix Conferences (*e.g., New York, 1998; Rio de Janeiro, 2000*), those organised by the

¹ Targeted Socio-Economic Research Programme, DG XII, 4th Framework Programme, European Commission.

Regional Studies Association (e.g., *Pisa, 2003; Leuven, 2006*), the European Regional Science Association (e.g., *Zürich, 1996, Dublin, 1999*), and the Association of European Schools of Planning (e.g., *Aveiro, 1998; Bergen, 1999; Shanghai, 2001; Volos, 2002; Napoli, 2007*). In addition, the research work gave rise to a number of publications in refereed international journals, such as, for example, *Research Policy* (CASTRO et al, 2000) and *Industry & Higher Education* (RODRIGUES et al, 2001; ROSA PIRES et al, 2002), and two book chapters (RODRIGUES et al, 2000, RODRIGUES et al, 2006).

In this context, this dissertation, rather than a *culminatum*, is part of an ongoing learning process that aims to contribute for the advancement of the knowledge about the role of universities in regional development and to set a basis for opening new research questions.

1.3

Organising and researching under complexity and multifariousness...

The structure of this dissertation mirrors a research trajectory that sequences the societal developments setting up the scenery for academic revolutionary change, the inherent challenges and turbulence faced by academia and their conceptual implications, and, finally, the perspective from practice, conferring empirical grounds to an enlarged and refocused version of the second academic revolution. This organising sequence is inevitably affected by the complex, intricate, multifaceted, and even controversial nature that characterises the area of study. Firstly, the co-evolution of the *idea of the University* and the *idea of the Society* makes the understanding of shifts in academic missions and roles hardly attainable if societal change is kept out of the picture. Secondly, societal change is the result of a multiplicity of transformative forces that bring about contexts, agents, features and challenges themselves multiple and complex. Hence the need for a multidisciplinary approach, on the one side, and for enduring knots and bolts to solidly bridge and found the organisational sequence referred to above, on the other side.

The attempt to find the adequate knots and bolts relied on two pillars. Firstly, an extensive and forcibly eclectic literature review, providing the theoretical and conceptual backcloth against which the context and justification of the investigative line will be explored. Secondly, an approach to the practice of the threefold mission of universities

based on a case study research method, that, in the context of *real-life* complexity, aims to find substantive answers to the research questions.

The dissertation, reflecting the organising sequence as outlined before, is structured according to four parts. The first part aims at conceptualising and reasoning the challenges associated to socio-economic development processes in the contemporary society and the effect they exert on the mission realm of a shifting academia. The resulting framework provides the referential to be followed when exploring the developmental role universities can play and searching for the meaning of the associated revolutionary move that it is said to have occurred in the academic world. It also opens up the opportunity to emphasise the regional dimension that can be attached to the role of universities as development agents.

Part I has five chapters, organised as follows:

- **Chapter 2** highlights the adaptive capacity of academia by addressing the evolution of the *social contract* binding academia and the rest of society throughout time. It addresses the evolutionary changes that would pave the way to the first academic revolution, and the features of the revolutionary change and how it has influenced the societal expectations towards universities in the subsequent decades, namely until the 1970s. It provides the backdrop against which the igniting factors and the nature of the second academic revolution can be better understood.

- **Chapter 3** attempts to capture the essence of the changes underpinning social and economic life in contemporary society and identify the inherent development challenges. It draws a picture of the nature and change implications inherent to the globalisation trends and tackles the contemporary condition of knowledge, looking at knowledge as the most strategic resource and learning as the most relevant process. It explores the evolving and variegated conceptualisation of innovation and culminates depicting it as a complex, interactive, and thus socially rooted phenomenon.

- **Chapter 4** draws on the interactive and social basis of innovative processes to contradict the “*death of geography*” argument often associated with the globalising trends, arguing, instead, in favour of a mutually dependent global-local nexus. In accordance, it brings about a variety of theoretical and conceptual approaches that underscore innovation as a territorially grounded process. It also

explores the regional development disparities in Europe and attempts to identify the major factors behind the existing gaps and the ingredients needed to materialise catching up trajectories in less favoured territories, asserting the unlocking of institutional inertia as a key effort.

- **Chapter 5**, with basis on the conclusions of the precedent chapter, establishes what institutional capacity building means in the context of this dissertation. It does that by bringing into the discussion the conceptualisations of social capital, institution, capacity and institutional change, and by making these concepts to converge on the definitional ground of institutional capacity.

The second part turns the spotlight onto contemporary academic change. It resumes the scenery depicted in Chapter 2, frozen in the 1970s, to outline in a detailed fashion the changing expectations of society *vis à vis* universities that shape the second academic revolution. Bearing in mind the lessons drawn from Part I, the approach points out the reasons why there is the need for and conceptualises a broader perspective on the academic revolution. It provides the backbone of the overall inquiry line and the formulation of the research questions to deal with in empirical terms. **Part II** comprises two chapters:

- **Chapter 6** attempts to keep abreast of the literature on contemporary academic change, addressing the shapes change is taking and the impacts on the mission and the ethos of academia. It confronts pessimistic with more optimistic views of the changing dynamics outlining the future of the University, and uses theoretical modelling to frame the revolutionary shifts. The picture, taken together, grounds the suggestion of the need for widening the reach of universities' role as development agents.

- **Chapter 7** nourishes the argument in favour of an enlarged perspective on the second academic revolution and introduces the regional dimension into the discussion. Under the light of the concept of institutional capacity building, it qualifies the new perspective on revolutionary change in academia, draws attention on the inherent organisational challenges, debates the novel nature of the university-region nexus, and highlights the particularities of the universities' regional role in less favoured regions. Finally, it grounds the inquiry line to be empirically pursued and the guiding research questions.

The third part reports the empirical work developed in three universities located in distinct European territorial contexts, offering a picture of the second academic revolution taken from the point of view of the *praxis*. It is aimed at providing answers to the research questions defined in Chapter 7, with basis on a case study approach. Three chapters compose **Part III**:

- **Chapter 8** discusses the methodological aspects of the research work undertaken. It explores the reasons for the choice of a case study-based methodology, presents the criteria used to select the units of analysis, i.e., the three studied universities (Tampere University of Technology, in Tampere region, Finland; Aristotle University of Thessaloniki, in Central Macedonia, Greece; Cardiff University, in Wales, UK), and describes the actions taken to collect information. It also establishes the operative research framework through which the collected information is organised and interpreted.

- **Chapter 9** profiles the regional contexts in which the three universities under study operate. It combines basic characterising figures with the historical evolution of each region and gives an account of the governance regional settings. Finally, it highlights the societal, legal and policy frameworks influencing the universities' regional engagement agenda and activities.

- **Chapter 10** reports the case studies carried out in the three selected universities. It provides general information about each university and depicts the evolution and present stage concerning their relationships with society. It addresses the role of the three universities as institutional capacity builders and the organisational arrangements in place to perform the third mission, and analyses the nature and implications of the university-region nexus. Drawing on these insights, the chapter searches for particularities of the role universities can play in less favoured regions.

Part IV consists of one chapter, **Chapter 11**, in which the conclusions of the dissertation are drawn.

1.4

About the significance...

In the context of a globalised, rapidly changing society, universities are at the core of the efforts to foster regional socio-economic development and increasingly active in the materialisation of the academic third mission. As such, an attempt to contribute to the advancement of knowledge on the nature, motivations, challenges, obstacles, mechanisms and outcomes of the university-region nexus, can be considered as significant *per se*. However, the significance of the present research work gains distinctive contours when called forth the argument that the mainstream scholar approaches to the universities' third mission are restricted to the commercialisation of academic research results with basis on technology transfer and the creation of new industrial ventures. The dissertation brings about dimensions of the regional role of universities that the predominant views neglect or, at best, look at as playing second fiddle. These dimensions are configured by scrutinising universities as regional institutional capacity builders, or, in other words, drawing attention to a variegated array of university resources that enhance the social architecture supporting innovation and development. In this sense, academic technological inputs are only a part of the university-region nexus, as well as industry is just one of the range of private and public agents instituting that nexus.

The enlarged picture of the role universities can play in regional development, as it will be asserted further on, acquires increased relevance when in presence of less favoured regions, generally affected by a fragile institutional fabric. Universities operating in these lagging regions can assume particular significance in the mitigation of the institutional weaknesses that curtail their capacity to pursue the development paths that allow them to escape laggardness. In addition, from a research point of view, if the university-region nexus is taken narrowly, - i.e., sticking to the technology-biased perspective -, such less favoured territories risk to be overlooked, because structurally ill-equipped to secure systematic flows of technical or technological knowledge between academia and production.

Being dominant, the narrow approach to the regional role of academia is powerful enough to influence policy-makers all over the industrialised world, either in more or less favoured regions. The same can be said about the university researchers and

administrators, meaning that the preparation of the academic settings to put in practice the third mission is likely to be framed by that narrow perspective. In this sense, a mismatch can occur between public policy and regional problems, as well as between university organisational arrangements for the third mission and regional needs. Hence, there are policy implications attached to this effort to justify the need for, investigate what does it mean, and give argumentative strength to a new extended perspective on the second academic revolution.

Part I

Setting the scenery for change in academia

The evolving social contract between the University and Society

2.1

Introduction

“[...] everything else changes, but the university mostly endures [...]. About eighty-five institutions in the Western world established by 1520 still exist in recognizable forms, with similar functions and with unbroken histories, including the Catholic church, the Parliament of the Isle of Man, of Iceland, and of Great Britain, several Swiss cantons, and seventy universities”, KERR (2001, p. 115).

It is widely accepted that the University, since times immemorial, is a cornerstone in the development of society. This societal status remained untouched through centuries, as the pursuit of knowledge and its dissemination onwards through higher learning stuck at the core of the University's mission. Arguably, the institutional stability that Clark Kerr underlines in his statement finds its roots in the perception of knowledge as an anthropological constant (STEHR, 2002).

Despite the temporal stability of the University as an institutionalised concept, and as much inexpugnable and immune to external influence the *ivory tower* can be, it has always evolved in a close dialectic with society and along a diversity of technical, technological, cultural and social facets, as well as absorbed and accumulated the changing aspirations of successive generations (SMITH and WEBSTER, 1997). In other words, evolutionary and revolutionary forces shaping societal development, and inherently, the value, the modes of production, storing, dissemination, and purpose of knowledge, placed academia under the strain of constant change.

There is thus a tension between the institutional stability and the vast transformations that shaped academia since the Middle Ages, when the term *University* encompassed the ecclesiastical institutions of secondary and higher education, born of the merger of the cathedral schools (HADDAD, 2000). This tension feeds an ongoing lively and controversial debate, both within and outside academia, aimed to find new grounds for the University's mission and functional realm. This debate is far from an ending, as well as far from consensus. To capture the full range of this debate is obviously an impossible task within the context of this dissertation. A few questions, however, are enough to provide a flavour of controversy, and even extreme antagonism, that shapes the debate:

- Is the University empty as a concept (BARNETT, 2000a)?
- Are real universities research institutions and “*not, repeat not, primarily places of teaching*” (OSWALD, 2002)?
- Is the University returning to its medieval roots (GEUNA, 1998)?
- Is the University becoming a factory, run by a *Captain of the Bureaucracy* as a parts-supply shop to the profit system (DRAPER, 1964)?
- Is the University in ruins (READINGS, 1996)?

Can change in academia assume a revolutionary nature? The term academic revolution was firmly introduced into the debate in the late 60's by JENCKS and RIESMAN (1968)², who developed a sociological and historical analysis of the evolution of American higher education. The authors used the term “*to describe the rise to power of the academic profession*” (id., p. xxiii), resulting from more scholarly and specialised faculties, whose foundation stones were laid by the end of the 19th century and would shape the evolution of the academic system in the United States. A major consequence of these shifting conditions has been the taking of research as a mission, together with teaching, by transformed older colleges and newly created universities.

Accepting the revolutionary nature of legitimating research as a mission of higher education, it can be argued that this academic revolution had already occurred in Europe, namely in Germany, when, in 1809, *Wilhelm von Humboldt* founded the University of Berlin, embodying then the concept of research-based teaching along with comprehensive humanistic education (OECD, 1999a). Moreover, there is historical evidence suggesting

² As JENCKS and RIESMAN (1968, p. xxiii) acknowledge, the term academic revolution “*is not, of course, original*”. The authors (id.) add: “*We do not, however, know anyone who has used it in anything like the same sense that we do*”.

that the American academic revolution owes much to the changing European university of the 19th and early 20th centuries. Quoting the OECD (1999a, p. 13), “*the American graduate school, with its focus on research and higher learning, grew out of the training of large numbers of American scholars in European, particularly German, universities, from the second half of the 19th century to the 1930s*”.

The aim of this chapter is not seeking for complete answers to the knotty questions outlined before. Rather, it will address the multidimensional problem of the evolving *social contract* between universities and the public and private realms of the rest of society. The discussion will focus on the evolutionary and revolutionary events that, since the medieval roots of the university, built the history of the academic institution, shaped its contract with society, and paved the way for the second academic revolution. Accordingly, changes occurred over this long time span are chronologically analysed upwards the 1980s, a key milestone as far as it concerns the emergence of a multiple set of political, economic, social and cultural conditions determining the upcoming new revolutionary wave in the higher education realm.

The chapter stresses the protean adaptive capacity to change of a resilient academic institution in its close dialectics with society. Bearing in mind that contemporary change should be interpreted in the context of history, it attempts to outlining the backcloth against which the second academic revolution, - at the core of the following chapters-, would be put in motion. Accordingly:

- firstly, the chapter presents a short overview of the development path followed by the university since its medieval roots until the early 19th century, when the revolutionary principles of Humboldt were brought to light;
- secondly, it highlights the nature of the first academic revolution and the resulting changes that have levered new expectations of society *vis-à-vis* higher education and shifted the institutional and organisational academic realm until the disruptive event that was the Second World War.
- thirdly, it addresses the post-war developments, during which the teaching and research academic missions, integrated after the first academic revolution, were re-contextualised under the scope of a new societal demand, initially for social and economic reconstruction, and later for the sustaining of the welfare state.

2.2

Academia under (r)evolution?

Simply taken, as in the *Oxford Advanced Learners Dictionary*, the concept of *revolution* entails a radical change in terms of conditions, working methods, beliefs, etc., that affects large numbers of people and organisations. Does it make sense to talk about revolutions within the resilient academic institution? Or, on the contrary, is it more adequate to tackle the changes in the academic world as a long history of more or less smooth transformative adaptation?

The vast research work on the subject indicates that there is a third way of looking at the transformation of academia, drawing on the perception that the University has a “*protean capacity to change its shape and function to suit its temporal and socio-political environment while retaining enough continuity to deserve its unchanging name*” (PERKIN, 1984, p. 18). It entails transformative revolutionary forces as well as smoother evolutionary forces, by combining continuous adaptive change along the timeline of history with somewhat disruptive events occurred in specific points on that timeline. This combination is called into play by the literature to sustain the possibility of an academic revolution. The meaning, essentially, is one of a dramatic change of the *contractual* base between universities and the rest of society, thus affecting the definition of the academic mission and *ethos*.

Going to the medieval roots of the University, the *studium generale* and the *universitas* were predominantly cosmopolitan places of instruction and living, with strong ties to monasteries in the beginning, becoming later an ally of the secular rulers (DELANTY, 2001). Bologna and Paris are generally mentioned as the oldest universities, if the term University is taken as characterising a “*peculiar institution of higher education developed to a level of organisational and educational complexity and could be considered the ancestor of the modern university*” (GEUNA, 1999, p. 38). University research was practically inexistent, or even forbidden, as research could threaten the established Roman Catholic Church’s dogma (HADDAD, 2000). Medieval universities had two basic functions: teaching priests, public servants, lawyers, etc. (MARTIN and ETZKOWITZ, 2000), and scholarship in a variety of disciplines structured by the Aristotelian *trivium* (grammar, rhetoric and dialectics) and *quadrivium* (arithmetic, geometry, astronomy and music).

Knowledge, namely due to limitations in the reproduction technologies, was compelled to be *metaphysical*, thus not embodied in social reality (DELANTY, 2001). Consequently, the linkages between universities and the external world were scarce and, as reminded by DELANTY (id., p. 27), “*those that did exist were mostly defined by the church*”.

The conservative character of the university in the late 15th and 16th centuries, consequence of a diminishing cosmopolitan nature and an increasing dependence on the support of local powers, favoured the development of new non-university institutions, such as the learned society and academies, which became the centres of knowledge development, mainly in literary domains (GEUNA, 1999).

The societal transformations of the Renaissance and the Reformation challenged (timidly the former, pervasively the latter) the dogma of the Church, contributing thus to gradually free academia from “*the oppressive yoke of the Church*” (HADDAD, 2000, p. 31). The declining influence of the ecclesiastical function of the University coincided with the rise of the nation-state from the 17th century onwards, and knowledge, as DELANTY (ibid., pp. 28/29) argues, “*became a free-floating discourse to be used for domination or emancipation*”. Universities gained in autonomy and identity, and developed an academic culture. Nevertheless, the *ivory tower* resisted as a *warehouse of precious goods* (VAN DER WUSTEN, 1998) and the place where a number of elite vocations (e.g. law) was taught. RUDY (1984, p. 87) suggests that universities “*still retained narrow and antiquated curriculum and methodologies, made few contributions to thought, and opposed the ideologies spawned by the Enlightenment*”. In the words of KERR ([1963] 2001, p. 8), universities, “*in their disdain for contemporary events [...], stood like castles without windows, profoundly introverted*”. Hence, universities did not play a crucial role in the advancement of knowledge, as opposed to scientific societies and academies where scientific research was developed (GEUNA, id.). Much of the shift from the global culture of Christianity to modern experimental science (despite the hampering impositions of the counterreformation, namely in Italy, the birth place of non-university academies, as evidenced by the trial of Galileo in 1633), was driven by those societies and academies, generating a revolutionary process³ that equated “*a development episode in which an older*

³ The scientific revolution of the 17th century reflected the protagonists’ conviction that orthodox science was comprehensively defective, because wrong in its metaphysics and methods, wrong in its facts and theories, wrong in its *ethos* and outlooks (PORTER, 1996).

paradigm [of science] is replaced in whole or in part by an incompatible new one”, (KUHN, 1970, p. 92), and generated changes in the ways scientists look at the world (id.).

Obviously, universities, in their dialectics with society, were not immune to the scientific, industrial and political revolutionary developments of the 17th and 18th centuries. For instance, in the revolutionary France more than 20 universities were abolished, since new institutions were thought of as necessary to cope with the conception of scientific research deriving from the French Enlightenment (CLAVAL, 1998). As the role of erudition was dismissed (id.), two new types of organisations were created: the independent faculties of liberal arts and the *Grandes Écoles*. In Britain, during the early phases of the industrial revolution, following JOHNSON (1991, pp. 571/572), “*qualifications, degrees, certificates, professional rules and trade conventions were swept aside by masters and men who were anxious to get on*”. Universities, “*as opposed to the grammar schools and Dissenting Academies, had little to do with it, and the government, nothing at all*” (id.). However, later on, the industrial revolution would be instrumental for the entrance of science as a respectable academic pursuit (MCKEE, 1996). Some historians of science and technology often suggest that science has been much more indebted to the steam engine than the steam engine has been to science (cf. ROSENBERG, 1982). Moreover, while the old British universities, though meanwhile modernised, did not change much their functional emphasis on training ministers for the Church and giving a common ground to the heirs of the establishment, the increasing demand for engineers, civil servants or clerks for businesses has been met by newly created universities more open to the technical sciences (e.g. Birmingham, Manchester, Glasgow, London) (CLAVAL, id.).

RÜEGG (1996) suggests that society has definitely changed only through the revolutions of the 17th and 18th centuries, determining a notorious pace of change within the academic world, which culminated, in the 19th century, in the birth of the modern University, or, according to GEUNA (1999), in the University’s recovery after approximately two centuries of atrophy. The same author (id., p. 44) stresses that “*in the new political, religious and scientific environment the university evolved into a new kind of institution, preserving some of the features of its medieval ancestor, and incorporating and developing methodologies and social organisation of the scientific research carried out in the eighteenth century societies and academies*”. Universities were given the responsibility “*to select and teach their elites, to shape (at least partly) their dominant ideologies, and to privilege*

science and technical modernity” (CLAVAL, 1998, p. 31). Universities have not stay immune to the rise of modernity, a change process with roots in the *Enlightenment*, witness of the start of a disruptive period of socio-economic and cultural change (MILLIKEN, 2004), marked by phenomena such as industrialisation, the growth of science and technology, the modern state, capitalism, and urbanisation (FEATHERSTONE, 1991).

SCOTT (1995, p. 12) suggests three decisive shifts during the 19th century, “*which not only created the demand for a more elaborate university system but also shaped (and continue to shape) its development*”: the stirrings of the democratic revolution, determining a growing emphasis on education, due to the increased polite culture among the middle-class and the growing consciousness of the working class; the industrial revolution, creating a demand for a much more sophisticated, expert-based, division of labour; the rise of a professional society, causing the development of organised professions and the growth of a bureaucratic state, and thus new training needs.

University’s recovery occurred under different organisational and functional academic contexts⁴, which kept on shaping disparate solutions to cope with the transformative pressures. The literature, in general, turns to the three major models of universities development⁵ suggested by GELLERT (1991): the *English* model (the personality model), the *French* model, (the training or professional model), and the *German* model, (the research or knowledge model). This categorisation describes ably enough the broad orientation of different higher education systems, though underestimating their diversity (SCOTT, id.).

The conceptual basis of the English model is generally connected to Cardinal Newman’s idea of the University and to Oxford and Cambridge. In Newman’s discourses delivered just prior to the foundation of the Catholic University of Ireland in 1854, he defined the university as a place of teaching universal knowledge, in order to mandate the presence of theology as a science of sciences (NEWMAN, [1899], 1996). University education was thus opposed to professional instruction. Newman’s definition is regarded as drawing on a sort of *immaculate* conception of the University, in which the creation of

⁴ Organisational diversity could already be observed in the medieval university: e.g. Paris as *universitas magistrorum*, in which power was concentrated in the masters, and Bologna as a *universitas scholarium*, in which power gradually passed into the hands of students.

⁵ The American system could be considered as a fourth model of university development. However, the transformation of higher education in North America was pervasively influenced by the introduction, in the late 19th century, of the organisational and functional principles of the German *Humboldtian* model.

knowledge for its own sake and its provision to students in order to enable them to reach their full individual potential, were at the core of academia's mission. It is worth noticing that, as reminded by GRAHAM (2002), the influence of Newman's positions on the British university system has probably been overestimated. The author (id., p. 2) argues that "*there is [...] a dangerous romanticism in thinking that once upon a time British universities were suitably Newmanesque until the arrival of utilitarian Philistines [...]*". In fact, universities such as the University College of London, founded in 1828, or the *redbrick* universities of Birmingham, Manchester, Leeds, etc., established during the second half of the 19th century, were already responsive to the technological and scientific needs of society, and, according to GEUNA (1999), their mission encompassed not only liberal education, but also professional education and research.

The French model sprang from the limitations of the higher education system restored by Napoleon after the revolutionary period, focused on the training of citizens for state service, both military and bureaucratic (RUDY, 1984). This highly state centralised system, after Napoleon's defeat in 1870, was severely criticised and the need for another forms of higher education was acknowledged (CLAVAL, 1998). The so-called French model results from the reforms introduced in 1896, when several independent faculties were reunited in 17 provincial universities. The elitist *Grandes Écoles* remained as the place where top professional positions were taught and ensured a dominant role in research. Universities mainly provided professional training (GELLERT, 1991). The model reflects, on the one hand, a clear institutional and functional segmentation between the *Grandes Écoles* and universities, and, on the other hand, the persistent centralised bureaucratic state control of the higher education system.

"[...] *it was in Germany [...] that it [the transformation of the medieval university] developed most rapidly, so that by 1809 the University of Berlin was offering laboratory based courses in experimental sciences [...]*", (GRAHAM, id., p. 7)⁶. The German model, drawing on the principles that guided the foundation of the University of Berlin by Wilhelm von Humboldt in 1810, had at its core the idea of science-based teaching (*Bildung durch Wissenschaft*). SPINNER (1993), in a summary of what is new and typical with respect to the *Humboldtian* idea of an ideal university, highlights five main features: firstly, the constitution of an ideal type of pure scholarship, resulting from the devotion of

⁶ GRAHAM (2002, p. 7) argues that the first stirrings of this new conception are associated with the establishment of the University of Halle, in Germany, by Lutherans in 1694.

teachers and students to science for its own sake, within an autonomous realm of knowledge organised according to the principles of self-formation; secondly, the integration of teaching and research, i.e., the “*fusion of teaching known results and searching for the new*” (SPINNER, 1993, p. 141); thirdly, the demarcation of an inner world of autonomous science from the outer world of the rest of society; fourthly, the conciliation of academic freedom with loyalty to God, king and nation, as well as with a minimum of external regulation – SPINNER (id.) argues that this is “*the most radical and least realized feature of the new university*”; fifth, the institutionalisation of scientific excellence. The author (ibid.) sums up: “[...], *the ideal university would be an institution for the cultivation of excellence, which is free in the internal realm of research, privileged by the State and the Law, discharged [...] in relation to the normal state of affairs in the broader society*”. The German model is often considered as referential of the development of the modern university in the Western world. In fact, and notoriously, the current idea of the University still heralds much of the *Humboldtian* reform.

Accepting that an academic revolution is a change in the purpose or mission of the university (ETZKOWITZ et al, 1998), one can argue that the *Humboldtian* reform had a revolutionary nature, as it appeased research to become an integral part of the academic mission along with teaching. Hence, the roots of the first academic revolution can be traced back to the developments occurred in Germany, in the early years of the 19th century.

2.3

The *Humboldtian* ideal and the first academic revolution

The University of Berlin, founded in 1810, has probably been the only genuine example of the *Humboldtian* model of university (GEUNA, 1999). However, Humboldt’s principles represent “*the idealistic background philosophy of an autonomous republic of science*” (SPINNER, 1993, p. 138) that, by making research to emerge as a legitimate academic mission, triggered the first academic revolution and created the so-called modern research university. Still today, the integration of teaching and research, in which teaching is expanded to enclose the methods for obtaining new knowledge as well as the passing on and reinterpretation of existing knowledge (ETZKOWITZ et al, 2000), is viewed as the very essence of the university.

“In the eight centuries of university life in the Western world that have stretched from twelfth-century Bologna and Paris to twentieth-century Stanford and Tokyo, no other change compares with the emergence and development of the modern research university”, CLARK, 1995a, pp. 1-2.

German universities, which had first adopted Humboldt’s ideas as guiding principles, in a few decades, became a successful example of scientific endeavour (CLAVAL, 1998), and established the organisational methods and practices of academic science that still hold today (e.g. the research-teaching laboratory, the publication of research results in scientific journals, graduate education, etc.). Hence, the German revolutionary pace was perceived as an appealing academic development in a number of other countries, such as the US and Japan, where the *Humboldtian* model has been most influential (CLARK, 1995a). In spite of the somehow diverse path followed by the British and French universities, one can argue that, in the second half of the 19th century, the first academic revolution initiated in Germany during the early years of the century, gave rise to the paradigm of a new type of university and, concomitantly, a renewed type of science, engaged in a search for truth and no longer controlled by church or state (SPINNER, 1993).

Despite national differences, very much under the light of Humboldt’s ideal, the modern research-oriented University became an institution committed to the production of knowledge for its own sake and to the preparation for professional careers, endowed with an articulate organisation and a legal status, and structured according to a crucial subdivision of knowledge into disciplines (GEUNA, 1999). Moreover, as the same author (id., p. 45) notes, *“the university became a national institution allowed to pursue the unconstrained development of knowledge but to the advantage of the nation-state”*. This process of *nationalisation* of the university (NEAVE, 2000), *“sets the bounds around the role and the responsibilities both university and academia are called upon to play in society”* (id., p. 6). This perspective assumes relevance when exploring the diversity of post-*Humboldtian* development trajectories followed by different national higher education contexts, shaping differently the accomplishment of the new social contract between university and society thrust by the academic revolution.

The nationalisation of the university was particularly acute in continental Europe, as opposed to English-speaking countries. NEAVE (ibid.) discusses the subject addressing the

community “to which the university was supposedly answerable [...]” (NEAVE, 2000, p. 10): whilst in the continent, the university was perceived as being at the service of the *national community*, in Britain, despite the funding role of the central state, a minimal legal framework allowed local initiative to shape the basic mission of the university (the process of *nationalisation* in Britain would start after the Second World War). The American case, marked by a strong local (and private) influence, diverged from the British because of the absence of a nationally defined state framework (ibid.). Still, as MAGALHÃES (2004) suggests, higher education systems, either strictly regulated by the state or largely dependent on private initiative, have endowed the nation-state with the educated people that its building required.

The *nationalisation* process can also be associated with a deviation from the *Humboldtian* ideal, as state interference went far beyond the supposed role of supporting the *lehrfreiheit* and *lernfreiheit* principles in universities. This is well illustrated by the events occurred in Germany (Prussia, for historical accuracy), where the modern university finds its roots. As put by SPINNER (1993), the *Humboldtian* principles had the intended consequence of promoting higher learning and scholarship. They had, however, the unintended consequence of making natural science and technology big and expensive, requiring heavy human and financial resources. This size effect raised the “*unsolved question of resources for a growing non-profit enterprise*” (id., p. 157), leading to the establishment of government control over science, by the introduction in the 1880s of the so-called *Althoff system*⁷.

This deviation *vis à vis* Humboldt’s ideal of the university would be largely extended by the increased demand for scientific knowledge and *knowledgeability* (SCOTT, 2000a) made explicit by a vibrant industrial society. The independence of the search for truth by academic science towards the state and society, very much at the core of the *Humboldtian* principles, was thrown into question by an increased interference of state regulation and control, as well as by the trend to calling into play the interactions between science and industrial technology.

⁷ Friedrich Althoff held the position of Prussian Minister of Education from 1882 to 1907. Quoting SPINNER (1993, p. 157), the *Althoffian* system “*combines the increase of external resource allocation with a shift of the gravity-centre of science towards the political pole of the State authorities, ministerial governance and bureaucratic administration*”.

In fact, Germany, in spite of the *Humboldtian* ideal of an *ivory tower* pursuing knowledge for its own sake, became also a pioneer in the domain of university-industry links. CLAVAL (1998) provides an explanation for the German anticipation, by arguing that, in the 19th century, “*German enterprises had for decades lagging behind British and up to a point, French firms*” (id., p. 32). As the need for developing firms’ competitiveness increased, university teachers were asked for consultancy, university laboratories were subsidised by firms and teachers and students, open to new management techniques, were recruited (ibid.). However, university-industry relationships, until the middle of the 19th century, were relatively sporadic, since technologies were constituted by self-contained intellectual systems, as well as largely empirical (STANKIEWICZ, 1986): “*The practitioners of various arts (techniques) have been relatively self-sufficient in terms of functional insights, design ideas and the knowledge of relevant properties of matter*”, (id., p. 11). The second half of the 19th century marked a reduction in the compartmentalisation between science and technology, particularly in the German chemical and electrical industry. In addition, by the same time, a new type of institution was created, the *Technische Hochschule*, technical universities aimed at the training of engineers required by the German industry, as well as at facilitating relationships between higher education and enterprises (CLAVAL, 1998). STANKIEWICZ (ibid.), drawing on an essay written by MEYER-THUROW (1982) on the case of a German dyestuff producer, *Bayer AG*, illustrates this shift, suggesting three interaction stages which can be summed up as follows:

- during the first phase, until the 1850s, though sporadic, there were links between German chemical industry and academia, involving, on the one hand, the recruitment of academic scientists (almost exclusively for production and control functions), and, on the other hand, the start-up of new firms by trained (and ill-paid) chemists who left their universities (though maintaining contacts with their former academic colleagues);
- the second phase, a transitional stage during the 1860s and the 1870s, was characterised by the emphasis on direct links between the industry and the university, namely contract-based links with reputed academic researchers which gave the company access to commercially relevant scientific outcomes. During this stage, *Bayer AG* has started supporting academic research laboratories, as well as sending its own scientists back to the university (or to

the *Technische Hochschule*). “All this sounds remarkably modern”, highlights STANKIEWICZ (1986, p. 13), before adding (id.): “Back in the 19th century Bayer was doing, albeit on a more modest level, what many companies in the fields of e.g. biotechnology, electronics or computers do today on a grand scale”.

- the third phase, from the 1880s onwards, marked the development of highly successful in-house R&D (though only in 1891 a formal laboratory organisation was established in *Bayer AG*). As a consequence of the *insourcing* of R&D, direct links between the company and academia decreased. However, chemical science and chemical technology kept close links, which remain until today. According to STANKIEWICZ (ibid., p. 15) the resilience of this “*sort of generous and liberal attitude to academic research [...] reflects the confidence on the part of large established science-based industries that the links they establish with the universities will eventually payoff*”.

In other countries, for instance in Britain and the United States, by the same period, linkages between universities and industry were not so intense or sophisticated as in Germany (cf. SWANN, 1988). Germany, until the beginning of the 1st World War, held the world’s most complex and advanced research system (HOUNSHELL, 1996). The same author (id. p. 20), argues that “*a key element of the German system was industrial sponsorship of research in universities*”. However, by the turn of the century, in the wake of Imperial Germany leadership, in both sides of the Atlantic, pharmaceutical, chemical, and electrical firms, amongst other, were relying on academic science and scientists to develop (CHARLES and HOWELLS, 1992; MOWERY and ROSENBERG, 1998). These linkages between academia and industry have contributed for the establishment of organised industrial research, pioneered by the German chemical firms, which would rapidly spread in other nations, such as, for instance, the US, where universities, besides providing industry R&D laboratories of trained scientists and engineers, became “*a focal point for the external technology-monitoring activities of many US industrial research laboratories before 1940*”, (id., p. 23).

Despite the differences in intensity and sophistication of university-industry relationships, one can argue that the expansion of academic research driven by the first academic revolution has dramatically changed the relationships between higher education and the world of production. Industry, namely large firms such as *Bayer*, *BASF* and

Hoechst in Germany (HOUNSHELL, 1996), *Du Pont*, *AT&T* and *General Electric* in the US (MOWERY and ROSENBERG, 1998), or *Sumitomo Corporation* and *Furukawa Corporation* in Japan (HASHIMOTO, 1999), maintained a close relationship with universities, seeking for innovation inputs and trained R&D personnel. Academia, in turn, induced by an increasing cooperation with industry, sheltered new engineering and applied sciences, thrusting the reinforcement of interaction (ROSENBERG and NELSON, 1996).

However, the ties between academic research and industry, though prolific in a number of industrial branches, as noted by ETZKOWITZ and WEBSTER (1998, p. 26), “*were either discarded or encapsulated in special sectors of the university world such as engineering and agricultural schools*”. In the US, this was the case of the land-grant colleges of agriculture established by the Morrill Act of 1862, which, by developing an integrated research and extension system and principles of scholar social engagement, have pervasively contributed to the high productivity growth of American agriculture (MCDOWELL, 2003). Social engagement, as a major distinctive feature of land grant universities, is often regarded as one of America’s finest contributions to civilisation and scholarly practices (id.). Another notorious case in the US was the Massachusetts Institute of Technology (MIT), established in 1861 as a creative synthesis of a research university and a land-grant university (ETZKOWITZ, 2002a), in which programmes were devoted to link science to applications in a diversity of industry and commerce domains. The exceptional character of MIT is well portrayed, for instance, in ETZKOWITZ (id.), who claims that “*as a science-based, technological university with strong industrial ties MIT does not fit into the existing categories of academic institutions*” (ibid., pp. 18/19), and classifies the MIT as “*a distinctive type of science-based university in sharp contrast to the ivory-tower mode*” (ibid., p. 19). At the same time, the *Humboldtian* principles of academic freedom and of searching truth for its own sake were well established in the founding mission of a large number of American universities, which abjured the capitalisation of academic research. The Johns Hopkins University, according to FELDMAN and DESROCHERS (2004), the first research university in the US, founded in 1876, is a paradigmatic example of “*unwillingness to allow commercial interests to influence research*” (id., p. 106). Nevertheless, this university would be at the forefront of the first academic revolution in the US, when, according to the same authors (ibid.), it became the first American university to offer a research-based graduate programme. It is worth

noticing that the development of research training initiatives and advanced graduate studies in the US is at the core of the Humboldt-inspired American first academic revolution (cf. JENCKS and RIESMAN, 1968).

The integration of science and technology tended to take place within what STANKIEWICZ (1986) calls homogeneous institutional environments. Accordingly, in general terms, academic and industrial science grew apart, each developing its own norms and traditions (ETZKOWITZ and WEBSTER, 1998). Even so, growing concerns raised about the extent to which the interaction between the two spheres, though restricted to a number of university niches and industrial branches, could disturb the established academic *ethos*. The rise of the notion of *pure* science, or, similarly, of a clear cut segmentation between basic and applied research (id.) can be regarded as an outcome of those concerns. In fact, for instance in the US, no clear distinction was held between basic and applied research until the late 19th century (ETZKOWITZ, 2002a).

The First World War brought a new impetus to the collaboration between academic research and industry. Several schemes of interaction, mainly driven by the national interest and, inherently, by governments, have been instituted. The US Naval Consulting Board gathering industry, universities and government to help organise naval research, or the coordinating role of the British government in the development of synthetic dyes, are examples of this government-led impetus (cf. CHARLES and HOWELLS, 1992). War transfigured the image of science, namely in terms of the valorisation of immediate applications of existing knowledge (MACLEOD, 1997). In the following years, there was a seemingly related rise in interest in university-industry co-operation, which would be disrupted by the Depression of the 1930s (ETZKOWITZ and WEBSTER, 1998), when, following MACLEOD (id., p. 376), “*in many quarters, the scientific ‘expert’ became an object of fear and derision*”. Nevertheless, in the mid-1930s, university science had been mobilised by national governments to work on the development of the future technology of war (CHARLES and HOWELLS, id.). Perhaps one of the most famous academic research efforts in defence domains was the development of radar technologies at the Cavendish Laboratory in Cambridge, Clarendon Laboratory in Oxford, and Birmingham University (ibid.). After the Second World War began, the belligerent nations geared academic and industrial research to defence purposes. A variety of organisational innovations have emerged. For instance, the *Kenkyu Tonarigumi* (Research Neighbourhood Groups) were

established in Japan, bringing together industrial and academic engineers (HASHIMOTO, 1999). The OSRD, Office of Scientific Research and Development, an American civilian agency, set up research contracts with universities and private firms, allowing to tap the academic and industrial R&D capabilities developed during the interwar period into military technologies (MOWERY and ROSENBERG, 1998). The German war effort made appear a number of new dedicated research institutes to develop specific technologies, such as in aerodynamics in Göttingen and Berlin, and the rocketry programme in Peenemünde (ASH, 1999). Warfare was a watershed that has pervasively transformed the structure and organisation of university research. The first academic revolution evolved towards a new threshold.

2.4

The science endless frontier, the linear model of innovation and the public interest

The socio-economic reconstruction needs in the aftermath of a devastating war, together with the success of science in providing practical results in the form of military technology, as well as the need to counteract the damaging effects of the Nazi racist idea of science (ETZKOWITZ, 2003a), induced new paths for the academic revolution to evolve. This transfiguration occurred not only at the level of the expectations that state and society had in relation to the two intertwined academic missions, but also in terms of a perceived need for a renovated ideology of science.

The transformed structure and organisation of academic science stemming from the war has been paralleled by a more active intervention of governments in the realm of higher education. As reminded by CHARLES and HOWELLS (1992), post-war governments set about to establish a more co-ordinated scientific and technological effort comprising higher education organisations, industry and government research institutes in order to meet the intensified scientific demands, particularly in defence. An immediate consequence of this new condition has been an increase, a dramatic one in the US, in public funding of academic research, piecemeal until after World War II (NELSON, 1988).

“During the 1920s and 1930s various influential scientists in industry were trumpeting the importance of university research, as well as teaching, to the health of their industries, but the policy message they and their academic colleagues gave was that industry should band together to support universities. For reasons that are obvious to economists, this call for industrial voluntary contributions to finance a public good failed to achieve its purpose. By the end of the Second World War, industry scientists and university scientists were ready to appeal for public funding for university basic research, and they got it”, NELSON (1988, p. 322)

An additional effect was that, as public funding increased, the relative weight of business support to academic research declined. As an example, in the US, according to data from the National Science Foundation, cited in HANE (1999), industry funding for academic research decline from a relative weight of 8% through most of the 1950s, to 2,5% in the late 1960s. Conversely, federal funding for university R&D grew more than tenfold between 1935 and 1960 and more than double again until 1965, when federal funding reached 73% of total (ROSENBERG and NELSON, 1996).

The development of academic science enjoyed the protection of state funding. In return, the academy was expected to provide a number of public goods in the form of knowledge and education (JACOB, 2000). The *endless frontier of science*, using the title of the famous Vannevar Bush’s report to President Roosevelt, issued in 1945 (BUSH, 1945), reflected the political perception that the most significant ways in which government could promote economic development were to increase the flow of new scientific knowledge through supporting universities in their basic research efforts (OECD, 1999a). The belief that the results of academic science could be directly applied in the economy was a consequence of the success achieved by scientific projects carried out during the war, such as the Manhattan Project or the MIT’s Radiation Laboratory (GEUNA, 1998).

*“New products, new industries, and more jobs require continuous additions to knowledge on the laws of nature, and the application of that knowledge to practical purposes. Similarly, our defence against aggression demands new knowledge so that we can develop new and improved weapons. This essential, **new knowledge can be obtained only through basic scientific research**”*, BUSH, 1945, (emphasis added).

Bush's propositions approximate an ideology of science as an isolated enterprise and a self-regulating mechanism, evolving along a linear progression (ETZKOWITZ, 2003a)⁸. The emerging ideology of science also resonated the normative structure of science built by Robert K. Merton during the war period (very much as a response to the Nazi view of science), which, under the CUDOS acronym, became a *leitmotiv* in the literature, namely the one related with the sociology of science. In fact, the CUDOS set of norms has been (and still is) at the core of the discussion about the conflicting relationship between the academic ethos and the interaction of university science with society. In short, the Mertonian *ethos* of academic science (cf. MERTON, 1973) is formatted according to four basic values: i) *communism*, meaning that the knowledge produced by academic science should be considered as public knowledge, since, according to MERTON (id., p. 273), "*the substantive findings of science are a product of social collaboration and are assigned to the community*"; ii) *universalism*, meaning, on the one hand, that knowledge claims are accepted or rejected through "*preestablished impersonal criteria consonant with observations and with previously confirmed knowledge*" (ibid., p. 270) and, on the other hand, that contributions to science should not be excluded because of race, religion, nationality, social status, etc.; iii) *desinterestedness*, implying that the outcomes of scientific endeavour should not be aimed at serving personal profit or social, economic, religious and political interests, but an attempt of achieving the consensual objectivity that allows for the dilution of individual interests into the collective realm; and iv) *organised scepticism*, establishing that any judgement about a theory should wait until all the facts are considered, as "*the scientific investigator does not preserve the cleavage between the sacred and the profane, between that which requires uncritical respect and that which can be objectively analyzed*" (ibid., pp. 277/278)⁹.

The issue at stake is that the scientist is supposed to feel fully rewarded by receiving the recognition of his/her peers for his/her contribution to knowledge (ZIMAN, 2000): "*the initial letters of the Mertonian norms spell out the reward that academic scientists get for communicating their research results to the communal archive*" (id., p. 45). Moreover, underlying Merton's norms there is the assumption that academic research is basically

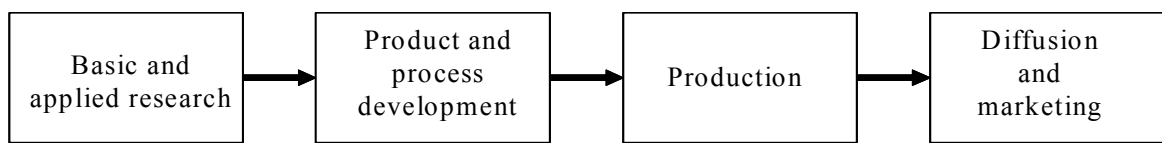
⁸ "[...] *put the money at one end and the results will flow out at the other in 50 years' time*", ETZKOWITZ, 2003a, p. 329.

⁹ ZIMAN (2000) suggests a slightly different version of the CUDOS normative set of scientific rules by adding the rule of originality. According to the author (id., p. 40), originality "*energizes the scientific enterprise*", as it keeps "*academic science progressive, and open to novelty*".

individualistic, i.e., in the words of ZIMAN (2000, pp 45-46): “Scientists are presumed to work very much on their own”.

One can argue that a linear science-push model of innovation was underway. According to the linear model of innovation (**Figure 2.1**), there is a sequence of events, departing from research, through development to production, towards diffusion and marketing. In this sequence visualised as “*flowing smoothly down a one-way street*” (KLINE and ROSENBERG, 1986, p. 285), there are no feedback paths or interaction.

Figure 2.1- The linear model of innovation

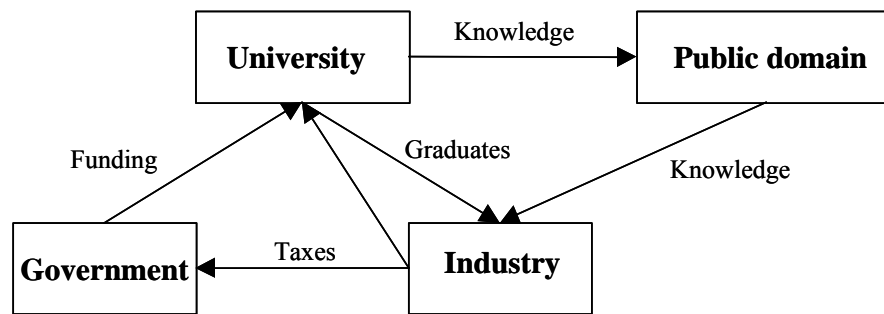


Source: MALECKI (1991)

In this context, government funding of basic research, public service and higher education were the three elements underlying the linkages between universities, society and government (OECD, 1998b), and thus shaping the social contract between academia and society. Private money was acceptable if in the form of grants or donations, hampering the possibility and admissibility of establishing contracted co-operation initiatives with private companies, often regarded as antithetical and contradictory with the aim of public service¹⁰. Hence, curiosity-driven research was the most appropriate kind of academic knowledge creation. Research results, for the sake of public service, should be made available (e.g. through publishing) to all who wanted to benefit from them. In parallel, research results were to be used as a tool for education, helping universities in their mission of educating highly skilled individuals. Accordingly, graduates were basically the most effective vehicles of knowledge transmission from university to companies (id.). **Figure 2.2** schematically illustrates the traditional model of university-industry-government relationships.

¹⁰ Obviously, a number of exceptions to the rule can be traced back in recent history. This is the case of computer technologies in the US and Great Britain. MOWERY and LANGLOIS (1996, p. 948) argue: “*In contrast to their stereotypical role as performers of basic research, university researchers pioneered in the development of computer technology in advance of industry [...]*”. The authors add (id.): “*In both nations, but especially in the US, technological advances and researchers from universities entered the domestic electronics industry [...]*”.

Figure 2.2 – Traditional university-industry-government linkages



Source: OECD (1998b)

Under the light of this relational arrangement, universities generate knowledge, transmit it through publications, and ideally do not sell it (ETZKOWITZ et al, 1998). The distinction between basic research, to be conducted in universities, and applied research, the realm of industry, or, similarly, the dichotomy between the advancement of knowledge, the concern of universities, and the capitalisation of knowledge, located in industry, is implicit to the model presented in **Figure 2.2**.

An approximation to this logic of separation is the model based on “*hydraulic assumptions of knowledge flows [that] include reservoirs, dams, locks, and gateways that facilitate and regulate the transmission of information between institutional spheres with distinctly different functions*” (ETZKOWITZ, 1999, p. 226). It reflects a one-way linear flow from basic research to innovation, with no feedback paths within and among each stage. In this context, as ETZKOWITZ (id.) claims, an effort to develop technology transfer transforms the university into a barrier. Technology transfer is thus carried out exclusively by intermediary organisations, collecting inventions stemming from basic research, which, after protected by patents, are sold to industry (ETZKOWITZ et al, 1998).

Knowledge transfer, in turn, is mainly conveyed through education, or, more accurately, the bridge relies on research-based training of future industrial scientists. The hydraulic view of knowledge generated within academia and then flowing to industry introduces a second bridge, an *epistemic* one, which, following ZIMAN (2000), emerges from the *ivory tower* through the archive that makes science a “*communal resource*” (id. p. 258). Taking this perspective, one can argue that the linear model of innovation does not conflict with the normative rules of academic science. Conversely, the model seems to be an incentive to compliance with those rules. ZIMAN (ibid., p. 54) provides a good example: “*the norm of communalism requires academic scientists to facilitate this process [the linear*

path from basic research to innovation] *by publishing their research results promptly, fully and freely*". The positioning of the university in the linear model of innovation, not counteracting the scientific normative set of rules sketched out by Merton, suggests in addition that the *Humboldtian* principles have gained a somewhat unexpected vigour in the post-war years. This is the reason why the *Mertonian* rules are regarded by some authors (e.g. SPINNER, 1993) as a "*sociologised*" view of Humboldt's ideal.

Still, it was under this framework that, after 1945, and especially after 1960, universities have reached their scientific power apotheosis and acquired their present position as leading institutions in knowledge production (SCOTT, 1995; 2000a). The *scientification* of the university (id., 2000a) was timely aligned with a rapid growth of university systems all over the world, which would last until the 1970s. The British system, for instance, nearly quadruplicated in size between 1945 and 1970 (SLAUGHTER and LESLIE, 1997). Rapid growth resulted in the massification of higher education, absorbed by the enlargement of existing universities, the establishment of new universities, and the creation of new types of higher education (GEUNA, 1999).

GEUNA (id.) highlights four major growth driving forces: firstly, due to the reconfiguration and subdivision of research domains into new sub-disciplines and the increased reliance on instrumentation, there was the need for an enlarged number of practitioners and financial involvement; secondly, scientific research, first in the US and then in Europe, was regarded by governments as a source of future welfare; thirdly, in particular during the 1960s, the transformation of the perception of the educational role of universities, resulting, on the one hand, from the shifting demand of industry and government for the level and range of skills, and, on the other hand, from social pressures for democratisation of the university system; fourthly, due to post-war strong economic growth and demographic boom, the dramatic expansion of the potential demand for higher education.

It was in this framework that a single idea became "*too many things*", as KERR ([1963], 2001, p. 4) puts it. The same author (id., p. 31) portrays change by introducing the *idea of a multiversity*, a "*city of infinite variety*", subduing the idea of a university, "*a village with its priests*", and the idea of a modern university, "*a town – a one-industry town – with its intellectual oligarchy*". Variety, in Kerr's view, concerns mainly the various, even conflicting, interests affecting the governance of *multiversity*, an inconsistent institution

composed of several communities (undergraduates, graduates, scientists, social scientists, non-academic professionals, administrators, etc.). The author deals also with the role of the *multiversity* in society. In this context, the *multiversity* is seen as a class society, because devoted to equality of opportunity. According to KERR ([1963], 2001, p. 14), the multiversity “*serves society almost slavishly*”.

Several authors (e.g. SCOTT, 1995, MELODY, 1997; NEAVE, 2002; MAGALHÃES, 2004; SANTIAGO and CARVALHO, 2004) approach these forces underpinning higher education expansion and diversification under the unifying (despite the diversity of national contexts) political and social framework of the welfare state. The argument here is that higher education, part of a political, economic, social and cultural modernisation process, has responded to the increasing democratisation of societies (SCOTT, 1995), namely by opening-up access. The shift from an elitist model of the university to mass higher education is the most evident sign of the modernisation and democratisation processes. NEAVE (2002, p. 60) assigns to the university a *redistributive role* that “*effectively cast it as an instrument for equalising educational opportunity by drawing deeper on the reserves of talent, a task which, by definition, lay beyond the capacities of the elite university*”¹¹. Still, these processes can also be viewed as a shift in the perception about the centrality of higher education in social and economic development. As put by MAGALHÃES (2004), higher education systems started to be conceived as a national economic factor, particularly through their contribution to the accumulation of human capital. According to SANTIAGO and CARVALHO (2004), initially, universities contributed for the construction and consolidation of the welfare state mainly through the training of students to be professionals in public services and other specialised social and economic sectors. Following the same authors (id.), beginning during the 1970s, the university, under the framework of equal opportunities ideology, was more aligned with the democratisation of societies.

Universities, in the context of the welfare state, were conceived as public institutions, aimed at the provision of services to help achieve public objectives (MELODY, 1997) and

¹¹ NEAVE (2002) argues that the advent of mass higher education conferred a new mission to universities, with two elements in it: the direct association with the pace of economic change and the contribution for equalising educational opportunities. Can this be regarded as a revolutionary development, as the definition of academic revolution would suggest? Seemingly, rather than a new mission, which would originate from a revolution, the two elements stressed by author can be seen as the role universities were expected to perform in society through developing teaching and research, i.e., through achieving the two basic missions assigned to them in the post-*Humboldtian* period.

guarantee the right to what LIPIETZ (1994, p. 355) calls “*the ‘organicist’ redistribution of the fruits of technical progress*”¹², while simultaneously reinforcing, as the same author (id.) contends, “*the hierarchical character of labour organization and society, by delegating power to technocratic castes*”.

In this sense, academic science, regarded as the search for universal truth, was expected to influence the development of a more equalitarian society (SANTIAGO and CARVALHO, 2004), as well as to respond, very much under the linear one-way flow between basic research and production, to the competitive requirements of national economies (SMITH and WEBSTER, 1997). In other words, universities, pursuing the public (national) interest, were crucial institutions in the welfare state, i.e., in a socio-political context characterised, as described by SCOTT (1995, p. 71), by an “*economic structure designed on the Keynesian principles of full employment and planned growth; a society in which the divisions of class and gender were diminishing but within an apparently stable social order; and a feel-good culture in which materialism and utopianism were powerfully combined*”.

In the late 1970s, the principles of the welfare state have been strongly put into question. In a purposeful account of change:

“The welfare state has been succeeded by the neo-liberal state; many public services, including health and education, have been moved into a privatized domain, if not the private sector. The Keynesian order has been overthrown and replaced by renewed enthusiasm for the free market; at the same time profound changes have taken place in the structure of the economy and organization of enterprises. Society has becoming increasingly fissiparous; classlessness and ungendering appear to have been accompanied by greater inequality and weakened the social cement of community. The motifs of contemporary culture are deconstruction, discordance and risk, qualities which slide readily from playfulness to pessimism”, SCOTT, 1995, p. 71.

Obviously, this societal transformation brought challenging framework conditions for the functioning of the expanded and diversified higher education system, placing

¹² “*It is ‘organicist’ in the sense that it does not, in principle, exclude anyone from a ‘share in the fruits of progress’ [...]*”, LIPIETZ, 1994, p. 342.

universities and other higher education organisations at the doorstep of a new academic revolution.

2.5

Concluding remarks: the university at the doorstep of a second academic revolution

This chapter has shown that the university, despite its institutional resilience, has the capacity to foster internal change and adapt to the evolutions and revolutions that shaped the development of society. It has also attempted to clarify the meaning of the term academic revolution and to contextualise the impacts of revolutionary change in academia, according to a historical account sharply delimited in time. The time span, from the medieval roots of the university to the late 1970s, was established with the purpose of providing a backcloth against which the underpinning factors and nature of the second academic revolution, to be dealt with in the next chapter, can be more efficaciously understood.

The nature and implications of the first academic revolution, together with the meaning that the literature ascribes to the second revolutionary change in academia, led to the bias towards academic research observed in the present chapter. While overlooking a number of relevant aspects that marked change of academia after the *Humboldtian* revolution, e.g. the problem of research and teaching integration and the enhanced role of universities in culture preservation or in acting as *critic conscience* of society, the chapter has emphasised the new societal expectations and uses of the university as research became a legitimate academic mission. Inherently, it has also highlighted the set up by universities of new ways of responding to those expectations, well illustrated by the land grant movement in the US and its scholar social engagement philosophy.

A first argument to be built upon the evolutionary and revolutionary account of change outlined above states that the academic institution, in its close dialectics with the rest of society, as much as protected by the *ivory tower* as it can be, is mainly mastered by more or less disruptive external transformative forces and pressures. In this sense, the *idea of the university* cannot be regarded as an insulate construct, as it is inextricably interwoven with the evolving *idea of society*. It was so when the process of secularisation emerged. It was

so when the revolutions occurred during the 17th and 18th centuries shifted the perception on the value and purpose of scientific knowledge. It was so when, in the aftermath of a devastating war, the university became a crucial institution in the consolidation of the dominant welfare state ideology.

Changing ideas of society determined changing expectations and uses of the university, placing the academic institution under the strain of constant change. However, history shows that change in academia is mostly evolutionary, rather than revolutionary. Hence the somewhat cautious fashion in which the term academic revolution was introduced. Accordingly, an academic revolution is said to have occurred when in presence of a disruptive shift in terms of the academic mission. This was what the spreading of the *Humboldtian* principles provoked, by adding to the traditional mission of disseminating existing knowledge the mission of producing new knowledge. This first academic revolution, giving rise to a new academic paradigm, brought forth a different contractual basis for the connection between the university and the rest of society, in terms of both its public and private realms. The first academic revolution, and the resulting modified social contract, accommodated the growing interaction between science and technology, as well as the prospects of nations and regions towards the role of higher education in positioning them in the world and contributing for their wealth and welfare.

The second argument is that the principles Humboldt heralded in the early 19th century, according to which academic research, primarily aimed at searching for universal truth, or similarly, the generation of knowledge for its own sake, should be protected from external interests, have been eroded along the revolutionary process they inspired by the needs, prospects and/or control claims of both government and industry. Arguably, even in periods of a certain revival of those principles, a prevailing framework of social relevance, though often indirectly, conditioned knowledge produced and disseminated by the academic institution. In fact, knowledge generated for its own sake within universities revealed to be crucial for the development of many applications that have had significant impacts in a wide array of society domains; knowledge disseminated through teaching contributed to nourish nations' private and public realm with, using the *Weberian* dichotomy, both cultivated and professionally trained men and women, who, namely under the political framework of the welfare state, were expected to perform the task of supporting and sustaining wealth and welfare. It was under this framework that universities

were expected to feed a linear model of innovation, tightly encapsulated in their role of developing (basic) research and thus producing the knowledge inputs that would follow a one-way flow until their end-users, i.e., the external world of production.

A third argument is that the revolutionary process initiated with Humboldt has blurred the distinctiveness of national higher education systems in terms of functions and mission, as well as the perception of society *vis à vis* the role of higher education. Though territorial, political, social and culturally context-dependent developments have always differently shaped change in higher education, one can argue that the academic revolution, by bringing legitimacy to the research mission of the university, while spilling over the frontiers of Germany, attenuated the differences among personality, professional and knowledge-based models. This blurring effect was exacerbated by the development of a prevailing post-war welfare state idea of the society and the associated democratising shift from elite to mass higher education.

An additional point is that, notwithstanding constant change, academia has been able to maintain many of its basic characteristics, some of them deeply rooted in the medieval ages. As much as dramatic change was, universities, at least, remained as *loci* where teachers and students gather together to engage in higher learning. It was this balance between continuity, slow adaptive change, and revolution that endured universities to become a crucial institution of modernity.

In the late 70s, the post-war prevailing idea of the society has dramatically changed. The often-labelled neoliberal ideology has superseded the welfare state as dominant political framework. Modernity is said to have been replaced by post-modernity, as well as the industrial society by a post-industrial society, and *Fordist* forms of labour and production organisation by post-*Fordism*. Coincidentally, globalising trends have ignited a rapid and dramatic transformation process in social, economic, cultural and political realms. The role of the nation-state has begun to be seriously questioned. The centralised Keynesian welfare state has been considered as unable to steer the social and economic complexity of an increasing globalising world. Concomitantly, the place of the university in society, hitherto closely linked to the national aspirations of wealth and welfare, has started to be widely challenged.

This *sea of change* is at the core of the next chapters, aiming at setting the scene that is shaping change in and raising new challenges to the academic institution.

Globalisation and innovation... the rise of a knowledge-based society?

3.1

Introduction

Universities, as argued in the previous chapter, despite its institutional resilience, evolve in a close dialectics with the evolutionary and revolutionary transformative forces that shape the idea of society. The knowledge about the societal framework conditions, determining the expectations *vis à vis* higher education and its positioning within society, emerges thus as a central issue when investigating the contemporary role of academia.

Amongst the many labels attached to the contemporary idea of the society, the term *knowledge society* seems to deserve the favouritism of academics, politicians, businessmen, and so forth. The term is broadly utilised to characterise the contemporary ways of living in society and ensuring wealth creation, which, according to the dominant argumentative line, are increasingly based on knowledge. As all socially “*sounding*” terms, the concept of knowledge society risks to be transformed into a fashionable idea (SCOTT, 2004), rather than a conceptual frame of reference able to provide an useful theoretical and analytical tool for understanding the challenges associated with socio-economic development processes in the contemporary society, and thus the role universities can play in their promotion. The frequent undifferentiated utilisation of either the *knowledge* or the *information society* concepts to portray the social and economic idiosyncrasies of current times is a tangible aspect of this fuzziness. It is against this veil of fuzziness that the commonplace view pointing to the maintenance of university’s centrality in societal development is constructed. The argument is straightforward: as major *locus* of knowledge

production and dissemination, the university should be a crucial institution of the so-called knowledge society. Can it be kept as simplistic as this?

An additional and fuzzy as well, dimension of present times concerns the “*novelty*” status attributed to the dynamics of the knowledge society. It is unanimously agreed that knowledge has always been a crucial ingredient in the development of societies. To what extent is there something new in considering knowledge as a central resource in the current development processes?

Conveying the scientific imperative of avoiding fuzziness and/or fashionable *clichés*, two arguments should be put forward to counteract such simplistic approaches:

- Firstly, knowledge, to emerge as a development resource, should assume the nature of an asset that needs to be generated, disseminated and, above all, used. Using the words of STEHR (1992, p. 2), “*knowledge can best be defined as a faculty or capacity for action, or may be described as the ability to indicate, in the case of a particular thing or process, how that thing is generated or set in motion*”. Accordingly, the capacity of generating knowledge is only one dimension of the socio-economic development problem. The ability to put in motion and feed flows of knowledge, crossing through both individual and collective societal actors, as well as the capacity to absorb and effectively use those knowledge inputs for acting, are two additional and intertwined dimensions which cannot be neglected. In addition, as many scholars contend, development relevant knowledge is not confined to scientific knowledge, which has in academia a privileged producer.
- Secondly, the novel nature of the current societal dynamics, in essence, stems from the accelerated rhythm of change and (consequently) increased complexity and uncertainty of the social, cultural, economic and political environments that characterise the contemporary society.

These two arguments have a structuring effect on the account of change aimed by this chapter, as they make necessary to look at, on the one hand, the forces that, by inducing rapid transformations, carried novelties to the societal context in which human activities evolve, and, on the other hand, the condition of knowledge within that new context subject to rapid transformation. In turn, this two-stage approach encloses two key analytical concepts: *globalisation* and *innovation*.

Change is being shaped by a diversity of events with enough power to exert global effects on the whole of society, such as the end of the world political bi-polar system, the market liberalisation and de-regulation trends, the development of transport infrastructure, and, last but not least, the revolution of information and communication technologies and infrastructures. In other words, *globalisation* brought in a new and inconstant societal context for human activities.

The need for building up capacities to adapt to a rapidly changing environment and to foster the creativity necessary to do new things in either new or renewed but more efficient ways, requires new and more complex modes of knowledge generation, and knowledge dissemination chains and structures, as well as new modes of knowledge utilisation. Learning gains in relevance as a resource and a means of coping with change, namely through the updating of existing, and creation of non-existing individual and collective skills. Knowledge, learning and innovation become key elements of the globalising society.

The present chapter sets the challenging scenery universities are facing in the contemporary society. It aims to provide a first step towards an account of the vigorous shift that, from the late 70s onwards, has challenged the hitherto prevailing idea of the society based on the welfare state ideology, and, concomitantly, questioned the role of higher education. In addition, it attempts to grasp the constitutive features of contemporary times, i.e. to contribute for a better understanding of the influential forces that are forging a renewed social contract between higher education and the rest of society. It is based on a literature review embracing the aspects influencing the dynamics of the so-called knowledge society, which can be synthesised by the metaphorical image of *an evolving globalised society, motored by innovation, fuelled by knowledge and lubricated by learning*.

The chapter is structured as follows:

- Firstly, it presents a brief portray of the globalising trends and the inherent dynamics of change and resulting challenges.
- Secondly, it grasps the contemporary condition of knowledge, its globalisation-forced new dynamics, relevance and value, and the way it flows through learning.

- Thirdly, it provides a screening of innovation theories, mainly based on the evolution of the economics of technological change and the economics of innovation.
- Fourthly, and culminating the scenery construction, it extends the theoretical discussion by bringing forward a systemic approach to innovation, leading to a broader perspective on the innovative endeavour, that is, going beyond the mere technical and technological aspects.

3.2

Globalisation and the dynamics of change

A story told by Anthony Giddens (GIDDENS, 2000), though prosaic, provides a good illustration of the intense dynamics of change induced by globalisation. The story is about a friend of Giddens who, during a visit to a remote area of Africa, has been invited to a local family's home and spent the evening watching "*Basic Instinct*" on video, a movie that at the time had not had its *premiere* in London. Giddens's short story suggests that globalising trends affected a wide range of human activities, behavioural norms and cultural values.

The wide range of effects exerted by globalising forces on the contemporary ways of living and doing business tends to gather unanimity. However, the meaning and consequences of globalisation are far from an agreement. The debate, following HELD et al (1999), is being shaped by three broad schools of thought: the *hyperglobalist* thesis, privileging an economic logic and, in its neoliberal variant, arguing for the hollowing out of the nation-state and praising the development of a single global market and global competition; the *sceptical* thesis, also according to an economistic conception, arguing that globalisation is a myth and contending for the increased relevance of nation-states in terms of regulation within a context of heightened economic internationalisation; the *transformationalist* thesis, accepting the current patterns of global processes as historically unprecedented, are focusing the need of governments and societies to adjust to profound change conditions.

An additional divide emerges between those who perceive globalisation as a threat to local diversity and autonomy and those who see in the globalising trends an unprecedented

opportunity for fostering equity in terms of socio-economic development¹³. Instead of judging or taking position about this divide, at least for now, it is perhaps more useful to draw on the view of STIGLITZ (2002), who states that globalisation in its essence is neither a good nor a bad thing. Rather, as GIDDENS (2000) claims, it is something that is really affecting our society functioning and progress, and thus cannot be ignored by any effort to lever social and economic development.

The globalising trends of contemporary society, normally seen as an all-pervasive force in the modern world (AMIN and THRIFT, 1994), deserve, as expected, the interest of social science disciplines, as well as from politics. A large number of “*emblematic (and enigmatic) indices of global change*” (id., p. 1) have been produced, providing, on the one hand, many attempts to seek for the causes and conceptualise globalisation, and, on the other hand, an extensive account of the effects globalisation exerts on the various facets of society. The causes and consequences of globalisation originated a burgeoning debate in the realms of the economy, the condition of knowledge, the role of states, the culture, the migrations, the war, the crime, or the natural environment (cf. HELD et al, 1999). Within each realm, one can find a vast array of insights to explore when investigating the contemporary challenges faced by higher education. However, bearing in mind the analytical and conceptual orientation of this dissertation, arguably a broad approach, embracing the thematic diversity, would be less productive than a more selective one. Hence, the analysis is biased towards the competitiveness dimension of globalisation and the value of knowledge in the globalising society, reflecting though concerns with the fate of the welfare state ideology, which, as argued before, grounded the post-war idea of the society and thus guided much of the role universities were expected to play. These interwoven dimensions accommodate in analytical terms the relationships between universities and innovation, and between universities and the state, providing a purposeful basis for the discussion about the forces that are shaping change in academia. The approach relies on two main accounts of globalisation-forced societal change knitted together: on the one hand, post-industrialism, which focuses on the economic/productive dimension, and, on the other hand, post-Fordism, a more dialectical approach that

¹³ “*The differences in views [about globalisation] are so great that one wonders, are the protestors and the policy makers talking about the same phenomena? Are they looking at the same data? Are the visions of those in power so clouded by special and particular interests?*”, STIGLITZ, 2002, p. 9.

subordinates changes in the wealth accumulation regime to the modes of political, social and cultural regulation (SCOTT, 1997).

Some authors (e.g. OMAN, 1996) argue in favour of a sequence of globalisation waves, with the previous influencing the following¹⁴. To what extent is the current wave of globalisation distinct from its predecessors and what kind of new challenges is it conveying? The ongoing wave of globalisation is said to have started in the early 70s impelled by developments in economic regulation, namely the break-up of the Bretton Woods system of controlling national economies (AMIN and THRIFT, 1994). It was facilitated and shaped by a multiplicity of events, forged within a diversity of evolutionary conditions and contexts. Examples of these are the end of the world political bi-polar system, the market liberalisation and de-regulation trends, the development of transport infrastructure, and, last but not least, the revolution of information and communication technologies and infrastructures. STIGLITZ (2002, p. 9) condenses this complex set of events suggesting that, in its fundamentals, globalisation is “*the closer integration of the countries and peoples of the world which has been brought about by the enormous reduction of costs of transportation and communication, and the breaking down of artificial barriers to the flows of goods, services, capital, knowledge, and (to a lesser extent) people across borders*”.

OMAN (1996) roots the current globalisation wave in the economic policy responses to stagflation occurred in Europe and the United States during the late 60s and early 70s, partly stemming from the production rigidities of *Taylorism*, which reduced productivity growth in the world leading economies. Those policy responses, according to the same author (id.), resulted in market deregulation and liberalisation, the development and diffusion of new technologies, the globalisation of financial markets, the massive shift by developing countries from inward- to outward-oriented growth strategies, and the globalisation of corporate competition and co-operation.

These transformations, an “*adjustment of kind*”, as DE LA MOTHE and PAQUET (1996a, p. 12) name the permanent shift of key economic parameters seriously shaking the

¹⁴ “[...], globalisation is not new. The last 100 years alone have witnessed three distinct periods of ‘waves’ of globalisation: we have been in the midst of one since the 1980s; another occurred during the 1950s and 1960s [the global spread of Taylorism]; while the previous wave took place during the 50 years or so prior to World War I [strong growth in trade and inter-continental financial and migratory flows]”, OMAN, 1996, p. 5.

previous institutional order, gave rise to new patterns of investment, production and trade, such as:

- the very rapid growth in foreign direct investment, alongside with the increasing power of finance over production (AMIN and THRIFT, 1994);
- the emergence of highly concentrated international supply structures and global oligopolies (OECD, 1992);
- the increased density and complexity of international interfirm collaboration networks (VICKERY and CASADIO, 1996), aimed at research and product development, production, purchase of inputs, and marketing (OECD, 1998a);
- the growth of corporate mergers and acquisitions (OMAN, 1996);
- the transnationalisation of technology, coupled with the rapid redundancy of given technologies, particularly in high technology sectors (AMIN and THRIFT, id.).

The inherent reorganisation of the world economy intensified transformation pressures, particularly due to the intertwined effect of more rapid technical change and enhanced competition regimes (LUNDVALL and BORRÁS, 1999). The period new products and productive processes enter the market became much shorter. Product life cycle has also contracted. The rate of development and diffusion of new technologies, namely information and communication technologies, brought new entrants to the market, dramatically increasing the number of buyers and sellers, and changing the competitive dynamics (id.). As the same authors claim (ibid., p. 13), “[...] *globalisation today has a direct impact on firms belonging to different industrial sectors and territories, through intensified competition*”. Consequently, the capacity of firms to use efficiently their productive inputs to adapt to constantly changing market conditions emerges as a key competitive factor in the globalising economy. The same can be said of firms’ capacity to recreate and develop new adaptive capabilities as old ones become obsolete (ibid.).

The referential framework provided by the so-called post-Fordist approach to societal change, in its heterogeneity and confrontational construction of a diversity of viewpoints and levels of analysis (AMIN, 1994), goes beyond the intensified competition faced by firms and extends the discussion to other arenas subject to transformative pressures. The point of departure of this heterogeneous debate is the consensual perspective according to

which the era of Fordist mass production, based on moving assembly-line techniques operated by the semi-skilled labour of mass workers (JESSOP, 1991), is under challenge, giving way to different and flexible modes of production and labour organisation and increasing uncertainty. Still rooted in the production sphere, a major point relates to the importance of flexibility, which, in the new competitive context, emerges as a core adaptive process. SABEL (1994) places the concept of flexible specialisation as the inverse of mass production (“*the manufacture of specialised goods by means of general-purpose resources rather than vice-versa*”, id, p. 139). The author also stresses the relevance of flexible specialisation to deal with uncertainty. Flexible specialisation is defined as “*a system in which firms know that they do not know precisely what they will have to produce, and further they must count on the collaboration of workers and subcontractors in meeting the market’s eventual demand*” (ibid.).

In a broader view, DE LA MOTHE and PAQUET (1996a, p. 1) define flexibility as “*a way to effectively manage a political, social and economic environment that is turbulent, in motion, and that thrives on surprise-generating mechanisms that are making impossible to make reliable predictions about what is going to happen next*”. This definition, while raising the problem of governing change, implicitly suggests that global forces have not only heightened competition between firms operating in increasingly globalised markets, but also put under stress the post-war modes and scope of state intervention. JESSOP (1994, p. 251), at the purpose, argues that “*the state is undergoing a fundamental restructuring and strategic reorientation*”. Following the same author (id.), a major feature of state restructuring and reorientation is the shift from the Keynesian welfare state, well adapted to Fordist modes of growth, to a kind of state promoting innovation-driven supply-side interventions and subordinating social policy to the needs of labour market flexibility and/or the constraints of international competition. In this context, full employment goals are superseded by international competitiveness, and the redistributive welfare rights become secondary *vis à vis* the *productivist* reordering of social policy (ibid.).

SCOTT (1995) labels this shift as the emergence of the *tertiary* welfare state (the *primary* being the safety-net welfare state of the early post-war period, the *secondary* the more active and interventionist welfare state that emerged during the 60s and 70s), conveying the transformation of a fiduciary into a contractual state. In this contractual state, according to the author (id.), the emphasis shifts from the state as provider to the

state as regulator of the various operating internal markets, and the state as auditor of their outcomes.

This shift had pervasive effects on higher education, which, as argued in the previous chapter, was a central institution of both the *primary* and *secondary* welfare states. SCOTT (1995, p. 80), offers a purposeful insight: “*Governments are now less likely to see their responsibility for higher education as an absolute duty, the various components of which – social justice, economic efficiency, individual enlightenment and so on – cannot be disaggregated. Instead, they have begun to see themselves as the purchasers, on behalf of taxpaying citizens, of a range of teaching, research and consultancy services*”.

Globalisation, by definition, has a geographical dimension (AMIN and THRIFT, 1994). In this sense, besides the problem of government scope, there is also a problem of scale. The rescaling of governance systems induced by globalisation, according to JESSOP (1994), lies predominantly in the hollowing out of the nation-state, as supranational regimes grow and regional and local governance resurge. However, as the same author (id., p. 274) reminds, “*despite these various upward, downward and outward shifts in political organization, a key role still remains for the national state as the most significant site of struggle among competing global, triadic, supranational, national, regional and local forces*”. Seemingly, modes and regimes of governance evolve as the national level is being reshaped from above by globalisation and from below by regionalisation (COOKE and MORGAN, 1998), which is not the equivalent to the total demise of the national state, as some hyperglobalists, such as, for instance, OHMAE (1990), would contend for.

Upwards, the growth of supranational governing bodies in the most recent decades reflects the emergence of new international economic and political regimes aimed at steering and regulating the globalising economy. This growth is not only quantitative, but encloses qualitative aspects such as the extension of the supranational bodies’ territorial scope or the acquisition of new functions, of which the concern with structural competitiveness is one of the most significant (JESSOP, *ibid.*). Downwards, the increased allocation of governing functions to sub-national layers, or the development of a “*perforated sovereignty*”, as MAYER (1994, p. 317) would call, relates, at a first stance, to the withdrawal of responsibilities by nation-states for the welfare of their regions (SABEL, 2001).

The institution of supply-side, mostly neoliberal, conservative and debt reduction oriented economic policies (SLAUGHTER and LESLIE, 1997), knitted together with the inherent change in nature of the relationships between the state, shifting in scope and scale, and the university, can be expected to exert a catalytic effect on academic change. A pervasive, though maybe prosaic, change driver was the constriction of public funding made available for higher education (MARTIN and ETZKOWITZ, 2000).

Taking the post-industrialist or, as labelled by ELAM (1994), technological deterministic approach to post-Fordism, developed by, for instance, FREEMAN and PEREZ (1988), a new techno-economic paradigm, driven by the development of microelectronics and information technologies, emerged with globalisation and superseded the post-war paradigm, based on low-cost oil and energy-intensive materials. Accordingly, competitive advantages depending on communication and transportation costs, pervasive in the precedent techno-economic paradigm, loose relative importance. FREEMAN and PEREZ (id.) see a techno-economic paradigm as a *meta-paradigm*, since it has “*pervasive effects throughout the economy, i.e. it not only leads to the emergence of a new range of products, services, systems and industries in its own right; it also affects directly or indirectly almost other branch of the economy*”, (ibid., p. 47). As a new techno-economic paradigm emerges, a new input or set of key inputs percolate a rapidly growing system of technical, social and managerial innovations, which, as far as the limits to growth become apparent under the old paradigm, gradually crystallise as the ideal type of productive organisation. This can create a mismatch between the techno-economic system and the old-institutional framework, giving rise to what FREEMAN and PEREZ (ibid., p. 38) call “*structural crises of adjustment*”. In this sense, societal change, very much subordinated to technical change, is regarded as a process of dynamic adjustment, which, if succeeded, allows for the development of intense interaction among economic agents and the diffusion of innovations across the whole economy.

According to the post-industrialist view, technical change becomes a fundamental ingredient of the process of growth and transformation of the economy (DOSI, 1988), and innovation the main source of dynamism in capitalist development (FREEMAN, 1988). In short, this view establishes a straightforward link between (technical and technological) innovation and competitiveness.

However, as the recent trends in international trade evidence, labour and other production costs continue to confer competitive advantages, following what MAILLAT and KEBIR (2001) call the “*voie basse*” of competitiveness. Nevertheless, bearing in mind rapid technological change, the short life cycle of products and the speed of information diffusion, cost-based factors of competitiveness tend to be eroded by time. This means that they provide short-term advantages and give rise to the risk of a downward spiralling cycle (id.).

The strategies of cost-based competitiveness tend to focus mainly on low wage levels, meaning that there are aspects of imbalanced wealth distribution that have to be taken into account. It is worth noticing that the United States Presidential Commission on Industrial Competitiveness, quoted by the OECD (1992, p. 242), defines competitiveness in the following terms: “*Competitiveness for a nation is the degree to which it can, under free and fair market conditions, produce goods and services that meet the test of international markets while simultaneously maintaining and expanding the real income of its citizens*”. Hence, low labour costs strategies can be considered as incompatible with the core implication of the definition outlined above, that is the ability to meet the challenges of market competition, while ensuring high standards of living.

The alternative (and generally socially more equitable) source of competitive advantage - or “*voie haute*” -, relies on secured or increased competitiveness by means of a qualitative differentiation in terms of the goods and/or services supplied, enhanced commercialisation methods, and management and labour organisation. The emphasis here is placed on non-cost factors in detriment of cost-based factors of competitiveness.

In a context of intensified competition, having in mind, on the one hand, the need for building up capabilities of rapid adaptation to constant changes in market conditions, and, on the other hand, the advantages in ensuring longer-term competitive levels by privileging non-cost based factors, one can argue that “*virtuous*” competitiveness depends on the capacity to innovate, i.e., to search, discover, experiment, develop, imitate and adopt new products, new productive processes and new organisational arrangements (DOSI, 1988). In addition, following GIBBONS et al (1994), as manufacturing technologies are easily transferred to low wage countries, advanced economies and established firms rely on technological innovation to counteract imitation of existing production methods by those countries. Advanced industrial nations, according to the same authors (id., p. 115), “*can*

only maintain their competitive advantage by using resources and skills in ways which cannot be so easily imitated".

This is the main rationale of the widely accepted argument according to which (technological) innovation is the *engine* of socio-economic development in the globalising economy (e.g. FREEMAN, 1987; DOSI, 1988; NELSON, 1993; LUNDVALL, 1992).

Technological innovation, allowing for the tautology, requires the ability to develop new technologies. These new technologies, in turn, depend on the production of new knowledge (GIBBONS et al, 1994). This link between innovation and knowledge, especially the part of knowledge called *technology* (i.e. the knowledge on how to make products and design processes) (LAMBOOY, 2005), or, in other words, the dependency of innovation upon science and technology, became stylised facts in economic growth and development research and policies. Accordingly, the availability of a strong knowledge base is widely regarded as a key input of successful innovation (LUNDVALL and BORRÁS, 1999).

It is under this framework that LUNDVALL (id.) suggests that knowledge emerges as the most fundamental resource in contemporary economies. In this sense, one can argue that the globalising economy has not only intensified market competition, but has also transformed it into market competition in which knowledge is a crucial ingredient (OECD, 2001). Therefore, learning, leading to growth in the stock of knowledge, is considered as basic in the dynamics of the modern economy (JOHNSON, 1992). Referring to LUNDVALL (ibid.) again, learning assumes the position of most important economic process. One can thus argue that the centrality of knowledge and learning is a major distinctive factor of the current globalisation wave in relation to previous waves.

In a context in which technological innovation, fed by knowledge resources and learning processes, the centrality of the university in a globalising economy seems obvious. As the main *locus* of knowledge production and transmission, the university, even crippled of the protection given by the welfare state, should maintain its prominent position in societal development. SLAUGHTER and LESLIE (1997), for instance, enthusiastically argue in favour of a reinforced relevance of universities in a globalised world. By pointing that large multinational corporations and nation states are pursuing *technoscience* as a means to increase shares of the world markets and to reduce multipolar competition (mainly from low wage countries), the authors (id. p. 38) argue: "*Universities, whether through R&D or education and training, are the font of technoscience for postindustrial economies*". Hence,

they add (SLAUGHTER and LESLIE, 1997, p. 39), globalisation underlines “*the importance of higher education to technoscience, to industrial policy, and to intellectual property strategies*”. Other authors are far less enthusiastic. KWIEK (2001), for instance, refers to the potential decline of the institution of the modern university, as globalisation “*brings about the devalorization of all national projects, one of them being the (nation- and state-oriented) university*” (id., p. 35). The scholar fears that “*if behind the university there are no longer the ideas of nation, reason, and (national) culture, then either new ideas have to be discovered or the university is doomed to surrender to the all-encompassing logic of consumerism*” (ibid.). These contrasting views on the fate and relevance of universities in the globalising society strongly advise to avoid straightforwardness when dealing with complex dynamics such as those impelling societal change and, inherently, academic change. This is the reason why, in the following sections, the chapter attempts a better understanding of two interwoven issues, perceived as determinant to acknowledge such advise: the contemporary condition of knowledge and the conceptualisation of innovation.

3.3

Checking the fuel: the contemporary condition of knowledge...

The attention paid to knowledge and its relationships with the economy in the development debate owes much to the OECD. In fact, several events and publications can be traced back making knowledge emerge as the new fundamental ingredient of wealth creation in the globalising economy (e.g. OECD, 1996, 1997)¹⁵. The strong evidence showing an increased dependency of advanced economies’ competitiveness upon the production, dissemination and use of knowledge has been the main thrust to develop the idea a knowledge-based economy. The fast expansion of output and employment in high-technology sectors (e.g. computers, electronics, aerospace), as well as the growth in knowledge intensive supportive sectors, according to the OECD (1996), reflect the high degree of dependency on knowledge as competitive factor.

¹⁵ Earlier works had acknowledged knowledge as a central resource in economic development processes. For instance, DRUCKER (1968) has highlighted the growth of knowledge relative weight in the structure of production of goods and services, *vis à vis* labour, physical capital or natural resources. STEHR (2002) refers to Robert Lane as the first social scientist to employ, in 1963, the terms “knowledgeable society” and “an age of knowledge”.

“In the past decade, the high-technology share of OECD manufacturing production and exports has more than doubled, to reach 20-25 per cent. Knowledge-intensive service sectors, such as education, communications and information, are growing even faster. Indeed, it is estimated that more than 50 per cent of Gross Domestic Output (GDP) in the major OECD economies is now knowledge-based”, OECD, 1996, p. 9.

In face of these developments, the OECD (id, p. 7) compares a knowledge-based economy to an economy *“directly based on the production, distribution and use of knowledge and information”*.

Despite the merits of this focus on knowledge economies, namely in terms of bringing much of mainstream economics *“residual”* component of economic growth to the forefront of the development debate, the approach and the conceptualisation is problematic from an analytical and theoretical point of view. Firstly, as SMITH (2002, p. 6/7) contends, the OECD’s definition *“is a good example of the problems of the term, for it seems to cover everything and nothing: all economies are in some way based on knowledge, but it is hard to think that any are directly based on knowledge, if that means the production and distribution of knowledge and information products”*. Secondly, a direct relationship established between the increased importance of knowledge in wealth creation and the growth of high-technology sectors, forcibly places the knowledge-based economy on the same footing of a high-technology economy.

The main point here is that there is empirical evidence showing that the knowledge bases of the so-called traditional, or low technology, productive sectors are cognitively deep and complex (id.)¹⁶. SMITH (ibid., p. 6) concludes: *“the term ‘knowledge economy’ is only meaningful if we see it in terms of widely-spread knowledge intensity across economic activities, including so-called ‘low technology’ sectors”*. More importantly, the author (ibid.) stresses that those industries labelled as belonging to low technology sectors *“are often far more intensive as creators and users of knowledge than usually acknowledged, but this knowledge is usually distributed across many agents and organizations”*.

An additional question concerns the extent to which there is something new about the role knowledge plays in economic development processes. As acknowledged by the OECD

¹⁶ For a detailed analysis, confer the empirical work undertaken by Keith SMITH (2002), drawing on the Community Innovation Survey (CIS) and the study of the Norwegian food processing sector.

(2004a, p. 13), “*knowledge has been at the heart of economic growth and the gradual rise in levels of social well-being since time immemorial*”. This is the motivation for statements such as the following:

“To those innocent of social theory, it should be perfectly obvious that knowledge has always played an important role in the organization and advancement of society. In that sense, saying that we live in a ‘knowledge society’ would seem to be no more informative than saying that we live in a ‘power society’ or a ‘money society’ or a ‘culture society’. This suggests that ‘knowledge’ here is really an instance of catachresis, the strategic misuse of words, perhaps an euphemism for a something a bit unsavoury, if said straight”., FULLER, 2001, p.177.

Steve Fuller’s view is helpful in the sense that it alerts for the risk of involving the developmental challenges debate in a veil of fuzziness, since the term is frequently used in a superficial and uncritical fashion. It essentially reflects the acknowledgment of what STEHR (2002, p. 17) calls an “*anthropological constant*”: human action, in its multiple facets, is knowledge-based.

Hence, one can argue that the novelty status attributed to the role knowledge plays in contemporary economies, in its essence, derives from the shifting conditions of knowledge generation, dissemination and utilisation (RODRIGUES, 2003). In this sense, the core question is seemingly to understand current knowledge dynamics and its implications for innovation activity, rather than to discuss the best ways of coining the contemporary society¹⁷. A number of major intertwined features inducing change in knowledge dynamics and knowledge economic relevance and value, help the effort to seek for such understanding.

The most popular of these features seems to be the developments in ICT and their effects on knowledge production, diffusion and use. RODRIGUES (id.), for instance, highlights the ICT-driven acceleration of those knowledge dynamics and refers to the increasingly sophisticated procedures to codify, to learn and to manage knowledge. The same author, elsewhere (RODRIGUES, 2002), argues that, due to ICT, working conditions

¹⁷ A number of alternative concepts to the “*knowledge society*” could be considered, such as the “*network society*” (CASTELLS, 1996), the “*information society*” (KATZ, 1988), the “*postmodern society*” (LYOTARD, 1984) or the “*risk society*” (BECK, 1992).

and living conditions are being redefined, as well as markets and institutions are being redesigned based on the new possibilities of exchanging information. FORAY (2004) considers the ICT revolution as a driver of new and more flexible modes of knowledge production and dissemination, enhancing “*creative interaction not only between scholars and scientists but among product designers, suppliers, and the end customers*” (id., p. 29). This mirrors the claims for the increased importance of entering knowledge-based networks, seen as *loci* of interactive generation of strategic knowledge (e.g. LUNDVALL, 2000a, OECD, 2004a). The OECD (id., p. 14) refers to “*knowledge-based communities, i.e., networks of individuals striving, first and foremost, to produce and circulate new knowledge and working for different, even rival, organisations*”. According to the same source (ibid.), as the members of such communities develop their collective expertise, they become agents of change, providing a sign that a “*knowledge-based economy is developing*”.

Other feature is the proliferation of places having as explicit goal the production of knowledge (SOETE, 2002; SCOTT, 2004). This proliferation results, according to SOETE (id.), from the collapsing (at least partially) dichotomy between deliberate learning and knowledge generation and activities of production and consumption, “*where the motivation for acting was not to acquire new knowledge but rather to produce or use effective outputs*” (ibid., p. 38). In turn, SCOTT (id., p. 293) contends that “*knowledge is not only produced in new places, new formats and new modes but is suffused throughout society through the action of information and communication technology and the proliferation of global cultures, images and ‘brands’*”. The same author (ibid.) stresses that the process of knowledge acquisition through learning “*no longer takes place predominantly in formal education settings such as schools, colleges and universities but in the community and, crucially, in the workplace*”.

RODRIGUES (2003) adds the social perception of knowledge as a strategic asset of firms, nations and people as an additional factor making the difference. LUNDVALL and BORRÁS (1999) argue that the more rapid the rhythm of change, the more relevant knowledge becomes a short-lived resource. This means that the pace of knowledge destruction (as well as creation) accelerates significantly. Accordingly, the same authors (id., p. 35) stress that “*what really matters for economic performance is the ability to learn (and forget) and not the stock of knowledge*”.

Paying more attention to the last assertion, and following GREGERSEN and JOHNSON (1997), it establishes a clear distinction between the role of knowledge, as a kind of stock, and the role of learning, as a kind of flow. This is the reason why LUNDVALL and JOHNSON (1994) prefer the term “*learning economy*” to portray contemporary economic life. The basic (and valid) argument is that in a rapid change context, learning becomes the most important process, since it is through a learning effort that new knowledge is generated and acquired, new combinations of old knowledge are established, and old knowledge is put in new heads (JOHNSON, 1992). Hence, learning is the process through which knowledge maintains its strategic nature as an economic development resource.

What is to be learned? The preferential view of knowledge in the most recent approaches to social and economic development seems to be one that approximates STEHR’s (2002, p. 27) bold definition: “*I define knowledge as a capacity for social action*”¹⁸. This strong assertion undoubtedly deserves further attention. At this stage, however, it will be solely used as a link to the four complementary types of economic relevant knowledge suggested by LUNDVALL and JOHNSON (1994), - *know-what*, *know-why*, *know-how* and *know-who* -, which help to explore the perspective of knowledge as a capacity to act in meaningful ways in an context of increased competition and rapid change. Taking this perspective, the building up of this capacity for action constitutes what is there to be learned.

Know-what concerns knowledge about facts. In this case, knowledge is close to information, since it can be broken down into bits and communicated as data. *Know-why* relates to knowledge about the principles and laws of motion in nature, human mind and in society, i.e. what Aristotle, in his taxonomy of knowledge, would name “*episteme*”. *Know-how* concerns skills, or the capability to do something (the “*techne*”). LUNDVALL (2000b, p. 2) acknowledges the crucial role of this type of knowledge: “*what distinguishes the successful businessmen and great scientists from more mediocre colleagues is know-how, for instance in the shape of experience based capabilities to interpret and give meaning to emerging complex patterns and to act purposefully on the basis of this insight*”. Finally, *know-who*, involving information about who knows what and who knows to do what (id.). This type of knowledge gains relevance when considered the increasing complexity and

¹⁸ As indicated by STEHR (2002), this definition draws on Francis Bacon’s famous observation “*scientia est potentia*”, meaning that knowledge derives its utility from its capacity to set something in motion.

multidisciplinary nature of economic activity, requiring the sharing and combination of different pieces of knowledge.

This knowledge typology conveys a set of connected implications of paramount importance for a better understanding of innovation. The first (and perhaps immediate), matches the views of STEHR (2002), who claims that knowledge, as capacity for action, cannot be reduced to scientific knowledge or, similarly, to the results of R&D activities. This assertion conflicts the traditional ways of measuring the knowledge intensity of a given economy, mainly based on the levels of business investment in research and development activities, and influenced by the OECD's taxonomy of high-, medium- and low-technology firms¹⁹.

ASHEIM and COENEN (2004) contribute to overcome the problem of equating R&D intensity with the ability to use knowledge as capacity to innovate, by suggesting two types of productive knowledge bases, the *analytical* and the *synthetic*. The analytical knowledge base often depends on cognitive and rational processes of knowledge creation or on formal models. Scientific knowledge, in this type of knowledge base, is highly important and both basic and applied research, as well as systematic development of products and processes, highly relevant. Typically, firms operating in sectors such as biotechnology, ICT or genetics, tend to have their own R&D departments, though relying also on external research sources (id.). The synthetic knowledge base concerns industrial settings where innovation mainly relies on the application of existing knowledge or on new combinations of knowledge. In this productive context, "*knowledge is created less in a deductive process or through abstraction, but more often in an inductive process of testing, experimentation, computer-based simulation or through practical work*" (ibid., p. 6). The same authors suggest that this type of knowledge base leads to a rather incremental way of innovation, dominated by the modification of existing products and processes.

The second implication concerns the need to distinguish knowledge from information. Taking knowledge as a capacity for acting, it becomes, in its fundamentals, a question of cognitive capability (FORAY, 2004). Conversely, information assumes the form of structured and formatted data that, as put by FORAY (id., p. 4), "*remain passive and inert*

¹⁹ For instance, the OECD (2002a) judges the economies' knowledge intensity by combining data on expenditures in R&D, software and higher education. The conclusion is that "*over the past decade, OECD countries continued to invest in knowledge – R&D, higher education and software – at an increasing rate*", id., p. 27.

until used by those with the knowledge needed to interpret and process them". The same author (FORAY, 2004, p. 4) adds: "[...] *the reproduction of knowledge and the reproduction of information are clearly different phenomena. While one takes place through learning, the other takes place simply by duplication*". Recalling POLANYI (1966, p. 4), "*we can know more than we can tell*"...

The third implication is about the distinction between the knowledge that is easily and less costly reproduced and disseminated across a wide spectrum of users, and the knowledge whose transmission depends on the establishment of close communicational links among organisations or individuals. In other words, there is the need to distinguish between codified and tacit knowledge.

The codification of knowledge requires its transformation into information that can be easily transmitted through informational infrastructures (LUNDVALL and BORRÁS, 1999). It requires a process of reduction and conversion rendering "*especially easy*" (id., p. 31) the transmission, verification, storage and reproduction of knowledge. According to NONAKA et al (2000), codified (or explicit) knowledge is objective and rational, and can be expressed in such forms as data, scientific formulas, specific actions and manuals. DAVID and FORAY (1995) argue that codified knowledge is generally expressed in a standardised and compact format, thus diminishing both geographical and organisational barriers to its dissemination.

Conversely, tacit knowledge cannot be easily transmitted, because it has not been stated in an explicit form (LUNDVALL and BORRÁS, id.), and may be unteachable (but not unlearnable) or unarticulable and not observable in use (MALECKI, 1999). Tacit knowledge is a relevant component of a wide array of skills and competences, meaning that know-how evidences a strong tacit nature, and, as argued by POLANYI (id.), it is closely related to contexts, the *locus* where amplification processes take place through a set of interpersonal contacts. Belief, perspective, mental models, ideas and ideals are examples of tacit knowledge, as indicated by NONAKA et al (id.). Tacit elements of knowledge, despite the codification trends enabled by ICT (LUNDVALL and BORRÁS, *ibid.*), remain at the core of both individual and collective knowledge (LUNDVALL, 2000b). This matches the assertion that some tacit knowledge is always needed in order to use new codified knowledge (FORAY, 1993).

Obviously, taking the typology of knowledge suggested by LUNDVALL and JOHNSON (1994), economic relevant knowledge is constituted by both codified and tacit components. NONAKA et al (2000) would argue that it is the interaction between codified and tacit knowledge, (i.e. the process of knowledge conversion), that matters in knowledge creation (at the firm level). Accordingly, and recalling the argument of ASHEIM and COENEN (2004), to analytical and synthetic knowledge bases correspond different mixes of tacit and codified knowledge, codification possibilities and limits. The former, despite the relevance of tacit knowledge, tends to rely more often on codified knowledge, as “*knowledge inputs are often based on reviews of existing studies, knowledge generation is based on the application of scientific principles and methods, knowledge processes are more formally organised [...], and outcomes tend to be documented in reports, electronic files or patent descriptions*” (id., p. 6). The latter, though knowledge embodied in technical solutions or engineering work is at least partially codified, tends to resort more to tacit knowledge, namely because “*that knowledge often results from experience gained at the workplace [...]*”, (ibid.).

A related but enlarged innovation-relevant knowledge typology is suggested by LAM (1998), who considers the explicit-tacit and individual-collective dimensions of knowledge. Four categories of knowledge result from these two dimensions: *embrained* knowledge (individual-explicit), assuming a formal, abstract or theoretical nature and depending on conceptual skills and cognitive abilities of the individual; *embodied* knowledge (tacit-individual), of practical, individual type, thus action-oriented (i.e. equating *know-how*); *encoded* knowledge (collective-explicit), of a codified character and easily accessible (often referred to as information); *embedded* knowledge (tacit-collective), assuming the collective form of knowledge that resides in organisational routines, practices and shared norms.

This set of implications allows for sketching two comments, respectively of a reinforcing and an anticipating nature:

- firstly, innovation depends on much more than the knowledge resulting from R&D activities, or, in other words, it cannot be reduced to the frequent link made between the knowledge-based economy and the growing number of high technology and R&D intensive firms;

- secondly, the straightforward perception of the enhanced relevance of universities in innovation and competitiveness promotion, drawn on their role as major scientific knowledge producers and transmitters, can be put into question.

Different kinds of knowledge and knowledge bases imply different modes of learning. In the literature, the terms learning-by-doing (ARROW, 1962a), learning-by-using (ROSENBERG, 1982), learning-by-interacting (LUNDVALL, 1992), and learning-by-searching (JOHNSON, 1992) mirror the different facets and ways of learning. LAM (1998) stresses the organisational dimension of learning, suggesting four distinct models: the *professional bureaucracy*, typical of an organisation which derives its capability from *embrained* knowledge; the *machine bureaucracy*, characteristic of organisations heavily dependent on *encoded* knowledge; the *operating adhocracy*, evolving in a highly organic form of organisation which relies on *embodied* knowledge; and the *J-form organisation*, highly dependent on knowledge *embedded* in its operating routines, team relationships and shared culture. GREGERSEN and JOHNSON (1997), in a similar vein, suggest the distinction between direct and indirect learning. The former concerns deliberately organised learning processes, as where some parts of the economy (e.g. higher education and R&D institutes) “*are organized with the creation and utilization of new knowledge in mind*” (id., p. 480). The latter refers to learning “*going on more or less as unintended by-products of normal economic activities such as procurement, production and marketing*” (ibid.).

A common feature of different types of learning is that all of them require some form of interaction. Learning, as JOHNSON (1992, p. 31) contends, “*is seldom done individually, without support of, or isolated from, interpersonal relations*”²⁰.

The crux of the matter is to acknowledge that almost all learning processes are interactive and depend on the ability to combine and recombine different pieces of knowledge into something new (GREGERSEN and JOHNSON, id.). As the same authors argue (ibid.), learning, in addition to be interactive, is also partially cumulative, that is, depends on what one already knows, which in turn, depends on the social and economic context.

²⁰ JOHNSON (1992) recognises that there is some simple, individual and isolated learning. However, he avers (id., p. 31): “*To observe nature and learn from it in splendid isolation is a rare form of learning. Not even Robinson Crusoe was very good at that. He was mostly experimenting with and using knowledge he had acquired earlier in a social context*”.

At this point, a broader conceptualisation of innovation can be outlined. If learning is a social, interactive and context-dependent process, one can argue that its qualities are deeply related with, on the one hand, the organisational features of the arenas where learning takes place, and, on the other hand, the institutional features that steer interaction between them. These features are open to improvements, - arguably resulting in enhanced learning capabilities -, through the development of innovative ways to organise human activities and to configure and bear webs of relations. In this sense, innovation entails the transformation of knowledge into not only new products and productive processes, but also new organisational and institutional forms.

Learning, as a process generating new knowledge and new combinations of old knowledge, is a dominant source of innovation. Therefore, innovation is an interactive, gradual and cumulative process. It depends on the capacity of a wide array of organisations to interact with each other. It is context-dependent and goes beyond its technical and technological dimensions. These attributes of innovation defy the simplistic nature of the causal link that often is made when discussing the role of universities in the so-called knowledge society, which avers that if knowledge is a fundamental input of innovation, academia, as major provider of that input, should automatically play a fundamental role. To what extent does academic knowledge contribute to enhance innovation and socio-economic development? Should universities rethink their knowledge production in order to be relevant in the contemporary society? These and other related questions will be under the spotlight elsewhere. At this point, as a further step to validate the challenge arising from the taken for granted importance of the university, one focuses on the theoretical and conceptual realms of innovation.

3.4

Opening out the engine: discovering the *residual*...

Innovation has for long deserved the interest of scholars concerned with the problem of economic development. Adam Smith, in 1776 (SMITH, [1776] 1976), has contended for a close link between the division of labour and the stimulation of technical progress and referred to the role of experts in the production of economic relevant knowledge. Friedrich List (LIST, [1841] 1966) has emphasised the contribution of knowledge creation and

dissemination to economic growth. In their 1848 *Communist Manifesto*, Karl Marx and Fredrick Engels (MARX and ENGELS, [1848], 1969) had claimed that the capitalist system (*the bourgeoisie*) would not survive without revolutionising its production instruments. However, only with the Austrian economist Joseph Schumpeter, in the early years of the 20th century, the term innovation would be soundly placed at the core of economic science. SCHUMPETER (1939, p. 87) defined innovation as “*the setting up of a new production function [...] [that] covers the case of a new commodity as well as those of a new form of organization such as a merger, of the opening up of new markets, and so on*”. The author referred to capitalism as a process of creative destruction, nourished by innovations that, in turn, result from new combinations of productive factors.

Schumpeter’s promising and influential views would be overcast during the 1950s, when neoclassical growth theory was lifted to the forefront of the economics of innovation and technical change. From that time until the current days, a myriad of theoretical developments took place. As ANTONELLI (2003) argues, different approaches to innovation are still competing and yet cooperating, “*so as to make this discipline a particularly fertile and creative area of economic theory*” (id., p. 3). Below, an (forcibly incomplete) overview of the vast research on the economics of innovation is sketched out.

The work of Robert Solow (SOLOW, 1956, 1957) was decisive as it pioneered a prolific line of research on the relationships between innovation and economic growth. While investigating the factors contributing for output growth, the Nobel Prize winner estimated that, from 1909 to 1949, more than 40% of the American economy growth and about 90% of the increase in output *per capita* were dependent on a factor, other than capital and labour production inputs, that could not be fully explained. The residual of the production function²¹ was translated into technical change, meaning that any contribution to output growth that could not be captured by capital and labour was attributed to it. Technical change, in the words of SOLOW (1957, p. 312), is a “*shorthand expression for any kind of shift in the production function*”.

Relying on the claims that “*all theory depends on assumptions which are not quite true*” and that “*the art of successful theorizing is to make the inevitable simplifying assumptions in such a way that the final results are not very sensitive*” (SOLOW, 1956, p.

²¹ ABRAMOVITZ (1956) classifies the residual as unexplained total factor productivity. This author, in his approach similar to Solow’s one, has estimated that the unexplained part of total factor productivity, between 1869 and 1953, represented about one half of US economic growth.

65), the author used strong assumptions to develop his model of economic growth. Following the neoclassical tradition, economic agents are rational and homogeneous, endowed with the capacity to take optimal decisions aimed at maximising profit or individual utility. These decisions are taken in a context of perfect competition in pure markets and where there is little room for uncertainty. Economic systems, in this framework, tend to reach a state of equilibrium. Technology emerges as codified knowledge or, in other words, freely available information. Most importantly, technical progress is regarded as *mana from heaven* (JONES, 1998), i.e., it is a fully exogenous phenomenon that, even if residual in the production function, contributes to improve the productive factors efficiency and increase the production output. In addition, the author assumed constant returns to scale, without which it would be impossible to call forth the residual as the explaining factor of the portion of growth that cannot be attributed to capital and labour. The assumption of exogenous technical progress, as well as of constant returns, has allowed for putting forward a methodological device to better understand its effects on the economy (ANTONELLI, 2003). The possibility of disentangling the analysis of technical change from the complex web of other forces and their interplay is an advantage (id.).

The *mana* metaphor approximates the linear flow between scientific developments and their application, as technology, in production. In other words, the depiction of technical progress made by Solow reminds the linear model of innovation. Academic research, shielded by the *Mertonian* institutional settings, would generate knowledge, or, more adequately, freely accessible knowledge, that would percolate across the economy and, eventually, give rise to technological innovations in the world of production. ANTONELLI (ibid., p. 6) argues: “*Scientists, mainly academics, generate new scientific knowledge in an appropriate institutional context, one where incentives are not defined in strict economic terms. Scientists generate scientific discoveries in the form of public science in order to achieve peer reputation. Publications increase the stock of knowledge available on the shelf and ready to be used, for economic purposes, by firms*”.

The recognition of Solow’s merit in calling attention to technical change equates the strong resistance against the assumption of its exogenous nature (the same can be said of the assumption of constant returns to scale). Several attempts to overcome the shortages of the *mana* metaphor were developed (the same happened in terms of the returns to scale mechanics). The endeavour of Kenneth Arrow (ARROW, 1962a) stands out, because

pioneer, among those attempts. Declaring his uneasiness with a “*view of economic development that depends so heavily on an exogenous variable, let alone one so difficult to measure as the quantity of knowledge*” (ARROW, 1962a, p. 155), the author engages in overcoming the shortages of a “*hardly intellectually satisfactory*” (id.) approach by suggesting an endogenous theory of the changes in knowledge which underlie shifts in production functions. Departing from the assumption that learning is the product of experience, i.e. that “*learning can only take place through the attempt to solve a problem and therefore only takes place during activity*” (ibid.), the author models a way to turn technical change endogenous, as it is ascribed to experience. The acquisition of knowledge, in this context, was the result of a quasi-automatic process (MYTELKA and SMITH, 2001) of *learning by doing*.

The *learning by doing* thesis implies that knowledge can be endogenously generated with basis on the productive or investment activity. In this case, the process does not need any allocation of resources specific to knowledge production. Where do research stand in this context? The author does not neglect this question and, in a paper written in the same year (ARROW, [1962b] 2002), deals with the private appropriation of the economic value of research findings. Quoting ARROW (id., p. 175), “*we expect a free enterprise economy to underinvest in invention and research (as compared with an ideal) because it is risky, because the product can be appropriated only to a limited extent, and because of increasing returns in use*”. There is thus a market failure in terms of knowledge provision that claims for public intervention. This conclusion had previously been drawn by NELSON (1959), who then argued that “*though the profit motive may stimulate private industry to spend an amount on applied research reasonably close to the amount that is socially desirable, it is clear [...] that under our present economic structure the social benefits of basic research are not adequately reflected in opportunities for private profit*” (id., p. 305). The economics of innovation provided a rationale for the increase in public research funding occurred in the post-war period. Recalling NELSON (ibid., p. 306), “*if society places the brunt of the basic-research burden on universities, funds must be provided for this purpose*”.

Knowledge, in these approaches, is a public good (since keeping research findings secret is economically inefficient), presenting high levels of indivisibility, non-tradability, non-excludability, and non-appropriability. These features, following ANTONELLI (2003),

create a division of labour between firms and universities. The production and distribution of knowledge is the responsibility of universities, while firms should be able to collect the stimulus set off by new scientific discoveries. This division of labour reminds the schematic view of university-state-industry relationships presented in the previous chapter, according to which the state plays an intermediary role, by collecting tax-money to finance academic research.

The rationale for research public funding has been extended by the work on the quantification of the social and private returns from R&D activities (e.g. GRILICHES, 1958; MANSFIELD et al, 1977)²², which, in turn, was followed up by increased interest in intellectual property rights (e.g. MANSFIELD et al, 1981; LEVIN et al, 1985; SCOTCHMER, 1991)²³ and the diffusion of innovations (e.g. METCALFE, 1981)²⁴. These theory developments reflected the growing concern of theorists in reducing the residual by rendering knowledge more tangible (MYTELKA and SMITH, 2001). A direct implication of

²² In his study about hybrid corn, GRILICHES (1958) estimates the rate of return on research expenditures in approximately 400 per cent per year. However, as the author (id.) highlights, almost none of the estimated social returns were appropriated by the hybrid seed industry or by corn producers. This gap between the social and the private rates of return is, in the words of GRILICHES (ibid., p. 430), “one of the major arguments for public investments in this area [agricultural research]”. In their work on the rates of return of industrial innovation MANSFIELD et al (id.), besides confirming the gap between social and private rates of return, show that it tends to be higher, on the one hand, for product innovation than for process innovation, and, on the other hand, for more important innovations than for innovations that competitors can imitate cheaply.

²³ The literature on intellectual property rights challenges the notion of knowledge as a freely accessible public good. While empirically showing that the strong appropriability stemming from intellectual property rights can affect positively innovation, LEVIN et al (1985) reveal caution in automatically praising that protecting instrument. In fact, they also suggest that there are social cost-benefit calculations to be made and argue that the correlation between appropriability and innovation is context and sector-dependent: “*Stronger appropriability will not yield more innovation in all contexts and, where it does, innovation may come at excessive cost*” (id., p. 816). SCOTCHMER (1991) sees the patent system as a blunt instrument trying to solve a delicate problem and points out that the prospects for fine-tuning that system seem limited, which “*may be an argument for more public sponsorship of basic research*” (id., p. 40). The work of MANSFIELD et al (1981) also raises doubts about the efficiency of a patent system in fully privatising knowledge. The authors (id., p. 917) use their empirical results to claim that patent protection, excluding the drug industry, did not seem essential for the development and introduction of a large portion (at least three-fourths of the studied innovations) of patented innovations. They also emphasise the need to carefully analyse the role of imitation in technological change.

²⁴ The economics of innovation diffusion, in its early phase, makes an analogy between the process of inter-firm diffusion and the spread of an epidemic, which equates the spreading of information about the innovation among a population of potential adopters characterised by their uncertainty of the innovation relevance. (METCALFE, 1981). In this context, firms do not adopt the innovation immediately. Rather they prefer to engage in indirect learning-by-doing in order to capture the experience of existing adopters (id.). This approach focuses exclusively on the demand side. METCALFE (ibid.) extends the model to the supply side, and, by linking the analysis of diffusion of innovation with analysis of the inducement of innovation, suggests a number of interesting insights: First, the diffusion environment changes as a consequence of the diffusion process; second, the innovation that is being diffused changes itself as a consequence of the diffusion process; and third, the displacement of old technologies by an innovation may stimulate competing improvements in the former.

this effort was that the strong questioning of the exogenous character of technical change would be added by sharp criticisms to other major neoclassical assumptions, namely the rationality and homogeneity of economic agents and thus the equilibrium mechanics. WINTER (1986), for instance, refers to the rationality-as-optimisation paradigm of neoclassical models as something that, “*if taken seriously, would condemn economists to silence on major policy questions in a world undergoing path-dependent historical change, since change is continually presenting economic actors with truly novel choice situations*” (id., p. S433). NELSON (1981) argues that the problem with the assumption connotes “*ability beyond human capabilities to perceive alternative courses of action and compare the consequences of exploring different parts of a previously unexplored terrain*” (id. p. 1059). The same author (ibid.) also challenges the homogeneity of economic agents, stressing that “*different people will inevitably focus on different parts of the choice spectrum, and make different evaluations about what is promising and what is not*”. ALLEN (1988), for instance, questions the equilibrium assumption by arguing that it “*explains only the economists’ obsession with simultaneous equations, regressions and static curves, and denies the importance of history, of time delay, of anticipation, and indeed of consciousness*” (id., p. 97).

In addition, new useful theoretical concepts and constructs were introduced in the economic analysis of innovation, such as, for instance, the concepts of path-dependence and lock-in (DAVID, 1985; ARTHUR, 1988). DAVID (id., p. 332) argues that “*a path-dependent sequence of economic changes is one of which important influences upon the eventual outcome can be exerted by temporally remote events, including happenings dominated by chance elements rather than systemic forces*”. Based on the story of the QWERTY keyboard diffusion, the author (ibid.) claims that QWERTY, despite superior alternatives, became *locked in* as the dominant keyboard arrangement, due to technical interrelatedness, economies of scale, and quasi-irreversibility of investment. ARTHUR (id.), on the notion of *lock-in*, suggests the occurrence of multiple long-run adoption-share outcomes when two or more superior and new technologies compete between each other to replace an old and inferior technology. He argues (ibid., p. 604) that “*the cumulation of small ‘random’ events drives the adoption process into the domain of one of these outcomes, not necessarily the most desirable one*”, adding that “*the increasing-returns*

advantage that accrues to the technology that achieves dominance keeps it locked in to its dominant position”.

A return to the neoclassical equilibrium conditions, though recapturing the effort to make technical progress endogenous and rejecting constant returns to scale, rose with the so-called new growth theory. ROMER (1986, 1990) departs from the non-rivalry and partial excludability qualities of knowledge to develop a model of monopolistic competition when in equilibrium, in which positive externalities are associated to new knowledge generated by research activities. The basic idea, in brief, is that, while there is strong knowledge appropriability in the context of monopolistic production, the knowledge resulting from research findings automatically spills over, increasing the stock of new ideas. The rate of growth of a given economy depends, on the one hand, on the level of investment in R&D, and, on the other hand, on the degree of new knowledge appropriability. Thus, knowledge can assume a both private and public good nature. This possibility, according to ANTONELLI (2003), makes new growth theory a rationale for privatising the public knowledge commons. The author (id.) argues that under this theoretical framework, universities are solicited to patent their discoveries and can be often forced to enter the markets for the technological outsourcing of large corporations, as public funding of R&D declines.

The criticisms of both *old* and *new* neoclassical modelling of innovation and the exploitation of new concepts and ideas gave rise to the consolidation of evolutionary economics, whose official birth, as SAVIOTTI (1997) argues, can be dated back to 1982, when Richard Nelson and Sidney Winter published “*An Evolutionary Theory of Economic Change*” (NELSON and WINTER, 1982)²⁵. The subsequent development of this theoretical body conveyed a more realistic approach to innovation and technological change, by acknowledging its complexity and placing knowledge and interactive learning at the very centre of economic growth explanation attempts.

²⁵ Evolutionary theories of economic growth can be traced back to the 19th century. Economists, such as Marshall and Veblen, developed economic analysis influenced by the Darwinian theory for the evolution of species, drawing thus on the similarity between economic and biological systems. Later, Joseph Schumpeter put forward evolutionary frameworks to address the problematic of growth in capitalist economies: “*The essential point to grasp is that in dealing with capitalism we are dealing with an evolutionary process*”, (SCHUMPETER, 1943, p.82). As argued by KWASNICKI (1996), the lack of formal elegance and mathematical clearness of evolutionary models, in a sharp contrast with neoclassical approaches, curtailed their initial impact on economic studies. Moreover, evolutionary modelling entailed an incompatibility with the assumptions and theses which supported the mainstream neoclassical economics.

The conceptual base of evolutionary theories draws on an analogy between economic and biological systems as opposed to the neoclassical *mechanicism*. Entities, presenting bounded rationality and capable to acquire and diffuse knowledge, as well as to explore and adapt to an evolving environment, constitute these dynamic systems. The biological concept of species evolution, based on mutation, variation, competition and selection, is translated into economic analysis, breaking free from the tight universe of neoclassical orthodoxy.

METCALFE (1997) suggests the existence of three essential mechanisms in evolutionary approaches to economic change. Firstly, the mechanisms generating variety, thus diversity, within an economic system²⁶; secondly, the mechanisms of hereditariness inducing imitative behaviour and supporting temporal stability and continuity of selection units; and, thirdly, the selection mechanisms, distinguishing the economic system components, according to their capacity for adapting to a changing environment. The combined effect of the three mechanisms induces the adaptation of a population structure to the environment, and, simultaneously, determines the nature of that environment. The capacity to adapt is shaped by recombination or mutation, concepts which can be translated into the introduction in the system of, respectively, incremental and radical innovations. This translation suggests that innovation is a central issue in evolutionary theories. Accordingly, a theory, in order to be considered as evolutionary, should incorporate a mechanism that introduces novelties in the system, i.e., that introduces innovations (NELSON, 1987).

The core conceptual trilogy of evolutionary economics, - reproduction, variety and selection -, shapes the dynamics of an economic system (ANDERSEN, 1997). The evolution of the system is nourished by organisational structures within which learning and knowledge accumulation mechanisms, influenced by path dependency and lock-in phenomena, are developed. Firms and organisations operating in the system tend to follow routines that are reproduced over time. This creates a context where there are some elements of continuity, or, as NELSON (1995) argues, of historical inertia. HEINER (1988) reminds that economic agents characterised by bounded rationality, benefit from displaying a diversity of routinised behaviour patterns. According to the author (id. p.

²⁶ The meaning of diversity is manifold, as it can include output diversity, process diversity, sectoral diversity, institutional and organisational diversity, competence diversity, etc.. A detailed discussion of the different meanings of diversity in evolutionary economics is provided by SAVIOTTI (1997), COHENDET and LLERENA (1997) and CORIAT and WEINSTEIN (2002).

162/163), “*such diverse yet routinized patterns will inertially adjust, thereby providing more time for selection processes to weed out relatively inferior behaviour patterns*”. This explains the existence of micro-diversity within a larger system, as well as of behavioural inertia giving selection mechanism more time to work (ibid.). Hence, routines are a source of diversity and selection (together with other selection mechanisms, such as market or technology diffusion) and, simultaneously, of stability.

Assuming path dependence as influencing the competences of economic entities, routines become what NELSON and WINTER (1982) call organisational memory. This memory, a store of accumulated knowledge, plays a crucial role in creating and sustaining the competences needed for coping efficiently with the challenges inherent to dynamics of change. SAVIOTTI (1997, p. 209) argues that “*routines can be considered similar to heuristics, which can be defined as a device that contributes to the reduction in the average search to solution*”. This suggests that routines, as well as habits, incorporate tacit knowledge, which, as mentioned above, is perceived as of particular relevance in economic processes.

The evolutionary link between diversity generation and the functioning of learning mechanisms evolving within the system is made explicit by the concept of routines, the elementary units of analysis (COHENDET and LLERENA, 1997). The authors (id.) identify two major learning mechanisms: the exploitation of existing routines and the potential of new routines experimentation. Taking this perspective, successful exploitation and the setting up of new routines increase diversity. Learning becomes essential to strike the balance between routines and creativity (COOKE and MORGAN, 1998), favouring the argument pointing to innovation as shaped by the attributes of the learning processes evolving in the economic system.

Evolutionary economics, emerging as a *counter-culture vis-à-vis* mainstream neoclassical thought (NELSON, 2002a), brought a fresh orientation to innovation and technological advance theorising. It grounds in a solid way the rejection of the linear model as a predominant mode of innovation. It does that by stressing that innovation results from path-dependent, random, open-ended and slow processes of reproduction, mutation and selection (EDQUIST, 1997), which, in turn, involve the accumulation of different types of knowledge upon interactive learning mechanisms.

One can argue that the view on the relevance of the role played by universities in innovation should be taken far beyond the imagery depicting academia as a mere producer of the basic knowledge necessary to start the one-way linear flow that culminates in the introduction of innovations into the market. The relevance of universities, in the evolutionary framework, cannot be reduced to their intrinsic capacity to generate scientific knowledge, since innovation, in that framework, is not regarded as the direct outcome of R&D activities. Moreover, the problem of knowledge transmission, assumed as automatic, or at least quasi-automatic, in other theoretical models, gains complexity, as it places universities within the wider network of knowledge-producing and diffusing relationships, upon which heterogeneous agents interact and learn.

Evolutionary theorising has thus cognitive interactivity at its very core. It emphasises the interactive mechanisms supporting learning and innovation and acknowledges that those depend on a myriad of social and behavioural shaping ingredients. Accordingly, evolutionary thought entails a strong institutional dimension, which, as CORIAT and WEINSTEIN (2002) suggest, comprises both the organisational architecture conditioning the interaction between different agents and the institutional framework defining social positions and functions of individuals and groups, and constraining their actions. The basic idea is that learning, of interactive and thus social nature, is embedded in institutions, which shape the vision, the interaction and the decisions of economic agents, and influence the generation, diffusion, use and destruction of knowledge (GREGERSEN and JOHNSON, 1997). Arguably, the institutional set-up also shapes the selection mechanisms, whose efficiency depends on the quality and extent of technical and economic information exchanged among economic agents (MCKELVEY, 1997).

As put by NELSON (2002a, p. 20), “*evolutionary economists are coming to see ‘institutions’ as molding the technologies used by society, and technological change itself*”. However, as the author, elsewhere (NELSON, 2002b) recognises, much of modern evolutionary theorising work has been “*as limited in its incorporation of institutions as has been neo-classical economic theory, which it is designed to replace*” (id., p. 266). The recent effort to embrace institutional analysis led to the development of a systemic approach to innovation, which, in an anticipatory vein, can help to purposefully enhance the framework for analysing the role of universities in the contemporary society.

“The innovation systems idea is an institutional conception, par excellence”,
NELSON, 2002b, p. 265.

3.5

Setting up the engine: towards a systemic approach...

The acknowledgment of the need to introduce institutional analysis into innovation theorising originated a growing scholarly interest in the systemic dimension of the innovative phenomenon. However, the innovation systems approach, rather than a follow-up of evolutionary economics or a new theory, is a conceptual framework that, though theory-rooted, as put by EDQUIST (1997, p. 28), assumes the form of a “*‘wide-trawl’ intended to capture processes of innovation, their determinants, and some of their consequences (e.g., productivity growth and employment) in a useful way*”. In a similar vein, ARCHIBUGI et al (1999, p. 531), bearing in mind the “*lack of any predictive element within systems of innovation thinking*”, characterise the approach as a partial model, “*rather than claiming to be a complete formal theory*”. As a conceptual framework, innovation systems can provide a useful analytical ground to understand innovation dynamics, the differentials existing between economies in terms of innovative performance, and purposeful guidance for policy design. Normally defined in institutional terms (EDQUIST and JOHNSON, 1997) they can help to grasp the perceived centrality of institutions in economic growth and development. These are major reasons for emphasising the conceptual realm of innovation and gearing the discussion below towards the outline of a systemic approach.

The evolution of theory in the economics of innovation, from the seminal contributions of Robert Solow to the evolutionary breakthroughs, has a parallel in the conceptualisation of the innovative phenomenon. The concept of innovation has dramatically changed, namely in terms of the shift in focus, from the single-act philosophy of innovation towards the current acknowledgement of complex social mechanisms (OECD, 1992) supporting new production processes, the production of new products or new organisational arrangements. This view equates what SCHUMPETER [1911] (1934) has called the socialization of the innovation process, against the image of the *heroic individual* model of innovation which, as COOKE and MORGAN (1998) remind, may have had some foundation

in earlier phases of capitalist development, but nowadays, though not insignificant, is highly circumscribed. LUNDVALL and BORRÁS (1999, p. 29) illustrate this point by claiming that “*the old image of a lonely scientist in a laboratory discovering new things and applying them to the production of a new product is no longer considered realistic*”.

The socialization of the innovation process brought increased complexity to innovation. This is perhaps the main reason for the troublesome search of a common definition of innovation. In fact, the term means different things to different scholars. In the literature, a multiplicity of definitions can be found, from strictly technical innovation (e.g. NELSON and ROSENBERG, 1993)²⁷ to broader meanings going beyond the technical aspects, such as the one made explicit by DOSI (1988, p. 222):

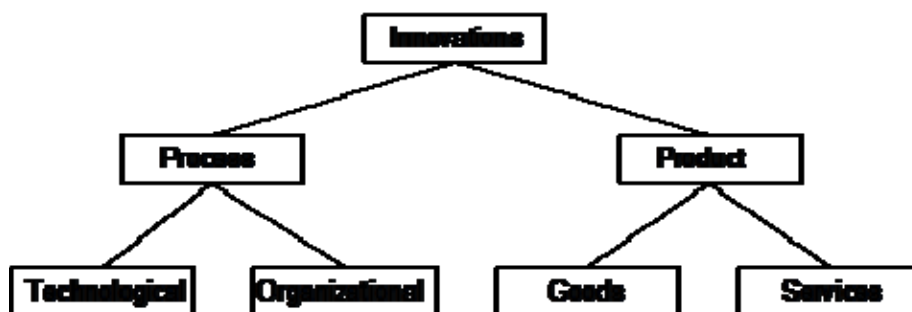
“[...] innovation concerns the search for, and the discovery, experimentation, development, imitation and adoption of new products, new production processes and new organizational set-ups”,

or by EDQUIST (1997, p. 2):

“Innovations are new creations of economic significance of a material or intangible kind. They may be brand new but are more often new combinations of existing elements”.

Rather than engaging in a definitional discussion, it seems more productive to tackle the nature and content of innovation. A first point concerns the taxonomic perspective.

Figure 3.1 – A taxonomy of innovations



Source: OECD (2001)

²⁷ NELSON and ROSENBERG (1993, p. 1), in the introduction of the book “*National innovation systems: a comparative analysis*” (NELSON, ed., 1993), state that it is about national systems of *technical* innovation, adding that 15 studies of national innovation systems “*have been carefully designed, developed, and written to illuminate the institutions and mechanisms supporting technical innovation in the various countries*”.

Figure 3.1 depicts the most common taxonomy of innovations. The broad category of innovations is divided into subcategories portraying how things are produced (process innovations) and what is produced (product innovations). In turn, it introduces the tangible and intangible dimensions of innovations, by acknowledging, on the one hand, the technological and organisational facets of process innovations, and, on the other hand, the different outcomes of product innovations, in the form of goods and services. Obviously, there are close relationships between process and product innovations, as well as between technological and organisational process innovations, and between new goods and new services (OECD, 2001).

A different taxonomy of innovations concerns the extent of the discontinuities in the supply and demand structure of an economy provoked by a new product or by changes in technological processes. This relates to the dichotomy between radical and incremental innovations. FREEMAN and PEREZ (1988) consider that incremental innovations occur more or less continuously in any industry or service activity, resulting not so much of deliberate R&D efforts, but as the outcome of existing and/or recombined knowledge, i.e. the synthetic productive knowledge-base, as ASHEIM and COENEN (2004) would argue. FREEMAN and PEREZ (id, p. 46) suggest that “*although their combined effect is extremely important in the growth of productivity, no single incremental innovation has dramatic effects, and they may sometimes pass unnoticed and unrecorded*”. Radical innovations are discontinuous events, usually resulting from deliberate R&D activities, or, in other words, from an analytical productive knowledge base (ASHEIM and COENEN, id.). This type of innovations, using again the words of FREEMAN and PEREZ (1988, p. 46), “*do bring about structural change but in terms of their aggregate economic impact they are relatively small and localised, unless a whole cluster of radical innovations are linked together in the rise of new industries and services [...]*”.

These taxonomies conceptualise innovation in the realm of production. This goes in line with the perspective according to which firms are a major repository of productive knowledge and a vehicle for continuous-learning and knowledge generation (COOKE and MORGAN, 1998). However, as the same authors (id., p. 17) suggest, “*the wider environment of the firm – the social and political system in which it is embedded and with which it interacts – can play a vital role in facilitating (or frustrating) its learning capacity*”. Accordingly, other type of organisational or institutional settings can be viewed

as innovation facilitators and even as innovation generators. This is the case, among others, of the public sector, for instance in terms of policymaking, involving a learning process directed at designing policy actions in new ways (LUNDVALL and BORRÁS, 1999), or in terms of public technology procurement (EDQUIST and HOMMEN, 1999), inducing the development of new products or processes by private companies.

This perspective reinforces the argument in favour of the interactive nature of innovation and fuels the critic to the linear model of innovation, which, as mentioned before, has guided for several decades the thought about economic development, as well as the formulation of science and technology policies²⁸. MALECKI (1991) argues that the linear model policy implications are straightforward: “*if the level of R&D is increased [...] a corresponding increase in technological innovation should follow*”, (id., p. 115). This is often considered as a misrepresentation of the innovation process, “*by depicting it as a smooth, well-behaved linear process*” (id.)²⁹. The chain-linked model developed by KLINE and ROSENBERG (1986), in **Figure 3.2**, is illustrative of the attempt to overcoming the linear model analytical shortages.

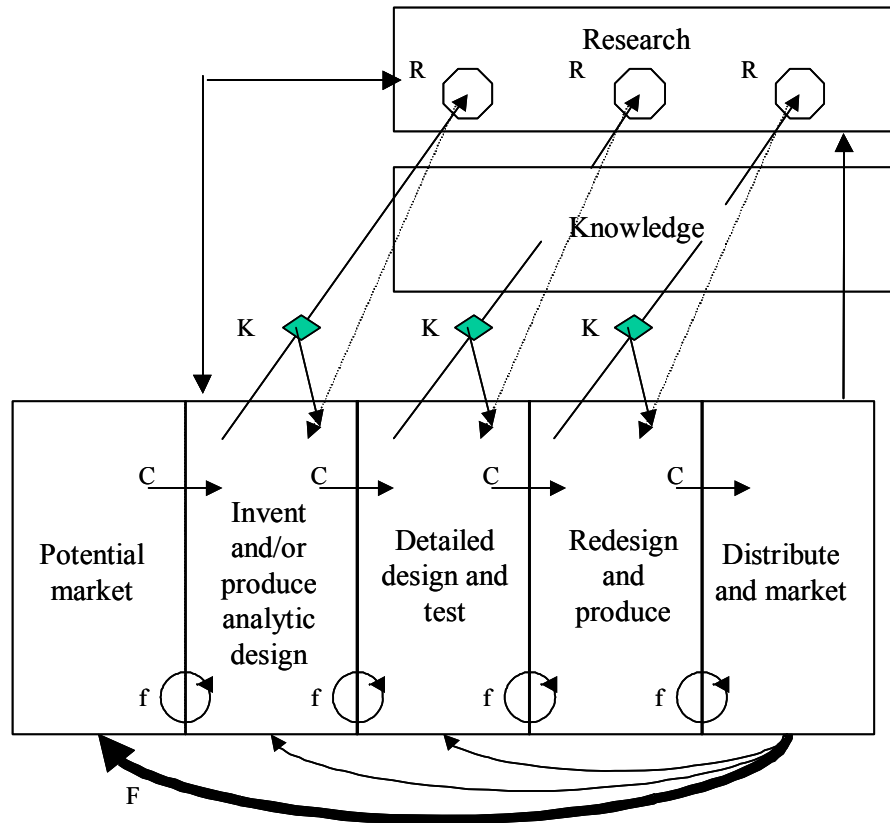
In brief, this model describes innovation as resulting of interactions and feedback mechanisms within and between production structures internal to the firm, as well as the interaction between the firm, the knowledge base in which it operates, and the research activity³⁰. The first path of innovation processes (C), the central chain of innovation according to the authors (id.) begins with a design and continues through development and production to marketing. The second path is a series of feedback links (f and F), which “*iterate the steps and connect back directly from perceived market needs and users to potentials for improvement of product and service performance in the next round of design*” (KLINE and ROSENBERG, *ibid.*, p. 289). Assuming that innovation is often impossible without resorting to accumulated scientific knowledge and to research, i.e., to new science, the model establishes a link from science to innovation (K and R), which extends all through the process. This is the third path of the innovation process.

²⁸ “*The [linear] model fitted well the ‘science push’ approach which prevailed overwhelmingly in the 1950’s and 1960’s [...]*”, OECD, 1992, p. 26.

²⁹ As MALECKI (1991, p. 116/117) reminds, “*despite its simplicity, elements of the linear model of technological change remain appropriate for understanding the dynamic nature of technology within economic activity*”.

³⁰ For a more detailed description of the model and its implications, see KLINE and ROSENBERG (1986), MALECKI (1991) or OECD (1992).

Figure 3.2- The chain-linked model of innovation



Source: adapted from Kline and Rosenberg (1986)

KLINE and ROSENBERG (1986, p. 304) draw on the model to conclude that there is “*the need to view the process of innovation as changes in a complete system of not only hardware, but also market environment, production facilities and knowledge, and the social contexts of the innovating organization*”. However, a clear (and deliberate) technical perspective of innovation and the description of a process evolving mainly within the firm lie at the centre of the authors’ contribution. In this sense, the model, though interactive, neglects the social character of a complex web of institutional and organisational relationships bearing learning, earlier assumed as a crucial component of innovation. Hence, it does not take innovation as institutionally embedded.

The creative use of new knowledge or new combinations of existing knowledge of which innovation, as noted before, is achieved through learning, searching and exploring, requiring any sort of contacts and relationships between agents acting in diverse organisational and institutional settings. This is the reason why LUNDVALL (1992) argues that innovation should be analysed as a process, rather than as an outcome or a primarily

single event along a timescale. Moreover, and accordingly, it is the reason why innovation is regarded as a complex social process (e.g. EDQUIST, 1997).

At this point one can extend the taxonomy illustrated in **Figure 3.1** to include the notion of social innovation. The literature provides a vast array of social innovation definitions and stresses its multidimensional character (cf. MOULAERT et al, 2005). Following Lundvall's advise, that is, the need to look at innovation as a (social) process, the definition offered by MUMFORD (2002) seems appropriate: "*The term social innovation [...] refers to the generation and implementation of new ideas about how people should organize interpersonal activities or social interactions, to meet one or more common goals*" (id., p. 253). Taking this definition, the concept of social innovation, as the same author suggests (ibid.) comprises, at one end of a continuum, the development of new ideas about social organization, or social relationships, the creation of new kinds of social institutions, new ideas about government, or even the development of new social movements. On the other end, it entails the creation of new processes and procedures for structuring collaborative work, new social practices in a group, or the development of new business practices. MOULAERT and AILENEI (2005, p. 2037) consider social innovation in the economy as being "*mainly about the (re)introduction of social justice into production and allocation systems*", a definition that goes beyond the one grasped by Michael Mumford. Taken together, these definitions bring forward two additional dimensions to the innovation debate. The first, in its essence, concerns the governance dimension of the innovative phenomenon. The second implies an *enhanced* concept of competitiveness: a competitive society is not the result of a free enterprise attitude, unattached from social consequences and pursuing, at any (social) cost, a privileged position in the markets. Conversely, a competitive society finds its ground on the capacity to look at itself as a living whole, in which the positioning in the markets is not dissociated of social welfare and cohesion goals.

This enlarged perspective, while bringing over the challenging domains of governance and social equity to the innovation debate, seems to reinforce the perception of the need for considering innovation as an instituted process, as POLANYI (1992) would say. Accordingly, the perceived advantage of a systemic approach to innovation holds its ground. Therefore, prior to extend the discussion, an attempt to soundly understand the

concept of innovation system, as constructed in the literature, is the necessary following step.

FLECK (1992, p. 5, quoted in EDQUIST, 1997) simply defines systems as “*complexes of elements or components, which mutually condition and constrain one another, so that the whole complex works together, with some reasonably clearly defined overall function*”. Systems are thus made of components, relationships and attributes (CARLSSON et al, 2002) (**Table 3.1**).

Table 3.1 – What is a system (of innovation)?

Components	Relationships	Attributes
Actors or organisations (<i>individuals, firms, banks, universities, governments, etc.</i>); Institutions (<i>regulatory framework, norms, habits, etc.</i>).	Links between the system’s components (<i>interdependence, feedback, learning, cooperation</i>).	Properties of the components and of the relationships between them (<i>robustness, flexibility, capability to learn and change, etc.</i>)

Source: adapted from CARLSSON et al (2002)

The components of an innovation system configure its operating parts (id.) and comprise the individual and collective actors acting within the system, - the organisational architecture -, and the institutions that shape behaviour and action, - the institutional framework. The innovation system’s components interact with each other in ways that, as put by CARLSSON et al (ibid., p. 234), “*the properties and behavior of each component set influence the properties and behaviour of the set as a whole*”. The interdependence of the system’s components implies that the system is more than the sum of its parts. Interaction provides the feedback relations that nourish learning and thus shift the knowledge base over time, inducing change within the system. Knowledge diffusion, either via market or non-market interactive mechanisms, requires some sort of collaborative effort between the system’s components. The attributes, following the same authors (ibid.), characterise a system of innovation, ranging from the capability of its components to generate, diffuse and use knowledge and the ability to learn and change, to its robustness and flexibility (the adaptive capacity to change).

GREGERSEN and JOHNSON (1997), drawing on the idea that “*the overall performance of an economy depends not only on how specific organizations like firms and research*

institutes perform, but also on how they interact with each other and with the government sector in knowledge production and distribution” (GREGERSEN and JOHNSON, 1997, p. 482), illustrate the systemic dimension of innovation by highlighting the influence specific sectors of the institutional fabric, the knowledge infrastructure, the specialisation pattern, the public and private demand structure and government policy exert on the innovative performance of a given economy. The authors depict these interactions as catalysers of direct and indirect learning processes and emphasise these processes as feeders of innovative performance (**Figure 3.3**).

According to GREGERSEN and JOHNSON (id.), infrastructures, production structures, institutional set-ups, consumer demand structures, and government policies are not independent explanatory factors for innovation performance. Rather, “*they are interdependent, and they evolve in interaction with each other*”, (ibid., p. 484). The broad picture outlined in **Figure 3.3** provides a way of looking at and understanding the determinants of the innovation performance of an (national)³¹ economy (ibid.).

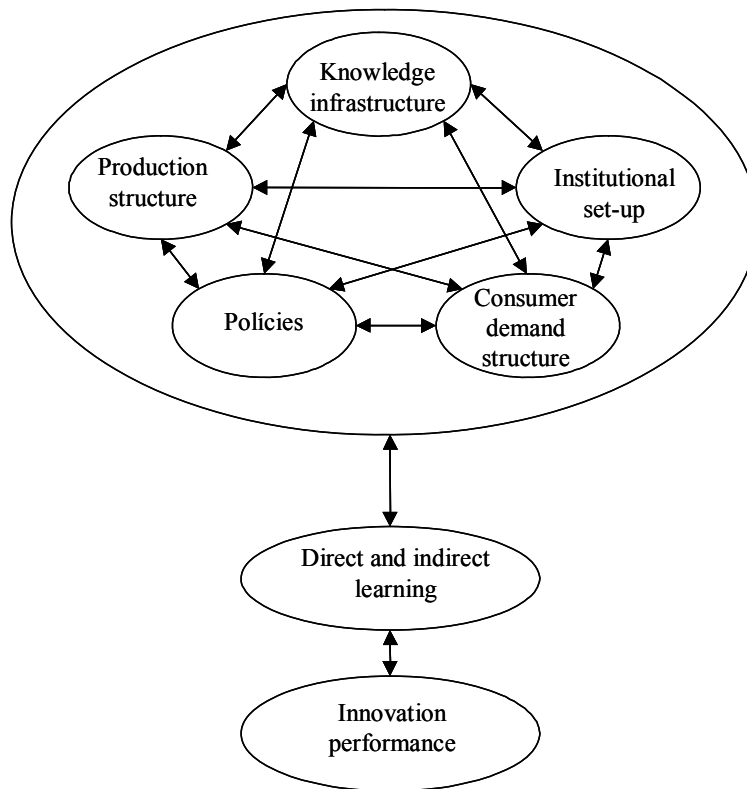
At this point, a synthetic definition of system of innovation can be provided:

“[...] a system of innovation is constituted by elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge”, LUNDVALL (1992, p. 2).

Both the schematic view and the synthetic definition suggest that an innovation system is a social system and perceive innovations as an outcome of social interaction between economic agents. A direct implication is that looking at innovation as systemic requires an interdisciplinary approach, or, as EDQUIST (1997) contends, a political-economic approach, since the conceptual framework allows for the inclusion not only of strictly economic factors influencing innovation but also organisational, social and political factors, both in terms of structure and agency.

³¹ The schematic view of the systemic dimension of innovation was meant to depict national systems of innovation, though recognising that the boundaries of such system are not completely defined in terms of national borders (GREGERSEN and JOHNSON, 1997). In other words, a national system of innovation is seen as an open system, influenced by international technological and policy elements, on the one hand, and, on the other hand, as containing many subsystems knitted together into rather loose structures (id.). This is the reason why EDQUIST (1997, p. 11) suggests that “*systems of innovation other than national ones, can be, should be, and are being identified and studied*”. This introduces a geographical dimension into the debate. This dimension will be tackled with detail in the next chapter.

Figure 3.3 – Main factors affecting learning and innovation: a systemic view



Source: Gregersen and Johnson (1997)

Taking this perspective, one can argue that the systemic approaches to innovation mirror the role of institutions, understood in the dual sense to include organisations – firms, higher education institutes, R&D laboratories, schools, labour market organisations, banking, government agencies, etc. - and social norms, - habits, routines, practices, etc.. Accordingly, the conceptualisation of systems of innovation encloses all parts and aspects of the economic structure, as well as the institutional set-up influencing learning, searching and exploring (LUNDVALL, 1992). Institutions, the medium for and the result of social action (GIDDENS, 1984), can either enable or constrain learning and innovation processes. Hence, both learning and searching develop from within the economy, through processes shaped by a variety of institutions (JOHNSON, 1992). “*This makes innovation an endogenous process*” (id, p. 33), or in other words, innovation has a strong territorial nature. As put by FELDMAN (1994, p. 4), “*innovation is a complex geographic process with multiple spatial determinants*”.

The concept of innovation system offers a promising potential to serve as an analytical tool contributing for better understanding the role one of the prominent components of any system, the university, plays in socio-economic development. Moreover, by acknowledging that innovation is territorially based, the systemic approach to innovation opens up the opportunity to discuss that role under the light of the regional development problematic.

3.6

Concluding remarks: hints for positioning the university in the knowledge society

This chapter depicted the dynamics of societal change that are configuring the contemporary idea of the society and, inherently, shaping the role and mission of the university. It was argued that the transformative pressures exerted by globalisation, impelling accelerated rhythms of change and enhanced competition regimes, brought forward new, inconstant and uncertain societal contexts for human activities. A better understanding of the role of and the challenges faced by academia in the contemporary society requires the analysis of these societal contexts.

The change process is well portrayed by the hollowing out of Fordist mass-production and the development of flexible production and labour organisation evolving within new modes of regulation and a new techno-economic paradigm driven by information and communication technologies. Universities are not immune to the structural crisis of adjustment associated with the rise of this new techno-economic paradigm. They are also affected in significant ways by the shifting scope and scale of the nation-state, as well as by the abandon or at least diminished influence of the welfare state ideology. The issues at stake are, on the one hand, whether the centrality of the academic institution in the welfare (national) state is at risk, and, on the other hand, what are the conditions necessary to keep that centrality in presence of a new techno-economic paradigm.

The discussion of the positioning of universities in current times should be looked at under the light of the metaphor used to illustrate the current state of affairs, the one of a globalising society, motored by innovation, fuelled by knowledge and lubricated by learning. The basic argument here is that, in a context of rapid change and enhanced

competition, innovation, - requiring new or recombined existing knowledge, whose generation depends on the ability to learn -, is crucial to thrive in the globalising society. At a first stance, the maintenance of universities' centrality, as major locus of knowledge generation and dissemination, would be unquestionable. This is a straightforward presupposition that, in this chapter, was challenged by the analysis of the contemporary condition of knowledge and the conceptualisation of innovation.

Different types of knowledge and different modes of learning underpin the innovation endeavour. Knowledge, regarded as a resource determining the capacity for action, cannot be reduced to scientific knowledge resulting from R&D activities. Different kinds of knowledge, - codified, tacit, analytical, synthetic, etc. -, mesh to put in motion innovation relevant knowledge flows. The ability to combine and recombine those different kinds of knowledge depend on direct and indirect modes of learning, which, in turn, are both based on interactive and cumulative processes. Innovation thus requires social interaction and becomes a complex phenomenon that cannot be efficiently grasped by smooth and well-behaved linear approaches or by models neglecting the social nature of organisational and institutional interactions. This alerts, as argued in this chapter, for the need to go beyond the mere technical and technological sides of innovation, shedding light over other dimensions of the innovative endeavour, particularly the dimension of social innovation.

Taking this perspective, universities, rather than considered as a mere basic knowledge provider placed at one end of a one-way linear flow, are components of a complex system upon which knowledge-generating interactive learning processes evolve. In other words, universities can be regarded as components of innovation systems. Accordingly, the centrality of academia in the contemporary society can be judged as depending not only on the positioning of universities as a component of the system, but also on the quantity and quality of the links established with the other components, as well as on the attributes of the system as a whole.

The argument developed in this chapter has also geared the perception that innovative processes, because interactive and thus socially rooted, entail a strong territorial dimension. This conveys extended analytical and conceptual grounds to judge the transformed role of universities in the contemporary society. To deal with the apparent paradox between *territorialisation* and *globalisation* seemingly implies an enlarged view on the problem of universities' centrality, hitherto national in scope. A major inquiry stemming from this

enlarged view is whether a sub-national dimension for the role and mission of the university makes any sense. The first step to purposefully engage in that line of inquiry is, on the one hand, the search for the reasons why territories in a globalising society still matter, and, on the other hand, the attempt to explain how territorial qualities affect socio-economic development trajectories. This is the central task of the next chapter.

A tale made of *unequal* territories

4.1

Introduction

The previous chapter was aimed at outlining the challenging conditions that are currently shaping change in universities. It has highlighted that intensity and direction of academic change is determined by a societal framework, metaphorically depicted as the one of a globalising society, motored by innovation, fuelled by knowledge and lubricated by learning. It was argued that innovation, conceptualised in an extended way, that is, going beyond the mere technological aspects, is a socially rooted interactive phenomenon, thus context-specific. This has grounded the proposition that the capacity to innovate is affected to a large extent by territorial determinants. Accordingly, one can argue that there is a territorial dimension influencing academic change. In addition, one can inquire the extent to which universities can influence and transform the qualities of the territories where they are located and the challenges brought over. Here the question is whether the academic mission, in the contemporary society, should incorporate specific concerns with the development of the places where universities are located, while guaranteeing the universalism inherent to the definition of academia. To understand the relationship between universities and territories, a previous step is necessary: the search for the reasons why territories in a globalising society still matter, and, on the other hand, the attempt to explain how territorial qualities affect socio-economic development trajectories. This line of inquiry is at the core of the present chapter.

There is an apparent paradox in calling forth a territorial dimension of innovation in the context of a globalising society. The argument here is that territories gained increased relevance because of globalisation. Taking this perspective, the views making the apology of the *death of geography* (e.g. O'BRIEN, 1992), associated with the image of a globalised world, in which market forces alone, acting in a global de-regulated and entropic system, guarantee efficiency, are strongly put into question. Open to questioning are also the arguments produced by authors such as NEGROPONTE (1995), announcing that, due to the power of information and communication technologies (ICT), the digital planet will look and feel like the head of a pin. Those who contend for the *death of geography* draw on broad discourses about global modes of economic regulation and organisation and/or the power of ICT in annihilating the friction of geographical distance. They ignore, on the one hand, the relational nature that confers to economic life its social embeddedness, or, more generally, the intangible realm of economic development processes, and, on the other hand, the major role tacit and context-specific processes of learning, knowledge exchange and innovation play. Conversely, they accommodate with the image of a *global village* made of entropy and de-regulation, in which virtual space replaces physical space, originating amorphous and monotonous productive systems, based on sectoral links to giant global networks. In this *global village*, a high level of innovation-inhibiting institutional inertia would raise (CASTRO et al, 2000).

The acknowledgement of the need for bringing geography into the debate does not mean to condemn the global dimension, by focusing on territories as hermetically sealed entities. Rather, it implies capturing the *global-local nexus*, enclosed in the argument above contending that territory gains increased relevance because of globalisation. As AMIN and THRIFT (1994) suggest, the crux of the matter is to understand the ways local initiatives structure responses to global challenges and themselves become a part of globalising processes. Arguably, the quality of those responses depends on a set of territorially embedded features, namely institutions, and knowledge and learning networks. In this sense, the meaning of geography is not only as referred to simple physical spaces, but also to complex relational spaces. It was in this context that the importance of territories and proximity in innovation and economic development has attracted great

attention of many scholars, especially from the 80s³² onwards. Within this literature, sub-national territories, generally termed regions, became major analytical units for scientific studies on innovation and development. Following the track open by pioneers such as Alfred Marshall (MARSHALL, 1919, 1952), references to industrial districts (e.g. BAGNASCO, 1977; BECATTINI, 1979), new industrial spaces (SCOTT, 1988; STORPER and SCOTT, 1989; SCOTT and STORPER, 1992), *milieux innovatives* (e.g. AYDALOT, 1986; CAMAGNI, 1991), industrial clusters (PORTER, 1990), regional technological complexes (SAXENIAN, 1994), regional innovation systems (COOKE, 1992, COOKE et al, 1998), or learning regions (FLORIDA, 1995; MORGAN, 1997a) can be found in a prolific collection of literature.

By bringing the territorial dimension to the forefront of the development debate, the problem of uneven development is inherently present. One can thus talk about unequal territories, performing differently in the globalising society, not only in terms of the capacity to compete in global markets but also in terms of the capabilities to engage in innovation. To unequal territories, one can expect to correspond different patterns of territorial engagement of universities, as well as different local pressures for academic change. Three major research questions seem to arise from this set of concerns: why do territories still matter in a globalising society? Why the existing territorial development and innovation capacity disparities? Why is it so difficult to diminish the territorial gap? Arguably, to grasp purposeful answers to these questions is a central ingredient when attempting to understand the role of academia. This chapter acknowledges this centrality. According, it is structured as follows:

- Firstly, the chapter grasps the global-local nexus, attempting to show the inadequacy of a hermetic view of territories and the tensions between the

³² The interest in the role of territories in innovation and economic development can be traced back to the early years of the 20th century. For instance, Marshall, in 1919, argued for the interdependency between economic growth and external effects of agglomeration, inter-firm relationships, and the availability of qualified labour in specialised industrial locations. However, as STORPER (1997, p. 3) states, “*something funny happened in the early 1980’s*”. The same author writes (id.): “*The region, long considered an interesting topic to historian and geographers, but not considered to have any interest for mainstream western social science, was rediscovered by a group of political economists, sociologists, political scientists, and geographers. Not that no attention had been paid to regions by social scientists before that: in regional economics, development economics, and economic geography, such topics as regional growth and decline, patterns of location of economic activity, and regional economic structure were well-developed domains of inquiry. But such work treated the region as an outcome of deeper political-economic processes, not as a fundamental unit of social life, on the same level as technology, stratification, or interest-seeking behavior. Economic geography was thus considered to be a second-order empirical topic for social science*”.

dynamics of constructing both the local out of the global and the global from the local.

- Secondly, it presents a first set of theoretical insights, which, in a variety of perspectives, help to ground the argument pointing to the relevance of territories, namely by emphasising the effects of economic activity agglomeration;
- Thirdly, an interlude aimed at making clearer the conceptualisation of territory is brought forward;
- Fourthly, the *territorialisation* of the systemic perspective on innovation is suggested with basis on the regional systems of innovation approach and extended through the associated notion of the learning region; in addition, an alternative model of territorial development, centred on social innovation is briefly analysed;
- Finally, the chapter addresses the problem of uneven development, illustrated by the European Union regional development gap; it also attempts to identify the major factors determining regional development disparities and the challenges raised by the efforts to catch up.

4.2

The global-local nexus

“It is, indeed, quite curious that a fundamentally geographical process labelled with a geographical term – ‘globalization’ – is analyzed as a set of resource flows largely without considering their interactions with the territoriality of economic development”, STORPER, 1997, p. 177.

The most recent decades have been characterised by a dramatic increase in the flows of goods, services, financial capital, information, and so forth, across national borders. Rapid change and new forms of socio-economic organisation and regulation have emerged, underpinning the so-called globalisation phenomenon. In the previous chapter, the roots, features and implications associated with the globalising economy have been grasped. At this point, the issue at stake is to question the often claimed deterritorialisation of

development processes due to globalising forces. In other words, the task associated with this section is to examine whether a global-local nexus can be established, hence whether the views contending for the death of geography can be contradicted.

Broadly, the claims for the death of geography (e.g. O'BRIEN, 1992), draw on the traditional categories used as frames of reference for the globalisation debate (STORPER, 1997): foreign direct investment (FDI), commodity trade, the global business hierarchy, and the global supply structure of commodities, knowledge and technology. STORPER (id.) argues that these categories, instinctively, seem to suggest the progressive deterritorialisation of economic power.

Another reference thrusting the globalisation debate and the “*geography is dead*” argument is the transformative power of ICT. Allegedly, digitalisation compresses in a dramatic way space-time relationships, annihilating the friction of physical distance. For example, NEGROPONTE (1995) speaks about digital neighbourhoods in which social relations will evolve, ascribing that physical space will be irrelevant and time will play a different role. MORGAN (2001), referring to the transformations introduced by ICT, points out two particular features enveloping the arguments for deterritorialisation. First, the tradability of outputs, in particular as far as the services sector is concerned, because ICT free the provision of services from their point of consumption. Second, codification, reducing knowledge into a universally accessible form of information, which, in turn, is susceptible of being reduced to bits.

Both STORPER (ibid.) and MORGAN (id.) produce harsh criticisms to the deterritorialisation discourse. The frames of reference traditionally used in the globalisation debate, according to STORPER (ibid., p. 177), “*upon closer observation, [...] are conceptual categories that are inadequate to the job of shedding light on the question of territorialization and deterritorialization*”. The author claims that there is no evidence sustaining the *deterritorialisation* of economic activities. Taking FDI, - the “*most obvious category of globalization*” (STORPER, 1997, p.175) -, as an example, he argues that it may reflect the presence of global supply oligopolies in goods or technology, for instance, but it may also reflect the need to establish relationships with territorially rooted foreign contexts of goods production or technology development. MORGAN (2001, p.3) argues that the narrative pointing to the end of geography due to the power of ICT, “*grossly overestimates the distance destroying capacity of information and communication technologies*

by conflating spatial reach with social depth". The author (MORGAN, 2001, p. 26) adds: *"the rapid diffusion of information and codified knowledge does not mean that tacit knowledge and understanding are also so freely available"*.

STORPER and SCOTT (1995, p. 506) remind that *"a great deal of what goes on in economic and social life may [...] be described in the analytical terms of transacting"*. Accordingly, the same authors argue that, in general terms, the greater the complexity, irregularity, uncertainty, unpredictability and uncodifiability of transactions, the greater their sensitivity to physical distance. The development of transacting technology, namely transportation and telecommunications networks, though altering the existing spatial scales of feasible transacting, does not give rise to a one-way direction of change, from geographical constraint to globalisation (id.). Moreover, as the same authors claim (ibid., p. 507), *"there is powerful evidence that changes in the technology of transacting are sometimes outweighed by the creation of new networks of transactions that are highly sensitive to geographical distance by virtue of their substantive complexity, uncertainty and recurrence over time"*.

A variety of additional insights asserting the significance of *territoriality* in the globalising economy can be found in the literature. For instance, the simple consideration of the existing development inequalities across territories emerges as a powerful argument *per se*. In fact, development processes do not evolve on the head of a pin, but unevenly in and through places (AMIN and THRIFT, 1994). As argued by MASSEY (1979, p. 234), *"at any point in time, [...], there is a given uneven geographical distribution of the conditions necessary for profitable, and competitive production"*. Accordingly, globalisation affects different places in different ways. The assimilation and inflection (AMIN and THRIFT, id.) of the challenges imposed by globalising forces are spatially differentiated as well. Different places are endowed with different capacities to face those challenges, giving rise to competitive and economic performance inequalities. The approaches to the international division of labour, fostered by globalisation (MASSEY, 1979, MASKELL, 2001), constitute a rich illustration. The uneven distribution of economic functions to different places is, simultaneously, an outcome and a source of territorial diversity. This is well captured by MASSEY (id., p. 235), who claims that *"the economy of any given local area will thus be a complex result of the combination of its succession of roles within the series of wider,*

national and international, spatial divisions of labour”, a statement that also highlights path-dependence.

At this point, one can argue that the rejection of the death of geography thesis does mean neither disregarding the influence of globalising forces in territorially based economies, nor looking at globalisation as a threat to places, cities, regions and nations. As MASSEY (2004, p. 98) avers, “*the aim has to be not to oppose local and global, for not only does that persistently lead to suspect kinds of localisms [...], but also it is simply impractical, doomed to failure*”, because “*the local can never be walled off from the global*”. The aim, as the same author suggests (id.), “*should rather be better to understand the relationship between the two and to work towards both better ‘local places’ and better ‘globalisations’*”.

In this sense, in order to avoid sterile polarisations between the global and the local scales, the crux of the matter is to stress that localities are the product of local, national and transnational influences (AMIN and THRIFT, 1994). Accordingly, the authors (id., p. 9), emphasise the “*continued salience of places as settings for social and economic existence, and for forging identities, struggles, and strategies of both a local and global nature*”. Implicitly, this emphasis suggests that globalisation phenomena are also shaped in territorially bounded communities. This accommodates with the thoughts of SCOTT and STORPER (2003, p. 582), - “*today’s wave of globalization appears to be similarly anchored in (and is also partially responsible for) an expanding intercontinental patchwork of urban and regional economic systems*” - , or MASSEY (ibid., p. 99), - “*Globalisation is made in places, local places, local economies*”. In sum, the global-local nexus stems from and consists of the tensions between the dynamics of constructing both the local out of the global and the global from the local.

The global-local nexus discussion gains increased interest when recalled the conceptualisation of a knowledge-driven and learning-based economy outlined in the previous chapter. As argued than, innovation pervasively determines the capacity to compete in a globalised economy. In turn, innovation capabilities are determined by the capacity to access, absorb and use relevant knowledge, through a learning-based process embedded in interactive, and, thus, social, relationships among a multiplicity of agents.

A focal point of this discussion relies on the distinction between and the complementarities of tacit and codified knowledge, previously tackled. As mentioned, the

codification of knowledge requires its transformation into information that is easily transmitted, verified, stored and reproduced (LUNDVALL and BORRÁS, 1999). Due to its generally compact and standardised character (DAVID and FORAY, 1995), codified knowledge flows over informational infrastructures regardless geographical and organisational boundaries. LUNDVALL and BORRÁS (id., p. 33), much to the purpose, argue that “*in a hypothetical world where all elements of knowledge were transformed into general codes to which there was equal access for everyone, globalisation would be extreme in all economic activities and the only reason to specialise in specific activities would be access to primary production factors and scale economies*”.

Conversely, tacit knowledge, being subjective and experiential, and hard to formalise (NONAKA *et al*, 2000), as well as person-embodied and context-dependent (MORGAN, 2001), is not easily codified and transmitted. These qualities confer to tacit knowledge a high level of local stickiness, and suggest that its transmission largely depends on face-to-face contacts (POLANYI, 1967), i.e. human interaction. Hence, physical proximity between development agents is of utmost importance if those agents are to exchange knowledge of tacit nature³³.

However, codified and tacit knowledge co-exist in time and complement each other (LUNDVALL and BORRÁS, *ibid.*, GERTLER, 2001). Furthermore, as LUNDVALL (1996) suggests, drawing on the observation of an “*increasing emergence of knowledge-based networks of firms, research groups and experts*” (id. p. 10), there is a growing relevance of knowledge which is codified in local rather than universal codes. According to the same author, this trend, on the one hand, encourages the establishment of long term and selective relationships in the production and dissemination of knowledge. On the other hand, it implies the development of skills and competences to understand and use those local codes. These are nurtured in interactive learning networks, “*some of which are local while others cross national boundaries*” (LUNDVALL, 1996, p. 11). While avoiding the “*quite misleading*” strict dichotomy between codified and tacit knowledge (ASHEIM, 1999, p. 349), these assertions also bear the multi-level spatial nature of the determinants of

³³ The acknowledgment of proximity as playing a crucial role in the diffusion of tacit knowledge does not mean that the local is the unique source of this type of knowledge, or, in other words, that it is immobile and locally confined. As MORGAN (2001) suggests, the issue at stake is to highlight that tacit knowledge is person-embodied, context-dependent, spatially sticky and socially accessible only through direct physical interaction.

creating, accessing and using knowledge, the development resource that LUNDVALL (1992) considers as fundamental.

Taking now learning, the process LUNDVALL (id.) sees as the most important, its interactive character, as mentioned before, makes it a socially embedded process. Hence, the organisational forms and institutional settings determining the outcome of interactions evolve rooted in socio-cultural and political-institutional factors, which incorporate both historical and territorial dimensions. However, the meaning of history and territory does not place learning into a hermetic container. Local agents promoting endogenous development rely on localised learning, building it on the strategic use of locally generated and shared tacit knowledge, as well as on knowledge codified in both local and supra-local codes. This openness to the outside world contributes to solve and avoid spatial lock-in, resulting from an excessive inward looking (BOSCHMA, 2005). As COOKE (2004a, p. 12) argues, *“it is impossible to discuss innovation processes and policies without reference to the interactions of local-regional, national and global actors and institutions”*.

A similar line of thought points out that learning depends both on physical proximity and organisational proximity (BELLET *et al*, 1993), the latter regarded as providing organisational grounds for knowledge sharing that may be or not subject to local stickiness. AMIN (1999) matches the concept of organisational proximity with relational proximity and highlights the *“rich source of informal learning”* (id., p. 369) provided by networks of transnational corporations. However, as MORGAN (2001, p. 26) validly contends, *“the richer learning potential of direct, face-to-face communication, perhaps the only sure medium for exchanging tacit forms of knowledge”*, implies that *“organisational proximity is at best only a partial substitute”* of physical proximity. This view is shared by GERTLER (2001) who shows that learning, when attempted across major institutional-contextual boundaries, is hampered by formidable obstacles, even in the presence of substantial corporate wealth and resources:

“The upshot is that transcending the bonds of spatial proximity may be possible, but it will also be difficult and expensive, because of the fundamentally different institutional environments involved – what we might understand as the distinctive and uneven (though systematic) ‘economic geography of context’”, (GERTLER, 2001, p. 17).

The global-local nexus, as sketched out here, provides interesting hints on the positioning of universities. Bearing in mind the universalistic nature implied by the definition of the academic institution, universities are in a privileged position to foster and qualify the articulation between the local and the global, namely by facilitating the local access to international networks, which, in certain *geographies of context*, can be vital. In other words, universities have the potential to integrate locally and non-locally generated knowledge and facilitate its strategic use at the local level. There is though a tension between this local role of universities and their universalistic character. It stems essentially from the perception that universities have to compete globally with other universities to attract top researchers and perform top research, which makes imperative to carry the academic work on a global scale (RUTTEN et al, 2003). Therefore, a question to be tackled derives from the extent to which universities can be concerned with the fate of their places of location. However, there is evidence indicating that universities both affect and are affected by the places where they are located (e.g. VAN DER WUSTEN, 1998; HUGGINS and COOKE, 1997). The issues at stake are thus the intensity and quality of the ties linking universities to places, and the arguably difficult balance between place engagement and global striving. The discussion of these issues, carried out elsewhere in this dissertation, appeals for focusing on the relevance of territories in social and economic development promotion.

4.3

About the relevance of territories I: the geography(ies) of agglomeration

The territorial dimension of innovation and economic development has been emphasised by many scholars, namely evolutionary and institutional economists, regional scientists and economic geographers who converged on the recognition of proximity and local embeddedness as pervasive determinants of innovation. The narrow idea of location was assimilated into the much richer conception of territory (SCOTT and STORPER, 1986), a “*humanly differentiated geographical space*” (id., p. 301).

The pioneering work of Alfred Marshall (MARSHALL, 1919, 1952) at the turn of the 19th century, as an attempt to counteract the then prevailing idea that economic efficiency

could only be found in larger firms, has highlighted the spatially bounded character of skills and knowledge accumulation, and thus the relevance of territories in the creation of favourable *industrial atmospheres* enabling economic growth and technological innovation diffusion. Looking at industrial areas such as Sheffield and the South-East Lancashire, MARSHALL (1952) spoke about *industrial districts*, within which external and agglomeration economies were generated.

“When an industry has thus chosen a locality for itself, it is likely to stay there long: so great are the advantages which people following the same skilled trade get from near neighbourhood to one another. The mysteries of the trade become no mysteries; but are as it were in the air, and children learn many of them unconsciously. Good work is rightly appreciated, inventions and improvements in machinery, in processes and the general organisation of the business have their merits promptly discussed: if one man starts a new idea, it is taken up by others and combined with suggestions of their own; and thus becomes the source of further good ideas”, MARSHALL, 1952, p. 225, cited from KEEBLE and WILKINSON, 1999, p. 297.

Geographical agglomeration, according to MARSHALL (id.), allows for small-scale firms to reap the advantages that were typically attributed to large-scale industries and the possibility of access innovative inputs that would not be available to individual small firms. In Marshall, physical proximity, rather than any institutional structuring, was the source of positive externalities to individual firms (KEEBLE and WILKINSON, 1999).

The *Marshallian* idea of industrial district, relegated to the background by aspatial mainstream accounts of economic growth³⁴, would be revived in the late 1970s, due to “*the emergence of conspicuously successful, twentieth-century variants of industrial districts in Italy, West Germany, Japan, Denmark, Austria, France, and the United States*” (SABEL, 1994a, p. 103). As object of research, the Italian case stood out, with the works of authors such as BECATTINI (1979, 1989, 1990), which emphasised (to a much larger extent than Marshall) the organisational dimension of production evolving in the Third Italy, a term introduced by BAGNASCO (1977) to differentiate the north-central and north-east parts of Italy (the *peripheral economy*) from the southern of the country (the *marginal economy*)

³⁴ But, among others, PERROUX (1955), describing territorial units as growth poles, in which leading firms influenced the performance of co-located industries, or HIRSCHMAN (1958) and MYRDAL (1959), considering uneven spatial patterns of development as part of growth mechanisms and the effects of circular and cumulative causation in territorial development.

and the heavy industry-based north-west (the *central economy*). Defined as a “*socio-territorial entity which is characterised by the active presence of both a community of people and a population of firms in one naturally and historically bounded area*” (BECATTINI, 1990, p. 38), the industrial district should thus be conceived as a social and economic whole, in which close relationships develop between the social, political and economic spheres (PYKE and SENGENBERGER, 1990). This conception is further elaborated by BECATTINI (1989, p. 132), by stating that “*what holds together the firms which make up the Marshallian industrial district, much diminishing the meaning of the cost of production of each single product, is a complex and tangled web of external economies and diseconomies, of joint and associated costs, of historical and cultural vestiges, which envelopes both inter-firm and interpersonal relationships*”. According to the same author (id.), this makes of the industrial district a localised *thickening* of inter-industrial relationships reasonably stable over time. The industrial district is thus more than a mere aggregate of productive units; it is, as BECATTINI (ibid., p. 40) classifies, “*an instance of a localised realisation of a division of labour, which is neither diluted in the general market, nor concentrated in one firm or in just a few firms*”. Firms in the Italian industrial districts, predominantly small and flexible units, are able to respond promptly to market changes. They tend to specialise in only one phase, or a few phases, of the production process dominant in the district, according to a vertical disintegration productive logic that generates economies of scale.

The foundational literature on the Third Italy industrial districts does not pay much attention to the role universities play (if any). Perhaps this neglect should be expected, as indicated by BIGGIERO (1998, p. 231), who argues that “*the higher education and science and technology research systems did not participate at all in the development of IDs [industrial districts]*”. The author (id.) finds the explanation for this distance between district firms and universities, on the one hand, in the structural inertia and bureaucratization of Italian academic institutions and the overall negative perception about developing linkages with industry, and, on the other hand, in the social patterns holding together the districts, in which the family, the church and cultural values play an essential role³⁵. Moreover, the core processes of new technology diffusion seem to be “*internal*” to

³⁵ In some Third Italy regions there is evidence of a deliberate effort to approximate the districts’ productive fabric to universities, as shown, for instance, by the LINK project, promoted by the *Scuola Superiore Sant’Anna*, located in Pisa (cf. BELLINI and FERRUCCI, 2002).

the industrial districts. As indicated by BECATTINI (1990), the introduction of technological progress assumes the form of a social process that allows for overcoming resistance to change through a gradual process of self-awareness on the part of all segments of industry and strata of the district's population, in which pride in being up-to-date in technological terms, as well as the perception of an opportunity to defend an already acquired position, are part of the equation. Technological innovation, largely incremental, according to ASHEIM (1995), becomes the result of informal *learning-by-doing* and *learning-by-using*, primarily based on tacit knowledge.

The social patterns characterising the districts remind the argument of COURAULT and ROMANI (1992), according to whom social relations, specific to each village, and cemented by clan, family and particular local foundations, underpin the economic organisation of each district. The authors (id., p. 206) suggest that these social relations “*act as a system for the exchange of economic information that in its turn feeds into and promotes the circulation of products throughout the entire district*”. This led COURAULT and ROMANI's (ibid.) to label the Italian industrial districts as a paradox, “*a blend of archaic and modern forms of social life, the age-old, guild-like producers' organizations and traditional social networks combined with the most sophisticated technologies and marketing strategies*”.

As a socio-economic notion (BECATTINI, id.), the industrial district can be analysed according to various perspectives and in a multidisciplinary manner. This appealing possibility, together with the ability of Third Italy's industry to withstand strong international competition, gave rise to an increased interest of numerous non-Italian scholars on territorial productive agglomerations. Both new and renewed theories and concepts emphasising the relevance of territories in innovation and economic development have emerged, much as an attempt to extend the Italian industrial districts model to other territorial contexts. Amidst these, the notion of localised flexible production as opposed to the mass, Fordist-type production (PIORE and SABEL, 1984), and the concept of new industrial spaces (SCOTT, 1988; STORPER and SCOTT, 1989, 1992) stand out.

PIORE and SABEL (1984), drawing on the example of Third Italy, argue for the re-emergence of craft production as replacing Fordist mass production, due to the mismatch between the rigidity of the latter mode of production and increasingly differentiated and segmented markets. They introduce the notion of flexible specialisation of *productive*

communities dominated by small firms, based on flexible technologies, and flexible and skilled labour. The authors (PIORE and SABEL, 1994) look at this shift in the production paradigm as a *second industrial divide* (the first one being the rise of mass production at the turn of 19th century, hindering craft-based production settings). Flexible specialisation, due to versatile labour and universal production equipment, is said to reduce the cost of customisation through economies of scope (HIRST and ZEITLIN, 1992). Internal economies of scope allow firms to produce two or more different, related products cheaper than in isolation; external economies of scope are generated when firms can use their know-how to apply to the activities of other firms and other markets (MALECKI, 1991).

PIORE and SABEL (id., p. 278) argue that craft flexible production depends on “*solidarity and communitarianism*”, which, according to the authors’ conception, implies the consideration of geographical proximity as central. Craft-based flexible specialisation finds in the industrial district the spatial form that was provided to Fordist production by the assembly line (BENKO and LIPIETZ, 1998). The industrial district, innovating in permanence and balancing competition and co-operation, in the view of PIRE and SABEL (ibid., p. 275), is able to do that due to “*the fusion of productive activity, in the narrow sense, with the larger life of the community*”.

The dualist logic, opposing flexible specialised production to mass production, has been strongly criticised (e.g. AMIN and ROBBINS, 1990; AMIN, 1994). For instance, AMIN (id., pp. 16/17) rejects the argument, labelled by the author as “*new orthodoxy*”, namely because it reduces “*a great deal of diversity on either side of the divide down to narrowly defined paradigms*” and “*makes the error of equating only industrial efficiency with competitiveness, thereby underestimating the power of the protagonists of Fordism (e.g. multinational firms)*”³⁶. BIANCHI (1998), in a review of the “*long controversy that finally led to recognition that dualistic models [...] were no longer suitable for understanding the multi-regional differentiation of contemporary Italian development*” (id., p. 93) writes about the rise and fall of a “*too successful concept*” (ibid.). WHITFORD (2001) addresses the influence that globalisation has on industrial districts, claiming that, without adjustment and institutional change, the “*likeliest prospect of most districts would be a bifurcation into a few lead firms well integrated into the world economy and a hinterland of small firms slowly failing as the local skill base dwindles to nothing*”, (WHITFORD, id., p. 60). In

³⁶ For a lively account of this debate confer PYKE et al (eds.) (1990).

addition, the author (WHITFORD, 2001) argues for the weakening of the advantages accrued to small firm by flexible specialisation in relation to large firms, as the latter discovered *lean* and networked production. SCOTT (1992, p. 266) shows concerns about the need “*to extend any generalised definition of industrial districts to include large production units, and that they often play a major part in the initiation, development and growth of industrial district*”.

Some of these criticisms bore on the utilisation of the flexible specialisation concept by the so-called Californian school of economic geography, namely its scholars Michael Storper and Allen J. Scott (SCOTT, 1988; STORPER and SCOTT, 1989; SCOTT and STORPER, 1992). In an attempt to overcome the problems of generalisation affecting Piore and Sabel’s model, because strongly rooted in the Third Italy phenomenon and the role of small manufacturing firms, a model providing possible explanations for the territorial agglomeration of high technology firms, revitalised craft industrial segments, and producer and financial services, was developed. It extends the initial approach to flexible specialisation to a mix of firm sizes, any sector and any mixture of interconnections (STORPER, 1997). Accordingly, the major novelty of the approach lies on the consideration of a broader spatial division of labour, as opposed to the self-contained regional economies present in Piore and Sabel (AMIN and ROBBINS, 1990).

The core argumentative line, as SCOTT (id., p. 175) contends, is that “*the tendency for internal economies to give away before a progressive externalisation of the structure of production under conditions of rising flexibility, leads at once to a revival of proclivities to locational convergence and reagglomeration*”, configuring a new geography of flexible accumulation³⁷. Agglomeration is encouraged by vertical disintegration of production, which, in turn, encourages agglomeration, resulting in regional flexible production complexes (STORPER and SCOTT, id.) or, as in SCOTT (1988), new industrial spaces. The

³⁷ As assumed by STORPER and SCOTT (1989), the model of *flexible accumulation* incorporates insights from the so-called regulation theory (e.g. BOYER, 1988). STORPER and SCOTT (id., p. 22) refer to the “*many alternative technological and institutional configurations*” that can be assumed by capitalist production. According to the authors (ibid.), “[...] *each such model is also roughly equivalent to what theorists of the French Regulationist Scholl call a regime of accumulation and a model of social regulation*”. Recalling BOYER (id., p. 71), a regime of accumulation is defined by “*the whole set of regularities which allow a general and more or less consistent evolution for capital formation, i.e. which dampen and spread over time the imbalances which permanently arise from the process [of accumulation] itself*”. A mode of regulation, as put by the same author (ibid., p. 75), designates “*any set of rules and individual and collective behaviours which have the three following properties: they make possible conflicting decentralized decisions compatible [...]; they control and regulate the prevailing accumulation mode; they reproduce basic social relationships through a system of historically determined institutional forms*”.

reasons behind the tendency for agglomeration are found through the analysis of the transaction costs inherent to the interaction between firms. It is argued that vertical disintegration, diminishing the risks of overcapacity and maximising the benefits of specialisation, increases transaction costs of input-output relations among firms. These costs grow also with geographical distance (along with the capacity to deal with complex transactions, requiring high levels of trust or tacit knowledge). Agglomeration is the outcome of the minimisation of these transaction costs, occurring when such minimisation outweighs other geographically dependent production cost differentials (STORPER, 1997).

Within the regional complexes, a multiplicity of socio-political relations evolve, establishing the mode of social regulation which, as STORPER and SCOTT (1989) argue, ensure the co-ordination of inter-firm transactions and dynamics of entrepreneurial activity, the organisation of local labour markets and reproduction of workers, as well as the community formation and social reproduction.

STORPER (1992), in a further analysis of flexible production systems, and responding to the acknowledgement of a rapid increase in internationalisation, refers to industrial agglomerations engaged in product based technological learning, which, regarded as an essential element in the globalisation of economic relations, tend to concentrate the key parts of the learning process. The author designates these agglomerations by *technology districts*. Silicon Valley, in Northern California, Modena, in Emilia Romagna, the Hollywood movie industry, and the fashion-clothing district in Paris, according to the author (id.), are examples of technology districts, which assume a particular form of the *Marshallian* industrial district because “*in the economic sense they have dynamic economies of scale, owing to the nature of technological change, that counteract equilibrium tendencies; in the organizational sense that their production networks are frequently characterized neither by markets nor by hierarchies, but by other kinds of durable interfirm relationships; and in the sociological sense that they have conventions of economic life that mobilize resources and regulate interactions so as to make PBTL [product based technological learning] possible*” (ibid., pp. 89/90). These particular kind of industrial districts convey STORPER’s (ibid.) perception that global competition is being played by a *mosaic of regions*, made of localised networks of transactions embedded in global networks of transactions.

The role of universities, even in the more technology-intensive districts, though loosely mentioned³⁸, does not deserve much attention. Conversely, the related approach to regional technological complexes developed by SAXENIAN (1994), places universities as decisive agents of regional economic transformation. In her comparative study of Silicon Valley and the Route 128, in the Boston's area, Stanford University and the MIT are seen as the spearheads of the economic transformation of the two regions: "*their pioneering research in radar, solid state electronics, and computing created localized pools of technical skill and suppliers that attracted established corporations and supported the formation of new enterprises*" (id., p. 11). The two universities are present in the competition/collaboration balance evolving in the Silicon Valley's technical community, as well as in the hierarchical and independent institutional arrangements that characterise the Route 128 industrial agglomeration (ibid.).

Attempts to describe the localised agglomeration of highly innovative industries had already been in place in Europe, fostered by the GREMI³⁹ research (e.g. AYDALOT, 1986; CAMAGNI, 1991a, 1991b; MAILLAT et al, 1993). The foundational research hypothesis was drawn on the perception that the innovative firm does not pre-exist in or separate from the local milieu in which it locates, rather it is the outcome of that milieu, because innovative behaviour essentially depends on local or regionally defined factors (AYDALOT, id.). Hence, the milieus become *innovation incubators*, the prism through which innovation is stimulated, i.e., a device central to an understanding of the spatial patterns and rhythms of technology diffusion (ibid.).

CAMAGNI (1991a, p. 3) defines innovative milieu as "*the set, or the complex network of mainly informal social relationships on a limited geographical area, often determining a*

³⁸ The loose references to higher education focus almost exclusively on the provision of human capital, e.g. STORPER (1993) on the role the French *Grandes Écoles* play in educating the engineers and administrators who occupy the upper ranks in most of French high-technology firms.

³⁹ The GREMI- *Groupe de Recherche sur les Milieux Innovateurs* was founded in 1984 at the University of Paris 1, by Philippe Aydalot. GREMI's research can be divided into six different but related stages (MATTEACCIOLI and TABARIÈS, undated). The so-called GREMI 1 research was focused on the influence of the milieu on technological innovation trajectories (e.g. AYDALOT, 1986); GREMI 2 analysed the impact of innovation on the local milieu, in particular the risk of local de-structuring of the milieu along the innovative process (e.g. CAMAGNI, 1991b). The concept of innovation networks, suggested in GREMI 2, would be further elaborated in GREMI 3 (e.g. MAILLAT et al, 1993), which analysed the ways those networks build up and sustain (or not) the local innovative milieu. GREMI 4 emphasised the long-term development dynamics of the innovative milieu and studied the laws of its emergence (e.g. MAILLAT, 1995). The next stage, GREMI 5, the relationships between innovative milieus and cities were taken into account, linking territorialized economic development to urban dynamics (e.g. CREVOISIER and CAMAGNI, 2000). Finally, GREMI 6 deviated from the previous technological innovation focus to approach the innovative milieu in terms of natural and cultural resources (e.g. CAMAGNI et al, 2004).

specific external ‘image’ and a specific internal ‘representation’ and sense of belonging, which enhance the local innovative capability through synergetic and collective learning processes”. According to the same author (CAMAGNI, 1991b, p. 122), the milieu emerges “*as a necessary and crucial element in the process of technology creation and as the ‘operator’ that allows the individual decision-maker to cope with the problems of static and dynamic uncertainty which are intrinsic in innovative behaviours”*”.

MAILLAT et al (1993) indicate that a milieu encloses:

- a geographical space, with no pre-defined borders but characterised by a certain homogeneity, which is translated into identifiable and specific behaviour of social actors, and a shared technical culture;
- a *collectif* of actors endowed with relative decision-making and strategy formulation autonomy;
- material (firms, infrastructures), immaterial (know-how) and institutional (different forms of local public government and governance) elements;
- an interaction logic, requiring interdependent relationships among different actors in order to enhance existing resources;
- a learning logic, that is, the capacity, constructed over time (historical dimension), to cope with environment changes.

According to the same scholars (id.), the interaction and learning logics are crucial to develop the know-how necessary to manage productive processes and the creation of new products and techniques, as well as the behavioural norms that allow for the balance between competition and co-operation. The economic space becomes “*a relational space, the field of social interactions, interpersonal synergies and social collective actions that determine the innovative capability and the economic success of specific local areas”* (CAMAGNI, 1991a, p. 1). Enhanced local creativity and strengthened capacity to foster product innovation and create technologies adapted to local industry needs are underpinned by collective learning processes, fed by social phenomena such as intergenerational transfer of know-how, imitation of successful management and innovation practices, interpersonal face-to-face contacts, formal and informal cooperation among firms, or tacit circulation of information (id.).

The concept of collective learning is thus at the core of the innovative milieu approach (CAPELLO, 1999). It is a major factor of distinction between the GREMI approach and the

industrial district model, in which local relationships, as CAMAGNI (1991a) contends, are considered mainly in terms of locational efficiency. This, in the words of the author (id., p. 2) leads to a “‘static’ approach to the interpretation of economic space”, as opposed to the “‘intrinsically dynamic’” approach, emphasising collective learning and the processes of reduction of the elements of dynamic uncertainty. The institutionalisation of co-operation and the establishment of formal mechanisms of information and knowledge, as noted by KEEBLE and WILKINSON (1999), create productive synergies and enhanced innovative capacity, inducing the transformation of an industrial district into an innovative milieu. Similarly, CAPELLO (1999) argues that a local industrial district becomes a milieu when cooperation and tacit transfer of knowledge is transformed into innovation synergy and capacity, rather than simply social solidarity and interaction.

As MAILLAT et al (1993) contend, the milieu is not isolated; rather it is placed in a wider technical and market context which is international and in constant evolution. Hence, the interaction and learning logics, besides nourishing the capacity to identify actor-specific and milieu-specific resources creating local interaction opportunities, should also define the relationships between the milieu’s actors and the external environment. According to CAMAGNI (id.), the development of these external linkages, in face of rapid and drastic change, can be essential for the local milieu, instead of suffering “*entropic death*” (CAMAGNI, 1991b, p. 140), to survive and prosper, as they take the form of innovation networks that attract external energies and know-how, and through which relevant complementary assets necessary to engage in economic and technologic competition are secured. The synergy effects stemming from a common cultural, psychological and political background, and revealed through networking, in the words of CAMAGNI (id., p. 134), “*contribute to the establishment of tacit codes of conduct, to the decoding of complex messages [...] and to the formation of common ‘representations’ and widely shared ‘beliefs’ on products and technologies*”. The intangible assets nurtured by network-based collective learning and supporting innovation in the milieu, because highly dependent on physical proximity, following the same author (ibid.), prevent any localised technical progress from being easily transferred through simple market transactions.

Innovation networks, in the GREMI approach, are defined according to five dimensions (MAILLAT et al, 1993):

- the organisational dimension, in which the innovation network is regarded as a *dépassement* of the firm-market duality;
- the temporal dimension, meaning that networking presupposes a system of durable relations between different actors, based on trust and reciprocity;
- the cognitive dimension, in which the network assumes the form of a repository of collective know-how superior to the sum of individual know-how, allowing for the development of collective learning processes;
- the normative dimension, ascribing a system of more or less formal rules which define members obligations and constraints;
- the territorial dimension, as the network ascribes to its members competitive advantages which are territorialized both in terms of proximity and remote relationships.

These multidimensional innovation networks, as put by QUÉVIT (1991), lead to partnerships which cover multiple spheres of interaction. The interaction between the local milieu and universities or para-university research centres is considered as one of the most important, along with agreements with educational environments, public authorities, and labour organisations (id.). Hence, universities and other R&D centres emerge as *protagonists* of the milieu (CREVOISIER and MAILLAT, 1991), together with firms, regional authorities, and so on. As *protagonists*, universities are expected to help the milieu, for instance, in the appropriation of new technologies generally developed elsewhere and to incorporate them into production (id.). In short, one can argue that universities, in the GREMI approach, are part of the *supporting space*, as RATTI (1991) depicts the space where strategic relationships between firms and the institutions operating in the territorial environment develop⁴⁰.

An influential contribution for the geography of agglomeration was given by the industrial *clusters* approach, in which the regional dimension is heavily derived from the nation-based studies of Michael Porter (PORTER, 1990), and his argument making national competitiveness dependent on the qualities of geographic concentrations of interconnected firms and institutions in a given industrial domain. The *diamond of national advantage*

⁴⁰ The notion of supporting space, according to RATTI (1991, p. 72) is meant to describe, besides the strategic relationships between firms and the institutions of the local environment, “*the qualified or privileged relationships at the level of the organization of the production factors [...]; the strategic relationships of the enterprise concerning its partners, marketing agents or customers [...]*”.

suggested by PORTER (1990) is meant to define four broad attributes that, either individually or as a system, determine the competitive level of a nation. According to the author (id.), these attributes are i) *factor conditions* (skilled labour, infrastructure, science and technology inputs, etc., necessary to compete in a given industry), ii) *demand conditions* (the nature of home-market demand for those industry's products or services), iii) *related and supporting industries* (suppliers and other industries internationally competitive), and iv) *firm strategy, structure and rivalry* (the framework conditions governing how firms are created, organised, and managed, and the nature of domestic rivalry). The cluster becomes the "*manifestation of the diamond at work*" (PORTER, 1998, p. 90).

LAGENDIJK (1997) argues that geographical analysis initially embraced Porter's cluster concept because its emphasis on proximity. In fact, PORTER (1990, p. 157), though nation-focused, contends that "*the process of clustering, and the intense interchange among industries in the cluster, also works best where the industries involved are geographically concentrated*". Moreover, as LAGENDIJK and CORNFORD (2000, p. 214) suggest, "*by building a strong link between clusters and the notion of 'competitiveness' and by presenting graphic cluster maps, it [Porter's 1990 book "The competitive advantage of nations"] paved the way for the successful career of clusters as a regional development concept*". As the same authors discuss (id.), the cluster emerged as an appealing concept for regional scientists and planners, because, besides knitted together with the notion of competitiveness, "*it rekindled thinking about linkages between economically related activities in spatial agglomerations*" (ibid.). However, the *regionalisation* of the cluster concept led to a significant shift away from Porter's model. As success factors for clusters, PORTER (id.) emphasises market and dynamic competition. The emphasis in territorialized uses of the concept has been placed instead on networking and social interaction (MOULAERT and SEKIA, 1999). ROSENFELD (1997), for instance, refers to groupings of firms endowed with the social infrastructure that enables the continuous flow of information, new ideas, the generation of networks and the appearance of new business ventures. MASKELL and LORENZEN (2004) use the concept of cluster as a "*specific spatial configuration of the economy suitable for the creation, transfer and usage of knowledge*" (MASKELL and LORENZEN, id., p. 991) and talk about the role of geographical clustering in supporting "*cognitive alignment, i.e. 'social codebooks' of a communal social culture*

including collective beliefs, values, conventions and language that significantly assist firms in obtaining and understanding information” (MASKELL and LORENZEN, 2004, p. 996). This connection of regional clustering analysis to social interaction would drive authors such as ENRIGHT (1996) to consider industrial districts, flexible production industrial complexes and innovative milieus as spatially concentrated industrial clusters.

In the mainstream approach to clusters, universities, notwithstanding recognised as an important actor, are regarded in a passive manner, as part of the *diamond's* factor conditions. They are expected to supply the cluster with inputs such as skilled labour and the R&D results that, if academic research is geared towards the needs of clustered industries, enable firms to constantly renew their knowledge base (PORTER, 1990). The role of universities is stressed in a more assertive way in the case of the clustering of high-technology firms, such in VARGAS (2000), who analyses the correlation between the investment in academic research and the distribution of innovations in the US. The author (id., p. 144), comparing the maps of innovations and university R&D distribution, concludes that, in the US, *“the largest university research clusters are clusters of innovation activities as well”*. In a more policy-oriented approach, universities are generally considered as pervasive elements of cluster formation and consolidation. For instance, in a practical guide to cluster development issued by the UK's Department of Trade and Industry (DTI, 2002), one can read: *“institutions such as universities and trade associations can play a key part in nurturing the development of the cluster”* (id., p. 27). However, the same source (ibid., p. 35) avers that *“R&D institutions are not essential for strong and successful clusters that perform strongly and are highly innovative but have no base in R&D”*. The strength of social ties binding together the community, rather than universities and R&D centres, is the cornerstone of those clusters' success⁴¹.

The broad-brush literature survey made in this section has emphasised the importance of territories in innovation and economic development⁴². Whereas a territorial basis for

⁴¹ The DTI (2002) refers to the Mississippi's furniture industry as an example to sustain the argument that universities need not to be present for the development of successful clusters. In the Mississippi's case, the key factor of success is the very strong social fabric of the community, which makes ideas to *“travel quickly through social contacts and worker mobility”* (id., p. 35).

⁴² The theoretical approaches to the territorial dimension of economic development associated with the so-called new economic geography (e.g. KRUGMAN, 1991, 1995) were deliberately left out of this broad-brush literature survey. Economic geography, in this theoretical strand, is equated to the study of production location in space, downplaying the social aspects of territorial development. KRUGMAN (1991) taking into account the costs to transactions across space and economies of scale in production, argue that preferred locations are those where demand is large or supply of inputs is particularly convenient. The author (id.,

innovative activities is a common feature of the theoretical approaches presented above, two lines of thought can be distinguished in terms of emphasis. At one end the view on the importance of the territory as forger of social interaction, determining knowledge dissemination and innovative capability (e.g. industrial districts, innovative milieus). At the other end, the focus is on the territorial basis of (socially regulated) input-output relationships and transaction mechanisms, which push innovative firms to agglomerate (e.g. the flexible production model). In both perspectives, the crux of the matter is territorial competitiveness, generally seen as dependent on the competitive capacity of firms, which in turn bears on their ability to networking. Firms, particularly manufacturing firms, are at the core of the theoretical approaches. The role of other type of organisations, such as universities, though mostly thought as taking a relevant part in the overall picture, tends to be downplayed as subject of analysis. Hence, setting the scene for the changing role of higher education in contemporary society requires further theorisations and conceptualisations, including in the territorial equation more than the conditions that nurture firms or industrial agglomerations competitiveness in global markets. The next two sections attempt to reflect this requirement.

4.4

An interlude for conceptual clarity...

The strands of economic geography tackled in the previous section call forth a number of concepts that the theory itself leaves wrapped in vagueness. Somehow paradoxically, this is the case of the notion of territory. For the sake of the argument being constructed here, the search for a sounder conceptualisation of territory emerges as of paramount importance. This is the central task of this *interlude*. The starting point is to acknowledge that the notion of territory is much more than the one of arbitrary geographic units within a nation-state or mere aggregation of firms, as actually mirrored by the theoretical insights described above, into a more or less greater extent.

A first possible point to debate concerns the issue of boundaries. How can a territory be delimited? TUSCHHOFF (1998) discusses the problem by asking whether a territorial

1995) refers to multiple productive agglomerations which, subjected to dynamic forces, tend to be evenly spaced across the landscape.

boundary is a sociological fact that generates a geographical effect or a geographical fact that causes sociological consequences. He concludes (TUSCHHOFF, 1998) that the conceptualisation of territories as interacting social spaces offers the most accurate description of reality, rather than mere geographical parameters. As importantly, TUSCHHOFF (id.) acknowledges that these interacting social spaces often transcend boundaries administratively defined, thus questioning the adequacy of a delimitation method that would be thought as the simplest one. This leads to a conundrum, particularly in an operative stance. A way of stepping away from it relies on the consideration of territory as an intellectual construct (COOKE and SCHIENSTOCK, 2000), which, in order to become operative as unit of analysis/intervention, has to be subjected to some sort of delimitation, based on criteria defined according to the specific analytical/interventional aim and/or method. The emphasis, at this point, will be placed on the search for an intellectual construction. Accordingly, the issue of boundaries can be downplayed. Instead, taking inspiration from COOKE and MORGAN (1998), light is shed over questions such as how can the territory be defined, what is it composed of, to whom or what does it refer and defer, and how does it function. In addition, aiming to align thoughts with the widely predominant tendency to equate territories to regions, henceforth the term *territory* will be expressed by the term *region*.

Defining the region is a controversial and somehow ambiguous issue, with historical, geographical, cultural, and political features, which cannot be analysed in depth in this monograph⁴³. COOKE et al (1997, p. 480) suggest that regions are “*territories smaller than their state possessing significant supralocal governance capacity and cohesiveness differentiating them from their state and other regions*”. COOKE and SCHIENSTOCK (id.) consider four criteria for defining a region: i) it must not have a determinate size; ii) it is homogeneous in terms of specific criteria; iii) it can be distinguished from bordering areas by particular kind of association of related features, and iv) it is endowed with some kind of internal cohesion. Both the definition and the definitional criteria match the formal, and somehow static, conceptualisation of the region (COOKE and MORGAN, 1998). The search for a more vibrant and illustrative definition of region, able to incorporate the dynamic

⁴³ See COOKE *et al* (1997) and HADJIMICHALIS (1987) for a more detailed discussion on the controversy about and ambiguity of the conceptualisation of regions.

conception of regions as entities subjected to evolutionary processes of emergence and transformation, led to a new formulation in which the region equates a “*nexus of processes rather than a thing, especially a thing to which other things (usually bad, sometimes good) are done*” (COOKE and MORGAN, 1998, p. 63)⁴⁴. This new formulation reflects the shift from looking at regions as *victims*, on which were inscribed the decisions of superordinate bodies of government and to which resources might be redistributed - the logic of classical regional policy-, into an active arena of economic and political force in its own right (COOKE et al, 2000a). The shift implies a move from what COOKE and MORGAN (id.) call a defensive analysis to an offensive analysis of the regional problem⁴⁵.

As a nexus of processes, regions, as in SCOTT (1996, p. 397), can be regarded as “*localized complexes of economic and social activity inscribed durably on the landscape*”. As any organised economic and social system, they embody different types of positive externalities that are internal to the economy as a whole, but external to the individual firm. SCOTT (id.) identifies four positive externalities of particular significance: specialization and complementarity of the productive fabric, to which one can associate the sharing of a technical culture (ASHEIM, 1996); access to “*suitably trained, habituated, and disciplined labour at reasonable cost*” (id.); untraded interdependencies functioning as vehicles for learning and innovation, “*often the basis for the formation of distinctive industrial/commercial cultures that help to underpin local economic order*” (ibid.); and quasi-political institutional arrangements that enhance the capacity to interact.

The concept of *untraded interdependencies*, firstly grasped by DOSI (1988)⁴⁶, grounds STORPER’s (1997, pp. 4-5) argument about the role regions play: “[...] *the most general,*

⁴⁴ “*To dwell on the «thingness» perspective of regions, often portrayable as «regions as victims», we need only think of classic regional policy, the essential elements, or what philosophy would call the ontology, of which still imbue contemporary European Union designations of regions into Objective 1, 2, 5b and so on. Thus, regions were defined by their degrees of «distress» (UK circa 1937) or status as «depressed» (UK circa 1944) or in need of «assistance» (UK circa 1974). Nowadays they are defined more gently as «less favoured», «older industrial» or «disadvantaged» (EU circa 1996)*”, (COOKE and MORGAN, 1998, p. 63).

⁴⁵ Defensive analyses concern local and regional development initiatives “*from below*”, with emphasis on distressed regions and localities, in need for locally and regionally based survival strategies, and accounts of what responses could be or were. Conversely, offensive analyses highlight how rich and dynamic regional economies are recovering from deindustrialisation, developing as significant players in the global economy, or emerging as fundamental arenas in which economic co-ordination is worked out (COOKE and MORGAN, 1998).

⁴⁶ DOSI (1988) considers untraded interdependencies as representing a “*structured set of technological externalities which can be a collective asset of groups of firms/industries within countries/regions [...] and/or tend to be internalised within individual companies*” (id., p. 226). The author (ibid.) refers to untraded interdependencies between sectors, technologies and firms, as an aspect of the public characteristics of technology, which “*takes the form of technological complementarities, ‘synergies’, and flow of stimuli and constraints which do not entirely correspond to commodity flows*”.

and necessary, role of the region is as locus of what economists are beginning to call 'untraded interdependencies', which take the form of conventions, informal rules, and habits that coordinate economic actors under conditions of uncertainty; these relations constitute region-specific assets in production. These assets, following the same author (STORPER, 1997, p. 5), "are a central form of scarcity in contemporary capitalism, and hence a central form of geographical differentiation in what is done, how it is done, and in resulting wealth levels and growth rates of regions".

In a similar vein, CAMAGNI (2002), departing from the embeddedness of the *socialised* growth of knowledge resulting from collective localised learning processes, suggests a threefold conceptualisation of region: "*It is at the same time: a system of localised technological externalities – i.e. an ensemble of material and immaterial factors which, thanks to proximity and the resulting reduction in transaction costs involved, can also become pecuniary externalities; a system of economic and social relations, which make up the relational capital [...] or the social capital [...] of a certain geographical space; and a system of local governance, which brings together a collectivity, an ensemble of private actors and a system of local public administrations*", (id., p. 2396).

Taking these views on the region and its role in the globalising society, one can anticipate an important contribution of universities to generate a number of positive externalities, as, for instance, by enhancing the regional access to skilled labour or providing knowledge to qualify and cement the shared technical culture. The argument also calls forth interrogations about the relevance of universities, as *protagonists* of the system of economic and social relations, or as members of the regional *collectivity*, in dealing with the *central form of scarcity* configured by *untraded interdependencies* and influencing the system of local governance.

The use of the term governance brings over an additional task for this *interlude* aimed at ensuring conceptual clarity. Governance is an ambiguous concept and has presently a variety of interpretations, enclosing both normative and analytical notions (HEALEY et al, 2002). Avoiding a comparative approach between different conceptualisations, and following HEALEY et al (id.), governance is here regarded as a general heuristic term, serving to highlight processes as much as organisations, active agency as much as formal structures, and roles, relationships and capacities to act, as much as power over resources and regulations. The heuristic definition of governance has the advantage to be broad

enough to enclose the organisations and procedures of the public sector, in terms both of political and executive functions (HEALEY et al, 2002), i.e., formal government, as well as the broader collective realm of social and economic development. This opinion matches the baseline agreement that “*governance refers to the development of governing styles in which boundaries between and within public and private sectors have become blurred*”, as stated by STOKE (1998, p. 17).

In this context, the “*imperative of intraregional governance in order to safeguard the collective benefits of the whole, as well as to steer development so that it locks into better than worse outcomes over time*” (SCOTT, 1996, p. 407) adds the acknowledgement of the need for localised processes of social regulation, enveloping the mechanisms for cooperative (learning inducing) relationships among regional development agents. This means, and using again the arguments of SCOTT (id.), that “*significant returns are likely to be earned from the creation of appropriate institutions of collective order at the regional level*”.

The *governance imperative* reinforces the offensive analysis of the regional problem. It also calls up a new paradigm of social and economic development. MORGAN (1997a) names it the *network* or *associational* paradigm, relying on the exhaustion of the classical paradigms:

“The paradigms of the Left, ranging from neo-Keynesian to Marxist, are impaired by an exaggerated and naïve faith in the capacity of the state. Less credible still is the neo-liberal paradigm of the Right, whose adherents are unable or unwilling to recognize the shortcomings of the market as a mechanism for promoting economic development and social welfare”, (id. p. 491).

Under the light of this new paradigm, a collective endeavour, or, using the words of HIRSCHMAN (1958), the dynamics of *collaborative entrepreneurship*, is said to underpin social and economic development processes at the regional level. Consequently, the new paradigm strongly questions the traditional justification, if solely taken, for the importance of regions, based on the assumption that the regional level is the basic level at which there is a natural solidarity and where relationships are easily forged (CEC, 1996). As COOKE and MORGAN (1998) remind, spatial proximity, though important, is not a sufficient condition for nourishing *collaborative entrepreneurship*. It has to be actively constructed

through conscious and demanding efforts on the part of public and private regional actors to create and sustain a robust social architecture (COOKE and MORGAN, 1998) able to generate, access and use knowledge provided by a wide variety of sources. Again in an anticipatory vein, universities, if engaged in contributing for the development of their regions of location, have to participate in the active construction of that robust social architecture.

At this point, having outlined the idea that a region has to be actively constructed, a striking conclusion to be drawn is that regions cannot be taken for granted. In this sense, one of the major criticisms to the approach above outlined, wrapped up by the critics as *new regionalist* thinking (cf. LOVERING, 1999; MACKINNON et al, 2002), loose ground. Thus, the “*tendency to take the foundational concept of ‘the region’ for granted*”, as put by MACKINNON et al (id., p. 297), is difficult to be identified in the associational paradigm depicted above. Much stronger criticisms are those made by LOVERING (id., p. 392), who attributes to the so-called *new regionalist* thought a place at the forefront of a neo-liberal attack aimed “*to dismantle national redistributive structures and hollow out the democratic content of economic governance, not least under the guise of constructing new regional structures*”. Placing the burden of grasping a response on MORGAN (2004, p. 877): “*In contrast to these functionalist and reductionist readings of devolution as the handmaiden of neo-liberalism [...] we judge regional devolution (or any other form of devolution for that matter) as being progressive or regressive in terms of its capacity to create or enhance the things we construe to be intrinsically significant, like deeper democratic structures, social and spatial solidarity, the integrity of the public realm and sustainable development for example*”⁴⁷.

In this context, to judge the importance of the region in the promotion of social and economic development in the globalising society requires to consider it as a *locus* of a particular collective social order (SCOTT, 1996) rather than a mere geographical *device* accruing agglomeration economies to firms. As a system of collective order in which networks of associative and inclusive governance evolve (COOKE, 1998a), the region becomes the territorial expression of the institutional routines, norms and values that articulate the interaction between regional actors and sustain the *intrinsically significant*

⁴⁷ MORGAN (2004) takes the Lega Nord in Italy and the Vlaams Block in Flanders as regressive forms of regionalism. Conversely, the author looks at the devolution process that took place in the UK as “*on the whole, a comparatively progressive affair*” (id., p. 878).

things referred to by Kevin Morgan. As a system that it is neither given nor simply established by administrative regionalisation, the region needs to be constructed with basis on what OSTROM (1989) would call microconstitutional regulation⁴⁸. However, regions are open systems which interact with and learn from other regions, the nation-state, as well as supra-national entities. Accordingly, a mix of top-down and bottom-up initiatives determines the qualities of the region's internal construction. One can thus argue in favour of the need to highlight the relevance of multilevel governance, namely in terms of power relations and inter-level knowledge flows. The consideration of multilevel layers of governance, besides incorporating the openness of regions in relation to supra-regional influences, also prevent, using the words of AMIN and HAUSNER (1997, p. 27), "*a pluralist bazaar based on the autonomy of even the most articulated and reflexive of networks and associations [...], [that] fails to tackle the qualities which render societies more than a sum of the parts, namely strategic orientation, social cohesion, and societal evolution*". It is worth mentioning that this conception of multilevel governance opens an additional line of inquiry regarding the role of universities in the development of the regions where they are located. Universities, by definition, have an entailed national and international dimension that, in a first appreciative stance, can be assumed as a potentially relevant asset in linking the regional level to the upstream governance layers.

The extended meaning of the region requires calling forth the enlarged conception of innovation grasped in the previous chapter. An innovative region is not solely the region that fosters technological innovation and takes the inherent competitive advantages, but also the one that endeavours in the promotion of social innovation, translated into innovative governance modes valuing inclusiveness and social justice. Recalling the claim made before for the need to capture the nature of innovation as a systemic process of learning, searching and exploring which is energised upon relationships interacting in the production, diffusion and deployment of relevant knowledge, at this point further conceptualisations about the importance of territories can be outlined.

⁴⁸ OSTROM (1989, p. 11) argues that "*the image of a constitution as a single document designed by a set of 'founders' for an entire nation and reformed only occasionally limits our understanding of the processes of microconstitutional change that often occur at many levels in an open, multiconstitutional political system*". The author (id., p. 12) adds that "*effective and long-lasting constitutions are frequently negotiated at a microlevel rather than at macrolevel for an entire political system*", allowing to overcome "*the current presumption that individuals facing various types of social dilemmas are trapped inside institutions that can only be changed from the outside or by external authorities*" (ibid., p. 13). OSTROM's (ibid.) arguments are empirically illustrated by a number of cases of microconstitutional regulation of common resource pools, such as inshore fisheries and groundwater basins.

4.5

About the relevance of territories II: regional systems of innovation and learning regions

The systemic approach to innovation was initially addressed as national in scope (FREEMAN, 1987, LUNDVALL, 1992, NELSON, 1993). The interest in sub-national systems of innovation, at the basic level, relates to the acknowledgement of significant development gaps among different regions, including regions located within the same nation. More significantly, the regional approach⁴⁹ was meant to deal with remaining questions regarding the adequacy of the national systems of innovation accounts of the innovative phenomenon. A major question concerned the appropriateness of the national level, particularly the relational complexity underlying innovation that requires disentangling, *“as the model of choice to be tested is no longer linear but interactive”*, (COOKE et al, 1997, p. 476). COOKE et al (2000a, p. 2) refer to the occurrence of conceptual difficulties in the national systems of innovation approach: *“we do not have a sense of the regularity or intensity of interactions, nor indeed the diversity of the network of actors with whom regular or irregular, intensive or non-intensive, important and non-important interactions occur”*.

The objective here is not to confront the conceptualisation of national and regional systems of innovation⁵⁰. But, as mentioned above, a purposeful approach to any regional system should recognise the relevance of multilevel layers of governance, namely due to *“the powerful, persisting role of national systems of innovation”* (COOKE, 2001, p. 952). Hence, the regional system of innovation is understood as an open system, interacting with other regional, as well as with national and even supra-national systems (MORALES, 2000, BORRÁS, 2004).

COOKE et al (1998, p. 1581) define a regional system of innovation as a system in which *“firms and other organisations are systematically engaged in interactive learning through an institutional milieu characterised by embeddedness”*. This definition, though

⁴⁹ The Welsh scholar Philip Cooke introduced the concept of regional system of innovation in an article published in 1992 (COOKE, 1992).

⁵⁰ For a detailed comparison of national and regional innovation systems approaches, see ACS et al (2000).

simple and short, as well as centred on firms, conveys the perception that the concept of regional system of innovation opens up the opportunity to engage in a richer conception of universities and their relation with regional development. Breaking the definition down, and recalling CARLSSON et al (2002) about the constituents of an innovation system, a multidimensional view on that relation can be put forward, since universities are components of the system, their relationships with other regional agents can be tackled, and the attributes, either as a component or as an interacting body, can be judged. In addition, bearing in mind the possibility of a duality of inquiry (COOKE, 1998a, 2001) based on the distinction between *operational* and *conceptual* regional systems of innovation, the position of universities can be understood under the settings of a real phenomenon, or under the configuration of a logical abstraction, a theoretical construct or, because related to a specific methodological approach, an analytical framework.

A robust regional system of innovation requires an effective organisational learning infrastructure, a panoply of innovation organisations, and systemic linkages and interactive communication among innovation actors (COOKE and MORGAN, 1998). The authors (id., p. 70), analysing the emergence of regionally integrated supply chains in Wales and Scotland, suggest that these parts of the UK “*have many of the key elements of a regional learning infrastructure, notably good sensing, awareness, and response functions in the organisations (development agencies, training organisations, territorial governance offices) that promote their regional economies*”. To the extent these organisations establish systematic linkages, both formal and informally, with higher education and research institutes, vocational training agencies, technology transfer offices, science parks, as well as regional firms, such regions can be regarded as approaching a regional innovation system (ibid.). Hence, as the same authors argue (ibid.), in a regional innovation system, learning is combined with the capacity to understand and initiate upstream innovations (close to the origin of new ideas or inventions) and downstream innovations (near-market). As COOKE et al (1997, p. 484) would argue, “*a regional innovation system will thus have moved from a learning disposition of rapidly understanding and developing the competence to implement, apply and adapt innovations originating from elsewhere to a ‘tutoring’ disposition where it displays the capability to innovate de novo*”.

COOKE (2001) and COOKE et al (1998) develop a set of infrastructural and superstructural conditions according to which the potential for regional systemic

innovation can be examined (**Table 4.1**). As the authors acknowledge, both sets of conditions are ideal-types. However, “*it is likely that there are tendencies by regions towards one or other pole*” (COOKE et al, 1998, p. 961). The set of conditions described in **Table 4.1**, assesses, on the one hand, the degree of political, policy and financial autonomy of a given region, and, on the other hand, the social embeddedness⁵¹ of that region, its institutions and organisations.

Table 4.1 – Conditions for higher and lower regional innovation systems potential

Higher RSI potential	Lower RSI potential
Infrastructural level	
Autonomous taxing and spending Regional private finance Regional partnership capacity for financing Regional mediation and promotion capability Policy influence on infrastructure Regional innovation strategy Embedded universities Regional university-industry strategy Integrated R&D laboratories	Decentralised spending National financial organisation Weak regional capacity for financing partnership Limited mediation and promotion capability Limited influence on infrastructure Piecemeal innovation projects Disembedded universities Absence of R&D laboratories
Superstructural level	
<i>Institutional dimension</i>	
Co-operative culture Change orientation Interactive learning Associative-consensus	Competitive culture Conservative Individualistic Institutional dissension
<i>Organisational dimension (firms)</i>	
Harmonious labour relations Worker mentoring Externalisation Interactive innovation	Antagonistic labour relations Self-acquired skills Internalisation Stand alone R&D
<i>Organisational dimension (policy)</i>	
Inclusive Monitoring Consultative Networking	Exclusive Reacting Authoritative Hierarchical

Source: adapted from COOKE (2001) and COOKE et al (1998)

The relevance of universities in the regional system of innovation approach is highlighted at the infrastructural level. They appear, in fact, as one of the major determinants of the system’s greater or lesser robustness. At the superstructural level,

⁵¹ COOKE (2001) defines embeddedness in terms of the extent to which a social community operates in terms of shared norms of co-operation, trustful interaction and *untraded interdependencies*, as opposed to competitive, individualistic, arm’s length exchange and hierarchical norms.

however, one can only guess possible roles for higher education in balancing the institutional and organisational dimensions determining lower or higher systemic potential.

Taking the analysis further, COOKE and MORGAN (1994) and COOKE (1998a) suggest two key and constitutive dimensions of regional innovation, the governance and the business dimensions. To each model defining these dimensions, one can speculate about different quantitative and qualitative contributions of universities to the system's robustness.

As explained in COOKE and MORGAN (id.), the governance dimension is approached according to three models. First, the *dirigiste* model, in which innovation activities are thrust mainly from outside the region (the centralised decision-making process that gave rise to the spreading of *technopoles* in France is a paradigmatic example). This model equates a *regionalised national system of innovation* (ASHEIM and ISAKSEN, 2002). Second, the *grassroots* model, based on the occurrence of a soft infrastructure of innovation support that emerges from the efforts of local, grassroots organisation aimed at coping with the absence of central dirigisme, (e.g. the *kohsetsushi* system of SME technology centres run by municipalities and prefectures in Japan, as well as the local SME support schemes evolving in some industrial districts in Italy). The grassroots model is similar to what ASHEIM and ISAKSEN (id.) call *territorially embedded regional innovation networks*, where innovation is based mainly on localised learning processes stimulated by geographical, social and cultural proximity. Third, the *network* model, based on multi-level networking, encompassing local, regional, national and supra-national support systems, and presenting high levels of coordination among simultaneously complementary and competing actors, (the German state of Baden-Württemberg is often regarded as approaching the network model). In ASHEIM and ISAKSEN (ibid.), the model becomes the one of a *regional networked innovation system*.

The business dimension, according to COOKE (id.), reflects, on the one hand, the position of firms in the regional economy, both towards each other and the outside world, and, on the other hand, their *modus operandi* as far as innovation is concerned. Three types of business innovation models are considered. First, the "*localist*" model, reflecting the domination of a large firm, which tends to originate a system with few or no large indigenous firms and few large branches of external large corporations but revealing high associative capacity (e.g. the *localist* kind of innovation support in Denmark). Second, the

interactive model, in which there is a balance between large firms and SMEs and higher associative capacity (e.g. the high interactive culture of association in Catalonia). Third, the globalised model characterised by the dominance of global corporations, often supported by supply chains of dependent SMEs, (e.g. the high-tech complexes in California).

The concept of regional innovation system, in its original form, is clearly focused on the firm and its competitiveness, which somehow contradicts the extended notion of innovation suggested before. This focus is made explicit by COOKE et al (1997) in their description of the conditions in which one may speak of a regional system of innovation. According to the authors (id.), it is not enough to have an innovative regional cluster of firms engaged in interaction with other firms and other organisations, and a governance structure. Whether these structures are available and, crucially, engaged in systemic, i.e., regular, two-way, interchange “*on matters of importance to innovation and **the competitiveness of firms**, we may consider this to be a regional learning system*” (ibid., p. 484, emphasis added). The regional learning system, if added by the financial infrastructure “*needed to enable **firms** to gain the necessary venturing finance and invest the necessary qualities of capital to generate endogenous innovation*” (ibid., emphasis added), becomes a regional system of innovation. This somehow restrictive view corresponds however to an ideal type of regional system of innovation, endowed with the infrastructural and superstructural conditions that determine the highest systemic potential. There is thus room to break away from that restriction, by recalling the possibility of ranging along the two ideal system types, i.e., the highest and lowest levels of systemic potential. In other words, the regional system of innovation can be constructed and thus lifted up to higher levels of systemic potential. The construction process itself can be thought of as an innovation, a social innovation indeed, which thus requires the generation, dissemination and use of knowledge and the engagement in processes of interactive learning. In this sense, the regional system of innovation, using the words of LANDABASO et al (1999, p. 8), is a “*process of generating, diffusing and exploiting knowledge in a given territory with the objective of fostering regional development*”. Accordingly, it is “*what determines the effectiveness and the efficiency of regional knowledge building/transfer among the different integrating parts of the system, including individual firms, sectoral/value-chain clusters, business consultants, technology centres, R&D centres,*

University Departments, laboratories, technology transfer and utilisation of R&D centres, development agencies, etc.” (LANDABASO et al, 1999, p. 8). The region engaged in processes of learning aimed at swaying up its innovation systemic potential can be regarded as a *learning region*.

The term learning region was first suggested by the American scholar Richard Florida (FLORIDA, 1995). The author (id., p. 528) states that regions are “*a key element of the new age of global, knowledge-based capitalism*”, and are themselves becoming “*focal points for knowledge-creation and learning [...], as they take on the characteristics of learning regions*”. Learning regions, following FLORIDA (ibid.), function “*as collectors and repositories of knowledge and ideas, and provide an underlying environment or infrastructure which facilitates the flow of knowledge, ideas and learning*”. They, FLORIDA (ibid., p. 534) argues, generate “*the crucial inputs required for knowledge-intensive economic organization to flourish: a manufacturing infrastructure of vendors and suppliers; a human infrastructure that can produce knowledge workers, facilitates the development of a team orientation, and which is organized around life-long learning; a physical and communication infrastructure which facilitates and supports constant sharing of information, electronic exchange of data and information, just-in-time delivery of goods and services, and integration into the global economy; and capital allocation and industrial governance systems attuned to the needs of knowledge-intensive organizations*”.

The American view can be regarded as based on the infrastructural qualities that allow for the region to become a learning region. Bjørn Asheim (ASHEIM, 1995) and Kevin Morgan (MORGAN, 1997a), the European major precursors of the concept, bearing in mind the connection between the learning region and the regional systemic potential made above, offer more promising insights, as they, though differently, focus on collaborative networks and interactive learning.

ASHEIM (id.) introduces the term learning region to fill in two analytical shortages attributed to the industrial districts and innovative milieu territorial models. The author (ibid.) refers, firstly, to the lack of specification of the mechanisms and processes which promote innovative capacity more successful in some regions than others, and, secondly, the increased possibility of ignoring the danger of supporting economic and social structures which create *lock-in* situations, because of the strong focus on the advantages of the territorial mode of integration. Drawing on the localised character of, on the one hand,

disembodied technical progress (CASTRO and JENSEN-BUTLER, 1993)⁵², and, on the other hand, interactive learning processes (LUNDVALL, 1992), ASHEIM (1995, p. 18) concludes that, in the context of the learning economy, the transformation of industrial districts into learning regions will allow for avoiding “*a lock-in of development, caused by localised path-dependency, through the formation of dynamic flexible learning organisations both at an intra- and inter-firm level*”.

ASHEIM (2003), elsewhere, calls forth the idea of learning regions as regional development coalitions, i.e., “*the inter-linking of co-operative partnerships ranging from work organisations inside firms to different sectors of society*” (id., p. 194), thought as of strategic importance for the promotion of innovation supportive regions. The notion of development coalitions, according to the author (ibid., p. 195), “*incorporates all the [...] forms of integration (i.e. territorial, functional and system integration), and adds social integration, as the formation of a regional development coalition takes place on a societal level of the system as well as the lifeworld, where the co-existence and co-presence of actors in space and time is of vital importance*”⁵³.

MORGAN (1997a) attempts to conceal the concepts of the associational (network) paradigm to the problems of regional development. The author departs from two propositions normally associated with the evolutionary school: innovation is an interactive process depending on collective learning, and innovation is shaped by a variety of institutional routines and social conventions. This starting point accrues relevance to the regional level, which, according to MORGAN and HENDERSON (2002), is the most able to act on local knowledge, particularly because an innovation relevant part of it is tacit, thus person-embodied and requiring mostly face-to-face contacts. In addition, as STORPER (1997) reminds, *untraded interdependencies*, such as institutional routines and social conventions, are more likely to be developed in contexts of geographical proximity. According to MORGAN (id.), trust, reciprocity and willingness to collaborate are examples of the *untraded interdependencies* that, determining the success of collective learning processes, are more easily generated at the regional level.

⁵² CASTRO and JENSEN-BUTLER (1993, p. 1) argue that disembodied technical progress “*can occur independently of changes in physical stock capital*”. According the same authors (id., p. 8), rapid disembodied technical progress requires “*a high level of individual technical capacity, collective technical culture and a well developed institutional framework [...] [which] are highly immobile in geographical terms*”.

⁵³ The *lifeworld*, according to ASHEIM (1995, p. 17), “*is constituted by the embedded socio-cultural structures of the civil society*”.

The learning region argument attempts to search for answering two relevant questions. The first one concerns the ways learning capabilities are nourished. COOKE and MORGAN (1998) call forth the notion of *reflexivity*, “*the process of monitoring and evaluating in complex ways the likely implications of the innovation – especially where it is radical – for the regional system*” (id., p. 73). The authors look at the reflexivity function as the “*crucial dimension of ‘intelligence’*”, which is itself considered as feeding the learning capability of the region. They argue (ibid.) that *intelligence*, taken in institutional and organisational terms, encloses three major dimensions:

- *Information*- the raw material which is the medium for learning in the sense of knowledge-building, the prelude to the achievement of competence and capability;
- *Monitoring*- the capacity to make judgements regarding the impact of information on the pathway or trajectory upon which the regional system is set;
- *Evaluation*- the capability to assess the extent to which trajectories or the ends to which they are aiming need to be marginally or significantly adjusted (or the monitored information to be rejected).

In this sense “*reflexivity is the systemic process which combines learning and intelligence such that, in a number of feedback loops the system receives guidance*” (ibid.). Three feedback loops are identified, as reflexivity i) involves the assessment of the extent to which the evolution trajectory of the system is appropriate; ii) concerns the performance of the system compared to that of peer-systems; and iii) focuses on the relationship between different elements within the same system. This triple-loop learning, though somehow differently approached, is taken by ERNSTE (2003) to shed light over learning limitations and consequences. The author (id., p. 114) argues that in a single-loop learning situation “*one cannot expect any fundamental changes to occur in the strategy, structure or culture of the innovative network, for it is exclusively oriented towards incremental improvements*”. Accordingly, ERNSTE (ibid.) contends that joint local strategies and basic assumptions and distinctions that, in single-loop learning, remain untouchable, can be questioned through double-loop learning. He argues (ibid.): “*as previous positions need to be abandoned before new ones can be taken, it is inevitable that various old and potential new insights and cultures will clash*”. Conflicts, contradictions, resistance, and uncertainties cannot thus be avoided in double-loop learning. It is a process that generates

new knowledge and, simultaneously makes old knowledge obsolete, leading ERNSTE (2003, p. 115) to state that “*it involves not only learning, but also unlearning*”. The same author (id.) suggests that in a situation of triple-loop learning, “*even the basic principles and goals of the innovative network are questioned, [...] [and], at this level, the identity of the innovative network and, consequently, the identity of the whole innovative milieu are totally renewed and reconstituted*”. In his view, double- and triple-loop learning constitute *reflective learning* (ibid.).

A second question relates the *locus* where learning takes place. Learning processes are said to evolve upon networks bringing together public and private regional agents, which co-operate in order to find joint solutions to common problems (MORGAN and HENDERSON, 2002). The classical paradigms of state versus market, public versus private, are contrasted by the emergence of collaborative networks, which constitute “*more eclectic ‘third wave’ conceptions of development [that] consciously try to eschew such binary thinking so as to open up to inquiry regional processes and intermediate institutions that were marginalized by the inordinate attention devoted to ‘state’ and ‘market’*” (MORGAN, 1997a, p. 492). COOKE and MORGAN (1998, p. 18) reinforce the argument by contending that this third wave repertoire “*eschews the first wave’s heroic assumptions about state power and rejects as dogma the second wave conception that the state should be rolled back to the limited nightwatchman functions it performed in the nineteenth century*”. Accordingly, the logic of institutional and organisational networking does not aim at the substitution of markets or the state by networks. Rather, as put by MORGAN and HENDERSON (id., p. 204), “*it claims that networks have the potential to make both states and markets more effective: in the case of the state by creating a more dynamic policy environment in which the state can engage, and in the case of the market by rendering it less of a Hobbesian war of all against all in which firms are inclined to opportunistic behaviour*”.

The perspectives on learning and collaborative networking sketched out by the learning region thesis open up a variety of lines of inquiry as far as the regional role of universities is concerned. A strong assertion can be made about the nature of the relationship between universities and regional development: there is the need to positioning universities on a threshold that represents much more than the mere status of scientific knowledge or human capital provider. In addition, conjectures can be made about

the degree of territorial embeddedness of universities, their capacity to enter and influence collaborative networks and the ways they influence and are influenced by the processes of learning and unlearning that determine the innovative capacity of the region.

Several criticisms to the so-called *new regionalist* (LOVERING, 1999) approach to territorial development, in which the regional systems of innovation and the learning region stand out, can be found in the literature. MARKUSEN (1999, 2003), for instance, talks about conceptual fuzziness and lack of empirical validation. DOLOREUX and PARTO (2004) refer to definition confusion, lack of clearness, and difficulties to turn the concepts operational. These critic statements will be further commented elsewhere in this dissertation (see Chapter 8). An additional criticism, however, should be tackled here, because it gave rise to the suggestion of an alternative view, in which territorial innovation is said to occur “*only if it offers opportunities to overcome community fragmentation, alienation of basic needs, deterioration of the eco-system, cultural ghettoization, extreme economic inequality, etc.*” (MOULAERT and SEKIA, 1999, p. 33). MOULAERT and SEKIA (1999, 2003) impute to the regional system of innovation and the learning region, as well as to other models such as industrial districts, innovative milieus and new industrial spaces, the charge of lacking an explicit definition of the purpose of innovation. The authors (id., 2003, p. 295) argue that “*reading through the various contributions one concludes that the main shared purpose of innovation is the development of new technology and its implementation*”, before asserting that “*there is no reference to improving the non-(market) economic dimensions of the quality of life in local communities or territories*” (ibid.).

Claiming for the need to “*broaden the discussion on territorial innovation in all its dimensions, as a lead theme for the progress of humanity at the local level*” (ibid., p. 299), the scholars, aiming at “*a more comprehensive ontology of community development*” (ibid.), introduce the idea of the *integrated area development* model (IAD) as an alternative for territorial development in general. The model, according to its proponents, is innovative in two ways, in social relations of governance, and in satisfaction of needs that are not satisfied by the market. It recognises the importance of institutional dynamics in innovation and territorial development, as suggested by the other territorial models of innovation, but rejects the “*narrowly defined instrumentality of institutional dynamics for the improvement of market competitiveness of a territory*” (ibid.).

Basically, the IAD model calls forth the argument that *“territorial development does not only mean enabling the local and regional market economy, but also empowering the other parts of the economy (public sector, social economy, cultural sector, low-productivity artisan production) as well as community life (socio-cultural dynamics as a level of human existence by itself, political and social governance of non-economic sections of society, cultural and natural life)”*, (MOULAERT and SEKIA, 2003, pp. 299-300).

These concerns would be acknowledged by one of the most prominent proponents of the learning region territorial model. Kevin Morgan, in a recent paper (MORGAN, 2004), considers innovation as an intermediate indicator of development, *“a means to an end rather than an end in itself”* (id., p. 883). The author recognises that *“mainstream concepts of regional development – and this applies to ‘old’ and ‘new’ regionalism alike – remain far too economicist”* and that *“these concepts are predicated on ‘fixing the economy’ as a prelude to, and as a platform for securing social well being”*, (ibid.). Accordingly, MORGAN (ibid., p. 884) refers to the need for a more explicit approach to *“things that are instrumentally significant (like jobs and income) and things that are intrinsically significant (like health, well being and education), a distinction which lies at the heart of the debate about quality of life”*⁵⁴.

Taking innovation in its extended meaning and as a fundamental ingredient to ensure not only economic growth and competitiveness but also social development and sustainability, the territorial dimension arguably gains increased relevance. As MORGAN (ibid.) suggests, the decisions and activities enforcing these enlarged development goals tend to be taken and managed at the local and regional scales, even though shaped by national and supra-national scales. This conception reinforces the importance of the notion of multilevel governance, but it brings over, in MORGAN’s words (ibid, p. 887), *“a salutary lesson in the exercise of power, a lesson that reminds us not to conflate the formal power to decide with the real power to transform”*. The author (ibid.) concludes: *“the former may still reside at the upper echelons of the polity, but the latter can only be achieved with the active co-operation of the lower echelons”*.

In this context, and as a possible synthesis, to investigate the positioning of universities as protagonists of territorial development, besides the need to go beyond the still

⁵⁴*“The full force of this distinction only fully hit me when I began to engage with the data on limiting long-term illness in the UK, which revealed that the South Wales Valleys dominated this league table, the league that no one wants to win”*, MORGAN, 2004, p. 884.

predominant focus on human capital and science-based technology, it is necessary to create an analytical frame of reference in which the regional innovation system emerges as the relational platform that makes the whole bigger than the sum of individual parts (LANDABASO et al, 1999), and the learning region, purposefully extended by the IAD's insights, assumes the form of a governance platform triggering change based on reflexive learning and determining the power to transform the regional futures.

This frame of reference calls forth the problem of uneven regional development, as well as the related capacity differential to engage in processes of consequent interactive learning and collaborative networking, that is, to foster transformative powers. The problem of *unequal territories* can thus be introduced. The next section deals with the problem to question, as put by MORGAN and HENDERSON (2002), whether LFRs are able to craft robust interactive networks to promote endogenous learning, innovation and development.

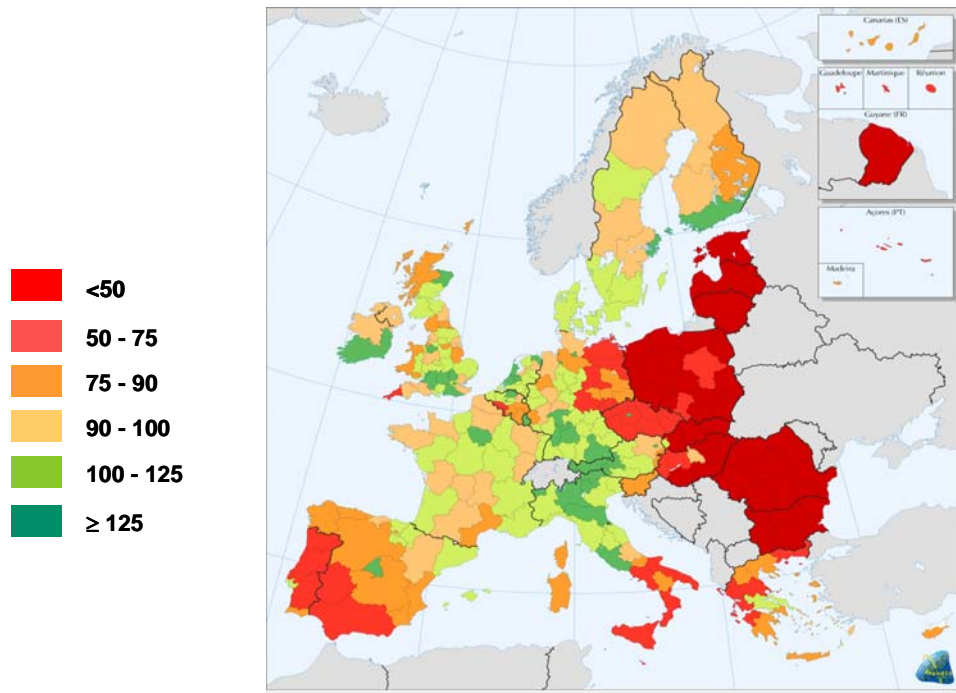
4.6

Unequal territories...

There is plenty evidence showing the uneven patterns of territorial development. Disparities in productivity, income, employment, educational levels, etc., are well depicted by a vast array of statistics. Taking the European Union as reference, social and economic convergence that the European Commission heralds for long as a primordial policy objective, is still far from accomplishment, both at the national and the regional level. Despite the convergence trends towards the EU average in place since 1994, when Structural Funds were strengthened, regional development disparities remain high and higher than the imbalances between member states (CEC, 2004a). In 2004, the regional gap has been significantly widened due to the entrance in the EU of the so-called Enlargement Countries.

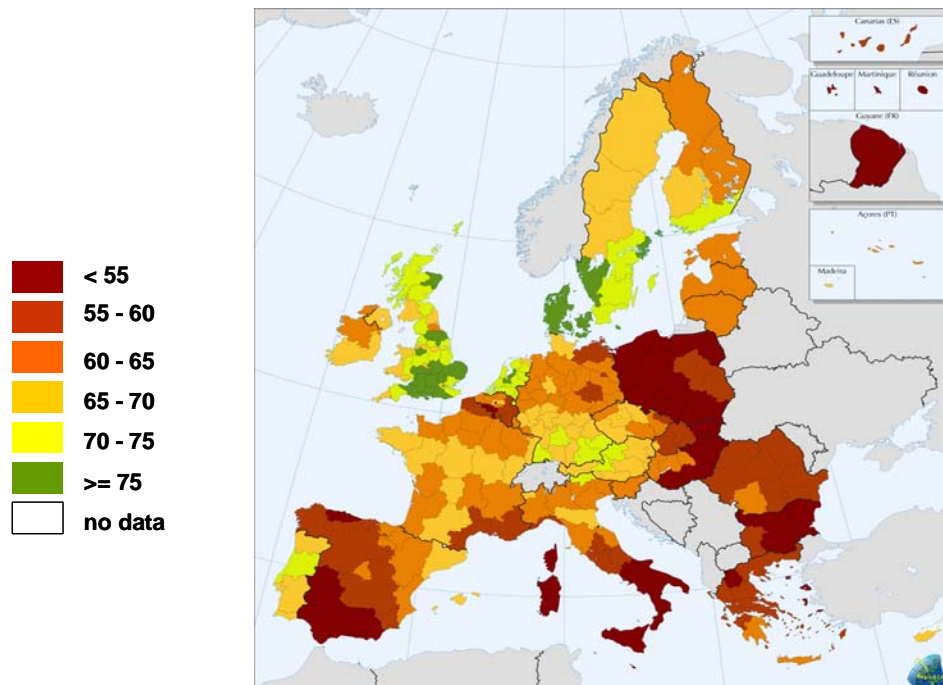
Regional development disparities in the EU can be illustrated using indicators measuring both output and factor conditions. The former are generally depicted by indicators such as the regional gross domestic product (GDP) per head (**Figure 4.1**) and the regional rates of employment (**Figure 4.2**).

Figure 4.1- GDP per head (% PPS, EU=100, 2002)



Source: CEC (2004a)

Figure 4.2- Regional employment rates (% employed 15-65 years old, 2003)



Source: CEC (2004a)

Based on CEC (2004a), some stylised facts on disparities in terms of wealth production and employment are sketched out below:

- In 2002, GDP per head, in the ten most prosperous regions was 89% above the EU-25 average, whilst 64% below average in the ten least developed regions;
- About 90% of population in the new member states live in regions with GDP per head below 75% of EU average (13% of population in EU-15 regions);
- 200 of the 254 EU regions are below the 70% employment rate targeted by the Lisbon strategy;

Indicators on income distribution are helpful to reinforce the perception that to grasp the problem of development imbalance there is the need to go beyond the differentials existing between member-states, in order to consider the disparities between regions belonging to the same nation (**Table 4.2**)⁵⁵.

Table 4.2- Income distribution disparities

	Low-income	Medium-low-income	Medium-income	Medium-high income	High-income	Total number of regions
No. of regions	51	27	53	22	20	173
Austria	1	-	4	2	2	9
Belgium	-	1	1	-	1	3
Germany	8	3	16	6	7	40
Greece	13	-	-	-	-	13
Spain	13	4	1	-	-	18
Finland	-	-	1	3	2	6
France	1	11	10	-	1	23
Ireland	-	1	-	-	1	2
Italy	8	2	7	3	-	20
Netherlands	-	2	5	2	3	12
Portugal	7	-	-	-	-	7
Sweden	-	-	-	7	1	8
UK	-	2	6	2	2	12

Source: CEC (2003c)

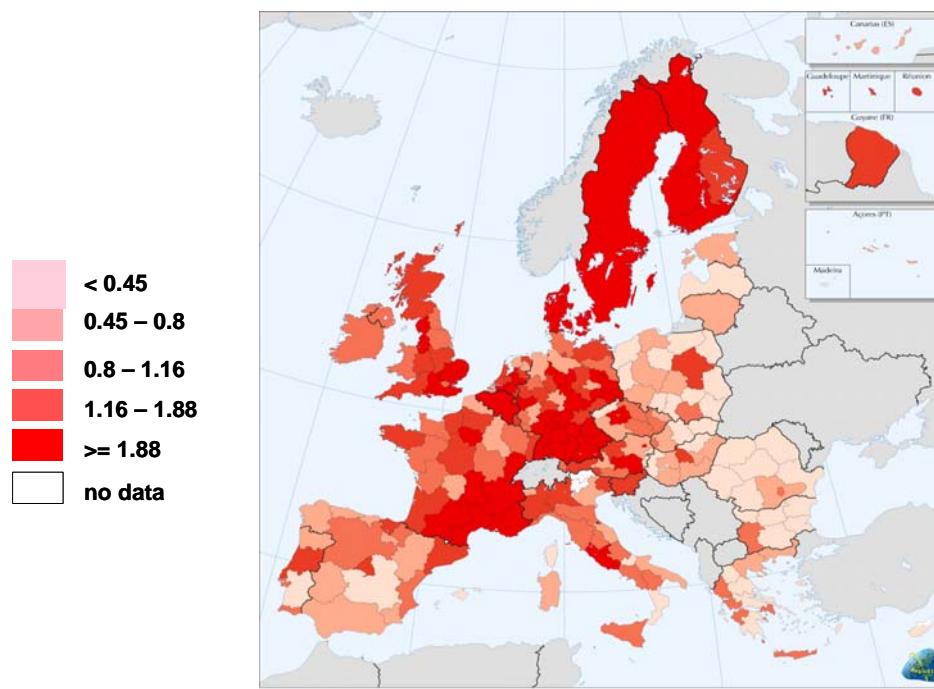
When dealing with factor conditions, R&D expenditure, strongly and positively correlated with GDP levels, is one of the most utilised indicators. As illustrated in **Figure 4.3**, the investment in R&D is highly concentrated in a few more developed regions of the EU. As expected, there is a similar concentration of patenting activities, a measure of

⁵⁵ Low-income is defined as being below 75% of the EU15 mean; medium-low-income is defined as being below 90% but above 75% of the EU15 mean; medium-income is defined as being above 90% but below 110% of the EU15 mean; medium-high-income is defined as being above 110% but below 125% of the EU15 mean; high-income is defined as being above 125% of the EU15 mean.

technological innovation output, with half of all high-tech applications to the European Patent Office being made in only 13 regions (CEC, 2004a).

Wider regional disparities emerge when disaggregating R&D performance sectors, particularly as far as the business sector is concerned. Amongst the ten leading regions in private R&D investment, four are German, three are Swedish and two are Finnish (CEC, 2003c). Taking Greece, Spain, Italy and Portugal together, only the Italian region of *Piemonte* presents business R&D expenditures higher than the EU average (id.).

Figure 4.3- R&D expenditure (% of GDP, 2002)

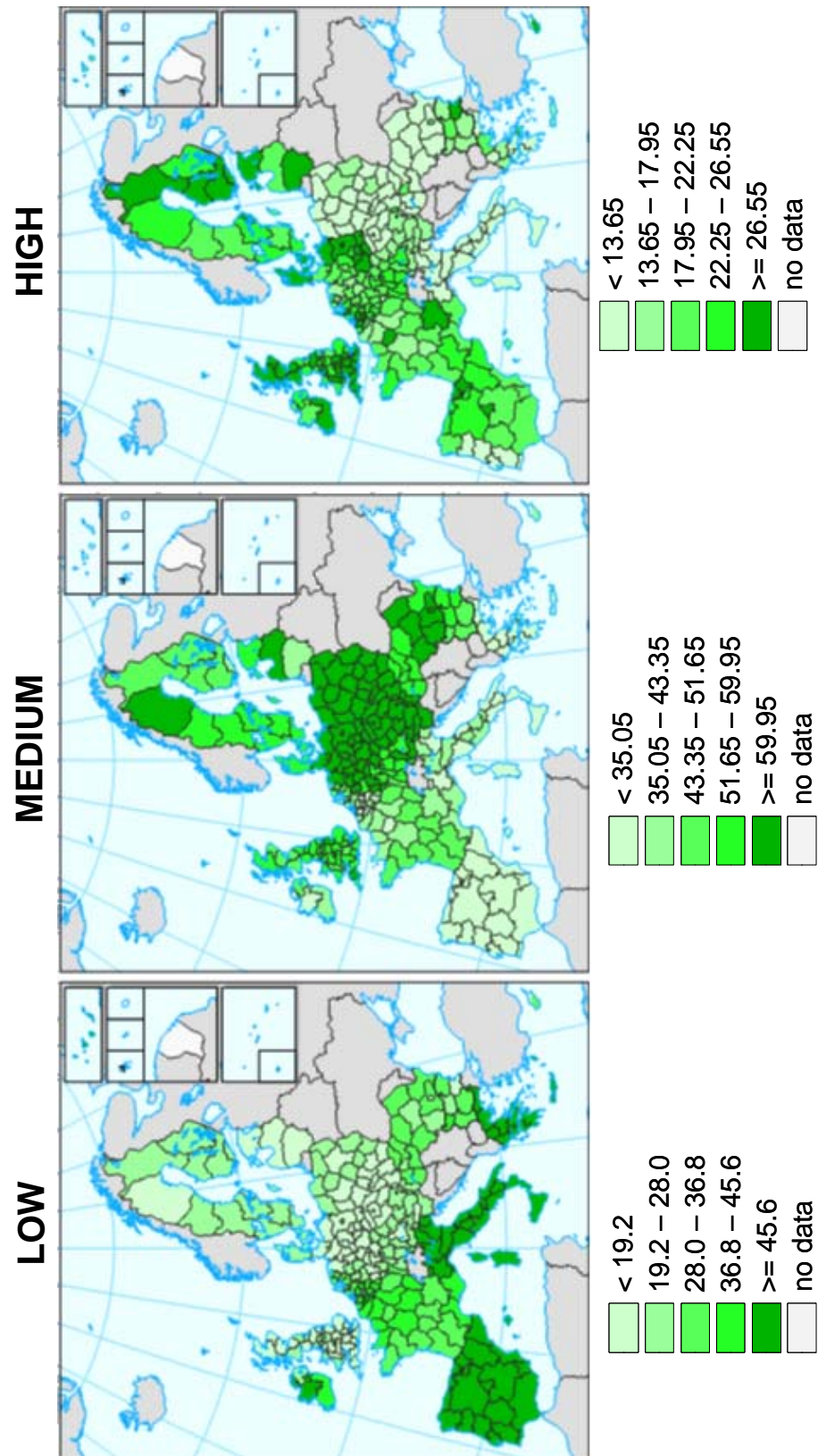


Source: CEC (2004a)

In parallel, in most LFRs, higher education emerges as the main research performer, thus as a major source of scientific knowledge. This prominent position provides the ground for the simplistic and frequent assumption that universities are crucial players in the efforts made by that type of regions to catch up (RODRIGUES et al, 2001).

Educational attainment can also be considered as a strong explanatory variable for regional disparities (**Figure 4.4**), and, as highlighted by the European Commission (CEC, 2004a), in this domain, there is little sign of the regional gap being closed.

Figure 4.4 – Educational attainment (% 25-64 age class, 2002)



Source: CEC (2004a)

Why the existing development gap? Why is it so difficult to diminish the gap? The search for purposeful answers to this pair of questions can be endeavoured in a variety of approaches. Often, the outcome of this search is the reliance on the existing differences in terms of human resources for innovation and the effectiveness of public financing schemes for the promotion of innovation. However, the reasons for the interregional imbalances in terms of innovative capacity go far beyond the quantitative aspects of human and financial inputs, as contended by LANDABASO (1997):

“[...] the inter-regional technology gap and the ‘innovation problem’ in LFRs is not only a quantitative problem measured in terms of availability inputs in the system but first and foremost a qualitative problem that refers to the structural factors besetting the regional innovation systems in LFRs [...]” (LANDABASO, 1997, p.10).

The author (id., p. 11), focussing on technological innovation at the firm level, identifies some of the hampering structural factors:

- shortcomings relating to the capacity of firms in the regions to identify their needs for innovation (and the technical knowledge required to assess them) and lack of structural expression of the latent demand for innovation;
- scarcity or lack of technological intermediaries capable of identifying and *federating* local business demand for innovation (and R&TD) and channelling it towards regional/national/international sources of innovation (and R&TD) which may give response to these demands;
- poorly developed financial systems (traditional banking practices) with few funds available for risk or seed capital (and poorly adapted to the terms and risks of the process of innovation in firms) to finance innovation;
- lack of a dynamic business services sector offering services to firms to promote the dissemination of technology in areas where firms have, as a rule, only weak internal resources;
- weak co-operation links between the public and private sectors, and lack of an entrepreneurial culture prone to inter-firm co-operation;
- small markets with unsophisticated demand;
- little participation in international networks;

- few large (multinational) firms undertaking R&D on the frontiers of technology with poor links with the local economy;
- lower level of public assistance for innovation in aid intensity and number of schemes poorly adapted to local SMEs innovation needs;
- lower quality and quantity of scientific infrastructure and science-technology systems less well integrated into the needs and capacities of the regional productive system.

LANDABASO (1997, p. 16), due to these structural barriers, points out that the basic R&D effort in LFRs is “*less relevant as a source of innovation than in other types of regions*”, an assertion of utmost importance when attempting to tackle the role played by universities in regional development, namely because it strongly questions the adoption of an exclusive focus on the transfer of academic R&D results. The author (id.) concludes that any policy effort directed at promoting LFRs’ innovative capacity “*should aim first at correcting these structural factors in each particular regional setting before trying to redress the quantitative gap by means of providing new inputs into the regional innovation system*”. Notwithstanding the technological innovation bias, LANDABASO leaves an useful insight, particularly concerning universities in LFRs, by arguing that “*balanced growth in the science and technology system in the less developed regions which can make a significant contribution to the innovative potential of those regions and hence to their economic development depends on the prior establishment of a strategy to link that system to the interests and needs of the region’s productive system*” (ibid., p. 11). In order to achieve this balanced growth, according to LANDABASO (ibid.), there is the need for “*substantial structural changes as well as a new set of relationships between the key regional players (the science and technology community, the regional and national public sector and the private sector in particular) so that the science and technology system can be given a fresh orientation*”.

OUGHTON et al (2002) refer to a *regional innovation paradox* as an illustration of the difficulties that LFRs face when attempting to close the innovation gap. The paradox, according to the authors (id., p. 98), concerns “*the apparent contradiction between the comparatively greater need to spend on innovation in lagging regions and their relatively lower capacity to absorb public funds earmarked for the promotion of innovation related activities, compared to the more advanced regions*”. Accordingly, the main cause for the

regional innovation paradox is not primarily the availability of public funds in LFRs, but the fragmentation of the regional system of innovation (OUGHTON et al, 2002).

The need for substantial structural changes and new or renewed interactive arenas to counteract the regional innovation paradox, approximates the perception of the need for LFRs to engage in processes of collective learning enabling qualitative change, or, in similar words, to become effective learning regions. MORGAN and HENDERSON (2002) refers to the endeavour to tackle the problems of institutional inertia affecting LFRs, by sponsoring new, consensus-based process of interactive learning within and between the public and private sectors. Therefore, the argument highlighting that, when attempting to understand the role of universities in regional development, one should go beyond the treatment of human and R&D inputs, gains increased strength in the case of lagging regions.

The lack of capacity to engage in collaborative networking and collective action, which, in general, characterises LFRs, makes institutional innovation one of the most important deficits in this type of regions (MORGAN and NAUWELAERS, 1999):

“[...] the most significant innovation [in LFRs] might be to develop voice-based mechanisms through which firms and public agencies can begin to interact locally so as to explore joint solutions to common problems” (MORGAN and NAUWELAERS, p. 3).

This statement falls within the remit of Albert Hirschman and his view on the economic development strategy (HIRSCHMAN, 1958). In fact, according to HIRSCHMAN (id.), the problem of uneven development relies on one basic scarcity, “*the basic deficiency in organization*” (ibid., p. 25), rather than on the scarcity of conventional factors such as physical capital, education or entrepreneurship. The author looks at the “*‘cooperative’ and ‘creative’ components of entrepreneurship*” (ibid., p. 17) as equally vital ingredients to reduce that basic scarcity, particularly through “*the art of agreement-reaching and of cooperation-enlisting*” (ibid., p. 19). Accordingly, two powerful arguments are produced:

“[...] the fundamental problem of development consists in generating and energizing human action in a certain direction”, HIRSCHMAN, 1958, p. 25,

and,

“[...] development depends not so much on finding optimal combinations for given resources and factors of production as on calling forth and enlisting for development purposes resources and abilities that are hidden, scattered, or badly utilised”, HIRSCHMAN, 1958, p. 5.

MORGAN and HENDERSON (2002) merit this conception of economic development strategy because, on the one hand, it treats resources as latent and conditionally available rather than absent or scarce, and, on the other hand, it highlights the pressing need to unlock institutional inertia in LFRs. In other words, it endorses MORGAN and NAUWELAERS's (1999, p. 11) claim that what LFRs need to do in the first instance *“is to create agreement-reaching and cooperation-enlisting mechanisms to promote the growth of more innovative linkages, more dynamic networks and more robust forms of voice”*.

In the particular case of LFRs, the creation of agreement-reaching and cooperation-enlisting mechanisms is easier said than done (MORGAN and HENDERSON, id.). At this point, rather than grasp the question of *how* to do it (the next chapter's core issue), one will focus on *who* is there to do it. The diagnosis made by MORGAN and NAUWELAERS (1999) of LFRs collective institutions (e.g. regional governments, chambers of commerce, labour unions), seen as *“very often part of the problem”* (id., p. 1), does not allow for prompting optimism. The same authors (ibid.) contend that *“to the extent that these institutions are implicated in clientistic networks, in which status is privileged over knowledge, power over learning, the past over the present, they are ill-equipped to generate and disseminate new practices”*. In this unfavourable context, following MORGAN and NAUWELAERS (ibid, pp. 1-2), *“without strong political support for new innovation networks, there is little or no prospect of countering the conservative cultural routines which lie at the heart of this kind of institutional inertia”*.

Drawing on PIORE (1995), the responsibility of orchestrating the framework for interactive learning falls over public policy and political leadership. In the case of LFRs, as MORGAN and HENDERSON (2002) put it, this can be a heroic assumption, because it presupposes that regional authorities are competent enough to effectively play the role of *animateur*. Moreover, there is evidence (e.g. COOKE et al, 1997, NAUWELAERS and MORGAN, 1999) showing that the orchestration of interactive learning is facilitated when in presence of regions endowed with strong government and finance autonomy. Accordingly,

an additional hampering factor stems from the dual system of a centralised national state and a fragmented myriad of elected local government bodies, which generally govern territorial units lacking critical developmental mass. KUNZMANN (2001), for instance, in his work about the Ruhr, clearly shows that strong local powers often block an effective regional co-operation. “*Intercommunal competition and jealousy are reigning local decision-making*”, stresses the author (id., p. 137), who adds (ibid.): “*the region does not have a clear joint regional vision for development, as all major cities pursue their own local (and quite parochial) development aims. And the smaller ones do neither have the imagination, nor the means or the power to form their own strategic alliances*”.

Two contradictory arguments can be drawn from this territorial fragmentation account. In a more pessimistic vein, one of them discards the possibility of fostering regional innovation, namely in the institutionally weaker LFRs, if strong regional powers are absent. This would condemn LFRs affected by the dual government system to lock-in in a vicious cycle that would retain them in a permanent situation of lagging behind. The other attributes to the local level of government, in the absence of regional powers, a possible and relevant role in the promotion of the change processes that would allow LFRs to escape from that vicious cycle. From this more optimistic point of view, the challenge would be to overcome exacerbated localisms and engage in supra-municipal associative dynamics aiming at the construction of what might be called *borderless regions* and the avoidance of the *tragedy of the (regional) commons*. Learning, and unlearning as well, in this case gains increased relevance in the creation of what BRYSON and CROSBY (2005) name self-sustaining regional cross-sector regimes of mutual gain. A specific learning subject falls on the acknowledgement, by the whole local community, that the development challenges no longer fit nicely within the boundaries of the current local jurisdictions, making explicit the need for creating a regional capacity to govern the *regional commons* (ARS, 2001). Learning is also necessary to foster regional leaderships, open to evolve towards regional stewardships, able to develop relationships across administrative and organisational boundaries, improve collaborative leadership skills, and build commitments to stewardship the region (id., 2002)⁵⁶. It can be argued that universities, in this context,

⁵⁶ The ARS (2002) distinguishes traditional leadership from regional stewardship. Traditional leadership involves one jurisdiction or one organisation, focus on specific problems or goals, leverages the leader networks and is committed to an issue or cause. Conversely, regional stewardship crosses jurisdictions and organisations, develops integrated visions/goals for the region, brings diverse networks together and is committed to place.

particularly those operating in LFRs, if regionally engaged, have forcibly to be involved in the amplified process of institutional change, exerting the power to influence regional and local organisations that stems from knowledge and societal prestige, as well as from privileged linkages with upper territorial echelons. Speculations can be made even about the extent to which a regional university can assume the leadership of change, particularly in regions affected by local fragmentation and/or lack of political and policy capacity.

A complementary support to ignite change in LFRs can be associated with the multilevel layers of innovation governance (COOKE et al, 2000a). National and supranational policies might encourage regions to enter the change processes deemed crucial to develop endogenous capacities for innovation. Using the words of NAUWELAERS and MORGAN (1999, p. 229), “*a stimulus from above may be very helpful to introduce new practices in policy-building in the regions, to influence the underlying conceptual framework behind the schemes, to help regions entering into international co-operations and exchanges of experiences, and to offer a new legitimacy to regional authorities’ actions*”. A fundamental condition, however, as the same authors remind (id.), concerns the “*need to respect the diversity of the regions, to let their endogenous dynamics unfold – in a word to act in the spirit of subsidiarity*”. The EU innovation policy provides a purposeful example of a *stimulus from above*. In addition, its evolution, in terms of design and delivery structure, evidences the shift from an emphasis on supply-push policies, mainly aimed at reinforcing the research and technological development (RTD) infrastructure, to the focus on the intangible info-structures that may encourage regions to nurture endogenous innovation capacity (MORGAN, 2004). The principle behind the EU innovation policy is of helping regions to help themselves through fuelling processes of collective social learning (MORGAN and HENDERSON, 2002). In other words, regions should be prepared to create endogenous capacities to interact with other regions, the nation and the supranational layers, in order to take full advantage of super-ordinate policies and resources. MORGAN and HENDERSON (id.), drawing on SABEL (1995), refer to these dynamics of vertical co-ordination along the multilayer governance mechanisms of innovation as *regional experimentalism*⁵⁷.

⁵⁷ Regional experimentalism provides the context in which, through learning-by-monitoring activities, organisations are enabled to re-evaluate and revising their substantive purposes, improving their capacity to master new disciplines of decentralised co-ordination which inform the policy of experimentalism itself, and their ability to adjust means and ends (SABEL, 1995).

During the 80s, the twelve *islands of innovation*, in the so-called *Archipelago Europe*, from London to Milan, (including Amsterdam and Rotterdam in the Netherlands, Île de France, Grenoble and Lyon in France, Turin in Italy, and Ruhr, Stuttgart, Munich and Frankfurt in Germany), were the recipients of approximately one half of the total RTD funds (CEC, 1996) that were the core of EU innovation policy. This concentration of financial resources resulted from the principle of scientific excellence used by the EU to distribute the funds. The outcome was that the socio-economic disparities between European regions and countries were exacerbated rather than redressed (MORGAN and HENDERSON, 2002).

The EU response to the poor level of participation of less favoured regions (LFRs) in the framework programmes of the 80s, has been the launching, in 1990, of STRIDE (Science and Technology for Regional Innovation in Europe) programme, mainly aimed at diminishing the interregional innovation and technological gap and, thus, contribute for territorial cohesion within the Union. STRIDE failed to deliver its noble objectives for a variety of reasons, such as, for instance, the lack of capacity to raise sufficient private sector input into projects, and the persistent focus on physical infrastructures (MORGAN and HENDERSON, id.), as well as the lack of understanding of innovation as an interactive endeavour and the inadequacy of networking skills and expertise (LANDABASO, 1997). The lack of critical mass and institutional legitimacy to ignite meaningful strategies was identified as an additional problem (NAUWELAERS and MORGAN, 1999).

Nevertheless, STRIDE has been an important learning experience, as LANDABASO and REID (1999, p. 30) acknowledge: “*a reflection [...] had begun as early as 1991 at European level as it became clear that the initial reorientation of Structural Fund expenditure was likely to be hindered by both the continued use of the outdated linear model as a theoretical reference for policymaking [...]*”. The main learned lesson, as the same authors (id.) indicate was that “*in the absence of a regional strategy to promote innovation which is based on the identified needs of firms and help to a stronger and better integrated regional innovation system, an injection of public funding into the system will be inefficient in terms of the return for regional economic development*”.

The learning process has forged a new approach to regional innovation promotion, recognising, on the one hand, the need for extending the concept of innovation, and, on the other hand, the importance of establishing new forms of institutional co-operation to

design and implement innovation policies attuned to regional circumstances. The successor to STRIDE, the Regional Technology Plan (RTP) was launched in 1994 aiming, first, to encourage LFRs to develop an inclusive and bottom-up regional innovation process, and, second, to provide a joint agreement between the recipient regions and the European Commission (EC) directed at establishing a more optimal strategy for future financing of RTD initiatives at the regional level (MORGAN and HENDERSON, 2002). The RTP exercise has been piloted in eight regions (four Objective 2 regions, undergoing industrial restructuring, and four Objective 1 peripheral LFRs⁵⁸). Despite the varying degrees of success, the RTP pilot initiatives raised the interest of many European regions. In addition, the EC decided that the RTP's concept was robust enough to be extended to other regions (MORGAN, 2004). In 1996, under the Article 10 of the European Regional Development Fund (ERDF), the RTP initiative was renamed as Regional Innovation Strategies (RIS), highlighting the non-technological realms of innovation. In parallel, under the fourth Community RTD Framework Programme, the EC launched the Regional Innovation and Technology Transfer Strategies and Infrastructures (RITTS), aimed to support regional policymakers in reinforcing their technology transfer and innovation infrastructures for a better response to SME's needs (CHARLES et al, 2000). Since then, more than one hundred regions have been involved in RIS/RITTS actions. In 1998, the EC further developed the concept through the RIS+ initiative, aiming to ensure that the strategic framework for action resulting from RIS and RITTS moves towards a concrete implementation of new measures and projects (CEC, 2001a).

The emphasis on the intangible factors of innovation and the recognition of an endogenous drive are well illustrated by the six key themes of RIS/RITTS methodology (CEC, 1997):

- Building a regional consensus;
- Analysis of the main technological and industrial trends affecting the region from regional, national and international perspectives;
- Strengths and weaknesses of regional firms: assessment of the regional innovation needs;

⁵⁸ The Objective 2 regions were Wales (UK), Lorraine (France), Limburg (The Netherlands), and Saxony-Anhalt (Germany). The Objective 1 regions were Central Macedonia (Greece), Castilla y León (Spain), Norte (Portugal) and Abruzzo (Italy).

- Assessment of the regional innovation support supply and the capabilities and objectives;
- Definition of a strategic framework;
- Design and implementation of a monitoring and evaluation system.

External evaluations of the RIS/RITTS show that the actions have been an important tool for increasing regional innovation policy capacity, through the creation of new regional partnerships and joint work methods and the development of new innovation projects (CEC, 1997). The approach was a socially participative process aimed at tapping local knowledge and building a common understanding of the problems and possible solutions. In the words of MORGAN (2004, p. 881), the RIS/RITTS exercise “*did not take the region for granted by assuming there was a singular view, on the contrary it was predicated on the belief that there were many competing voices that needed to be refined into a commonly agreed strategy*”. In addition, as the same author (id.) argues, innovation was recognised “*for what it really was, namely a collective social endeavour in which many organizations had a role to play, hence the significance it ascribed to social capital, that is a relational infrastructure for collective action which requires trust, voice, reciprocity and a disposition to collaborate for mutually beneficial ends*”.

The RIS/RITTS approach had a strong policy impact, contributing to mainstream the positive lessons learned into the conventional Structural Funds (MORGAN and HENDERSON, 2002). In fact, under the framework provided by the Lisbon strategy⁵⁹ and the objective of moving towards a European Research Area (CEC, 2000), the EC innovation policy led to the launching of the ERDF regional programmes of innovative actions. As major novelty, the initiative had the prime objective of influencing the quality of the ERDF assistance to Objective 1 and 2 regions, through the reinforcement of links between innovative actions and operational programmes (CEC, 2001b). The innovative actions programme was assumed as a catalyst and an experimental tool in exploring the future orientation of regional policy, in domains of strategic importance for LFRs (regional economies based on

⁵⁹ The Lisbon strategy was adopted in March 2000, as setting out the new strategic goal of transforming the EU into the most competitive and dynamic knowledge-based economy in the world (CEC, 2003a). Among other key objectives, the strategy was meant to open up a new framework for innovation promotion, emphasising the need to move towards a European research area and translating this need into targets such as increasing RTD spending in order to reach 3% of GDP by 2010, and increasing the business participation in the effort to two thirds of the total expenditure.

knowledge and technological innovation; e-Europe Regio, the information society; and regional identity and sustainable development) (CEC, 2001b). Hitherto, 126 regional innovative actions programmes have been developed. The results are yet to be fully evaluated, though a number of positive outcomes can already be identified, namely in some LFRs (cf. RODRIGUES and PIRES, 2006).

Figure 4.5 – The evolution of EU innovation policy

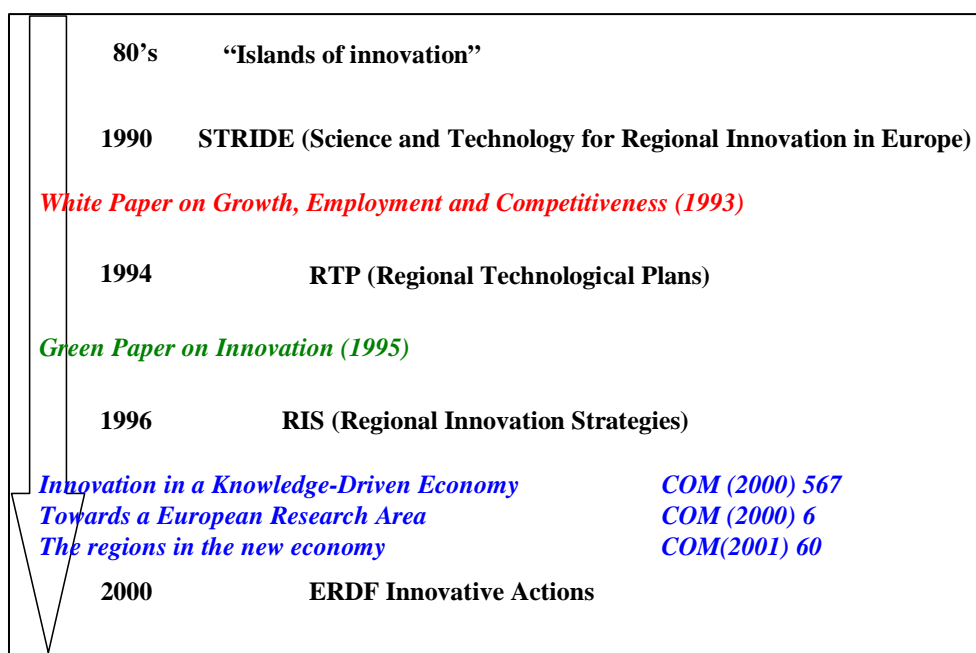


Figure 4.5 presents a simplified diagram of the evolution of EU innovation policy, connected with the key conceptual documents framing policy change.

The experimentalist approach and the associated process of learning evolved according to a mix of top-down support and bottom-up initiative, the former in the form of resources and advice provided by the EC, and the latter in the form of local knowledge and local ownership of the initiatives (MORGAN, 2004). The approach also placed at the core of the development problem the need for robust multi-level partnerships, in which, as MORGAN and NAUWELAERS (1999, p. 17) argue, “*the regional actors are genuinely empowered to develop bottom-up initiatives that draw on their local knowledge, and these need to be prosecuted alongside more supportive top-down measures from the ‘higher’ levels of the member states and the Commission*”. **Table 4.3** synthesises this division of labour.

Table 4.3 – The multilevel governance of innovation in the EU

European Union level	To stimulate innovative practices, namely by providing benchmarking tools, encouraging interregional learning mechanisms geared to the process and the content of innovation regional policies.
National level	To set up favourable conditions for innovation to prosper, endowing the nation and the region with adequate public research centres, education systems and legal, administrative and fiscal framework; central governments can also contribute for disseminate good practices to other regions in the country.
Regional level	To create an adequate spirit for fostering innovation, making best use of available resources through the development of co-operative learning mechanisms specific to the region.

Source: after NAUWELAERS and MORGAN (1999)

Universities, in the context of EU innovation policy, are seen as “*unique*” (CEC, 2003b), “*due to the key role they play in the three fields of research and exploitation of its results, thanks to industrial cooperation and spin-off; education and training, in particular of researchers; and regional and local development, to which they can contribute significantly*” (id., p 2). In line with the argument produced above, universities are regarded not only as privileged organisation supplying the region with human capital and scientific knowledge inputs, but also “*as a catalyst for multiple partnerships between economic and social players within a range of networks*” (ibid., p. 22). Recalling the assertion that in LFRs institutional innovation is overwhelmingly important, one can thus speculate about a major role to be played by academic organisations in those lagging regions, the one of a central driver of institutional change.

The centrality of universities’ role, as well as the intensity and the purposes of their efforts to assume a regional development engaged position, depends on the qualities of the governance threshold where regions stand, as well as on their tangible and intangible resource endowment. In this sense, it can be argued that to unequal territories correspond unequal expectations of regional societies towards universities and unequal patterns of academic involvement, namely in qualitative terms. Universities regional engagement can range from the simple provision of inputs, as in technology transfer activities or skills development, to a deliberate effort to mobilise the co-operation potential latent in their region of location.

4.7

Concluding remarks: hints for the regional role of universities

This chapter has questioned the thesis claiming for the *deterritorialisation* of economic processes due to globalisation, i.e. the argument for the death of geography. It has argued, conversely, that the instituted and socially embedded nature of innovation accrues relevance to territories, which emerge as product of local, national and global mastery, thus configuring a global-local nexus.

By qualifying the global-local nexus, some important implications for the positioning of universities in the contemporary society were grasped. It was asserted that the universalistic nature intrinsic to the very definition of academia, places universities in a privileged position to contribute for the articulation between the local and the global. In other words, universities can arguably contribute for integrating locally and non-locally generated knowledge, as well as facilitating the local access to global networks.

The broad-brush literature survey developed above was directed at highlighting the “*territoriality*” of innovation and socio-economic development processes and recognising the determinant nature of proximity and local embeddedness. It has also provided useful hints as far as the territorial role of universities is concerned. Though differently, the various theoretical approaches then mentioned emphasise the intangible realm of social networking when attempting to explore the territorial basis of development processes. Under the light of this emphasis, the argument pointed out a governance imperative relying on a new paradigm of social and economic development, the network or associational paradigm. Accordingly, it was established the idea that territories, equated to regions, are not static geographies but *loci* of an active construction of social architectures nourishing particular collective social orders and microconstitutional regulation mechanisms. In this context, the traditional way of looking at the local engagement of universities, focussed on the provision of human capital and scientific knowledge inputs, becomes incomplete. Universities, when locally engaged, should be protagonists in the construction of the social architectures mentioned above.

The degree of territorial embeddedness of universities, as well as their capacity to enter and influence networks or the ways they affect and are affected by the processes of collective learning and unlearning, emerge as core research issues. A possible frame of

reference to tackle those issues places universities as a component of a regional innovation system, contributing, to a more or less extent, to construct a learning region.

Taking the geographies of context into the discussion, that is the problem of unequal territories, the chapter contended that universities, when engaged in the development effort of the regions where they are located, are expected to play roles arguably different in quality and in intensity. Those universities operating in LFRs have to be part of a forcibly intensified process of change. In these lagging regions, in general affected by severe structural problems hampering their capacity to escape relatively low levels of development, universities can become a sort of guidepost for tracking alternative development trajectories. Seemingly, they are endowed with the potential to help unlocking the institutional inertia that troubles LFRs. In this sense, universities become a potential protagonist in building up regional institutional capacities.

The building up of regional institutional capacity

5.1

Introduction

In the previous chapter, by constructing the argument acknowledging the relevance of territories for innovation and socio-economic development and highlighting their intangible determinants, it was identified a possible role for universities in regional development, particularly in less favoured regions (LFRs), the one of contributing to build up the regional institutional capacities that underpin a collective social order based on microconstitutional regulation depending on trust, reliability, exchange, and cooperative interaction. A cascade of interrogations falls over this research hypothesis. The fundamental one is what is meant by institutional capacity building, which, in turn, unfolds the underlying questions about the meaning of institutions and the reasons why institutions do matter. The present chapter attempts to grasp some answers. Hence, it is aimed at providing the backcloth against which the role of academia as part of processes of institutional capacity building can be purposefully judged and better understood.

As shown before, the socially and territorially based approaches to innovation and development highlight a number of intangible and context-dependent ingredients, such as trust, reciprocity and networking. In that literature, these ingredients tend to be wrapped up by the overall concept of *social capital* (e.g. COOKE and MORGAN, 1998, COOKE et al, 2000a, MASKELL, 2001), generally taken as defined by PUTNAM (1993, p. 35-36), i.e., as

“features of social organizations, such as networks, norms, and trust that facilitate coordination and cooperation for mutual benefit”.

Institutions are often regarded as a form of social capital, along with networks and trustworthiness (OSTROM and AHN, 2003), which are said to contribute for the generation of trust in a given context, which, in turn, determines the contextual conditions for collective action (id.). The emphasis here is thus placed on the role institutions play in establishing trustful relationships between agents. The way institutions generate trust relies mostly on the provision of what can be termed as rules of the game, defining permissible behaviours and actions of interacting agents, as well as sanctions for those who do not follow the rules. In this sense, what would be the meaning of an effort to build up regional institutional capacities? Forcibly, it would concern an improvement in the regional capacity to foster trust-generating processes, and/or change the rules of the game framing social relations. Recalling the analytical referential of the regional innovation system, regarded as a relational platform, this somehow limited view of the dynamics of institutional capacity building, without further examination, would seemingly fit the research design requirements. However, the regional players, their practices and ideas (knowledge), the arenas for interaction, as well as their attributes, - e.g. robustness, flexibility, capability to engage in learning processes, ability to access multilevel networks -, are part of the equation, forcing an extended meaning of institution, and, consequently, an enlarged conception of the dynamic processes of institutional capacity building. The issue at stake is not only the rules of the game but also the kind of collective game to be played (HEALEY, 1998) and the collective tactics and strategies that, following HEALEY (id., p. 1542), offer *“the hope of providing a rich ‘soil’ in which individual projects, partnerships, and associations can ‘grow’ in flexible and innovative ways”.*

The extended meaning of institution supports that institutionally *thick* regions (AMIN and THIFT, 1994) are more able to foster interactive learning processes generating the knowledge that feeds regional social and economic development. However, institutional thickness might convey resilience to change, creating a situation of lock-in. The concept of institutional capacity building is seemingly more appropriate as it embraces the more strategic dimension of institutional change by focussing on the improvement of the regional agents' power to make the difference and set up flexible and innovative responses to rapidly changing circumstances. Institutional capacity is conceptualised as the combined

effect of three forms of capital - intellectual, social and political -, recast as knowledge resources, relational resources and mobilisation capacity (INNES et al, 1994; HEALEY, 1997, 1998, HEALEY et al, 1999a).

As mentioned in the beginning of this introductory section, the aim is to contribute for establishing what is meant by institutional capacity building, a binding step in the search for answers to the foundational research question of this dissertation. Accordingly, the chapter is organised as follows:

- Firstly, it attempts to show that social capital, though central in the enhancement of trustful interaction, is only a part of the equation that gives expression to socio-economic development trajectories;
- Secondly, drawing on a brief review of *institutionalist* theoretical thought, it seeks a meaning for the term institution and looks at the problem of institutional change, introducing then a discussion about the co-evolution of institutions and organisations, the transformative relationships between agency and structure, and the question of institutional thickness;
- Thirdly, it addresses the concept of regional institutional capacity and, drawing on the combination of the theories of collaborative planning and communicative planning, sheds light over the ways the building up of institutional capacities are understood;
- Finally, the chapter concludes with some remarks about the positioning of universities in the processes through which regional institutional capacities are nourished.

5.2

Social capital: the missing link?

As mentioned above, much of the debate on the intangible realm of socially and territorially embedded development processes, and the inherent development paradigm, draws on the concept of social capital. Seemingly, social capital “*has evolved into something of a cure-all for the maladies affecting society [...]*” (PORTES, 1998, p. 2). Nevertheless, as suggested by many authors (e.g. PUTNAM, 1993, WOOLCOCK, 1998, FUKUYAMA, 2000), social capital is considered as an important ingredient for the efficient

functioning of modern societies. The concept encloses a number of aspects omitted by standard approaches to innovation and widely agreed as pervasive in development processes, such as trust, norms of reciprocity, networks, and civic engagement. Moreover, social capital is also advancing from an academic concept to a policy objective (FUKUYAMA, 2002).

Social capital is not a new conceptual construction, though only recently it started to gain prominence in social and economic development studies. In their overview of the rising of social capital in contemporary thinking, OSTROM and AHN (2003) place the origins of the concept on Alexis de Tocqueville⁶⁰, in the mid nineteenth century, and refer to Pierre Bourdieu⁶¹ as responsible for the ideas that, in the early 80s, foretold the current meaning of the term. The authors also highlight the work of James Coleman⁶² in the late 80s, as pioneering in terms of systematic conceptualization, along with the writings of Robert Putnam⁶³, considered as the responsible for unleashing the concept in the last decade.

The rapid growth in popularity of social capital has a parallel in controversy, namely about meanings, roles and outcomes. Controversy, as argued by many authors (e.g. PORTES, 1998, FUKUYAMA, 2000, FINE, 2001), derives essentially from the spreading

⁶⁰ De Tocqueville ([1840] 1945, p. 122-123), though accepting self-interest (“*if rightly understood*”) as “*the best suited of all the philosophical theories to the wants of the men of our time*”, claims that “*the individual is helpless socially if left to himself*”. The author claims for a bottom-up reconstruction of self-governing order, necessary to counteract the tendency to atomize individuals. This tendency is viewed as a contradictory result of democracy, parallel to the expansion of the condition of equality among citizens.

⁶¹ BOURDIEU (1983) distinguishes three fundamental types of capital: economic capital (directly and immediately transformable into money and susceptible of institutionalisation though forms of property rights), cultural capital (sometimes susceptible of conversion into economic capital and institutionalisation through forms of educational attainment), and social capital (involving social relationships that, under certain conditions, can be converted into economic capital). The author defines social capital as an aggregation of actual and potential resources related to networks, emphasising conflicts and power relations.

⁶² COLEMAN (1988) defines social capital by its function. The author argues that social capital is not a single entity but a variety of diverse entities existing in the relations among persons and sharing two common characteristics: “*they all consist of some aspect of social structures, and they facilitate certain actions of actors – whether persons or corporate actors – within the structure*”, id., p. S98. Hence, social capital, in Coleman’s view, is above all a resource for action.

⁶³ PUTNAM (1993, 1995) associates social capital with the level of civic engagement of communities. The author, drawing conclusions about the development differentials between the Northern and Southern parts of Italy, argues that social capital “*embodied in norms and networks of civic engagement seems to be a precondition for economic development, as well as for effective government*”, Putnam, 1993, p.37.

across disciplinary fields and disagreement on the measurement of the concept⁶⁴, forging a somewhat confusing conceptual ground.

The controversy about social capital goes beyond the lack of agreement as to its definition. It embraces other substantive issues, such as those illustrated, for instance, by the question whether social capital is a public good, as COLEMAN (1988) and PUTNAM (1993) seem to favour, or, contrarily, is it similar to a private good which produces confined externalities that, because “*personalized*”, are “*not anonymous*” (DASGUPTA, 2003, p. 326). An additional issue relates the existence of good and bad types of social capital. MORGAN and NAUWELAERS (1999) refer to the Mafia in Southern Italy, ETA in the Basque Country and the IRA in Northern Ireland, to differentiate social and unsocial capital as driving forces of obviously different kinds of networks. In the same line of thought, PORTES (1998) considers social capital as cutting in both ways, susceptible of originating either public goods or socially undesirable outcomes: “*whereas bounded solidarity and trust provide the sources for socioeconomic ascent and entrepreneurial development among some groups, among others they have exactly the opposite effect*” (id., p. 18). This controversy also takes the form of acute criticisms, such as those produced by SOLOW (1999), who claims for the fuzziness of the concept and judges social capital as a bad analogy of physical capital.

This controversy, though important, is not the crux of the matter. The point is to understand to what extent the concept of social capital is the missing link in the construction of an adequate framework to grasp the new associational paradigm of socio-economic development and envelop the claim for the centrality of institutional capacity building dynamics.

Taking the overall theoretical and analytical framework constructed before, and assuming social capital as defined by PUTNAM (1993), one can argue that social capital is deemed to play a crucial role in innovation and socio-economic development⁶⁵. In this line

⁶⁴ For instance, as argued by PORTES (1998), sociological analysis of social capital tends to emphasise relationships between actors or between an individual and a group. In other words, it stresses the potential benefits actors can access when entering networks or broader social structures. Conversely, political science analysis equate social capital with the level of associational involvement and participatory behaviour in a given community, i.e., with the level of civic engagement. FUKUYAMA (2000) considers the absence of consensus on how to measure social capital as one of the greatest weaknesses of the concept. The author refers to two broad approaches: the counting of groups and group memberships in a given society, and the use of survey data on levels of trust and civic engagement.

⁶⁵ “*Social capital enhances the benefits of investment in physical and human capital and is coming to be seen as a vital ingredient in economic development around the world*”, PUTNAM (1993, p. 36).

of thought, LANDRY *et al* (2001) claim that the increasing interest in social capital as an explanatory ground of development can be attributed to the growing relevance of knowledge as a source of innovation (alongside with the “*less and less*” effective way of explaining innovation and development “*solely in terms of new combinations of physical capital*”, *id.*, p. 74). Innovative processes require the combination of different forms of knowledge held by a multiplicity of agents. Hence, those agents should share relevant knowledge they possess. These flows of knowledge transfer or exchange take place within networks of relationships whose success largely depends on the social capital accumulated both by involved agents individually considered and by the collective structure upon which networks evolve. Drawing on this perspective, particularly at the firm level, one can argue that social capital contributes for diminishing transaction costs, such as search and information costs, bargaining and decision-making costs, as well as policing and enforcement costs (MASKELL, 2001). This enables firms to improve their efficiency in terms of both resource allocation and activities co-ordination.

“Firms in communities with a large stock of social capital will, of course, always have a competitive advantage to the extent that social capital help reduce malfeasance, induce reliable information to be volunteered, cause agreements to be honoured, enable employees to share tacit information, and place negotiators on the same wave-length”, MASKELL, 2001, p. 7.

This view also links to the challenges associated with globalization, namely those stemming from increased division of labour and inherent augmented need for co-ordination. As put by MASKELL (*id.*), social capital, as far as it contributes for the reduction of co-ordination costs, exerts direct impacts on the boundaries of firms, “*by placing them in a better position than their competitors to outsource and specialize still further, and to appropriate the excess rents flowing from the resulting deepening of the division of labour*” (*ibid.*, p. 7). However, social capital is nourished and put into action when members of a given community interact. Accordingly, as the same author recognises, even if some communities are not confined to a single geographical locality, most of them are place specific⁶⁶. Hence, the understanding of the role this type of capital plays in

⁶⁶ MASKELL (2001, p.8) avers: “*In order for interacting firms to attain the social capital of geographically embedded communities they usually need to co-locate within the boundaries of the community*”. Drawing on this assertion, the author argues that the concept of social capital can contribute to current research work on

development promotion requires a socio-cultural and a political-institutional account, which, as argued by ASHEIM (1999), incorporate both historical and territorial dimensions. These assertions empower the argument in favour of the strong territorial nature of innovation, which thus gains increased argumentative strength through the introduction of social capital into “*the new development lexicon*” (WOOLCOCK, 2001, p. 16).

The relevance of social capital in the globalising society relates to the core conceptual references thrusting the debate: networks, institutions, and trust. This core suggests that social capital, similarly to physical or human capital, can assume a multiplicity of forms. OSTROM and AHN (2003) contribute for sustaining this argument. The authors list three forms of social capital: trustworthiness (defined in terms of “*preferences that are consistent with conditional cooperation even in the absence of material incentives*”, *id.*, p. xvi); networks (social interactive platforms providing not only additional incentives to selfish individuals for cooperative behaviour, but also encouraging “*the rise of the norm of generalized reciprocity*”, *ibid.*, p. xxi); and institutions (defined in broad terms, as “*prescriptions that specify what actions – or outcomes – are required, prohibited, or permitted, and the sanctions authorized if the rules are not followed*”, *ibid.*, p. xxii). Trust, in their view, is transposed to the status of outcome, rather than a form of social capital in itself. Drawing on second-generation theories of collective action⁶⁷, the authors consider the concept of social capital as a general rubric, and place the fundamental theoretical issue on the ways collective action is achieved, that is, how the forms of social capital enhance trust and, consequently, breed cooperation. The three forms of social capital link to collective action by means of trust (**Figure 5.1**).

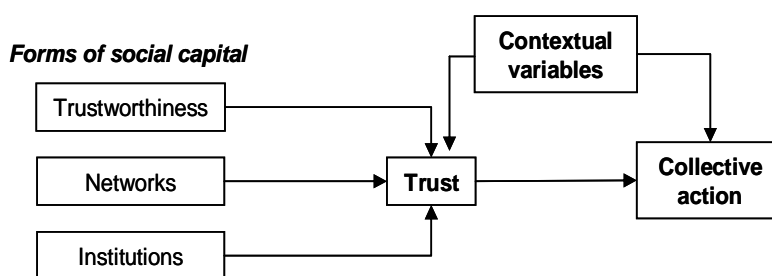
In this line of thought, trust becomes the cornerstone of the collective endeavour thrusting development. Unsurprisingly, trust has kindled huge interest among scholars working on a diversity of fields (e.g. ARROW, 1974, COOKE and MORGAN, 1998, MASKELL, 2001, FARREL and KNIGHT, 2003). Trust, as simply put by FARREL and KNIGHT

clustering, as well as to grasp the reasons why some regional and national patterns of specialization are so “*sticky*”. In addition, he suggests the advantages of a place specific large stock of social capital as one of the factors explaining why low-tech firms continue to operate successfully in high-cost regions.

⁶⁷ In brief, theories of collective action relate to the overcoming of selfish incentives in order to achieve mutual benefits through cooperative ways of doing things, in a context where a group of individuals share a common interest among them, and a potential conflict exists between that common interest and each individual’s interest. The major difference between the first and second-generation theories of collective action stems from the assumptions made about the nature of individuals. The former looks at individuals as atomized, selfish and fully rational. The latter emphasises the existence of a variety of types of individuals (OSTROM and AHN, 2003).

(2003, p. 541), is “a set of expectations held by one party that another party or parties will behave in an appropriate manner with regard to a specific issue”. Hence, trust facilitates agents to work together for mutual benefit and refrain from opportunism. If secured, it can be a relevant economic asset (COOKE and MORGAN, 1998), or a commodity such as knowledge or information (DASGUPTA, 2000). It can be regarded as an input condition for an economic system to stimulate support activities in situations of risk and uncertainty (LUHMANN, 2001).

Figure 5.1 – Forms of social capital, trust and collective action



Source: adapted from OSTROM and AHN, 2003

The work of MASKELL (2001) on the relationships between social capital and firms’ innovation and competitiveness reinforces the idea of trust as an economic asset by asserting that it is “an excellent mechanism to overcome intricate market failures”, (id., p. 4), such as those deriving from asymmetrical distribution of information. In addition, the same author looks at trust as the cement of the strong and stable relationships of inter-organisational co-ordination and co-operation needed to tackle the “somewhat puzzling question of product innovation” (ibid., p. 3). A distinctive mark of trust *vis-à-vis* other economic assets is that it cannot be acquired by means of economic transactions. COOKE and MORGAN (1998, p.30) state that trust is “one of those rare assets, like loyalty and goodwill, which have a value but no price”.

COOKE and MORGAN (id.), drawing on the literature on trust, provide a summary of the benefits that can result from trust-based relationships: firstly, the economies of time and effort due to the efficiency of relationships in which one is able to rely on the word of one’s partner; secondly, the endowment of partners with better conditions to cope with uncertainty, “because, while it does not eliminate risk, trust reduces risk and discloses possibilities for action which would have been unattractive otherwise” (ibid., p. 30-31);

thirdly, the improvement of partners' learning capacities, "*because they are party to thicker and richer information flows*", (COOKE and MORGAN, 1998, p.31).

In this context, when discussing the problem of development, a question of utmost importance is how to secure trust (MORGAN and HENDERSON, 2002), in order to maintain its economic value, or, similarly, how does trust evolve (COOKE and MORGAN, id.). Broadly, the literature on trust offers three theoretical explanations (PURDUE, 2001) to tackle the question. A first one suggests that trust is dependent on rational calculations and/or predictions of the advantages accrued to collaboration. A second school of thought attributes the formation of trust to shared cultural norms. A third approach claims that trust depends on shared cognitive understandings and/or discourses. These broad explanations encircle a number of conceptual flaws, such as, for instance, the taken for granted capacity of agents to anticipate the precise advantages that they can obtain through collaboration. In the words of POWELL (1996, p. 63), this "*rational or calculative view of trust [...] overstates the extent to which the continued success of a relationship is based on the ability of parties to take a long-term view and practice mutual forbearance*". The direct causal and deterministic link between a common deep-rooted culture or language and the building of trustful relationships seems also inadequate. About the cultural or social norm view, POWELL (id., p. 62) argues: "*[...] those communities well endowed with trust will reap the benefits of cooperation while those without it are doomed to suffer*".

COOKE and MORGAN (1998) use Walter Powell's contribution to grasp a more appealing approach, suggesting that trust is neither an outcome of calculative action nor a norm established by culture, but a disposition which can be learned and strengthened through successful collaborative experiences. According to this perspective, in trust building processes, consensus is a by-product of success rather than a pre-condition for it.

The recognition that trust can be learned and reinforced by repeated successful collaborative activities has analytical and conceptual implications. Perhaps the most evident concerns the unveiling of some explanatory shortcomings affecting the mainstream approaches to social capital, particularly the assumption of a historical legacy determining trust-nurturing forms of social capital, or, in similar terms, that trust depends on pre-existing forms of social capital (e.g. PUTNAM, 1993). Surely, history, culture and civic engagement traditions, as well as other contextual variables, strongly influence the levels of trust existing in a given community. However, whilst history cannot be changed, culture

and traditions, as well as contexts, are fluid and dynamic, that is, are not fixed or given (HEALEY, 1997), and thus susceptible of transformation. This line of thought brings hope to the otherwise hopeless lagging regions, generally characterised by historically and culturally determined low levels of social capital.

Trust, as an asset that neither is chosen nor embedded, but learned and strengthened, can be regarded as an outcome of ongoing interaction and discussion (POWELL, 1996). The “*reconciliation*” made by SABEL (1994b) of learning and monitoring⁶⁸ is particularly useful at this point:

“[...] *the economic actors can often resolve the problem of reconciling learning and monitoring by making the two indistinguishable: by creating institutions that make discussion of what to do inextricable from discussion of what is being done and the discussion of standards for apportioning gains and losses inextricable from apportionment. Through these institutions, discrete transactions among independent actors become continual, joint, formulations of common ends in which the participants’ identities are reciprocally defining. Put yet another way, these institutions transform transactions into discussions, for discussion is precisely the process by which parties come to reinterpret themselves and their relation to each other by elaborating a common understanding of the world*”, (SABEL, 1994b, p. 138).

In this conceptual framework, trust-based relationships, to be effective and secured, demand rich structures of consultation, - or discursive institutions, as SABEL (1994b) would designate those structures -, allowing agents involved in co-operative activities to monitor their interactions (COOKE and MORGAN, 1998). This relates to the need for developing voice-based mechanisms (MORGAN and HENDERSON, 2002), with basis on *discussions*, intersecting *conversations* driven by the key issues of who talks to whom and what they talk about (PIORE, 1995), and *talk* and *confidence* to promote mutual understanding (STORPER 1997).

The argumentative line above, on the one hand, allows for vexing the hierarchically indistinct function of institutions, as form of social capital, in relation to trustworthiness and networks, in trust-generative processes (recall **Figure 5.1**). A more appealing and

⁶⁸ SABEL (1994b, p. 137) contends: “*The central dilemma of growth is reconciling the demands of learning with the demands of monitoring*”. The author argues that learning undermines the stability of relations normally required for monitoring, by disrupting regularity and thus originating a “*potentially paralyzing fear of the breakdown of monitorability*”.

appropriate conception is that institutions are not merely one of the three forms of social capital, but something that primarily conditions the other two. This accommodates the role of institutions as affecting the willingness of agents to behave in a trustworthy manner, as well as the availability of information about the trustworthiness of agents (FARREL and KNIGHT, 2003). In addition, and consequently, it outlines the dependency of agents' networking capabilities upon the institutional settings.

On the other hand, the argument suggests that the approaches to social capital qualifying institutions as simple prescriptions that agents are compelled to follow in their co-operative endeavours and the sanctions they, otherwise, may incur are reductive. Though accepting the pervasive influence of both formal and informal prescriptions in shaping collective action, the acknowledgement of agents' capacity to reinterpret themselves and their relationships in order to construct a common understanding of the world, indicates that those agents are not solely prescription "*followers*", but can also be the "*drivers*" of processes conducing to the creation of new or transformation of existing prescriptions. Moreover, the narrow conceptualisation of an institution does not fully entail a number of relevant facets of development processes, such as institutional innovation, imitation, adaptation and drift, as it does not embody the fundamental and mutually change-inductive relations between institutions and organisations (EDQUIST and JOHNSON, 1997).

In sum, the concept of social capital is widely recognised as fundamental when grasping the development challenges that regions face in a globalising world. Regional capabilities to foster innovation-based development processes are deeply rooted in existing stocks of social capital, which becomes not only a pre-requisite but also something that have to be accumulated. At this point, one can argue that universities active in regional development are expected to contribute for the accumulation of social capital, as suggested by WILSON (1997, p. 755) who avers that "*effective universities will become social capital builders both inside and outside the classroom*".

The concept of social capital, however, relates to the building up of trustful relationships between agents (HEALEY, 1998). Accordingly, and bearing in mind the organisational and institutional complexity of systemic innovation and socio-economic development determinants, one can argue that the concept presents explanatory shortages. It gains a new vigour when incorporated in the broader framework offered by

institutionalist lines of thought, which, as AMIN (1999) reminds, grab explanatory power by means of analysing the effects of formal and informal institutions subject to slow evolutionary change; the values and rationalities of action configuring networks and institutions; the role of networks of economic association in disseminating information, knowledge, and learning; and the intermediate institutions, between market and state, ensuring purposeful and participatory forms of institutional arrangement.

5.3

Overhauling the engine: institutions, institutional change, and institutional thickness...

Defining an institution is a troublesome task, concerning, for long, many scholars working in a wide variety of scholar branches of social science. COMMONS (1931), for instance, in the 30s, attempting to find a field for the so-called institutional economics, referred to the uncertainty of meaning of an institution:

“Sometimes an institution seems to mean a framework of laws or natural rights within which individuals act like inmates. Sometimes it seems to mean the behavior of the inmates themselves. Sometimes anything additional to or critical of the classical or hedonic economics is deemed to be institutional. Sometimes anything that is ‘economic behavior’ is institutional. Sometimes anything that is ‘dynamic’ instead of ‘static’, or a ‘process’ instead of commodities, or activity instead of feelings, or mass action instead of individual action, or management instead of equilibrium, or control instead of laissez faire, seems to be institutional economics”,
COMMONS, 1931, p. 648.

Seven decades later, WILLIAMSON (2000, p. 595) contends: “*we are still very ignorant about institutions*”. Complexity, according to the same author (id.) is “*chief among the causes of ignorance*”. Despite *ignorance*, a wide range of definitions can be found in the literature:

“[...] a verbal symbol which for want of a better describes a cluster of social usages. It connotes a way of thought or action of some prevalence and permanence, which is

embedded in the habits of a group or the customs of a people”, HAMILTON, 1932, p. 84.

“[...] *the rules of the game in a society or, more formally, [...] the humanly devised constraints that shape human interaction*”, NORTH, 1990, p. 3.

“[...] *durable systems of established and embedded social rules that structure social interactions*”, HODGSON, 2002, p. 113.

To definitional variety correspond important differences among the various schools of thought, as well as a temporal divide configured by the widespread categorisations based on the so-called *old*, *neo*- and *new* institutionalisms. An outcome of this buzzing was that, as put by RUTHERFORD (2001 p. 190), “*many different ‘institutionalisms’ have flourished at various times and places within the social sciences*”. DIMAGGIO and POWELL (1991, p. 1) identify another outcome, arguing that institutionalism “*purportedly represents a distinctive approach to the study of social, economic and political phenomena; yet it is often easier to gain agreement about what it is not than about what it is*”. Though variety in definitional and scholarship branches, there is reasonable unanimity as to the role of institutions (PARTO, 2003). HODGSON (1988, p. 205) argue that they “*play a functional role in providing a basis for decision-making, expectation, and belief*”. NORTH (1991, pp. 97) contends that institutions “*create order and reduce uncertainty in exchange*” and “*provide the incentive structure of an economy*”. JESSOP (2001, p. 1217) sums up the role and the reasons why institutions matter as follows: “[...] *institutions matter because they are seen, inter alia, as the points of crystallization of social forms, as defining the rules and resources of social action, as defining opportunity structures and constraints on behaviour, as shaping the way things are to be done if they are to be done, as path-dependent path-defining complexes of social relations, as the macrostructural matrices of societies and social formations, and so on*”.

The aim here is not to develop a comprehensive account of differences, similarities and disputes between the various strands of institutionalist thought⁶⁹. SCOTT (1995) offers a purposeful synthesis and, simultaneously, provides useful insights that can give support to the overall argument construction.

⁶⁹ For detailed accounts confer, for instance, POWELL and DIMAGGIO (eds.) (1991).

The author (SCOTT, 1995, p. 33) begins with a “*omnibus*” definition of institution: “*institutions consist of cognitive, normative, and regulative structures and activities that provide stability and meaning to social behavior. Institutions are transported by various carriers – cultures, structures, and routines – and they operate at multiple levels of jurisdiction*”. This broad definition, besides the identification of the three institutional pillars (regulative, normative and cognitive), allows for viewing institutions as multifaceted systems which incorporate symbolic systems, namely cognitive constructions and normative rules, as well as regulative processes carried out through and shaping social behaviour. It establishes a connection between meaning systems, monitoring processes and actions, and it acknowledges that, despite constructed and maintained by individual actors, institutions are an impersonal and objective reality which “*ride on various conveyances and operate at multiple levels – from the world system to subunits of organizations*” (id., p. 34). It is under the light of this broad definition that the author tackles controversy. He centres it around three axes: i) the varying emphases on institutional elements, ii) the varying carriers of institutional elements, and iii) the varying levels of institutional elements.

Along the first axis, differences between schools of thought reflect unequal weights attributed to each of the three *pillars* of institutions. The emphasis on the *regulative* dimension gives pre-eminence to rules, rewards and sanctions, or, in the words of HODGSON (2006, p. 8), “*stresses the restraints of the metaphorical prison in which the ‘inmates’ act*”. This accommodates Douglass North’s view of institutions, which equates them to the “*rules of the game in a competitive team sport*” (NORTH, 1990, p. 4). Coercion can thus be regarded as a central ingredient in the regulative view of institutions, as well as expedience, since actors tend to calculate rewards and penalties and (expediently) act in their self-interest by conforming to the prevailing rules (SCOTT, *ibid.*).

The *normative* dimension focuses both values and norms that, though imposing constraints on social behaviour, can simultaneously empower and enable social action. According to SCOTT (*ibid.*), values are conceptions of the preferred or the desirable taken together with the construction of standards to which existing structures or behaviours can be compared and assessed; norms function as a means to specify how things should be done. In the normative context, conformity of actors yields because they are expected, or obliged, to do so, rather than because it serves their individual interests (*ibid.*). In other

words, as suggested by MARCH and OLSEN (1989), the normative dimension encloses the logic of appropriateness, as opposed to the logic of instrumentalism associated with the regulative approach.

The core issues in the *cognitive pillar* are the rules that constitute the nature of reality and the frames of reference through which meaning is made (SCOTT, 1995). Very much in the *Weberian* tradition of looking at social action as action to which subjective meaning is attached, an internalised symbolic representation of the world links the external world of stimuli to the response of the individual organism, and shapes the meanings attributed to objects and actions (SCOTT, id.). In this sense, as the same author contends (ibid., p. 45), “*a cognitive conception of institutions stresses the central role played by the socially mediated construction of a common framework of meaning*”. Rules, in the cognitive dimension, become constitutive, enabling the creation of institutional facts⁷⁰ (SEARLE, 2005). Constitutive rules differ from regulative rules, since, as argued by SEARLE (id. p. 9) they “*not only regulate but rather constitute the very behaviour they regulate, because acting in accordance with a sufficient number of the rules is constitutive of the behavior in question*”. These constitutive rules, according to SCOTT (ibid.), are cognitive elements of foremost importance, and can result in the social construction of both individual and collective actors.

Table 5.1 – Varying emphases on institutional elements

	Regulative	Normative	Cognitive
Basis of compliance	Expedience	Social obligation	Taken for granted
Mechanisms	Coercive	Normative	Mimetic
Logic	Instrumentality	Appropriateness	Orthodoxy
Legitimacy	Legally sanctioned	Morally governed	Culturally supported, conceptually correct

Source: adapted from SCOTT (1995)

The compliance of actors occurs by mimetic processes and routines are taken for granted mechanisms indicating the way things are done. Scripts, rather than norms, emerge as guidelines for sense making and choosing meaningful action. Orthodoxy, in the sense of shared ideas and concepts, becomes the prevailing logic. The sources of legitimacy differ

⁷⁰ SEARLE (2005, pp. 9-10) argues that institutional facts “*only exist in virtue of collective acceptance of something having a certain status, where that status carries functions that cannot be performed without the collective acceptance of the status*”. This collective acceptance, according to the author (id., p. 10), “*is the glue that holds society together*”.

between the three pillars, as legally sanctioned forms prevail in the regulative dimension, as opposed to morally governed and culturally supported in the normative and cognitive dimensions. **Table 5.1** sums up the major differences between the varying emphases on institutional elements.

The second axis of controversy concerns the various types repositories or *carriers* in which institutions are embedded (SCOTT, 1995). Three types are identified: cultures, social structures and routines. *Carriers* based on cultures depend on interpretative structures, codified patterns of meanings and rule systems. Conventions, rules and law are under the spotlight of regulative theories; in the normative approaches, shared values and normative expectations tend to be stressed; cognitive theorists focus on categories of social actors, to which specific ways of acting are associated, and typifications of social settings, which define the ends and shape the means by which interests are determined and pursued (SCOTT, 1987), or, using the words of HEALEY (1997, p. 37), “*the systems of meaning and frames of reference through which people in social situations shape their institutional practices*”.

The social structural carriers, following SCOTT (1995, pp. 53), “*rely on patterned expectations connected to networks of social positions: role systems*”. Social structures empower and, simultaneously, are reproduced and transformed by the behaviour of actors. Similar structural forms, i.e. structural isomorphism, or similar relations among forms, i.e. structural equivalence, occur when structures are widely shared across many organisations. Specific structural forms may be unique to particular organisations, embodying localised belief systems (id.). Structural isomorphism is stressed by the cognitive approaches, as “*cognitive typifications are often coded into organisational structures as differentiated departments and roles*” (ibid., p. 54). The normative and regulative *pillars* tend to focus on governance systems. The latter emphasises coercive power, the former the authority features of structures.

Habits, - the mechanism by which dispositions to engage in previously adopted or acquired rule-like behaviour are ensured (HODGSON, 2006) -, and routines, - a collection of procedures which, taken together, lead to predictable and specifiable outcomes (NELSON, 2002a) -, also carry institutional elements. Though shared by the three pillars, routines as *carriers*, in the regulative theorists, assume the form of protocols and standards, whereas

normative approaches tend to focus on conformity and the performance of duty. In the cognitive dimension, the programmatic nature of routines (id.) is emphasised.

Table 5.2 synthesises the different theoretical approaches to the *carriers* of institutional elements.

Table 5.2 – Varying carriers of institutional elements

	Regulative	Normative	Cognitive
Cultures	Rules, laws	Values, expectations	Categories, typifications
Social structures	Governance systems, power systems	Regimes, authority systems	Structural isomorphism, identities
Routines	Protocols, standard procedures	Conformity, duty	Performance programs, scripts

Source: adapted from SCOTT (1995)

The third axis of controversy concerns different *foci* of institutional analysis, which, according to SCOTT (1995) can be turned operative by the range of jurisdiction of the institutional form under study. Macro and micro phenomena, different spatial and temporal dimensions, or the number of people affected, establish the varying levels of analysis. The same author (id.) identifies the world system, societal, organisational field, organisational population, organisation, and organisational system levels of analysis.

The overview on institutionalism outlined above can help in bringing robustness to the analytical link made between the dynamic processes of institutional capacity building and the frame of reference based on the concepts of regional system of innovation and learning region. Both the systems of innovation and the learning region are institutional conceptions par excellence (NELSON, 2002a, 2002b). Collective orders, microconstitutional regulation mechanisms, embeddedness, or interactive learning networks, being central elements of regional systems of innovation and learning regions, imply *per se* an institutional approach. In addition, the evolutionary foundations of the concepts highlight the central role played in innovation and learning by institutions such as cognitive routines, search heuristics, exemplars, technological paradigms and technological communities (GEELS, 2004). The instituted character of innovation systems is also well evidenced in the set of conditions suggested by COOKE (2001) for judging the systemic potential of a given region. Bearing in mind those conditions, one can even argue that the institutional basis shaping a high systemic potential region would be predominantly cognitive (e.g. associative-consensual

dimension), though both the normative (e.g. role expectations) and regulative (e.g. intellectual property rights) *pillars* cannot be discarded.

Although this somehow *static* discussion of the institutional construction of the regional system of innovation and the learning region, could be carried further on, it seems more productive to tackle two additional and pervasive questions that remain unanswered. The first one stems from the components of which the regional system is made, as it comprises not only the kind of institutions conformable with the three institutional *pillars* referred to above, but also, as NORTH (1990, p. 361) would suggest, “*groups of individuals bound together by some common purpose to achieve certain objectives*”, or, in the words of HODGSON (2006, p. 8), “*special institutions that involve a) criteria to establish their boundaries and to distinguish their members from non-members, b) principles of sovereignty concerning who is in charge, and c) chains of command delineating responsibilities*”, i.e. what is generally termed as organisations. The second bears in mind that, as asserted before, regional systems are able to move both up and downwards the higher and lower systemic scale, which conveys the need to consider the dimension of institutional change, otherwise intrinsic to the possibility of building up the institutional capacities of a given societal context.

The word institution, both in lay and scholar terms, is often used in ways that shelter rules, habits, conventions, routines and other types of “*real*” institutions, together with organisations. To what extent can an organisation be an institution? The two definitions of organisation gave above suggest that there is not a common understanding on the subject. NORTH (1990), for instance, makes explicit a clear-cut divide between institutions and organisations: institutions are the rules of the game and organisations are the players. In his words (id., p. 5): “*Conceptually, what must be clearly differentiated are the rules from the players. The purpose of the rules is to define the way the game is played. But the objective of the team within that set of rules is to win the game*”. HODGSON (2002, p. 113, emphasis added), conversely argues that “*language, money, law, systems of weights and measures, traffic conventions, table manners, **firms (and other organisations)** are all institutions*”. Extracts from correspondence between Douglass North and Geoffrey Hodgson (HODGSON, 2006), however, indicate the divide has been blurred. Hodgson presses North to answer the questions “*a) When you say ‘organizations’ are the players [...] you mean to say a) for the purposes of analysis of the socio-economic system as a whole it is legitimate to treat*

organizations as if they are players? [...] a) Would you accept a definition of organization that accepted that organizations themselves had internal players and systems of rules, and hence organizations were a special type of institution?"* (HODGSON, 2006, p. 20), adding that *"if your answers [...] were in the affirmative then I would be in complete agreement with you"* (id.). North replies: *"[...] I agree that a) and a*) are exactly what I have in mind, so we are in complete agreement"* (ibid.).

Despite blurred the definitional divide, when paying attention to systemic innovation and learning, following EDQUIST and JOHNSON (1997), it is important to make a distinction between the roles played by institutions and organisations and acknowledge the relevant complex two-way relationships of mutual embeddedness existing between them. Keeping it simple, a possible distinction can be made between concrete things, i.e. organisations, and things that pattern interactive behaviour, such as norms, habits, routines, conventions, laws, technical standards, etc. (id.), or, as in COOKE and MORGAN (1998), *hard* and *soft* institutions.

At the level of *hard* institutions, or organisations, operating in the regional system of innovation, a large diversity of functions and roles can be summoned. A possible division is to consider the organisations defining the production infrastructure (e.g. firms, entrepreneurial associations, chamber of commerce), the knowledge infrastructure (e.g. higher education institutes, schools, training centres, R&D laboratories), and the innovation enabling infrastructures (e.g. government agencies, regional development agencies, financial organisations). There are also hybrid types of organisations, such as, for instance, science and technology parks, where production and knowledge generation and diffusion usually overlap. In addition, each organisational category can be divided into different functional realms, as, for instance, the distinction between knowledge production (e.g. universities), knowledge distribution (e.g. science parks), and knowledge regulation organisations (e.g. patent offices and standard setting committees) (EDQUIST and JOHNSON, id.). The role of *hard* institutions in the regional system of innovation can be summed up by means of regarding the organisational structure as the main vehicle for the introduction of novelties in the system, or, in similar words, the main carriers of innovation. Bearing in mind the argument underscoring the social nature of innovation, and drawing on GERTLER and WOLFE (2004), the key issue for organisations within a regional system of innovation is how to pool and structure knowledge and intelligence in social ways.

This perspective stresses the collective dimension of regional systems of innovation and makes networks to emerge as cross-organisational structures of utmost importance in interactive learning processes. The scope of networks, in this sense, goes beyond the meaning generally given by social capital mainstream literature, namely the assumption of selfish individuals being stimulated to cooperate, in the pursuit of self-interest. According to the enlarged view on networking, cooperation emerges out of mutual interests, and the behaviour of participants is based on standards that cannot be determined by individuals alone (POWELL, 1990).

Taking the collective and interactive nature of the regional system of innovation, *soft* institutions function as “*sets of common habits, routines, established practices, rules, or laws that regulate the relations and interactions between individuals and groups*” (EDQUIST and JOHNSON, 1997, p. 46). In other words, *soft* institutions play the functional role of *guideposts* and incentive structures, providing, as HODGSON (1988) would argue, the basis for decision-making, expectation, and belief, and structuring the interactive innovation endeavour, both through regulation and influence. This role matches the three basic functions of institutions in a system of innovation identified by EDQUIST and JOHNSON (id.): the reduction of uncertainty through information provision; the management of conflicts and cooperation; and the provision of incentives. These three roles of *soft* institutions enlist features of the regulative, normative and cognitive dimensions as described above (SCOTT, 1995).

The relationships between *hard* and *soft* institutions can be simply addressed by the argument according to which organisations are embedded in (*soft*) institutions (COOKE et al, 1998), which is similar to view the former as strongly influenced, coloured, and shaped by the latter (EDQUIST and JOHNSON, id.). EDQUIST and JOHNSON (ibid., p. 59) provide an example: “[...] *there are laws, rules, and norms, which affect the operation of banks and other financing organizations. These influence the repayment periods for loans – which in turn may have a strong impact on the incentives, risks, and uncertainty related to innovation. Similar ‘rules of the game’ also influence the operation of both private firms and public organizations*”. But, (*soft*) institutions are also embedded in organisations, which become “*hosts for specific institutions*” (ibid.), as exemplified again by EDQUIST and JOHNSON (ibid.): “*Certain established practices, for example, in bookkeeping or concerning the relations between workers and managers, are only relevant in the*

operation of firms. A lot of institutions develop in organizations and are only used in or in connection with organizations”.

Taking the mutual embeddedness of institutions and organisations, one can argue that the intensity and quality of the role played by such organisations as universities in regional development, largely depends on the shaping, encouraging, or constraining *general* laws, rules and norms, as well as on *soft* institutions, both formal and informal, *specific* to the academic organisational settings. An additional insight involving the mutual embeddedness of organisations and institutions, particularly rules, and universities’ regional engagement can be drawn if recalled forth the Hodgson-North debate. NORTH (1990) defines organisations as groups of individuals who pursued together a given common purpose, which, according to HODGSON (2006), may not be always the case. The issue here is to discuss the extent to which regional engagement, similarly to what happens with teaching and research, can be regarded as a *common purpose* of a diversified group of individuals, i.e. the academics, often pursuing, and acting accordingly, a differentiated range of individual interests. HODGSON (id.) refers to internal mechanisms by which organisations coerce or persuade members to act together to some degree and stresses the need for rules of communication, membership, or sovereignty, or, in other words, a system of organisational embedded rules. In the case of universities, this is at least questionable, namely when the academic freedom *ethos* is brought forward. This discussion is recaptured elsewhere in this dissertation (see Chapter 7).

The mutual embeddedness of *hard* and *soft* institutions helps to introduce the question of institutional change. This is reflected in a variety of ways by the *institutionalist* literature, where four major dimensions of institutional change are identified (VAN DE VEN and HARGRAVE, 2004): institutional design, institutional adaptation, institutional diffusion and collective action. Briefly, and taking VAN DE VEN and HARGRAVE’S (id.) work as reference:

- the *institutional design* approach focuses on the roles and actions that individual actors undertake to create or change institutional arrangements in order to solve problems or correct an injustice. This aim is achieved through a dialectical process of creating working rules, i.e., the new rules of game that enable and constrain actors by changing their rights, duties, or roles;

- the dimension of *institutional adaptation* deals with the ways organisations, proactively or reactively, adapt to their institutional environment, through coercive, normative, and mimetic processes of adaptation and change. The outcome of change is the adoption of isomorphic institutional arrangements;
- the *institutional diffusion* approach attempts to explain how do institutional arrangements reproduce, diffuse or decline in a population or organisational field. Change stems from competition for scarce resources which forces imitation and conformation to legitimate institutional practices, and follows evolutionary processes of variation, selection and retention of institutional forms. Institutionalisation or deinstitutionalisation are the possible outcomes of change;
- *collective action* based theories emphasise the way institutions emerge to facilitate or constrain social movements or technological innovations. Interorganisational networks made of individuals embedded in collective processes of institutional change, engage in framing and mobilising structures and opportunities for institutional reform. The results can be new or changed working rules and institutional innovations.

As VAN DE VEN and HARGRAVE (2004) acknowledge, the process of institutional change is more complicated than any one of these four theoretical perspectives, mainly because it is not a unitary concept, i.e. it can assume a variety of forms difficult to capture under one-eyed approaches. In a more integrative stance, the problem of institutional change can be addressed by grasping the more or less disruptive effects of the interdependence and interaction between institutions and organisations.

Institutional change can give rise to brand new institutions or organisations and/or organisational forms. MANTZAVINOS et al (2003) argue that an effect of institutions concerns the provision of incentives to create organisations. For instance, institutionalised beliefs that specify new or renewed means-ends relations in a rule-like fashion (SCOTT, 1995) can originate new organisations or, at least, new organisational forms. An example of the former is the devolution of power, by national legal initiative, to sub-national territorial units, impelling the creation of new government organisations at the regional level. NELSON (2002a) draws on the late 19th century and first half of the 20th century

history of manufacturing industry – namely the rise of mass production - to illustrate how institutions can alter organisational arrangements. The author (id.) refers to the emergence of new modes of organising businesses resulting from the reshaped shared beliefs of how the economy worked. PELIKAN (2003, p. 242), drawing on the same history, talks about the appearance of “*new rules of the game within firms – e.g., dividing them into divisions*”. Conversely, some organisations are directly responsible for the creation of institutions (EDQUIST and JOHNSON, 1997). This is the case of standard-setting organisations, which, by formulating or determining new technical standards, are in fact creating new institutions (id.). The same can be said about new organisational forms. Back to PELIKAN (id.), the specification of rights and obligations that the different divisions into which large firms were split had *vis-à-vis* each other and *vis-à-vis* the headquarters, can be regarded as the emergence of new institutional settings generated by changing organisational arrangements. Networks, a central organisational form in the associational paradigm, provide an additional illustration. As AXELROD (1984) has shown, cooperation between individuals becomes stable only if there is a sufficiently large *shadow of the future*, i.e. a high probability of future association that makes defection and unprofitable strategy. Accordingly, repeated interaction between individuals makes them more willing to cooperate in the future and possibly more keen to punish those who do not engage in cooperation (id.). In this sense, one can talk about the emergence of a new institutional arrangement. Technological advancement can also be regarded as inducing institutional evolution. NEALE (1987, p. 1200), simply but purposefully, provides an illustration of how new technologies originate new institutions: “*Patterns of courtship changed with the introduction of the automobile. The criteria of sexual morality changed with the advent of effective contraception. The nature of the corporation changed with the advent of railway*”.

However, institutions are more likely to follow slower evolutionary paths of change, as suggested by NORTH (1990, p. 6) - “*institutions typically change incrementally rather than in discontinuous fashion*” - or by NEALE (id.) who, similarly, talks about institutional change as occurring “*within the context of existing rules and folkviews, adapting some rules and folkviews and creating some new ones*”. Accordingly, institutional change is not a complete transformation. It is rather a continuum and a rearrangement of existing patterns or a recombination of existing factors (PARTO, 2003). This view is consistent with the evolutionary concept of path-dependency, as well as with the notion of institutions as

something that accrues stability to a given socio-economic system. In an evolutionary vein, institutional change is a complex phenomenon depending on specific mechanisms of variation, selection, and retention in specific spatial and temporal contexts (JESSOP, 2001).

The discussion on institutional change gives strength to the perception that institutions and organisations co-evolve (SCOTT, 1995). This suggests that there is a dual relationship between structure and patterns of action (NELSON, 2002a), and appeals for taking stock of the *theory of structuration* (GIDDENS, 1979, 1984). The theory, in short, states that social structure and human agency, rather than two separate constructs, are affected by feedback loops. This is what GIDDENS (1984) calls duality of structure, as opposed to a dualism structure-agency. Agency determines social structure and, in turn, structure conditions the development of agency. Structure, according to GIDDENS (id., p. 377), consists of “*rules and resources recursively implicated in the reproduction of social systems*”. Rules are taken as “*generalizable procedures applied in the enactment/reproduction of social life*” (ibid., p. 21) and resources as “*the media whereby transformative capacity is employed as power in the routine course of social interaction*” (ibid., 1979, p. 92). A distinction is made between authoritative resources, stemming from the co-ordination of the activity of human agents, and allocative resources, deriving from control of material products or of aspects of the material world (ibid.). Routine-like action, undertaken day after day, according to GIDDENS (ibid.), is the material grounding of the recursive nature of social life, or, in other words, the basis on which knowledgeable agents, acting reflexively, constantly recreate the structured properties of social activity out of the resources which constitute them.

In the words of GIDDENS (ibid., p. 3), “*continuity of practices presumes reflexivity, but reflexivity in turn is possible only because of the continuity of practices that makes them distinctively ‘the same’ across time and space*”. Reflexivity is thus understood “*not merely as ‘self-consciousness’ but as the monitored character of the ongoing flow of social life*” (ibid.). This mirrors the previously addressed statement of COOKE and MORGAN (1998), according to which reflexivity is a crucial dimension of the regional system of innovation learning capacity. It also touches SABEL’s (1994b) learning-by-monitoring approach and the related claim for the need to establish discursive institutions where agents engage in action-guiding discussions. It reflects as well the important argument according to which, as put by HOLLINGSWORTH (2000, pp. 597-598), “*the interaction among actors and their institutional environment is a multi-faceted process and that successful actors over time*

must not simply respond to the institutional environment in which they are embedded but must modify their environment in order to maintain competitive advantages". COOKE (1997a) calls forth the notion of *institutional reflexivity* and suggests a higher dimension of learning, the one of learning-by-learning, "*where the self-monitoring of the learning process already engaged in is the stimulus for further knowledge-enhancement*" (id., p. 289). The same author (ibid., pp. 299-300) adds: "*successful socio-economic spaces are indeed characterised by institutional reflexivity which is built on a learning propensity derived from the formal application of discursive intelligence to the socio-economic problems of the day*". In this sense, learning, or more accurately, learning-by-learning, might be regarded as a pervasive factor of positive institutional change. Trust, as a disposition that can be learned and strengthened through repeated interaction (COOKE and MORGAN, 1998), is more likely to be nourished in institutional environments endowed with higher propensity to engage in the collective processes that ground learning-by-learning and thus institutional reflexivity.

Where do regional systems of innovation stand in this framework of institutional change? First, the framework establishes a bridge linking the regional system of innovation and the learning region concepts, as the latter casts institutional reflexivity as its foundational stone. Second, it sketches out clearer the possibility of moving a regional system of innovation from lower to higher levels of systemic potential, as system's components and features, as well as the quality and intensity of their relationships, change over time, subject to the transformative (internal and external) forces arising from the duality of structures. Taking an evolutionary vein, those systems can develop institutional and organisational devices in order to secure or switch their inherited path-dependencies (COOKE and MORGAN, 1998), by enhancing the regional capabilities to learn and un-learn. Third, it sheds light over the *innovation problem* affecting LFRs, where institutional change is a major challenge faced by their generally weak systems of innovation. As HOLLINGSWORTH (2000, p. 626) much to the purpose reminds: "*It is highly unlikely that a society will develop a new style of innovativeness without changing its institutional structure*".

Change, hitherto, has been understood as affecting positively socio-economic systems. Is this always the case? COOKE and MORGAN (id.) help to grasp a negative answer. They (ibid., p. 72) contend: "*disruption to parties or totalities of some of the network relations*

embedded in the institutional milieu can, in principle, result in either positive effects where new opportunities are seized or rapid system-degradation". Accordingly, institutional change can move a system from lower to higher levels of systemic order, but also give rise to the erosion of the system's institutional capabilities. A well-known eroding situation is the problem of institutional lock-in. As COOKE and MORGAN (1998) explain, high-trust, intensely networked, and relatively closed systems develop institutional features embedded in forms such as institutional memory, insider-outsider practices and obligations, tending to privilege consensus and denigrate dissonance. According to the authors (COOKE and MORGAN, id., p. 75), "*the absence of dissent delays 'creative destruction' processes and creates a barrier to innovation*". The persistence of an over-enclosed system of innovation in which microconstitutional regulation is too exclusive and localised learning is over-emphasised (ibid.) may lead to a regional lock-in situation. This relates to GRANOVETTER's (1973) argument about the weakness of strong ties. In order to locking-out, the regional innovation system should develop processes of unlearning (MASKELL and MALMBERG, 1999), often involving "*the disintegration and removal of formerly important institutions which now hinder further development* (id., p. 179). Here, the claim about the relevance of institutional reflexivity gains further strength...

The strong dependence of regional innovation and socio-economic development on the institutional makeup is often captured under the multifaceted notion of *institutional thickness*, defined as "*the combination of factors including inter-institutional interaction and synergy, collective representation by many bodies, a common industrial purpose, and shared cultural norms and values*" (AMIN and THRIFT, 1994, p. 15). The proponents of the concept identify four factors contributing towards the construction of institutional thickness (id.):

- First, the existence of a plethora of institutions of different kinds, which provide the basis for the growth of particular local practices and collective representations;
- Second, the interaction between institutions, which should actively engage with and be conscious of each other, in order to display high levels of contact, cooperation, and information interchange;

- Third, the development, stemming from high levels of interaction, of sharply defined structures of domination and/or patterns of coalition, which give rise to a collective representation of interests, the socialisation of costs and the controlling of rogue behaviour;
- Fourth, the development amongst regional agents of a mutual awareness that they are participating in a common enterprise.

The combination of these four factors produce, in the most favourable cases, six outcomes (AMIN and THRIFT, 1994):

- Institutional persistence, or reproduction of regional institutions;
- The construction and deepening of an archive of commonly held knowledge, both codified and tacit;
- Institutional flexibility, fostering institutional learning and change;
- High innovative capacity, as a common property not only of individual organisations but also of a region;
- The extension of trust and reciprocity;
- The consolidation of a sense of inclusiveness.

The same authors (id., p. 15) state that institutional thickness “*establishes legitimacy and nourishes relations of trust, [...], continues to stimulate entrepreneurship and consolidates the local embeddedness of industry*”. More importantly, they (ibid.) stress that “*what is of most significance here is not the presence of institutions per se, but rather the processes of institutionalization, that is the institutionalizing processes that both underpin and stimulate a diffused entrepreneurship [...]*”.

However, as GRABHER (1993) has shown in his work on the Ruhr region, institutionally thick regions can enter a situation of institutional lock-in, making change difficult to occur since the regional institutional set-up reflects the past dominance of industries now declining. Drawing on this insight, HUDSON (1999, 68) avers: “*this is a salutary reminder that institutional thickness per se is no guarantee of successful regional economic adaptation and innovation as it can constrain rather than facilitate processes of collective learning and change*”. Hence, though important, to institutional thickness an emphasis on the strategic dimension and the creation of synergies should be added

(HASSINK and LAGENDIJK, 2001). Arguably, rather than just thickness, the issue at stake is the development of joint capacities embedded in institutional configurations (id.), and nourished within institutional coherent environments through which shared problems can be collectively addressed (HEALEY, 1997). The problem of institutional change becomes a problem of building up regional institutional capacities, seen as an open governance process, influenced by inner and outer transformative pressures, that forges new or renewed collaborative links among the system's components and improves the conditions for reflexive learning, through which new knowledge is tapped into, acquired and disseminated in order to improve the regional system's capacity for innovative developmental designs and actions.

5.4

Regional institutional capacity in perspective

What is *institutional capacity building* all about? *Institutional* is meant to enclose both *soft* and *hard* institutions, and, concomitantly, the recursive relationships between structure and agency that *build up* new institutions and institutional arrangements, as tackled above. But, in order to ensure a full picture of how the process of institutional capacity building is understood, a prior step, directed at specifying the meaning of *capacity*, is deemed as necessary.

This step is not exempt from problems, since “*it is unlikely that a consensus definition of ‘capacity’ will ever be reached*” (HONADLE, 1981, p. 575). The term is mostly used to specify the objectives guiding global agencies, such as, for instance, the United Nations and the World Bank, in their activities aimed at assisting developing countries in the improvement of the respective public administrations ability to deal with the challenges of development in partnership with private organisations⁷¹ (LUSTHAUS et al, 1999). Another meaning widely used focuses on the realm of the enterprise and highlights the individual capabilities of firms (e.g. labour force skills, entrepreneurial capacity) to maintain or reinforce their competitive capacity (DE MAGALHÃES et al, 2002). Obviously, these meanings of capacity do not offer a consistent definitional ground for the purposes pursued in this dissertation. A third common use, - community capacity - brings the term closer to

⁷¹ For a full account of the meanings of *capacity* taken in this sense, confer LUSTHAUS et al (1999).

those purposes, but the implied *geography* generally restricts the approach to the neighbourhood level (CHASKIN et al, 2001). Nevertheless, the literature on community capacity offers useful insights to carry on the discussion. CHASKIN et al (id., p. 7) aver that the word capacity “includes the ideas of both **containing** (holding, storing) and **ability** (of mind, of action)”. This implies that a community with capacity can act in particular ways and has specific faculties or powers to do certain things that promote or sustain the well-being of the community and its components (ibid.): “Community capacity, in a general sense, is what makes communities ‘work’. It is what makes well-functioning communities function well” (ibid.). Capacity resides in the community’s individuals, formal organisations, and the networks of relations tying them to each other and to the broader systems of which they are a part (CHASKIN, 2001). Taken in this sense, the meaning of capacity approximates the concept of governance capacity, which seems to be the most appropriate to be entrenched by the whole conceptual framework of institutional capacity building. INNES and BOOHER (2003, p. 7) provide the key terms: “A governance system with capacity can learn, experiment, and adapt creatively to threats and opportunities. [...] A society with capacity is self-organizing and works in real time through networked, shared, and distributed intelligence”.

As in HEALEY et al (1999a), institutional capacity is addressed here by focussing on the webs of relations underpinning collective learning processes and the design and implementation of regional development policies which interlink government organisations, the private sector and other relevant regional agents involved in interactive governance, that is, in collective action. A possible way of conceptualising institutional capacity, bearing in mind the features of interactive governance, is to combine two lines of thought within planning theory, namely the collaborative approaches to planning (HEALEY, 1997) and the theory of communicative planning (INNES et al, 1994). The idea of collaborative planning was inspired by Healey’s perception of planning as an interactive process and as “a governance activity occurring in complex and dynamic institutional environments, shaped by wider economic, social and environmental forces that structure, but do not determine, specific interactions” (HEALEY, 2003, p. 104). The author (1997, p. 49), elsewhere, contends: “how we act in structured situations not only ‘makes the difference’; our actions constitute (instantiate) the structural forces. We make structural forces, as we are shaped by them. So we ‘have power’ and, if sufficiently aware of the

structuring constraints bearing in on us, can work to make changes by changing the rules, changing the flow of resources, and, most significantly, by changing the way we think about things". These two quotes, taken together, acknowledge the core issues addressed in Giddens's *structuration theory*, namely the duality of structure, as well as the relevance of reflexivity, which, if consciously exerted upon "*our assumptions and modes of thinking, on our cultural referents*" (HEALEY, 1997, p. 49), carries transformative power⁷².

Communicative planning theory rests on the idea that in order to coordinate development processes, involved agents should engage in consensus-building processes, which, as INNES (2004, p. 16) argues, are called "*for where uncertainty is rampant, where no one has enough power to produce results working alone, where stakeholders are engaged in self-defeating and paralyzing conflict, where there are gaps in understanding and in discourses among players, where the solutions to well-recognized problems have not been developed or where old solutions no longer work*". Consensus-building aims at ensuring what HABERMAS (1984) would call communicative rationality. Following INNES (1996), communicatively rational decisions are those that come about because there are good reasons for them, rather than because of the political or economic power of particular stakeholders. According to the same author (id.), *emancipatory knowledge* becomes central to be truly communicatively rational, as it consists of "*knowledge of the deeper reality hidden behind popular myths, scientific theories, and the arguments and rationalizations in common use*" (ibid., p. 461).

The conceptualisation of institutional capacity, under the framework provided by the combination of structuring dynamics and agency invention with the transformation inducing processes of social learning and consensus-building, stands against the perspectives taking it merely as a stock that, because bound by history, it is hardly changeable. Institutional capacity is regarded as continuously evolving, that is, it stresses the dynamics of emergence rather than static conditions (GUALINI, 2002). It focuses on

⁷² HEALEY (1997) also draws heavily on the *Habermasian* communicative ethics to place collaborative planning as a tool ensuring an inclusive approach to the development of interactions, through social mobilisation based on the cultivation of the capacity for collaborative, multi-cultural communication and learning and fostered by the building up of relations of understanding and trust. In short, communicative ethics (HABERMAS, 1984) are based on the concept of communicative action, which refers to "*the interaction of at least two subjects capable of speech and action who establish interpersonal relations (whether by verbal or extra-verbal means)*", (id., p. 95). HABERMAS (ibid.) argues that "*the actors seek to reach an understanding about the action situation and their plans of action in order to coordinate their actions by way of agreement*". The central concept of interpretation relates, in the first instance, to negotiating definitions of the situation that admit consensus. This consensus rests on the intersubjective recognition of criticisable claims, which means that those who communicate are capable of mutual criticism.

cognition and learning processes that create the institutional conditions for building structures of opportunity for collective action and developing trajectories of institutional change (id.).

As argued before, regional systems of innovation are not static entities. Recall that both internal and external institutional changing forces can either move a regional system from lower to higher levels of systemic order or erode its capabilities. The movement upward the systemic scale arguably can be equated to a process of institutional capacity building. In turn, the learning region is such a region in which processes of institutional capacity building are on the move. Accordingly, accepting that the qualities of a regional system of innovation depend on the levels of trustful systemic cooperation between a multiplicity of agents, one can argue that processes of social learning and mobilisation and the efforts to develop commonly agreed strategies for the promotion of regional innovation and development, - i.e., the research *foci* of collaborative planning and communicative planning theory -, become central.

These processes and efforts contribute to deploy in the interactive governance dynamics that nurture the collective order binding regional systems of innovation, the *institutional capital* (INNES et al, 1994; INNES and BOOHER, 2003; HEALEY, 1998; HEALEY et al, 1999a; DE MAGALHÃES et al, 2002), whose *stock* and *accumulation* determine their systemic qualities. Institutional capital results from the development of three different types of capital - *intellectual capital*, *social capital* and *political capital*-, as described by INNES *et al* (id.). The three dimensions above, according to INNES et al (ibid.) can be thought of as *capital* because they incorporate shared value that can grow as it is used. The authors suggest that these types of capital live on among participants even after the group dismantles, helping to institutionalise coordinated action in the future. In their formulation (ibid., p. 47), intellectual capital assumes the form of “*shared and agreed-upon facts and understandings*” and “*provides a common basis for discussion and moves the players towards agreement on policy issues*”. Social capital takes the form of “*trust, norms of behaviour, and networks of communication*” and “*creates the potential for serious discussion to take place among otherwise conflicting stakeholders*”. Political capital, viewed as “*alliances and agreements on proposals that provide mutual benefits*”, opens the “*possibility that proposals will be adopted and implemented in the political arena*”. This perspective approximates the sound definition of (community) capacity given by

CHASKIN (2001, p. 295): “*Community capacity is the interaction of human capital, organizational resources, and social capital existing within a given community that can be leveraged to solve collective problems and improve or maintain the well being of a given community. It may operate through informal social processes and/or organized effort*”.

Hence institutional capital assumes the role of a conceptual device linking the three forms of capital feeding social interaction (DE MAGALHÃES *et al*, 2002) and purposeful collective action. Following HEALEY *et al* (1999a), the typology is recast as *knowledge resources (K)*, *relational resources (R)* and *mobilisation capacity (M)*, the first two leading to the third. The reach of this modification goes beyond the mere issue of nomenclature. In fact, it allows for extending the meaning of each dimension, deemed necessary to give coherence and robustness to the conjugation of communicative and collaborative planning theories, and, more importantly, to set up the framework against which the role of universities in institutional capacity building processes can be studied.

Accordingly, knowledge resources embrace not only the knowledge produced by discussions aimed at reaching consensual decisions, but also the knowledge generated by other learning processes, such as, for instance, those put in motion within (and between) the spaces of scientific inquiry, education, technical development, expertise pools or policy making. In this sense, knowledge resources define, qualify and bring legitimacy to shared development trajectories, and forge the capacity for action. In the words of HEALEY (1997, p. 29), it is a matter of recognising that “*the development and communication of knowledge and reasoning take many forms, from rational systematic analysis, to storytelling, and expressive statements, in words, pictures or sound*”. There is a social architecture in which relational resources based on trust, norms and networks, besides avoiding conflicts and individual interest advocacy, bear the necessary connection between the production, diffusion and utilisation of knowledge, or, back to HIRSCHMAN (1958), call forth and enlist knowledge for development purposes. The more robust this social architecture, the more effective, efficient and inclusive the endeavour to strategically acknowledge the challenges, establish priorities and select targets, access development resources, outline adequate divisions of labour, and co-ordinate development action. It is within this social architecture that knowledge and relational resources are mobilised, enabling regional system’s components to flexibly respond to new circumstances (HEALEY, 1998). Mobilisation capacity goes beyond the problem of setting commonly agreed development

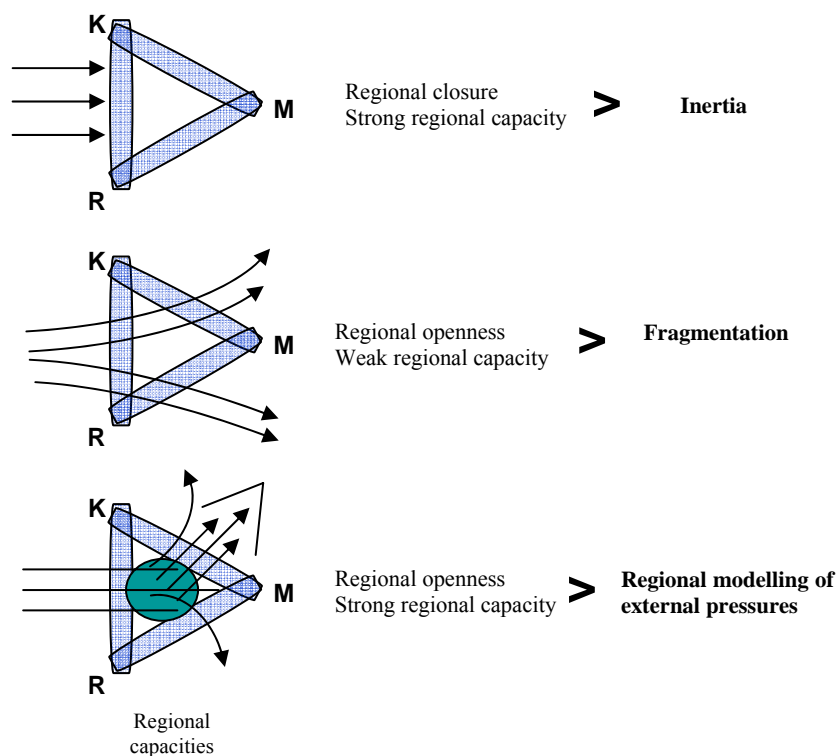
agendas. It embraces the distributed power to influence, act and make the difference (HEALEY et al, 1999a), or, similarly, to give concrete expression to the meaning of associative governance.

It is though doubtful that a regional system of innovation, by itself, based on a grassroots approach, might gather and effectively mesh the resources that nurture its institutional qualities. As MOULAERT and SEKIA (1999, p. 32) remind “*it will not suffice to count on the goodwill and social energy of the concerned groups of people*”. The authors (id., pp. 32-33) argue for the need “*to build supportive networks, involving partners in other communities, regulatory agents at higher spatial scales or political levels, countervailing organisations such as Unions, national and global lobbies, national and global governance institutions, etc.*”. Scale and power factors do matter and should be taken into account when attempting to shed light on the processes of institutional capacity building. “*Otherwise sandcastles will be the result*” (ibid., p.33)...

An additional point acknowledges that the generation, level of access and qualities of the constituents of institutional capacity, and thus the innovation systemic potential of a region, depends on, to a large extent, the region’s position towards external pressures. There is thus a global-local nexus moulding regional institutional capacities. As in HEALEY et al (1999a), three alternative scenarios encapsulate the global-local nexus, combining two pairs of regional innovation systems’ attributes (closure/openness, weak/strong capacity), each one conducing to different outputs when facing external (global) pressures (**Figure 5.2**).

The first scenario can be equated to a regional system of innovation that, though evolving in an institutionally thick territory, suffers from institutional inertia, or, in other words, is trapped in a lock-in situation. The second relates to a system of innovation that, though open to external pressures, does not possess the capacity to enlist for its advantage the externally-driven flow of resources, giving rise to a fragmented system. Finally, the third scenario portrays a regional innovation system tending to reach high levels of systemic potential, because endowed with the internal capacity to engage in reflexivity-driven collective trajectories that makes to flourish favourable sets of infrastructural and superstructural conditions for innovation, by using local assets to embed external inputs, and tapping external sources to stimulate the system (NAUWELAERS and MORGAN, 1999).

Figure 5.2 – External pressures and regional institutional capacities



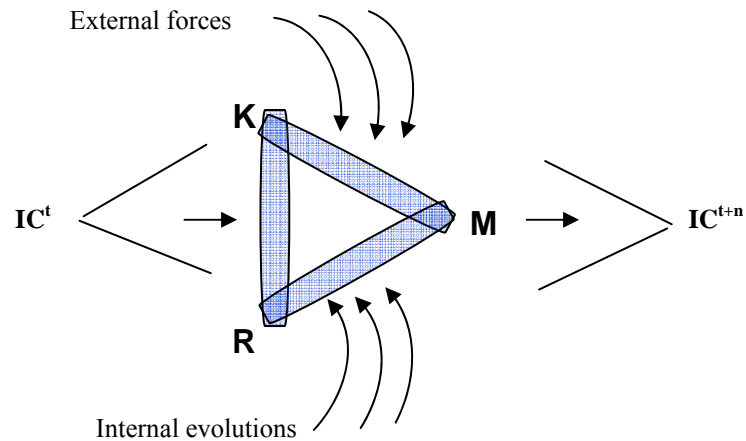
Source: adapted from HEALEY *et al* (1999a)

In the line of thought of HEALEY *et al* (1999a), as illustrated in **Figure 5.3**, institutional capacity is built up through the way external forces and local traditions and capabilities mesh together in the flow of knowledge generation and dissemination, social networks and bonding values, and the fashion in which they are translated into pro-active efforts to organise strategically to shape and change the dynamics in which individuals and organisations in places find themselves.

This representation of institutional capacity deployment and development acknowledges the conditions, as well as constraints, to foster changing processes within a regional system of innovation. It also conveys both the generative and enabling dimensions of institutional capacity (GUALINI, 2002), that is, it explores both the processes leading to mobilisation and commitment, the contingent unity of meanings and the formation of collective action, and the way institutional configurations affect the production of and access to resources that can be utilised when endeavouring in collective action. In addition,

it emphasises the complex interactions between external and internal structuring driving forces and the active work of agency that shape the regional system of innovation, underpinning the invention of “*ways of going on*” (HEALEY et al, 1999a, p. 124).

Figure 5.3 – Developing regional institutional capacity



Source: HEALEY *et al* (1999a)

The way institutional capacity building is represented in **Figure 5.3** shelters the structuring principles of the associational paradigm, namely in its push towards the need to empower a wide array of stakeholders, lubricating mechanisms of institutional learning that ground the combination between public sector strategic guidance with decentralised, transparent and consultative, thus associative, governance. Taking this perspective, the regional system of innovation is itself subject to the process of learning, becoming a learning region (MORGAN, 1997a; OUGHTON et al, 2002). The development of the collective intelligence (LANDABASO et al, 2003) necessary to spark the process of becoming an advanced learning region, that is to lever the regional system towards the higher systemic levels, finds its ground in the way knowledge resources are accumulated, applied and used, and in the qualities of relational resources, assumed as learning vehicles (id.). Hence, the collective intelligence of a regional system of innovation determines the level of stakeholder engagement in policy-driven action (HASSINK and LAGENDIJK, 2001), that is the system’s mobilisation potential, and, inherently, the build up of regional institutional capacity.

Making the case for LFRs, one can anticipate the huge challenges faced by that type of regions, generally characterised by their fragile institutional fabric (RODRIGUES et al, 2001). The need to change and build up LFRs' institutional capacity is as large as the difficulties to shift ways of thinking, governing and acting, i.e. of doing it. The easier paths of capitulation, *laissez-faire*, or cathedrals in the desert deployment gave and, if holding ground, will give rise to the maintenance or even widening of development disparities. Different development trajectories have to be sketched out and coloured. Universities operating in LFRs, using HEALEY's (1998) metaphor, arguably have a *stake* in what is going on. The *value background* of higher education (BARNETT, 1994), particularly the pursuit of knowledge, the development of students' critical abilities, character formation and autonomy, and the provision of a neutral and open forum for debate and a critical centre within society, seems to suggest that universities do not only have a *stake*, but indeed a pervasive role in nourishing knowledge and relational resources to mobilise capacity. In other words, universities, in particular in lagging regions, might be expected to assume the task of contributing for the building up of regional institutional capacities and incorporate it into the mission realm of academia.

5.5

The social contract linking society and universities: solely new or new and unequal?

Can universities be institutional capacity builders? This foundational research question carries the need for an intermediate step directed at giving substance to the notion of institutional capacity building. This was the core issue the present chapter attempted to address. By breaking down the constitutive parts of the notion, - institutions, capacity, and institutional change -, it unfolded the complex virtuous circle outlined by the mutual dependency of interactive learning and institutional evolution and highlighted its relevance in the construction of the robust social architectures ought to bear regions' higher systemic innovation potential.

The argument pointed out that this social construction is not solely dependent of trust-generative processes based on the deployment of a region's social capital. It was argued that the stock and accumulation of this resource, though thought of as vital ingredients, are

parts of a bigger picture calling forth other development resources. This bigger picture has been outlined by bringing institutions, taken broadly to enclose both *soft* and *hard* institutions, into the discussion, which opened up the possibility to focus on the co-evolution of both types of institution, making to emerge the mutually influential relations between the main vehicles for the introduction of innovations in the system and the guideposts and incentives that structure it. In addition, it was contended that institutional thickness might not be a sufficient condition determining regional capacities to reach higher systemic innovation levels, namely due to the possible occurrence of a lock-in situation. The more strategic dimension of institutional capacity building was then introduced and depicted as an inclusive governance process that nurtures new webs of relations and renews ways of thinking and acting.

Institutional capacity building has been identified as a process resulting from the meaningful combination of knowledge and relational resources, nourishing the capacity to mobilise innovation agents for collective action. This a challenging endeavour, because it entails a pluralist and inclusive approach to policy making and an ability to learn from individual and organisational interaction, that is the social dynamics that deploys the flows of knowledge necessary, on the one hand, to grasp and implement the solutions to prevailing problems, and, on the other hand, to feed collective sense making of development trajectories. The inherent challenge is to overcome the resilience of institutions and organisations subject to inertial forces, by fostering institutional and organisational change.

Universities, bearing in mind the very nature of academia, have the potential to contribute pervasively to enhance the institutional qualities of the regional systems in which they operate. In a first instance, and taking the constituents of institutional capacity building processes, the simple acknowledgement of universities as major providers of human capital and scientific and technological knowledge could endorse that contribution. Accordingly, universities would add up directly the knowledge resources pool available in the region by supplying specific (e.g., industrial production or policy-making oriented) knowledge pieces or skilled labour, and, indirectly, influence the regional relational capital and mobilisation capacity, through the injection into the system of ideally *creative and critic minds*. One can argue that, in regional contexts presenting already fairly high levels of institutional capacity, this would eventually satisfy the societal expectations *vis à vis*

academia. Otherwise, this view seems consistent with the frames of reference guiding scholarship on the contribution of universities to development. The issue at stake is to judge whether this frame of reference maintains its validity when in presence of LFRs, generally characterised by the weakness of the regional institutional settings.

In lagging regions the substantial need to change ways of thinking and acting is as larger as the difficulties to accomplish it. LFRs tend to lack the social critical mass that enables purposeful change. Building up institutional capacities in these contexts is of paramount importance, but represents a huge challenge and effort. Universities located in this type of regions, if engaged in regional development, must be an active part of that effort. The question is if their action, to be effective and contribute for placing the region on the tracks of institutional change, can be circumscribed to the transfer of knowledge either embodied in individuals or technologies.

Nevertheless, the transformative pressures exerted by globalising forces are bringing over a *sea of changes* that can be taken for granted as influencing the idea of the society and thus the idea of the university. Some scholars argue that a second academic revolution is underway, and, accordingly, a new academic mission is emerging. Hence, a new social contract linking society is gaining ground. Taking the problem of *unequal* territories, the question is to know more about whether this social contract is merely *new* or *new and unequal*...

Part II

Universities and regional development: introducing a new perspective on the second academic revolution

Capturing the essence of the second academic revolution: a literature review

6.1

Introduction

History shows that the idea of the university is not separable from the idea of society. The protean adaptive capacity of academia revealed along the timeline of history was underpinned by evolutionary change, rather than by revolutions inducing radical change. However, as argued before, a revolutionary shift occurred when, in the beginning of the 19th century, research was incorporated into the mission realm of academia along with teaching. Since then, the interplay between an evolving idea of society and an adaptive academic world originated new forms of delivering, through teaching and research, the university's responses configured by the also shifting societal expectations towards higher education.

What is the current condition of universities determined by the *sea of change* as depicted earlier? How are universities responding to the challenges arising from a globalising society, motored by innovation, fuelled by knowledge and lubricated by learning? The present chapter attempts to grasp some answers to these questions, through a review of literature on the subject of contemporary academic change in general, and of the second academic revolution in particular. By doing that, bearing in mind the emphases of scholar work, particularly the one on the academic revolution, only partial answers will be sketched out. In fact, the literature does not unveil the additional challenges arising from the perspective that looks at universities as institutional capacity builders, because its focus is placed on the narrow and technical-biased conceptualisation of innovation. Accordingly,

anticipating a major concluding remark of this chapter, it will be asserted that there is the need to widening the lens through which the second academic revolution can be analysed.

The contemporary University, or calling into play the widely used term *post-modern* University (e.g. SCOTT, 1997), is said to have entered “*a time of disquieting turmoil that has no end in sight*” (CLARK, 1998, p. xiii). Building upon the first revolution, an ongoing second academic revolution is identified as the emergence of “*the translation of research findings into intellectual property, a marketable commodity, and economic development*” (ETZKOWITZ and WEBSTER, 1998, p. 21). In simple terms, technology transfer, taken broadly, is being integrated as a third mission of universities, adding to teaching and research (ETZKOWITZ, 1994). Academic science, in this context, is said to have become entrepreneurial, as academia, in its inner dynamics and pressured by external needs, assumed the third mission, which can be purposefully summed up as the one of economic development (ETZKOWITZ and LEYDESDORFF, 1997).

The nature of this second academic revolution is encompassed, on the one hand, by the notion of the *entrepreneurial University* (CLARK, 1998), or by the “*gentler in overtone*” (id, p. 4) concept of the *innovative University*. On the other hand, it encloses a shift in modes of knowledge generation, portrayed by GIBBONS et al (1994) as the move from *Mode 1* towards *Mode 2* of knowledge production. In addition, the assumption of a new mission seems to have blurred the dividing lines between the state, industry and academic institutional spheres, creating a new interinstitutional arrangement that enhances the role of universities in the globalising economy through the development of a *triple helix* of university-industry-government relations composed of tri-lateral networks and hybrid organisations (ETZKOWITZ and LEYDESDORFF, 1997, 1999, 2000).

The second academic revolution bears ground when it is attributed to universities an enhanced role in the globalising economy, particularly as a major potential source of economically useful knowledge. As a result, universities, attached to a new social contract, become under close scrutiny of governments and firms. *Bottom up* and *top down* induced processes of adjustment to change are undergoing in the academic institutional and organisational realm (ETZKOWITZ, 2003b). The third mission of universities, in general, is becoming a core issue of supra-national, national and regional socio-economic development strategies. In this context, organisational and institutional turbulence is

unavoidable, as it was when the *Humboldtian* first academic revolution has integrated research as a mission of the university along with teaching.

The present chapter aims to contribute for a better understanding of the position the university is assuming in the contemporary society and the challenges and turbulence that are affecting academia. It does that by mirroring two different perceptions on academic change, which, basically, confronts pessimistic and more optimistic stances towards the shifting dynamics. Accordingly, the chapter is structured as follows:

- Firstly, it sketches out the condition of the contemporary university which is being shaped by changing expectations of society towards the academic world, and the inherent institutional turbulence; it pays attention on the scholarly controversial ground that opposes the more pessimistic to the more optimistic readings of what is happening to higher education;
- Secondly, it develops the more optimistic view by introducing a literature-based review on the second academic revolution; it emphasises not only the conceptual framework that encapsulates the revolutionary move of academia, but also the associated driving forces, policies and practices;
- Thirdly, it draws on the triple helix model of university-industry-government relations to positioning theoretically the features of the second academic revolution;
- Finally, some concluding remarks are made, highlighting the need for widening the *revolutionary* frame of reference, in order to accommodate the role of universities in institutional capacity building processes.

6.2

Where does the contemporary university stand?

Because of or coincidentally with the current globalisation wave, major redefinitions in the society's social, cultural, economic and political building blocks are underway, forging the diverse but interwoven transformative forces that are shaping contemporary university. The discussion about the current condition of the university encompasses a myriad of analytical prisms and, as expected, stands far from consensus, both in terms of what is happening and what are the impacts on academia. However, two intertwined drivers of

change seem to stand out in the accounts of academic change: first, the fade out of the welfare state ideology, which has redefined the role of the (national) state and its relationships with the university, and, concomitantly, challenged the role of academia in the society and arguably fostered new academic values, cultures and practices; second, the contemporary condition of knowledge (DELANTY, 2001) which, mirroring significant changes of and increased complexity in the organisation of economic life, put into question the linear model of innovation and the positioning of academia as major provider of knowledge.

As argued before, in the late 70s, the hitherto predominant welfare state ideology started to be strongly challenged, either by the left or the right (SCOTT, 1995)⁷³. Since then, the general responsibilities of the state in relation to society have shifted substantially (KWIEK, 2001), as the welfare idea was superseded by a kind of state that many would label as *neoliberal* (e.g. SCOTT, id.). The need to enter and succeed in an environment of global competition has formatted the justificatory political discourse and the practice of cutting back funding to social welfare and entitlement programs and redirecting it to economic development promotion, freeing capital and corporations from taxation and regulation, as well as leaving them operating unrestrainedly (SLAUGHTER and LESLIE, 1997). In parallel, nation-states responded to enlarged exposition of national economies to global competition through an increased involvement in managing the process of internationalisation “*in the hope of minimizing its harmful domestic repercussions and/or securing maximum benefit to its own home-based transnational firms and banks*” (JESSOP, 1994, p. 262). JESSOP (id.) talks about the emergence of the *Schumpeterian workfare state*, presenting distinctive objectives in economic and social reproduction, such as “*to promote product, process, organizational and market innovation in open economies in order to strengthen as far as possible the structural competitiveness of the national economy by intervening on the supply side; and to subordinate social policy to the needs of labour market flexibility and/or the constraints of international competition*” (ibid., p. 263).

These shifts impacted strongly on universities, a central institution in the welfare state, as new expectations of society towards higher education were forged.

⁷³ “According to [the neo-conservative] critique, the welfare state is responsible for producing an under-class and, more generally, a dependency culture, which has sapped the spirit of enterprise on which wealth creation depends and undermined the ethic of personal responsibility”, SCOTT, 1995, p. 75. “Marxist and neo-Marxist analysts have always emphasized how precarious, indeed illusionary, have been the gains attributable to the welfare state”, id..

“More students and more different types of students of all ages appear at the doors of universities and colleges to be diversely and repeatedly educated in a growing array of subjects and programs of educational renewal. Knowledge-based enterprises in the economy and society create an expanding and rapidly changing professional labor market for which universities are expected to provide competent graduates. Governments expect universities to do much more for society in solving economic and social problems, but at the same time they back and fill in their financial support and become unreliable patrons. Most important, the research base of the university world rapidly creates new knowledge and technique, steadily increasing specialties and stretching the range of disciplinary and interdisciplinary fields”, CLARK, 1998, p. xiii.

The vast literature on academic change, in its search for the drivers of change, tends to pay particular attention to the impact originated by the pronounced reduction of public funding of higher education teaching and research:

“Within three days of Mrs. Thatcher’s taking office in 1979, 100 million pounds were cut overnight from the universities’ budget, and between 1980 and 1984, 17 percent was removed from the grants made by government to the UGC [University Grants Committee] [...]”, SHATTOCK (1989, p. 34)

As cuts in higher education public funding paved their way, universities and other tertiary education institutions started to be under pressure to seek for alternative funding sources, namely in private economic activities, both at the national and international level (CHARLES and HOWELLS, 1992). In addition, the access of academics to public R&D funding became subject to competitive mechanisms, which some classify as market alike (e.g. DEEM, 2001). The changing research funding system is part of a more broad transformation, often seen as a *marketisation* process of higher education (e.g. JONGBLOED, 2003, DILL, 2003), or the *corporatisation* of the university (e.g. STECK, 2003), and related to the transformative forces of globalisation and the challenges of the knowledge society (e.g. SCOTT, 1999, BECHER and TROWLER, 2001; KWIEK, 2001; GIBBONS, 2001; ALTBACH, 2004). Other scholars (e.g. SLAUGHTER and LESLIE, 1997), in a similar vein, classify the shift in higher education as the rise of *academic capitalism*.

“In recent years, we have witnessed the introduction of marketisation policies and market-type mechanisms in sectors previously characterised by a high degree of government steering” (JONGBLOED, 2003, p. 113). In the field of higher education, according to JONGBLOED (id.), these *marketisation* policies, on the one hand, *“are aimed at strengthening student choice and liberalising markets in order to improve the quality and variety of the services offered by the providers of higher education”*, and, on the other hand, *“by emphasising competition and introducing performance-related reward schemes, [...] are aimed at increasing efficiency in the sector, making institutions and students more aware of the consequences of their decisions in terms of costs”*. Market competition is said to be an incentive for greater innovation and adaptation in higher education, as opposed to *“traditional forms of coordination relying on state control or professional norms”* (DILL, 2003, p. 138). It is worth noticing that, following JONGBLOED (ibid., p. 111), there is not a single market for higher education, but *“a market for students [...], a market for research staff, a market for lecturers, a market for research grants and scholarships, a market for donations, a market for graduates, a market for company training, and so on”*.

In this competitive environment, students are often equated to *clients, consumers* or *customers* (KWIEK, 2001) who are provided of higher education by universities and other institutions. Cost sharing, for example in the form of tuition fees, is an increasingly established strategy to cope with state funding restrictions⁷⁴. The availability of compensatory schemes reveals a trend of public policy towards subsidising students rather than tertiary education institutions, i.e. the consumers rather than the providers (KWIEK, id.). Taking an equity perspective, so dear to the welfare state ideology, the remark to be done is that market competition in an expanded higher education system, particularly in the absence of adequate regulatory and compensatory mechanisms, increases students' institutional choice, but can give rise to increased inequality in terms of access (STEIER, 2003).

The *marketisation* approach is intimately connected with the *corporatisation* thesis. In the words of STECK (2003, p. 74) the *corporatised* university *“is characterized by the entry of the university into marketplace relationships and by the use of market strategies in university decision making”*. Hence the emphasis here is placed on the management

⁷⁴ *“Fees have been introduced in public universities in Chile (beginning in the early 1980s), northern Mexico (mid-1990s) and the University of West Indies (late 1980s). Mongolia and China have introduced fees on a national scale”*, STEIER, 2003, p. 162.

challenges. The same author (STECK, 2003, p. 74) defines the *corporatised* university as “an institution that is characterized by processes, decisional criteria, expectations, organizational culture, and operating practices that are taken from, and have their origins in, the modern business corporation”. This definition is smoother than the straightforward one suggested by MOK and LO (2002, p. 57), - “by ‘corporate model’, we refer to turning universities into ‘corporations’” -, and breaks away from the simple attribution of a *corporatised* character to any university maintaining close links with business corporations. It approximates though to HARVEY’s (1998) perspective, well illustrated by the title of his highly critical article - “*University Inc.*”, or to READING’s (1996, p. 55) *bureaucratic corporation* in which “intellectual activity and the culture it revived are being replaced by the pursuit of excellence and performance indicators”, i.e., in which economic management supersedes cultural conflict (id.).

STECK (id.) associates the alleged *corporatisation* of the university to a change in the academic culture and the academic profession. “Today, many top university administrators look at their institutions as businesses retailing and wholesaling a product, whether research, information, or training” (ibid., p. 76). This reflects a shift of the university culture to a culture which, using STECK’s words (ibid.), is “colored by values appropriate to the modern business corporation”. The argument about the academic profession is that “academicians are being transformed from autonomous professionals to a salaried professorate” (ibid., p. 78). In addition, the author (ibid.) refers to changes in the academic profession language: “research replaces scholarship and scholars become researchers; professors no longer profess but are teachers encouraged to adopt fresh new pedagogical methodologies [...]”. His account of *corporatisation* also highlights that universities tend to lose their franchise: “corporations that look at themselves as being in the information or education business reach into the academic marketplace [...]” (ibid, p. 77)⁷⁵.

Both *marketisation* and *corporatisation* arguments relate the burgeoning debate on university management. In such a competitive environment, according to SHATTOCK (2003), management needs to be able to define what is success and ensure that performance is geared to achieving it. Universities become risk organisations (MCWILLIAM, 2004), because, similarly to all organisations, they “*must, of necessity, focus*

⁷⁵ According to STECK (2003), since the late 1980s, the number of universities operated by corporations has increased in a number by from 400 to 2000, among which 300 have partnerships with traditional brick-and-mortar universities.

on guarding themselves against the possibility of failure” (MCWILLIAM, 2004, p. 152). In this line of thought, the debate leads to the conclusion that management emerges as an integral and even determining factor in achieving institutional success (SHATTOCK, 2003). The two arguments referred to above also relate the influence of the so-called *managerialism* ideology in higher education (DEEM, 2001; SANTIAGO and CARVALHO, 2004), which, as SANTIAGO and CARVALHO (id, p. 428) argue, “*starting in the 1980s, [...] gained an increasingly visible position in Anglo-Saxon countries as a tool of the conservative and neo-liberal purpose of transforming the welfare state*”. Efficiency, or perhaps more adequately, economic efficiency, understood as *value for money* (DILL, 2003), accountability, planning, resource allocation, unit costs, performance indicators (BARNETT, 1994), are core concepts of *managerialism*. Excellence in academia, formerly defined in terms of broader cultural considerations, becomes dependent on scientific quality and productivity (SCOTT, 2000a). Behind excellence, in the words of KWIEK (2001, p. 33), there are “*the ideals of the most useful, best-selling, and most rapidly attained knowledge (or merely certification)*”. HARVEY (1998, p. 113) recalls an illustrative incident: “[...] *when my own department was rumoured to be ‘in trouble’ with the dean [...] we prepared voluminous documentation to prove how [academically] excellent we were. The dean said that he had never questioned our excellence but was interested in only one thing, and it was ‘colored green’. We were not, apparently, earning enough of it to justify our existence*”.

Taking *marketisation* and *corporatisation* together, the resulting overall argument is that the values of the market and the organisational style and culture of corporate life are shaping contemporary university. STECK (2003, p. 68) sums it up metaphorically: “*If I had to look for a metaphor, I guess I would turn to the classical film, Invasion of the Body Snatchers, a story of alien creatures who steal the soul and personality of individuals while retaining the identical and pleasant and amiable exterior*”. While the *body snatchers* multiply, subjects within the curriculum are favoured to the extent that they make a clear contribution to the economy, science and technology subjects are supported and humanities and social science subjects try to prove their worth, mainly by developing skills-oriented courses (BARNETT, 1994). Academia becomes aligned with what HARVEY (id., p. 115) calls “*the economic logic of contemporary capitalism*”, converting “*knowledge into*

information and students into consumers, and transforming the ability to think into a capacity for information processing”.

Much to the purpose, the notion of *academic capitalism* (SLAUGHTER and LESLIE, 1997) is introduced in the debate to define “*the reality of the nascent environment of public research universities, an environment full of contradictions, in which faculty and professional staff expend their human capital stocks increasingly in competitive situations* (id., p. 9). Triggered by the globalisation-driven creation of new structures, incentives and disincentives, and rewards and constraints (ibid), in which the reduction of public funding is enclosed, the thesis look at academics, especially those belonging to globally *marketable* scientific fields (the fonts of *technoscience* for the globalising knowledge-driven economy), as acting as capitalists from within the public sector. In this sense academics are “*state-subsidized entrepreneurs*”, encroaching the profit motivation into the academy (ibid.).

These perspectives on academic change, taken together and in a broad fashion, bring over the intuition that the university, as perceived by the society in the welfare state, or at least much of the core academic values, culture and practice, have been destroyed, giving its place to a different kind of institution that struggles, like any business corporation, in an environment of fierce competition ruled by the hidden hand of market forces. Governments, at least in some of the most advanced world economies, have encouraged and in fact provided the lion’s share of funding for academic capitalism (ibid.). The rationale was based on the combination of the more prosaic pressures to control public expenditure with the ideological stance that by rewarding *market-efficient* universities (more value for money...), an enhanced contribution of academia to improve the national economies’ global competitiveness and decrease unemployment would come up. This means that, while struggling in the market, universities continue to be enlisted by national governments ruling in the Schumpeterian workfare state that JESSOP (1994) refers to, as a central institution in pursuing the national interest, translated though into the nation’s (economic) competitive capacity in the globalising economy.

The conceptual umbrella of the knowledge-based economy envelops the political discourse that moulds the relationship between the state and the university. Somehow paradoxically, governments, while cutting back expenditure in higher education, view the investment in science and technology as the surest way to foster innovation and generate

economic wealth and, using the words of SCOTT (2005, p. 298), “*surely less confidently*”, social well being. Seemingly, a major reason for this view, following the same author (id.), is that governments, “*even those most respectful of free markets, naturally incline to emphasize the significance of the levers they themselves control or can most directly influence – including investment in science and research*”. An additional element of continuity can be identified: the linear model of innovation is still very much shaping public policy and funding of science and technology. Universities, in this context, are still expected to produce, at least partly, the knowledge needed to feed the one-way innovation flow between research and markets. However, *marketisation, corporatisation* or the *capitalist nature* of the current academic endeavour implies the acknowledgement of a significant shift in the kind of knowledge to be generated and disseminated. BARNETT (2000b, p. 420) argues that “*university knowledge, understood as offering a pure, objective reading of the world, does have to be abandoned*”. University knowledge should instead seek to have economic value, and, as such, be transformed into a commodity. In other words the public character of knowledge, taken for granted in the linear model of innovation as idealised in the post-war years, is vigorously questioned in the current idealisation. In parallel, universities are also charged with the provision of the skills and competences upon which the linear model depends to work efficiently. SCOTT (id., p. 299) draws on this intuition to introduce other component of change: “[...] *mass higher education – originally grounded in notions of opportunity, emancipation, and democracy – is now justified in terms of meeting skill shortages*”.

Knowledge, in this context, loses its power to enlighten and becomes performative (BARNETT, id.). GIBBONS et al (1994) refer to a shift from a *Mode 1* to a *Mode 2* of knowledge production to explain this transformation, conveyed, on the one hand, by the expansion in the number of potential knowledge producers on the supply side and, on the other hand, the increased requirement of specialist knowledge on the demand side.

Mode 1, according to the authors (id., p. 2), “*refers to a form of knowledge production – a complex of ideas, methods, values, norms – that has grown up to control the diffusion of the Newtonian model to more and more fields of enquiry and ensure its compliance with what is considered sound scientific practice*”. This kind of knowledge, – “*traditional knowledge*”, as GIBBONS et al (ibid., p. 1) name it -, is generated within a disciplinary, primarily cognitive, context, which resembles what is generally meant by science and

implies that problems are set and solved in ways that are largely governed by the academic community (GIBBONS et al, 1994). The disciplinary structure, which, following GIBBONS (2001, p. 4), “*defines both what shall count as ‘good science’ and prescribes, as well, what students need to know if they intend to become scientists*”, has been institutionalised in universities, transforming them into the primary legitimating *locus* of knowledge produced according to Mode 1. Being discipline-based, Mode 1 is characterised by a high degree of homogeneity of knowledge producers, which tend to pursue an academic career, centring thus the production of knowledge in academia (JACOB, 2000). Quality control, in Mode 1, is determined mainly through the peer review judgements about the contributions made by individual scientists (GIBBONS et al, id.), operating “*to channel individuals to work on problems judged to be central to the advance of the discipline*” (ibid., p. 8).

In Mode 2, knowledge production is carried out in a context of application, implying that knowledge is intended to be useful to industry, government, or, more generally, the wider society. This, in turn, makes the production of knowledge dependent on a continuous negotiation of needs, interests of a variety of actors, - the context of application -, or, in other words, on the joint operation of supply and demand factors (ibid.). As opposed to Mode 1, Mode 2 is *transdisciplinary*, as the determinants of a potential solution for a given problem enclose the integration of different skills, going far beyond any single contributing discipline. In terms of quality control, in Mode 2, a diverse range of intellectual interests is added to peer review, incorporating criteria such as market competitiveness, cost-effectiveness or social acceptance and is extended to social, economic and political ones. In other words, the review system is determined by a wider set of criteria which, following GIBBONS et al (id.), reflects its broadening social composition. Moreover, this broad social basis is said to concur for an increased social accountability and reflexivity.

A crucial difference of Mode 2 consists of its heterogeneity and organisational diversity, marked by three dimensions (ibid., p. 6):

- “*An increase in the number of potential sites where knowledge can be created; no longer only universities and colleges, but non-university institutes, research centres, government agencies [...].*”
- *The linking together of sites in a variety of ways – electronically, organisationally, socially, informally – through functioning networks of communication.*

- *The simultaneous differentiation, at these sites, of fields and areas of study into finer and finer specialities. The recombination and reconfiguration of these subfields form the bases for new forms of useful knowledge. Over time, knowledge production moves increasingly away from traditional disciplinary activity into societal contexts”.*

A striking implication to universities is that academia tends to lose its predominance as a source of knowledge in society. In the words of GIBBONS et al (1994, p. 85): *“In the future the institutions of higher education, the universities in particular, will comprise only part, perhaps only a small part, of the knowledge producing sector”*. According to the authors (id.), the reasons behind this diminishing centrality relies on the perception that universities *“are no longer in a strong enough position, either scientifically, economically or politically, to determine what shall count as excellent in teaching and research”*. If the diversification of research locations is well evidenced by statistical measurements (e.g. OECD, 2002a; CEC, 2005a), the decline in importance of universities as a source of knowledge is, at least, doubtful. GODIN and GRINGAS (2000), for instance, present sound evidence that university research is stable and even increasing. The authors (id., p. 274) argue that *“diversification is one thing and the decline of universities is another”*, suggesting in addition that *“one cannot infer the latter from the former as is implicitly done by Gibbons et al”* (ibid.).

Additional criticisms towards the Mode 2 thesis can be found in the literature. RIP (2000) contend that Mode 2 knowledge production *“has been there all the time”* (id., p. 29) and attributes the approach popularity, at least with science policy makers, to three different reasons: firstly, Mode 2 *“names a feature of science which has become more relevant”*; secondly, *“it creates an occasion for policy making”*; and thirdly, *“it feeds the need for mimesis in science policy making”*. MARTIN and ETZKOWITZ (2000), similarly, contend that research carried out in the context of application has been present within universities at the end of the 19th century, namely in Germany and the United States. The same authors (id.) remind that there have always been interdisciplinary research areas and point out a number of historical examples, such as, for instance, the emergence of experimental physiology based on a combination of anatomy and physiology with philosophy or biochemistry formed upon biology and chemistry. KUTINLAHTI (2005) considers that the thesis, because emphasising the economic significance of academic

research, fails to capture the social values that influence the conduct of research. She (KUTINLAHTI, 2005, p. 36) adds: “*It would therefore be misleading to say that all of these purposes can be served in equal measure by all universities (or disciplines), nor can it be supposed that individuals can or need to contribute to these goals*”. ETZKOWITZ and ZHOU (2006, p. 78) contend that Mode 2 knowledge generation “*represents a partial view by neglecting practical knowledge generated in the context of theorizing and fundamental investigation, something apparent in areas such as molecular biology and nanoscale material science*”.

None the less, the Mode 2 knowledge production thesis “*struck a chord of recognition among both researchers and policy-makers*” (NOWOTNY et al, 2003). Revisiting the conception almost a decade later, some of its original proponents (id.) refer to a divide between those who espoused it most warmly and those who were most sceptical. The former, “*with most to gain*”, were “*politicians and civil servants struggling to create better mechanisms to link science with innovation; researchers in professional disciplines [...] struggling to wriggle out from under the condescension of more established, and more ‘academic’, disciplines; and researchers in newer universities, other non-university higher education institutions, or outside the academic, and scientific, systems strictly defined*” (ibid., p. 179). The latter, “*with most to lose*”, were “*researchers in established disciplines and institutions, who feared that the quality of science would be eroded if such levelling ideas gained political currency, and who feared that their own autonomy would be imperilled if more explicit links were established between research and innovation*” (ibid.).

The divide largely derives from different positioning *vis à vis* the impacts of the new mode of knowledge generation on the academic *ethos*, namely on the principles defined by the *Mertonian* rules (CUDOS) and the spirit of the endless frontier of research (see Chapter 2). ZIMAN (1994, 2000, 2003) refers to a worldwide evolutionary transition to what he calls *post-academic science* as irreversible, and argues for the incompatibility between the academic *ethos* expressed by CUDOS and “*the general processes of collectivization [that] inevitably pushes academic research towards the cultural practices of conventional R&D organizations*” (id., 1994, p. 176). The author (ZIMAN, 2000) suggests the acronym PLACE to portray industrial-like science, as it is *Proprietary, Local, Authoritarian, Commissioned* and *Expert*, as opposed to the *Communal, Universal, Disinterested, Original* and *Sceptical* character of academic science, the latter a “*self-consistent ‘form of*

life' that was practised systematically and productively in universities and many other 'academic' institutions" (ZIMAN, 2003, p. 24).

SOUSA SANTOS (1994) talks about symbolic and institutional turbulence within the university structure, provoked by the more and more intense pressure on academia to foster applied research. The author (id.) contends that there is the risk of a "*degenerative transformation*" (ibid., p. 176) of scientific priorities, as the criteria to prioritise become the economic relevance and profit expectations of research, its potential for creating product or process innovations, and the probability of accessing funding provided by firms. According to SOUSA SANTOS (ibid.), an additional risk is related to a sort of *Faustic pact*, since researchers can become dependent on the financing firms, at the expense of autonomy, constant conflicts between firms' short-term pressures and long-term scientific criteria, and cessions in the control of research results quality. The devaluation of humanities and social sciences constitutes another possible consequence of the *commercial distortion* that, following SOUSA SANTOS (ibid.), is shaping the contemporary university. Those areas of knowledge risk to be marginalised, because, according to the author (ibid.), are *less commercial*.

SCOTT (2000b), on the impact of Mode 2, argues that, because of transdisciplinarity, scientific communities become diffused and the university structures that create and sustain those communities, such as departments, faculties, institutes or centres, become less relevant. The same author (id., p. 201) adds that, under Mode 2 conditions, "*the distinction between research and teaching tends to break down [...], not only because the definition of research actors must be extended far beyond the primary producers of research, but also because the reflexivity of Mode 2 knowledge production transforms relatively closed communities of scientists into open communities*".

More radically, some would argue that the transformation in the modes of knowledge production brings about the end of knowledge in higher education (cf. DELANTY, 2001), as the "*Enlightment framework is no longer capable of legitimating the production of knowledge*" (id., p. 106). BARNETT (2000b) highlights three forms underlying the end of knowledge thesis. Firstly, the *substantive form*, based on the perception that the knowledge sustained by the university has no particular status, as it simply takes place and its changes amid the proliferating knowledges that society has now to offer; secondly, the *ideological form*, concerning the lack of legitimacy of the knowledge the university stands for; thirdly,

the *procedural form*, implied by the perception that the university can now secure its future only by selling its knowledge wares. DELANTY (2001, p. 106) associates the end of knowledge argument to the dual process of globalisation and fragmentation: “*on the one side, knowledge is increasingly being globalized and detached from its traditional reliance on the nation state and its custodians, the intellectuals and university professors; on the other side it is also being fragmented, that is, knowledge is losing its ability to provide a sense of direction for society and is breaking up into specialist discourses that arise in the context of application*” (id.).

Knowledge globalisation and detachment from the nation state is often addressed against the background set up by the rapid development in information and communication technology (ICT) and its arguably huge impacts on higher education (e.g. SALMI, 2001). Seemingly, there is a high degree of unanimity around ICT as an enhancer of academic activities (DE BOER et al, 2002). ICT enables the rapid exchange of information and knowledge, has the potential to turn teaching more flexible, may increase access to higher education, contributes for faster and more internationalised research or makes more efficient the access and use of resources, databases and infrastructures (id.). However, dissent perspectives arise when the “*geography is dead*” thesis is recovered. While DE BOER et al (ibid.), for instance, insist that despite mitigating the friction of distance, ICT does not have the power to completely replace face-to-face contacts in academic interactions, be it in teaching or research, others (cf. SALMI, id.), drawing on the “*quasi abolition of distance*” (ibid., p. 108), state that “*the best universities of any country can decide to open a branch anywhere in the world or to reach out across borders using the Internet or satellite communication links, effectively competing with any national university on its own territory*” (ibid., p. 111). In the more radical views of academic transformation, the issue is not only the end of university knowledge, but also the end of the physical buildings that shelter academic activities. This seems to be the thought of famous commentators such as Peter Drucker, who, in an interview to Forbes magazine, as quoted in DUDERSTADT (1998, p. 21), has said that “*thirty years from now the big university campuses will be relics*” and that “*universities won’t survive*”. In other words, the basic argument here is that the ICT-driven *death of geography* can originate the *death of the (physical) university*, i.e., the materialisation of READING’s (1996) metaphor of the *university in ruins*.

To what extent is this somehow catastrophic picture reproducing the observable reality? Recalling BAUMAN (1997), teachers and students are still gathering together, generally inside brick-and-mortar buildings, in pursuit of higher learning. National governments, as mentioned above, still rely on universities as major providers of the skills and knowledge that enable national economies to strive successfully in the globalising economy. Widely commented examples of contemporary economic success, e.g. the Silicon Valley, would not have taken place without the decisive contribution of academic generated knowledge. Globally oriented institutions, such as the World Bank, continue to praise the university, regarded as a “*critical pillar of human development worldwide*” (WORLD BANK, 2002, p. ix). Without denying the tensions and complexity of the present, and the uncertainties of the future of universities, what the reality shows is an enduring institution assuming new forms and acting differently under the framework of an altered idea of the university, and striving for fulfilling renewed societal expectations. Universities are thus crossing fundamental change amidst tensions, contradictions and paradoxes. “*The role for universities to play consists of an emerging set of paradoxes: lead by following the needs of society; be accountable by doing things that cannot be counted; be traditional in a changing environment; be agents of change in a traditional environment. Oh, yes, and do all of these things without the necessary resources*” (REINHARTSEN, 2003, p. 73).

Nevertheless, using the words of SMITH and WEBSTER (1997, p. 14), the university “*is, has been and can only be a place where thinking is a shared process, where the teaching is part of the unending dialogism of the outer society, ‘where thought takes place beside thought’*”. There is hope thus, that is, “*there must be a future for the university in its work of thinking, which goes on outside the instruction package of corporate excellence, one that has survived the attractions and repulsions of the nostalgic and the romantic*” (id.).

Accordingly, a less catastrophic framework is necessary to deal with academic change, its tensions, contradictions and paradoxes, as well as to avoid the consideration of universities as a sort of victims of circumstances, very much present in such decline-prone thesis as the *marketisation* and *corporatisation* of academia. A possible way out is to bring about the inquiry on the institutional and organisational challenges faced by academia as connected to the emergence of economic and social development as a function of the university in addition to teaching and research (ETZKOWITZ, 1994). In fact, as opposed to the *declinistic* approaches, a body of literature addresses this new function, acknowledging

that it shakes the foundations of the modern university, but simultaneously strengthens the role of academia in society, mainly because academic-based science and technology is perceived as of use to industry, in the struggle to revive or replace declining traditional industries (ETZKOWITZ et al, 1998). One can argue that it reflects the mutual dependence, co-evolution and complementarity between Mode 1 and Mode 2 knowledge production.

Universities, according to that literature body, are assuming a role in the fulfilment of the economic competitiveness needs and expectations of a society being trespassed by innovation pressures requiring new modes of generating, disseminating, transferring and using knowledge. The dialectics between higher education and society are underpinning an emerging new academic mission, and thus a revolutionary change. Accordingly, a second academic revolution is said to have occurred, setting off a third mission that carries tighter links between universities and users of knowledge and establishes the university as an economic actor in its own right (ETZKOWITZ, 2004)⁷⁶. The new mission folds over into the old ones, “*recursively making the university an efficient institution of reproduction and production of knowledge, and therefore the paradigmatic institution of a knowledge-based society*”, (ETZKOWITZ et al, 2001, p. 7).

The capacity to endure as an institution in the 21st century can be thus be related, on the one hand, to a deliberate and proactive attitude towards the provision of society with the seeds of future economic and social development in the form of human capital, tacit knowledge and intellectual property (ETZKOWITZ and LEYDESDORFF, 1997), and, on the other hand, to the development of new organisational elements which, in the words of CLARK (1998, p. 5), confer to universities operating in fast-moving times the capacity to follow the prudent course of action that is “*to be out in front, shaping the impact of demands made upon them, steering instead of drifting*”. As suggested by the same author

⁷⁶ VIALE and ETZKOWITZ (2005) have recently argued that a third academic revolution is impelling the next great transformation of universities. The third revolution is, according to the authors (id., p. 25), based upon “*the creation of entrepreneurial universities embedded in triple helix relations*”. They add (ibid.): “*the third academic revolution integrates forward and reverse linear models in a programmatic and regulatory framework, synthesizing knowledge, organization and institutions: the endogenous, exogenous and mesogenous drivers of innovation*”. BENSON and HARKAVY (2000), in a different perspective, had already suggested the occurrence of three academic revolutions (in the US), a first one coinciding with the foundation of John Hopkins University (1876), emulating the German model, the second beginning in 1945 with the “*Big Science, Cold War, Entrepreneurial University*” (id. p. 47), and the third resulting from the fall of the Berlin Wall and the end of Cold War, which “*provided the necessary conditions for the ‘revolutionary’ emergence of the democratic cosmopolitan civic university [...]*” (ibid., p. 48). However, taking the argument that to an academic revolution corresponds a shift or extension in the mission realm of academia, these two claims cannot be considered as *revolutionary*.

(CLARK, 1998) this capacity is what configures the so-called *entrepreneurial university*, where the term entrepreneurial is taken “*as a characteristic of social systems [...] of entire universities and their internal departments, research centres, faculties and schools*”, and as mirroring “*a willful effort in institution-building that requires much special activity and energy*” (id., pp. 3-4). Therefore, as SUTZ (1997) claims, the third academic mission embraced by the entrepreneurial university is not solely externally imposed, since within academia there are sectors that see it as “*the materialization of a deeply felt vindication*” (id., p. 13).

The notion of *entrepreneurial university*, in its original formulation (CLARK, *ibid.*), is not meant to characterise a business-oriented and profit-seeking university, that is, it goes far beyond the capitalistic view of academia evidenced in thesis such as *marketisation* or *corporatisation*. The entrepreneurial university, using CLARK’s (*ibid.*, p. 4), “*seeks to work out a substantial shift in organizational character so as to arrive at a more promising posture for the future*”. The transformation of academia, according to the author, is not accidental or incidental, rather it occurs “*when a number of individuals come together in university basic units and across a university over a number of years to change, by means or organized initiative, how the institution is structured and oriented*” (*ibid.*). Hence, it is a collective entrepreneurial action that is at the heart of the transformation.

Taking this perspective, the term entrepreneurial, rather than the aggressive business oriented and profit-maximisation seeking individual or group, mirrors the effort to foster innovative and pro-active ways of facing internal and external demands, which can help to insure that academic values are guiding transformation. CLARK (2003, p. 115), counteracting the *declinist* thesis on the fate of universities, contends: “*Universities can transform themselves into a highly pro-active character that is largely under their own control*”.

CLARK (1998) highlights five elements, constituting “*an irreducible minimum*” (id., p. 5), that configure the entrepreneurial university: a strengthened steering core; an expanded developmental periphery; a diversified funding base; a stimulated academic heartland; and an integrated entrepreneurial culture. In brief, these five elements can be described as follows:

- Entrepreneurial universities herald an ambitious idea or self-concept, which requires a change-oriented and integrated administrative core (CLARK, 1996),

i.e., a strengthened steering core. It must embrace central managerial groups and academic departments, and reconcile new managerial values with traditional academic ones.

- Entrepreneurial universities take the risk of fostering a new periphery of units (outreach offices, lifelong learning, intellectual property development, etc.) that reach across old university boundaries to establish linkages with external organisations, more readily than traditional academic departments.
- Entrepreneurial transformation of universities generally requires greater financial resources, particularly discretionary funds. This turns essential the diversification of the funding base, adding to the diminishing state support a vigorous effort to compete for grants and contracts in research councils, and a widened and deeper portfolio of third-stream income (patents, local and regional governments, industrial firms, etc.).
- Universities are generally structured according to traditional discipline-based academic departments, in which most of the academic work is carried out. If those structuring units oppose change, any innovative effort is most likely to fail. Hence, departmental units should embrace themselves an entrepreneurial attitude and manage to blend traditional academic values with innovative managerial perspectives. Stimulated academic heartlands, in the entrepreneurial university, accept a modified belief system.
- Entrepreneurial universities develop a culture that embraces change, which may start out of a simple institutional idea that later turns into a set of beliefs that, if diffused in the academic heartland, transforms into a university-wide culture. An institutional sense of direction (CLARK, 1996) becomes crucial in an entrepreneurial university.

ETZKOWITZ (2004b) looks at the entrepreneurial university as an emergent phenomenon stemming from the working out of an inner logic of academic development that expanded the academic enterprise from a conservator to an originator of knowledge. The same author (id.) contends that the entrepreneurial university transcends and incorporates academic dichotomies (e.g. ivory tower/polytechnic, research/teaching), creating a new synthesis expressed by five intertwined conceptions: capitalisation,

interdependence, independence, hybridisation and reflexivity. According to the author's perspective (ETZKOWITZ, 2004b), the capitalisation of knowledge (created and transmitted both for utilisation and disciplinary advance) becomes the basis for social and economic development, and insures an enhanced role of academia in society. Whereas interacting with other institutional spheres, the entrepreneurial university emerges as a relatively independent institution. The resolution of the tensions between interdependence and independence impels the creation of hybrid organisational formats, which accommodate the diversity of academic functions. Finally, the entrepreneurial university is a reflexive institution, as it continuously renovates its internal structure in order to adapt to changes in the relations with government and industry. These five conceptions, following ETZKOWITZ (2003a, p. 333) guarantee that the entrepreneurial university "*is not the 'commercialized university' but a university that encompasses the conservation and passing on of knowledge, integrating teaching and research, as well as supporting innovation*".

Hence, the rise of the entrepreneurial university is closely attached to the second academic revolution and the inherent institutional and symbolic turbulence. Entrepreneurial universities herald the argument that, using the words of CLARK (2001, p. 9), "*the many demands and challenges of the day in themselves are not going to determine the fate of universities*". Rather, the ways "*universities respond to and shape the many forces that play upon them becomes the heart of the matter*" (id.). In this sense, one can argue that it is as collective entrepreneurs that universities become fitted out to face the challenges inherent to the introduction of economic and social development as an academic mission, which, as argued by ETZKOWITZ (2004b, p. 77), "*called into question the purpose of the university as a research institution, for some academics, even as the introduction of research as an academic mission disturbed the taken-for-granted assumption of the university as a single-purpose educational institution*".

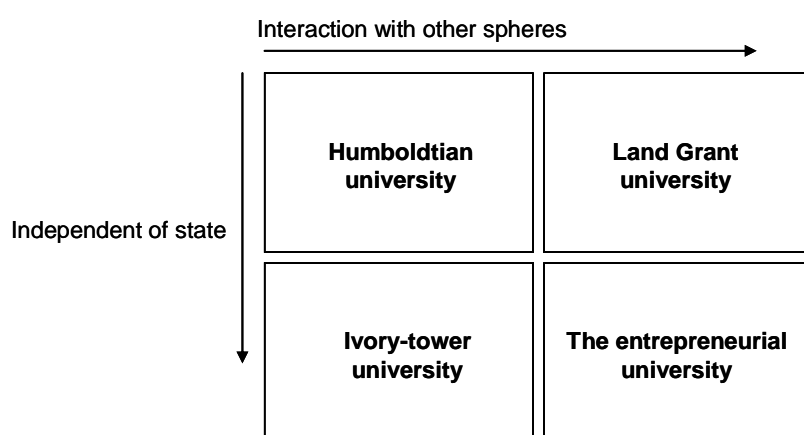
6.3

Towards an optimistic view on contemporary academic change

The literature generally associates the second academic revolution to the functional and structural changes developing within universities conveyed by the shift from a concentration on the production and dissemination of knowledge to an emphasis on technology transfer and the formation of firms. As defined by ETZKOWITZ et al (1998, p.

1), the second academic revolution is “*the translation of research into products and into new enterprises*”. It transforms the research university into the entrepreneurial university (ETZKOWITZ, 2003a), as “*universities took up the task of economic development, in the course of which the valorization of research is integrated with scientific discovery, returning science to its original 17th century format prior to the appearance of an ideology of basic research in the mid 19th century*” (id., p. 318). **Figure 6.1**, though predominantly based on the case of US research universities, illustrates this transformation in academia.

Figure 6.1- The second academic revolution



Source: ETZKOWITZ (2003a)

The traditional model of university-industry-government relations has significantly changed, because, on the one hand, knowledge flows from universities to industry no longer have to pass through the public domain, and, on the other hand, resource flows from industry to the university are no longer restricted to grants and endowments (OECD, 1998b). This shift places universities in a new alignment with the productive system (ETZKOWITZ and LEYDESDORFF, 1997) and makes the *ivory tower* an unviable structure (ETZKOWITZ et al, 1998). Hence, universities “*are now engaged in a major reorientation that breaks away from a traditional mould or offers an important evolutionary adaptation of an older form*”, as CLARK (1995b, p. 7) claims. It is argued (ETZKOWITZ and WEBSTER, 1998), that the change process encloses the appearance of a new type of academic institution, “*one that is oriented much more directly to playing a role on behalf of the state as an agency of economic development*” (id., p. 39). The argument adds that this role carries a new social contract between the university and the rest of society, at the heart of

which lies the *capitalisation* of knowledge produced by academic research (ETZKOWITZ and WEBSTER, 1998). However, the *capitalisation* of academic knowledge, taken as the transformation of scientific research results into economic goods, cannot be considered as a novelty. In fact, as mentioned before, the transfer of knowledge produced within academia to the productive sector had already been in practice during the 19th century, at least in a few number of places, such as the MIT in the United States or the German *Technische Hochschule*, and in a few number of industries, e.g. chemical and pharmaceutical (cf. STANKIEWICZ, 1986, CHARLES and HOWELLS, 1992, ETZKOWITZ, 2002a). In other words, confining the approach to the changing contract between higher education and society to the transformation of scientific knowledge into economic goods would place the second academic revolution as in motion almost immediately after the introduction of research as a mission of the university, i.e., the first academic revolution⁷⁷. Therefore, to capture the essence of the second academic revolution requires disentangling a set of novel factors which thrust revolutionary change. Moreover, the task goes far beyond the simplistic link inherent to the argument that in a knowledge-driven economy there is an enhanced role to be played by a major knowledge producer, keeper and diffuser such as the university.

The predominant approaches to the development challenges of the globalising economy outline a strong dependency of the so-called knowledge society for its growth on the production of new knowledge, mainly scientific knowledge, its transmission through education and training, its ICT-based dissemination, and on its utilisation through new industrial products, processes or services, i.e., technological innovation (CEC, 2003b). Accordingly, in a global intense and rapidly changing competitive context, universities are regarded as a key institution in the contemporary society. As highlighted in CEC (id., p. 2): “Universities are unique, in that they take part in all these processes [production, transmission, and utilisation of knowledge], at their core, due to the key role they play in the three fields of research and exploitation of its results, thanks to industrial cooperation and spin-off; education and training, in particular training of researchers; [...]”. In a similar vein, following the commonly recognised interactive nature of innovation, the

⁷⁷ “It is tempting to view industry, academic and public research collaboration as a new phenomenon, with interested individuals and bodies entering new uncharted waters. However, industry-academic links in fact go back a long way; they were well in place by the late nineteenth century and many of the issues and problems faced then still prevail, and remain just as important, today”, CHARLES and HOWELLS, 1992, p. 10.

competitive performance of an economy is made dependent on the intensity and effectiveness of the interactions between those actors involved in the generation and diffusion of knowledge. Hence, as in OECD (2002b, p. 15), “*the vital role that healthy and adaptive industry-science relationships [...] play in the development of fast-growing new industries and in training, retaining and attracting highly qualified labour*”.

Accepting these arguments, the conclusion is that, on the one hand, the linkages between higher education and industry seem to be more important today than in the past, resulting in a more intense relationship between academia and production, and, on the other hand, there is a more direct effect of academic research on innovation⁷⁸. **Table 6.1**, presenting the investment of private firms in academic R&D in selected countries during the 1980s, illustrates this trend.

Table 6.1 – Business expenditure in R&D performed by HEIs (1981-1987)
(Millions US dollars, 1985 prices)

Country	1981	1983	1985	1987
Germany	52	147	157	201
USA	344	413	561	763
France	26	27	42	82
Japan	67	88	125	158
United Kingdom	51	57	77	119

Source: OECD, 1990

Accordingly, the increased intensity and enlarged scope of university-industry relationships emerge as tangible signs of the second academic revolution. In fact, the *capitalisation* of knowledge was formerly limited to a few scientific domains and applied sciences and to a few higher education organisations (ETZKOWITZ et al, 1998). Intensification of links can find explanation in the combined effect of supply-push and demand-pull factors (SENKER, 1998). Supply-push factors remain at the forefront of the attempt to understand the changing intensity of contacts between academia and industry and relate mainly to the already mentioned decreasing trend of higher education’s public funding. This trend is compelling universities to look for alternative funding sources, and

⁷⁸ The OECD (2002b), recognising the difficulty of measuring science-industry relationships, uses the average number of scientific papers cited in US patents and depending on applicant’s nationality, and the number of scientific papers resulting from university-industry cooperation to provide empirical evidence of these trends. Based on these indicators, it is argued (id., p. 16) that, for instance, in the US, “*almost three-quarters of the references to scientific publications listed in US patents are from public science*”, and that “*between 5% and one-third of new products, depending on the sector, could not have been introduced without direct input from recent academic research*”.

thus extending the academic researcher's role to an effort that, in the words of BECHER and TROWLER (2001, p. 9), is of "*chasing the dollar (or the Euro)*". Here, an immediate connection can be established between this search and the self-interested development in academia of closer relationships with industry, particularly through the commercialisation of research results.

Self-interestedness and a reactive stance to change is inherent to the three insights provided by NOWOTNY et al (2003) on the reasons behind the intensification of interaction:

- firstly, the authors argue that as public funding of higher education tends to decline, public support to research becomes quasi-commercial, rather than fiduciary, in an attempt "*to align public policy with market priorities in research policy – creating what are, in effect, public-private partnerships [...]*", (id., p. 182).
- secondly, they point out a growing emphasis placed on the accountability of science, in particular through evaluation efforts of its effectiveness and quality, involving not only academic peers but also users' representatives, which, among other effects, have often encouraged researchers to adopt an industry-style production, because "*it is said to be safer to deliver predictable (and second-best?) results on time than ground-breaking research, late*" (ibid., p. 184).
- thirdly, they claim that as universities became more aware of the increased economic value of knowledge *products* in the contemporary economy, they developed the exploitation of intellectual property as an alternative funding source⁷⁹.

However, when attempting to explore the drivers of the second academic revolution, the causality established between the declining public funding of higher education and the intensification of academic connections with industry requires further clarification, mainly because if it solely involves self-interest motivations, change is conveyed by an adaptive

⁷⁹ Obviously, the diversification of what CLARK (2003) calls university generated income includes other activities besides the commercialisation of knowledge (e.g. tuition fees, campus operations, etc.). The commercialisation of knowledge itself can be extended beyond intellectual property related instruments.

evolution, rather than a revolution implying the pro-active assumption of a new academic mission. This perspective suggests that the growth of university-industry interactions, being at the conceptual core of the second academic revolution thesis, should be seen as part of a universities' endeavour directed at a deliberate construction of an inner logic and deployment of adequate mechanisms envisaging an effective incorporation of economic development as their third mission, while, simultaneously, ensuring the financial rewards that allow for the diversification of the funding base. In this sense, universities are crossing the revolution adopting a mix of reactive and pro-active stances:

- reactive, or maybe more accurately adaptive, because facing changing research policy and accountability contexts, mirroring the tendency to move from curiosity-driven research towards economically relevant research;
- pro-active, because universities, using the words of ZAHARIA and GIBERT (2005, p. 36), "*must pursue their encounter with the knowledge economy*", thrusting a dynamic and interactive stance towards society.

Pro-active attitudes of academic organisations towards the reinforcement of linkages with industry can be also associated with the potential benefits that interaction may accrue to universities, such as ensuring good employment prospects for students, keeping curricula up-to-date in a number of scientific domains, accessing and consolidating their position in innovation networks (OECD, 2002b), and identifying significant, interesting and relevant problems (OECD, 1998b).

Taking a demand-led approach, the intensification of relationships is encompassed by two intertwined factors. Firstly, the increased industrial demand for innovation in a context of increased competition; secondly, the need of industry to get close to a major source of new knowledge (SENKER, 1998). This matches the views pointing to the enhanced role of science-based knowledge in the innovation process (OECD, id.). It also reminds the argument of ETZKOWITZ et al (1998), who highlight an "*increased reliance of industry on knowledge originated in academic institutions*" (id., p. 2).

According to the OECD (2002b), the motivations of industry to co-operate with universities are manifold, ranging from the privileged access to new knowledge and the leveraging of internal research capabilities, to the renewal and expansion of a firm's

technology and the access to the university's research infrastructure. However, as in OECD (2002b, p. 21), the "*improved access to better trained human resources is by far the main benefit that industry expects from linkages with publicly financed research*". This perspective is consensual, as the access to highly qualified graduates can be considered as a traditional motivation for industry to develop academic connections (ETZKOWITZ and KEMELGOR, 1998). Some authors (e.g. LUNDVALL, 2002) argue that providing the economy with well-educated graduates will remain the most significant contribution of higher education to economic development.

Industrial reliance on academic knowledge can also be associated with the fact that research performing firms, due to the rapid pace of technological change and increased competition, ceased to find in their internal research laboratories sufficient inputs for product development (ETZKOWITZ and LEYDESDORFF, 1997). This lack, along with the trend to downsize to core competencies, led firms to turn to external sources of new knowledge, e.g. universities, forming technological systems configured by the interaction among knowledge producers and users. Moreover, the reduction of the R&D timescale combined with the increased complexity of industrial innovation and accelerated renewal and aging of knowledge (LUNDVALL, id.), both in terms of competencies and technological inputs, impelled industries to become nearer universities and other external R&D performers, and rely on them to contribute for balancing short-term needs for product development and longer-term research endowed with the potential to foster either the improvement of existing products through incremental innovation, or the creation of new products and processes (ETZKOWITZ and LEYDESDORFF, id.).

New industrial demand upon universities has been also underpinned by the development of new, high-opportunity technology platforms, namely computer science, molecular biology and material science, as well as the general growing scientific and technical content of the whole industrial production (FELDMAN et al, 2002). In addition, firms, in their innovation endeavour, increasingly require highly skilled scientific and technical labour, as well as advice from experts of outstanding scientific excellence (CHARLES and HOWELLS, 1992).

In general terms, the vital role of interaction and networking in the production, accumulation and dissemination of knowledge inputs needed to reinforce competitiveness can be seen as an obvious reason for the development of linkages between universities and

industry, two prominent actors in such a process. Accordingly, the conceptual view of innovation as a systemic endeavour, namely because claiming that firms' innovative performance are determined by the interaction of a set of knowledge institutions (NELSON, 1993), carries the assumption of interactive dynamics among science, technology, innovation and economic competitiveness. Furthermore, the system of innovation is characterised by its knowledge distribution power, as much as by its new knowledge production capabilities (FORAY, 1997). Hence, one can argue that enhanced university-industry relationships, in conceptual terms, are intrinsic to higher levels of systemic innovation.

The intrinsic character of academia-industry linkages in the system of innovation conceptual framework is a point of departure to grasp the rise of those linkages to the core of economic development policy, or, in other words, to analyse the additional pressure encompassing their intensification deriving from government policy. In fact, there is evidence, at the supra-national, national and sub-national government layers, that the systemic approach to innovation promotion has been adopted as a major organising concept of economic development policy (cf. MIETTINEN, 2002). In addition, the concept, at least in its initial foundations (e.g. LUNDVALL, 1992, NELSON, 1993), by emphasising product innovation, places firms at the centre of the system of innovation. This centrality led governments, increasingly disengaged from military and civil programmes, to focus on the support of firms, namely by attempting to use public sector research as a major vehicle (LARÉDO and MUSTAR, 2004). Following the OECD (1998b, p. 43), *“most policy makers subscribe to the view that [university-industry] collaboration increases the distributive power of innovation systems by allowing the smoother and faster flow of knowledge from universities to the final users of this knowledge – private sector companies”*. Accordingly, governments, while attempting to raise the economic returns of publicly funded research activities (FELDMAN et al, 2002), are introducing in their development policy agenda the promotion of close relationships between academic science and industry, and, with varying degrees of success, a diversity of policy instruments and mechanisms to put it in practice, by removing legal constraints and/or creating explicit and implicit incentives.

The American 1980 *Bayh-Dole University and Small Business Patent Procedures* act, which, in brief, conveyed an implied duty on the part of grant recipients and government contractors to establish partnerships with industry to commercialise federally-funded

research (HENDERSON and SMITH, 2002), is perhaps the written piece of public policy most cited in the literature as an illustration of the growing government pressure on universities to get close to industry. However, these pressures are well present in other policy-making contexts, such as the European Union,

“Co-operation between universities and industry needs to be intensified [...], as well as geared more effectively towards innovation, the start-up of new companies and, more generally, the transfer and dissemination of knowledge. From a competitiveness perspective it is vital that knowledge flows from universities into business and society”, (CEC, 2003b, p. 7),

India,

“Every effort will be made to achieve synergy between industry and scientific research. Autonomous Technology Transfer Organizations will be created as associate organizations of universities and national laboratories to facilitate transfer of the know-how generated to industry. Increased encouragement will be given, and flexible mechanisms will be evolved to help, scientists and technologists to transfer the know-how generated by them to the industry and be a partner in receiving the financial returns. Industry will be encouraged to financially adopt or support educational and research institutions, fund courses of interest to them, create professional chairs etc. to help direct S&T endeavours towards tangible industrial goals”, Department of Science and Technology, 2003.

or, South Africa,

*“The development of research capability in South Africa's higher education institutions is of fundamental importance to national self-reliance. The Government holds the view that participation in research, whether basic or applied, is a necessary function of higher education institutions. To give practical effect to this view, the Ministry will provide earmarked funds to preserve and strengthen existing areas of research excellence; to develop areas of research excellence [...]; **to develop research links with industry and to facilitate industry-related collaborative research**”*, Department of Education, 1996 (emphasis added).

University-industry linkages have thus not only intensified but also became an international phenomenon (ETZKOWITZ et al, 1998)⁸⁰, contributing effectively to economic

⁸⁰ *“The process is increasingly international, taking place not only in the United States but around the world*

development in some parts of the world, still limited to the political agenda or political discourse in other parts (SUTZ, 1997)⁸¹.

Additional evidence concerning the growing government intervention in the development of close links between academic science and industry can be found in the widespread creation of physical interface spaces, such as science parks, innovation relay centres and incubators. Successful experiments in high innovative agglomerations such as Route 128 around Boston and Silicon Valley, in the US, or Cambridge, in the UK, are being emulated all over the world, mainly by force of government-led initiatives⁸².

The literature on the second academic revolution indicates that change is being underpinned by a wide variety of inducing dynamics, both supply and demand led, which, in short, pave the way for the intensification of university-industry relationships. Cooperation is emanating from both university and industry spheres, and increasingly encouraged by governments (ETZKOWITZ and LEYDESDORFF, 1998). In a generally more favourable public policy framework, firms look at academic research as a source of knowledge inputs for their innovative performance, and universities, responding to external pressures and developing new forms of engagement, attempt to effectively accommodate in their functional and organisational settings the novel mission of economic development added to teaching and research.

This set of driving forces conveys significant qualitative and quantitative changes in university-industry links, namely in terms of cooperation typologies and mechanisms, as well as outcomes. NIEMINEN and KAUKONEN (2001), for instance, refer to direct, indirect and mediated linkages between academia and users of academic knowledge. According to the authors (id.), direct linkages - "*usually the most visible form of linkages*" (ibid., p. 23) - are established through university-industry joint research projects, research contracts or, more informally, meetings and conferences. Indirect linkages include activities such as

in both developed and underdeveloped countries. It is a feature of capitalist-free market, mixed economies and socialist and post-socialist economic systems, North-South, East-West", ETZKOWITZ et al, 1998, p. 2.

⁸¹ "[...] in all discourses knowledge and innovation are elevated to the heights of Olympus. But contrary to what occurs in the 'center', where the vocation of the state to support innovation is positively fed back into its capacity to do so, in the periphery such vocation is scarce – if it exists at all- and is generally accompanied by amateurism", SUTZ, 1997, p. 15.

⁸² According to the IASP- International Association of Science Parks, 96% of the science and technology parks existing in the world were established after 1980, and approximately half of them between 1990 and 2000. In addition, the number of IASP's associates grew 106% from 1994 to 2003.

researcher training, background knowledge and professional networks affecting society's problem-solving capacity. Mediated linkages aim at facilitating and creating opportunities for the establishment of direct linkages, namely through the establishment of funding instruments and criteria that privilege university-industry interaction. From an institutional point of view, the same scholars (NIEMINEN and KAUKONEN, 2001) point out three general categories of interaction, - research, service/consulting, and education/training, - and suggest a typology based on the distinction between collaborative research and knowledge transfer modes of interaction. The latter include innovation centres, patenting and licensing, continuing education, science and technology parks, consulting, personnel exchange and seminars and publications exchange. The former include university-based institutes aimed at serving societal/industrial needs, jointly owned or operated laboratories, research consortia, contracted university research and government-funded co-operative research initiatives.

A common characteristic of these types of linkages between academia and the users of knowledge is the formal character of interaction mechanisms. It reflects the increased formalisation of cooperative arrangements and supportive schemes (CHARLES and HOWELLS, 1992; OECD, 2002b). Still, there is evidence that formal interaction is the tip of the iceberg. As the OECD (id., p. 22) suggests, "*the bulk of industry-science relations take place through informal and indirect channels and also through unrecorded direct channels in countries where the regulatory framework has been fairly restrictive in the past*". A good illustration is provided by a survey conducted by SPRU in the UK (SPRU, 2000), which indicates that approximately half of surveyed manufacturing firms declare that universities are an important source of innovation, but only 10% of those firms have developed formal contacts with academia. The OECD (1998b, p.48) reinforces the argument favouring the relevance of informal contacts: "*informal partnerships among individual researchers in universities and enterprises are often the most fruitful form of collaboration and are on an upward trend*". Moreover, according to the same source (id.), "*informal communication channels between industry and universities far exceed the number of formal linkages and are often essential to success in more formal research partnerships*". An additional insight is that formalisation of previously informal interaction may actually result in a decrease of collaboration, as argued in CEC (1998).

Changes in the nature of linkages between academia and industry can also be thought of as a shift in logic, from industrial sponsorship to knowledge partnership-based academy-industry interaction (ADLER et al, 2000). In the sponsorship mode, prevailing cooperation between the two spheres implied a sharp division of labour between the industrial participant, providing the funds and the research outline, and the researchers, fully controlling the research process content and organisation, which often gave rise to “*a source of frustration for the funder*” (id., p. 127). Knowledge partnership relations arise from this feedback of industry, together with the universities’ need for extended industrial funding and the researchers’ willingness to access interesting empirical problems, which, according to ADLER et al (ibid.), “*has precipitated a growing shift towards an interactive model of academy-industry cooperation that promotes joint problem solving*”. This equates an interactive mode characterised by a joint effort of scientific *problematization* (RODRIGUES et al, 2000), assuring that industry’s problems and needs are built-in the academic processes of knowledge generation and problem solving.

An expected outcome of the rise of knowledge partnership forms of cooperation between universities and industry, taken together with its increased formalisation, concerns the development of new research locations, in the form of new academic organisational arrangements, able to accommodate the challenging demands of a time-consuming and *ethos*-threatening continuous dialogue with industry. This can be related to the emergence of hybrid organisations or of an expanded academic developmental periphery within the (entrepreneurial) university. SCOTT (2000a) refers to the development of freestanding research institutes within universities with independent budgets and separate staff. ETZKOWITZ (2003b) calls forth quasi-firm research groups, “*lacking only a direct profit motive to make them a company*” (id., p. 111), underscoring the shift from an individual to a group focus in the academic missions. Besides the already mentioned science and technology parks, new institutional arrangements can take the form of small university-based firms aimed at marketing and exploiting innovations derived from academic research (JACOB, 2000). A number of universities have established commercial services and industrial liaison offices in order to foster and manage more effectively their relationships with industry (CEC, 1998).

Much at the purpose, ETZKOWITZ, (1999) refers to a more integrated model of academic-industry links developing along with a diversified network of transfer institutions

as being superseding arm-length types of interaction. The new organisational arrangements enclose a sharp distinctive feature of the changes associated to the second academic revolution: the attempt to create “*an industrial penumbra around the university*” (ETZKOWITZ et al, 1998, p. 17), with “*faculty and administration directly involved in translating knowledge into intellectual property and economic development*” (id.). This corresponds to an institutional and organisational change process, which, in the words of ETZKOWITZ and WEBSTER (1998, p. 23) is impelling universities and equivalent institutions to become “*increasingly autonomous and prepared to play a role – at least in the margins – that is similar to industry, spawning a wide range of local and regional linkages with the private sector as well as generating spin-off companies that may service larger corporations or develop into much more important corporate actors*”.

The extension and multiple facets of change in academia as described above are summed up, and somehow contracted, by the second academic revolution predominant thesis as a shift in emphasis “*from traditional modes of academic-industry relations oriented to supplying academic ‘inputs’ to existing firms, either in the form of information flows or through licensing patent rights to technology in exchange for royalties*” (ETZKOWITZ, 1999, p. 225). Rather than inputs, academic knowledge provides outputs, namely because, using the words of ETZKOWITZ (id.), “*utilizing academic knowledge to establish a new firm, usually located in the vicinity of the university, has become a more important objective*”. Hence, multiplying the value of intellectual property derived from academic research, either directly through the creation of a new firm or indirectly through a stream of royalty income from an existing firm is at the core of the second academic revolution (ETZKOWITZ, 2002a).

The second academic revolution, following ETZKOWITZ and LEYDESDORFF (2000), represents the move from the era of the science endless frontier, underpinned by the linear model of innovation, to an era of mediated innovation, in which basic research is closely linked to industrial utilisation by means of a series of intermediate processes, often encouraged by governments, expressing an endless transition “*that continuously redefines the borders of the endless frontier*” (id., p. 119). A “*network overlay of communications and expectations that reshape the institutional arrangements among universities, industries, and governmental agencies*” (ibid., p. 109) is developing, giving rise to a *triple-helix* of university-industry-government relations.

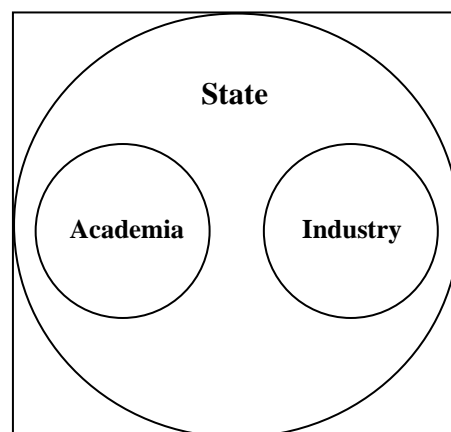
6.4

Modelling the second academic revolution: the triple helix of university-industry-government relations

The Triple Helix (TH) model of university-industry-government relationships was first suggested by Henry Etzkowitz and Loet Leydesdorff (ETZKOWITZ and LEYDESORFF, 1997, 1998, 1999, 2000). The scholars aimed to depict the “*new social contract between the university and the larger society [which] is being negotiated in much more specific terms than the old one*” (id., 1997, p. 1). According to the authors (ibid.), the former contract, based on the linear model of innovation, thus presuming solely long-term contributions of academic research to the economy, is giving place to one in which long and short-term contributions are possible. The TH model emerges because “*a spiral model of innovation is required to capture multiple reciprocal linkages at different stages of the capitalization of knowledge*” (ibid.). They (1999, p. 112) add that “*the future location of research and technology reside in a ‘triple helix’ of university-industry-government relations that play off a set of technological sub-dynamics*”.

The basic assumption of the model is that universities “*can play an enhanced role in innovation in increasingly knowledge-based societies*” (ibid., 2000, p. 109). This possibility finds its ground in the perception that universities, industries and governments are “*no longer non-intersecting, with relations across strongly defended boundaries*” (ibid., 1999, p. 113), rather taking the role of the other, even if retaining autonomy.

Figure 6.2 – The TH I or the *etatistic* model



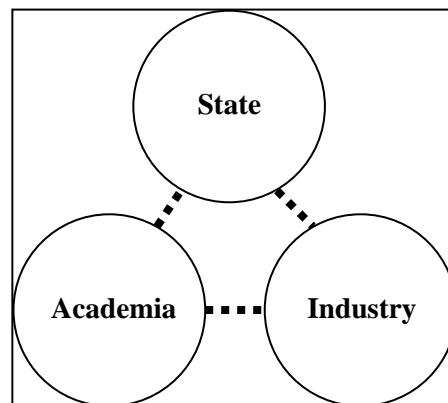
Source: ETZKOWITZ and LEYDESORFF (2000)

The TH model of equivalent and overlapping institutional spheres is an evolution of two opposite institutional arrangements enveloping linkages between universities, industry and government. In the first one (**Figure 6.2**), labelled as TH I and exemplified, in its stronger version, by the former USSR and, in its weaker version, by Latin American countries, the nation state encompasses universities and industry and directs the relations between these two spheres.

In the *etatic* model, government takes the lead in co-ordinating and providing resources to eventual interactions between academia and industry, which are seen to be relatively weak spheres, thus requiring strong guidance (ETZKOWITZ, 2003a). According to ETZKOWITZ (id., p. 304), “the idea of the statist version of the Triple Helix is that the country should keep its local technological industry separate from what is happening in the rest of the world”.

The second arrangement (**Figure 6.3**) stresses the separation of institutional spheres, with strong dividing lines between them and highly circumscribed relationships among the three spheres. The TH II model, denominated as *laissez-faire* model, is the polar alternative to the *etatic* model, in which universities appear as a provider of basic research and human capital to industry, and the government assumes a role limited to regulation and procurement.

Figure 6.3 – The triple helix II or the *laissez-faire* model



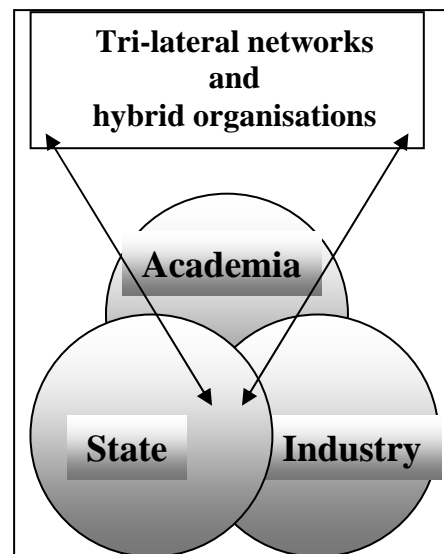
Source: ETZKOWITZ and LEYDESDORFF (2000)

ETZKOWITZ (ibid., p. 305) stresses that in this model “people are expected to act competitively rather than cooperatively in their relations with each other”, thus one can expect limited interaction between the three institutional spheres. The same author (ibid., p. 306) contends that “when there is interaction and interrelationship among the spheres, it is

expected to take place across strongly defended boundaries and preferably through an intermediary”.

As highlighted by ETZKOWITZ and LEYDESDORFF (2000), the *etatistic* model is largely regarded as a failed developmental model, letting too little room for bottom-up initiatives, discouraging rather than encouraging innovation. According to the authors (id.), the *laissez-faire* model advocates a shock therapy to reduce the role of the state as in TH I. As these two models are open to change, a new configuration is developing, *generating a knowledge infrastructure in terms of overlapping institutional spheres, with each taking the role of the other and with hybrid organizations emerging at the interfaces”* (ETZKOWITZ and LEYDESDORFF, *ibid.*, p. 111). The triple helix model of university-industry-government relationships, as illustrated in **Figure 6.4**, expresses this new configuration.

Figure 6.4 – The TH III model of university-industry-government relations



Source: ETZKOWITZ and LEYDESDORFF (2000)

The triple helix of university-industry-government relations develops according to four dimensions (ETZKOWITZ, 1997; 2003a; ETZKOWITZ and LEYDESDORFF, 1998). The first dimension is the internal transformation in each one of the helices. Universities are not only teaching and doing research but also attempting to capitalise the knowledge they produce. Lateral ties among firms based on strategic alliances are developing within industry. Governments, in a number of countries are taking the role of venture capitalists.

The second concerns the influence of one helix upon another, illustrated by the US Bayh-Dole Act of 1980, which instituted an indirect industrial policy through which the federal government encouraged academia to assist industrial innovation. The third is the generation of a new overlay of institutional structures stemming from the interaction among the three helices. Established to produce new ideas and formats for innovation-based development, these trilateral structures typically emerge under crisis conditions provoked by economic depression or increased global competition. Small and large firms, universities and other research organisations, local, regional and national governments get together to *brainstorm* new ideas and attempt to fill in gaps in the innovation systems. The fourth consists of a recursive effect of the trilateral networks on the spirals from which they emerge and on the wider society. The interaction of universities with industry and government is transformed when the capitalisation of academic knowledge displaces disinterestedness and the inherent public nature of knowledge. This, in turn, has arisen from the practices of industrial science, internal entrepreneurial dynamics within academia, and from government policies.

The TH III model challenges the conventional and linear modelling of interaction between universities, industry and government, which tend to emphasise the distinction between basic research, to be carried out by academia and government, and applied research, typically the realm of industry (KAGHAN and BARNETT, 1997). The model attempts to encapsulate the dynamics of non-linear interactive innovation (LEYDESDORFF, 2005). It distinguishes several sub-dynamics, namely the diffusion of technologies through markets, the technological trajectories that propel change and restructuring, and the reflexive levels of control, including government and private firms (ETZKOWITZ and LEYDESDORFF, 1999). The model proponents (id., p. 113) state that “*the triple helix regime operates on these complex dynamics of innovation as a recursive overlay of interactions and negotiations among the three institutional spheres*”. Interacting sub-dynamics are continuously and reflexively reconstructed through these discussions and negotiations, which occur in a context of creative friction between the institutional spheres and technological systems. This creative friction generates new combinations and recombinations of technological and organisational innovations (ibid.).

The TH becomes a platform for *institution formation*, in the sense that the interaction among university, industry and government can originate the creation of new

organisational formats, e.g. the incubator, the science park or the venture capital firm (ETZKOWITZ, 2003a). The emergence of these new organisational formats supports the TH underlying argument that the university is positioning itself as a leading institutional sphere, along with industry and government, in the promotion of social and economic development. It also links to the basic features of the second academic revolution, seen by ETZKOWITZ (1998) as underpinned by the translation of research into products and into new firms. Incubation, as stated elsewhere by the same author (id., 2002b, p. 117), is an exemplar of the TH model of university-industry-government relations, as “*firm-formation from academic institutions has been systematized from a series of individual entrepreneurial initiatives into an organizationally refined method of economic and social development*”.

Institution formation within the triple helix fuels the move from the endless frontier towards the endless transition, since the prior relatively distinct phases of basic research, applied research and product development are increasingly co-evolving and, according to ETZKOWITZ (2003a, p. 330), “*they will blend into each other and move back and forth without strict separation between them*”. A second endless transition is occurring between different technological areas, heretofore regarded as connected to different disciplines and industries, but now increasingly cross-fertilising each other (id.). A third endless transition, according to the same author (ibid.) concerns the relationship between basic research and the uses of research, namely the public policy effort to facilitate technology transfer in order to reap the benefits of public research funding.

The original construction is being extended in order to encapsulate the issues of sustainability raised by innovation (ETZKOWITZ and ZHOU, 2006). This extension stems from the question whether the *public* can be considered as a fourth helix in university-industry-government relations (cf. LEYDESDORFF and ETZKOWITZ, 2003). The role of the public is mainly directed at redressing the negative impacts of science and technology development or innovation, in particular on the environment (ETZKOWITZ and ZHOU, id.). Rather than adding a fourth helix, which might cause the triadic model to lose its creative dynamics, it is suggested that the triple helix can be conceptualised as a dual set of helices, or, in the authors’ words (ibid., p. 79), “*triple helix twins*”. Accordingly, the triple helix of university-industry-government relations is complemented by a twin triple helix of university-public-government. The former represents the different forms of collaborative

institutional arrangements between universities, industry and government inducing innovation. The latter expresses the dynamic of controversies over technological innovation (ETZKOWITZ and ZHOU, 2006). It is suggested that the two triple helices operate in tandem: “*the university-industry-government Triple Helix works to promote innovation and economic growth, while the university-government-public one serves as a balance wheel to insure that innovation and growth take place in ways that will not be harmful to the environment and health*” (id., p. 80). Interaction between the twins is what fosters sustainable economic and social development.

The Triple helix thesis translates institutional turbulence affecting academia into creative tension that periodically comes into conflict (ETZKOWITZ et al, 2000). As suggested by ETZKOWITZ et al (id., p. 326), the contemporary university “*is an amalgam of teaching and research, applied and basic, entrepreneurial and scholastic interests*”. The authors (ibid.) add that academia is able to reconcile, through compromise and normative change, different and opposed ideological elements, such as entrepreneurship and the extension of knowledge. In other words, following ETZKOWITZ (2003a, p. 333), “*the entrepreneurial university is not the ‘commercialized university’ but a university that encompasses the conservation and passing on of knowledge, integrating teaching, and research, as well as supporting innovation*”. Taking this perspective, under the triple helix regime, the classic legitimation for scientific research as a contribution to culture still holds, along with its role as source of economic development (ETZKOWITZ and LEYDESDORFF, 2000). This is the reason behind TH architects’ perception that the university “*can be expected to remain the core institution of the knowledge sector as long as it retains its original educational mission*” (id., p. 117). ETZKOWITZ and ZHOU, ibid., p. 127) conclude: “*The structure of the triple helix depicts the university as a regional innovation organizer as well as a disinterested observer and social critic, a capacious institution capable of incorporating multiple functions and reconciling apparently contradictory objectives in the search for truth, beauty and wealth*”.

The TH model has been criticised (and even caricatured: e.g. the *Triple Felix* model, cf. LEYDESDORFF and ETZKOWITZ, 2003), according to a variety of perspectives. Three of these are of particular interest. The first, as suggested by SHINN (2002), concerns the link between the TH thesis and the second academic revolution and rests on the author’s perception that “*the disturbing dislocations of the Triple Helix are being supplanted by*

evolutionary, transitional and incremental adjustments within academia” (SHINN, 2002, p. 609, emphasis in the original), that is, there is a contradiction between the alleged academic revolutionary change and the endless transitions which lies at the core of the model. The condition previously established to consider an academic revolution as representing an extension or change in the academic mission is perhaps useful to deal with this criticism. Taking this perspective, the triple helix, rather than “*to be found in the second academic revolution*” (ibid.), can be regarded as an illustration of or an empirical tool to study the transformations in the relationships between academia, industry and government that, on the one hand, have ignited the emergence of a new academic mission, and, on the other hand, are being influenced by the inherent change dynamics. Second, as in SCOTT (2000), the TH model is blamed because overlooking the role of social sciences in influencing innovation processes and policy. The author (id., p. 8) argues that, being innovation a social process, “*one would expect to see the research and analysis incorporate all of the significant factors involved in innovation*”. This criticism gains increased relevance when recalling the core argument of this dissertation, i.e., the role of academia in building up the institutional capacities that nurture innovation and innovative behaviour not only in industry but also in the wider society. Third, as expressed by SEIDL and PIRRO E LONGO (1999), there are concerns about the possibility to make generalisations upon the TH model. The authors stress that interactions between the three institutional spheres depend on a particular country stage of development. Looking at the qualities of each helix in developing countries, they identify problems in the academic, industrial and governmental spheres. CASTRO et al (2000) talk about a *crippled triple helix*. In relation to the academic segment SEIDL and PIRRO E LONGO (id., p. 137) contend that “*MIT or Caltech can hardly be considered a paradigm for universities dedicated to teaching, not research, almost totally supported by federal or state governments, in which salaries are regulated by law, not competence*”. This critic is mitigated when considered that, as mentioned above, the model proponents acknowledge the existence of different types of triple helix (e.g. *etatistic* and *laissez-faire*), thus accommodating the expected contextual differences in modes of interaction. Nevertheless, as ETZKOWITZ and LEYDESDORFF (2000, p. 112) argue, “*in one form or another, most countries and regions are presently trying to attain some form of Triple Helix III*”. A commonly addressed difference is the one between Europe and the US. ETZKOWITZ (2003b) argue that the US

entrepreneurial university emerged *bottom-up* as opposed to Europe, where academic entrepreneurship is a recent *top-down* phenomenon “*in response to the innovation gap between the US and Europe*”, (ETZKOWITZ, 2003b, p. 109). There is evidence though that TH III is most likely to occur in territorial contexts endowed with higher systemic innovation potential. In those territorial contexts, in turn, the TH, rather than national, frequently assumes a localised nature, which impels to bring into the debate the regional problem. In fact, the regional dimension of innovation promotion has been made more explicit by the TH approaches in the most recent theorising developments (e.g. ETZKOWITZ, 2002b, but GULBRANDSEN, 1997). This will be fuller addressed in the next chapter. At this stage, the criticism to retain is the one related with the concerns of SCOTT (2000), since the claims for an extended concept of innovation made before, going beyond technological and technical innovation, are far from being encapsulated not only by the TH thesis but also by the predominant view on the nature of the second academic revolution.

6.5

Concluding for the need to widen the framework...

This chapter discussed the change drives and features that are shaping and challenging the contemporary university. A wide array of events, ranging from the more prosaic problem of public funding of universities to globalisation, the welfare state decay, and the emergence of the so-called knowledge-driven society, has ignited transformative forces with the power to induce the integration of a new mission in the academic realm, that is, the occurrence of a second academic revolution. The new academic mission added to teaching and research is said to be the one of contributing for economic development.

The perspectives on the nature and impacts of change in academia are far from a consensual view. One can argue that there is a sharp divide between a *declinist* and a more optimistic stance in relation to the fate of universities. The pessimistic view is mainly derived from the particular attention paid to the reduction of public funding of universities, which become under pressure to find alternative sources of money, namely in private economic activities. The basic argument is that closer interaction with the private realm is originating the *marketisation* and *corporatisation* of academia. Market competition and economicist logics of contemporary capitalism are transposed into the academic world,

which, accordingly, adopts the management logic of corporations. In parallel, the welfare state ideology decay transfigures the relationship between the nation state and the university. The role universities played in pursuing the national interest was mainly based on the provision of knowledge produced by basic research, which, along a linear flow, would be transformed and applied by industry to foster innovations. In the contemporary conditions, the national interest requires from the universities the generation of knowledge in the context of application. The so-called Mode 1 of knowledge production gave its place to a Mode 2, which has not only shaken the inner academic research structure and nature, but also removed the centrality of the university as source of knowledge.

The changing mode of knowledge production gave additional strength to the declinist thesis, as it pulled down the intricate core academic values, as expressed by the *Mertonian* rules. The basic claim here is that the norms of communism, universalism, disinterestedness, and organised scepticism are being superseded by the norms legitimating proprietary, local, authoritarian, commissioned and expert scientific work. Institutional turbulence is thus regarded as a demolishing job on universities, which, in the more radical perspectives, become an institution in ruins.

Counteracting this somewhat catastrophic view on the future of academia, the more optimistic theses, while acknowledging as inevitable the occurrence of institutional turbulence, argue in favour of an enhanced role of universities in a knowledge-driven society. The integration of economic development as a third academic mission, along with teaching and research, is placing the university in a privileged position to meet the expectations of a society being trespassed by innovation pressures. The second academic revolution, similarly to the *Humboldtian* first revolution, is transforming the university into the entrepreneurial university, as reactive and pro-active developments within academia are taking place allowing for, on the one hand, the university to endure as an institution because ensuring that academic values guide the transformation, and, on the other hand, an organisational and management structuring adequate to effectively respond to the expectations of society.

The economic development mission of universities that configure the second academic revolution is generally associated with knowledge and technology transfer from universities to firms and the creation of firms based on academic research results. The theoretical body that wraps up the second academic revolution, drawing on the metaphor of

a triple helix of university-industry-government relations, according to which institutional spheres overlap and can take the role and functions of each other, confirms the technological bias. Bearing in mind the variety of mechanisms and arrangements that are being deployed to foster the third academic mission on the one side, and the conceptualisation of innovation as social interactive process that requires much more than R&D and technological breakthroughs, the defining core of the second academic revolution can be criticised. The very research hypothesis suggested before, speculating about the possibility of a role to be played by universities in processes of institutional capacity building, carries with it a potential for criticism.

Accordingly, there is the need to widen the second academic revolution conceptual framework, in order to deal with innovation as a social process and bring into the debate the fundamental problem of the dependency of a given regional system's innovative capacity upon its institutional qualities. This need becomes of utmost relevance when addressing the particular case of LFRs. Hence, the task of the next chapter becomes clear: to fill in this need by extending the academic revolution conceptual framework in order to explore the role of academia in the processes of regional institutional capacity building.

Universities and regional development: towards a new perspective on the second academic revolution

7.1

Introduction

In the previous chapter, the nature of the second academic revolution has been explored under the overall framework provided by the seminal literature on the subject. The main point was that this predominant approach on revolutionary change in academia, because biased towards technology transfer and spin-off firms' creation, provides a too narrow perspective on the extended social contract attaching universities to the rest of society. In fact, it brushes aside the diversity of ways universities can help the processes of institutional capacity building necessary to construct the social architecture that sustain interactive learning and systemic innovation. The conclusion was that, in order to properly capture the multidimensional role of universities, the predominant perspective should be widened, particularly when in presence of LFRs. The present chapter shelters these concerns and, while calling forth the regional dimension of the problem, pursues the ultimate goal of introducing a new and more encompassing perspective on the second academic revolution.

The increased importance attributed to the regional level in the globalising society is strongly configuring the second academic revolution that has integrated socio-economic development, along with teaching and research, in the mission of the university. As CHATTERTON and GODDARD (2003, p. 19) argue, "*while they are locate 'in' regions, universities are being asked by a new set of regional actors and agencies to make an active*

contribution to the development of these regions". The third mission carries within it pressures to establish closer links between universities and regional development, as academia becomes increasingly recognised as having a crucial role to play in the development processes of the regions where they are located.

As expected, the role of universities in regional development attracted scholarly interest, originating a burgeoning and diversified literature on the subject. In addition, supra-national, national and regional public bodies evidence high interest in that role, as shown by the number of studies, policies, strategies and programmes that were and are being undertaken in many countries and regions (cf. OECD, 1999b) in order to render concrete the regional development potential existing in universities. Academic institutions themselves are more and more placing regional development as a primordial institutional objective, and producing mission statements and institutional plans in accordance⁸³.

This buzz gave rise to the explicit *regionalisation* of the overall second academic revolution theoretical grounds. The part played by universities in the developments occurred in such places as Silicon Valley and the Boston area in the US, or Cambridge in the UK, had a decisive influence on the strengthening of the regional dimension as focus of scholar interest. The rise of these high-tech agglomerations, in turn, favoured the bias towards technological innovation and the inherent emphasis on technology transfer and high-tech firms when studying the regional mission of academia. The role of universities in regional development, accordingly, continued to be largely scrutinised under the influence of a mental model of what constitutes innovation derived from the technological frontier, - from activities like R&D, from sites like Silicon Valley -, even though, in the words of MORGAN and NAUWELAERS (1999, p. 2), "*most regions depend on more prosaic activities*".

A counterpoint to the predominant technology-oriented approach can be found in a body of literature that emphasises universities' regional engagement, involving the redesign of teaching, research, and extension and service functions for universities to become, as averred by the KELLOG COMMISSION (2001, p. 13), "*even more sympathetically and productively involved with their communities, however community may be defined*".

⁸³ For instance, the 2001 survey on university-business interaction carried out in the UK (HEFCE, 2003; CHARLES, 2003) shows that, on the one hand, approximately 65% of respondent universities consider regional development as a high priority, and, on the other hand, 46% of them took their cue from the priorities defined by regional development agencies strategies.

Without discarding the great importance of technology transfer activities and spin-off firms, this literature brings into the debate a multiplicity of effects that universities can exert on the qualities of the places where they are located. Despite still relatively incipient and placed on a kind of penumbra as far as the mainstream literature and, all too often, the policymaking mind settings, it broadens the framework and sheds light over fundamental aspects of development processes that were identified in Part I, by assembling the narrow techno-economic view to other facets, namely the promotion of the regional networking and governance capabilities. In this sense, the extended account is a purposeful referential to address the role universities can play in the processes of institutional capacity building that, as suggested before, underpins the efforts to lift regional systems of innovation upwards higher scales of systemic potential. By studying the contribution of universities to knowledge and relational resources accumulation and mobilisation capacity furtherance, a new and more encompassing perspective on the second academic revolution can be suggested. This new perspective acknowledges the increased relevance of universities operating in LFRs, generally affected by weaker institutional qualities encumbering their efforts to develop and escape backwardness. By taking into account the mutually reinforcing relationships between universities and their regions, it also calls up the idea of the inevitability, at least in LFRs, of placing regional engagement at the core of academic change. Concomitantly, it brings about the augmented challenging conditions that universities can expect to come across, in terms of management, organisational forms, and *modus operandi*.

The chapter sheds light over aspects of the universities' regional mission that are neglected by the narrow approach and constructs a new perspective on the second academic revolution, which, in turn, allows for defining the major inquiry line and research questions to be worked further on. It draws on the following structure:

- Firstly, it addresses the regional dimension of the predominant discourse on the revolutionary change in academia and attempts to depict the approach as an incomplete model of the role of universities in regional development;
- Secondly, it carries an effort to extend the narrow techno-economic perspective by resorting to a body of literature that, though acknowledging the relevance of the technological dimension, enlarges the framework and brings into the debate a multiplicity of contributes that universities can give to their regions;

- Thirdly, it introduces a new perspective on the second academic revolution, under the definitional framework of institutional capacity building processes developed in Chapter 5;
- Fourthly, it draws attention on the augmented organisational challenges that can be expected to arise along with the regional third mission, and discusses the possibility of a win-win game yielded by the university-region nexus;
- Fifthly, it approaches the reasons why universities can play a role of paramount importance in LFRs;
- Finally, it sketches out some conclusive remarks, provides the backbone lines of inquiry to be pursued and outlines the research questions to be investigated.

7.2

Universities and regional development: the predominant and narrow technology-oriented view

The acknowledgement of the importance of territory in the promotion of socio-economic development, together with the recognition that the processes of academic change evolve in a close dialectics with society, impels the perception that any effort to capture the essence of the second academic revolution would be incomplete if not incorporating an explicit developmental link between the university and its region. As noted above, this link is calling particular attention not only as an object of scientific inquiry but also as an issue of policy-making.

“Within advanced economies, there is a growing conviction that university teaching and research should be directed towards specific economic and social objectives. Nowhere is this demand for ‘specificity’ clearer than in the field of regional development”, CHATTERTON and GODDARD, 2003, p. 19.

Hence, the third academic mission encapsulates a strong regional dimension, as the contribution of universities to social and economic development is increasingly viewed as depending on how they help their regions to succeed in the globalising society. This contribution draws on a wide range of academic activities and interactions with the region.

The perspectives used to observe and study that contribution, while converging on a consensual intuition about university's centrality in pursuing regional development objectives, tend to diverge in what concerns the observation lens and focal points.

The measurement of university economic impacts on the region, utilising variables such as expenditure, consumption, employment or population growth, and methods such as input-output analysis or multiplier calculation, constitutes an important and prolific research field. Significant income and employment impacts have been identified by these studies (e.g. GODDARD et al, 1994; HUGGINS and COOKE, 1997), meaning that the mere presence of a university in a given region positively influences its economic status. Moreover, as CHATTERTON and GODDARD (2003, p. 19) highlight, "*regionally engaged universities can become a key locational asset*", meaning that universities can be an attraction factor for new firms or R&D laboratories of large companies, retail, culture and other quality services, and can enhance attractiveness of their towns of location, both in physical and social terms (MASKELL and TÖRNQVIST, 2003). This is the reason why national governments have been keen to found universities as a means to stimulate the development of less attractive regions. These research streams, though important, mainly account for passive impacts, thus placing it far from the argumentative alignment to be followed here.

The development of the so-called knowledge-based society opened up an equally prolific research trajectory starting in the assumption that if knowledge is a crucial resource for regions to strive in the global, the university, transformed into a sort of *knowledge-factory* by the second academic revolution, has a central role to play in regional development. This reasoning generally finds its ground in a close link between the development of a given region and its capacity to foster technological innovation. Hence, as CHARLES (2006a, p. 118) contends, "*much of the contemporary debate about the role of universities in regional development has focused on technology transfer and spin-off firms*".

This technological focus is well evidenced by the predominant view on the nature of the second academic revolution or the evolving triple helix theorising work. The triple helix thesis, in its foundations, argued that universities were increasingly viewed as actors in national and regional innovation systems, as distinct boundaries between academia and industry were elided and replaced by a web of ties (ETZKOWITZ and LEYDESDORFF, 1997).

It acknowledged that national innovation systems were being supplemented by regional (and multinational) innovation systems and “*the spread of technology policy to virtually all regions, irrespective of whether they are research oriented or industrially intensive*” (ETZKOWITZ and LEYDESDORFF, 1997, p. 4). Despite this acknowledgment, at least initially, the regional role of universities has played a second fiddle in the triple helix overall approach, as the emphasis was placed on the explanation of the dynamics underlying new configurations of university-industry-government relations. Nevertheless, the triple helix debate gave rise to a number of explicit incursions in regional development, as shown by contributions such as those of GULBRANDSEN (1997) and ROSA PIRES and CASTRO (1997).

GULBRANDSEN (id.) argues that it could be fruitful to talk about a regional triple helix, because “*regional cooperation between universities, other research organizations, industry (including funding institutions and consultants) and authorities is increasing in importance*” (ibid., p. 125). The author produces some sound statements, such as that universities seem to prefer collaboration with geographically close companies and select partners further away only if “*forced to select them by international research funding, or if regional industry is not sophisticated enough for cooperation*” (ibid.). Drawing on the cases of Cambridge and Grenoble, GULBRANDSEN (ibid.) evidences how regional and international innovation systems are combined and concludes that “*technology is developed locally, while the firm’s markets, and science, are international*”.

ROSA PIRES and CASTRO (id.) discuss the triple helix in the context of the new trends in regional policymaking. The basic argument is that the innovative capacity of a regional economy depends on the region’s ability to synthesise three pairs of attributes: i) coherence and heterogeneity of the regional productive system; ii) competition and co-operation; and iii) regional availability of codified and tacit techno-economic knowledge. The same authors (ibid., p. 17) contend that “*universities can provide a very wide contribution towards the consolidation of coherent systems of innovation through a careful selection of relevant courses and curricula, designed to fit regional technological needs and to orient the development of local technical cultures in order to meet the requirements of expected future scenarios*”. The scholars also argue that the processes of creation, acquisition, adaptation and diffusion of new knowledge developed within universities can generate variety. In addition, according to them, universities are able to upgrade the regional

networking potential through the development of specific projects involving co-operation among firms, diminishing the gap between science, technology and society, between fundamental and applied research and between the discovery of new technologies and the development of economically viable products and production processes. In the words of ROSA PIRES and CASTRO (1997, p. 17), *“by adopting this behaviour, universities are, in addition, contributing to the accumulation of tacit knowledge”*, a kind of knowledge that, as noted before, is deemed to play a fundamental role in the promotion of regional innovation.

More recently, the regional dimension of triple helix configurations has been made more explicit and placed at the core of the argument. Accordingly, as regions seek to create a self-reinforcing dynamic of knowledge-based economic development, the three institutional spheres are being internally transformed and new relationships between them are being established across institutional boundaries (ETZKOWITZ, 2002c). These new networks underpin the process of regional change, namely because, following ETZKOWITZ (id., p. 11), they *“may allow the emergence or renewal of high-tech complexes and the creation and organization of new industrial sectors”*. About the ways universities contribute for regional change, ETZKOWITZ and ZHOU (2006, p. 125), stress the role took by academia *“in helping start up businesses and in encouraging the development of regional ‘clusters’”*. ETZKOWITZ (2003a) talks about the growth of industrial conurbations around universities that, in his words (id., p. 298), *“has become the hallmark of an entrepreneurial region, exemplified by Silicon Valley’s electronics and semiconductor industry”*. About the future of the university, ETZKOWITZ and ZHOU (id.) claim that it will play a more prominent role in society, through exchanging functions with industry and government, and by *“creating the pre-conditions for regional economic and social development”* (ibid., p. 127). Accordingly, in the words of COOKE and LEYDESDORFF (2006, p. 10), *“for research knowledge, industry and government can be expected to pay more for privileged access to knowledge-based growth opportunities by funding research, stimulating closer interactions among the three institutional spheres, subsidizing infrastructure (e.g., incubators and science parks), and stimulating academic entrepreneurship skills and funding”*.

The basic underlying assumption here is that the strengthening or maintenance of regions’ economic competitiveness in the global economy depends on the performance of

regional knowledge-intensive firms that use knowledge, namely science-based knowledge, as a factor of competitive success. The importance of universities, as major source of scientific knowledge, becomes obvious in this context. The degree of importance significantly increases when universities are looked at as a generator or attractor of highly skilled talent (GERTLER and VINODRAI, 2004), matching the high demand of knowledge-intensive sectors for adequate skills and competences. Academic research, generating scientific and technical knowledge, and the production of talent, according to the predominant view, are the defining elements of the role universities play in regional development. The so-called high-technology sectors are, therefore, the focal point, which means that, as reminded by STORPER (1997), these approaches tend to isolate cases of *advanced* regional development. Such places as Silicon Valley and the Boston area in the US, or Cambridge in the UK, become the paradigmatic illustration of how relevant universities can be for the development of their regions. Accordingly, Stanford University, the MIT, or Cambridge University are taken as role models for responsiveness to economic change and contribution for creating wealth (KITAGAWA, 2005).

The attention paid to the specific places referred to above did not limit to the academic sphere, as policy-makers, worldwide, have been keen in trying to find out how to imitate those successful regional development experiences. VARGA (2000, p. 140) argues: “*The classical examples of Silicon Valley, Route 128 and the Cambridge Phenomenon stimulate regional economic policy-makers to build their own high-technology centres around research universities*”. LEYDESDORFF et al (2002, p. 7) confirm: “*The Silicon Valley experience [...] challenged the imagination of local policy makers*”. Universities, viewed as *engines* of innovation that pump out new ideas able to be translated into commercial innovations and regional growth (FLORIDA, 1999), emerged as instrumental in regional policy. As a consequence, overly mechanistic national and regional policies aimed at commercialising those new ideas and transfer them to the private sector flourish in most industrialised countries of the world (id.). Research and science parks, incubators and venture capital pools were created, in the words of MALECKI (1991, p. 298), “*as potential cores of new Silicon Valleys*”. LEYDESDORFF et al (2002, p. 12) place these developments under the legitimating framework of public sector’s “*duty to absorb and disseminate [the] lessons [from cases like MIT, Cambridge or Twente] to the market as well as to other important parts of the regional innovation system if all are to reap the benefits of the*

massive historical investment that has, practically everywhere, been committed to the science and technology base”.

The willingness to emulate the “*totemic sites*” of the new economy, as ARMSTRONG (2001, p. 525) labels such high-tech agglomerations, was, more recently, meshed with the popular Michael Porter’s notion of industrial clusters (PORTER, 1990). The resulting public policy rationale has placed universities in a central position in the effort to build up new or regenerate existing high-tech clusters (LAMBERT, 2003; WOLFE, 2005; CHARLES, 2006b). This trend is well evidenced by recent regional policy developments in the UK. The White Paper on Enterprise, Skills and Innovation (DTI/DfEE, 2001, p. 37) establishes the commitment to create university-based innovation centres to foster “*top class, long-term research partnerships between major business interests and the university sector*”, which “*will be at the heart of cluster development and support for new start-ups and businesses that are growing in business incubators*”. The White Paper on Science and Innovation (DTI, 2000, p. 38) highlights the role of regional development agencies in supporting “*the development of clusters, geographical concentrations of companies, specialised suppliers and associated institutions such as universities, co-located for mutual competitive advantage*”.

The alleged primordial role of universities in cluster formation is explained by the highly individualised and, thus, localised character of knowledge transfer between academic research and firms, that is, by the significance of geographical proximity for the process of knowledge transfer (WOLFE, id.). Clusters also provide an ideal means for universities to match firms’ needs and incorporate them into research and training programmes, as well as to target strategically areas of research where the university can build an international reputation and where firms can draw locally on a globally oriented knowledge base (CHARLES, id.). In addition, universities, as argued by LAMBERT (id.), can form the cornerstone of many successful clusters because attracting knowledge-intensive businesses around their strong research base and a ready supply of skilled graduates.

Biotechnology and ICT are perhaps the two most studied clustering experiences (e.g. COOKE, 2002; LAWTON SMITH, 2004; ETZKOWITZ and KLOFSTEN, 2005). There is a common understanding about the prominent role played by universities in the formation of such clusters, particularly in biotechnology, in which, academic research appears as both the originator, the maintainer and the developer of bio-industry agglomerations. COOKE

(2002, p. 133) contends: “*Growing from research laboratories, the [biotechnology] industry is characterised by many new start-up firms needing major support from university technology transfer and licensing agencies, venture capitalists, large firms (as corporate partners) and regional governance bodies, both political and industrial*”. Sticking to biotechnology as an example, both COOKE (id.) and LAWTON SMITH (2004) point out that bio-clusters have strong enterprise support infrastructures complementing strong local science bases. LAWTON SMITH (id., p. 991), on the Oxfordshire biotechnology cluster writes: “*It has a high concentration of research, especially in biomedical sciences; it is enormously successful in the application of research; and it has a specialised institutional system*”⁸⁴. In addition, high quality communication channels amongst key actors and effective networking characterise this type of clustering (COOKE, *ibid.*).

The rationale behind the policy approaches linking academic research to the formation of technologically advanced clusters matches the claim of ETZKOWITZ and KLOFSTEN (2005) that an *assisted* linear model of innovation is underway. According to the authors (id., p. 247), it differs from the traditional linear model, based on the transfer of research results to industry through publication or mobility of graduates, because it comprises “*a variety of interlocking organizational mechanisms such as research centres, technology transfer offices and incubators that move research with long-term commercial potential into use*”. The authors (*ibid.*, p. 253), though acknowledging that “*each regional development is a unique instance*”, attempt to legitimate the *high-tech valley* orientation for the role of universities in regional development, by suggesting that a generalisable model can be derived from success cases such as Silicon Valley and Route 128, because some general elements can be identified, namely, the triple helix and the entrepreneurial university. They ground their argument on the developments occurred in Linköping, the fifth biggest Swedish city, which is viewed as an innovating region because, based on an efficient triple helix of university-industry-government relations, “*has the capability to creatively reconstruct itself on a new knowledge base*” (*ibid.*). The argument is reinforced by referring to science parks developed in relatively isolated environments, such as Kista Science City, near Stockholm, and Sophia Antipolis, close to Nice, where the triple helix

⁸⁴ Oxford University has at least 14 interdisciplinary research centres in the biomedical field and maintains easy and strong links to hospitals. The supportive institutional structure comprises both local, regional and national organisations and instruments, such as the Oxford Investment Opportunity Network, the Oxford BioBusiness Centre or the DTI’s Biotechnology Mentoring and Incubation Challenge (LAWTON SMITH, 2004).

and the entrepreneurial university were not present at the beginning of the projects, but “*appear at a later phase to fill gaps*” (ETZKOWITZ and KLOFSTEN, 2005).

The issue at stake is whether these cases, if not *totemic*, are also marked by regional specificities that turn the respective development experiences hard to be reproducible in other contexts, particularly in LFRs. In fact, looking at Linköping, for instance, similarly to the case of the Oxfordshire studied by LAWTON SMITH (2004), it is possible to identify a number of features that accrue some singularities. First of all, the existence of a large and technologically advanced firm in the region (SAAB), which, in close cooperation with the national government, has been crucial for the creation of the local university in the 1960s and its orientation towards industry, namely in computer science related fields; second, an active municipality which, in the early 1980s, had created incubation facilities for start-ups, the root of Mjärdevi science park, an essential structure in sustaining Linköping’s innovative development trajectory.

Recalling the portrait made before of the regional inequalities still marking Europe, particularly the account on the unequal capabilities to pursue innovation-based development strategies, one can argue that any attempt to generalise the grounding models of successful experiences such as those referred to above seems to be too optimistic, mainly because it takes for granted the availability of interactive governance capabilities. Moreover, the generalisation of the so-called *assisted* linear model of innovation, if incorporated into public policy design, may result in the perpetuation, and even widening, of the innovation and development gap that still configures the lack of territorial cohesion in Europe. The thesis pointing to the possibility of generalising that type of linear model is counteracted by a diversity of arguments, as found in a brief literature review on the subject.

A first argument refers to the geography of high-technology clusters. MALECKI (1991, p. 222) reminds that “*the growth of these areas [Silicon Valley, Route 128, Cambridge] as seedbeds of innovation and high technology owe their success more to large urban regions in or near which they are located than to any close or direct relationship between firms and universities*”. Kista Science City and Sophia Antipolis, the examples used by ETZKOWITZ and KLOFSTEN (2005) to contend for the possibility of generalising the assisted linear model of innovation, because considered as *relatively isolated* places, do not contradict Malecki’s assertion. In fact, the latter is located halfway between Nice and

Cannes and the former at 15 minutes from Stockholm's city centre. Thus, the locations of both high-tech agglomerations can barely be seen as *relatively isolated*. BENNEWORTH and CHARLES (2005), at the purpose, refer to the possibility of university spin-offs relocate from their parent institutions to larger centres, implying that "*policies promoting spin-offs were actually undermining the economic development of peripheral places*" (id., p. 539). This has in fact happened with the Carnegie Mellon's spin-off Lycos (the Internet search engine company), which moved to Boston in order to access the skills necessary to cope with its needs in terms of management and marketing, unavailable in Pittsburgh (FLORIDA, 1999).

The second argument is provided by evidence showing that the presence of an outstanding research university in a given place does not necessarily foster the development of a high-tech industrial agglomeration (cf. MALECKI, 1991; WOLFE, 2005). Highly rated research universities, such as Johns Hopkins, did not succeed to, or perhaps more accurately, engage in, producing an entrepreneurial phenomenon equivalent to the one generated in Silicon Valley. Recalling the study made by FELDMAN and DESROCHERS (2003) on Johns Hopkins University, an additional insight can be added: the university culture stands out as a conditioning factor of an effective *assisted* linear model of innovation. Furthermore, the importance of universities, if merely taken as knowledge factories filling in the technological needs of existing industry or promoting the translation of scientific knowledge into economic activity through spin-offs, can be seriously put into question. MASKELL and TÖRNQVIST (2003, p. 140), for instance, in their analysis of the Øresund cross-border region, strikingly conclude that "*the economic role played by universities in one of the most prosperous and advanced regions in the world is mainly indirect*". The authors (id.) identify those indirect benefits as derived essentially from the influence exercised on public governance, civic culture, and informal institutions rather than on private sectors directly. They (ibid.) add: "*Few university graduates find their way into business, and few firms employ university graduates while the region, nevertheless, has been able to sustain a long-term rate of economic growth, new firm formation, job generation, and welfare at or above the national average*". Accordingly, the same authors (ibid.) aver that these findings "*make it rather difficult to subscribe to any version of the popular notion of a chain of causality from universities to research to innovations to firm spin-offs and subsequent growth*".

A third aspect, of a more quantitative nature, can be derived from the Community Innovation Survey (CEC, 2004b), which indicates that less than 5% of European innovative firms rank higher education and other research centres as a very important source of information and knowledge, as opposed to sources internal to the firm (37%), customers (27%) and suppliers (19%). In addition, universities tend to be more valued by larger firms (CEC, 2004b), or by specific sectors, such as biotechnology and ICT (OECD, 2002b), that is the firms and the sectors endowed with what MEYER-KRAHMER and SCHMOCH (1998) would call *structural absorptive capacity*, establishing a connection between successful innovation strategies based on university-industry linkages and the science intensity of technologies, the industrial life cycle, and the size structure of the industrial sectors. Moreover, the number of university spin-offs born each year, as shown by the OECD (id., p. 41), “*remains very modest compared to corporate spin-offs (i.e. a few hundred compared to several thousand), which themselves represent only between 10% and 30% of total technology-based start-up activity in European countries*”.

A possible synthesis of this set of arguments matches the conclusion of VARGA (2000, p. 152), according to whom “*the effect of universities on the creation of new technological knowledge exhibits a strong dependence on the development level of the local innovation system*”. Therefore, the technology-biased view of the universities’ third mission carries within itself an additional bias, one of a geographic nature. In fact, how to address the role of universities in the development of LFRs, generally characterised by a lack of the critical mass, namely in terms of the communication density (MASKELL and TÖRNQVIST, 2003), needed to put in motion an *assisted* linear model of innovation, by the predominance of the so-called traditional productive sectors, and by a fragile policy making framework?

The European Commission (CEC, 2003b), seems to urge the academic side of the problem by suggesting that “*it would facilitate the dissemination of knowledge into the EU industrial fabric, including SMEs in traditional sectors, if universities were actively to pursue the promotion of effective university-industry relationships, and better to exploit the results of their knowledge in relationships with industry*” (id., p. 7). This position, in the case of LFRs, reflects that in lagging regions higher education organisations tend to be the major performers of R&D activities, i.e., the major producers of scientific knowledge (RODRIGUES et al, 2001). In fact, many universities operating in LFRs have already developed policies and/or strategies aimed at reinforcing their interaction with industry and

overcoming the prejudices, rooted both in academics and non-academic public and private agents, that hinder easier and more effective links between academia and industry (RODRIGUES et al, 2001). It is worth noticing that the existing prejudices seem to be common to less and more advanced regions (CEC, 1998). Why did the university-led initiatives fail to achieve the objectives in a greater number of LFRs? RODRIGUES et al (id., p. 253) provide a hint for answering the question: “[...] *LFRs generally lack a supportive policy framework for the reinforcement of cooperative activities between academia and society. Universities are left on their own to devise an adequate strategy to foster links with the outside world*”. In addition, in LFRs, industrial demand for R&D innovative inputs tend to be low, provoking a mismatch between the technological knowledge supply and demand. One can thus argue that the triple helix mechanism lacks the high degree of synchronism between its components necessary to an effective functioning. As CASTRO et al (2000, p. 196) contend “*if one or two helices are weakly developed or poorly synchronised, the interaction between the productive apparatus, the research and education system and the public authorities is seriously compromised*”.

At this stage, the argument pointing to the need for going beyond technology transfer and spin-off firms creation when studying the role of universities in regional development has gained increased strength, particularly when in presence of LFRs.

“The point at issue is that an exclusive or disproportionate emphasis on the study of this [the exploitation of academic research results by business and industry] specific (and undoubtedly important) domain of interaction carries with it the risk that other dimensions and other relevant benefits of university-industry links will be undervalued”, ROSA PIRES et al, 2002, pp. 113-114).

The decisive point, however, can be drawn from the intuition that the university in regional systems of innovation has the potential to be central in the construction of a learning region, participating or even igniting the processes of interactive learning and unlearning that develop social architectures supporting collective social orders and microconstitutional regulation mechanisms. In this sense, the analysis of the universities’ third mission in LFRs should also focus on the ways they may help to unlock institutional inertia. Arguably, this third mission facet can be regarded as a pre-condition for the exploitation of technology generated in academia by the regional industrial fabric.

In this context, knowledge transferred from academic research is aimed at reinforcing a region's capacity for developmental action, be it within a specific firm that uses research inputs to improve its technical or organisational capacity and thus its products and processes, or within a local or regional government body seeking for scientific guidance or legitimacy to design and implement development public policies, or within governance networks nourishing interactive learning processes. In other words, the third academic mission calls forth the university as a builder of regional institutional capacity. This status encompasses a new perspective on the second academic revolution. Prior to fully explore this new perspective, the task is to contribute for extending the revolutionary narrow techno-economic account.

7.3

Extending the approach...

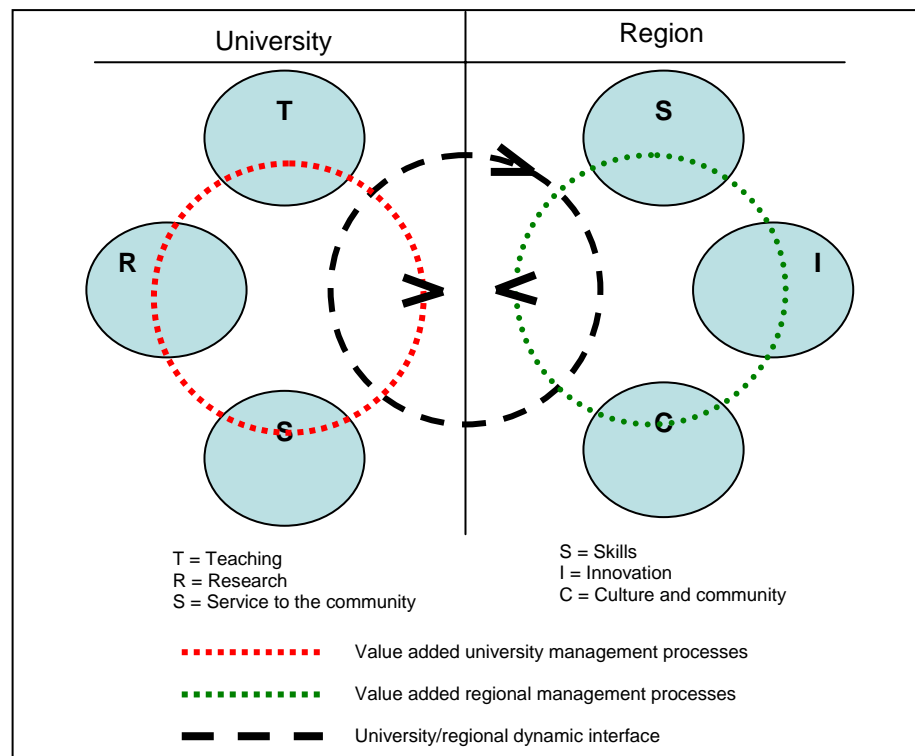
The predominant technology-oriented approaches on the second academic revolution are being complemented by a burgeoning body of literature that widens the perspective on the relationships between universities and their regions. Despite its varying emphasis, the effort unanimously acknowledges that the *assisted* linear model of innovation, based on a chain-linked path involving R&D, technology transfer, new firm development and academic entrepreneurship, though important, is an incomplete model of the role of universities in regional development. As put by GUNASEKARA (2006), the *generative role* for universities, centred on knowledge capitalisation and other capital formation activities, is added by a *developmental focus*, bringing into the debate a range of mechanisms by which universities engage with their regions.

The body of literature extending the university-region nexus calls forth such diverse issues as lifelong learning, health and social wellbeing, culture and sport, urban and rural regeneration, or regional governance (e.g. CHARLES and BENNEWORTH, 2001), thus satisfying the “*need to look beyond business success to include also the means of maintaining social cohesion and the quality of life in successful regions*” (id., p. 18).

GODDARD and CHATTERTON (1999) summarise this extended framework under the light of what they call a “*university-region value-added process*” (id., p. 689) (**Figure 7.1**). The diagram emphasises the management processes which link together all of the

components within the university and the region into a learning system (GODDARD and CHATTERTON, 1999).

Figure 7.1 – The university-region value-added management process



Source: adapted from GODDARD and CHATTERTON (1999)

According to the authors (GODDARD and CHATTERTON, id.), within the regionally engaged university, the linkages between teaching, research, and community-service are ensured by internal mechanisms (e.g. funding, staff development, communications, incentives and rewards), which, in turn, make the academic activities more responsive to regional needs; within the region, the challenge for universities consists of engaging in many of the facets of the development process (e.g. skills enhancement, technological development, innovation, cultural awareness), and link such facets with the *intrauniversity* mechanisms. This substantiates the idea of university-region value-added management processes.

As put by GODDARD and CHATTERTON (ibid., p. 689): “*the successful university will be a learning organisation in which the whole is more than the sum of its parts and the successful region will have similar dynamics in which the university is a key player*”. Following CHARLES and BENNEWORTH’s (2001) interpretation of **Figure 7.1**, activities

within the community mirror those in universities, and include the acquisition of a vast range of skills and expertise, the continuing processes of change and innovation, and the creation and maintenance of community culture in the widest sense. The same authors (CHARLES and BENNEWORTH, 2001, pp. 19-20) argue: *“Thus the economic development process and combating social exclusion involves skills development, to which higher education institutions contribute through their teaching and learning role; industrial and service innovation, to which higher education institutions contribute via their research activities; and cultural change and social welfare, to which higher education institutions contribute through their traditional third role activities and teaching and research in such fields as healthcare”*.

In this extended framework, how does the literature detail the regional role of universities, or, in other words, what does it add to the technology transfer and new business venture creation predominant views? A common perception is that universities and other higher education organisations have an important role to play in what MORGAN (2002) labels as the (regional) social reproduction process, - *“the way in which labour is produced and reproduced”* (id., p. 65). In the post-Fordist environment, the author (ibid.) argues, educating and training for technical and intellectual skills become crucial. This mirrors the common perception of universities’ relevance in helping their regions to develop, attract and retain highly skilled, talented and creative people, that is, in setting forth a pre-condition to succeed *“in the emerging creative age of the knowledge economy”* (CEC, 2006, p. 55). The shifting pattern of skills demand in the labour markets generated by ever-rapid technological changes, together with the increased location of learning in the arena of social equity and social integration, makes lifelong learning and continuing education another important contributions of higher education organisations to their regions (GODDARD and CHATTERTON, 1999; DUKE, 1999). An additional and related dimension goes beyond the cognitive domain by calling forth the use of university teaching to promote what ROSA PIRES (2002) calls *civic entrepreneurship*. This establishes the (regional) relevance of universities in the formation of *“civic-minded graduates who are as well prepared to take up the complex problems of our society as they are to succeed in their careers”* (KELLOGG COMMISSION, 2001, p. 17). The ACU (2001, p. 4) reinforces the idea: *“University study should enable students to acquire not only such skills as are useful in the working world but also those skills necessary to participate as citizens in society”*.

Universities can also impact on the wellbeing of regional communities, as discussed, for example, by CHARLES and BENNEWORTH (2001). The authors (id., p. 41) identify a vast array of activities that confers to universities “*a key role to play across [the] whole agenda*” of health and wellbeing, e.g. the provision of discrete services and the instrumental role in the evolution of the occupational structures which shape the delivery of health services; the provision of expertise enriched by the integration of life sciences, engineering, and social science into a coherent whole; the generation of knowledge about the causes of social deprivation and specific social problems, etc.. The same scholars (ibid.) extend the discussion to the active or indirect support universities give to local and regional cultural and sport activities. VAN DER WUSTEN (1998, p. 5) adds that universities “*provide their cities with captive audiences, critical comment and sometimes performers in the world of arts*”. By affecting their regions’ cultural life, universities, according to HUDSON (2000, p. 12), are active in processes of *region building*, as they play a role in “*the creation or retention of a regional identity*”, as well as “*in attracting and retaining a highly qualified workforce*”. Taking wellbeing in a broad manner, one can argue that universities have a part in urban and rural regeneration processes, namely, as stressed by CHARLES and BENNEWORTH (ibid.), through urban related research activities, environmental sustainability promotion, and real estate development.

Of utmost relevance for the central argument of this dissertation is the recurrent effort made in the literature to stand out the role universities play in linking the local to the global and in supporting regional governance. The universality that lies at the core of the academic endeavour places universities in a privileged position to help the region in *tying down the global* (MORGAN, 2002). As part of a global community knitted together by research networks or activities such as student/teacher exchange (HUDSON, 2000), universities operate within multiple and overlapping territories and tend to manage a portfolio of activities ranging from the global to the local (CHATTERTON and GODDARD, 2003). Thus, they can provide a qualified link to articulate the global and the local (ROSA PIRES, 2002). In the same vein, KITAGAWA (2005, p. 67) argues that universities “*fulfil a useful role in blurring the distinction between the different geographical scales, in part by ‘regionalising’ world class research and making such knowledge available to actors whose innovative locus is more limited in geographic scope*”. GUNASEKARA (2006, p. 104), accordingly, sees universities as network brokers bringing together “*national and*

international contacts and key regional actors". In the presence of LFRs, which generally face significant barriers to access supra-regional networks, this facet of the university's regional role gains overwhelming importance. The same can be said of the contribution of universities to strengthening regional governance capabilities in lagging regions.

Shifts in the governance of the development interests of regions, according to CHARLES (2003, p. 8), "*are resulting in opportunities for universities to become involved in the planning and governance of their regions in ways that have never previously been so transparent*". CHARLES and BENNEWORTH (2001), though focussing on the English case, point out four general dimensions according to which universities can contribute for developing regional governance capacity.

The first dimension concerns the ways universities - as "*large regional bodies with their own governance structures and their own interests that they seek to represent locally*" (id., p. 55) -, represent themselves in local and regional governance structures. According to the authors (ibid.), the main effect of this is in the estates' planning of higher education institutions, because of the growing demand for new infrastructure whose development needs local approval. They (ibid., p. 56) argue: "*This has drawn higher education institutions into partnerships at different levels of closeness with their local authorities to integrate their efforts for local and physical regeneration*". However, the involvement of academic organisations can be extended to the drafting of new regional development strategies, which, as the same scholars state (ibid.), "*ensures that [higher education institutions] are not regarded purely as service providers, [highlighting] their full potential to contribute to regional governance*". The second dimension refers to the increasing provision of university knowledge in matters of governance to support local and regional activities. CHARLES and BENNEWORTH (ibid.) underscore, on the one hand, the work of higher education organisations with steering groups to identify what the partnerships want to achieve, and the best ways of achieving that, and, on the other hand, the contribution to local and regional governments structures to meet the demands of central government. The third dimension reflects the borrowing of institutional management expertise of university managers to particular bodies delivering regional governance. As reminded by GODDARD and CHATTERTON (1999), university staff, either in formal or informal capacities, can act as regional *animateurs* through representation on outside bodies "*ranging from school governing boards and local authorities to local cultural organisations and development*

agencies” (CHATTERTON, 1999, p. 688). Finally, CHARLES and BENNEWORTH (2001, p. 55/57) stress that higher education organisations, as “*democratic communities of intelligent and thinking individuals [...], pull together communities of individuals with natural proclivities for political activities*”, which can be of benefit for their regions. They (id., p. 56) add that academic organisations “*are also a vital conduit for traditionally weakly represented groups to involve themselves with regional level activities*”, as they can open up these regional activities to groups (namely, voluntary and community groups), that are not oriented towards lobbying activities.

GODDARD and CHATTERTON (1999, p. 688), purposefully, argue that “*universities, through their resource base of people, skills and knowledge, increasingly play a significant role in regional networking and institutional capacity building*”. In a similar vein, MORGAN (2002, p. 66) considers that universities are “*institutions which act as catalysts for civic engagement and collective action and networking*”. Accordingly, as the same author (id.) contends for, universities can play a key role in the building of social capital in the regions where they are located. CHARLES (2006) seems to agree and brings forward the key challenge of enhancing “*the role which universities, and their staff and students, play in the development of such networks of civic engagement, and hence in the wider, political and cultural leadership of their localities*” (id., p. 121).

Hence, regionally engaged universities can help their regions by providing leadership, analysis and resources, as well as credibility to regional development strategies and trajectories (OECD, 1999b). Those universities take a part in the building up of regional social networks that link key agents and feed intelligence into these networks. In addition, as reminded by the OECD (id.), they can inject an element of unbiased and informed realism into such networks. They are also a repository of knowledge about future technological, economic and social trends that, following the OECD (ibid., p. 107), “*need to be harnessed to help the region understand itself, its position in the world and identify possible future directions*”. ROSA PIRES (2002) adds that the academic intrinsic concern with the long-term, - “*the cornerstone of sustainability*” (id., p. 13) -, can emerge as a judicious factor counteracting the natural tendency of a wide array of agents to operate according to a short-term logic. The same scholar highlights the singularity of the multidisciplinary resources available in universities, which can provide the regional settings with integrative approaches to territorial development, “*an essential value when*

facing the interdisciplinary nature of development problems, opportunities and projects” (ROSA PIRES, 2002).

Taken together, the extended framework suggests that universities are central organisations in regional innovation systems and crucial elements of the learning region. The enlarged perspective on the third academic mission, joining the *commodification* of knowledge, the development of skills and competences, and the enhancement of regional networking and governance capabilities, marshals the potential for universities to emerge as a key and integrating organisation in regional innovation systems, namely because, as argued by CHARLES (2006, p. 121), innovation systems “*require all of these forms of knowledge in combinations that are both coherent and mutually reinforcing*”. It also allows for suggesting- as DUKE (1999) does⁸⁵ -, that universities can be regarded as the hubs of learning regions.

Accordingly, the proposition pointing to the pervasive role universities can play in the processes of institutional capacity building evolving in their regions gains additional strength. Universities have the potential to help their places in the creation and combination of the knowledge and relational resources that nourish the mobilising capacity and thus the ability to act collectively. The third academic mission, in this sense, acquires an extended meaning. A new perspective on the second academic revolution can be suggested.

7.4

... and introducing a new perspective on the second academic revolution

The challenge associated to the introduction of a new perspective on the second academic revolution is to confer conceptual coherence to the multiplicity of ways, beyond technology transfer and spin-off firms, through which universities contribute to their regions’ development. In this context, the unifying concept of institutional capacity building developed in Chapter 5, extended in a way that places technology transfer and spin-off creation alongside other engagement facets overlooked by the narrow approach,

⁸⁵ See also KEANE and ALLISON (1999), ALLISON and KEANE (2001) or VAESSEN and VAN DER VELDE (2003).

can be made to emerge as the bottom line of such effort. The issue here is to explore the extent to which the third academic mission encompasses the role of universities in meshing together external pressures and regional evolving capabilities in the flow of knowledge creation and diffusion, social networks and values, as well as in transforming them into the pro-active endeavour necessary to shape and change the dynamics of regional systems of innovation and to set them higher up in the systemic potential scale. This outlines the new and integrative perspective on the second academic revolution. Therefore, the basic task is to explore the ways universities relate with the three dimensions through which regional institutional capacity building processes are materialised.

Universities and knowledge resources

The narrow view on the second academic revolution looks at universities predominantly as generators of knowledge in the form of R&D results and patents that can be injected in productive activities by means of knowledge transfer, directed at either enhancing the technological innovation capacity of existing industries or the creation of new high-tech industrial ventures. Relevant university knowledge, in this view, approximates what STEHR (2002) calls *productive* knowledge or, as, for instance, in CHARLES (2006), a *commodity*. However, knowledge resources, as a dimension of institutional capacity building, are not looked at as a given, unified object or asset (DE MAGALHÃES et al, 2002). The emphasis is placed on the interactive character of their development and transfer, that is on the learning processes that are put in motion within complex webs of social relations through which, in the words of HEALEY (1997, p. 44), “*ways of thinking, ways of organising and ways of conducting life are developed, maintained, transformed and reproduced*”. Therefore, knowledge flowing from academia throughout the regional settings cannot be reduced to productive knowledge, or even to scientific knowledge (STEHR, id.).

The extended approaches tackled above embrace a significantly wider range of knowledge that regions can resource from their university or universities. In this sense, universities can be regarded as having the potential to help their regions in accessing the wide range of knowledge forms that HEALEY et al (1999a) acknowledge as essential in institutional capacity building processes. The argument is that universities, as institutional capacity builders, can provide their regions with not only codified knowledge forms, e.g.

R&D results or patents, but also tacit knowledge deriving, for example, from university staff networks, university-industry collaborative platforms, academic entrepreneurship, or community networks (ALLISON and KEANE, 2001)⁸⁶. They can be a source of *meaningful* knowledge, as STEHR (2002) conceptualises the knowledge whose primary function affects mainly the social consciousness of members of society. They can draw together scientific and technical knowledge, as well as offer sources of practical understanding and reasoning (HEALEY et al, 1999a) and be an active part in the knowledge-generating feedback loops in the reflexive functions of monitoring and evaluating (COOKE and MORGAN, 1998). Accordingly, universities, as institutional capacity builders, can be a source of individually held knowledge, both theoretical and practical (action-oriented), and collectively shared knowledge, both codified and tacit (LAM, 1998).

Regions can resource the different forms of university knowledge to turn explicit the territorially embedded frames of reference configured by cultural assumptions about ways of thinking and act. As HEALEY et al (id.) would argue, taking into account that individuals and organisations are embedded in different social relations, making explicit those frames of reference is a prerequisite when mutual learning and knowledge transfer are to be developed. In this sense, universities can play an active part in dealing with different co-operative cultures and moulding the perceptions about the need for changing, as well as influencing the ways policy is designed and deployed. Hence, universities, through the knowledge resources they generate, can shape the institutional dimension of the regional system of innovation superstructural level, and thus the frames of reference which condition, on the one hand, the meanings and interpretations of the challenges inherent to the global-local nexus, and, on the other hand, the value attributed to the flows of knowledge trespassing social relations (ibid.). ROSA PIRES (2002) relates this to the “*significant added value*” (id., p. 13) that universities can bring to their regions in the qualification of regional development trajectories. In addition, by shaping and (scientifically and/or technically) sustaining shared frames of reference for action, universities are in fact contributing to socially legitimize subsequent policy choices.

⁸⁶The transmission of tacit knowledge, based on personal mobility and face-to-face contacts, is often considered as the main benefit of partnerships involving universities and other organisational settings, particularly industry (cf. PAVITT, 1998).

The broad range of knowledge flowing within the regional system of innovation is produced by a variety of both internal and external sources. Universities, by the very nature of the academic institution, are well positioned, on the one hand, to enhance the access to external sources, and, on the other hand, to integrate the meshed knowledge flows across the variety of system's elements, an essential ingredient to enhance the system's capacity to act. One can thus argue that universities have a role in enhancing the regional system of innovation capacity to absorb new ideas and stimuli, both externally and internally produced, and to combine them with existing knowledge. As HEALEY et al (1999a) suggest, these absorptive and integrative capacities endow the system with the ability to search for innovative ways of understanding and acting, as well as to access new sources of information and inspiration. In other words, universities can work upon the openness of the system *vis à vis* new knowledge flows, and its ability to engage in interactive learning processes which lead to the use of new knowledge in meaningful ways. Accordingly, a most relevant role of regionally engaged universities is to amplify "*the permeability of the frames of reference to new stimuli and opportunities*", using the words of HEALEY et al (id., p. 126).

Universities and relational resources

The predominant approach to the second academic revolution, though recognising the relevance of relational assets to support knowledge transfer activities between universities and the regional economy, tend to circumscribe those resources to the intermediating dynamics of organisations such as technology transfer offices, venture capital firms, innovation or science and technology public policy bodies and alike. Moreover, the narrow perspective has little to say about the ways (circumscribed) relational resources are nurtured, despite the determinant part they take in the interactive process that encompasses technology transfer from universities to industry. One can thus argue that, by enlarging the lens, as hinted by the extended insights on the role of universities in regional development, the academic revolution's techno-economic paradigm is enriched. But, the issue at stake here is more all-embracing, as it deals with the relational dimension of institutional capacity building, "*the heartland of the concept of 'social capital'*", in the words of HEALEY et al (ibid., p. 127).

The societal missions pursued by universities place them as a prominent part of the social networked architecture upon which the neuralgic chain that puts in motion and feeds the flows of knowledge and interactive learning processes develops and voice mechanisms are deployed. The new perspective on the second academic revolution implies to pass over a passive stance and consider the formal and informal ways universities contribute to make the social architecture denser, knowledge richer and more outwardly oriented (HEALEY, 1998), and enable collaboration between a broad range of partners, fostering the capacity to co-ordinate policy decision-making processes and action (KHAKEE, 2002), while nurturing trust and reciprocity. Using the conceptual framework suggested by BOOHER and INNES (2002), it is a matter of conferring power to regional networks, - namely the power of ideas, modes and methods, the power to foster structural change and the power of action.

Universities have the potential to widen the range of social relations, thus to increase the diversity of values, resources, experience and information within networks and provide “*the building blocks for a network to create new conditions and solutions*” (id., p. 227), i.e. the ability to innovate. They might help to develop the nuanced and complex understanding of regional problems, strategically making sense of the diverse views of the world inherent to network diversity. Accordingly, they can contribute to foster agreement on the problems’ technical characteristics and the respective political, economic and social dimensions (ibid.). In this sense, it is within diverse and active regional partnerships that universities assist the building of new collective ways of thinking and acting, as well as the effort to re-frame and re-structure ways of proceeding (HEALEY, 1997), enhancing the regional system’s openness to new ideas and frames of reference.

The robustness of a regional system of innovation relies on the density of evolving networks and network interconnections. The system develops relational resources in different ways, more or less effective, depending on networking patterns and their spatial and temporal reach, as well as on the quality of nodes and major *switching* points, through which different networks are connected and the integration of knowledge flows is processed (HEALEY et al, id.; DE MAGALHÃES et al, 2002). Universities, namely in institutionally weaker regions, because, due to the very nature of academia, in principle distant from the gridlock affecting the regions, are well positioned to be important and clear nodal and/or *switching* points of networks, thus having a part in enhancing network

accessibility and communication channels. In addition, they might assume the role of a *switchboard* that taps into the regional networks knowledge and other resources available in other regions or supradordinate scales.

In this context, it can be argued that universities influence the power relations holding networks together and determining the degree and quality of access (HEALEY et al, 1999a). Identifying key agents within the regional system of innovation, opening up relational linkages and even challenging power structures in order to unfold development resources hidden within close and exclusionary networks of interests, particularly in LFRs, might be seen as relevant contributes of universities. Power relations also influence the authoritative, ideological and allocative structuring forces connecting the diversity of networks developing within the system and those linking different networked elements of the system to supra-regional powers (id.). Regions, namely the lagging ones, can find in universities a powerful partner to establish and maintain good relationships with regulatory and resource allocating powers.

Universities and mobilisation capacity

The mobilisation capacity of a regional system of innovation basically consists of the ability of its elements to deliberately mobilise knowledge and relational resources in order to release the respective potential supporting the move from knowledge and social interaction to action. The concept of mobilisation capacity, in this context, encapsulates a perspective of both agency and structure. The former emphasises the mobilisation *techniques* and the ways learning is favoured, creativity is released, and trust and the capacity to act collectively are developed (DE MAGALHÃES et al, 2002). The latter refers to the capacity to read institutional dynamics, to identify *windows of opportunity* in the prevailing power structures (HEALEY at al, *ibid.*), and to shape agendas for action (KHAKEE, 2002).

Universities can build up the agency as well as the structural aspects of mobilisation capacity. Teaching and research about the specific subject of mobilisation *techniques* is undertaken in a number of academic departments and faculties. As resulting knowledge percolates the regional settings, through either transfer to other organisations or active participation of individual academics and/or academic organisations, the *technical* qualities of mobilising efforts can be expected to improve. Academia, by its very nature, is a

learning and creativity-encouraging environment where individual and collective knowledge, and, as STEHR (2002) would argue, capacities for action are nourished. Universities, in this sense, forge individual and collective change, whose synthesis, following WILSON (1996, p. 618), consubstantiates *empowerment*, “*the sine qua non of community economic development*”. From the perspective of structure, when regionally engaged, universities can purposefully profile their regions and provide consequent readings about the respective institutional dynamics. Accordingly, they become instrumental in the identification of key arenas and networks to target in the mobilisation initiatives, that is the institutional *loci* where key resources and regulatory power lies, where real changes can be made and where strategic *perceptions* about the regional futures can be developed (HEALEY et al, 1999a). Concomitantly, the regional system of innovation can count on the engaged university to collaborate in unveiling and subsequently exploring latent opportunity structures devised either internally or externally to the region. In addition, academia can be a resourceful agent in the joint efforts of shaping and implementing development agendas.

Universities have the potential to enter the set of skilled change agents, leading organisations and brokers that enable the collective force underpinning change in the regional system of innovation. They can help to widen the “‘*cracks*’ of opportunity” (id., p. 131), and create what, as pointed out before, BRYSON and CROSBY (2005) call self-sustaining cross-sector regimes of mutual gain. Additionally, they can enhance the mobilising effort by providing their regions with new arenas of debate, - seedbeds for improved voice formation and augmented *untraded interdependencies* -, where previously isolated relevant agents are motivated to cooperate (AMDAM, 2003), new learning networks, or stronger lobbying capacities.

Regionally engaged universities, in sum, can be expected to take an outstanding part in the regional leadership dynamics, which, in the words of DE LA MOTHE and PAQUET (2000, p. 35), is “*what enables the complex inter-institutional and inter-sectoral partnerships to develop and become operational*”. The key and abridging proposition is that, because focused on the ways universities can enhance the qualities of the three dimensions underpinning institutional capacity, the new perspective on the second academic revolution looks at the expanded academic mission as an integrated developmental resource that can make a difference to the dynamics lifting the regional system of innovation from lower to

higher levels of systemic potential and empowering its ability to change and purposefully mould and respond to the challenges inherent to the global-local nexus. In other words, the new perspective associates the third mission to the development of the collective intelligence that LANDABASO et al (2003), as referred to before, suggest to be central in igniting the process of becoming an advanced learning region.

The extended perspective on the second academic revolution would be incomplete if neglecting, on the one hand, the organisational challenges that regionally engaged universities arguably have to face, and, on the other hand, the role of universities as institutional capacity builders in the institutionally fragile LFRs, which, expectably, can be looked at as of paramount importance and, at the same time, as a cause for swelling up the challenging conditions to the academic organisation. These two aspects are at the core of the following sections.

7.5

Challenging the academic organisational settings...

The new perspective on the second academic revolution brings over new and challenging conditions for the academic endeavour, as the need for changing university's organisational cultures, working practices and management modes, is most likely to arise. The OECD (1999b, p. 41) argues: "*It is often observed that the traditional values and collegial governance models of HEIs are not effective mechanisms for increasing regional engagement*". The portfolio of a multiplicity of territorial roles and the development of national and international activity whilst meeting regional needs (id.) place universities in the sight of a complex and problematic situation.

Regional engagement is frequently confused with the low status of the *regional* university, set as in opposition to being international and loosely linked to being a teaching-only organisation aiming just the learning and accreditation needs of its region (DUKE, 2000). The OECD (ibid., p. 42) talks about "*significant cultural obstacles to adopting greater regional engagement within HEIs partly because the connotations which regionalism has with parochialism, newness and unsophistication*". CHATTERTON and GODDARD (1999) aver that some academics see the term *region* as the antithesis of *metropolitanism* and *cosmopolitanism*, "*adjectives which are heavily associated with the*

historical development of many old universities” (CHATTERTON and GODDARD, 1999, p. 22). They add that it is often the opinion of regional partners that the best way for universities to meet regional needs is by working as a national and international centre of teaching and research excellence.

Rather than a dichotomic situation of either regionally engaged or national and internationally excellent, an alternative approach stems from the perception that the two dimensions are intertwined and even mutually dependent. DUKE (2000, p. 62), for instance, states that “*the research base and prospectively the international identity, and ultimately reputation and stature, of a university reside in its local region, and that region’s need for higher education, learning and useful research in the globalised knowledge society in which virtually no place is an island*”. In the same line of thought, CHARLES and BENNEWORTH (2001) contend for the possibility of looking at the regional, national and international reach of the academic missions “*as potentially interlinked, and hence not mutually exclusive*” (id., p. 21). Firstly, they stress that an appropriate regional strategy may underpin the desire for high quality research, and the region can be used as a basis for strengthening research excellence. On the one hand, many research problems have a regional manifestation, which makes the region itself a purposeful laboratory for study⁸⁷, and creates favourable conditions to establish regional partnerships to address fundamental research problems. On the other hand, the proximity of the research problem and application site can contribute to sustain collaboration or monitoring over time, which, according to CHARLES and BENNEWORTH (ibid.), confers “*a qualitative change in the ability to build up longitudinal datasets, or monitor phenomena under conditions that might vary over a period of years*”. Secondly, the scholars refer to the contribution of international quality research to regional action. They highlight the significant potential benefit that international research carried out by universities can bring to their regions, arguing that “*the need for all kinds of activities to be based on the access to knowledge, benefits can be realised by all forms of local partners through access to international good practice*” (ibid., p. 22). In addition, the international reputation of a given university, following the authors (ibid.), “*can be transferred onto the profile of the region, leading to investors regarding the region positively for knowledge-based activities*”. Thirdly, CHARLES and BENNEWORTH (ibid.) address the regional benefits that can emerge from

⁸⁷ DUKE (2000, p. 62) looks at the regionally engaged university as “*the beneficiary of a region-wide ‘laboratory without walls’*”.

international research that underpins public policy design and delivery: “[...] *the higher education institution can be an important conduit of international knowledge, leading to direct improvements in service delivery for the local population*”. ARBO and BENNEWORTH (2006, p. 50) refer to universities “*well-positioned within national innovation systems*” that “*make strong contributions to their regional economies*”, such as Leuven in Belgian Flanders, Oslo in Norway, and Oxford and Cambridge in the UK.

However, universities are characteristically loosely coupled organisations, where, as GODDARD and CHATTERTON (1999, p. 697) suggest, “*individual academics pursue their own research and teaching agendas, which may or may not involve regional engagement*” and, in most cases, their “*principal allegiance [...] is to their discipline and not to their institution, with standing amongst peers being largely determined through publications*”. Accordingly, one can expect this to hamper a widespread perception of the mutually reinforcing relationship between regional engagement and national or international academic work. Focussing on the British case, the same authors (id.) state: “*Senior staff (Vice-Chancellors, Pro Vice-Chancellors, Registrars) often have a responsibility to represent the university to regional interests but have limited capacity to ‘deliver’ the university or particular parts in relation to evolving external agendas. Various central administrative functions (Estates, Communications and Public Affairs, Industrial Liaison, Centres for Continuing Education, Careers Guidance Services) often engage in quasi-autonomous work with regional actors and agencies*”. These assertions bring about a major implication: if universities regional engagement is to be taken seriously, far more than general mission statements and institutional plans are needed. As the ACU (2001, p. 2) suggests, “*engagement is less an initiative than an orientation towards the future*”, thus requiring new management and organisational forms, as well as a shift towards some would call a learning organisation (e.g. DUKE, 2000).

New or restructured internal organisational settings seem to be necessary in a regionally engaged university, in order to overcome “*one of the most significant problems facing HEIs in a regional context – their perception as a closed door or black box*” (OECD, 1999b, p. 45). The OECD (id.), for example, refers to single-entry points or front-door mechanisms that have taken a diversity of forms, such as Regional Offices, City Offices, R&D Offices, and External Liaison Offices, “*all of which are a growing element*

and can make a contribution towards meeting regional needs and creating an institutional capacity to respond?

An additional challenge of regional engagement is that institutional capacity building processes, as TAYLOR (2000, p. 1033) refers to, “*require new forms of knowledge and ways of knowing, new skills and new structures which can live with the complexity of communities and communicate across boundaries*”. Universities, by assuming the role of institutional capacity builders, are thus urged to develop internally a set of new skills, some of them intuitive and able to be learned through practice, some requiring training and institutional support (GODDARD and CHATTERTON, 1999). The same scholars (id.) list the relevant competencies: management of change; building and managing networks; facilitation and mediation; working with different organisational cultures; project planning and implementation; raising financial support; self-directed learning; supervision and personal support techniques; and organisational politics and dynamics. ROSA PIRES (2002, p. 13) adds the need “*to promote the capacity of communicating science to diversified publics, the capacity (and the humbleness) to learn from and value non-scientific knowledge, and the capacity to construct the willingness to resort to science through communication flows in which there is room for opinion dissonance without alienating mutual trust*”.

A final and most important circumstance refers to the higher education funding and evaluation mechanisms. Generally, the bulk of financial resources allocated by national governments to universities tend to follow formulae that have little connections with the regional agenda (CHARLES AND BENNEWORTH, 2001). The emphasis is placed on such criteria as the number of students and the results of research assessment exercises, meaning that teaching and research are the two components of the academic mission considered in the funding formulae. Furthermore, research evaluation is most frequently ruled by the contribution research performers give to the national science goals and the recognition that their results might deserve from their peers at an international level. Following the polarised approach of CHARLES and BENNEWORTH (id., p. 66), the outcome of this situation is that “*high-scoring departments seek to maximise their academic research performance, whilst low-scoring departments and institutions tend to be limited in their scope of activity by the need to be efficient in using their teaching funds*”. Regional engagement, in both cases, can become marginal within the academic mission realm.

Whereas low-rated academic units concentrate their efforts on widening the access to education, high-scoring units will endeavour to further strengthening their research status. By doing that, the latter can develop improved knowledge and technology flows between academia and society, which will not necessarily be directed at regional development, unless, as the same authors acknowledge (CHARLES and BENNEWORTH, 2001, p. 66), “*the region was already dynamic and offered an attractive market for technology and a good seedbed for spin-offs*”. From this, one can suggest that in more advanced regions, comparing with the less favoured ones, it is much more easier for a university to put its agency at the service of regional development. In addition, the expected smaller *absorptive capacity* of university’s governance partners in LFRs can be an important limitation on universities potential impacts (ARBO and BENNEWORTH, 2006). Hence, regionally engaged universities operating in that type of territorial context, besides augmented striving to heighten up the regional absorptive capacity, will arguably be forced to stand up to more pronounced organisational turbulence, particularly because of the need to fall into step with the pursuing of international recognition and the overall funding criteria while engaging in (regional) activities that, in general, are not sufficiently valued. Is this a conundrum?

7.6

Universities regional engagement in LFRs: conundrum or inevitability?

Universities are often considered as the most sophisticated source of knowledge and strategic intelligence available in lagging regions. This status, *per se*, gives a strong indication of the utmost importance of universities in helping LFRs to strive in the so-called knowledge economy. The corresponding ideal type of university-region nexus would be one of a university generating and disseminating knowledge through regional production networks, thus straightforwardly contributing to enhance the competitive arguments of regional firms and lifting the region up in the development rank. However, as suggested before, this approach fails to capture the innovation and development problem of LFRs, which is not the result of a mere shortage of productive knowledge, but, chiefly, of institutional inertia and governance debility. Accordingly, the relevance of universities in

LFRs stems not only from their (productive) knowledge-supplier condition, but also, and particularly, from the part they can play in helping those regional contexts to escape from the inertial forces keeping them locked into low development profiles. Drawing on Hirschman's lessons (HIRSCHMAN, 1958), a most valuable contribution universities can give to LFRs is to unlock institutional inertia by counteracting conservative routines, and help overcoming the existing structural, - political, productive and cultural -, problems. Turning to HIRSCHMAN (id.) again, it is a question of furnishing the region with the knowledge and relational factors that call forth and enlist for development purposes resources, skills and competences, which, in LFRs, tend to be hidden, scattered and bad utilised, and generate and energize human action in the direction of purposeful change. When the university-region nexus takes this form, it acquires a far more transforming power than the mere dissemination of knowledge through regional production networks (ARBO and BENNEWORTH, 2006). In this sense, the new perspective on the second academic revolution, when in presence of LFRs, takes a particular meaning, namely because the furtherance of those lagging regions is very much dependent on the qualities of their university or universities as builders of institutional capacity. Taking the argument further, in LFRs, the extended view on the second academic revolution might be considered as a prerequisite of a translation into practice of the original narrower techno-economic perspective. In other words, fluid and systemic processes of technology transfer from universities to industry, to take place in LFRs, are subordinate to upstream efforts of building up regional institutional capacity.

Bringing back the discussion on organisational turbulence, the problems tackled above arguably acquire a more pressing nature in LFRs. As to the mutually reinforcing nature of region-oriented and national and international academic work, though maintaining its validity in theory, one can argue that it is much less evident when in presence of lagging regions. Generally, these regions, due to their structural characteristics, present lower levels of demand for the advanced knowledge that academics should develop in order to strive for national and international recognition. This is particularly true in technology related fields, since, as in ARBO and BENNEWORTH (id., p. 77), the "*fit to local industrial structure is one constraint on universities' impacts on local innovation systems*". Concomitantly, academics, particularly those working on these fields, are more likely to overlook the region as an important scale for their personal agenda. In turn, regional actors

tend to undervalue university knowledge, because perceived as far from tuned with the regional reality. In addition, the lack of resources can force universities operating in LFRs to concentrate their financial and organisational assets in the more traditional missions of teaching and research, putting aside the third mission and its requirements, such as to initiate staff development programmes or establish new organisational structures directed at regional engagement. Moreover, the national policy vacuum in which, generally, the relationships between universities and their regions are evolving cannot be disdained.

Rather than taking this kind of vicious circle within which LFRs and their universities seem to be locked as an unsurpassable situation, which would set off an irresolvable conundrum, a more productive approach is to recall forth the argument produced before that lagging regions can learn and thus change, and universities, even though requiring more energy and creativity, have a lion's share in the process of breaking the circle. Furthermore, the extent to which regional engagement of universities operating in LFRs can be regarded as an inevitable development arises pertinently. The hypothesis of inevitability finds its grounds on two major aspects, one of a "*contractual*" nature, the other of a "*selfish*" nature. On the one hand, the binding values of the social contract linking academia to the rest of society, including the responsibility to reciprocate public funding (particularly when allocated by regional governing bodies), put the universities under the (at least moral) obligation to engage in the promotion of their regions' development. On the other hand, the mutual dependence of universities and their places makes regional engagement a question of self-interest: more robust regions, because generally presenting more favourable conditions for universities to grow strong, – e.g. positive demographic dynamics, technologically advanced productive structures, more encouraging policy frameworks -, are more likely to provide regional universities with strengthened capacity to attract students and teaching and research staff, as well as to diversify funding sources. In the words of GODDARD and CHATTERTON (1999, p. 687): "[...] *a strong and supportive regional economy will create a competitive university, and a strong university has more to offer a region*". Elsewhere (CHATTERTON and GODDARD, 2003, p. 25) the same scholars state: "*Regional networking can be thought of as an institutional survival or strengthening strategy for universities*".

Taking into account, on the one side, the suggestion of inevitability, and, on the other side, the augmented challenges and barriers to universities regional engagement that are

inherent to LFRs, the point made by GODDARD and CHATTERTON (1999) signalling the need to “*develop a framework for engagement and regional understanding within the university*” and to “*maintain pressure for mainstreaming of regional engagement through the normal channels of the institution*”, seems to acquire much relevance. Nevertheless, one can argue that universities are providing regions, both more and less favoured ones, more or less intensely, and according to a variety of forms, with ingredients that percolate the regional settings and enhance the dimensions of the institutional capacity building process. Most of them are doing that *unconsciously*, i.e. maintaining traditional governance methods and structures and academic practices associated with the attainment of national and international standards, and lacking mainstreaming for regional engagement. Others impact on their regions’ development not only *unconsciously* but also *inadvertently*, because against an explicit discouraging framework towards regional engagement, of which the Johns Hopkins University case in the region of Baltimore might be regarded as an illustrative example (cf. FELDMAN and DESROCHERS, 2003). A few universities can be said to have a well-developed regionally oriented framework for engagement, matching the point of GODDARD and CHATTERTON’s (id.) mentioned above. This is the case, for instance, of Twente in Holland (cf. SCHUTTE and VAN DER SIJDE, 2000) or the Welsh universities (cf. HIGHER EDUCATION WALES, 2003).

7.7

Sketching out conclusions and defining the inquiry line and research questions

The integration of socio-economic development in the mission realm of academia comprises a strong regional dimension, as universities have the potential to play a fundamental role in the development processes determining their regions’ futures. Accordingly, the complex change dynamics of the second academic revolution are being strongly configured by the developmental interactions between universities and regions. This chapter, acknowledging the relevance of a *regionalised* academic third mission, has critically explored the prolific literature on the subject, in an attempt, on the one hand, to pull off a better understanding of how universities interact with their regions, and, on the

other hand, to widen the focus and inform the introduction of a new and more encompassing perspective.

The bias towards technology transfer and spin-off firms creation that affects the original conceptual and theoretical framework of the second academic revolution, holds ground, perhaps even more markedly, in the efforts made to turn explicit its regional dimension. The predominant view, influenced by the developments occurred in a few places, - the *high-tech valleys* -, focuses narrowly on the interaction of universities with regional knowledge-intensive firms presenting high absorptive capacity of results achieved by academic research, imposing, thus, a restrictive view on the role universities can play in regional development. An assisted linear model of innovation, - differing from the non-assisted model because of a variety of intermediate mechanisms linking academia to industry -, is said to be undergoing, but little attention is paid to the ways of functioning of the intermediate mechanisms or the required networking and social skills.

Following up the conclusions of the previous chapter, which claimed for the need for widening the approach, evidence has been brought over to sustain that claim, namely by reminding the problem of LFRs, where the assisted linear model of innovation should be significantly extended in order to fully understand universities development potential. It was argued that when studying the university-region interaction, particularly in lagging regions, other facets, beyond technology transfer and spin-offs, should be taken into consideration. The emphasis was placed on the potential existing in universities to help their regions in constructing the robust social architecture that bears interactive learning and systemic innovation, without which any linear model does not function properly.

A broader outline of universities' regional role sheds light over the multiplicity of resources that regions can source from their university or universities, ranging from technical, intellectual and civic skills to knowledge informing policy-making processes and enhancing regional governance and networking capabilities. This approximation to the concerns with the social architecture referred to above, endorsed the argument pointing to the utmost importance of universities in the regional system of innovation and the learning region. Moreover, it provided the foundations for the introduction of a new perspective on the second academic revolution, which looks at the role of universities in regional development from the point of view of their contribution as builders of institutional capacity. Accordingly, the new perspective on the revolutionary change in academia

encloses the ways regionally engaged universities provide their regions with the knowledge and relational resources whose combination mobilises the potential for consequent developmental action. This new perspective allows for looking at aspects of the large development potential existing in universities that, though crucial in the so-called knowledge society, remain unobserved in the narrow view.

Universities can feed the region with a broad range of knowledge resources through their internal teaching, research and engagement activities, and, taking advantage from their privileged access to supra-regional networks, tap into the region relevant knowledge generated elsewhere. University knowledge can influence the perception about the need for shifting frames of reference for action and ground newly constructed ones, by bringing legitimacy and providing improved basis for a shared strategic view on development challenges and opportunities. In this sense, universities are instrumental in making the frames of reference for action permeable to the new ideas and stimuli that foster institutional change.

Universities are well placed to assume a key role in improving the pool of relational resources in their regions, that is, to help them in the process of social capital accumulation. They can, both through formal and informal ways, assist, or even set off, the efforts to confer density, knowledge, improved internal and external connections, and enhanced accessibility and communication channels to the various networks upon which interactive learning and the resulting innovative mind settings and forms of action are nourished. In fact, universities can themselves emerge as a crucial nodal platform in which network interconnections are established. By helping on their regions' relational capacities, academia is also influencing the power relations that bind collaborative networks together and define access, as well as the relationships between the region and regulatory and resource allocating structures.

Universities can be instrumental in the mobilisation of knowledge and relational resources that enact regions to act collectively. Besides the access to knowledge about the technical aspects of social mobilisation, regions can take advantage from the capacity existing in universities to read the dynamics shaping territories and to identify development opportunity structures, both internal and external, i.e., to focus the mobilising efforts on resources and power structures more able to ensure change-oriented action. Academia

itself can be a leading *animateur* of institutional change processes and an arena where common problems are co-operatively and innovatively solved.

As builders of regional institutional capacity, universities have to face increased turbulence. New challenging conditions will arise as shifts in organisational cultures and structures, working practices and management methods become necessary to effectively match the multidimensional facets of regional engagement, while balancing this commitment to their regions' development with efficient responses to the requisites of national and international recognition. This contradicts an *either-or* situation and stresses the mutually reinforcing nature of the regional and supra-regional *foci* of academic activities.

The new perspective on the second academic revolution also acknowledges the paramount importance of universities in LFRs, generally characterised by the weakness of the respective institutional settings. Lagging regions, to succeed in endeavouring to escape low development profiles, are strongly dependent on the relatively few organisational settings within which the resources to build up institutional capacity tend to be concentrated. Universities, undoubtedly, are one of such places. However, a diversity of hampering factors affects both the way the regional mission of universities is undertaken and the capacities of region to tap university resources into the development process. Is this an unbreakable vicious circle? If so, the fate of regions, and consequently of their universities, would not be brilliant. In a more optimistic vein, that is giving credit to the possibility of institutional change occurring in LFRs, the circle can be broken. Accordingly, regional engagement of universities located in lagging regions holds as an inevitable development, as inevitable are also the resulting different and perhaps more intense challenging conditions for academia to meet.

Taking the picture together, the resulting inquiry line to be pursued further on can be structured according to four statements:

- Universities are increasingly assuming the role of regional development agents, whose *agency* is shaped not only by the provision of production with technological inputs, but also by the contribution given to the processes of institutional capacity building;

- Universities are organising themselves in new or renewed ways in order to cope with the organisational challenges inherent to the assumption of the role of regional development agents;
- The relationships between universities and their regions of location are affected by contextual framework conditions and take the form of a sort of win-win game, i.e., the university-region nexus is one of a mutually reinforcing nature;
- The part played by universities as institutional capacity builders gains particular importance in the context of institutionally weaker LFRs.

This inquiry line, taken under the new perspective on the second academic revolution, compels the work to provide answers to the following basic research questions:

- How are universities contributing for the development of their regions and to what extent might that contribution be considered as enclosing the participation and enrichment of regional institutional capacity building processes?
- How are universities organising themselves to interact with their regions of location?
- How do the regional framework conditions, or, in other words, the systemic level of the regional innovation system, affect both the ways universities are involved in institutional capacity building and the ability of the regional settings to take advantage of their university or universities? How do the mutual benefits expected to occur as a result of the university-region nexus are generated?
- Why do universities assume a role of particular importance in the context of LFRs? Are there augmented organisational challenges to be faced by regionally engaged universities operating in LFRs?

Part III

**The second academic revolution in practice: universities
as regional development agents and institutional capacity
builders**

An introductory (and methodological) remark to Part III

8.1

Introduction

“There is little agreement on what kinds of methods characterize science beyond the rather bland point that it is empirical, systematic, rigorous and self-critical, and that disciplines such as physics and chemistry are exemplars of it”, SAYER, 1992, p. 7.

The question of method in science is being, for long, the object of academic controversy. In social science, the dispute is particularly acute, as it arises not only from judgments coming from other scientific fields but also from the inside: *“Outsiders’ attitudes towards it are often suspicious or even hostile, and social scientists themselves are deeply divided over what constitutes a proper approach to social research”* (SAYER, 1992, p. 1). Regional development studies, obviously, do not escape scholar disagreement (cf. MARKUSEN, 1999). Accusations of fuzziness, scanty empirical evidence, etc., are thrown at these studies. MARKUSEN (id., p. 702), for example, qualifies the recent scholar developments in the field as *“a largely uncontested and increasingly obtuse dialogue, relying on what I will call ‘fuzzy concepts’ – characterizations lacking conceptual clarity and difficult to operationalize”*.

The present chapter does not aim to discuss the controversy in detail. The point is to ground and reason the specific method used to develop the work through which answers to the research questions defined earlier can come across, and not to engage in a debate about research methods. However, the chief task seems to carry in itself the need to grasp some parts of the dispute. In fact, the nature of the overall guiding line of inquiry and the

associated research questions led to the choice of a method that falls under the case-study approach. This choice implies to counteract conventional wisdom about case study research, well expressed in the story told by FLYVBJERG (2004), who, interested in understanding how power and rationality shape each other and configure urban environments, and willing to develop in-depth case studies to achieve the goal, was dissuaded by teachers and colleagues:

“‘You cannot generalize from a single case’, some would say, ‘and social science is about generalizing’. Others would argue that the case study may be well suited for pilot studies but not for full-fledged research schemes. Others again would comment that the case study is subjective, giving too much scope for the researcher’s own interpretations. Thus the validity of case studies would be wanting, they argued”, FLYVBJERG, 2004, p. 420.

Conventional wisdom about case studies, in brief, generally sustains criticisms with basis on problems of generalisation, - and the associated issue of representativeness -, verification and replication of research findings (YIN, 1992; HUDSON, 2003; PECK, 2003). According to SAYER (1992, p. 4), much of this conventional wisdom reflects forms of *“methodological imperialism”*. The same author (id.) highlights one of this forms, - *scientism* -, to argue that it *“uses an absurdly restrictive view of science, usually centring around the search for regularities and hypothesis testing, to derogate or disqualify practices such as ethnography, historical narrative or explorative research, for which there are often no superior alternatives”*. In this context, this introductory chapter attempts not only to describe and justify the research methodology thought of as the most adequate to fulfil the investigation goals, but also to deal with the alleged problems heralded by conventional wisdom about case study methods.

In order to achieve the aim, this chapter is structured as follows:

- Firstly, it explores the reasons why, bearing in mind nature of the questions to be investigated, a case-study research method was adopted;
- Secondly, it identifies the territorial contexts in which the case-studies were undertaken, attempts to explain the determining criteria for their selection, and describes the methodology utilised;

- Thirdly, it refines the methodological approach by establishing an operative research framework through which dimensions, qualities and criteria for interpreting research findings can be drawn;
- Fourthly, a synthesis is provided.

8.2

Why a case study approach?

“In general, case studies are the preferred strategy when ‘how’ or ‘why’ questions are being posed, when the investigator has little control over events, and when the focus is on contemporary phenomenon within some real-life context”, YIN, 1994, p. 1.

Taking this statement and recalling the research questions to be investigated, one can argue that a case study approach seems, from the outset, the most appropriate strategy to support the investigation. The first proposition to be tackled is that universities, either consciously or unconsciously, are agents of regional development, whose *agency* can provide their regions of location with important elements of institutional capacity building processes, thus going beyond technology transfer and spin-off firms creation. The second brings over the perception that by assuming that role, universities need to adapt their organisational settings to the challenges implied by the extended academic mission. The third proposes that the university-region nexus, depending on the systemic qualities of the regional system of innovation, has the potential to become mutually beneficial, i.e., to form a kind of *win-win* situation. The final proposition put forward for consideration the particular relevance of universities as institutional capacity builders in the context of generally institutionally fragile LFRs, and suggests the occurrence of increased turbulence within the academic environment. Thus, the questions at stake are i) *how* universities are building up regional institutional capacity, ii) *how* they are organising themselves to do it, iii) *how* their linkages with the region are affected by contextual conditions and *how* the mutual benefits accrued to interaction are processed, and iv) *why* the role of academia in LFRs is particularly important, and *how* this role swells up the organisational challenges. In addition, it is obvious that the interaction between universities and their regions produces events over which the investigator has little or no control. Moreover, institutional

capacity building processes are contemporary phenomena evolving within a real-life context, and the boundaries between the phenomena under study and the contextual conditions where they evolve are not evident, or, in other words, context is highly pertinent to the phenomena analysis (YIN, 1994).

The research context seems to compel a pronounced explanatory nature, which, in turn, brings about the issue of *causation*. As YIN (id., p. 110) states, “*to ‘explain’ a phenomenon is to stipulate a set of causal links about it*”. This carries the discussion into the troubled waters of the controversy about method in social science. In fact, traditional views on the scientific endeavour assume that causation is established by regularities in relationships between events, implying that, as SAYER (1992, p. 2) concludes, “*without models of regularities we are left with allegedly inferior, ‘ad-hoc’ narratives*”. Attached to this depreciative stance come the problems of *generalisation*, commonly assumed as an exclusive source of legitimacy for scientific inquiry, and *replication/prediction power*, the way to validate research quality. MARKUSEN (1999, p. 705) puts it as follows: “*authors of qualitative accounts often fail to make the case that the particular case study is representative or that the findings from it are generalizable*” and “*case studies are difficult for others to replicate, a time-honoured method of checking the quality of evidence, simply because they are so time-intensive and require on-site interviews*”⁸⁸. Taking these assertions as indisputable, the choice of the research strategy announced above would be problematic. Augmented problems would be expectable, as that choice does not comprehend any significant quantification effort, often regarded as a requisite to avoid scanty evidence. Accordingly, additional remarks on the reasons underlying the choice are needed.

Institutional change, or building up, through which regional systems of innovation move from lower to higher systemic levels, is at the core of the theoretical and conceptual framework from which the research questions and propositions came out. The explanation of change and its carrying processes requires causal analysis (SAYER, 1992). However, causality, when attempting to explain institutional change, hardly concerns the establishment of relationships between discrete events, that is, cause-effect relationships. Rather, following SAYER (id.), it concerns *causal powers* or *liabilities* of objects and

⁸⁸ Elsewhere (MARKUSEN, 2003), the author slightly moderates criticism. She (id., p. 751) reminds the call for *replicability* in qualitative work, but states: “*I mean simply the good sense requirement that anyone’s qualitative work be transparent to others, so that findings can be verified independently*”.

relations, or more generally, their *ways of acting*, which, in turn, depend on conditions whose presence and configuration are *contingent*. Translating this assertion into the specific matter under inquiry, the role universities play in regional institutional capacity building largely depends on a number of spatial and temporal *contingencies*, such as, for example, the infrastructural qualities of the regional systems of innovation in which they operate, or their regional engagement supportive structure.

In this context, the link between causality and regularity loses ground. Concomitantly, also does generalisation, if taken as a legitimating step of research findings enforced by statistical inference and sample representativeness. As SAYER (1992, p. 110) contends for, “*what causes an event has nothing to do with the number of times it has been observed to occur and nothing to do with whether we happen to predict it*”. HUDSON (2003, p. 744) corroborates: case studies “*may not be representative in a statistical sense, i.e., be a representative randomly drawn sample of some putative underlying population, to which the results of analysis may be generalized, with a given probability of error, [...] [but] they may be representative of key causal processes and mechanisms*”. The same author (id.) adds: “*as such, they may well be much more valuable than yet another statistical or quantitative analysis of spatial pattern in revealing the social processes that underlie regional development, in revealing the ways in which causal mechanisms may or may not be activated in specific contingent circumstances*”. In other words, the knowledge revealing social processes, though failing the statistical test, still can enter into the collective process of knowledge accumulation and help to cut a path towards scientific innovation (FLYVBJERG, 2004)⁸⁹. YIN (1994, p.10) differentiates between statistical and analytical generalisation: “*the case study [...] does not represent a ‘sample’, and the investigator’s goal is to expand and generalize theories and not to enumerate frequencies*”.

As for the validation of research findings, in the specific case of context-dependent social processes such the one of institutional change, replication encloses a basic contradiction, since a key assumption for *replicability* to be possible is that objects and subjects of analysis will not change. HUDSON (id., p. 742) argues that this assumption “*fails to acknowledge that people, unlike natural objects and things, learn and consciously alter their behaviour in light of this, and may deliberately seek to subvert replicability [...] as part of their strategies as knowledgeable and rational social actors*”. The predictive power

⁸⁹ On this, FLYVBJERG (2004) purposefully reminds the German word for science, - *Wissenschaft* -, which means literally “*to gain knowledge*”.

of scientific findings is often conflated with their explanatory power, and thus with their validity. However, predictions, relying on empirical regularities, offer the grounds for expecting something to happen, and can provide explanations when the necessary and sufficient conditions are known to exist or to be about to come into existence (SAYER, 1992). Causal explanations give knowledge about what makes things happen (id.). In this sense, and bearing in mind the research goals to be pursued, the validation of research findings is not dependent on any predictive powers, but on their capacity to identify, describe and explain the generative mechanisms and contextual conditions that configure the university-region nexus and its role in fostering institutional change.

At this stage, it is perhaps imperative to state that the intention is not to derogate the use of quantitative research methods in social science, which proved, in a number of fields, to be of high value to improve our understanding about the way society functions. The point is that research methods should be adequate to the nature of the object under study and the purpose and expectations of inquiry (SAYER, 1992). This leads to the problem of quantification or measurement. PECK (2003, p. 731) assertively states: “*multiply-determined and historically-produced social phenomena are rarely amenable to being crammed into quantitative empirical categories*”. This equates the question posed by SAYER (id., p. 176): “*what must objects be like for it to be possible to quantify them?*”.

Redirecting the question to the conceptual framework underpinning the research objectives stated above, what can be *meaningfully* measured? Certainly, the number of research contracts linking a given university to regional firms or the number of spin-offs it generates within the region, for example, can be collected and be utilised as an indicator of the amount of knowledge resources the university is providing to its region. The number of regional network switching points existing in that given university or the amount of communications between its research centres or individual academics with firm managers, policy-makers, politicians, etc., as much able for collection, can offer an indicative measurement of the relational inputs the university is generating. Through more or less sophisticated formal modelling, and some initial assumptions, it would be possible, in a first stage, to estimate an *amount* of mobilising inputs supplied by the university, in a second stage, to measure the university’s stake in *increases* of institutional capacity, and, finally, to extrapolate the results to other regions. The aim is not to deny the applicability of such a model, quite simplistically depicted here of course, as an effective research tool

to cope with some adequate research questions. It is, rather, to judge whether that research tool and the inherent measurements would be meaningful when searching for explanations about *how* universities are contributing to enhance the complex qualities of institutional capacity building processes in their regions, *how* they are organising themselves, *how* the mutual benefits of their links with the regions are generated, and *why* they are so important in LFRs. In addition, crucial spatial and temporal dimensions of the process of institutional capacity building would be put aside the picture, because not quantifiable, - e.g., can one measure the local persistence and cunning required to create a university (KOSTIAINEN and SOTARAUTA, 2002) that would become a cornerstone of the successful development trajectory of one of the studied regions? PECK (2003, p. 738) gives the final touch: “*the shift towards qualitative methods does not imply lower ‘standards of evidence’; it entails different standards of evidence*”.

Following LAGENDIJK (2003, p. 725), what is required are “*insights into how, in particular places, a multitude of forces, factors and actors produce specific outcomes, that are beyond the reach of model-based approaches*”. Thus, complexity is intrinsic and intensive research designs are necessary. Whereas conferring accrued support to the choice of a case study approach, the acknowledgement of complexity of objects under research and intensiveness of research methods raises methodological challenges, which bring to forefront a wide range of concerns: from the need for a theoretically-informed empirical work⁹⁰ (SAYER, 1992) to the need for collecting and interpreting a variety of sources of evidence (HUDSON, 2003), from the need for a purposeful selection of cases (FLYVBJERG, 2004) to the need for efficient ways of communicating research findings, in their many-sided, complex and sometimes conflicting aspects (id.). The research design is described in the following section.

⁹⁰ SAYER (1992, p. 83) states that observation “*is neither theory-neutral nor theory-determined, but theory-laden*”

8.3

Making case study research in Tampere, Central Macedonia and Wales

Using the insights of FLYVBJERG (2004), the selection of cases to develop empirical work was information-oriented, that is, based on the researcher's expectations about their information content. Previous acquaintance with the cases, though superficial, grounded those expectations and reduced the obviously wide selection spectrum. This, together with the perceived need for studying the object of research in different contexts, made the decision to converge on three universities, differing in size, organisation, management, etc., operating in three regions with very different territorial features, be they economic, political and administrative, or in terms of development policy frameworks. Taking into account the propositions under scrutiny, a compelling criteria for selection has been that, among those three regions, the so called less favoured ones were represented. In addition, aiming to ensure information about the significance of different territorial contexts for the way universities interact with their regions and mutual benefits are yielded, a more developed one should also be considered. The finishing touch of selection was given by the expected level of access to key sources of evidence, be they actors or documentation. Hence, advantage has been taken from previous personal acquaintances in the three selected regions.

At this stage, two additional remarks are due. The first concerns the meaning of the term *region* in the context of the selected cases. Instead of a perfect match between the research lens focal distance and administrative frontiers (though some basic profiling statistical data), a *zooming* perspective was preferred, that is, the reach of events taken as relevant determined the *field* covered. As a consequence, when reporting the case study materials, different scales were mingled, since while some of those events impacted on or were determined by the whole region, others involved only parts of it or even parts of other regions (administratively taken). In this sense, recalling COOKE and MORGAN (1998), the *region* is viewed as a *nexus of processes* rather than a thing subjected to administrative delimitation. The second remark concerns the meaning of *less* or *more favoured* to describe the regions' attributes. The deterministic labelling method based on the differentials found in such indicators as GDP or educational levels taken in relation to an average (in this case

the EU average) still stands as a useful marker. Nevertheless, previous knowledge about the selected cases, already mentioned above, also helped to establish the relative positions of the three regions in terms of the capacity to promote innovation and socio-economic development. The point to retain is that, whereas the label *more favoured* automatically distinguishes one of the regions, the *less favoured* one does not imply similarities between the other two regional contexts.

Giving names to the cases, the selection fell upon the **Tampere University of Technology (TUT)**, located in the (more favoured) region of **Tampere** (Finland), the **Aristotle University of Thessaloniki (AUTH)**, in the region of **Central Macedonia** (Greece), and **Cardiff University (CU)**, in **Wales** (United Kingdom)⁹¹.

The research questions guiding the investigation compel to consider the universities as the main case study units of analysis. However, as one of the research questions indicates, the role of those universities in regional institutional capacity building is perceived as strongly context-dependent. Moreover, it is expected that the institutional capacity building blocks provided by the universities make them context-influencing. Hence, the need to look also at the territorial entities with which they interact and within which the processes take place and outcomes are generated. In other words, regions should become a kind of *contextual units of analysis*. This dual but intertwined focus makes more pressing the access to various sources of evidence, deemed as necessary in case study research (HUDSON, 2003; YIN, 1994).

Accordingly, the search for empirical evidence drew heavily on targeted direct interviews, carried out with 25 informants operating in a variety of key regional organisations, and on the analysis of a wide range of documentation⁹².

In terms of the selection of agents to be interviewed an attempt was made to cover the political, policy-making and practice levels that encompass the interaction between universities and their regions, as well as to grasp the view (or perhaps more appropriately, the views) of academic staff about their universities as institutional capacity builders.

⁹¹ A question that has been frequently asked during the making of this dissertation was why not to study the case of Aveiro, that is, to make research on the *backyard*. Rather than an escaping strategy from the risks of falling on what MARKUSEN (1999, p. 713) calls “*provincial boosterism*”, the option was very much influenced by the hope that the findings stemming from the work carried out elsewhere can be of value for future developments concerning the role of the University of Aveiro in helping its region to enhance institutional capacity qualities, but at the planning level, not as an academic dissertation.

⁹² The participation in several seminars about regional development in the three regions also provided valuable information.

Basically, political, policy making, and regional development officers, firm owners, university third mission officers and academics were interviewed (**Table 8.1**):

Table 8.1 – Regional agents interviewed

Political/Policy-making/Regional development officers	6
Academic staff	10
University third mission officers	7
Firm managers	2
Total	25

Rather than “*conveniently-scheduled chats designed to furnish researchers with anecdotal confirmations of their theoretical prejudices*”, borrowing here from PECK (2003, p. 734), interviews should provide the researcher with increased chances of learning from the interviewees, which, following SAYER (1992, p. 245) is better accomplished with “*a less formal, less standardized and more interactive kind of interview*”, because, as the same author adds, “*the respondents are not forced into an artificial one-way mode of communication in which they can only answer in terms of the conceptual grid given to them by the researcher*”. These insights were quite influential of the way the 25 interviews carried out in the three regions were conducted. In fact, though geared by a guiding conceptual framework, most of them rapidly transformed into conversations about the topic, in which ideas and experiences were exchanged, disagreements were discussed, and new interrogations were produced. Obviously, the course taken by those conversations varied sharply, namely because, on the one hand, the level of familiarity with the concept of institutional capacity building was far from uniform (an additional effort to explain what it was meant by it was sometimes needed), and, on the other hand, both the territorial and organisational contexts, most interestingly, seemed to affect the views, expectations and even ways of expressing ideas. In addition, the original version of the second academic revolution, i.e., the technology transfer and academic spin-offs *foci*, revealed to stand firmly as the mindset framing insights on the role of universities in regional development processes. This mindset, rather than a sticking point, would enrich (and, in some cases, stiffen) the conversation and thus the learning endeavour. It is worth noticing that electronic mail was of great usefulness for dealing *a posteriori* with ambiguities or misunderstandings, as well as to treat new issues arising along the information processing work and to corroborate interpretations.

The evidence collected through interviewing was complemented by, and often compared with, a vast documental analysis. Academic papers and research reports, policy documents, programme evaluation reports, strategic and action plans, financial statements, etc., concerning both the developments occurred in the studied universities and regions, and the national and international policies, regulations and programmes affecting those developments, were taken into account. The availability (and quality) of relevant written information largely varied among the three studied regions, which, in a first instance, was an indication of different levels of awareness, valorisation, policy, and practice concerning the interaction between the universities and the regions.

The search for knowledge on the actual causal, structural, and substantial relations (SAYER, 1992) underpinning the interaction between the universities and the regions was undertaken by meshing together the evidence collected through interviewing and documental analysis, and by reporting it, for coherence sake, under the light of the conceptual framework of institutional capacity building outlined before (a research operative form of this conceptual framework is developed in the next section). The final step was directed at abstracting, rather than generalising, from contextual conditions, aiming a contribution to increase knowledge on such a relevant issue as the role of universities as builders of regions' institutional capacity.

8.4

Universities and institutional capacity building: a research operative framework

The theoretical and conceptual framework designed previously converges on the argument that looks at universities as a key regional development arena in contemporary society. As such, it is argued that universities are becoming active agents in development processes, and such agency assumes the form of a contribution to build up regional institutional capacity. The argument, in short, is backed up by the path linking, firstly, the development challenges associated with globalisation and the rapid dynamics of societal change to the relevance of innovation; secondly, the interactive nature of innovation to its inherent strong institutional and territorial basis; thirdly, the ability to follow innovation-based development trajectories to the institutional qualities of a place. This flow of

connections brought in a number of issues, of which, taking into account the overall investigative goals, stand out the way history influences development trajectories; the strong impacts of public-private associative governance on the furtherance of innovation; the wide development and institutional capacity gap among regions, corresponding to different systemic innovation potential levels; the dependency of the institutional qualities of a place on the ability to mesh together knowledge and relational resources in ways leading to the mobilisation for collective action. A related and most relevant point is that universities do not act in isolation from their territorial environment, that is, the fashion universities place their agency at the service of regional development purposes is not context-independent.

From an empirical research operative point of view, these issues are translated into the case study reporting by a descriptive territorial view of the regions where the three studied universities operate, in which distinctive histories, social and economic features, government and governance structures, and development policies (including higher education policy) are addressed. One can argue that the aim here is to describe the regional system of innovation to which the universities belong, both in terms of its internal configuration and its linkages to supraordinate innovation governance levels. This is the point at issue in the first of the two following case study related chapters. The descriptive approach can be regarded as the contextual backbone for the more explanatory stance needed in order to find out answers to the specific set of research questions defined earlier, which, in the end, configure the heart of the investigation.

Recalling forth the research questions, the investigative *devices* to be manipulated consists of a dynamic conceptualisation of institutional capacity building processes; the evolving universities' organisational configuration that shape their role in those processes; the systemic qualities of the territorial *stages* where institutional capacity is built up and the universities operate, as well as the mutually reinforcing university-region nexus; and the particularities of the case of institutionally weaker LFRs.

The first *device* counts on the work of HEALEY et al (1999a, 1999b), which offers a valuable help to set up qualitative criteria enabling the understanding of the particular mechanisms through which each one of the three dimensions of institutional capacity building processes are materialised, and, as such, to address how universities contribute to

their materialisation. Accordingly, the case study reporting will look at the knowledge resources universities tap into the region, highlighting:

- the range of university knowledge and knowledge-generating activities;
- the influence university knowledge has on the frames of reference for action;
- the ways university knowledge flows are integrated across a variety of regional arenas; the linkages between the range of knowledge and the frames of reference;
- the ways universities affect the permeability of the frames of reference steering action in the regional system of innovation *vis à vis* new ideas, innovative forms of acting and reasoning, and new sources of information and inspiration.

It will also address the contribution of universities to enhance relational resources, focussing on:

- the identification of key players with whom universities interact and the qualification of those interactions in terms of extent, nature and reach;
- the morphology, or architecture, of the web of relations, directly participated or indirectly influenced by universities underpinning the regional systems of innovation (network density, nodal points, switching points, patterns, spatial reach);
- the positioning of universities in relation to nodal and/or switching points connecting regional networks;
- the influence, mastery, and reputation of universities in the power relational structures that hold together regional networks; the capacity of universities to affect access to regulatory and resource allocating powers, namely supra-regional and supra-national.

In addition, it will attempt to capture the part universities play in enhancing the mobilisation capacity of their regions, by analysing:

- the contribution universities give to the creation and identification of development opportunities and their influence in shaping shared regional agendas for action;

- the intervention of universities in the identification of key arenas and networks (regional and/or supra-regional) to privilege by the mobilising efforts;
- the positioning of universities within the set of change agents (e.g., brokers, openers, maintainers or developers) assumed as critical to mobilise knowledge and relational resources and, thus, empower the regions' capacity for collective action.

The second *device* pays attention to the organisational configurations affecting the role of universities as builders of regional institutional capacity. The effort involves not only an assessment of the current situation, but also of the evolutionary changes occurred over time and the respective motivations. In addition, to look at those organisational settings does not convey an exclusive focus on the infrastructural level, that is, on the tangible arrangements dedicated to the interaction with the regions deployed within the universities (e.g. technology transfer centres, regional development offices, formal networks, etc.), their aims, geographical and sectoral range and funding streams. The policy *environment*, both internal (e.g. universities strategic third mission plans) and external (e.g. the national higher education policy) to the academic institution, encouraging or restrictive, binding or heedless, strongly conditions the ways universities organise themselves in their interactions with their regions. The same might be said about the more intangible dimension of culture and working practice traditions, since to different *institutional cultures*, from an approximation to the *ivory tower* to an external cooperation prone attitude, correspond different forms and intensity, - e.g., formal or informal, active, reactive or passive -, which, in turn, configures differently universities' organisation. The extent to which regional engagement trespasses the various functions configuring the academic organisation, or, in other words, the mainstreaming of third mission activities, is an additional factor to be taken into account.

The third investigative *device* is based on the suggestion, as made in the literature, of a mutually influencing relationship between the regions and the universities, meaning that the issues to be tested are twofold: firstly, the expectation that the overall features characterising the regional system of innovation mould in significant fashion the role academia plays; secondly, the proposition that the university, to be strong, needs a strong region, and a strong region needs a strong university. Hence, the chief task is to find a guiding set of criteria against which those influencing forces might be assessed and the

ways the mutual benefits are accrued might be judged. COOKE et al (1998) and COOKE (2001) borrow the criteria to qualify the systems of innovation in terms of their systemic potential (cf. Chapter 4). Accordingly, the infrastructural and suprastructural levels defining the systemic potential are divided into a number of integrative dimensions, thought of as indicative of the major forces affecting the overall functioning of the regional system, and, thus, the interaction with academia. At the infrastructural level, the issue of power converges on the degree of political, policy-making and financial autonomy. The theoretical insights suggest that the higher the degree of autonomy, the higher the innovation systemic potential of the region, and, thus, interactions with the university ought to be more fluid. The availability of a regional innovation policy framework, generally conferring to universities a primordial role, is not a sufficient condition for enhancing the university-region nexus. Effectiveness is determined by the extent to which the various components of the regional system are aware of such a framework, its translation into the realm of decision-making and action, its sustainability over time, and its flexibility towards co-evolution and change. The perceptions maintained by the system components towards the role universities can play, because shaping the expectations, the value, and thus the demand for more qualified ways of universities' regional engagement. The issue at stake is to know whether these perceptions assume a strategic nature, i.e., whether they have been activated. Otherwise, they can be latent, - e.g., locked in the political discourse -, or even distant, both raising difficulties to university-region links. An additional dimension related to expectations, value, and demand concerns the qualities of the regional economic structure. As suggested before, the linkages between universities and industry are more likely to take place and endure in regions endowed with large firms and/or R&D intensive sectors. At the superstructural level, the basic argument, borrowed from theory, is that the more the associational paradigm is embedded in the region's decision-making processes and forms of action, the higher its systemic potential. Under the two overall dimensions of culture and social innovation, the attitudes towards co-operation and change and the attributes of the governance processes can be judged, and the effect exerted on university-region links be assessed. While studying the features of the university-region nexus, evidence on the mutually reinforcing nature of that nexus is expected to come to light.

The findings stemming from the application of the three previous research components will help to deal with the specificities of regional contexts generally characterised by low levels of systemic potential and gather evidence showing the reasons why the role universities play in LFRs can be considered as particularly important. Obviously, the construction is made with basis on outcomes, that is, on the detected institutional progresses made on the terrain ascribable mainly to the agency of universities and unlikely to occur in the absence of that agency. Complementarily, the differing development and institutional stages of the three studied territorial contexts, arguably implying varying degrees of *uniqueness* and prominence of academia as a source of institutional change, will be used to collect additional evidence about the utmost relevance of LFRs' universities as institutional capacity builders.

8.5

Synthesising...

This chapter was aimed at outlining the methodology used in the search for empirically based answers to the research questions previously constructed, which will inform the findings about the core propositions configuring the inquiry line. Having in mind the issues to investigate, the methodological choice fell over a case study research strategy. The choice was made with basis on the adequacy to the research questions, namely to the inherent need for understanding causal, structural, and substantial relations linking the universities to their regions. It was also compelled by a set of conditions inherent to the objects and subjects to be investigated, such as, for instance, the impossibility of the researcher to have any control over the studied events, or, recalling an argument that cuts across this dissertation, the context-dependent character of those events.

The choice of a research method that frequently attracts methodological criticisms impelled an incursion into the realm of controversy. An attempt was made to counteract conventional wisdom about case study research, particularly concerning the problems of generalisation, verification and replication arising from a restrictive view of the scientific endeavour. The basic argument was that research findings stemming from approaches based on case studies do not forcibly provide scanty evidence but a different kind of evidence.

Besides the search for arguments sustaining the choice of a case study approach, the chapter also introduced the reasons why three specific cases, - i.e., three universities operating in three distinct territorial contexts -, have been selected to develop the empirical work. It has also outlined the major accessed sources of evidence, - interviews with key regional agents and documental analysis -, and accounted for the virtues and difficulties found in the field. The learning process inherent to interviewing was configured by a balance between the benefits of informality and lively conversation and debate, and some conceptual misunderstandings or difficulties in addressing a topic overlooked by the predominant technological mindset framing the perceptions about the regional role of universities.

In order to avoid scanty evidence, a research operative framework was built up by making to converge the dimensions, qualities and criteria to assess i) the ways universities can enhance their regions' institutional capacity, ii) the evolving organisational arrangements that support the role of universities as builders of institutional capacity, and iii) the influence of the varying systemic potential of the regional systems of innovation on the forms and extent of that role, and the argument pointing to the mutually reinforcing nature of the university-region nexus, and iv) the particular importance of universities' role in institutional capacity building processes when in presence of LFRs.

Under the light of an account of the new perspective on the second academic revolution in practice, the next chapters endeavour to report the research work undertaken in Tampere, Central Macedonia and Wales, and target the discussion of research findings at judging the set of arguments that constitute the bottom line of this dissertation.

Tampere, Central Macedonia and Wales: a territorial descriptive overview

9.1

Introduction

The present chapter aims at providing some background information about the territorial contexts where the case studies were carried out. As a consequence, it has a predominant descriptive nature and attempts to take a picture whose colours, contrast and brightness, set the explanatory approach in places marked by the specificities in history, structure and agency that heavily determine the figures coldly dictating their *more* and *less* favoured status. Accordingly, the chapter draws attention on the quantitative mirror of dissimilarities. Though, it attempts to go further and offer a livelier characterisation of the regions. It does that by combining the interpretations of numbers with some observable facts that, by their nature, marshal pieces of information relevant for a better understanding of the territorial contexts.

The differences existing between Tampere, Central Macedonia and Wales, though well expressed by such indicators as economic production, R&D expenditure or educational attainment, can be captured in a more complete and purposeful manner by checking some details of the regional histories and looking at the regions through the prisms of governance, policy-making, and policy implementation infrastructures. History matters, as, for instance, the evolutionary economists accurately uphold. So does the state of political affairs, the *loci* where development policies are designed and the *foci* they stand for, and the parts of the regional machinery that translates the policy objectives into practice.

Having in mind the investigation's bottom line, it becomes obvious that light should also be shed over the diverse legal framing conditions of higher education, on the one hand, and the expected role of higher education as inscribed in regional development policies and programmes.

The chapter is organised as follows:

- Firstly, it combines some basic figures and facts in order to depict the socio-economic characteristics of the regions and to capture a flavour of the dissimilar historical evolution that influenced the regional development trajectories;
- Secondly, it looks at the government, governance, policy and practice structures evolving in the three regions, aiming to offer insights into different traditions and ways of policy design and delivery;
- Thirdly, it pays attention to a variety of conditions that are expected to influence the role of universities in regional development, namely, the legal and policy frameworks, the management arrangements and funding mechanisms, the expectations that each regional context maintain towards its university or universities, and the setting of research agendas.
- Finally, a synthesis of this *tale made of unequal territories* is provided.

9.2

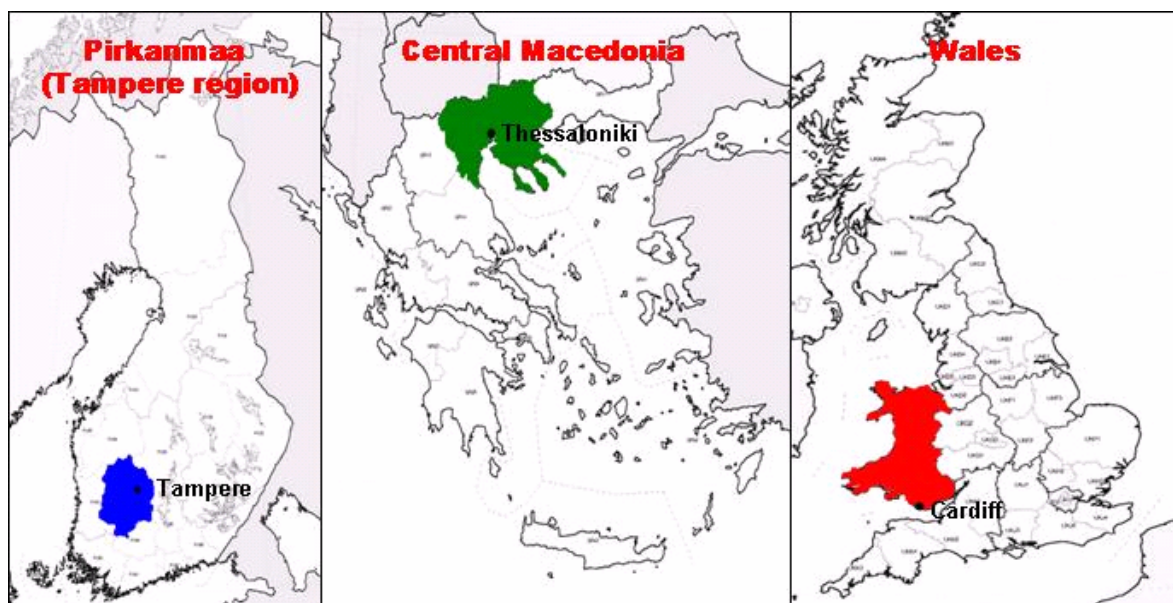
Basic facts and figures...

The regional contexts selected for the case study research are representative of three of the four cardinal points, - North-South, East-West -, often used to allude to the development gap dividing the European mosaic of regions. Any superficial quantitative approach to the three selected regions, using some basic figures, would suffice to clearly express the dissimilarities between them.

The short geographical and demographic introduction of the regions is the starting point. Tampere region (*Pirkanmaa* in Finnish) is part of the NUTS II region of *Länsi-Suomi* (Western Finland), and, in relation to the other Finnish NUTS III administrative units, ranks second in terms of population (ca. 459 thousand inhabitants), the first being the Helsinki city-region (ca. 1.4 million inhabitants). Central Macedonia is located in the northern parts of Greece, with a population of about 1.9 million (17% of the country total),

which places it as the second larger Greek NUTS II region, just after Attica (ca. 3.8 million) where the capital city Athens is included. Wales is one of the countries that form the United Kingdom, representing approximately 5% of its population, i.e., reaching approximately 2.9 million people.

Figure 9.1- The selected regions



The relatively more favoured status attributed to Tampere region relies on the gross production of the regional economy, which, taken in a *per head* basis, reached approximately 27.3 thousand € in 2003, thus placing the Finnish region 26 points above the EU25 average. The same indicator in Wales falls down to 21.1 thousand €, approximating the region to the European average. Central Macedonia, with 13.7 thousand €, is 27 points below the EU25 average.

Unemployment in Tampere (11.1%) and Central Macedonia (11.5%) is higher than the EU25 average (about 9%). Wales takes advantage in this domain, presenting a rate of 5.6%. Long-term unemployment stands out in Central Macedonia, because affecting almost a half of unemployed people. In Tampere, where the same indicator falls down to 25.5%, the situation gains particular heaviness in the more than 50 years of age group, which, according to KAUTONEN et al (2004b), accounts for 60% of long-term unemployment. The same authors (id.) refer to skills mismatching, due to a pervasive process of industrial transformation, as rooting the problem. The Greek region also registers a high rate of young employment, almost 30%, substantially higher than the EU25 average of about 18%.

The sectoral distribution of employment reveals the services sector as predominant in the three regions, reaching a particularly high proportion in Wales (71.2%). Employment in industry places Central Macedonia (24,9%) and Wales (26.2%) below the EU25 average (28.8%), while Tampere stands out with its 33% share. Primary activities, relatively marginal in Tampere and Wales, are still very important in Central Macedonia (about 16% of total employment against a EU25 average of 5.4%). The relevance of primary activities for the Greek region would become much more expressive if not considered the Thessaloniki area, where the majority of non-primary sectors is concentrated, namely services (URENIO, 2006).

Table 9.1 – The regions: basic figures

	Tampere Region	Central Macedonia	Wales
Population (2001, x10 ³)	459	1881	2903
GDP <i>per capita</i> (2003, €/inhab, x10 ³)	27.3	13.7	21.1
GDP <i>per capita</i> (2003, EU25 = 100)	126	73	97
Unemployment rate (2002, %)	11.1	11.5	5.6
Long term unemployment (2002, % unemployed)	25.5	48.6	20.1
Young unemployment (2002, %)	n.a.	29.4	14.0
Employment primary sectors (2002, % of total)	3.0	16.2	2.6
Employment industry (2002, % of total)	33.0	24.9	26.2
Employment services (2002, % of total)	62.0	58.9	71.2
Educational attainment age 25-64 (2002, % of total)			
Low	8.9 a)	48.4	21.4
Medium	64.5 a)	33.1	51.5
High	26.5 a)	18.5	27.1
R&D expenditure (2003, % GDP)	6.17	0.66	0.83
R&D expenditure (2003, x10 ⁶ €)	767.8	172.2	515.4
<i>Private</i> (% total)	78.4	18.2	41,0
<i>Public</i> (% total)	21.6	81.8	59,0
Patent applications (per million inhab., average 99-01)	614.2 c)	9.8	69.9

a) 2000, % of total population > 15 years old; the medium level corresponds to population with at least the secondary level; the high level corresponds to population with a higher education degree;

b) 2003;

c) only business patent applications.

Sources: Eurostat, Statistics Finland, own calculations

The differential among the regions gains reinforced contours when analysed the levels of educational attainment. Though not comparable, because of different measurement methods, available data strongly signals the advantageous position of Tampere, where only about 9% of population older than 15 years of age present low educational levels, against

approximately 49 and 21% (in relation to total population aged 25-64) in Central Macedonia and Wales, respectively.

The most striking imbalances, however, concern R&D expenditure. Tampere leads by far in this domain, dedicating about 6% of the regional GDP to R&D, while the same proportion in Wales falls down to 0.83%, and, in Central Macedonia, to 0.66%. Utter differences dividing the three regions occur also when disaggregating the total expenditure in R&D by the private and public sectors. Whereas in Tampere the business sector is sharply predominant, being responsible for about 78% of total expenditure, the situation is the inverse in Wales and Central Macedonia. Public R&D expenditure represents almost 60% of the total in Wales and more than 80% in Central Macedonia. As expected, the leading position of Tampere is extended to the number of patent applications.

Table 9.1 above presents the basic figures configuring the dissimilarities between Tampere, Central Macedonia and Wales. Hidden behind these figures lie the imbalances existing within each one of the three regions and the associated dependence on the major urban agglomerations, the city of Tampere, Thessaloniki and Cardiff. For instance, the city of Tampere concentrates about 45% of the region's total population. More than a half of Central Macedonia's population lives in the Thessaloniki area. In the case of Wales, the capital Cardiff, with its 310 thousand inhabitants, weights slightly above 10% in total population. However, the country's South East, where the capital is located, accounts for almost a half of the Welsh population (SOUTH EAST WALES ECONOMIC FORUM, 2005). As expected, these demographic imbalances match a pattern of unequal development within the regions. For instance, in the Finnish region, there are some sub-regions, such as Lounais-Pirkanmaa and Kakkoiis-Pirkanmaa, where the GDP per head is about 25 points below the EU25 average (HÄMÄLÄINEN, P. 2004); in Central Macedonia, Thessaloniki accounts for approximately 58% of the regional GDP (URENIO, 2006); Cardiff accounts for 23% of the Welsh total GDP.

In addition, the basic figures analysed above do not allow for telling the whole case study-relevant regional stories. On the one hand, they just offer a static picture of where the regions stood at given moments of time. On the other hand, they leave in the dark non-quantifiable episodes that were determinant for the regions' development trajectories.

The strong industrial tradition shared by Tampere and Wales constitutes one of those episodes. To a large extent, it still lasts as a reference for regional identities and, in fact,

proved to be a reference also for development policy targeting in both regions. Though determined by natural forces or natural resources, this industrial tradition has not much more in common.



The 18 meters difference in level between the two lakes that bound on the north and south the city of Tampere, was decisive for boosting the process of industrialisation. The energetic potential of the *Tammerkoski* rapids has in fact powered the city to become the first industrial centre in the whole Finland. Founded expressly as an industrial town (KOSTIAINEN and SOTARAUTA, 2003)⁹³ by the Swedish king Gustav III in 1779, Tampere, endowed with the hydro-energy provided by the rapids and the free trade and entrepreneurship rights given by the founder, would rapidly attract a variety of industries. However, crucial developments would happen a few years later, after Finland became an autonomous grand duchy of Russia in 1809. Large-scale industrialisation started in 1820, when the Scottish entrepreneur James Finlayson, granted with the ownership of the rapids, founded an industrial complex producing machinery, spinning and weaving cotton and manufacturing cotton thread. Though textile industries dominated Tampere's industrial fabric until the turn of the century, a diversity of other activities had been established (e.g. footwear, pharmaceuticals, paper mills, and metal works). Moreover, the industrialisation process spread to some small cities near Tampere, such as Nokia, where paper, rubber and metal factories were founded. KOSTIAINEN and SOTARAUTA (id., p. 422) argue: “*At the beginning of the period of independence (1917), all the core fields of heavy industry were established in Tampere*”.

During the inter-war period, while the predominant textile industry started to decline, metal and mechanical engineering industries grew steadily. The establishment in Tampere of the national airplane factory in 1931 has been determinant, namely in the increase of the demand for mechanical engineering industry. After World War II, though textiles, paper, footwear and leather industrial activities were still important, metal industries became the main sector. According to KOSTIAINEN and SOTARAUTA (ibid., p. 423), “*the growth of industry in Tampere, and metal industry in particular, can partially be explained by the*

⁹³ KOSTIAINEN and SOTARAUTA (2003) offer a detailed and very interesting historical perspective on the industrial evolution of Tampere.

war reparations to Soviet Union". During the 1970s, intra-firm reorganisations, - e.g., increased automation -, local events, - e.g., the problematic relationships between local government and industry which led some firms to move (KAUTONEN et al, 2004a) -, and global events, - e.g., the oil recession -, provoked significant job losses in a variety of sectors. More than 5 thousand jobs were lost in the textile, clothing, footwear and leather industries (NIEMI, 2004). Nevertheless, the weight of industry in the regional employment structure fairly held out (**Table 9.2**), mainly due to the metal and mechanical engineering industries.

Table 9.2 – Employment structure in Tampere region (1970-1990, %)

Sector	Year	1970	1975	1980	1985	1990
Primary		15.3	11.7	9.9	8.3	6.6
Industry		45.9	47.0	44.3	39.8	37.2
Services		38.8	41.3	45.8	51.9	56.2

Source: Statistics Finland

The slightly descending curve initiated in the mid 1970s anticipated the overall decrease of industrial employment in the region during the 1980s, as opposed to an increasing importance of services. KAUTONEN et al (2004a) argue that in the early 1980s it became clear that, due to global competition, a streamlining of traditional industries would be inevitable and industrial jobs losses would be significant. At the purpose, SEPPÄLÄ (1998, p. 230), quoted in KAUTONEN et al (id.), asserts that "*the old will be renewed as far as possible, and dying occupations and jobs will be replaced by something new that has never ever existed yet*". Under this motto, some developments took place, both in terms of the regional industrial policy and infrastructure, such as the foundation of a science park and a venture capital firm, and the establishment of some research units of Nokia group and VTT, the national technical research centre (ibid.). These developments, detailed below, can be regarded as the spark that ignited the substantial transformation of Tampere region's socio-economic profile. They might also help to explain how the region successfully overcame the fierce recessive period it has crossed in the early 1990s, due to the collapse of the Soviet Union, the major trade partner of Finland, and the crisis of Finnish banking (SCHENSTOCK et al, 2004).

According to KAUTONEN et al (ibid., p. 175), "*the recession at the beginning of the 1990s had hit Tampere Region even more than the Finnish economy as a whole*". The

extent of the Finnish economic crisis is well illustrated, for instance, by the unemployment rate growth, from 3,5% in 1990 to approximately 18,5% four years later, or the 12% national GDP decrease in only two years (1991-1993). In Tampere region, industrial production dropped about 10% (SCHIENSTOCK et al, 1998), and the unemployment rate surpassed the 20% in 1994. As shown in **Table 9.3**, in the three-year period 1990-1993, the overall number of jobs in the region diminished 22.4% (about 28% in manufacturing).

Table 9.3 – Evolution of employment in Tampere region (1990-1993, %)

Primary sector	- 19.9
Manufacturing	-27.7
Private services	-23.7
Public services	-6.0
Total	-22.4

Source: Statistics Finland; SCHIENSTOCK et al (2004)

Finland, in less than ten years, overcame the “*collective nightmare that shook the whole Finnish society*” (LEMOLA, 2004, p. 268). LEMOLA (id.) suggests that the country recovered from the crisis almost as quickly and surprisingly as it had fall into it, connecting this rapid achievement to the growth in exports, particularly in the ICT sector⁹⁴, and, within it, one of the world telecommunications leaders, the Nokia company⁹⁵. Tampere is a paradigmatic regional example of this ICT-based awakening, which can be illustrated by the evolution of employment structure in the region (**Table 9.4**).

Table 9.4 – Evolution of employment in Tampere region (1993-1998, %)

Primary sector	-29.2
Manufacturing	20.8
Private services	36.4
Public services	4.8
Total	17.9

Source: Statistics Finland; SCHIENSTOCK et al (2004)

The region’s ICT sector, between 1993 and 1997, more than doubled in size (O’GORMAN and KAUTONEN, 2004), as shown by the increasing number of jobs in ICT

⁹⁴ “*Traditional industries such as paper, metals and engineering, and chemicals all increased their exports, but the strongest growth has been in the industrial cluster called information and telecommunication technology (ICT)*”, LEMOLA, 2004, p. 268.

⁹⁵ “*In the latter part of the 1990s, the most visible impact of Nokia on the Finnish economy was its contribution to GDP growth, In 2000, the contribution of Nokia to growth peaked, exceeding 1,6 percentage points. In the same year, Nokia accounted for 2,8 per cent and 20 per cent of Finnish GDP and total exports, respectively.*”, ALI-YRKKÖ and HERMANS, 2004, p. 106.

firms, from about 3,000 in 1994, to 6,750 in 1997, and to approximately 10,000 in 2000 (id.)⁹⁶. Nokia Corporation, in 2004, had approximately 3,700 employees in Tampere (CITY OF TAMPERE, 2005a), all of them working on R&D. Following SCHIENSTOCK et al (2004), the various Nokia's business units accounted for over half of total growth in Tampere region ICT sector. However, during the second half of the 1990s, nearly 100 new ICT firms were established, resulting from the expansion of existing firms or the creation of new businesses by firms having their headquarters elsewhere, rather than of a local entrepreneurship boost (id.). In 2000, ICT industries represented 13% of total employment, 41.3% of total production, and 56% of total exports in the region (MARTINEZ-VELA and VILJAMAA, 2004).

The ICT sector growth was crucial for the restructuring of Tampere region's economy, or, following SCHIENSTOCK et al (id), for the region to escape path-dependency and enter knowledge-driven development trajectories. However, the older pulp and paper and mechanical engineering industries still stand firmly sharing with the ICT sector the forefront of industrial Tampere. In fact, at the turn of the century, pulp and paper, metal manufacturing and machinery and equipment industries provided about 37% of total region's industrial employment, 32% of total production, and 30% of total exports (MARTINEZ-VELA and VILJAMAA, id.).

Table 9.5 – Global market leaders in Tampere region

Firms	Products	Global market share
Kalmar Industries	Container handling machinery	>50%
Sandvik-Tamrock	Mining and construction machinery	35%
Metso Automation	Automation for paper industry	>15%
Metso Minerals	Mobile rock crushers	15%
PCE Engineering	Hollow core slab machinery	70%
Tamglass	Safety glass machinery	>70%
Bronto Skylift	Fire and rescue platforms	>60%
Fastems	Software for flexible manufacturing	70%
Ata Gears	Marine applications	50%
Avant Tecno	Mini loaders	40%
Timberjack	Forest machinery	30%
Gardner Denver	Ship compressors	30%

Source: adapted from NIEMI (2004)

⁹⁶ If the media and new media sectors and the related services and commerce are added, ICT employment reaches about 15,500 jobs (O'GORMAN and KAUTONEN, 2004).

The overall current industrial picture of Tampere encloses approximately 26,000 firms and plants, of which about 3,300 (13%) are industrial companies, 600 operating in global markets and a dozen being world market leaders (**Table 9.5**). About 80% of firms employ less than 10 workers and only 40 companies employ more than 250.

KAUTONEN *et al* (2004) qualify the transformation of Tampere by suggesting a development trajectory leading the region from the status of Finnish industrial heartland towards the category of node in the global knowledge economy. At this descriptive stage, the link between this transformation and the national driven policy acknowledging the central role of R&D activities to respond to the economic recession of the 1990s (e.g. LEMOLA, 2002, 2004) should be made to emerge. In fact, while cutting back public expenditure in general, the Finnish government kept on the increasing trend of the 1980s in terms of R&D expenditure. Moreover, the private sector, though the depressing situation, has continued to systematically invest in R&D (NIEMINEN, 2004). Policy statements such as the following gave the motto:

“Aspirations for rationalising and intensifying the public sector and for developing its structures have gained new importance with mass employment and the necessity to cut expenditure in order to curb the growth of the public debt. The nature of the problems has changed in other respects, too. They are becoming both more international and more complicated. The only way to find a sustainable solution to many current problems [...] is to generate new knowledge and know-how”, STPCF, 1993, p. 32.

Table 9.6 shows the evolution of Finland’s R&D expenditure between 1991 and 2000, and its breakdown by performance sectors.

Table 9.6 – R&D expenditure in Finland (1991-2000)

Year	R&D expenditure x10 ⁶ €	Growth (%)	R&D expenditure % GDP	Private sector (% total)	Public sector (% total)	Universities (% total)
1991	1976	-	2.0	57	21	22
1995	2346	18.7	2.3	63	17	20
1998	3508	49.5	2.9	67	13	20
2000	4423	26.1	3.4	71	11	18

Source: Statistics Finland

The growth of R&D expenditure in Tampere has also been remarkable, having triplicate between 1995 and 2000 (**Table 9.7**). KAUTONEN et al (2004) highlight that the real annual change was as high as 25% compared to the national level of 14%. In addition, as the same authors (id.) show, Tampere’s share in national R&D expenditure, of about 10% in 1995, increased to approximately 14% in 2000. This positive trend continued until 2003, when Tampere represented 15% of the national total⁹⁷. More importantly, increases of business investment in R&D took the major slice in the region’s overall growth.

Table 9.7– R&D expenditure in Tampere region (1995-2003)

Year	R&D expenditure x10⁶ €	Private sector (% total)	Public sector (% total)	Universities (% total)
1995	211	63.5	11.8	24.6
2000	633.9	77.4	6.6	16.1
2003	767.8	78.4	5.2	16.4

Source: Statistics Finland

The history and recent reinvention of Tampere are proudly used to marketing the city and the region. Anyone who travels to Tampere will easily come upon references, in buildings, public presentations, brochures, talks, etc., about the pioneering role of the region in a wide array of events, e.g., the first Finnish paper mill in operation (1783), the first textile factory (1821), the first paper machine (1842), the first shoe factory (1875), or the first electric light in Northern Europe (1882). More recently, the “*first in Finland...*” became the “*first in the world*”: e.g., the first GSM call (1991), the first analog data card (1993), the first digital X-ray photograph (1998), or the first fog screen (2003). Rather than its marketing potential, this long list of achievements becomes more productive if seen as signalling, using part of the title of KOSTIAINEN and SOTARAUTA’s (2003) article, “*the great leap or long march to knowledge economy*” which took place in Tampere.

When shedding light over Central Macedonia, a whole different evolutionary picture comes to the forefront. Its ancient history, full of distressing episodes over the centuries, its geo-strategic importance, the role of the city of Thessaloniki in the Balkans and in Greece, colour the complex backcloth against which the regional development path has been delineated. When attempting to grasp the roots of the current regional situation, rather than

⁹⁷ The Uusimaa region, where Helsinki is located, in 2003, accounted for 43% of total R&D expenditure in Finland.

going back to the time of the Ottoman rule, during which events such as trade liberalisation in 1830, thrust industrial development in some urban areas of the region (particularly in textile manufacturing), or to the early 20th century when inflows of war refugees speeded up and revitalised economic activities namely in Thessaloniki (HASTAOGLOU-MARTINIDIS, 1997)⁹⁸, it is more productive to emphasise the process of neo-industrialisation (KOMNINOS, 1997) occurred in Northern Greece during the 1980s, the decade in which Greece joined the then European Community (January 1981). According to KOMNINOS (id.), a dynamic industrial complex has been developed particularly in Central Macedonia, Eastern Macedonia and Thrace, relying not only in endogenous initiative but also on changes in the location behaviour of Greek industry, which moved away from areas near Athens to less central zones of the country (ibid.). This development, together with the much lower economic weight of tourism, distinguished Greek Macedonian regions from the central and southern parts of the country, especially because of the relatively more solid industrial activity. This is evidenced by a research study on Macedonian firms, cited in TSIPOURI (1998), which presents comparative data showing that industrial firms in Macedonia perform well above the Greek average in terms of employment, sales and profit (**Table 9.8**).



Table 9.8 – Industrial performance in Greece and Greek Macedonia

	Greece	Macedonia
Industrial employment (% of total non-primary sector employment, 1991)	46.7	81.3
Growth in industrial turnover (1990-1991)	13.5	19.7
Change in net profit (1990-1991)	-37.2	+38.2
Share of companies earning profits (1991)	74.4	77.3

Source: ICAP cited in TSIPOURI (1998)

Within Northern Greece, Central Macedonia became the major industrial centre, specialising mainly in food processing, textiles and footwear, and tobacco sectors, all together providing more than 50% of total industrial employment. SMEs account for 98%

⁹⁸ “The refugees revitalised industry and commerce with a considerable labour force, new consumers and entrepreneurial skills integrated in manufacturing and building industry; vigorous entrepreneurs set up new businesses chiefly in various sectors of the food, textile, carpet and tobacco industries”, HASTAOGLOU-MARTINIDIS, 1997, p. 503.

of all manufacturing firms and provide approximately 70% of total industrial employment (KAFKALAS and KOMNINOS, 1999). The average size of manufacturing firms is only of 6,5 employees per unit (id.). More importantly, in general, they present low levels of organisation and significant management deficiencies, as well as an approach to international markets on the basis of price rather than product quality (KOMNINOS, 1997). This, following KOMNINOS and SEFERTZI (1998), also relates to the features of the neo-industrialisation process, which, according to the same authors (id., p. 37) promoted “*neo-Taylorist corporate strategies [...], involving flexible and fragmented labour markets, innovation linked to fixed capital and machinery, and concentration on labour cost rather than product quality*”. As a result, in the authors’ (ibid., p. 39) words, a “*regional environment poor in technology resources and innovation support institutions*” has flourished.

Though stable in terms of the regional share, - between 1997 and 2002, it slightly decreased from 25.6 to 24.9% (CEC, 1999, 2004a) -, industrial employment has recently crossed some changes in sectoral terms, mainly due to the job losses in textile industries and increases in metal manufacturing. **Table 9.9** shows the changes in industrial employment in the period 1995-2000. Still, textiles continue to be the main providers of manufacturing employment in the region (ca. 30% of total).

Table 9.9- Industrial employment (1995-2000)

Sector*	Employment 1995		Employment 2000		Variation (number)	Variation (%)
	No.	%	No.	%		
Food, beverages, tobacco	12609	26,4	12815	27,9	206	1.6
Textiles	18325	38,4	13583	29,6	-4742	-25.9
Wood industries	1090	2,3	764	1,7	-326	-29.9
Paper and pulp	1218	2,6	1568	3,4	350	28.7
Chemical industries	1692	3,5	1808	3,9	116	6.8
Rubber and plastics	1793	3,8	1986	4,3	193	10.7
Other non-metallic products	2037	4,3	2392	5,2	355	17.4
Metal products	3187	6,7	4650	10,1	1463	45.9
Machinery and equipment	1390	2,9	1716	3,7	326	23.5
Electronics and optics	694	1,5	838	1,8	144	20.7
Transport equipment	1475	3,1	1290	2,8	-185	-12.5
Other	1167	2,4	1473	3,2	306	26.2
Total	47753	100	45959	100	-1794	-3.8

*firms with more than 10 employees; footwear sector not available

Source: Eurostat

Along the process of neo-industrialisation occurred in Central Macedonia that has contributed to distinguish the region from the rest of the country, a path of economic growth has been established. In 1986, taking the GDP per head as reference, Central Macedonia was in the group of the 25 poorest regions of Europe (at 15 member states), 42 points below the European average (CEC, 1999). The region, growing at an annual rate of approximately 4 %, escaped the 25 laggards' list, reaching, in 2002, 67% of EU15 average and 98% of the national GDP per head (CEC, 2004a). However, despite the distinctive industrial development dynamics, economic growth in Central Macedonia has been mainly underpinned by tertiary activities. Data for the period 1981-1991, for instance, show that services' output grew at an annual rate of 3.2%, against 1% in industry and 1.3% in primary activities (URENIO, 2006). The importance of the services sector in the region⁹⁹ is well illustrated by its relative share of gross value added (GVA) formation, as shown in **Table 9.10**.

Table 9.10 – Gross value added by sector (2000-2003, x10⁶ €)

Sector	Year	2000	%	2003	%
Agriculture, forestry, fishing		1460	7.7	1717	7.5
Industry		4042	21.4	4820	21.1
Services		13420	70.9	16331	71.4

Source: National Statistics Service of Greece

The same indicator is also useful to stress the high dependence of the region's economic performance upon its main city, which, as noted before, concentrates much of the regional industrial and service economic activities, employment and wealth creation (**Table 9.11**).

The intraregional imbalances are also acute in the employment structure. In fact, ignoring the Prefecture of Thessaloniki, agriculture is the major occupation, with a wide variety of crops and, according to KOMNINOS (1997), fairly healthy prospects for growth. Central Macedonia, in 1996, was part of the top 15 regions of the EU in terms of high shares of agricultural employment (about 20%). Though the declining trend (approximately 16% in 2002), the region, even if considered the enlarged EU, still stands prominently between the 25 regions presenting higher primary employment. In addition,

⁹⁹ According to TSIPOURI (1998), the service sector in Greece is characterised by a high share of banking, insurance and public administration.

Central Macedonia produces 18% of the total primary production of Greece, which is the highest regional share in the whole country (URENIO, 2006).

Table 9.11 – Gross value added by sector and Prefecture (2003, x10⁶ €)

Prefecture	Primary	%	Industry	%	Services	%
Imathia	145	8,4	406	8,4	782	5,2
Thessaloniki	385	22,4	3372	70,0	10617	70,4
Kilkis	139	8,1	412	8,5	427	2,8
Pella	294	17,1	192	4,0	721	4,8
Pieria	143	8,3	93	1,9	767	5,1
Serres	350	20,4	184	3,8	932	6,2
Chalkidiki	262	15,3	160	3,3	834	5,5
Central Macedonia	1717	100,0	4820	100,0	15079	100,0

Source: National Statistics Service of Greece

Unemployment in Central Macedonia, during the 1990s, oscillated between 9 and 10% of the total active population, having reached 11.5% in 2003. **Table 9.12** benchmarks the evolution of Central Macedonia's unemployment rate and structure against the EU (at 15 member states) for the period 1997-2003. It shows that, the region, as opposed to the European diminishing trends, not only suffered from an unemployment rate increase, but also did not reverse the problem of long-term, female and young unemployment.

Table 9.12 – Unemployment rate and structure (1997-2003, %)

	1997		2003	
	Central Macedonia	EU15	Central Macedonia	EU15
Unemployment rate	9.2	10.7	11.5	7.8
Long-term unemployment	48.8	49.0	48.6	40.2
Female unemployment	14.5	12.2	17.5	8.8
Young unemployment	28.2	20.9	29.4	15.2

Source: Eurostat

The characteristics of economic activity in Central Macedonia, namely the specialisation in the so-called traditional, low technological content, industrial sectors, is consistent with the relatively low regional investment in R&D activities and, more importantly, with the position of higher education as predominant sector of performance.

As shown in **Table 9.13**, R&D expenditure, taken in absolute terms, increased in very significant ways from 1986 to 2003 (taken as percentage of GDP, R&D grew from 0.38% in 1986 to 0.66% in 2003), in all the sectors of performance (with the exception of the

residual non-profit organisations). Still, the higher education sector stands out not only in terms of absolute growth, but also in terms of its weight in the overall regional R&D performance, which, in 2003, was of almost 70%.

Table 9.13- R&D expenditure by sector of performance (1986-2003)

	1986		1995		1999		2003	
	X10 ³ €	%	x10 ³ €	%	x10 ³ €	%	X10 ³ €	%
Total expenditure	19.0	100.0	77.2	100.0	126.8	100.0	172.2	100.0
Business	3.4	17.9	14.9	19.3	20.9	16.5	31.3	18.2
Government	7.0	36.8	11.8	15.3	15.4	12.1	21.8	12.7
Higher education	8.6	45.3	49.0	63.5	89.4	70.5	117.7	68.4
Non-profit orgs.	-	-	1.5	1.9	1.1	0.9	1.4	0.8

Source: Eurostat

This short regional profile situates Central Macedonia in the group of typical southern European LFRs, characterised by relatively high levels of primary economic activity, an industrial structure based on traditional sectors affected by organisational and management shortages, low investment in scientific knowledge generation, etc.. The region, however, has some distinctive factors *vis à vis* other LFRs. The more evident concerns its dependence on a large metropolis, - the second biggest city in Greece -, where population and economic activity are concentrated, and development is motored. A less visible one, to be detailed further on, is well expressed by TSIPOURI (1998, p. 277): “*despite the very centralized nature of the Greek administration, agents in Central Macedonia successfully distinguished themselves in a short period of time by becoming active components of the modernization process and shaping both concrete actions and informal rules that influenced the design of regional industrial policy*”.



The abundant metal and coal reserves played in Wales’s evolutionary path the role the water rapids had played in Tampere. Though the first industrial developments can be traced back to the 17th century, when the Society of the Mines Royal and the Society of the Mineral and Battery Works established brass foundries and wireworks in the southeast (Monmouthshire) and copper smelting units in West Glamorgan, it was mainly during the 18th and, mainly, the 19th century that the industrialisation process gained the power to transform Wales in the world’s first industrial

nation (MORGAN, 2006a), in the sense that as early as 1841 it had more workers in industry than in agriculture. In the 1860s, coal mining, hitherto a subsidiary branch of iron industry, became of prime importance in Wales, namely after the opening up of the Rhondda Valleys.

The specialisation pattern in coal mining and steel-making, because overwhelmingly thrust by merchant capital originating outside the region, whose interests maintained their dominance over the region's development, resulted in the stunting of technological innovation and relative absence of diversification into other related industrial sectors, such as engineering (COOKE and REES, 1981). As COOKE and REES (id., p. 285) argue, "*the economic and social catastrophe of the 1920s and 1930s tragically highlighted the weaknesses of this industrial structure*". During the recessive inter-war period almost half a million people had left Wales. To relieve the economic situation, in the context of a massive involvement of the UK government in the Welsh economy (ibid.), huge investments were made, namely in steel and tinplate works, and new coal pits were open. In fact, Wales, at the time, would become the leading supplier of steel, tinplate and coal related products in Britain. As an example, in 1938, 97% of total UK anthracite production was concentrated in South Wales (NSO, 1998).

In the post-World War II period, Wales became the recipient of special aid under the UK regional policy. The aim was to attract new manufacturing industry and diversify the employment base. COOKE and REES (ibid.), focussing on South Wales, assert that regional policy resulted in the increase of the steel industry relevance, meaning that it "*did nothing to alter South Wales's role as a primary producer*" (ibid., p. 287). During the 1960s, Wales experimented again a severe economic contraction due to the development of sources of energy cheaper than coal. According to the same authors (ibid., p. 286), "*the effects in South Wales, historically a high-quality but high-cost coalfield, were calamitous*". However, the 1960s coincided with the beginning of new regional policy outcomes as concerned the attraction of new industries. During the 1960s and the 1970s, companies such as Ford, Ferodo, 3M, and Hoover were established in Wales. COOKE (1998b, 245), about this development argues: "[...] *there was no obvious pattern to the incoming foreign investments other than that they were classical branch-plants, mainly in consumption goods industries, seeking and finding large numbers of semi-skilled shop-floor workers, both male and female*".

A crucial event has happened in 1976 with the creation of the Welsh Development Agency (WDA), aimed to promote economic renewal and environmental improvement (MORGAN, 1997b) in a region marked by a legacy of high unemployment and environmental degradation (id.). According to COOKE (1998b, p. 245), the foundation of the WDA meant that “*for the first time, Wales had a body capable of promoting strategic economic development*”, essential to open up the new pathway. This strategy was focused on the intensification of foreign investment, which reached its higher level during the 1980s, particularly in the automotive and electronic engineering industrial sectors (id.). The relevance of foreign industrial investment is well illustrated by the number of foreign owned manufacturing firms, which, in twenty years, more than triplicate, the growth of the number of jobs, which in the same period increased 81%, or by the share of those firms in the total Welsh manufacturing employment, which was of 13% in 1976 and reached approximately 37% in 1996 (**Table 9.14**).

Table 9.14- Foreign owned manufacturing firms (1976-1996)

Year	Nr. Firms	Employment (x10³)	Employment (% of total Welsh manufacturing)
1976	95	41,5	13,1
1981	144	45,4	19,3
1983	146	40,5	19,5
1988	166	41,2	18,5
1994	284	67,8	30,5
1995	295	73,1	36,4
1996	294	75,1	36,5

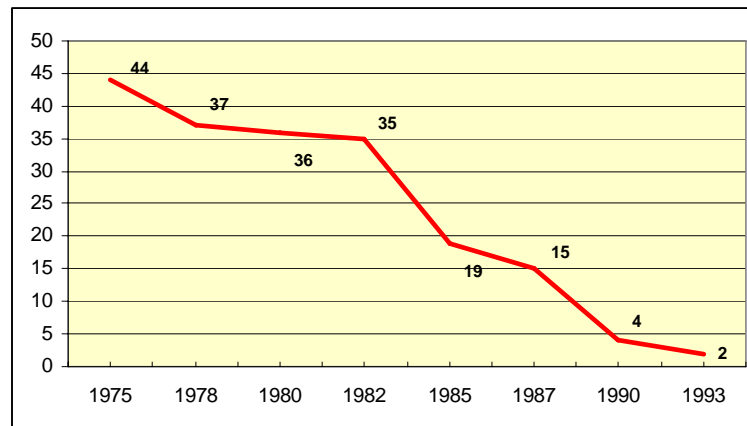
Source: National Statistics Office

Following COOKE (2004b), from 1983 to 1993, Wales attracted between 15 and 20% of inward investment in the UK. As the same author (COOKE, 1998b, p. 247) elsewhere argues, “*the most striking development resulting from the emergence of a new engineering industry in Wales is that it is now both more a manufacturing economy than it was and, proportionally, more of a manufacturing economy than the UK has become*”.

While foreign direct investment was gaining pace, the still dominant coal and steel industries were declining, as illustrated by **Figures 9.2** and **9.3**, concerning the number of deep coal mine operations (only those operated by British Coal) and the number of blast and steel furnaces. However, only in the final quarter of the 20th century a permanent structural change has been effected (NSO, 1998), particularly because of the rundown of

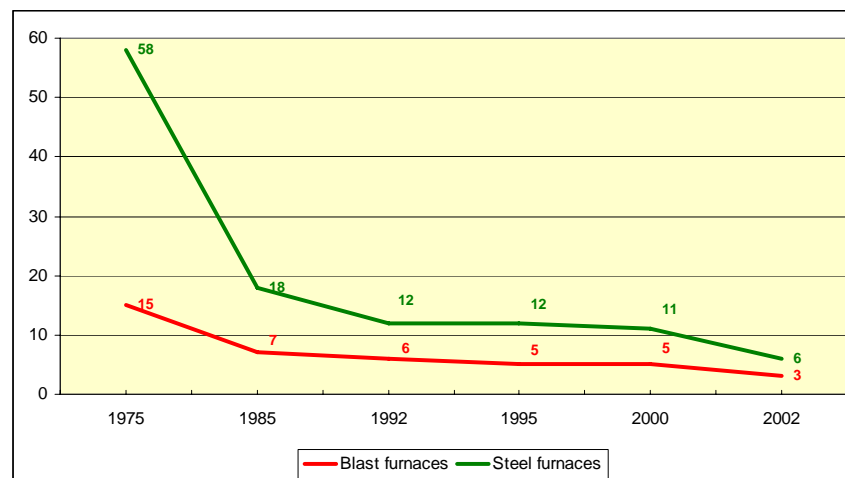
the steel industry started in the 1970s (OSMOND, 1981), and, in the words of COOKE (1998b, p. 245), “*the effective ending of major coal production following the defeat of the miners in the 1984-5 national strike*”.

Figure 9.2 – Number of deep coal mine operations (1975-1993)



Source: NSO (1998)

Figure 9.3 – Number of blast and steel furnaces (1975-2002)

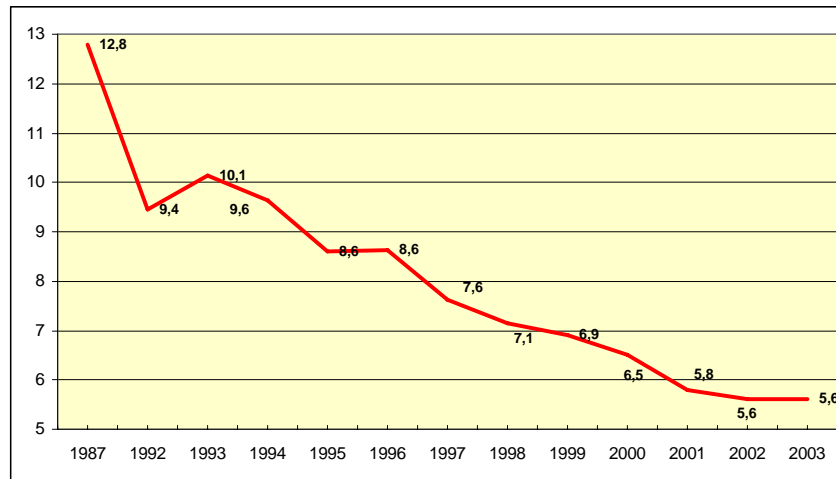


Source: WAG (2003a)

The 1980s were marked by the most intense loss of jobs in coal and steel industries. Following OSMOND (id.), from January to August 1980, 44 thousand redundancies were declared in Wales, of which 20 thousand in the steel industry. In his article published in 1981, the author (ibid., p. 133) did not foreseen a bright future for Wales in terms of employment: “*As a region’s basic industries disappear, the secondary and induced effects of major closures can decimate local manufacturing and service companies. At the same time the supply of labour over the next 10 years will increase: with 40,000 young people*

leaving school and the continuing trend for women to go out to work, the labour force in Wales is predicted to increase by a rate of nearly three times the national average”. In 1987, the unemployment rate in Wales reached almost 13%. However, during the 1990s, the country reverted the trend and entered the new millennium with a rate below 6% (**Figure 9.4**).

Figure 9.4- Unemployment rate (1987-2003)



Source: Eurostat

Perhaps the recent history of Welsh economy, as summarised by COOKE (2004b, p. 214), provides an explanation for this achievement: “Wales, as a pioneer of the first industrial revolution was, in the 1990s, leading an unusual pathway out of ‘lock-in’ and path dependence on a legacy of declining coal and steel industries that had begun production as far back as the 1780s”. Seemingly, foreign direct investment, as noted above, was crucial to open up this new pathway. This conflicts with the crude version of the *branch-plant syndrome* (COOKE and MORGAN, 1998), portraying these units as low-pay, low-skill, assembly-based operations which, in the words of COOKE and MORGAN (id., p. 147), “have limited linkages with firms and training institutions in the regional economy”, the reason why they are often regarded as having little if anything to do with regional development (ibid.). Foreign owned firms established in Wales, though biased towards manual occupations and, generally speaking, revealing low levels of local purchasing, had a pervasive role in the creation of opportunities for local innovative SMEs to become suppliers (COOKE, 1998b). This was particularly true in the automotive and electronics sectors. COOKE and MORGAN (ibid.) offer an example of this “*new sourcing stance*” (ibid., p. 148): Sony, established in Wales in 1974, when adjusting to a just-in-

time strategy in the late 1980s, set a premium on working with locally based suppliers whenever possible, and persuaded its plastic-mouldings suppliers to relocate to the region “because it preferred face-to-face contact to meet the challenge of ever shorter product-lead times” (COOKE and MORGAN, 1998, p. 148). The Japanese firm developed 25 indigenous suppliers in South Wales, from a total of 300 located in the EU (Cooke, 2004b). As multinationals became less impervious to local purchasing, a number of public policy initiatives aimed at supporting endogenous suppliers were put in place. This context, according to COOKE (1997b, p. 372), favoured the development of industrial clusters, namely in automotive and electronics engineering industries, “which are both globalized in that they are led by multinationals but regionalized by being linked systematically [...] to indigenous industry”.

The once coal mining and steel-making dependent nation, under the influence of foreign direct investment, renewed its employment structure in significant ways, with manufacturing assuming a leading position, as shown in **Table 9.15**.

Table 9.15- Employment structure (1998-2003)

Sector	1998 X10 ³	%	2003 x10 ³	%	98-03 %
Agriculture, fishing, forestry	16.2	1.5	12.5	1.1	-22.8
Mining and quarrying	7.5	0.7	4.3	0.4	-42.7
Energy and Water	22.0	2.0	8.1	0.7	-63.2
Manufacturing	226.1	21.0	183.2	16.3	-19.0
Construction	53.2	4.9	47.3	4.2	-11.1
Distribution, hotels and restaurants	247.5	23.0	260.8	23.2	5.4
Transport and communications	38.5	3.6	53.2	4.7	38.2
Banking, finance and insurance	112.1	10.4	132.3	11.8	18.0
Public administration/education/health	300.6	27.9	368.4	32.7	22.6
Other services	52.5	4.9	55.8	5.0	6.3
Total	1076.2	100.0	1125.9	100.0	4.6

Source: Eurostat

The same table also gives indication that manufacturing, in the more recent years, has lost some prominence. Manufacturing employment, from 1998 to 2003, decreased of 19%. This downturn, following COOKE (2003b, p. 10), signals that Wales is crossing a process of “*manufacturing meltdown*”, overwhelmingly caused by large firms (id., 2004b), which is unravelling the regional system of innovation:

“The unravelling occurs when [...], a firm like Hitachi, or Aiwa with its local suppliers association shared partly with its parent Sony, disappears. It impacts when a firm such as LG (later LG-Philips) that set up with fanfares and research grants for university academics retrenches and, in crisis, is forced by the South Korean government to sell its underdeveloped, last generation semiconductor production and R&D facility to its rival Hyundai, whose subsidiary Hynix wishes to sell it back to the WDA who built it in the first place”, COOKE, 2004b, p. 219.

Despite the significant decrease, the major foreign investment led sectors, such as electronics and transport equipment, remain quite important, providing, all together, more than 25% of Welsh total manufacturing employment (**Table 9.16**).

Table 9.16- Welsh manufacturing employment (2003)

Sector	Persons employed (x10³)	%
Food, beverages and tobacco	24.1	13,2
Textiles	5.4	2,9
Leather	0.3	0,2
Wood products	4.2	2,3
Pulp and paper	16.1	8,8
Coke, petroleum	0.9	0,5
Chemical products	10.5	5,7
Rubber and plastic	13.1	7,1
Other non-metallic products	6.0	3,3
Metal products	28.5	15,6
Machinery and equipment	12.1	6,6
Electronics and optics	24.1	13,2
Transport equipment	21.8	11,9
Manufacturing n.e.c.	16.1	8,8
Total	183.2	100,0

Source: Eurostat

Simultaneous to the diminishing trend in manufacturing jobs, a rise of about 68 thousand jobs in Welsh public administration have occurred (see **Table 9.15** above), overwhelmingly in health and education (COOKE and CLIFTON, 2005). COOKE and CLIFTON (id., p. 441) comment: *“Naturally, these [public administration new jobs] substituted higher value adding, higher productivity, export-earning jobs for largely those increasingly reliant on financial transfers from Whitewall”*.

Despite these developments, private business activities, at the turn of the century, had deposited higher education as the leading sector in terms of R&D expenditure (**Table 9.17**). Nevertheless, Wales shares with Northern Ireland the bottom position in terms of the UK business R&D expenditure, which, as COOKE (2004b) reminds, coincides with a declining trend in terms of employment in private R&D, mainly due to the 200 jobs lost when the firm Corus shut down its materials research laboratory in 2001. Research output, measured in terms of patent applications, also places Wales, with 69.9 application per million inhabitants, below the UK as a whole (124.4) and the EU25 (128.6)

Table 9.17- R&D expenditure by sector (1995-2003)

	1995		1999		2003	
	x10 ³ £	%	X10 ³ £	%	X10 ³ £	%
Total expenditure	228	100.0	387	100.0	483	100.0
Business	96	42.1	203	52.5	264	54.7
Government	30	13.2	55	14.2	43	8.9
Higher education	102	44.7	129	33.3	176	36.4

Source: National Statistics Office

Lifted by the arrival of global transplant firms (COOKE, id.), Wales escaped the dependence of the old coal and steel industries. Alongside with the regional public policy efforts to integrate inward investors with local supply firms, multinationals, namely those operating in automotive and electronics industry, contributed to enlarge and diversify Welsh manufacturing industrial structure and injected a propulsive element of innovation into the regional economy (ibid.). The effects of this global-local interaction seem to be waning, as inward investors, under different competition patterns, change their locational selection criteria. Heavily dependent on multinationals, Welsh manufacturing, which has been central to break the dependence on the heavy legacy of coal and steel, seems to be loosing ground. Arguably, Wales is on the point of facing new development challenges.

This descriptive evolutionary view established the regions' different development histories and trajectories, bringing over the significant inequalities that characterise the territorial contexts in a wide array of economic, production and employment domains, and, concomitantly, the relative position of the regions upon the development scale ranging between the less and the more favoured status. In the next section, this *tale made of unequal territories* is extended through an approach to the different frameworks conditioning regional government and governance, and policy and practice structures.

9.3

Government, governance, policy, and practice...

The three selected regions reflect the diversity of government structures existing in Europe. From the centralised state in Finland and Greece, - the former counterbalanced by strong local government, the latter acting according the organising principle of decentralisation -, to the Welsh “regional” state, the range covers quite different public administration configurations, which, arguably, give rise to diverse forms and *loci* of policy design, as well as to distinct implementation mechanisms.

In highly centralised Finland, regional policy draws on the premise that central government, namely the Ministry of Interior in cooperation with other Ministries and regional bodies, decides on regional development targets to be pursued in a given period. The Regional Development Act (602/2002), which amended the original 1993 law, asserts that municipalities and the state are responsible for regional development. The regional administrative dimension of policy making emerges within this duality of powers in the form of Regional Councils existing in the 19 regions defined by the Division into Regions Act (Act 1159/1997)¹⁰⁰. Municipalities, compulsorily, are members of the Regional Councils, which take the form of joint municipal boards independent from central government and endowed with a political mandate from local elections. In general terms, they are responsible for the design, in close cooperation with the central government, municipalities and other key agents, of regional strategic plans and the respective implementation plans, the management of EU Structural Funds programmes, and the promotion of cooperative networks between municipalities and with other regions or relevant development agents. The legal text also establishes responsibilities concerning the functions of development monitoring and international relations management. Thus, local governments, endowed with significant financial¹⁰¹ and development policy autonomy,

¹⁰⁰ The Åland Islands are not included in this division into 19 regions. The archipelago has administrative autonomy since 1991. It is the only territory endowed with legislative capacity (shared with central government).

¹⁰¹ According to the CITY OF TAMPERE (2006a), the 2005 balance sheet shows a surplus of 5.7 million € (disregarding the internal property transfer of 58.8 million € of the power network to a municipal subsidiary).

play a crucial role in regional development, either acting alone or in association under the auspices of Regional Councils¹⁰².

In Greece, despite administrative changes introduced in the 1980s by influence of the then European Community (IOAKIMIDIS, 2002), which led to the establishment of some regional structures, power is strongly concentrated in Athens, the capital city. The need to adapt to European regional policy was fulfilled in 1986, by enacting decentralisation as the organising principle of the Greek state (Law 1622/1986 for local government, regional development and democratic programming). This organising principle would be legally reinforced in 1994 and 1997, respectively through the Laws 2218/94 and 2503/97 for organisation and management of regions. The 1994 Law upgraded the regions to administrative units, and the 1997 Law provided the current meaning of the term *region*: a decentralised administrative unit of the central state, aiming to contribute to the national planning and programming and the implementation of the government policy concerning the regions. Under this framework, the country was divided into 13 regions to which responsibilities in terms of regional development planning, programming and coordination were allocated. The General Secretary's Office, the Regional Council, and the Department of Emergency Political Planning compose the regional Greek authorities. The Secretary General represents the national government in the region and takes responsibilities in the implementation of goals defined by the national government in terms of regional development. He or she supervises the first (municipalities) and second level (prefectures) local authorities and chairs the Regional Council, a policy design body composed by representatives of a wide array of stakeholders, such as, for instance, the prefectures, first level local government associations, trade unions, chambers of commerce and industry, etc.. The Secretary General also chairs the Regional Development Fund Board, which manages regional funding coming from a variety of sources such as the national Public Investment Plan and the European Union. The Regional Council, among other responsibilities, drafts the medium-term Regional Development Plan on the basis of proposals made by prefectures and municipalities, and under the framework of the National Development Plan. As opposed to the Finnish case, in Greece, the regional Secretariat is not endowed with any political mandate emanating from regional or local

¹⁰² During the preparation final stage of this thesis, there have been some changes in Finnish regional policy.

elections, being directly appointed by the central government. An additional relevant political body is the Ministry of Macedonia and Thrace, which deals with a broad development agenda of Northern Greece, aiming mainly the coordination of central government policies applied in the Macedonian and Thracian Greek regions¹⁰³.

Stronger regional powers can be found in Wales, as a result of the devolution process decided by the UK government, which culminated with the creation of the Welsh National Assembly in 1999. The degree of autonomy in policymaking increased in a very significant way, though Wales has only secondary legislative powers. As LAFFIN (2004, p. 215) argues, Wales “*is still constrained by the Westminster primary legislative framework*”, which, in the words of MORGAN and MUNGHAM (2000, p. 200), leaves the country “*a long way short of controlling its own destiny – whatever that means in today’s inter-dependent world*”. Nevertheless, in this context of *executive* devolution, as opposed to a *legislative* devolution (id.), Wales has acquired a number of relevant functions, in such domains as economic development policy, environment and rural development, education and training, health and social services, planning and housing, culture and sport, and local government (HULL, 2004). In addition, the Welsh regional state is responsible for the management and allocation of an annual budget that, in 2005, reached approximately 12 billion £ (IWA, 2004a), received as a block grant from the UK government. The Welsh Assembly has 60 elected members, having the responsibility to elect a First Minister, who, in turn, appoints an eight-person executive cabinet (the Welsh Assembly Government- WAG). Following HULL (id., p. 331), this administrative arrangement constitutes “*the forum to construct more distinctive Welsh-specific solutions, visions and action-plans for sustainable development*”.

To these distinct administrative structures correspond, as expected, different regional development policy targets and forms of policy design and delivery. In addition, the territorial dissimilarities marking the three regional contexts influence policy priorities. Still, one can argue that the promotion of regional innovation capacity is a shared policy concern in the three regions.

In the Finnish case, due to the strong influence of central government on regional development, one cannot dissociate the policy environment evolving in Tampere region from the national framing context. To speak about the national policy framework is

¹⁰³ The roots of the Ministry of Macedonia and Thrace date back to the incorporation of the “*new lands*” of the North into the Greek state, just after the Balkan Wars and the I World War.

equivalent to highlight innovation as the keyword that cuts across ministries, public agencies and development policy domains. The national innovation system concept has



been adopted as the guiding framework for designing and implementing development policy in Finland, capturing the correspondent interactive dimension and coordination needs (LEMOLA, 2002, STPCF, 2003)¹⁰⁴. The balanced development of the national innovation system as a whole, together with the high level of investment in R&D and the promotion of networking between different policy sectors, stands as the long-term development line in Finnish science, technology and innovation policies (STPCF, 2000). It is worth noticing that, as argued by NIEMINEN (2004), the concept of national innovation system was kept sufficiently broad to include knowledge producers and users and a diversity of organizations and sectoral policies. LEMOLA (id.) suggests that the interpretation given to the concept by Finnish decision-makers was of a whole set of public and private factors affecting the development and use of new knowledge and know-how.

The broadly taken concept of national innovation system, and its flexible and multifaceted character, made easier the design of policy initiatives, as well as resource coordination and concentration (NIEMINEN, id.). Moreover, it helped to foster a consensual view on development priorities across the Finnish society (MIETTINEN, 2002)¹⁰⁵. According to LEMOLA (2004), the concept has gained a rhetorical and symbolic value in science and technology policy documents, endorsing the efforts to intensify national and international R&D cooperation. The same author (id.) adds that the concept has given policy and decision-makers arguments in favour of the central role of R&D and education in industrial and economic development. In other words, the concept has helped to increase

¹⁰⁴ “[...], the national innovation system has significantly helped to develop, specify and analyse innovation policy, especially interaction and coordination among the stakeholders”, STPCF, 2003, p. 21. “The concept has given policy planners and decision-makers’ arguments on the central role of R&D and education in industrial and economic development”, LEMOLA, 2002, p. 1485.

¹⁰⁵ MIETTINEN (2002), though recognising the contribution of the national innovation system concept for consensus building, criticizes its straightforward adoption as a planning model for innovation policy. The author argues that policymakers assumed the innovation system as given, self-evident and susceptible of improvement, against the unavailability of rigorous bases for acknowledging the existence of such system. “This approach, in a way, responded to the age-old dream of policy-makers to plan and control the development of complex social processes”, id., p. 68.

policy efficiency and social legitimacy in a context of urgent need for an effective response to the economic recession of the 1990s and correspondent high unemployment rates.

The national innovation system framework was complemented in the mid-90s by the frame of reference provided by the concept of knowledge-based society. This emerging concept has reinforced the perception that knowledge-intensive growth was of utmost importance for economic growth and productivity and that this type of economic prosperity could not be guaranteed by macroeconomic or labour market measures alone (LEMOLA, 2002)¹⁰⁶. Thus, science, technology and education gained strength as development driving force. Simultaneously, in particular when Finland became a full member of the EU, a new trend towards the regionalisation of policy has been installed¹⁰⁷. Regional development policy instruments were developed under the influence of a new public administration mindset that led to new methods based on programmatic management and aimed at overcoming the problems associated with the lack of horizontality in policymaking and management processes at the central level (HARRINVIRTA and KEKKONEN, 2004).

In this public policy context, the Finnish Ministry of the Interior, in 1994, established the Centres of Expertise (CoE) Programme, which would become the major instrument of the national regional policy. The Programme's basic idea was to focus on regional strengths and to enhance and further develop top-level knowledge and expertise instead of supporting weak areas (SCHENSTOCK, 2000), or, in other words, to pool local, regional and national resources to develop selected internationally competitive fields of expertise. The cornerstone of the CoE Programme is the development of networks, within which companies, universities and other higher education organisations, vocational training organisations and local and regional authorities co-operate to jointly improve the conditions that enable innovative and internationally competitive activities to flourish (id.). Besides its highly selective nature, the Programme also presents a strong competitive character. In fact, regions compete to be included and, in order to achieve that, must have

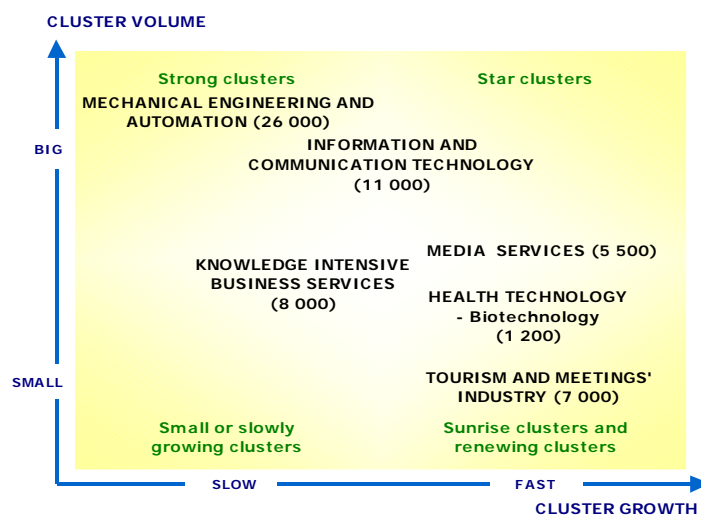
¹⁰⁶ "Above all, the promotion of knowledge-intensive growth requires various innovation policy measures relating to R&D, education, competitive conditions, laws and regulations for the protection of intellectual property, national and international cooperation networks, and technology transfer and exploitation. The new [knowledge-based society] concept complemented in an appropriate way the concept of the national innovation system", LEMOLA, 2002, p. 1485.

¹⁰⁷ According to SCHENSTOCK *et al* (2004), the relevance attributed to sub-national political and policymaking structures by the Finnish central government was not a rational policy choice, but instead triggered off by the European regional policy. LEMOLA (2002, p. 1486) agrees: "to a large extent, this development has been due to political pressure from the EU, assisted by financial aid from the EU's structural funds".

resources and proof of their capacity to use them (SOTARAUTA, 2000). The allocation of CoEs to a given region depends on the fulfilment of a set of key selection criteria, which, following SCHIENSTOCK (2000), reflect the dimensions of quality, effectiveness and organisation: i) the quality of research and education, business activities and their degree of internationalisation; ii) the effects on regional and national development, and iii) the critical mass (in terms of research and businesses), the networking capacity (namely the co-operation between firms and research organisations), the functionality, and the realism and relevance of the financing plan.

In the first phase of the Programme (1994-1998), three of the eleven CoEs created in Finland were allocated to Tampere region, operating in mechanical engineering and automation, ICT, and health technologies. The second phase (1999-2006) brought into the region one additional field of expertise, in media services (Tampere also participates in the nationally networked CoE for tourism activities, focusing on the meetings industry). Knowledge intensive business services had also been proposed by Tampere as field of expertise, but the national panel that judged the proposals did not accept it. However, the firm local belief that it would be well worth developing this domain led to the decision that it would be continued utilising local funding without any official programme backing (KOSTIAINEN and SOTARAUTA, 2003).

Figure 9.5 – The CoE cluster-based approach (employment in brackets)



Source: CITY OF TAMPERE

The Tampere CoE Programme thrust a cluster-based strategic approach to regional economic development (**Figure 9.5**), and, simultaneously, an underlying backbone to various initiatives aimed at reinforcing the regional system of innovation. The Programme's impact on the region is commonly measured by the growth in employment and turnover achieved by the clusters business activities: e.g., 5 thousand new jobs created in the mechanical engineering and automation, about 13 thousand in ICT, 2 thousand in health technologies, and approximately 5 thousand in knowledge intensive business services (NIEMI, 2004); turnover growth of 247% between 1998 and 2000 in mechanical engineering and automation and ICT (LÄHTEENMÄKI-SMITH, 2003).

However, growth in employment and turnover stem from a variety of factors, of which, as LÄHTEENMÄKI-SMITH (id., p. 17) argues, "*public intervention in general and the CoE programme in particular is but one small part*". But, as the same author (ibid.) highlights, "*scepticism should be tempered [...] when we consider the nature of the programme as one of prioritising, focussing and channelling development resources (both public and private) and seek to identify future growth clusters*". In this context, one can argue that a major impact of the Tampere CoE Programme has been the contribution given to the building up of a solid institutional basis, upon which the perception of public and private stakeholders about the mutually supportive and beneficial dynamic process of competence nourishing and new knowledge generation has been strengthened (SOTARAUTA, 2000). The genuine and committed participation of regional agents in the Programme is mirrored by the amount of complementary funding coming from private businesses, which, in Tampere, during the first phase, financed over 35% of total investment (NIEMI, id.)¹⁰⁸. In addition, the CoE Programme has contributed to institutionalise knowledge and expertise-based economy as part of Tampere development strategic thinking (KOSTIAINEN and SOTARAUTA, 2003), and fostered the attribution of a kind of *strategic status* to a few activity sectors: "*in the earlier urban economic policy programmes in Tampere no stand had been taken in favour of any particular field of expertise, line of business or cluster, which meant that strategic choices for the focal points of development had not been made*" (id., p. 429).

¹⁰⁸ In general, basic funding directed at launching development projects only amounts to 6% of the total funding available (LÄHTEENMÄKI-SMITH, 2003). Tampere and Oulu were the CoEs presenting the higher degree of private financing (id.).

How does Tampere run this nationally driven but regionally steered initiative? The Regional Council and the City of Tampere are the goal-setting arenas. The third public organisation with responsibilities in the CoE Programme is the regional Employment and Economic Development Centre¹⁰⁹, which assumes a prominent role in financing development projects. The co-ordination needs of the CoEs are fulfilled by development organisations specialised in the specific fields of expertise, namely the two technology centres of Tampere and three other city owned development companies. The *Technology Centre Hermia* co-ordinates the CoEs for ICT and mechanical engineering and automation, and *Finn-Medi Research* the CoE for health technologies. *Professia Ltd.* was the company responsible for the CoE for knowledge intensive business services, and *Media Tampere Ltd.* for the CoE for media services until March 2006, when the two companies merged and *Professia Ltd.* took the co-ordination of both CoEs. The *Tampere Convention Bureau* is the local co-ordinating unit of the nationally networked CoE for tourism.

Following SOTARAUTA (2000, p. 9), the basic idea behind this delegation of responsibilities “*is that it enables the developer organisations to improve their own competencies to a sufficiently high level to have credibility and be attractive partners for enterprises*”. Hence, the infrastructure established to co-ordinate the CoE Programme has enhanced the regional system of innovation ability to organise itself and effectively use endogenous resources and tap into the region nationally and internationally available resources. Moreover, as a privileged forum for co-operation (KOSTIAINEN and SOTARAUTA, 2003), the CoE has accelerated the synergies between different fields of expertise, of which the incorporation of information technologies into heavy machinery equipment, - fundamental in the regional engineering industries renewing and strengthening -, is perhaps one of the most paradigmatic examples.

Part of the infrastructure was already in place before the national regional policy came into light, as it is the case of *Hermia* technology centre, established in 1986. *Finn-Medi* technology centre, though it started its operations only in 1995, had already been planned in the late 1980s. In fact, much of the great leap in the development of Tampere was supported by the activities carried out in such places as *Hermia*. In 1988, two years after its

¹⁰⁹ The Employment and Economic Development Centres (*TE Keskus*) are a joint initiative of the Ministry of Trade and Industry, Ministry of Labour, and the Ministry of Agriculture and Forestry, directed at supporting SMEs and firms technological development, implementing regional labour policies and adult training, and promoting farming and rural business activities. At present, there are 15 regional centres in Finland.

foundation, the premises housed 50 companies and 350 jobs, figures that would increase during the years to come, reaching more than 150 companies and R&D organisations, among which Nokia, and about 3 thousand jobs. Regional development, however, would only be incorporated into *Hermia*'s mission realm after it was given the task to co-ordinate some of the Tampere CoEs. At present, as stated in the company's 2005 annual report (TECHNOLOGY CENTRE HERMIA, 2006, p. 2), one of the major goals is the implementation of "*the City of Tampere industrial policy and Tampere Region regional strategy in knowledge-intensive fields of industry, with the aim of maintaining and continuously developing the sustainable competitiveness of business life*". This entry of regional development to the technology centre activities can be regarded as the acme of a changing process that took *Hermia* from the initial focus on real estate business¹¹⁰, to the development of a service network and, later, of business development activities¹¹¹. In *Finn-Medi* campus area, comprising the technology centre, the Tampere University Hospital and Medical School, and the science park, there are about 20 companies and research organisations and approximately 5 thousand workers. The most distinctive feature of *Finn-Medi* is the multidisciplinary network that brings together education and research, health care services and business development.

More recently, the whole organisational basis has been called to design and deliver two major transversal programmes in the areas of the information society (*eTampere*) and biotechnology (*BioneXt*), launched in 2001 and 2003, respectively, drawing on an extensive co-operative platform. The overall objective of *eTampere* was to make Tampere a global leader in the research, development and application of the information society, by strengthening the knowledge base, creating new business activities, and developing new public online services aimed at improving citizens' daily life. This five-year programme,

¹¹⁰ The real estate activities of both *Hermia* and *Finn-Medi* technology centres, since 2004, are co-ordinated by a single city-owned firm, *Tampere Science Parks Ltd.*

¹¹¹ Olli Niemi, former director of Tampere Technology Centre Ltd., describes the reasons behind this process of change: "*Rents for office space even in the city centre had fallen as low as 20 marks per square meter, and the utilization rate of space in Hermia's first building stage rapidly fell to 70 per cent. Tenants were asking why they should pay such a comparatively high rent for premises that were located ten kilometres from the city centre. [...] Around our core product – premises – we began to purposefully build a service network, synergy between both companies and companies and research, and the image of the Technology Centre. [...] And so Hermia's premises started to fill again [...]. However, because most of the companies were young, they couldn't afford to pay for the services provided by the service companies. Once again, expectations and reality didn't meet. [...] The concept required further development. One new opening was the business development activities launched in spring 1992*" (TECHNOLOGY CENTRE HERMIA, 2002, p. 16).

involving an investment of 132 million €¹¹², of which 20% seed funding from the City of Tampere, has been implemented through six independent sub-programme which co-operate with each other and various other players (VITELI, 2004). The six sub-programmes were the following (id.; JUSSILA, 2004):

- *Technology Engine Programme*, aimed at bringing top expertise for the use of firms through high-quality research;
- *Research and Evaluation Laboratory*, directed at the development of easy-to-use services for everyday life and testing environments for the production, development and evaluation of services;
- *eBusiness Research Centre*, pursuing the production of research-based knowledge and practical expertise related to electronic business for the use of firms and the public sector;
- *eAccelerator*, aimed at accelerating 20 companies to grow as globally successful technology companies;
- *Information Society Institute*, aimed at the development of multidisciplinary research and education on the building up of an information society based on active citizenship;
- *Infocity*, directed at the development of practical online services and the enhancement of citizens' skills in their use.

According to Jarmo Viteli, *eTampere* director, the most valuable results of the implementation of these six sub-programmes were the enhancement of the local levels of expertise and social capital and the development of a networked, multidisciplinary mode of operation (CITY OF TAMPERE, 2006b). However, as Viteli acknowledges, the targets concerning employment, growth and business in the ICT sector were not met, mainly due to the recession in Finland's IT sector soon after the programme was launched. Nevertheless, in the words of that officer, "*one of the most important merits of eTampere is that it kept Tampere afloat through the IT downturn*" (id., p. 19)¹¹³.

The ongoing *BioneXt* programme is co-ordinated by *Finn-Medi Research Ltd* and aims to foster multidisciplinary biotechnology research, profitable businesses, and improved

¹¹² More than 20 million € were added to the initial investment, due to EU R&D funding allocated to Tampere sub-region.

¹¹³ In 2004, Tampere, where employment grew 7,5%, was the only ICT growth centre in Finland. In Helsinki, for example, ICT employment fell by more than 10%.

healthcare. The programme, which targets an investment of 100 million € by the year 2010, promotes co-operation between scientific domains and brings together a vast array of actors in the fields of research, health care provision and business. It draws on the expertise already existing in Tampere in the field of medical research and healthcare technology, namely immunology, oncology, autoimmune diseases, implant technologies, and information technologies applied to healthcare. During the *BioneXt* first three years, the focus was placed on detailing the definition of leading projects (CITY OF TAMPERE, 2006c). Among these spearhead projects is the creation of a world class research centres working on biosensor technology and processing of biological data, and on the combination of biomaterials and cell-biology know-how with clinical expertise (id.).

As *eTampere* came to an end in 2006, the City of Tampere has already put in motion a new six-year development transversal programme, named *Creative Tampere*, which, in brief, aims at “*building the Tampere central region into a magnetic environment that inspires people and businesses alike into creative activity*” (CITY OF TAMPERE, 2005b, p. 7). The programme, according to the CITY OF TAMPERE (id.), will emerge around the themes of technology, business, environment, and culture.

The city of Tampere can be considered as the development driving force of the whole region. Its prominence is widely recognised by the surrounding municipalities and acknowledged by the regional authorities as crucial to face the big challenge of uneven development between the Tampere central region and the rest of Pirkanmaa (HÄMÄLÄINEN, 2004). Following MATHUR (2005), the Tampere central sub-region finds in its surrounding municipalities important allies, rather than rivals, as its leadership is regarded as beneficial for the whole region¹¹⁴. The Regional Council, under the framework of EU structural funds for Objective 2 areas, is promoting several development projects focussing mainly on entrepreneurship, skills and technology enhancement, and the quality of environment. Examples of these are the *Elastopoli* development that took place in the city of Vammala, comprising a materials R&D laboratory aimed at serving local industry, the maintenance know-how centre for process industry in Valkeakoski and the multimedia and software programming services in Virrat and Mänttä (id.).

¹¹⁴ The municipality of Lempäälä, for instance, instead of highlighting any local distinctive characteristic in its marketing efforts, prefers to stress its proximity to the city of Tampere: “*Lempäälä on lähella*”, which means “*Lempäälä is near*” (MATHUR, 2005).

KOSTIAINEN and SOTARAUTA (2003) suggest that the linkages between global, national and local forces and resources provide a general point of departure to understand what happened in Tampere. The external pressures of the global, the national resources and programmes, and the local capacity to take advantage from those resources, sustained by the development of a strong institutional basis that effectively links policy strategic thinking, design and delivery, can be regarded as distinctive marks of the Finnish region. Nevertheless, as the same authors (id., p. 433) argue, *“there is reason to consider that Tampere has not been at the mercy of global forces or its transformation a result of national programmes, resources and/or decisions. Tampere has been able to strategically adapt to each phase of social and economic development as a pioneer”*.

Central Macedonia, as the other 12 Greek regions, has little autonomy to make policy decisions and strategic planning, since this is basically done by the central government. The Regional Development Plan, drawn annually by the Regional Council, after proposals of and consultation with municipalities and prefectures,



emerges as the major instrument that the region can use to foster local strategic thinking and policy formulation. Despite this opportunity for endogenous policy making, one can argue that regional policy developments are quite dependent on the guidelines issued by Athens, that is, they are greatly conditioned by the national guidelines for regional development.

The development of large physical infrastructure projects, as typical in so many Objective 1 regions, was, for long, the major concern of Central Macedonia's regional authorities. Although this concern was still present in the CSF round (1999-2006), a different focus has been brought forward, as the need to highlight areas such as capacity building in local industry, developing technology transfer actors, and building the soft infrastructure of clusters and networks, was fully acknowledged (CEC, 2005b). This difference in emphasis is most evident in the development projects to be undertaken in the

Thessaloniki's area, and under one of the defined priority axes¹¹⁵, the one of promoting the main city metropolitan role and encouraging innovation and entrepreneurship.

The main stated objective under this priority axis is the development of the spirit of innovation in the region and the networks of co-operation binding together the most dynamic and modernising elements of the metropolitan city's business, research and education spheres. The underlying perception is that the development potential of Thessaloniki and its particular geopolitical position are expected to reduce the weaknesses of the whole region and give it a new momentum through the development of modern functions and the mobilisation of the productive system in the conurbation (cf. Regional Operational Programme Central Macedonia, www.pepkm.gr). The bottom line is the building up of an innovation infrastructure, with basis on a reinforced R&D infrastructure and its specialisation in a few innovative sectors, and on the combined development of innovation and entrepreneurship.

The Thessaloniki Innovation Zone project is a 30 million € emblematic initiative within the effort to transform the city into a central technological pole for Greece and the Balkans. The major aim is to create a network structure, combining research, technology and innovation, business activities, and urban development and quality of life. The Innovation Zone, according to KOKOROTSIKOS (2006), will serve as an umbrella for organising and implementing a vision for Thessaloniki of the future. The promotion of networking and the avoidance of sectoral dispersion seem to be the key principles guiding the initiative. It gathers a wide range of public and private stakeholders and narrows the focus to four sectors, namely ICT, agro-biotechnology, biomedicine, and energy and environment. The project will be managed by a public company, whose board will include representatives of the four national Ministries involved in it (Economy, Development, Public Works and Environment, and Macedonia and Thrace), the region's General Secretariat, and the Federation of Industries of Northern Greece (FING).

The Innovation Zone project takes advantage from the array of activities already existing in the eastern zone of Thessaloniki, such as, for instance, the two science parks and business incubators, four university departments, three hospitals, and five

¹¹⁵ The Regional Operational Plan of Central Macedonia defines seven priority axes: the promotion of Thessaloniki's metropolitan role and encouragement of innovation and entrepreneurship; the protection and promotion of the environment; the reduction of intraregional disparities; rural development; the reduction of unemployment and provision of equal opportunities in knowledge and skills; the development of mountainous areas, hinterland zones and disadvantaged/problematic areas; technical assistance.

multinational companies. It also draws on the outcomes of an intense participation of Central Macedonia in several innovation-related international projects that helped the region to escape from a predominant brick and mortar approach to regional development. This change is highlighted by several authors, as, for instance, TSIPOURI and DAOULTZI (2003), who consider the region an exception in the strong priority given by regional policy makers to research infrastructure. It was one of the few regions where “*an effort to introduce soft measures at the regional level*” (id., p. 8) took place, despite, as the same authors (ibid.) argue, the “*major administrative difficulties related to the clarification of the regime, state aids prerequisites, etc.*”.

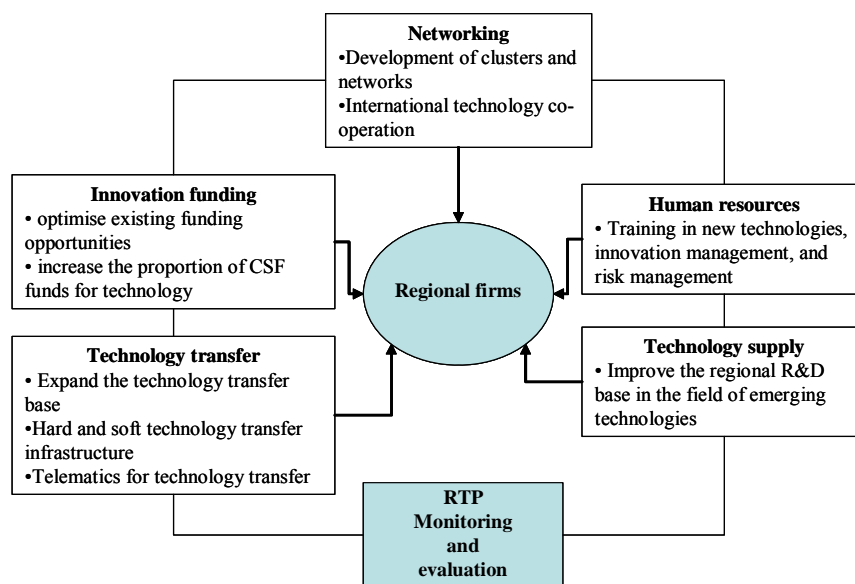
This somehow distinctive stance of Central Macedonia *vis à vis* other Greek regions and other European lagging regions, has a history behind. Its starting point can be dated back to 1992, when FING decided to launch and co-finance, under the *Interreg* community initiative, a strategic plan for industrial development in Macedonia and Thrace, which would largely influence the national and regional Operational Programmes for Industry under the 2nd CSF (1994-1999) (TSIPOURI, 1998). The steering committee, led by FING’s chairman and two vice-chairmen, provided industrialists with the conditions to have an active role in shaping regional development interventions (id.). In the words of TSIPOURI (ibid., p. 286): “*The Northern Greece program indeed gave a head-start to the region and established a reputation for the local industrial federation; in the following years the Federation tried to exploit all opportunities available to implement the totality of the proposals included in the study. The benefit was substantial. The study not only directly and considerably influenced the creation of the regional operational plan (as was its original aim), but also enhanced the reputation of Central Macedonia as an attractive area for other interventions, both by national and EU authorities*”. This reputation began to pay off, when the EU, “*impressed with the moderate but above average achievements, the commitment, and the documented positions*” (ibid., p. 287), decided to consider Central Macedonia as a pilot region.

In this context, the region was one of the eight European regions that participated in the Regional Technological Plan (RTP) pilot initiative, launched by the EU in 1993¹¹⁶. According to KOMNINOS (2002, p. 113), “*the plan opened a window on to intra-regional cooperation*” and “*united all the regional bodies that promote applied research,*

¹¹⁶ Central Macedonia was also selected by the EU as a pilot region for the Interregional Information Society (IRIS) initiative.

cooperation between research and industry, technology transfer, human technology skills and entrepreneurial capabilities”. The RTP strategy, which enclosed a broad local partnership, was focused on industrial firms, and particularly on their latent R&D integration (KOMNINOS, 1997). Drawing on the analysis of both weaknesses and strengths of the regional system of innovation, it defined six priorities, as illustrated in **Figure 9.6**, three of them directed at reinforcing the technological and networking capabilities of firms, one at fostering technology transfer, one at improving the endogenous R&D base, and, one aimed at monitoring and evaluating the RTP strategy implementation.

Figure 9.6- The Central Macedonia RTP strategy



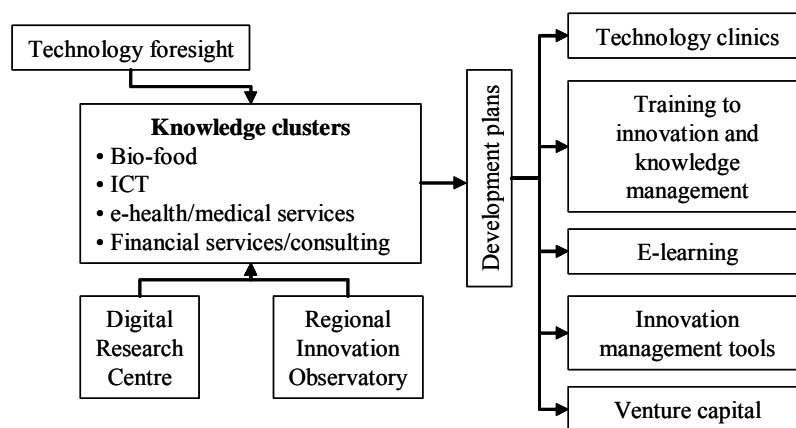
Source: adapted from KOMNINOS (2002)

The six priorities were specified and translated into a set of particular actions and an assessment method to select the projects that would best fit those priorities (KOMNINOS, 2002). The resulting RTP Action Plan was thus composed of the six priorities and 22 projects, chosen among a large number of proposals submitted by local actors (id.). The subsequent concern was to find the most adequate financing sources for the projects, using the opportunities open up by regional, national and European programmes. Rather than judging the bigger or lesser success achieved by the individual projects¹¹⁷, the point to

¹¹⁷ From the 22 projects, only 7 were approved for funding (URENIO, 2002). According to an evaluation report (TECHNOPOLIS, 1998), two lead actions remained out of the implementation process, whereas others, lower in priority, were adopted. In addition, as pointed out in the same report (id., p. 125), some of the funded projects had “to moderate their ambitions or to re-orient their directions to respond to the requirements of the call where they submitted a proposal”.

highlight is that, as acknowledged in an independent evaluation report (TECHNOPOLIS, 1998, p. 127), the initiative “introduced a voluntary planning process in a region where there was neither the culture nor the will to do so”, and contributed to “the establishment of a culture of regional planning and consensus building [...] in a previously totally virgin ground”. In 1999, the EU approved the extension of the RTP experience, through a RIS+ initiative. Its aims were, on the one hand, to fund the experimental phase of 9 projects that had been designed under the RTP framework, and, on the other hand, to update the RTP Action Plan and elaborate a revised strategy for regional innovation and development (URENIO, 2002). Three major pillars were defined, concerning high technology clusters, an enhanced match between the regional technology supply and demand, and an experimentation with and exposure to new technological tools to increase regional technology intelligence (id.). This represented a significant turn in relation to the RTP strategy, because from a focus point placed on the individual firms operating in predominant sectors, there was a shift towards clustering and, particularly, to high-technology clustering activities, regarded as “a key element in changing the regional production structure” (ibid., p. 35). The new regional innovation strategy is schematically presented in **Figure 9.7**.

Figure 9.7 – The general structure of the new Action Plan



Source: adapted from URENIO (2002) and KOMNINOS et al (2003)

The guiding framework provided by the new Action Plan, as well as the lessons learned in both the RTP and RIS+ experiences, impacted on and brought some coherence to the follow-up initiatives that the region has carried out, such as, for instance, the *Excellence in Central Macedonia* action, funded by the ERDF Innovative Actions

Programme. The 4 strategic axis and 10 projects the programme enclosed were clearly linked to the priorities and targets established in both the RTP and RIS+ initiatives. The programme, in fact, was used to fund at least parts of the general structure of the new Action Plan, - e.g. technology foresight actions and the observatory of regional innovation (URENIO, 2006). Another example is the development of a regional pole of innovation, under the framework of a new programme launched by the Greek General Secretariat of Research and Technology (GSRT), specialised, in a first stage, in ICT, and aiming at the creation of technology platforms binding together businesses and R&D agencies, and the promotion of spin-off firms.

In terms of the more tangible development impacts exerted by the whole set of initiatives on the region, it is too soon to make a definite judgment. Still, signs of a change dynamics in the productive fabric can be already detected, as illustrated, for instance, by the creation of more than 50 start-ups, the establishment of two private incubators (*i4G* and *Thermi*), or the foundation of a second technology park in Thessaloniki, *Technopolis*, promoted by a regional association of ICT companies (SEPVE), in which 13 companies are operating. Nevertheless, the experience of Central Macedonia initiated by the RTP planning process has significantly improved the associational conditions to approach regional development in innovative ways. It has also conferred coherence to the development initiatives that followed the pilot action and to the various infrastructures, such as the technology parks, that otherwise would be acting in isolation, thus risking to become *cathedrals in the desert*. In addition, it placed innovation at the core of the political and policy agenda of the region. The interactive dynamics installed by the RTP and follow-up projects, as well as some of the instruments resulting from these initiatives, (e.g. regional foresight) are informing the regional strategic plan that will prepare the region to take advantage of the new CSF (2007-2013).



A “vibrant Welsh economy delivering strong and sustainable economic growth by providing opportunities for all” (WAG, 2005a, p. 5) is the vision configuring the current strategic framework guiding economic development policy in Wales, well stated in the document’s title, “*Wales: a Vibrant Economy*”. It draws on the overall Welsh

development agenda, set out in 2000, under the framework of two overarching strategies, “*Betterwales*” (NAW, 2000a) and “*A Sustainable Wales: Learning to Live Differently*” (NAW, 2000b), and revisits the economic development strategy designed in 2002, - “*A Winning Wales*” (WAG, 2002a). The revisited strategy stated priorities are to increase employment still further and to raise the quality of jobs, so that average earnings increase and close the gap with the whole UK average (WAG, 2005a). It identifies a set of key actions, which can be grouped according to four major goals: i) supporting job creation, ii) investing to regenerate communities and stimulate economic growth, iii) helping businesses to grow and to increase value-added, and iv) ensuring that all economic programmes and policies support the principles of sustainable development (id.). In addition, it is considered as a starting point for a wide consultation on the WAG’s development agenda, including making best use of the 4th CSF 2007-2013 (ibid.). Andrew Davies, Welsh Minister for Enterprise, Innovation and Networks (formerly Economic Development and Transport), in the Assembly’s plenary that took place in June 2006 to discuss the new strategy, said that *Wales: a Vibrant Economy* “sets out priorities to raise employment, income and prosperity by creating a favourable business environment, including support for manufacturing, exports, tourism, new start-up businesses, strong and vibrant communities, as well as town centres” (IWA, 2006, p. 21).

In relation to the *A Winning Wales*, the most remarkable innovation, - or, perhaps more appropriately, as COOKE (2004b) would argue, a repackaging of already existing instruments-, included in the new strategic framework concerns the creation of the *Knowledge Bank for Business* (KB4B), focused on supporting high-growth firms in Wales, through the provision of tailored solutions to individual businesses that help them grow more rapidly (WAG, ibid.).

An additional novelty is that *Wales: a Vibrant Economy* is the first economic strategy document issued after the *bonfire of the quangos*, as MORGAN (2006b) labels the process that culminated in the merge of some prominent development actors, such as the WDA, the training agency ELWa, and the Wales Tourism Board, with the Assembly’s civil service. This controversial rupture with the policy design and delivery structure that, both before and after devolution, has strongly underpinned Wales development trajectory, was “ostensibly designed to render economic policy more accountable and more effective” (id.,

p. 199)¹¹⁸. The same author (MORGAN, 2006b, p. 198) considers that the merge reflects “*the centralizing instincts of the Labour-controlled Assembly government*”. According to COOKE and CLIFTON (2005), the *bonfire of the quangos* transformed Wales into a state-centric country. Still, as MORGAN (id., p. 199) puts it, “*for good or ill, the results of these policies will take years to manifest themselves*”.

To deliver the most recent economic policy in Wales, the WAG relies on the variegated and somewhat complex innovation support infrastructure, whose building up started just after the shift in focus occurred during the early 1990s in the WDA, from the supply of *hard* infrastructure, like land reclamation, factory building and inward investment, to an innovation-driven stance implying the role of regional *animateur* directed at the development of “*a soft info-structure of business services, skills and social capital*” (MORGAN, 1997b, p. 70). This shift, according to MORGAN (1997a), was mainly motivated by novel demands from branch plants in Wales, on the one hand, and the pressures resulting from the cutting back of UK regional aid¹¹⁹. The same author (id.) points out the increased difficulties in attracting foreign inward investment, on account of growing competition of other European regions, as an additional reason for the revision of the WDA’s traditional strategy. Under the revised strategy, the WDA has put in place a variety of business support services, directed at both local SMEs and foreign owned units, (e.g., technology audits, centres of expertise and technology clubs), and animated inter-firm networks, as, for instance, the supplier associations, as well as training consortia (MORGAN, 1997b). However, at the time, the centrality of innovation for regional development was far from a consensual view, namely across the Welsh SMEs¹²⁰.

The development of a consensus on an innovation strategy would be nurtured by the participation of Wales in the EU-sponsored RTP pilot action, which, similarly to what happened in Central Macedonia (though Wales, at the time, could not be regarded as a

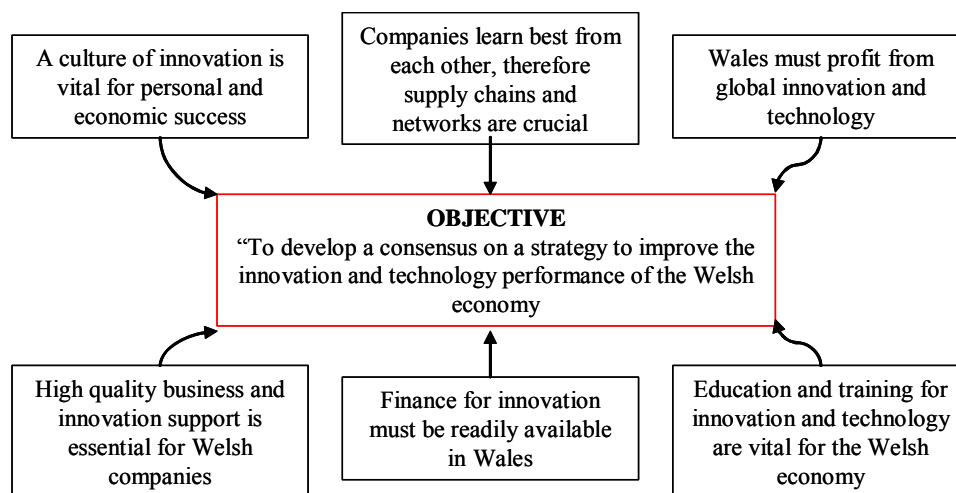
¹¹⁸ Kevin Morgan, in an article published in the Western Mail newspaper (23 July 2004), offers a flavour of controversy. He writes: “*Politicians tend to interpret accountability narrowly, meaning accountable to them. But there is a wider sense of accountability, and that is to being accountable to the public forums of civil society – to boards of specialised professionals, to the glare of media inquiry, to the scrutiny of publicly-convened subject committees and so forth. The politicisation of civil society means that all roads will lead to and from the Assembly, rendering Wales a less pluralistic and more state-centric society than ever before*”.

¹¹⁹ In the decade to 1992, UK regional aid funding has been cut by some 70% (MORGAN, 1997a).

¹²⁰ HENDERSON and THOMAS (1999, p. 83) illustrate the lack of consensus by telling the story of a meeting between regional actors in the early 1990s to discuss participation in an “*Innovation Handbook*”: “*This lasted for some three hours, during which time two hours was spent debating the definition of innovation, with the final hour taken up by most organisations deciding that this was a topic which did not fit into their agendas and which they would not wish to participate in*”.

totally *virgin ground*, on account of the WDA), revealed to be a crucial step to firmly introduce innovation into the regional development agenda and to create a wide range of innovation support mechanisms. Initiated in April 1994, the planning process involved desk research on the Welsh economy and innovation capacity, 350 technology audits and a survey of innovation and technology support infrastructure, as well as a discussion that encouraged *talk* around the key issues and trends facing Wales and a vast consultation (over 1000 participating organisations) about innovation issues, priorities and projects (MORGAN and HENDERSON, 2002). The process led to the RTP Action Plan, which, as shown in **Figure 9.8**, set out six priority areas to achieve the ultimate goal of developing “*a consensus through extensive consultation on a strategy to improve the innovation and technology performance of the Welsh economy*” (WDA, 1996, p. 1).

Figure 9.8 – The RTP priorities for action



Source: WDA (1996)

The Action Plan defined a flagship project for each priority, such as, for instance, the *Welsh Innovation Challenge*, aimed at promoting a culture of innovation through the integration of existing innovation awards with improved prizes, promotion and publicity, and assistance with commercialisation, or the *Bargaining for Skills* project, directed at assisting a joint effort of employers and trade unions to work on raising the skills of Welsh labour force (id.). The Plan also included approximately 40 projects already committed to by lead organisations and 20 projects challenging Welsh organisations to come forward and become *project champions* (ibid.).

The implementation of the RTP, according to an evaluation made in 1998 (TECHNOPOLIS, 1998) has been judged as the weakest part, namely because “*expectations have been raised by the large consultation actions, yet the funding was not available for a majority of the proposed actions*” (id., p. 82). However, as acknowledged by HENDERSON and THOMAS (1999, p. 92), “*with ambitious objectives [...] it seems clear that many of the outcomes of the RTP exercise will be long term in nature*”. In addition, following MORGAN and HENDERSON (2002), whatever the long-term impact of the RTP and associate projects, the strategy-making process *per se* has been a valuable learning exercise. The benefits, according to the same authors (id.), fall primarily into three major areas: i) the acquisition of a better understanding of the innovation process, best-practice support structures and the needs of firms; the development of new interactions and relationships between regional support organisations; and the promotion of more inclusive regional policy-making routines in the field of innovation. HENDERSON (2000, p. 353) adds that the RTP “*does appear to have forced many key regional actors to reconsider their operational priorities in the light of the issues raised during the process*”. In this sense, the exercise was seemingly much more than “*a small scheme to subsidise networking elites*” or “*a new way to tap into Brussels funds*”, as in LOVERING’s (1999, p. 387) criticisms. Moreover, other regions, and the European Commission itself, have drawn lessons from the way the WDA adapted the RTP process, in an early stage, in order to widen its scope and go beyond the narrow technology focus. According to TECHNOPOLIS (1998), this was a major reason for the European Commission decision to name the RTP’s successor *Regional Innovation Strategies* (RIS) instead.

The Steering Group, which continued to meet even after the official completion of the exercise in 1996¹²¹, promoted, in 1998, a first review of the RTP, which incorporated a new iterative and interactive process of discussion and knowledge exchange among a wide array of regional organisations (MORGAN and HENDERSON, id.). According to the WDA (1998, p. 1), the RTP was revisited “*in order to provide added momentum to the drive for a culture of innovation throughout Wales*”. The review confirmed the major priorities set out in the first Action Plan and stressed the need for further communicating the RTP objectives and priorities to the innovation and technology support community (id.). It produced also an updated and long-term objective, the one of creating in Wales a culture encouraging and

¹²¹ According to MORGAN and HENDERSON (2002), the Steering Group remained in place after the formal completion of the RTP in order to ensure that momentum built up during the planning exercise was not lost.

valuing innovation (WDA, 1998). The consensual view of regional organisations in turn of a strategy to foster an innovation-driven development strategy, in this review, was thought of as largely met (id., MORGAN and HENDERSON, 2002). A second update took place in 2000, aimed at assessing the extent to which the long term objective had been met, has reinforced the idea that a wide consensus on the importance of innovation and technology had been achieved, though judging poorly the outputs and outcomes (COOKE, 2004b). Nevertheless, COOKE and MORGAN (1998, p. 135) wrote: “[...], *Wales can be considered something of a regional laboratory in economic development terms in the sense that it has developed a number of institutions and a policy repertoire which simply have no equivalent in the English regions*”.

The achieved consensus was mirrored by the Welsh Office¹²² in the 1998 economic strategy for Wales, - “*Pathway to Prosperity*” (WELSH OFFICE, 1998), - in which, besides the need to continue to secure inward investment, acknowledged endogenous innovation and entrepreneurship as a core issue. It was also reflected by the WDA, which has fully incorporated into its innovation and business support programmes the priorities defined in the RTP. A “*bewildering array*” (COOKE, id., p. 221) of instruments, meshing together regional, national and European funding streams, has been made available, - the same author (ibid.) talks about some 250 schemes listed in the WDA site by 2003. Initiatives such as the Innovation and Technology Counsellors Service, the Finance Wales Spin-out programme, the Centres of Excellence for Technology and Industrial Collaboration, the Know-how Wales programme, or the Technology Exploitation Grant, have resulted from the RTP process.

Though the trace of the RTP priorities can be found in the various policy documents issued as soon as power has been devolved to Wales, the post-devolution *status quo* arguably missed much of the emphasis on the planning process, inclusive policy routines, and the search for broad consensus (SOBRAL, 2005). Following SOBRAL (id., p. 33), “*as the Assembly is expected to produce this kind of documents and as it has to be seen using their newly devolved powers and representing the public opinion, such documents are developed on a passive consultation basis and imposed on the regional actors on a top-down fashion,*

¹²² The Welsh Office, established in 1964 as a *territorial* department of UK central government, which, though “*rarely if ever departed from the Whitehall script*” (MORGAN and MUNGHAM, 2000, p. 64), furnished an institutional framework in which a system of governance could develop (id.). COOKE and CLIFTON (2005, p. 439) argue that the Labour UK Government, at the time, “*dipped a toe in administrative devolution waters by establishing the Welsh Office*”.

missing the most important outcomes of the RTP". This argument matches the one of COOKE (2004b, p. 228), according to which much of the innovation framework conditions put together or strengthened during the RTP process "*have been affected by governance problems of different kind arising from an increasingly centralised mode of animating the regional innovation system*".

In this new context, entrepreneurship was put under the spotlight, as well evidenced in a resolution of the National Assembly for Wales (NAW), dated October 1999 (NAW, 2000c, p. 2): "*the Assembly notes that a successful future for the Welsh economy depends on a strong culture of entrepreneurship and agrees that the relevant Assembly policies should reflect the importance of successful entrepreneurship and the need to increase the level of business start-ups in Wales and the rate of survival, innovation and growth rates among small and medium sized firms in Wales*". Accordingly, a 235 million £ *Entrepreneurship Action Plan* (id.) has been issued in 2000. Two years later, the WAG pointed the way towards a "*Winning Wales*" (WAG, 2002a), the already mentioned overall economic development strategy, in which the way forward is considered crystal clear (id.), as it should embrace the "*need to increase the number of new and growing businesses in modern economic sectors*" (ibid., p. 6). An innovation Action Plan, - "*Wales for Innovation*", (WAG, 2003b) -, followed, delivering "*on the commitment in 'A Winning Wales' to make Wales more competitive within the global economy*" (id., p. 5). The Plan focused five main action areas (ibid.): i) communicating what can be achieved through more innovation; ii) developing more high growth potential businesses; iii) better equipping people to innovate; iv) simpler, more accessible, business innovation support; and v) maximising the economic development impact of Welsh universities and colleges. In the line of the emphasis placed on entrepreneurship, approximately 60% of the total 260 million £ investment (excluding venture capital funds and EU structural funds extra innovation support resulting from the mid-term review), were allocated to the rolling out across Wales the *Technium Centre* concept¹²³, which, basically, reflects the idea of providing facilities for and support academic spin-off firms and other high-technology businesses (both local and from abroad). At the time of writing this dissertation, nine of the twenty planned *Technium* centres were operating in Wales, most of them located in the Objective 1 area of the West and the Valleys. This major action of the "*Wales for*

¹²³ The *Technium Centre* concept was pioneered in Swansea, starting in 2000. Presently, there are 16 firms operating in the Swansea facility.

Innovation“ Plan is said to be affected by a number of policy design flaws (COOKE, 2004b, p. 228), because presenting “*an inclination to replicate old incubation approaches*” and reflecting the WDA traditions, since the *Technium* centres “*are properties leasing space, now for SMEs – previously for FDI businesses*”. COOKE (id.) concludes: “[...] *thus they are not in themselves innovative*”.

At a more general level, development strategy design in the post-devolution era is often seen as “*largely a ‘repackaging’ of old strategies, lacking content and, more crucially, consensus*” (SOBRAL, 2005, p. 33). This poor judgement gains a more acute dimension in the words of COOKE (ibid., p. 233): “[...] *the old FDI-dependent systems interaction among the engineering Triple Helix [...] has effectively been eclipsed, that the efforts of the WAG to develop a new one focused upon generic entrepreneurship and innovation has so far failed to achieve its objectives*”. COOKE and CLIFTON (2005) blame the *precautionary* economic governance, largely confined to the reorganisation of the administrative apparatus, which arguably stems from the weak devolution settlement, on the one hand, and the need for meeting the tight administrative requirements attached to Objective 1 windfall¹²⁴ on the other hand.

The arguments pointing to the waning of the Welsh regional system of innovation can be associated with MORGAN’s (2006b) suggestion that the economic dividends of devolution in Wales are elusive until now. The author (id., p. 198), on the economic development front, points out “*the most distinctive policy divergences since devolution*”: the decision to abolish the Welsh *quangos*, and the decision to subsidise the fees of Welsh-domiciled students studying in Wales. But, of utmost importance for the nation’s development, MORGAN (ibid.) highlights the “*robust public health strategy*” designed by the WAG. This point makes a relevant bridge with COOKE’s (2004b) perception about the possibility of Wales, underpinned by a new type of public sector interaction involving healthcare and higher education, to evolve into “*an innovative, university-led type of innovation system designed to fit the demands of the new ‘knowledge economy’*” (id., p. 233). The policy emphasis placed by the WAG on the healthcare system, combined with the competences gathered in the research organisations and the incubation experience of

¹²⁴ The redesigning of Wales sub-regions, leading to the replacement of the old north-south division by an east-west one, rendered the western and the Valleys areas eligible for EU Objective 1 structural funding. The process provoked a lively debate within Wales, namely at the political and academic level (see LOVERING, 2000; MORGAN, 2003).

biotechnology firms already in place¹²⁵, provides, in the words of COOKE (2004b, p. 232), “*the seed crystal of a possible biosciences cluster for which the healthcare demand and the education and research supply are crucial components*”.

This description of the government and governance, and policy and practice structures evolving in Tampere region, Central Macedonia, and Wales has deliberately overlooked, or perhaps more accurately, kept implicit, the positioning of universities within those structures, both as policy making object and policy delivery instrument. To make it explicit is the point at issue in the next section.

9.4

Where do universities stand?

The acknowledgment of universities’ relevance to regional development is transversal to the three regions under scrutiny. Academic teaching, research and third mission activities are inscribed in the strategic and programmatic realm of regional policy making and delivery, as universities are expected to provide the right mix of skills and competences needed by the regional labour market, to feed the regional knowledge basis, and to activate this by interacting with regional society. However, similarities among the three regions do not reach beyond acknowledgment and general expectations. In fact, a variety of structural, as well as historical and cultural factors shape differently the policy and practice of university regional engagement. These might be both internal and external to the academic sector, such as the nature of legal and financing frameworks in which universities operate, the quantity and quality of intermediation mechanisms, the geographical scale of policy designing, the differentiate productive fabric, and so forth. Moreover, as BOUCHER et al (2003, p. 891) remind, “*not all universities are equally involved in their region’s development and particular types of universities are more engaged than others*”.

According to the Finnish Universities Act (645/1997) “*the mission of the university shall be to promote free research and scientific and artistic education, to provide higher*

¹²⁵ Approximately 30 start-ups are growing in *Medipark*, a biotechnology incubator located in Cardiff’s medical school.



education based on research, and to educate students to serve their country and humanity". An amendment of 2004 (715/2004) gave force of law to the third academic mission: *"In carrying out their mission, the universities shall interact with the surrounding society and promote the societal impact of research findings and artistic activities"*. The

same amendment also mirrored the claim for a shift in emphasis from the quantitative and regional expansion of the system, in place over the last decades, to content, quality and impact, as proposed in a higher education steering and development review (RANTANEN, 2004). Among the quality targets for Finnish universities, the strengthening of *"regional vitality by networking with the key actors in the regions"*, the development of *"interaction with business and industry by improving their business expertise, innovation services and commercial exploitation of research findings"* and the support to *"the needs of the regions by providing a variety of adult education programmes"*, (MINISTRY OF EDUCATION FINLAND, 2005, p. 9) came to the fore. The 20 Finnish universities are thus expected to contribute for the development of their regions and, simultaneously, achieve top quality teaching and research (id.).

The expectations towards universities are reflected by the management and steering system of higher education that Finland has started to put in place from the 1990s onwards. Tools like the three-year period performance agreement established between the Ministry of Education and each university and the performance monitoring system¹²⁶, are aimed *"to achieve a high quality of university operations and their strong impact on society and the regions"* (MINISTRY OF EDUCATION FINLAND, 2004, p. 9). The performance agreements determine quantitative and qualitative targets, the resources needed to achieve them, the monitoring and evaluation of outcomes¹²⁷, and further operational developments (id.). The resources supporting university operations consist of state funding, which is allocated by

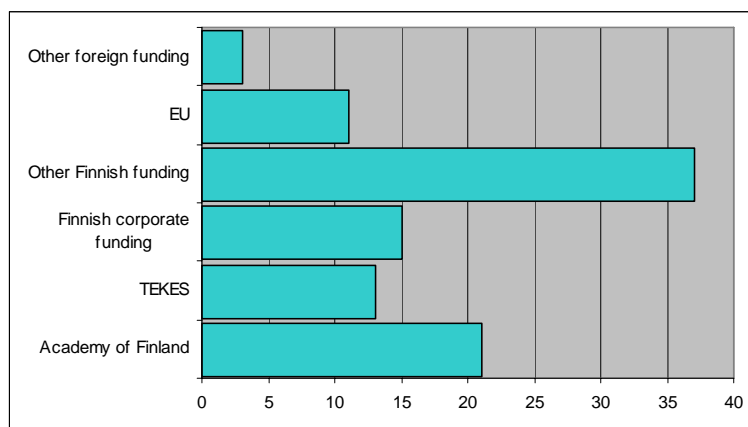
¹²⁶ The KOTA database is the most important monitoring system in Finnish higher education. It is a constantly updated statistical database maintained by the Ministry of Education, in which university performance by institution and field of study is described.

¹²⁷ It is worth noticing that, as stated by the Ministry of Education (MINISTRY OF EDUCATION FINLAND, 2004, p. 10), *"the premise is that there is no significant connection between evaluation findings and the resource level, especially as concerns teaching"*. The purpose of evaluation, according to the same source (id.), is *"to enhance the quality of operations, and the main responsibility for using evaluation findings rests with the university"*.

the Ministry of Education, and external funding, managed by the university itself. The Ministry takes the annual universities' budget decisions according to a unit-cost formula geared to secure the teaching, research and societal mission. To this core-funding stream, representing about 89% of total expenditure (MINISTRY OF EDUCATION FINLAND, 2004), supplementary monies are added for financing national tasks (1.5% in the period 2004-2006), national programmes (4.7%), and university projects (1.9%), as well as performance-based funding (2.4%). The national priority of regional development has an important stake in the supplementary funding allocation decisions.

In 2004, the Ministry of Education allocated budget (taken together with building investments) represented about 64% of total funding of universities. The remaining 36% came from external funding, which, as shown in **Figure 9.9**, involves a variety of sources, both national and international, and public and private. Besides the relatively high share of corporate funding (15%), two research support public bodies, the Academy of Finland and TEKES, the National Technology Agency of Finland¹²⁸, stand out as individual funding sources of university basic research and applied research and development, respectively.

Figure 9.9 – Universities external funding, breakdown by source (2004, %)



Source: Ministry of Education Finland, 2005

The acknowledged relevance of universities in the development of national programmes of regional development promotion, such as the CoE programme, and in initiatives put together by local and regional bodies (e.g. municipalities, the regional

¹²⁸ University research funding by TEKES represents approximately 41% of the total R&D funding granted by that public agency. The remaining 59% consists of industrial R&D loans, capital loans and industrial R&D grants to companies (TEKES, 2004).

councils) widen the available funding spectrum. SITRA, the Finnish National Fund for Research and Development (dependent on the Parliament), is an additional relevant income source, covering a wide range of research, education and venture capital initiatives. It adds to a public funding system, which, according to KUTINLAHTI (2005, p. 165), “*follows the linear model of innovation created after the Second World War*”.

Two universities operate in the Tampere region, - the University of Tampere (UTA) and the Tampere University of Technology (TUT) -, both being widely regarded as major resources to animate and secure regional development. KOSTIAINEN and SOTARAUTA (2003, p. 432), for instance, look at UTA and TUT as “*the core resources of Tampere*”, having substituted the *Tammerkoski* rapids as the regional development *power station* (NIEMI, 2004). The two universities, since their creation in the 1960s¹²⁹, are closely attached to the evolution of Tampere towards what KOSTIAINEN and SOTARAUTA (id.) call the birth of a knowledge economy in the region. The authors (ibid., p. 427) argue: “*The most important critical incidents with regard to the birth of the knowledge economy were the arrival of the university and the technical university to the city. [...]. The two educational institutes created the foundation for the transfer from industrial society to information society. [...], they later became the most important resources of the knowledge economy, and core factors concerning the appeal of Tampere in the competition for an expert workforce*”. In fact, plenty of examples showing the regional role of UTA and TUT could be highlighted here¹³⁰. Taking a general perspective, one can argue that both universities, as source of expertise and active elements of multi-organisational networks, are the backbone of the strong institutional basis that binds together policy strategic thinking, design and delivery. This is mirrored, for instance, by the central role they play in the networks put together to design and develop the Tampere’s CoE programme and local initiatives such as *eTampere* and *BioneXt*, or in the innovation support services and business development functioning in Hermia Technology Centre and Finn-Medi Science Park. In addition, they tap supra-regional resources, such as those made available by TEKES, the Academy of Finland or SITRA, into a wide range of regional development

¹²⁹ The creation of UTA, in 1966, resulted from the transfer of a private School of Social Sciences from Helsinki to Tampere, occurred in 1960. UTA became a state university in 1974. In 1965, first as a branch of Helsinki University of Technology, the university of technology has been established in Tampere. TUT became an independent unit in 1972.

¹³⁰ For a detailed picture of the close linkages between UTA and TUT and the development of Tampere region, see KOSTIAINEN and SOTARAUTA (2003)

instrumental actions, either through the provision of technological innovation inputs and business expertise to local firms or the strengthening of the regional analysis and monitoring capacity of the innovation system¹³¹.

Two major legal documents, - the 1975 Constitution of Greece and the 1982 frame-law 1268/82 -, configure the goals, and the organising and functioning principles and structures bounding Greek universities. The fundamental law, in its Article 16, places education as “*a basic mission for the State*” (HELLENIC PARLIAMENT, 2004, p. 30) and establishes that “*education at university level shall be provided exclusively by institutions which are fully self-governed public law persons*” (id.), and that “*the establishment of university level institutions by private persons is prohibited*” (ibid., p. 32). Law 1268/82 marked the beginning of a period of radical changes in the higher education system, the first since 1931 (EURYDICE, 2000). The reform of 1982 introduced a new institutional and organisational framework, namely through the abolishment of professorial chairs, the consolidation of university asylum and the autonomy and self-governance of the academic organisation, and the definition of new internal organisational structures (CEC, 2004c). The framework law also establishes the basic goals to be pursued by the 22 Greek universities. Their mission is “*to produce/promote knowledge through teaching and research, and to cultivate the arts, [...] to contribute to the development of responsible human beings with scientific, social, cultural and political consciousness and to provide the necessary means to ensure their adequate preparation for a scientific and professional career*”, and “*to contribute to meeting the social and developmental needs of the country*” (Law 1268/82, as quoted in KAZAMIAS and STARIDA, 1992, pp. 101/102). Although the significant number of legal initiatives taken since 1982¹³², aimed at partial improvements and supplements, the overall philosophy, the values and the basic principles of democracy, collective participation, accountability and transparency enclosed in the frame-law were not affected, as well as the organisational, personnel and educational structuring principles



¹³¹ The analytical and monitoring capacity of the regional system of innovation and cluster development, based mainly on the expertise available in a number of UTA's research units, is considered by LÄHTEENMÄKI-SMITH and STEINEKE (2003) as a major strength.

¹³² E.g., Laws 1404/83, 2083/92, 2188/94, and 2525/97.

of the higher education system have remained practically untouched (PAPADIMITRIOU, 2004).

At this stage, two points should be made. First, the third academic mission in general and the regional development potential existing in universities are absent from the overall legal framework, meaning that universities are very much left on their own as far as regional engagement is concerned. The most evident approach to the role of higher education in regional development seems to be limited to a locational logic, as in 2002 the government approved a policy establishing that “*each Region of the Greek Territory should in general contain a dipole composing of one University and one TEI with complementary functions at the regional level*” (MNERA, 2003, p. 1). Since 2002, two new universities were established in Greece under this policy (the University of Western Macedonia, in Kozani, and the University of Continental Greece, in Lamia).

Secondly, despite the profound organisational changes induced by the 1982 framework, the capacity of the Greek university system is poorly judged both by internal and external commentators. This is well evidenced in several reviews (e.g. OECD, 1997), pointing out that the Greek higher education system is “*ill fitted to meet the present and future demands that should be made of it*” (id., p. 163). The Constitution’s Article 16, namely the prohibition of private universities and the free higher education entitlement is one of the basis upon which poor judgements are drawn. For instance, PSACHAROPOULOS (2003, p. 132), a member of the Parliament, blames Article 16 of the Constitution: “*beyond any reasonable doubt, Article 16 of the Greek Constitution is an economically inefficient and socially inequitable law costing the country billions of Euros in tangible terms, and an unknown amount of other social costs that are not easy to quantify*”. At the moment, there is a lively debate in Greek society confronting the opinions of those who are close to the thinking of the member of the Parliament with the defenders of Article 16, such as the Hellenic Federation of University Teachers’ Associations (HFUTA, 2006), which state that “*Greek University teachers are fighting for publicly funded Higher Education of a high standard*”, and demand that “*the Government fulfils its obligations towards the Greek system of higher education as stipulated by Article 16 of the Greek Constitution*”¹³³. The

¹³³ Article 16 has been put for amendment in the Greek Parliament during January 2007, as the two main political parties agreed on opening up the road for the creation of private universities. The agreement is provoking strong protests all over the country. According to the *People’s Weekly Newspaper* (www.pww.org), in its edition of the 18th January 2007, “*marches and demonstrations were held all day long*

other judgement basis is the organisational structuring of higher education deployed by force of Law 1268/82. Bearing in mind the thematic core of this dissertation, the latter is perhaps worthier to be explored in a more detailed fashion.

Following DENIOZOS (2006), the legal framework is based mainly on educational contingencies, imposing homogeneous structures and decision-making procedures. The same author (id., p. 7), argues that this framework makes “*the transition from the traditional ‘humboldtian’ model to a model that is more responsive to market and societal needs extremely slow*”. The legal framework enacted in 1982 stipulated four levels of university internal structure, the whole organisation, the school, the department and the division, establishing a hierarchy in decision-making which led to organisational fragmentation and thus transformed Greek universities into quite loose organisations, “*whose members operate as professionals with the only tying bonds being the provision of the undergraduate curriculum and the administration of a common infrastructure*” (DENIOZOS, ibid.). The EUA (2005, p. 8) writes: “*The central decision-making role at the university is also very restricted. Indeed central figures at the university, such as the Rector, and central bodies of the university, such as the academic Senate, have very restricted spheres of influence. Departments, rather than schools or faculties, enjoy a high level of autonomy, while the central bodies function essentially to represent those departments. Meanwhile, the official role of the Rector and her/his staff is mainly to execute the decisions of the central bodies. This leaves a gap where strategic decision-making and university-wide development should be taking place*”. According to the same source (id.), the effect of these structures and practices “*is that the university mission is largely defined and given to the university by the government, and significant obstacles are then placed in the path of the institution in its attempts to fulfil this mission*”. These framework conditions, in which a highly centralised and regulated system meshes together with loose organisational arrangements internal to each university, expectably, influence the role universities play in the development process of their regions. In the absence of a regional remit emanated from the central government, the interaction of universities with their regions can be regarded as strongly dependent on the strategies of individual academics and respective research groups.

in over 40 cities on the mainland and on the islands”. “*Thousands upon thousands came out to protect the right of this and future generations to be educated. Their battle cry was ‘free public education for all’*”.

An additional effect of the law is that Greek universities are almost exclusively state-funded, through both budgets, set up by the universities and approved by the Ministry of National Education and Religious Affairs and the Ministry of Economy and Finance, and research programmes, managed by the General Secretariat for Research and Technology (GSRT). This strong dependence on central state funding is still in place despite the diversification of income sources which occurred with the membership of the then EEC, due to accessing funds provided by European competitive research programmes. The introduction, in the early 1980s, of the *special account* system freed universities from the rather dysfunctional public accounting and financial control system (DENIOZOS and DAOULTZI, 2004) that was hampering not only internal organisational development, but also any attempt to take financial advantages from commercial linkages with external partners. Special accounts are managed by the Research Committees existing in each university, an organisational arrangement that, following PAPADIMITRIOU (2004), has increased the flexibility, efficiency and effectiveness of financial management of non-budget research funding.

According to the GSRT (2000), since 1993, the dependence of university-based research on government funding, - the primary source of funding -, has been declining, while the EU Framework Programmes and Structural Funds, - the second source -, has been steadily increasing. However, as indicated by the GSRT (id.), about 65% of total university research funding still comes from the government (ca. 25% from abroad and only 4% of private sources). DENIOZOS and DAOULTZI (2004, p. 9), on the Greek research funding mechanisms, write: “[...] *the whole system operates ‘bottom-up’, so the orientation of research activities depends on the personal strategies of professors and the leverage effect of various project-funding schemes of GSRT, the EU, the industry and other ministries*”. This, as the same authors (id.) contend for, leads to “*the fragmentation of research*”. Moreover, it gives strength to the idea expressed above that the regional mission of Greek universities depends on the bigger or lesser extent to which individual academics’ strategies comprehend regional development concerns. Nevertheless, a number of recent GSRT programmes bring implicit a role in the promotion of regional technological and industrial development, such as, for instance, ELEFTHO, aimed at the creation of science and technology parks and incubators, PRAXE, dedicated to the

exploitation of research results, and AKMON, directed at the development of research centres with the participation of knowledge users (GSRT, 2000).

Central Macedonia has two universities, both located in Thessaloniki - the Aristotle University of Thessaloniki (AUTH), established in 1925, and the University of Macedonia (UM), founded in 1957¹³⁴. Besides the size-effect (e.g. over 100 thousand students) that the universities exert not only on the capital city but also on a number of locations in Central Macedonia¹³⁵, there is evidence that academia (particularly AUTH) is contributing to transform the region into an exceptional territory if compared with the majority of other Greek regions, which, following TSIPOURI and PAPADAKOU (2005, p. 37), are unable “*to give innovation policy a new dimension*” because suffering from “*difficulties of co-ordination*”. They (2005, p. 37) argue: “*Central Macedonia is one example of a region that could escape from this process and create its own momentum*”. The influence on the regional development process is also evidenced by the active participation of academics in the planning process evolving in the region, which can be associated with the increasing recognition of their expertise relevance by the regional authorities, nurtured, at the outset, by the RTP and RIS experiences. This has been well evidenced by the preparation of the EU structural funds 4th programming period. In the words of Georgios Tsiotras (TSIOTRAS, 2005, p. 14), Secretary General of Central Macedonia: “*In the Region of Central Macedonia we are [...] trying to elaborate the specific strategic development plan with help from the university community that participates actively in the whole strategic planning*”. However, much of the problems associated with the national higher education system and those affecting the national innovation system are also reflected by Central Macedonia and, concomitantly, by the role regional universities play as concerning the region’s development process. The fragmentation of research activity (cf. TSIPOURI and PAPADAKOU, 2005, DENIOZOS and DAOULTZI, 2004) provides a good illustration. The team responsible for the development of the RTP and RIS initiatives in Central Macedonia has identified 277 research units of applied research, 138 of which belonging to universities (130 in AUTH, 8 in UM), 110 to the regional Technical Education Institutes, and 29 to national sectoral research bodies (KOMNINOS, 1997). This fragmentation, together with the individual basis on which each R&D unit defines its strategy, most likely leads to a

¹³⁴ Officially decreed only in 1990, the UM is the successor of the Graduate School of Industrial Studies, founded in 1948.

¹³⁵ AUTH has units in the cities of Serres and Veroia; UM has campuses in the cities of Naoussa and Edessa.

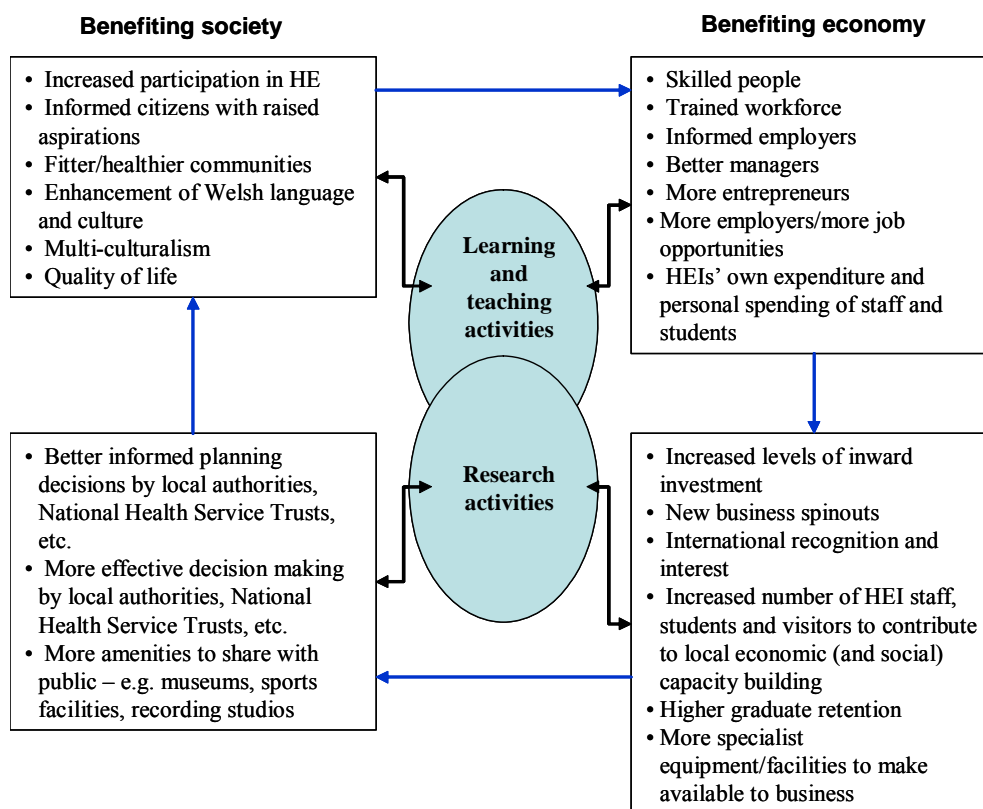
situation of mismatch between the knowledge generated and the knowledge needs of the region. Taking university-industry relationships, for example, despite the large number of university research units able to contribute to industrial development, either through technology or service provision, interaction between universities and the productive fabric is extremely limited (KOMNINOS, 1997). This is confirmed by the work of KYRGIAFINI and SEFERTZI (2003), who claim that in Central Macedonia, “*cooperation with universities could be considered as almost non-existent, demonstrating the low level of links between research and production*” (id., p. 895). Nevertheless, the two universities are at the core of the regional structure that is being put in place in order to achieve major development goals such as those stated in the regional operational programmes, e.g. the creation of an Innovation Zone based on a network structure, combining research, technology and innovation, business activities, and urban development and quality of life. Moreover, recalling the argument pointing to the crucial change-inducing development which was the RTP and RIS experiences, it is worthy of notice that the promoter, designer and developer of both initiatives has been a research unit belonging to AUTH.



Wales presents a completely different picture, since, by mirroring the UK wide focus on the regional mission of universities (cf. CHARLES and BENNEWORTH, 2001; DFES, 2003), it has developed an extensive strategic and programmatic framework that places higher education and its impacts at the core of the political agenda. For many years, Wales lacked an overall strategy for higher education (JONES, 2002). This has been drafted in March 2002, under the title “*Reaching Higher*” (WAG, 2002b) and the firm belief of Jane Davidson, the Minister for Education and Lifelong Learning, that “*no country [...] can nurture the best possible prospects for its people without strong entrepreneurial and successful institutions of higher education, with active links with all parts of society and the economy*” (id, p. v). Together with teaching and research excellence, widening access to higher education and the commercial exploitation of academic knowledge are acknowledged as central objectives. In order to achieve these, the strategy states the need for the system’s reconfiguration in a way that “*higher education in Wales be defined less by institutions than by networks of excellence*”

(WAG, 2002b, p. 4). The basic idea is to foster higher education clusters with a shared mission as a means to reach sufficient critical mass in the different tasks which universities are expected to perform¹³⁶.

Figure 9.10 – Delivering a higher education institution’s third mission: the TMC view



Source: adapted from HEFCW (2004)

The application and exploitation of academic knowledge related objectives, in 2003, would be wrapped up by a broader conceptualisation of the university’s third mission, extending the initial focus on commercialisation to include a variety of social, cultural and economic relevant activities it comprises. Succeeding to a working group on the third mission established in 2002, a Third Mission Committee (TMC) has been created in May 2003 to advise the Higher Education Funding Council for Wales (HEFCW) on its “*developing vision for third mission activities and the policies and principles that need to underpin it in the long term*” (HEFCW, 2004, p. 13). TMC’s work, namely because providing a overall guiding framework associated with a specific funding stream made

¹³⁶ Hitherto, the merger between the University of Wales College of Medicine and Cardiff University is the major achievement of the reconfiguration effort.

available in 2004 (see below), might be regarded as playing a pivotal role in enhancing the culture of change which, according to the WAG (2004), appears to have been trespassing institutions and individual academics. The broad view on third mission activities utilised by the TMC is illustrated in **Figure 9.10** above. One can argue that it specifies in a detailed manner the university-region value-added process that GODDARD and CHATTERTON (1999) refer to when modelling the extended perspective on the universities' regional third mission.

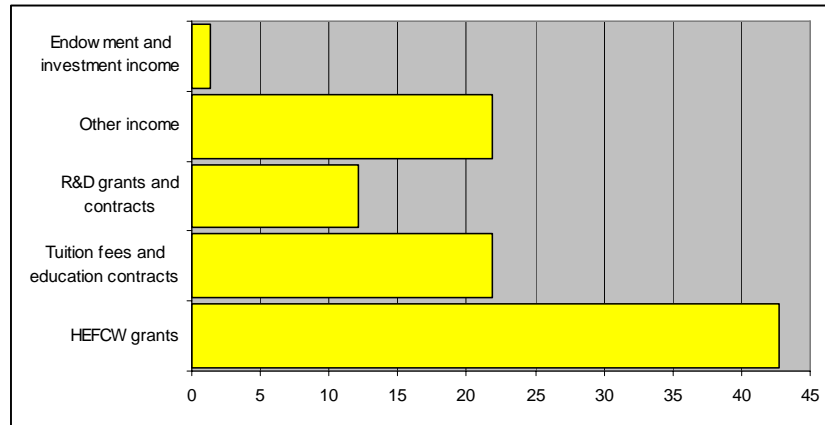
The framework has been recently enriched by a government's strategic vision for sciences, engineering, and technology (WAG, 2006a), which, besides reasserting the "*pivotal role*" of Welsh higher education organisations "*in delivering the science, innovation and skilled people which are important in enabling economic, social and cultural success*" (id., p. 8), encourage them to focus their third mission activities on three key priority areas, the low carbon economy, the enabling of sustained social and economic renewal, and health. Although the "*highly-regarded*" feature of academic autonomy (ibid., p. 14), meaning that academic organisations have the freedom to choose their research priorities, "*strong support for activities in the three priority areas*" is envisaged (ibid., p. 8).

The policy developments ongoing in Wales in the field of the regional role of universities deviate the region from the policy contexts of continental Europe, generally taken, concerning, in particular, the extent to which the third academic mission, as well as the encouragement given to higher education organisations to introduce it into the respective mission realm, are made explicit. The current university funding system mirrors the relevance attributed to the extended academic mission, as evidenced by the establishment, in 2004, of a Third Mission Fund managed by the HEFCW. As legally independent corporate institutions, all Welsh (and UK) universities enjoy a high level of autonomy to manage funding received from a diversity of both public and private sources, namely, the UK government (distributed in Wales by the HEFCW), tuition fees, R&D grants and R&D contracts. Universities are free to distribute the grants internally at their own discretion, as long as funds are utilised for the broad purposes for which they were provided (EURYDICE, 2000).

As shown in **Figure 9.11**, in 2003/2004, from the total income of Welsh higher education organisations (ca. 799 million £), approximately 43% took the form of HEFCW

grants. The second major income source consists of tuition fees and educational contracts (22%), followed by research grants and contracts (12%).

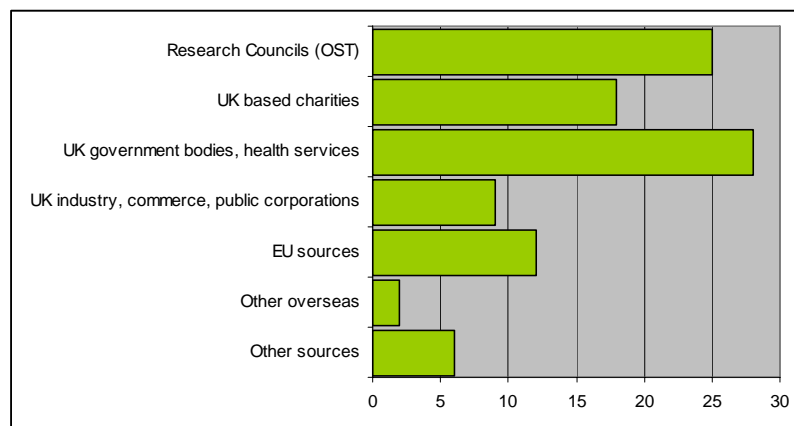
Figure 9.11 – Income of Welsh higher education organisations by source (2003/2004, %)



Source: Higher Education Statistics Agency

The breakdown of research related income (**Figure 9.12**) shows that government and non-government public bodies are the major funding sources of Welsh universities, representing more than a half of total. Private funding represents less than 9%, thus far below the amount of the same indicator in Finland (ca. 15%).

Figure 9.12 – Research grants and contracts, breakdown by source (2003/2004, %)



Source: Higher Education Statistics Agency

It is worth noticing that the weight of private research funding varies largely among universities. For instance, whereas the figure for Cardiff University and University of Wales Swansea reaches approximately 15 and 11%, respectively, in Glamorgan it does not exceed 2%. At any rate, a “*very impressive list of successful and effective support*

programmes” (WAG, 2004, p. 28) directed at the development of university-society interactions is in place, particularly in the domains related to knowledge transfer and commercialisation (**Table 9.18**).

Table 9.18 – List of programmes directed at supporting university-society interaction

Programme/Initiative	Date	Aim
Knowledge Transfer Partnerships	2003	To offer work experience in SMEs to students
GO Wales (merging Cymru Prosper Wales and Graduate Wales)	2003	To provide work experience to students.
IP Wales	2002	To provide expertise, training, and financial support to SMEs in the field of intellectual property
CETIC- Centres of Excellence for Technology and Industrial Collaborations	2001	To stimulate academia-industry collaborations and technology transfer
Technium Programme	2001	To stimulate R&D, assist firms with high growth potential, to foster spin-offs, and to attract projects from international corporations
Knowledge Exploitation Fund	2001	To generate a more entrepreneurial and innovative culture within Welsh higher education; to increase the training interaction with Welsh firms and foster commercialisation of research
Wales Spinout Programme	2000	To support new business ventures emerging from Welsh universities
Know-How Wales	1999	To broker the expertise of Welsh higher education organisations with Welsh businesses
Help Wales	1998	To provide financial support to small university-SME collaborative projects
Design Wales	1994	To help SMEs to incorporate the latest design concepts relying on university expertise

The 13 higher education organisations operating in Wales, using the wide range of programmes available, have developed a variegated set of collaborative initiatives, whose outcomes, as put by the WAG (id., p. 9), “*suggest areas of encouraging performance in higher-education-business interactions*”. There is, in fact, some quantitative evidence indicating an increase in interaction between academia and industry (e.g. HEFCE, 2003, 2006). The last survey on higher education-business interaction (HEFCE, 2006) shows that

income from formal collaborative research in Wales, between 2000 and 2004, grew more than 100%. According to the WAG (2004), the improved quality of research carried out in higher education, together with the encouragement given by government policies and activities, and the growing interest in innovation of both inward investors and indigenous firms operating in Wales are the three major factors behind the enhanced interaction between the two spheres. This positive judgement is far from being consensual in Wales, as well shown by the arguments produced by Richard Wyn Jones, a senior lecturer at University of Wales, Aberystwyth (IWA, 2004b): “*Wales’s universities do not take Wales seriously. Indeed, the existing higher education system does the people of Wales a great disservice and in many senses it fails*”. He attacks Welsh higher education on three broad fronts (id.): the “*failure to promote Welsh medium education, the small amount of research work carried out on Welsh issues and an inability to stem the brain drain of talented young people to universities in England*”. In a smoother vein, COOKE et al (2000b) refer to the tendency of Welsh academia to focus on large-scale industrial research projects, rather than on develop collaborative efforts with Welsh SMEs. JONES-EVANS (2002, p. 16) argues that “*despite the plethora of schemes that have been developed under such programmes as the Regional Technology Plan, Wales still does not have the scientific and technology infrastructure required for a high value knowledge economy and which can support the development of a strong high technology small firm sector*”. The more or lesser optimistic views on the environment framing the role of universities in the development of Wales do not blur, however, what can be regarded as significant specific policy and practice developments, namely when taking the situation in the past and an extended perspective on the third academic mission.

Plenty of illustrative examples of an enhanced role of higher education in Wales can be picked up from a variety of sources. This is the case, for instance, of Know-How Wales supported bridging sessions, encouraging businesses and academia to find ways in which they can work together, to build a long-term relationship and to break down barriers between the two (DAVIES, 2003). Another example is the collaborative work carried out in the framework of the Centres of Excellence for Technology and Industrial Collaboration (CETIC). The 18 centres accredited to the CETIC programme, during the first three years of operation have assisted 1533 companies in Wales and 2005 non-Welsh (UK and multinationals) firms, generating, respectively, contracts of 4.6 and 12.3 million £ (WAG,

2005b). According to recent data made public by the government (WAG, 2006a), the third mission activities of Welsh academic organisations gave rise to 17 active staff start-up firms with over 100 full-time employees, 168 active graduate start-up firms with over 200 jobs (10.5% of UK graduate start-up employment), and over 230 thousand individuals benefiting from free events organised by universities and other higher education organisations ranging from science lectures to creative arts performances. An additional example is provided by the innovative ways of tapping academic knowledge into the policy making process, since the NAW, in 2001, decided to establish a steering group aimed at bringing together senior academics and senior policy officials, in order to foster closer relationships between the Assembly and the Welsh higher education organisations. In parallel, the NAW has organised a set of related events involving policy and professional staff from the Assembly and leading academics and researchers in several policy areas. As a result, academic networks were established focussing on policy areas such as economic development, health and wellbeing, higher education, and sustainable development.

Notwithstanding, perhaps the most distinctive feature is the separation of third mission funding arrangements from the bulk financing of higher education, as mentioned above. Though short monies are being allocated, - 4.1 million £ in 2005/2006¹³⁷ -, the principles underpinning third mission funding provided a framework supporting Welsh higher education organisations in their efforts to develop a strategic oversight of third mission activities (each organisation has to build a three year third mission strategy reflecting its strengths, knowledge base and areas of expertise, identifying the expected outcomes/impacts, and demonstrating that adequate systems and procedures are in place to manage and monitor its performance). According to the HEFCW (2004, p. 10), this strategic approach is done “*in a way that pulls together knowledge and technology transfer activity, the skills and employability agenda and wider social/community outreach into a broader conception and articulation of how each HEI does, and could, relate directly to its local environment, while also continuing to play on the wider UK and international stage*”.

¹³⁷ According to the HEFCW (2004, p. 7), “*even when other monies that support third stream activity, eg., GO Wales funding, are brought into the equation, support for third mission activities still accounts for barely one percent of the total monies allocated by HEFCW, and affords HEIs only limited flexibility to lever in additional funds*”.

The description of the general framework conditions affecting the universities located in the three regions and their operation as contributors to regional development discloses sharp distinctions that can be expected to shape differently the ways the second academic revolution is evolving and affecting the role of academia in the processes of institutional capacity building, the organisational arrangements and the relationships with the respective regional systems of innovation.

9.5

A descriptive synthesis...

The present chapter was aimed at describing the territorial contexts in which the three universities selected as case studies operate. It has drawn a tale of economically, socially and politically unequal territories and thus portrayed the diverse geographies of context that are expected to shape not only the constitution and functioning of regional systems of innovation, but also the role universities play within those systems and in the processes aimed at building up their institutional capacity.

The territorial description has established, on the one hand, the dissimilarities between the regions in terms of development trajectories and current stages, thus marking their more or less favoured status. On the other hand, it has endorsed the idea from evolutionary economics according to which history matters when attempting to understand the roots of development gaps among regions. In addition, it has acknowledged the importance of institutional change to set up innovative ways of responding to crises and new development challenges.

Amidst the sharp dissimilarities existing between the three studied regions, the pursuing of enhanced innovation capabilities might be seen as a common thread configuring the bulk of the respective development policies. Innovation, particularly technological innovation, because perceived as a basic requisite to secure and reinforce the regional productive systems' competitiveness, stands out as shared policy objective. The centrality of innovation as major policy goal cannot be detached from processes of institutional change, which, though in a variety of manners, introduced new development thinking and doing modes, representing, especially in Central Macedonia, a clear fracture with past traditions. In this sense, the three territories might be regarded as learning

regions. Learning (and unlearning) processes, underpinned both by external pressures and opportunities (e.g., the EU framework with particular learning effects in Central Macedonia) and the need to face deep social and economic crises (e.g., Tampere and Wales), fostered change in the regional policy environments.

However, the varying geographies of context, together with episodic but influential events occurred on the timeline of the regional histories, marshal striking differences concerning the resources, the driving forces, the agency and the structures upon which each region rely to strive for the enhancement of its innovation capacity. These differences draw on a wide range of regional features, from the predominant type of firms and productive sectors to the regions' position and strength in the multilevel governance settings. In other words, the three regions present varying capacities i) to tap into their development endeavour both endogenously and externally generated knowledge resources, ii) to nurture the relational resources that underpin collective learning, and iii) to mobilise these resources to feed collective action. Hence, unequal institutional capacities differently mould the ways regions respond to external pressures and their internal evolutions, giving rise to variations in the systemic potential of the respective regional systems of innovation.

The descriptive view indicates that the *more* and *less favoured* labelling attached to the studied regions, in a hypothetical *institutional capacity league*, would mirror their relative sorting, with Tampere holding a top position, followed by Wales and Central Macedonia. This relative ranking is far from being something totally unexpected, because heralding much of the well established overall north-south divide, namely between the generally institutionally richer Nordic regions and the Mediterranean regions evidencing LFRs' typical structural problems. The intermediate *league* position of Wales, however, requires further attention, as it cannot be addressed with basis on a simple geographical divide. In fact, after a period during which Wales revealed the institutional capacity, widely acknowledged, to take advantage of a fairly well lubricated global-local nexus, there is evidence pointing to some loss in the region's institutional momentum, which, somehow paradoxically, - at least under the light of regional innovation theory -, seems to have coincided with the devolution of powers.

Nevertheless, as asserted above, the three regions are engaged in institutional change processes. New institutions are being designed and existing institutions redesigned. In one way or another, processes of institutional capacity building are underway in the regions, as

they are attempting to *accumulate* knowledge and relational resources for the sake of collective action. Moreover, they show common expectations in relation to the role that their universities can play as partners of that *accumulation* process. In turn, those universities, either encouraged or hampered by the specificities of academic cultures and legal and financing frameworks, either drawing on deliberate strategies and organisational settings or on the initiative of individual academics, and to a larger or lesser extent, are participating in such process, thus going beyond the mere transfer of technological knowledge. They are thus doing that under different framework conditions:

- in Tampere region, regional engagement can be considered as something expected and *natural*. The regional mission of higher education is fully acknowledged by national, regional and local levels of governance, which makes the Finnish environment highly encouraging for co-operation.
- in Central Macedonia, the regional orientation of universities is dependent on individual academics' willingness, rather than on national or regional policy frameworks. Despite the changing process in university policy-making, mainly driven by the EU influence, co-operation with the regions is far from being transversal to the whole organisation, relying on the activity of specific research groups. These groups face the problems arising from fragile networking capabilities and absorptive capacity that characterise the region. Seemingly, academia in Central Macedonia assumes a prominent role when attempting to fulfil the fully acknowledged need for regional change.
- in Wales, academic change and regional engagement mainstreaming seems to be pushed forward by the government, which, through a wide range of instruments, both strategic and financial, directed at the enhancement of the third mission, tries to influence higher education organisations, not only to adopt a regional orientation, but also to focus on specific areas judged as key priorities for the development of the nation.

In this sense, the selected regional contexts can be regarded as well suited to develop the university-focused case studies as proposed in Chapter 8. The point at issue is to find out how three specific universities operating in each region are participating in the

institutional capacity building processes, how they are organising themselves in order to do it, and how they influence and are influenced by the regional settings.

The second academic revolution in practice: universities as agents of regional development

10.1

Introduction

How are universities contributing to regional development and to enhance regional institutional capacity building processes? How are they organising themselves to interact with society? How is the mutually reinforcing relationship between universities and the regional systems of innovation in which they operate being processed? How particular is the role of universities in lagging regions? The present chapter aims at attempting to answer these questions, drawing on the study of three universities, - Tampere University of Technology (**TUT**), in Tampere region, Aristotle University of Thessaloniki (**AUTH**), in Central Macedonia, and Cardiff University (**CU**), in Wales.

As mentioned before, the chief task is to search for knowledge on the causal, structural, and substantial relations that are underpinning the collaboration between the universities and the respective regions. This is done against the analytical framework set up in Chapter 8, thus implying that attention should be paid, firstly, to the influence exerted by universities on the qualities of each dimension of institutional capacity, - knowledge and relational resources, and mobilisation capacity; secondly, to the organisational settings that configure the role of universities as institutional capacity builders, i.e. much of the *modus operandi* adopted to purposefully manage and steer their way out of the *ivory tower*, and cope with the seemingly inherent turbulence; and, thirdly, to the expected mutually influential relationship between the universities and their regional systems of innovation.

Additionally, the part played by universities in LFRs, ought to assume particular relevance and configurations, is addressed not only through the conclusions drawn from the Greek and the Welsh cases, but also by the particularities identified by dissimilarity in relation to the more advanced territorial context, which is the Finnish region.

The chapter is organised into sections, each of them dedicated to one of the three studied universities. Each section, besides the basic profiling of the higher education organisations, is divided into subsections, which intend to reflect the major inquiry lines as referred to above. The chapter ends with an attempt to synthesise the case studies report.

10.2

Tampere University of Technology: at the core of regional reinvention

The “*active efforts of the Tampere town management*” (KOSTIAINEN and SOTARAUTA, 2003, p. 425) that, in 1960, brought the first university to Tampere, would be called for



again to satisfy the local aspiration for a technical higher education institute. With “*local persistence and cunning*”, and after “*various adventurous developments*” (id.), the aim was achieved in 1965, when a branch of the Helsinki University of Technology started its operations in Tampere. In 1972, it became independent, under the designation of Tampere University of Technology. From the three teaching programmes (in civil engineering, electrical engineering, and mechanical engineering) and the 110 students enrolled at the very beginning (NIEMINEN and KAUKONEN, 1998), TUT rapidly and remarkably expanded to the current teaching and research diversified portfolio which gathers in the Hervanta campus¹³⁸ over 12,000 students and 1,900 academic and non-academic staff (see **Table 10.1**). At present, the university has 11 departments and 37 institutes, covering all major domains of technology and architecture. Its core competence

¹³⁸ Hervanta is located at approximately 8 kilometres from Tampere’s city centre. Osmo Hassi, former TUT’s rector, visiting the place where the university would be built, has said: “*I went to see the place. We had rubber boots and a camera. Hervanta was natural wilderness: footprints of moose and brown hares here and there. It was quite depressing*” (in MAULA, 2004).

is basic research in technology, which provides strong foundations for applied research and innovative product development (www.tut.fi).

Table 10.1 – TUT: basic figures (2005)

Date of foundation	1965
Number of students	12,642
Undergraduate	10,637
Postgraduate	2,005
Staff	1,906
Teachers	365
Researchers	796
Assisting teaching and research	490
Other staff	255
Departments	11
Institutes	37
Research centres	2

Source: TUT

TUT, since its creation, has been seen as an *industry's university*. This epithet was evidenced in the first law on the technical university, which established the obligation to carry out research in product development (NIEMINEN and KAUKONEN, 1998), and, concomitantly, an emphasis on collaboration with the world of production.

Even though during the 1970s, when there were acute criticisms about the orientation of Finnish universities' research towards external requirements and limitative directives emanated from the Ministry of Education, TUT continued to work in close co-operation with industry. KOSTIAINEN and SOTARAUTA (2003, p. 425) write: "*In Helsinki University of Technology, for instance, the regulations destroyed research services for companies altogether. TUT, however, knew how to live with the directives, which meant that the university continued its policy that emphasized industrial co-operation*". The authors (id.), quoting Osmo Hassi, former TUT's rector, add: "*if discrepancies of interpretation occurred, the interpretations were consistently made in the university*". NIEMINEN and KAUKONEN (id.) provide some quantitative evidence: between 1973 and 1976, in a quite unfavourable national framework, service and research contracts at TUT increased from the worth of 21,000 to 600,000 FIM. Expectably, TUT is commonly considered as having had a pioneering role in university-industry interaction in Finland.

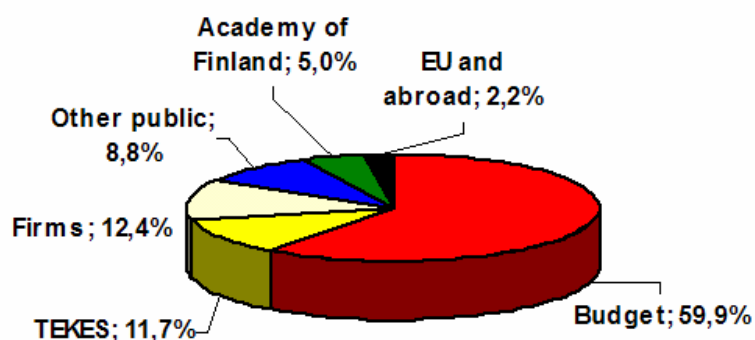
The strong technology policy developments occurred during the 1980s, and the influence of the national system of innovation concept concurring for the integration of

science and technology policy in the 1990s (cf. LEMOLA, 2002; NIEMINEN, 2004), radically changed the overall perception about the role of Finnish universities. According to a researcher at the University of Tampere (UTA): “*in the 1980s, the development of new technologies emerged as the first academic research priority; during the 1990s, there has been a kind of ‘reconciliation’ between social, science and technology policy. As a result, TUT’s work with industry gained in strength and became highly valued by society and a reference for other Finnish technical universities*”.

The “*symbiotic*” cooperation (TECHNOLOGY CENTRE HERMIA, 2002, p. 14), between TUT and Technology Centre Hermia, established in 1986, has enhanced the infrastructural capacity of the university to contribute to Tampere’s industrial development, mainly because fulfilling the demand for a mediator to transfer new product ideas to industry and providing premises for university spin-offs (id.).

The emphasis on industrial collaboration is evidenced by the university’s funding structure. Breaking down TUT’s funding sources, as in **Figure 10.1**, companies rank second, representing 12.4% of total funding, following government budget monies (ca. 60%). Moreover, financial support granted by TEKES, which, in the case of TUT, reached about 12% of total funding, is mostly directed at research carried out in co-operation with industry. It is worth noticing that firms, in some of TUT’s institutes, constitute the major financing source (e.g., approximately 70% of funding in the Automation and Control Institute comes from industry).

Figure 10.1 – TUT funding sources (2005)



Source: TUT

The role of TUT in the development of Tampere’s productive structure can be extended to the creation of new industrial ventures based on the knowledge produced

within the university and on the close partnership it holds with Technology Centre Hermia. From 1998 onwards, approximately 50 spin-off firms have been established. Some of them are already operating in global markets and growing at fast pace. Others, while well positioned in global markets, have themselves given rise to new firms¹³⁹.

The part played by TUT in the development of new sectors such as ICT, as well as in the renewal of traditional sectors such as mechanical engineering, places the university at the core of the regional system of innovation. Some local commentators attribute to TUT a crucial role in decisive events like the establishment of Nokia in Tampere, as stressed by one of the interviewees: *“the expertise in information technologies and electronics available in TUT, particularly in digital signal processing, was a major magnet for Nokia”*. Further, the reinvention that allowed the traditional mechanical engineering industries to survive is usually connected to TUT. In the words of MARTINEZ-VELA and VILJAMAA (2004, p. 4): *“The key to the survival of the machinery industry in Tampere has been the introduction of new technologies into traditional machine-building. [...] Tampere University of Technology has played an especially important role in recent decades as a provider of skilled labor, technical know-how and problem-solving abilities relevant to local industry”*.

Additional arguments reinforcing the regional importance of TUT can be drawn from its influence on the development in the region of national initiatives such as the CoE programme, - in the first place, the educational and research expertise available at TUT strengthens Tampere’s capacity to compete nationally for the allocation of CoEs -, or locally promoted programmes like *eTampere* and *BioneXt*.

TUT’s regional role seems to provide ground for statements such as the one produced by KOSTIAINEN and SOTARAUTA (2003, p. 427): *“the most important critical incidents with regard to the birth of the knowledge economy were the arrival of the university and the technical university to the city”*. They (id., p. 428) add: *“the two educational institutes created the foundation for the transfer from industrial society to information society. [...], they later became the most important resources of the knowledge economy, and core factors concerning the appeal of Tampere in the competition for an expert workforce”*. If the energy of the Tammerkoski rapids has been the driving force of early Tampere’s

¹³⁹ This is the case, for instance, of *Corelase Oy*, established in 2003 in Technology Centre Hermia. The firm is a spinout of *Coherent-Tutcore*, a TUT spin-off specialised in laser technologies and created in 1991.

industrial development, higher education is commonly perceived as a major contemporary *power station* for regional development.

10.2.1

TUT as institutional capacity builder: a matter of technology and technical knowledge transfer only?

The common perception about the role played by TUT in regional development draws heavily on its praised capacity to interact with industry, provide skilled labour, promote technology transfer and, perhaps to a lesser extent, foster the creation of new companies. One can argue that this common perception mirrors the narrow perspective on the second academic revolution. Accordingly, against the research framework guiding the case studies, the point at issue is whether the way TUT contributes to institutional capacity building in Tampere region can be fully depicted by the supply of a range of knowledge inputs limited to technology and technical know-how¹⁴⁰. The orientation towards the needs of industry, both in terms of teaching and research, makes the supply of knowledge resources directed at the enhancement of firms' technological innovation capabilities the most evident feature when looking at TUT as a builder of institutional capacity. In fact, this is the major reason for attributing to the university the status of key actor in the regional innovation system (KAUTONEN et al, 2004).

The highly valued knowledge resources transmitted through TUT's students and graduates hold a prominent position. As put by a member of Hermia's staff: "*Tampere is a city of engineers and industry. The role of TUT is very important as a source of technology, but its main role is to keep on providing the region with the good engineers that serve properly the needs of regional industry*". A member of TUT's staff corroborates the view and adds: "*there is a continuous flow of students between the university and industry. We do firmly believe that many important engineering skills cannot be acquired in the classroom. This is the reason why we value students' direct contact with the daily practice of firms*". The completion of master and doctoral theses made in industry, focusing on specific industrial development needs, is the most important vehicle of

¹⁴⁰ At first, this question generally led interviewees to converge on the idea that the reinforcement of Tampere region's institutional capacity does not enter the mission realm of TUT. The narrow approach to the third academic mission prevailed as the framing reference for the role of universities.

knowledge transfer and university-industry collaboration. According to a local industrialist: *“through Master’s theses, the University’s theoretical perspective is combined with the practical R&D for industry. Master’s theses also provide a sturdy bridge for students to cross over from university to industry. For us it is important that MSc graduates possess the basic tools required in a rapidly developing international corporate environment. Our future employees need a solid theoretical foundation and experience gained from international research work”* (www.tut.fi). At TUT, the large majority of theses are developed bearing in mind the needs of industry. Firms monitor, support and commission students’ research work in a regular basis. Frequently, newly graduates will find their first employment opportunity in the company that has commissioned their graduation theses. The importance evidenced by this form of interaction increases when taken the breakthrough product and process innovations that were based on the research carried out by students. This is the case of Nokia’s Communicator, developed with basis on several applications discovered by students during the elaboration of their theses, and later built into the innovative device. The work of TUT’s students in industry is regarded as an enhancing factor for Tampere’s industrial competitiveness and business investment attractiveness. It is so relevant that those (few) authors producing criticisms on the regional development model (e.g., MATHUR, 2005) place this type of university-industry collaboration among the most crucial factors. In MATHUR’s (id, p. 9) words: *“The attractiveness of Tampere stems from the availability of cheap student labour and lower costs of living compared to Helsinki and the quality of life the region offers”*¹⁴¹.

Exchanges between the university and industry also involve TUT’s staff, namely in the framework of applied research or problem-solving joint projects. MARTINEZ-VELA and VILJAMAA (2004, p. 46) talk about many professors who *“move back and forth between the industry and the university”*. The authors (id.) highlight the *“substantial industry experience”* held by a large number of TUT’s teaching staff. According to them (ibid.), *“they hold two identities and can speak the language of industry and the language of*

¹⁴¹ MATHUR’s (2005) opinion is quite dissonant in relation to much of the analysis made on the regional development trajectory of Tampere region. He (id.) particularly derogates, on the one hand, the *“eternal project mode”* that, in his words (ibid., p. 12), *“constitutes a drain of resources that leaves little room for international business development”*, and, on the other hand, the *“prohibitive”* (ibid, p. 15) transaction costs associated with the linkages between many agencies and numerous brokers, *“primarily connections between individuals working in these organisations creating activities for each other without a true customer base”* (ibid., p. 16).

academia; the language of practice and the language of theory". This allows for the maintenance of open and fluid communication channels through which contacts between TUT and industries, both formal and informal, are established. In addition, many industrial leaders and engineers working in local industry share a common background as TUT's students. MARTINEZ-VELA and VILJAMAA (2004, p. 16), accordingly, look at TUT as serving as "*a socialization mechanism*". According to one of the interviewees, this *socialization* has been essential to provide Tampere with "*a kind of engineering 'tribe' whose members share a common view of the world*".

The sense of belonging to the *tribe*, shared by academics and industrialists, proves to play a significant part in the joint work developed by TUT's Departments and Institutes and local industries operating in different branches. Firms are frequently involved in the preparation of university educational and research programmes and can easily access the available academic know-how essential to solve production problems, as well as take advantage from technological developments stemming from academic research activities. In addition, easiness in establishing collaborative partnerships seems to improve the capacity to meet the demands of public funding streams encouraging university-industry interaction, such as those made available by TEKES technology programmes, which, in 2000, represented about 32% of total external research funding in TUT¹⁴².

The reinvention of the mechanical engineering industry in Tampere is a paradigmatic example of how the *tribe* general feeling has drawn near TUT and firms, which, as commonly perceived, would be determinant for that reinvention. In the words of a researcher at UTA, "*without TUT, Tampere's mechanical engineering industry would not have survived*". MARTINEZ-VELA and VILJAMAA (2004), who tell the story in fully detail, provide sound evidence corroborating TUT's prominent and decisive role in the process that would led some firms operating in the sector to reach a leading position in global markets. They highlight TUT's contribution, on the one hand, in the education of skilled engineers, and, on the other hand, in the enhancement of knowledge integrative capabilities, "*a central factor to support innovation in the local mechanical engineering industry*" (id., p. 46). The authors (ibid., p. 35) attribute much of the competitive stance acquired by the firms to the integration of ideas and knowledge produced in a variety of research fields: "*The ability to integrate measurement devices, control systems, software,*

¹⁴² Approximately 60% of total research expenditure at TUT is financed by external sources.

and wireless technology into the machines has been the core process of innovation and the key to the survival of these companies”.

TUT’s interaction with industry involves mainly large firms and small units that because of their specificities (e.g. spin-offs from TUT, small firms located in Hermia or Finn-Medi Science Parks) have specific needs for and privileged access to R&D inputs that can be provided by the university. A researcher at UTA avers that *“it is much more difficult for a university to interact with small firms”*. He adds: *“university-industry interaction does not benefit large and small firms in the same way. In addition, SMEs, in relation to firms such as Nokia, are not so able to take advantage from support programmes like TEKES”*. However, there are examples of small firms, some of them operating in mature industrial sectors, co-operating with TUT. According to KAUTONEN (2006), this co-operation is mostly based on the completion of master theses and ranges *“from rather loose interaction, mostly between the student and a firm, to projects in which a firm commits its own funding and a supervising professor is also involved personally”* (id., p. 193). In addition, as put by a member of TUT’s staff, *“there are links between TUT and SMEs established indirectly via cooperation with the large firms that use those SMEs as subcontractors”*.

TUT taps into the region relevant knowledge generated elsewhere, namely because of the participation of its departments and institutes in several international academic networks. The university interprets and makes available to the local context that knowledge, in the form of both education and applied research. According to MARTINEZ-VELA and VILJAMAA (2004, p. 17), *“this interpretation happens typically through research contacts, publications, and joint projects with other companies and universities in Finland and elsewhere in Europe and, in some cases, around the world”*. A good example is TUT’s Optoelectronics Research Centre (ORC), which is attaining success in achieving the major goals of disseminating the latest R&D results in semiconductor technology and ultra-fast and intense optics throughout the world, and of contributing to support existing industry and generate new firms. ORC leads an international industry club, with partners from Finland, France, UK and the US. Meshing together its internal R&D capabilities and the enhancing power of international networking, the research group has been the research source of a number of technological innovations and of several spin-off firms, which have created more than 100 new high-tech jobs in Tampere region.

Knowledge resources generated within TUT are key to both national initiatives of regional development carried out in the region and endogenously designed programmes and projects. It provides the region with increased capacity to act, as well illustrated by the evolution of the CoE Programme. TUT participates actively in this nationally driven regional development initiative and, in some of the five centres existing in Tampere, it is assumed as major driving force, due to its research and education capabilities. TUT's leading-edge fields of research and strong areas of competence¹⁴³ match the CoE Programme cluster selective logic. The same can be said about the extensive *eTampere* information society programme and the multidisciplinary biotechnology focused *BioneXt* initiative.

The university also plays a part in the management and relational structure underpinning those regional development programmes. In fact, TUT is represented in the governing board of several programmes such as *eTampere* (the programme director was a member of TUT's staff) and *BioneXt*. In a number of sub-programmes TUT assumed a coordinating role. This is the case, for instance, of the *eTampere* sub-programme named *eBRC*- eBusiness Research Centre, whose coordination was allocated to TUT (together with UTA) and ensured by the Institute of Business Information Management (BIM), a new unit established in 2002, which has added competences in knowledge and information management to TUT's hitherto almost exclusive engineering-related scientific expertise.

BIM has also brought into TUT new insights concerning its relationships with industry and government and, namely through the eBRC related activities, new opportunities of interaction open by the match-making and catalysing action it performs, aiming to cross borders between the elements of the triple helix¹⁴⁴. The unit, in this sense, plays a part in the creation of new arenas for developmental debate and cooperation, because providing a

¹⁴³ TUT's leading-edge areas of research are signal processing, nanophotonics (semiconductor lasers, optoelectronics components and photochemistry), biotechnology (biomaterials, environmental biotechnology, bioinformatics, biosensors), and intelligent mobile machines and hydraulic systems. The strong areas of competence are software systems, telecommunications and electronics, machine and process automation, production technology and paper machines, energy technology, numeric methods related to field theory, the strength of materials and rheology, materials technology, industrial management, knowledge management and management accounting, and urban planning and architectural design, structural engineering and building renovation.

¹⁴⁴ BIM, besides its work on improving TUT's overall interaction, carries out several collaborative research projects, such as VISIPRO, a research project aimed at studying business intelligence processes and technologies in improving the visibility of business processes and value networks, co-financed by TEKES and regional industrial partners like, among others, Nokian Tyres and Metso Automation.

meeting place for researchers, businesses and research funders, and a privileged joint platform for new knowledge dissemination.

Seemingly, BIM is, in addition, contributing for setting up the perception about the need for renewing the frames of reference that have hitherto steered regional action. One of the professors responsible for the new scientific area at TUT says: “*the Finnish economy collapse in the early 1990s forced us to redefine competences and find new methods to facilitate innovation and promote competitiveness; we are now needing to do a similar redefining effort to face new challenges such as the ageing of population or the rise of China, which is both an opportunity and a threat*”. The same informant adds: “*We are so happy with ourselves, that the perception of the need for constant changing can easily vanish. We have to redefine the issues to focus on, both in terms of education and research*”.

TUT is, in fact, participating in the regional effort to endeavour in a new reinventing cycle, signalling that the knowledge resources it provides go beyond technological innovation inputs to firms. Several interviewees stressed informal networking, through which TUT’s members of staff establish “*conversations with individuals endowed with the power to change and do things*”, as a relevant factor. At a more formal level, the university, through its Centre for Technology Research (CTR), is coordinating the foresight activities held within the Tampere Region Council. The regional authority has an innovation unit, in which representatives of business, science and public bodies work together to define regional development priorities and frames of reference for future action. This work is directly influenced by the CTR, which, drawing on regional, national and global developments, and integrating knowledge produced in a variety of scientific fields, provides political decision-makers with information about possible areas of importance for regional economic and social development and with alternative scenarios, resource requirements and risk factors (ERIKSSON, 2003).

The part played by TUT in the past and current regional reinvention efforts draws on its active participation in different kinds of networks, varying in formality, extension and reach. Networks can be a “*bunch of crazy guys*” discussing new ideas (MARTINEZ-VELA and VILJAMAA, 2004, p. 40). This kind of networks, based on what GRANOVETTER (1973) calls *weak ties*, revealed to be decisive in the development trajectory of Tampere, namely because bringing operative strength to the ideas and willingness to act of a number of

individuals. This relates the perception of a researcher at UTA: *“the way the previous generation of teachers and researchers used to act in their interaction with industry allow us to say that individual agency was a major driving force”*. In fact, it is easy to find the names of academics and other staff connected to TUT when telling the story of Tampere reiventon. MARTINEZ-VELA and VILJAMAA (2004), for instance, in their approach to the part played by TUT in the survival of the mechanical engineering industry, highlight the prominent work of *Matti Vilenius*, the founder and current director of TUT’s Institute for Hydraulics and Automation. KOSTIAINEN and SOTARAUTA (2003, p. 426) highlight the *“significant event”* that was the appointment of *Yrjö Neuvo* as professor of electronics back in 1977. Neuvo, as soon as he took his position at TUT, has worked in close cooperation with industry. He specialised in digital signal processing and would make significant contributions to the development of mobile phone technologies¹⁴⁵. A recurrent name is the one of *Seppo Loimio*, head of TUT’s administration for more than 30 years (retired in 2003). In the words of one of the interviewees, Loimio *“was very keen to university-industry interaction”*. The same informant points out: *“during the 1970s, when the involvement of universities with industry was not very well accepted in Finland, TUT, without Seppo, would not have managed to continue its close work with industry”*.

Neuvo and Loimio would also play a central role in the creation of Hermia science park, the new development arena established in 1986 and consensually regarded as a crucial initiative in Tampere’s *great leap* (KOSTIAINEN and SOTARAUTA, 2003). Hermia is generally considered as being a result of a joint effort of TUT, VTT and the City of Tampere. However, the story behind its creation reveals the importance of informal and person-to-person networking, as well expressed in the story told by Seppo Loimio (TTC, 2002, p. 7): *“the group [besides Loimio and Neuvo, the City’s Trade Ombudsman, Taisto Kauppinen, and VTT’s researcher Niilo Saranummi] sat in the sauna and outlined ideas about the establishment of technology centre activities. In the early 1980s, the group visited Oulu [...]. Here, we got acquainted with the local technology centre plans in Oulu. As we left for home, we snatched up their brochures and decided that we would make one in Tampere too ”*.

Hermia’s episode mirrors the significant role played in Tampere by individuals as builders of networks or transmitters of visions (KOSTIAINEN and SOTARAUTA, 2003) and

¹⁴⁵ Yrjö Neuvo became a member of Nokia governing board in 1993.

illustrates how influential have been, using the words of KOSTIAINEN and SOTARAUTA (2003, p. 433), “*the visions of a few brave individuals*”. However, as the same authors (id.) underline, Tampere’s *secret* rests on the step-by-step crystallisation into official thinking of the views on new developments stemming from those visionary individuals. They add (ibid., p. 431): “[...] *above all the knowledge economy is promoted better by institutional thickness and the combination of different kinds of competencies than by lone rangers*”. Accordingly, the point at issue is the capacity built upon the combination of individual agency, innovative coalitions between public and private actors, and the design and development of new institutions. TUT, in a variety of ways, plays a key part in this process: firstly, among its staff a number of brave and visionary individuals can be identified, as of the cases of Yrjö Neuvo and Seppo Loimio mentioned above; secondly, it actively participates in the formation and subsequent powering of public-private development coalitions, as, among other programmes, in *eTampere* or *BioneXt*; thirdly, it is involved in the design of new institutional arrangements and, perhaps more importantly, in the setting up of the institutional threshold that allows newly created institutions to endure over time, as shown, for instance, by Hermia’s case, in which expertise available at TUT (together with VTT) is commonly regarded as the most central magnetic factor of the technology centre from the very beginning (TTC, 2002).

TUT’s role in regional development reaches beyond the urban area and affects not only the whole Tampere region but also other Finnish regions, particularly in Western Finland. In fact, TUT has decentralised R&D facilities to places such as Vammala, Rauma and Salo, and established professorship donation schemes in Kokkola, Valkeakoski, Jalasjärvi, Kankaanpää and Hyvinkää. Furthermore, TUT is playing an active role in the university alliances operating in Lahti/Nastola, Pori and Seinäjoki (South Ostrobothnia). These alliances are commonly seen as determinant for the strategic adaptation of Finnish less favoured regions to the demands of a changing economy (e.g., SOTARAUTA and KOSONEN, 2004). A professor at UTA says: “*to achieve territorially balanced development in a country with the specificities of Finland is quite difficult. Earlier, universities were founded in relatively remote places because they retained people that otherwise would go to the larger urban centres. Nowadays, this type of regional policy is not there anymore, mainly because the 20 universities existing in the country are perceived as being far*

enough. The emphasis, at present, is placed on the concentration of efforts, that is, in establishing alliances between universities to develop less favoured regions”.

Following a member of TUT’s staff, the university “is a major hub in the regional networks evolving in Western Finland, and, together with other universities and local actors, it is contributing for the identification of development opportunities in rural areas”. The same interviewee, who has been involved in the process leading to the establishment of the South Ostrobothnian university network¹⁴⁶, says: “Our main job was to identify opportunities and hidden resources that could transform such rural areas. We have made an effort to bring together local actors, which, naturally, had different objectives and interests, and we have done that using as reference the triple helix theoretical model. We had to help those local actors to understand the concept and to clarify the roles each sphere should play. The issue was to build up a consensual view on the regional development trajectory”. Seemingly, to achieve this consensus was not an easy task. For instance, a researcher at UTA, also involved in the setting up of the network, avers that the whole process was one of “unlocking old mental models, very much linked to the rural character of the region, and fostering an innovative environment”. Difficulties are also illustrated by the account of SOTARAUTA and KOSONEN (2004, p. 9) on the common reactions to the proposed network: “‘Crazy idea- 12 professors, here, in an academic wasteland? There are none here now!’; we’ll be never able to recruit professors to Seinäjoki, there is no academic tradition here’; and ‘who wants to destroy his/her university career by coming to Seinäjoki, the periphery of academe’”. Despite scepticism, the South Ostrobothnian University Network, - named EPANET-, was established in 2001, bringing together TUT, UTA, the universities of Helsinki and Vaasa, Sibelius Academy, the Seinäjoki Polytechnic, the Regional Council of South Ostrobothnia, the regional Employment and Economic Development Centre, the regional Health Care District, the City of Seinäjoki, and the region of Western Finland. The network is focused on the provision of knowledge for the development of the productive sector, namely the food, metal and wood industries. Accordingly, the R&D activities carried out in the framework of several professorships, are dominated by short term and practice-oriented projects. Though mostly financed by various national, regional and local public sources and by the

¹⁴⁶ The South Ostrobothnian University Network was first proposed by SENTE, the UTA’s research group for urban and regional development studies.

EU Structural Funds, the network is also being funded by approximately 100 regional firms, most of them SMEs. SOTARAUTA and KOSONEN (2004, p. 14) consider that “*through EPANET many difficult borders and barriers between universities, between universities and polytechnics, and between businesses and universities have been overcome*”. TUT provides 5 of the 19 existing research professorships, in the fields of polymer composites technology, metal engineering, intelligent systems, virtual technology and health care related information systems. In 2003, drawing in a national policy initiative, the regional development role of university alliances has been enhanced in South Ostrobothnia through the creation of the Seinäjoki University Consortium, formed by the five universities mentioned above, in a joint effort to intensify collaboration between the higher education organisations and their decentralised units already in place. TUT is participating in the consortium through its Institutes of Machine Science, Materials Science, Structural Engineering, and Production Engineering, and the Digital Media Institute. The university, according to one member of staff, “*looks at these outposts as a key part of technology and knowledge transfer to firms*”. Moreover, as the same informant highlights, “*they constitute an opportunity for TUT’s researchers to learn from cooperation with local actors and simultaneously contribute for the development of those regions where there are no universities*”.

This account of TUT interaction with the region allows for arguing that the university is placed at the core of the regional development effort. It also indicates that TUT’s regional relevance results not only from the transfer of technological knowledge to local firms, but also from the provision of other important types of knowledge, the contribution for the accumulation of relational resources, as well as the enhancement of the capacity for collective action. Hence, TUT can be regarded as an important player in the process of institutional capacity building in Tampere region.

Taking into consideration the part played by TUT in technical and technological innovation, *productive* knowledge, resulting from both research (technical and technological inputs) and teaching (skills and competences), is the most visible type of knowledge resources the university taps into the region. The transfer of academic research results to industry, together with the provision of the human skills and competences it needs, are most relevant inputs for improving firms’ ability to compete in global markets (*e.g. the link between TUT’s research in digital signal processing and innovation in Nokia*

Corporation). The transformation of research results into *productive* knowledge also bears on the creation of spin-off companies (*e.g. TUT's research in optoelectronics*), which contribute to the renewal of the regional entrepreneurial fabric. However, these more visible aspects of knowledge provision, perhaps entirely satisfactory in an approach driven by the narrow perspective on the second academic revolution, are only part of the picture. In fact, the transfer of explicit embrained and encoded knowledge from TUT to firms is itself generating and disseminating knowledge of tacit embodied and embedded nature. Abstract or theoretical knowledge meshes together with practical, craft-based, and action-oriented knowledge (*e.g. the role of TUT in the reinvention of Tampere's mechanical engineering industry; the completion of Master and Doctorate theses in companies*). Moreover, this blending of knowledge types reaches beyond the business sphere, as it percolates the regional (and local) public policy design and implementation circuits (*e.g. the e-Tampere programme*). One can thus argue that the region brings into use a range of knowledge resources generated in TUT that cannot be fully captured if solely looking at the university as a mere source of science and technology inputs.

The range of knowledge resources made available by TUT assumes particular importance in the framework for collective action shared by the core group of government, business, education and research organisations that gear Tampere's development. On the one hand, the focus on innovation and business development featured by the regional frame of reference for action is largely connected to the educational and research expertise available in TUT. On the other hand, the widening of acceptance *vis-à-vis* the frame of reference relies, to a significant extent, on the fluid knowledge exchanges evolving between TUT and its external partners, namely those endowed with vision-influencing power (*e.g., the close co-operation with prominent firms, the science and technology parks and the local and regional authorities*). One can argue that knowledge flows initiated by TUT are highly integrated across a variety of regional public and private actors and closely linked to the regional frames of reference for action.

TUT's close interaction with the regional public and private organisational settings allows for placing the university among the major animators of the regional learning mechanisms that steer change in Tampere region. There is a rich infusion of new ideas and knowledge originated in TUT, in terms of both technology (*e.g. scientific breakthroughs strengthening the ability of regional firms to face increased global competition*) and

territorial organisation (*e.g. the new organisational arrangements that are driving change in the rural area of Seinäjoki*). The rich infusion of new ideas allows for looking at TUT as a major partner in the learning processes that steer change in Tampere region and drive the regional ability to read and locally adapt to external new or renewed policy and competition signs (*e.g., the benefits taken by Tampere region from the national policy developments supporting innovation*). In this sense, TUT, not only through the knowledge it produces but also through the networks it participates, helps the regional system of innovation to maintain high levels of permeability in relation to external stimuli and to act purposefully. TUT's interaction with the region places the university as a relevant source of new information, knowledge, and inspiration.

The remarks on the role of TUT as a source of knowledge resources signal a wide range of public and private key players with whom the university collaborates. As of industry, TUT has a long tradition of interaction with local large firms operating in different sectors (*e.g., Nokia and Metso Automation*). SMEs, though less intensively, are also supported by TUT (*e.g., through the completion of Master theses or along the subcontracting chain of larger firms*). Co-operation with SMEs becomes more visible in the places where TUT has decentralised R&D facilities (*e.g., Vammala, Rauma and Salo*) or outposts (*e.g., Seinäjoki and Pori*). An additional most relevant business-focused co-operative structure is the one resulting from the partnerships between TUT, Hermia and Finn-Medi science parks, as well as a number of business development oriented firms (*e.g., Professia Oy*). Bearing in mind the stake the public sector holds in this co-operative structure, the strength of linkages between TUT and the public settings is brought over. The City of Tampere and, to a lesser extent, the Pirkanmaa Regional Council, can be regarded as major public partners, at the level of both policy design (*e.g., the foresight activities conducted by TUT within the Regional Council*) and delivery (*e.g., eTampere and BioNext programmes*). Joint work carried out by TUT and UTA, and TUT and VTT, should also be highlighted, as it has been feeding the regional system of innovation with complementary knowledge resources that revealed to be of major importance for supporting several development initiatives (*e.g., the eBRC initiative and the progress in health and telecommunications technology*).

The roll of main TUT's partners signals the strong integration of the university in the regional development networks, which, as evidenced before, are characterised by high

levels of connectivity and convergence and by a mix of formal and informal network coordination. TUT, as a major research and education node, feeds regional networks with the critical knowledge and skills that brings legitimacy and operative power to the networks, and ensures a balance between stability and flexibility. At a more informal and intangible level, the university is the source of ingredients facilitating social interaction and trustful relationships, contributing thus to sustain and improve the qualities of regional networking over time (*e.g., the socialization process underlying the “engineering tribe”*). TUT’s role as switching point is mostly revealed at the national and international levels, namely by guaranteeing access of local industry to production relevant knowledge and facilities generated and located elsewhere (*e.g., the participation in the university research and education alliances*). The spatial reach of networks participated by TUT has been significantly enlarged by the establishment of outposts, which gave rise to dense networking binding together a number of public and private organisations operating in regions other than Tampere (*e.g., Pori and Seinäjoki*).

In terms of power, though intervening in policy design and agenda setting, TUT’s position acquires distinctive contours when considered the transformative power of an array of university resources aligned with the regional needs and expectations. In this sense, and taking into account the clearly defined distribution of responsibilities across the networks, when discussing the place of TUT in the power relational structure, the point at issue is the positive effect that the development resources generated at the university and put at the service of the region exert on the stability and plasticity of regional networks, rather than the *loci* where controlling functions are located. In addition, the scientific and technological potential available at TUT has revealed to be an essential factor to tap supra-regional resources into the region. Accordingly, TUT influences the access of the region to supra-ordinate regulatory and resource allocating powers (*e.g., the scientific expertise available at TUT is at the heart of Tampere’s strengths when competing for the allocation of funding streams related to the national regional policy, such as the case of the CoE programme*).

The increased policy interest on innovation and science and technology occurred in the 80s at the national level, opened up a number of new structural opportunities to which Tampere region targeted its mobilising endeavour. TUT has played a prominent part in enhancing the regional capacity to identify and take advantage from these supra-regional

development opportunities, which proved to be decisive to strengthen the regional reinvention process (e.g., *TEKES technology programmes or, again, the CoE programme*). The university has given this contribution not as a leading organisational arena but, rather, as an integrative piece of a network-based development machinery made of a somehow restricted group of key regional players. The same could be said about TUT's influence in giving shape to the regional agendas for action. This influence can be looked at from three different points of view. Firstly, much of the agenda setting, or, more accurately, the development targeting, takes into account the scientific and technological potential existing at the university, as well as the web of relations it maintains (mostly) with industry (e.g., *the cluster-based development policy approach*). Secondly, TUT provides the region with specialised prospective knowledge that informs policy-making processes (e.g., *the foresight activities ongoing in the Pirkanmaa Regional Council*). Thirdly, the recognised prestige of the university, as well as of a number of individual academics and other staff, turns TUT into a source of advice and new ideas for local and regional policy-makers, giving rise, in some cases, to improvements that would prove to be determinant for Tampere's development trajectory (e.g., *the foundation of Hermia science and technology park*).

TUT is a change agent placed at the centre of the regional structures and mechanisms upon which knowledge and relational resources are mobilised. Rather than in isolation, TUT's role should be analysed as part and parcel of the collective capacity associated to the core group of organisations that digests external pressures and opportunities and translate them into local development pathways. TUT, in fact, empowers the group's ability to collectively perform the functions of *brokers, openers, developers* and *maintainers*, which is at the basis of a sustainable high level of institutional capacity.

10.2.2

Institutional “*spirit*”, institutional thickness and networks...

“*Individual researchers at TUT can do what they want when interacting with the outside world. The same can be said of the university departments and institutes*”. These words uttered by one of the interviewees mirror a widely shared view on the way the university develops its third mission. At first, the statement can be interpreted as signalling

a quite loose academic organisation, whose collaborative work with society, on the one hand, depends almost exclusively on the will and agency of individual researchers or units, and, on the other hand, escapes any regulative framework. The same interviewee clears up the meaning of his words: *“I do not want to suggest that there are no rules. What I mean is that both individuals and departments are endowed with a lot of autonomy concerning the modes and intermediating vehicles chosen for developing linkages with industry”*. He adds: *“This can be related with the absence of an overall strategy, as well as of an internal service aimed at organising such interaction. In fact, there are clear, strict and straightforward rules in TUT concerning collaboration with industry. These rules do not aim at controlling the work of researchers or units, they rather target the coherence between education, research and third mission activities. There are historical reasons behind this, namely the need TUT felt to put together a set of rules in order to face the unfavourable environment for university-industry links that existed in Finland during the 1970s”*. Signalling the existence of regulations, collaborative research with industry is limited to those domains constituting strong areas of academic expertise, meaning that, following one of the interviewees, *“the autonomy of individual academics, departments and institutes is still high, but only within specific research clusters, or, in other words, it is very important to get the money from industry, but this should be done in close connection with academic research”*

The match between areas of co-operation and academic research spearheads can be regarded as part of the answer to the tensions that are expected to occur when trying to achieve scientific international excellence while maintaining close collaboration with industry. The question in Tampere, according to an informant, often takes the form of *“whether TUT is selling its soul to industry”*. Within the debate, TUT’s position, at the highest-level, is that the proximity to industry remains the university’s main strength. Rector Jarl-Thure Eriksson considers that *“there are no juxtapositions or contradictions between basic and applied research”* (TTC, 2002, p. 14). *“We have many examples of how results from basic research have led to new product ideas that are commercially interesting”*, adds Eriksson (id.). As put by a member of staff, *“even smaller projects aimed at solving problems in firms are frequently included in bigger basic research initiatives”*. In addition, according to the same interlocutor, *“the benefits TUT takes from its co-operation with industry go beyond funding, since the work with companies is a*

learning process that allows for improving both university teaching and research". These points of view find consonance in regional industry. Companies tend to give significant value to the basic research carried out at TUT (e.g. KAUTONEN, 2006). A firm manager says: *"our company is sponsoring basic research at TUT, but we cannot ask the university to develop what we need. However, we are paying attention to what TUT is doing and if something useful is detected, we will start the development of a new product based on the research results"*.

The seemingly untroubled intimacy between academic research and the world of production is well evidenced by the story of some spin-offs that grew upon scientific developments achieved by TUT researchers. The common perception, using the words of an interviewee, is that *"many start-ups would not be able to grow if TUT had not been so flexible and open"*. In 1991, for instance, as soon as breakthrough research results in optoelectronics were achieved, and realized the non-existence of businesses in the area, a group of researchers decided to found a company. In the words of one of its promoters: *"at the time, there were no risk money, loans or industries interested. We had no money to rent or buy our own space, so the firm started its activities within TUT facilities. The work related with the company was carried out in the evening, after the normal teaching schedules. Despite this limitation, it was good for TUT, which has optimised its equipment and laboratories, as well as for the firm, which has avoided the pressure inherent to the need for spending lots of money in facilities "*. The situation lasted until support of Finnvera, the national public venture capital firm, has been granted. *"We could then invest in our own equipment and pay a rent for floor space outside TUT, which meant the end of our interference with the students and, consequently, of our work off normal schedules"*, says the academic entrepreneur. The firm grew very fast and turned to be a quite profitable business. In 1996, 80% of the firm has been sold to an American group, and, in 2003, particularly due to the possibility of transferring the activities to California, some of the original promoters left to develop a new entrepreneurial venture.

The story of this spin-off is a good reason to recall the *symbiotic* relationship between TUT and Hermia Science Park, where the majority of new academic research based ventures give their first steps. The physical proximity between the two organisations is translated into a close operational collaboration, which, as suggested by an informant, *"helps the university to overcome eventual conflicts between the values of academia and*

the practice of working with industry". Hermia is a privileged arena of intermediation between TUT research and industry. The technology centre is endowed with skilled people specialised, on the one hand, in identifying academic research results that can be applied in industry, and, on the other hand, in helping firms to access new technologies stemming from university research and applying them in productive processes. In addition, through consulting and planning, firms are assisted to understand the existing complex set of funding programmes dedicated to foster university-industry interaction, which, according to a member of Hermia, "*contributes to find the more adequate resources to put in motion the transfer of new technologies and their application in production*". Additionally, through Hermia's Business Development Services (a private organisation since 2002, owned, among others, by Hermia Technology Centre Ltd and the City of Tampere), support to academic entrepreneurship is provided. About 250 business ideas are analysed per year, giving rise to approximately 20 new firms, some of them resulting from TUT research, either involving the academics as entrepreneurs themselves, or finding managerial alternatives to ensure the use of available knowledge in production¹⁴⁷.

The external infrastructure supporting TUT's work with industry also comprises *Tamlink Ltd.*, a private firm owned by the university, SITRA, *Finnvera* and the City of Tampere. Established in 1986, *Tamlink* specialises in technology transfer, bringing together TUT and industry in product development, consortium, and EU projects, and in research results management activities. The firm is a kind of subcontractor of TUT for the management of the university's *knowledge fund*, whose aim is to commercialise research results. Usually, it is utilised when firms do not want to make direct deals with TUT, due to such situations as intellectual property problems or secrecy. On November 2006, TUT has acquired the majority share of *Tamlink*. The acquisition was aimed at integrating TUT "*more tightly as part of the Finnish innovation system*" (www.tut.fi).

The CoE programmes ongoing in Tampere region, particularly those managed by Hermia, – mechanical engineering and automation, and ICT -, provide an additional organisational platform upon which TUT relies to balance academic and commercial modes and purposes of action. The network-based architecture of those regional

¹⁴⁷ The case of *Fogscreen Ltd.*, manufacturing walk-through screens, is often cited to illustrate a situation in which the researchers at TUT responsible for the scientific developments that formed the basis for the new product did not want to become entrepreneurs. Hermia Business Development Services found a non-academic manager and a company that shares ownership of *Fogscreen* with TUT researchers on a 50% basis.

development programmes, binding together companies, public bodies and science and technology organisations in a collaborative environment that, as put by an interviewee, “owes its success to the installed collective capacity to digest global and local knowledge”, sets favourable conditions for the establishment of a kind of *virtuous circle* within which, in the words of another informant, “*basic research feeds applied research and applied research gives strength to basic research, and, at the same time, international knowledge is adapted to local needs, and locally generated knowledge gains power to be internationally recognised*”. Taking this perspective, the intense participation of TUT in such co-operative programmes like the CoEs is far from bringing turbulence into the academic settings. On the contrary, it seems to improve the internal capabilities to excel in international academic arenas.

Despite the *virtuous circle*, several organisational changes are underway at TUT. This is mainly due to the introduction of new national laws and regulations concerning the role of higher education in economic development that, according to a member of TUT’s staff, “*is implying to find out new ways of doing things*”. The possibility of universities to invest in spin-off companies or the obligation of researchers to communicate any achieved invention to their universities’ administration are two examples of the changing national framework. TUT is developing an internal organisation directed at the commercialisation of results, either through incubation or licensing mechanisms. An immediate consequence was the establishment of a different relationship between TUT and Hermia, namely in the field of business incubation and licensing. As an informant says: “*TUT still is a close partner of Hermia’s Business Development Services. But, as soon as the university has started to put together its own organisation to commercialise research results, the links between the two are not so strong as they were before*”.

Additional organisational changes can be identified. According to one of the interviewees: “*earlier, heads of TUT’s departments could make a direct deal with a company. They only needed to let the central administration know about the deal and to ensure the 10% amount due as overheads [the overheads are allocated to the university’s so called support fund, which, benefiting also from industry donations, is directed mainly at financing MSc and PhD courses in cooperation with firms]. Nowadays, every deal has to be signed by the head of the university’s central administration*”. As put by a member of TUT’s staff: “*though maintaining the independence, that is, a free choice of modes of*

cooperation, we are trying to bring coherence and a systematic approach to the collaborative work with industry, namely by providing guidelines about TUT's role in innovation". According to the same informant, "the guidelines are directed at knowing better what is innovation, rather than at improving the relationships between the university units and firms, which do not need much guidance, since those units are successfully interacting with industry for many years". Signalling this shift, an internal innovation unit has been created in 2004, aimed at, following the interviewee, "a systematic and coherent approach to the monitoring of the whole trajectory between research, commercialisation of results, and its application in industry". "TUT needs to have an idea about the possibilities of commercialisation of research results since the beginning of the researching activities", he adds.

Mirroring the changing organisational conditions, TUT is about to issue the university's innovation strategy, aimed, in the words of a member of staff, "to provide guidelines about the role of TUT in innovation". It is worth noticing that there were in the past attempts to wrap up the interaction with the world of production under the framework of a unifying strategy. The first one dates back to 1994, but, according to NIEMINEN and KAUKONEN (1998), it was a response to pressures of the Ministry of Education, rather than a deliberate effort to create an overall guiding framework, which, as the same authors (id., p. 26) argue, reflected difficulties "to steer with any unified pattern of management". It did not bring significant changes to the collaborative *modus operandi*. In fact, it was not approved by any official decision-making body. Still, it influenced the introduction of new administrative arrangements (e.g., performance-based management) and, above all, gave the motto to the development of departmental processes of strategic planning. Departments and institutes started to design their own strategies and, a "bit unexpectedly", as put by NIEMINEN and KAUKONEN (ibid., p. 28), to communicate their plans and needs to TUT's central administration. In this context, according to these authors (ibid.), the university's central administration took more responsibility for macro contextual factors, such as the demands presented by the national policy guidelines, whereas the departments focused more on detailed planning of micro contextual factors.

The changes being introduced in TUT, however, do not weaken the recurrent argument pointing to the existence of a kind of *institutional spirit* that makes cooperation with the external world, as put by a member of staff, "something natural and expected". According

to him, “*it can even be said that it is almost implicit when an academic comes to the university that he or she should work with industry*”, which is the reason for the widespread perception that “*TUT does not need any encouraging strategy to interact with industry*”.

The absence of a regional engagement framework does not mean that TUT counts merely on the initiative of individual academic or units and that collaboration with the region is a mere sum of piecemeal events. The active, both formal and informal, interaction of TUT with society is supported by organisational arrangements that, though based on a high degree of autonomy of academics and academic departments and institutes in terms of *modus operandi*, are liable to a set of clear rules, and, above all, reflect the institutional emphasis attributed to regional engagement and the tacit agreement, spread across academics and units, about the *naturalness* of engaging in third mission activities. Any existing constraints, as well as the recent efforts to increase the degree of formality (these efforts can be regarded as an internal response to the requirements of a new national policy, rather than as a result of an internally felt need to change the ways things are done), are directed mainly at ensuring the balance between education, research and third mission activities (*e.g., the restriction of collaborative work to areas in which TUT has high levels of educational and research expertise*). However, the seemingly absent organisational turbulence relies much on the proximity of TUT to infrastructures (*e.g., Hermia science park and Tamlink Oy*) and collaborative platforms (*e.g., the CoE programmes*) that, because of their aims, nature and scope, as well as high connectivity and convergence, effectively support a balanced and indeed reinforced relationship between the three academic mission realms.

The nexus linking TUT to the development process of its region can be summarily characterised as one that is supported by adequate internal and external infrastructural conditions, facilitated by an encouraging national higher education policy, underpinned by a long standing culture and tradition of openness towards the external world, and enhanced by the perception, widely shared by academic individuals and units, of the value of third mission activities. All this in the absence of a formal framework directed at fostering and guiding collaborative work with society, which, in a first instance, brings over arguments contradicting the attachment of a well-succeeded regional engagement effort to a sort of institutionalised commitment. One can instead talk about an institutionalised *spirit*

nourished and legitimated by highly favourable contextual conditions underpinned, at the regional level, by a thick institutional fabric and an effective network-based social organisation, and, at the national level, by a friendly and encouraging policy framework.

10.2.3

TUT and the regional system of innovation: a mutually reinforcing relationship

The evidence collected about the part played by TUT in Tampere development trajectory, as well as the organisational settings that assisted that part, allows for casting a glance over the strong integration of the university in the regional system of innovation. More importantly, it also suggests that TUT is instrumental for improving the systemic qualities of the territorial context, which, in turn, proves to be helping the university to grow as an academic institution. Accordingly, the following account is one of a mutually reinforcing relationship between TUT and the regional system of innovation in which it operates. “*When talking about TUT in the regional innovation system we are referring to a kind of win-win game*”. This statement, produced by one of the interviewees, heralds much of the commonly assumed perception that, using his words, “*Tampere would not be the same without TUT, and TUT, without the region, would not have achieved its current solid international prestige in a number of fields of academic science*”. A paradigmatic example can be drawn from the match between the selective cluster-based approach to regional development and TUT’s leading edge fields of research and strong areas of competence. One can argue that much of the international recognition achieved by TUT in specific scientific fields such as automation and hydraulics, ICT, and biotechnology largely relies on the major clusters of expertise that the regional system has focused on and TUT itself has helped to strengthen. Strong pieces of evidence are given by cases such as the Digital Media Institute (DMI), the Institute of Hydraulics and Automation (IHA), or the Optoelectronics Research Centre (ORC). TUT’s research on signal processing is being awarded by the Academy of Finland as Centre of Excellence¹⁴⁸ for several years. The IHA, a research unit with a long tradition of close cooperation with local industry, namely in the field of mechanical engineering, undertakes research whose level of excellence has been recently acknowledged by the European Union, which, under the framework of the

¹⁴⁸ The international recognition of research is a major criterion for the nomination as Centre of Excellence.

European Fusion Programme, allocated to Tampere a divertor test platform. This development became operative at the end of 2006 and originated the establishment – by the IHA and VTT – of ROViR (Remote Operation and Virtual Reality), a centre where virtual technologies, robotics and remote operation technologies are developed for benefit of industry. In fact, a related industrial forum has been already established, aiming at compiling the needs of industry. Additional evidence can be gathered in fields that are making to emerge new industries in the region, like the case of laser technology applications. The industrial links of the Optoelectronics at TUT are allowing the university to improve the machinery used in teaching activities. A firm owner involved in the process tells the story: “*we suggested to TUT the creation of an application centre of new laser technologies, because demonstrative actions were thought of as of importance for our business and for other companies operating in the area. TUT welcomed the idea and new lasers will be tested and demonstration actions will take place at the new centre. This development is quite relevant for industry, but it is also very important to the university itself, which, similarly to other universities, works and teaches using machinery that industry does not want anymore. With this new centre, TUT will be endowed with the most advanced equipment available in the field, which will enhance the quality of teaching*”. The same interviewee adds: “*the City administration is putting money in TUT to help the application centre to develop, which, in my opinion, shows that local public authorities are aware of industry needs, and value higher education as an asset to help them in their economic development strategies*”.

The last statement signals, on the one hand, the key role of the public sector in Tampere’s system of innovation, and, on the other hand, the high value public authorities attribute to higher education. The City of Tampere is a good example, as suggested in assertions such as the following: “*The main architects of the birth of the Tampere knowledge economy were not entrepreneurs, investors and industrial managers as in the birth of industrial Tampere, but perhaps most surprisingly were the ‘fathers’ of the city – the leading officeholders and elected officials*”, (KOSTIAINEN and SOTARAUTA, 2003, p. 428). According to the same authors (id.), the City of Tampere takes a central part in the regional development process “*perhaps not as much as a creator of ideas but rather as a quarter that has been ready to even take big risks and make quick decisions*”. As a quarter, the City has “*created institutional thickness and opened up new processes*” (ibid.). The

highly valuing of higher education resources, manifested at the outset by the City's decisive involvement in getting the university into Tampere, paves the way for strengthening the long collaborative tradition between the local public authorities and the higher education system. Using the words of an informant: "*TUT, as the whole regional higher education system, works in close cooperation with the City. There is a lot of collaboration in policy design and implementation. Programmes such as eTampere or BioneXt are good examples of the collaborative environment that characterises the links between TUT and the City*". The operative proximity between TUT and the City is also well established when recalled the episode that has ensued the creation of the City's Business Development Centre (BDC). Taisto Kaupinen, who had been employed by the BDC with the specific aim of developing a new technology centre, engaged in establishing a working relationship with TUT, where "*enthusiasm emerged immediately*" (TTC, 2002, p. 7). "*I even had my own room at TUT where I could meet students and personnel who were interested in entrepreneurship*", Kaupinen tells (id.).

TUT is operating within a system that, as in KOSTIAINEN and SOTARAUTA (2003, p. 433), "*has indeed been a political project in which local interests have had a great significance*". This political project, according to the authors (id.), emphasised the mobilisation of local actors and expertise, in an attempt "*to develop institutions, structures and processes so that the responding ability of the city develops and the nexus to different global flows and networks improves*". One can argue that it is more than a process of institutional thickening; it is, in fact, a process of institutional capacity building nurtured by easily and purposefully established bridges connecting a plethora of key public and private agents. SCHIENSTOCK et al (2004, p. 151) argue that these bridges "*have produced a good match between the private and public knowledge bases in the region*", an instrumental factor of Tampere's success "*in escaping the traditional resource-based path and forging ahead on a new knowledge-based development path indicated by rapid growth rates*" (id.).

The institutional qualities of Tampere are commonly used to explain the conditions that induced the birth and the systematic institutionalization of the knowledge economy in the region (e.g., KOSTIAINEN and SOTARAUTA, *ibid.*). The theoretical approaches to regional development highlighting trust and the generation of voice-based mechanisms as instrumental seem to find a *praxis* environment in Tampere's system of innovation.

According to a UTA's professor, "*here in Tampere, as in the whole country, people tend to trust in each other, which helps not only to make things happen, but to make things happen in a fairly short period of time*". The same interviewee, about the local capacity for bold and fast decision-making, gives an example: "*a newspaper from Helsinki has published an article in which the absence of big development projects in Tampere was noted. Our Mayor recognised the accuracy of the article and started passing the message across informal arenas that something had to be done. At the time, there was a big debate and a large number of initiatives in Europe in the fields of ICT. 'Let's make it even bigger in Tampere!' was the motto. These were the roots of the eTampere programme. The first discussions, involving key local actors, were kept at an informal level. Seven months after these first discussions the programme has been officially launched*". This story shows, on the one hand, the importance of informal contacts, based on trustful relationships nurtured by personal acquaintances and previous collaborations, and configuring what the interlocutor called "*informal policy communities*". On the other hand, it reveals the capacity, along the formalisation process of ideas, to gather and combine the both local and external knowledge and relational resources that mobilise the system to act collectively. Rapid decision-making also relates to what KOSTIAINEN and SOTARAUTA (2003, p. 423) call "*brothers-in-arms axis*", born during the post-war years with basis on the "*cooperation between the National Coalition Party and the Social Democrats*" and rooted on "*the members' comradeship during the war*". According to the authors (id.), this axis, still influencing the ways of doing politics in Tampere, allowed for the crossing of the traditional gap between the political right and left in decision-making.

TUT is normally involved in the initial informal debate of developmental ideas, mainly in an individual basis, that is, the university's participation relates to the (informal) individual contacts established between members of its staff and other regional agents (e.g., *the foundational ideas that would led to the creation of Hermia science park*). As soon as the ideas develop towards a formal policy operative framework, TUT's participation becomes institutionalised and an essential enhancer of the region's critical mass.

The relationships between TUT and the regional system of innovation place the university as component of a well-lubricated triple helix, upon which knowledge and relational resources are meshed together and mobilisation capacity is nurtured. This

completes a kind of *virtuous circle* defining a mutually reinforcing connection and signalling that the higher the systemic potential of the regional system of innovation, the stronger the university, and vice-versa.

The acknowledgement of the high systemic potential of Tampere regional system of innovation starts with the issue of power. Though operating in a highly centralised country, many municipalities are endowed with the autonomy (and the capacity to endogenously bring forth and/or access to external resources) to design and make operative their own development initiatives. Obviously, the larger the municipality the bigger its autonomy, such as evidenced by the City of Tampere, which clearly assumes a leading role in Pirkanmaa's development path. Power gaps among larger and smaller municipalities, however, become blurred by the collaborative environment characterising the relationships between them (*e.g., the so-called Tampere central sub-region, aggregating the main city and the municipalities of Nokia, Lempäälä, Kangasala, Pirkalla, Vesilahti and Ylöjärvi, or the associational platforms provided by the Pirkanmaa Regional Council*). The accomplishment of TUT's third mission takes advantage from this autonomy, either at the local level (*e.g., through policy initiatives such as the eTampere and BioneXt programmes*) or at the regional level (*e.g., the CoE programme*). Policy design and implementation maintain high expectations and value towards the resources available at TUT. These expectations and value can be extended to the whole system of innovation, whose components widely share the development agenda. In this context, the activation of the third mission finds an encouraging environment, which gains an additional dimension when brought over the qualities of Tampere's productive structure. The mutually reinforcing relationship comes forward namely through the match existing among TUT areas of scientific expertise, the specialised and globally competitive production domains, and the development clusters spotted by local and regional policy making arenas (*e.g., the CoE programme again*).

Underlying this sort of triple helix configuration, cultural features such as the valuing of trust and co-operation are second to none. The embeddedness of the associational paradigm, deeply rooted in history (*e.g., the 'brother-in-arms axis'*) places the regional system of innovation higher in the systemic potential scale and, concomitantly, endows it with the capacity to act swiftly and evolve rapidly towards renewed development pathways, or, in other words, to foster social innovation. The university-region nexus, in

this knowledge-valuing and co-operative context, becomes fluid. TUT provides the region with a range of knowledge and relational resources that sustains and reinforces the regional capacity for collective action and, in turn, the *reinforced* region opens up opportunities for a balanced development across the three basic academic missions.

10.3

Aristotle University of Thessaloniki: inducing change and building trust

In 1925, just a few years after the liberation of the so-called northern *new territories* of Greece from the Ottoman rule, the country's second university had been established in Thessaloniki, under the patronage of the famous Greek politician Eleftherios Venizelos and the then Prime Minister Alexandros Papanastasiou. ATh is presently the largest higher education organisation of the country and one of the biggest in Europe, enrolling more than 95,000 students and employing over 4,000 people. These impressive numbers are further stressed when considered the 430,000 square meters campus area located at the city centre and the several faculties, schools and university organisations spread over the region (e.g., Serres, Fiorina, and Kozani). PAPANASTASIOU (2004, p. 14) associates ATh's size to a high level of organisational complexity, classifying it as "*the most complex institution of higher education in the country*". The university has 7 faculties, within which 37 schools offer education and develop research in a broad scope of scientific fields (**Table 10.2**). In addition, it has several independent schools and research laboratories, as well as a number of organisational offshoots (e.g. the Experimental School, a model primary and secondary education aimed at providing practical teacher's training for university students).



According to the university's rectorate (ATH, 2005, p. 5), ATh "*is called upon to fulfil a triple mission: ensure the production and dissemination of scientific knowledge through teaching and research, provide the necessary means for a successful career both to its students and its academic and teaching staff, and contribute to the satisfaction of social, cultural and development needs at a regional, national, and international level*".

This statement, though following the nationally defined prescriptions about the mission of Greek universities, carries with it a small but significant change. In fact, until 2005, the *country* was the geographical focus in the official AUTH's mission statement. The inclusion of the regional scale might be associated with the recent change dynamics that took place in Central Macedonia, in which AUTH had a central role, as it will be evidenced further on. Change gave rise to an increased recognition of the region as policy-making arena and the uptake of new strategic thinking that is looking at innovation, in its tangible and intangible aspects, as a critical development issue in a less favoured regional context.

Table 10.2 – AUTH: basic figures (2005)

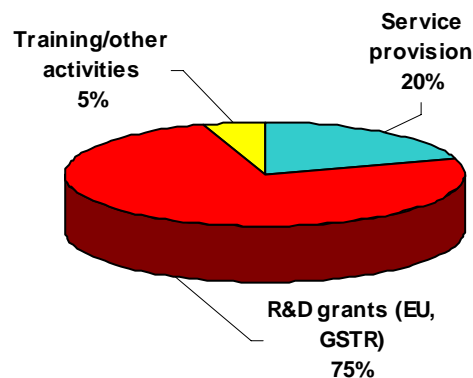
Date of foundation	1925
Number of students	95,138
Undergraduate	86,115
Postgraduate	9,023
Staff	4,047
Teaching and research	2,285
Scientific teaching staff	115
Special laboratory teaching staff	336
Special technical laboratory staff	492
Administrative staff	819
Faculties	7
Schools	37
Independent schools	5

Source: AUTH

AUTH is the kind of higher education organisation that, namely because of its size, makes obvious how the mere presence of such an organisation exerts huge direct impacts on local expenditure, income, real estate markets, etc.. Moreover, the university is actively involved in research and technological development projects, as shown by the following figures (www.auth.gr): R&D funding, in the past five years period, amounted to approximately 15 million €; about 12,000 external associates have been employed in R&D projects, which makes AUTH one of the biggest scientific employers in Greece; 250 AUTH laboratories have participated in EU funded projects. What the numbers do not unveil is the extent to which, on the one hand, the impacts of AUTH go beyond such quantifiable measures as multiplier effects and so on, and, on the other hand, R&D activities are contributing to regional development and making operative the regional dimension of the third academic mission.

The analysis of documental sources, which tend to place the regional role of AUTH under the framework of the narrow perspective on the second academic revolution, originates a somehow contradictory outcome. For instance, according to the figures provided by the AUTH's Research Committee (RC, 2002), in the period between 1999 and 2001, about 20% of research funding came from companies, representing about 37% of the total number of projects (**Figure 10.2**).

Figure 10.2 – AUTH's research funding sources (2001)



Source: RC/AUTH

Moreover, according to the same source (id.), 45% of the total number of AUTH's *clients* operated in Central Macedonia (17% in Attica and 6% in Crete), which, at a first sight, would indicate a significant interaction between the university and the regional economic fabric. However, the previously cited work of KYRGIAFINI and SEFERTZI (2003) on university-industry interaction in Central Macedonia draws a completely different picture, according to which, if taken the narrow perspective on the second academic revolution, AUTH does not rank very well. The authors (id., p. 904) offer sound evidence of the “*low levels of systematic collaboration, and the limited knowledge transfer activities*”, which “*render interaction between the [technology] demand and the supply side [...] irregular and weak*”. The diagnosis made during the RTP exercise (KOMNINOS, 1997), suggesting that the overwhelmingly majority of Central Macedonia's businesses do not consult universities and research institutes when looking for problem-solving solutions, confirms this state of affairs. The contradictory ground gains a new dimension when brought over the results of a survey on the needs for strategic intelligence in ICT companies located in Central Macedonia (URENIO, 2004). Though operating in a typical

sector of the so-called *new economy*, only approximately 10% of the surveyed firms attributed great relevance to universities as a source of information, while about 33% judged that source as not relevant at all. Additional evidence is offered by the research developed by BAKOUROS et al (2002) about the interaction between firms incubated in three Greek science parks and universities. On the case of Thessaloniki (together with Crete), the authors (id., p. 126), conclude: “[the] *results did not confirm our expectations about the role of a science park in bringing together university and industry*”.

According to one of the interviewees, the contradiction “*becomes apparent when considered that, in Greece, most collaboration between universities and industry takes place within the framework of research projects financed by public national and European programmes in which the set up of partnerships involving research institutes and firms is a basic requirement*”. A possible interpretation of this statement is that often the motivation of firms to interact with universities, rather than driven by an explicit demand for academic research assistance, stems from piecemeal opportunities to access funds, both national and European. Referring to the case of AUTH, the same interviewee adds: “*we have a large number of research institutes with high potential for helping industries in their technological and innovative capabilities. The co-operation between universities and regional companies is limited and, when it exists, it is mostly financed by national or European mechanisms. This means that we are mainly talking about research and development projects that put university laboratories and some firms working together*”. “*The problem is that when the project final report is completed, this normally represents not only the end of the project itself but also the end of the linkages between the academic and business partners*”, he concludes. Information about the number and type of regional firms interacting with AUTH would be helpful to look for sounder evidence to deal with the contradiction. However, the university did not authorise the disclosure of this information.

Whatever the intensity of university-industry interaction in the region, the fieldwork carried out in Central Macedonia gave strong indications that, first, the link between the third academic mission and regional development is a relatively new theme in the region, and, second, the extended mission faces several hampering factors, of which, the national higher education legal framework and the inherent academic organisation, as well as the predominant features of the regional productive system, are second to none. Still, as

commonly agreed by the agents interviewed in the region, AUTH, though acting in an environment that is far from being favourable, is regarded as “*a key innovation player in the region*”, which, arguably, brings over another contradiction. By using an analytical approach stuck to the narrow perspective on the second academic revolution, this contradictory ground would be difficult to disentangle. Arguably, an extended perspective allows for settling the matter, namely because opening the opportunity to look at the decisive role AUTH played and is playing in changing deep-rooted development policy and practice paradigms.

10.3.1

Opening minds and new development paths: a major contribution of AUTH

As highlighted in the previous chapter, the recent policy developments in Central Macedonia enabled, using the words of TSIPOURI (1998, p. 295), a “*momentum of change and trust-building*” in the region, which, above all, had the merit of placing innovation in a policy agenda hitherto almost exclusively focused on physical infrastructures, while boosting new working practices and ways of bringing together public and private actors. The RTP process is commonly regarded as being the foundational stone of the dynamics of change, as illustrated by the words of one of the interviewees: “*before the RTP, innovation was far from the regional agenda, and even the understanding that we could deal with innovation in the region did not exist*”. Bearing in mind that the initiative to develop the EU funded pilot action was due to AUTH, a promising signal of the relevant university’s regional role comes forward. Moreover, the key role in regional innovation attributed to AUTH gains clearer contours and, most importantly, places the university at the forefront of a planning effort that carried much of a process of institutional capacity building. In this sense, the position of AUTH as an agent of developmental change, rather than judged by its capacity to transfer the knowledge it generates to the regional productive fabric, seems to be adequate to explore looking at the university as a provider of the knowledge and relational resources that not only opened up the opportunity for a mobilising momentum, but also to sustain it over time in a territorial and academic context whose conventions and formal rules were far from being favourable.

The details of the RTP story, as well as the subsequent initiatives, are a good departure point for the attempt to look at AUTH as a builder of institutional capacity. Central Macedonia, mainly because of its distinctive industrial performance within Greece (cf. TSIPOURI, 1998), had been one of the three Objective 1 regions suggested by the EU to the Greek government to pilot the RTP exercise in less favoured areas. URENIO, a research unit operating in AUTH's Department of Urban and Regional Planning and Development (School of Engineering) was the active part of the university setting off the process. As told by an informant who has been directly involved in the process, "*URENIO informed the regional administration that there was an opportunity for starting to do something about innovation in the region*". "*They said no*", he adds, an answer that mirrored the low importance attributed at the time by the regional powers to innovation. This stance is well evidenced in TECHNOPSIS (1998, p. 118): "*[...] the reason behind this lack of interest was that RTD was not high in his [the Regional Secretary's] agenda*". The negative answer could have had, in fact, a demolishing effect on any attempt to proceed, since the Regional Authority, as first step to be taken in order to allow the participation of Central Macedonia, should send a formal letter to the European Commission expressing its commitment to support the exercise and ensure match funding. As the deadline was coming closer and the Regional Authority was not showing any signs of flexibility, URENIO researchers turned their attention to the Ministry of Macedonia and Thrace. The persistency of URENIO staff would be rewarded, as they found in that Ministry the political support needed to succeed in Brussels. The same interviewee says: "*the Minister was very supportive and one of the Ministry's consultants [a regional planner who had strong links to AUTH] was very enthusiastic about the initiative*". Meanwhile, the promoters looked for allies within the regional industry. The effort brought to the play the powerful and influencing Federation of Industries of Northern Greece (FING), an ally that would prove to be quite important during the planning process.

The proposal of the Central Macedonia's RTP would be approved in Brussels and the process initiated with basis on a triple alliance between the Ministry of Macedonia and Thrace, AUTH and industry, which, according to TECHNOPSIS (id., p. 119), "*proved sufficient to mobilise the rest of the relevant actors in the region with the exception of the regional authorities*". The same source (ibid., p. 118) points out: "*While the intervention of the Ministry saved the project it also triggered a long lasting confrontation with the*

Regional Authority, who considered that the Ministry went beyond its legal competence. The General Secretary and the administration in the Periphereia¹⁴⁹ virtually ignored the existence of the RTP for a very long time. Thus the RTP started in a joint effort of the AUTH and the Ministry with non-negligible hostilities from other relevant actors”.

URENIO assumed the coordination of the RTP and put together the whole steering and administrative machinery to cope with the EU requirements. The research unit has done this almost in isolation from AUTH top administration, which, at the time, had a passive stance towards the initiative. This is well evidenced by KAFKALAS and KOMNINOS (1999, p. 115), who talk about the “*gradual build-up of the interest to participate and support the RTP efforts*” that the management unit has put in motion, and include AUTH in the set of regional partners that were targeted by those mobilising efforts. Under the influence of the RTP planning principles defined by the Commission, URENIO started by setting up an idea around which a set of intertwined targets was established and, subsequently, provided the arena for the bargaining between interests, the clarification of misunderstandings and the balance between competing and/or cooperating partners (id.)¹⁵⁰. According to KAFKALAS and KOMNINOS (ibid., p. 117), the management unit “*had a decisive role in maintaining clarity and cohesion of the initial concept as well as in coordinating the involvement of partners and the deliverables of the many specialised working groups at each stage*”. This role has also been instrumental to build up a wide consensus on innovation targets in a region lacking a consensus culture, and a development agenda focused on innovation. The persistency of the AUTH research unit shown at the very beginning of the RTP process was called forth again in the consensus building effort, not only because of the unfavourable environment, but also due to the difficulties and ups and downs found during the exercise, much of which, as pointed out in TECHNOPSIS (1998), were associated with the fact that it was a university assuming the leadership: “*alone the fact that the promoter was a university created conflicts and often reduced the efficiency of the whole process*” (id., p. 129). The mistrusting stance fed by the prevailing uncooperative

¹⁴⁹ *Periphereia* is the Greek word for region.

¹⁵⁰ “[...], the instances of competition were more numerous in the beginning, while at the later stages there was greater need to have time in order to elaborate the framework of cooperation. Furthermore, competition, at least in the beginning, was greater between the partners with similar interests such as, for example, competition between government agencies for political control and supervision, or between the technological service-providers for having priority access to R&D funding. It was very important to have the initial competition settled before any serious debate concerning the priorities of the action plan for the promotion of an Innovative Region Strategy”, KAFKALAS and KOMNINOS (1999, p. 115).

way of action that characterised the development trajectory of Central Macedonia can be regarded as rooting the difficulties. The strength of the promoter, as the same source (ibid.) identifies, “*was the strategy of keeping a low profile and assuring the support of the business world*”. As part of the consensus building effort, while bringing together key innovation agents that hitherto had worked in isolation, the management unit filled in the knowledge gap on the existing innovation capabilities available in Central Macedonia. This is often regarded as a major achievement of the RTP (e.g. NAUWELAERS and MORGAN, 1999), namely because supporting the detailed monitoring of the regional innovation system, which would in fact contribute to mould the policy initiatives and action programmes that followed the RTP. According to a member of AUTH’s staff, this allowed for “*the continuous observation of the regional innovation system evolution and, simultaneously, a closer interaction with firms, namely SMEs, and the promotion of a new, more innovation oriented mentality*”.

One can argue that the experience of Central Macedonia mirrors a university-driven process of institutional learning deploying significant dynamics of change, particularly in culture and frames of reference. In the words of one of the interviewees, the “*cultural changes in business associations and firms, and the reorientation of existing innovation infrastructures*”, as well as “*the recognition among a wide array of actors of innovation as a fundamental asset for regional competitiveness*” were the most relevant outcomes of the RTP. The process opened the opportunity for establishing new partnerships and new ways of designing and delivering regional development policies. The close cooperation between the Regional Authority, - distant and even adversarial at the beginning of the planning process-, and AUTH is a good illustration of the changing environment. In fact, from a situation in which, as in TECHNOPSIS (1998, p. 130), “*the general practice in Central Macedonia [...] was that the regional authorities ignored researchers in their planning process and successful researchers found their alliances outside the region*”, the region evolved towards a stage in which, using the words of the current General Director of the Regional Authority¹⁵¹, “*AUTH and other higher education institutes existing in the region constitute the basic source of specialised knowledge and the basic consultant of the region*”.

¹⁵¹ The current General Director of Central Macedonia’s Regional Authority has played a crucial role in the setting off of the RTP process. He was, at the time, the consultant of the Ministry of Macedonia and Thrace, who, together with the Minister, provided the political support required by the European Commission to put in motion the programme.

and the Regional Council in the configuration of specific questions in regional policy issues". According to the same interviewee: *"during the recent process of planning the Regional Development Strategy for the 4th EU programming period, a team of experts, proposed by the universities and the technological colleges, was constituted aiming the elaboration of proposals concerning a variety of domains"*. AUTH is involved in this policymaking process in the fields of territorial and urban development (Spatial Development research unit), integrated agriculture and quality of agricultural products (Faculty of Agronomics), and innovation and development (URENIO research unit). The closer relationship between the Regional Authority and the university, as argued by a researcher at AUTH, *"was a factor of most importance to place innovation as top priority within the new 2007-2013 programming period"*.

The institutional change path opened by the RTP continued to be strengthened by a continuum of EU initiatives, such as, for instance, the RIS, the RIS+ and the Innovative Actions Programme. URENIO kept the leadership of these follow-up initiatives and funds made available by the regional Operational Programme 1999-2006 were earmarked to undertake a number of the innovation-directed actions that had been defined with basis on the consensus established during the continuous planning process. The placement of innovation among the regional policy priorities was followed closely by the renewal of the region's innovation infrastructure (e.g., the innovation observatory, the incubators, a new technology park dedicated to ICT, new research centres). In addition, a soft infrastructure of networks, sector associations and clustering activities (CEC, 2005b) was gradually developed, focussing mainly on four new industry and service clusters – organic food, ICT, consulting and health technology -, thought of as reflecting the industrial strengths and needs of the region (id.).

The continuous process of interactive learning started with the RTP is currently being kept alive by a number of initiatives that are strengthening cooperative networks involving the key regional innovation agents and, particularly, collaborative platforms upon which the university works together with the Regional Authority. A good example is the institutionalisation of regional foresight as a tool for policymaking. The first foresight exercise at the regional level in Greece has been carried out in Central Macedonia, as a result of a proposal made by URENIO to the Regional Authority. As soon as funding (from the EU and the national government) was secured, AUTH's Research Committee (see

below for details on this university body) took the lead and, in articulation with the Regional Authority and a consulting firm (a spin-off from URENIO), started an exercise that would prove to be an important tool, on the one hand, to maintain and enrich the mobilising momentum initiated by the RTP initiative, and, on the other hand, to improve the knowledge basis supporting regional development policymaking, namely the Regional Development Plan under the 4th Community Framework. During approximately two and a half years, more than 70 experts, working in different development areas with the time horizon set to 2018, created a learning platform that, in addition to in depth prospective information, brought a number of more intangible results, of which, as put by an interviewee, the “*reinforced awareness and motivation*” or the “*enhanced synergies between regional firms, research institutes, universities and policy-makers*” stand out.

The changing regional environment opened windows of opportunity to create more favourable conditions for improving the incipient relationships between research and production. A good illustration is provided by the growth registered in the activity of the Thessaloniki Technology Park (TTP), which was established in 1990 and started its operations in 1995. According to one of the interviewees, “*there is a lot of enthusiasm around the development of new technology-based firms*”. He adds: “*there were about 160 applications for a place in the TTP, coming from a variety of sectors and types of entrepreneurs, of which 25 were selected. Fourteen of those selected new ventures have already left TTP facilities, and most of them are competing in global high-technology markets. Presently, 11 firms are located in the TTP*”. It is worth mentioning that, among the 25 selected industrial projects, 12 resulted from research carried out in AUTH. The expectations on entrepreneurship promotion, according to the same source, “*are kept high, namely because there are new policy supportive events coming to the forefront, such as, for example, the Thessaloniki’s regional pole of innovation*”. Besides entrepreneurship, other activities signalling the improved conditions for research-industry interaction are taking place in the TTP, such as those promoted by the Centre for Research and Technology Hellas (CERTH), located in the park since its foundation in 2000. In 2004, CERTH’s turnover reached approximately 18 million €, of which about 45% were generated by contracts with industry. Though mostly co-operating with large foreign firms, the amount of CERTH’s collaborative work with regional industries is increasing, namely in the field of fuel processing, chemical processes, and renewable energy. The nearing of

CERTH to regional industry can be regarded as a direct consequence of the changing dynamics initiated with the RTP. In fact, one of the several follow-up projects, funded by the EU Innovative Actions Programme, gave rise, in the period 2002-2004, to the creation of 9 technology clinics¹⁵², implemented by CERTH. The objectives were to raise SMEs awareness of innovation and to implement customised action plans directed at firms' specific needs. According to a report on the project's results (CERTH, 2006, p. 1), "*the process introduced innovation to SMEs in the region*" and "*the mechanism of technology clinics for transfer of technology between research organisations and SMEs was an innovation for this region*". An additional note refers to the *innovation* consisting of "*the participation of SMEs in terms of contribution of financial resources (no 'in kind' resourcing was allowed)*" (id.). The project has involved technological audits to 110 firms, resulting in 30 actions implemented. URENIO and AUTH's Research Committee were represented in the project's steering committee.

Much of these improved conditions for a closer relationship between research and industry were created by AUTH, namely through URENIO, with a strong basis on innovation conceptual and good practice knowledge resulting from international research networks participated by that unit. These knowledge resources are being used not only to maintain over time the mobilising environment created by the RTP exercise, but also to provide the regional productive fabric with specific innovation support services. This is the case, for instance, of the assistance being offered by URENIO on innovation management techniques. The service is linked to a network binding together academic and technology organisations from 18 European countries, and runs upon virtual platforms, including technology watch services, benchmarking, technology transfer and technology clinics, new product development, and supply chain management.

"It is too soon to see more concrete outcomes, but we can take for sure that Central Macedonia is not the same region as it was ten years ago. We are now much better prepared to face the challenges of globalisation and to reinforce our position in Southeast Europe, mainly because we have learned that it is working together to follow common

¹⁵² A technology clinic, following RHISIART et al (2000, p. 2), "*is an activity implemented by a technology support organisation which aims to bring together a series of priorities in the development of small and medium sized enterprises (SMEs); technology problem solving, technology watch, and technology transfer*". The same authors (id.) add: "*The aim is that the process of going through a clinic would equip a SME with the appropriate know-how and support from technology experts to allow it to successfully implement new technologies*".

purposes that we will ensure a better future for our region". This statement produced by one of the interviewees, mirrors the dynamics of institutional change that percolated Central Macedonia in the last decade. The change process had a major contributor in AUTH, (or, at least, parts of it), which, by providing specialised knowledge, nurturing relational resources and meshing these together in order to mobilise the region around a renewed development policy focus, played a decisive part to unlock institutional inertia in a territory where there was not the culture or the will to do it.

The knowledge resources tapped into the region by AUTH underpinned institutional change in Central Macedonia. Pieces of knowledge derived from the interpretation and the linkage to local circumstances of the conceptual framework and the mechanics of systemic innovation, made by AUTH's research unit URENIO, proved to be the backbone of change in the region. In this sense, when looking at the range of knowledge resources provided by the university, the spotlight is turned on the knowledge felt as needed to overcome the associational shortage that affected the region and to sustain and legitimate change, or, in other words, the basic organisational deficit constraining a typical LFR. One can argue that the supply of knowledge for change comprised the transformation of encoded knowledge (*e.g., the knowledge on innovation systems and regional innovation organising principles*) into knowledge of embedded nature (*e.g., the RTP and the planning continuum it has initiated*). It ensued social innovation and improved the framework conditions that would allow for the diversification of the transfer of knowledge resources from AUTH to the region, such as the specialised knowledge aimed at informing policy-making (*e.g., the knowledge provided by AUTH influencing the design of the regional operational programme 2007-2013*), and the knowledge supporting the productive fabric (*e.g., the innovation management techniques programme run by URENIO*), and, maybe less intensively, the creation of new firms (*e.g., AUTH spin-offs growing in the TTP*).

The range of knowledge resources coming from AUTH, because introducing a new development paradigm, can be regarded as a critical factor in changing the frames of reference for action. The infusion of such knowledge originated a profound shift in policy focus, which brought over innovation as a central issue, in tandem with the hitherto overwhelmingly predominant objective of physical infrastructure development. Accordingly, new ways of policy design and delivery, more based on the associative potential of key regional agents came forward (*e.g., the regional innovation pole*

programme). Moreover, university knowledge, which has itself rooted change, entered the set of resources widely thought of as essential to act under the renewed frame of reference. Concomitantly, the conditions for a higher integration of such knowledge across different public and private agents have significantly improved, particularly concerning the flows of knowledge between the university and the regional policy-making arena.

As holder of a lion's share of the process of institutional change in Central Macedonia, AUTH, or more properly URENIO, was the responsible for increasing permeability to new ideas, new information and knowledge sources, and *modus operandi* of a system hitherto introverted and conservative (*e.g., the relevance of foresight as a generator of knowledge and information for policy-making*). The consequent gain in openness towards learning and innovation, in turn, has lifted AUTH's regional mission to a superior state, since the university is assumed as a key player in the networks that are striving to improve the performance of Central Macedonia in the so-called knowledge society.

The region is breaking with a long tradition of institutional dissension and organisational disembeddedness. The shift in policy focus and the raise of awareness in relation to innovation and its challenges has extended the regional associative potential. AUTH integrates the most relevant networks build up in the region to achieve its development objectives. The morphology of these networks places the regional authority, entrepreneurial associations such as FING and the Northern Greece ICT companies' organisation, and independent research laboratories as CERTH, among the strongest partners of AUTH (*e.g., the steering of innovation support programmes*). There are though gaps to be filled in, as illustrated, for instance, by the unproductive lack of formal links between AUTH and the TTP, which jeopardises much of the innovative potential that is expected to stem from the proximity of academic research and those spaces of innovation.

At present, the major networks participated by AUTH evolve under the leadership of the Regional Secretariat and bring together a few (but influential) actors. One can refer to dense networks that, although limited in reach, concentrate the *intelligence* and the power to set up the regional agenda. Because established to design and steer development strategies and action plans that are mainly regional adaptations of national and European programmes, these networks acquire a formal nature. The represented regional agents function as switching points that, in each specific field of operation, connect the steering networks to more or less formal and action-oriented sub-networks (*e.g., CERTH*).

URENIO, which has been the precursor of the institutional change process that nurtured the relational resources upon which networking is relying on, can be regarded as AUTH's arm in the steering networks, generally holding a structuring and strategic position within them. As such, URENIO functions as a major link between the networks and other university's units (*e.g., the Research Committee*). The research group assumes also a critical role in providing the networks with strategic knowledge on systemic innovation it produces or captures elsewhere (*e.g., the knowledge spillovers stemming from URENIO's participation in international research projects*). In this sense, AUTH, through URENIO, becomes an important switching point connecting the steering networks to relevant external knowledge sources. In terms of the spatial reach of networks, there is an overwhelmingly weight of Thessaloniki area, which mirrors the firm belief that the innovation critical mass existing in the main city is essential to develop the whole region.

The proximity of AUTH to the regional power structures gives indication of a strong influence of the university on decision-making processes, which, in some cases, takes the form of a controlling position (*e.g., the network sustaining regional foresight activities*). The collected pieces of evidence, taken together with the relative incipency (tough improving) of links between academic research and regional production, convey the perception that AUTH's *real*, or at least most prominent and systematic, mastery and interference takes place at the level of policy and strategy making, not only in preparation and design, but also in forming the collaborative platforms where, in the end, resides the capacity to act (*e.g., the Central Macedonia's RIS and Innovative Actions Programme*). In parallel, the university, because of its scientific and technological potential, and national and international connections, provides the region with augmented arguments to access supra-regional and supra-national resource allocating powers (*e.g., the continuity of European funded initiatives directed at regional innovation promotion*).

In this context, one can argue that AUTH has a large influence on the shaping of regional development agenda. This influence extends to the matching between the agenda and the policy and programmatic developments ongoing both in Athens and Brussels, meaning that the university functions as a kind of lighthouse for the regional interpretation of policy trends and development opportunities (*e.g., the strengthened focus on innovation in the current regional plan and the stated goals of the programming period 2007-2013*). Moreover, the knowledge clusters that are at the core of the innovation efforts inserted in

the regional development agenda were defined, from the beginning, in the framework of initiatives run by AUTH (e.g., *the Innovative Actions Programme and the regional foresight initiative*), resulting, mainly, from an attempt to match academic expertise with the research and production dynamics already in place in such specific sectors of economic activity.

AUTH, through URENIO, has been the *animateur* of the institutional change process that freed the region from the moorings of a tradition marked by fragmentation and dissension. With perseverance and mastery, the research unit succeeded in overcoming barriers (e.g., *the adversarial stance of the regional authority politicians in the early 90s*) and convening key agents around a gradually shared view on the regional problems and possible solutions. The university can be regarded as a major change agent, mainly because opener of minds and new paths of development and maintainer of an enhanced associative way of thinking and acting (e.g., *the innovation planning continuum that followed up the RTP*). The bottom line is that AUTH initiated and fed a process of institutional capacity building that placed Central Macedonia in a better position to escape the laggard development status.

10.3.2

Organising for a changing environment: AUTH as a whole or just parts of it?

The dynamics of change introduced by the process of planning for innovation initiated with the RTP had, as expected, an impact on AUTH, as the expectations from the region and even the internal attitudes towards its role in regional development have also significantly shifted¹⁵³. Accordingly, new or renewed organisational arrangements, some of them aimed at a more specific focus on the needs of the region, have been set up in AUTH. Yet, the extent to which the regional development goals are trespassing the whole academic organisation appears to be far from achieved. A multiplicity of hampering factors, both external and internal to the university, is causing fragmented change within AUTH, with some parts of it enthusiastically embracing regional engagement, - either because of the effect of a rich past experience in working with the region (e.g. URENIO),

¹⁵³ Change should also be related to the developments occurred in national policy, which, as argued before, mainly by influence of the EU, fostered a new framework for research and its links with competitiveness.

or the increased awareness and willingness resulting from new perceptions about the regional academic mission (e.g. AUTH's Research Committee) -, and other parts neglecting the region as partner for academic development.

Among the set of hampering factors, the inadequacy of the national higher education legal framework seems to deserve widespread criticisms. This is set down in black and white in a number of documents: *“the legislation passed by the state is only targeted to roughly serve some patchy policies. [...] these policies do not usually take into account the existing structure, the potential consequences, the existing prospects, the viability potential of these bodies [organisations active in research and education], etc.”* (RC, 2002, p. 6). The need for changing the current legal framework was also claimed by several interviewees. According to one of them: *“we need to change mentalities in universities, regional governments and industries, we need translators establishing bridges between academia and industry, but one of our biggest problems is still the law. We have to change, and even if the national government does nothing, the universities should go ahead and try to overcome the situation ”*. Another informant stresses the *“huge developments”* that took place in the research and innovation legal framework, regretting that *“the same had not occurred in education”*¹⁵⁴.

The attempt to escape the *“legal strait jacket”*, as one interviewee labelled the restrictive higher education legal framework, has indeed originated a number of organisational developments that would be very important in the process of regional change. This was the case of the technology park (TTP), whose establishment resulted from an initiative of an AUTH based research unit, the CPERI- Chemical Process Engineering Research Institute. An interviewee tells the story: *“four professors who had developed a research laboratory at AUTH were willing to transform their scientific results into something with economic impact, that is, they wanted to start interacting with the outside world. At the time, they felt suffocated by the restrictions, prohibitions, and bureaucratic requirements imposed by the law, so they decided to establish an independent institute. The group applied for funding from the Ministry of Development to build its own research facilities, but the reply was that the allocation of funds would only be considered for the creation of a technology park. As a result, TTP was established and Thessaloniki*

¹⁵⁴ The Ministry of Development is the responsible for innovation and science and technology policies. The Ministry of Education and Religious Affairs is in charge of the whole educational system, thus including higher education.

gained a new science and technology infrastructure". CPERI is currently integrated in the CERTH, together with other five research institutes¹⁵⁵.

At the internal level, a similar situation occurred in 1981, when, as it was the case of the other Greek higher education organisations, AUTH created its Research Committee (RC) in order to mitigate the restrictive effects of the tight legal framework and improve the university's capacity to manage non-budget funding. The RC is responsible for the so-called university's *special account*, and can be presently regarded as the central organisational unit within AUTH when looking at the promotion and operation of the third mission. It is a collective elected body aimed at the management and transfer of research, technological and training programmes, and other services that can be provided by the university. Since its foundation, the RC has managed over 10 thousand research and development programmes involving more than 15 thousand university and external partners. In 2006, the RC had about 60 staff and generated an annual turnover of approximately 50 million €. Funds managed by the RC, according to an informant, represent "*four times the budget research funding allocated by the National government to AUTH*". The RC's relevance is well expressed in the university's evaluation made by the EUA (RC, 2002, p. 8): "[...] *the Research Committee is a valuable organisation for the University, as it provides services to the University members, encourages research in an organised manner, provides a competitive advantage for research projects, and offers opportunities to students and staff to get involved in external projects, acquire practical experience, put together proposals and develop useful skills, and – equally important – it secures funds for the University [...]*".

The strategic and operative framework of AUTH's interaction with the region is centred on the RC. In fact, it is mostly through the RC that the message placing the university as "*a competent body for the realisation of plans with a regional dimension*" (RC, 2002, p. 8) is put forward. The university's top administration, namely the rectorate, does not have much influence in the promotion and steering of the third mission. According to one of the interviewees, "*the rectorate is very much centred on the distribution of budget funding across the faculties and other administrative issues*". "*Top*

¹⁵⁵ The CERTH is composed by the following institutes: CPERI- Chemical Process Research Engineering Institute, ITI- Informatics and Telematics Institute; INA- Institute of Agrobiotechnology, HIT- Hellenic Institute of Transport, ISFTA- Institute for Solid Fuels Technology and Applications, and IBBR- Institute for Biomedical and Biomolecular Research.

administration, from a strategic point of view, has little to do with the university's research policy design and maybe less with the interaction with the region", he adds. This situation, using the words of other informant, originates "the lack of an institutional mission statement which soundly places AUPh as a regional development agent". The same interlocutor, however, finds a positive side: "this is partly a good thing, because it prevents cyclic changes in the position of AUPh towards its relationships with the region. For instance, a rector coming from such schools like Theology would influence the position of the university in relation to its interaction with the external world, and particularly, with the region, and the inclination would be towards the ivory tower". However, as a member of AUPh's staff puts it, "the other side of the coin is organisational fragmentation".

The distance that puts aside the rectorate from third mission related issues, together with the high degree of autonomy of faculties, favours fragmented attitudes and operations. One of the interviewees states that *"to different departments and schools corresponds different ways of looking at the changing and challenging environment"*. He illustrates this through a comparison between the engineering schools and the medical school: *"the Medical School works according to the traditional way of doing things, and that is why, in an area presenting a huge research potential, mainly because increasingly attractive in terms of funding, it only contributes with 3% of the total research budget of the university. At the other end, the engineering schools are already adopting principles and procedures that are known, from the experience of other countries, as adequate to the knowledge economy"*. He sums up: *"the new concept of a better funded, more open, university is not reflected yet on the majority of staff and students. The dominant university policies are still quite traditional and subjected to pressures such as those of the student unions, which, at the end of the day, reflect the pressures of political parties"*. In this line of thought, the same academic avers that *"in some units there is still the idea that co-operating with society means to ruin teaching and destroy the academic values"*.

Nevertheless, a few cases showing a *peaceful* and enriching link between teaching, research, and regional engagement can be identified. The Laboratory of Heat Transfer and Environmental Engineering, for instance, integrates international research networks of recognised scientific excellence (e.g. ACCENT, the Network of Excellence on Atmospheric Composition Change), is responsible for eleven postgraduate courses, and, at the same time, provides relevant services to several local organisations, such as the

Thessaloniki Museum of Byzantine Culture (to monitor and evaluate indoor climate and air quality in the White Tower, one of the main Thessaloniki's historical *ex-libris*) or the association of local governments of Thessaloniki's area (to measure the effects of the gas emissions provoked by a landfill fire occurred in 2006 in a local waste disposal site).

The divide is acknowledged by AUTH's RC (2002, p. 10): "*the greatest number of inactive teaching and research staff members, in relation to the total, are found at the Faculties of Health Sciences and of Law, Economic and Political Sciences, where there are unexploited opportunities and the research staff could undertake more active research*". According to the same source (id.), the expectation that new teaching and research staff would become involved in research due to a new internal research programme directed at the humanities "*was not confirmed*". "*Only 4% of the scientific supervisors from the humanities research programme (ANEP) took on new projects as a result*" (ibid.). Following one of the interviewees: "*AUTH has a number of research units which are very keen to interact with society in general and industry in particular, mainly because they have already identified the opportunities that co-operation can give them in terms of increased funding and scientific enrichment. These units tend to be concentrated in the engineering schools. However, even in such schools, we cannot say that everybody is willing to interact with the external world*".

The problem of fragmentation is also identified in terms of the decision-making processes, which relies on each faculty's assembly. The EUA evaluation report on AUTH (ibid., p. 2) states: "*[...] a more concentrated power structure would help to make the decision-making process more focused, more dynamic and more flexible, and would strengthen the cohesion of the University in pursuing and realising a commonly shared vision*"

Fragmentation seems to be well diagnosed by the RC, which, in 2002, has endeavoured to know better the strengths and limitations of the university, particularly concerning the research and third mission areas, signalling the will to identify problems and acting accordingly. A major problem (which, as one informant argues, "*can be extended to many universities in Greece*") arises when "*competitiveness and personal ambitions clash with one another and there is no single, cohesive strategy that deals with the University's spheres of activity on a short term and long-term basis*" (RC, 2002, p. 7). This relates with "*internal rivalry*", attributed to the prevalence of "*outdated values, such*

as, for instance, the perception that funding should be equally distributed among the research units, irrespective of performance” (id, p. 11). To this adds (ibid.) the “*confusion of roles and relations between agents involved in research*” and the “*dominant misconception*” that “*between TRS [teaching and research staff] (Scientific Heads) and the Research Committee there is a client-supplier or employer-employee relationship*”. The “*general absence of internal review, evaluation and feedback systems for individual and collective research activities*”, as well as “*communication problems between the RC and AUTH academic departments*”, according to one of the informants, root this misconception. The situation is stressed in the EUA evaluation report (ibid.), by stating: “*despite the fact that each department is represented on the Research Committee, there seems to be a need for better communication towards all departments*”. The recommendation is that the “*University authorities might plan a public relations campaign to pass the message that the Research Committee works for the benefit of all AUTH associates*” (ibid.).

Fragmentation and lack of cohesion in decision-making can be related to the non-institutionalised relationship between AUTH and TTP, which, according to one of the interviewees, “*is jeopardising the synergetic potential associated with the proximity between a university and a technology park*”. AUTH, which rooted the initiative (through the CPERI research unit, as mentioned above), as put by the same informant, “*has nothing to do with the technology park, at least in terms of management*”. He adds: “*there are efforts to make AUTH to participate as a shareholder in TTP’s board¹⁵⁶, but until now those efforts did not succeed*”. At the informal level, however, there are strong interactions between individual academics or academic units and the TTP. “*In fact, there is a close interaction between TTP and AUTH’s staff, though escaping the official signet of the university’s administration*”, states the interviewee¹⁵⁷. On the one hand, a high number of PhD students develop their empirical work in the technology park laboratories, and undergraduate students are also brought in by their teachers in order to contact with science in a context of application. On the other hand, many AUTH’s researchers work in the TTP, - as put by one interviewee, “*it is easy to see lots of professors doing research in the*

¹⁵⁶ The TTP’s board of directors is formed by representatives of CERTH, the Federation of Industries of Northern Greece, and of a number of regional firms.

¹⁵⁷ After referring to the non-institutionalised relationship between TTP and AUTH’s researchers, the interviewee hurried saying: “*this does not mean that we are in presence of something illegal*”.

morning at the TTP and teaching at AUTH in the afternoon” -, some of them under the framework of research projects and contracts, namely with CERTH institutes.

In addition, a few “*very successful*” spin-offs originated by individual AUTH researchers grew in the TTP. The university, according to the same source, “*as organisation, did not have any formal or informal participation in these entrepreneurial initiatives*”. It is worth noticing that AUTH, or more adequately the RC, in parallel, is also promoting the development of spin-off companies. In 2005, the Greek Ministry of Development funded 10 entrepreneurial projects nurtured at AUTH, five of which were about to go to production during the final stage of preparation of this case study. Following a member of the RC, who has closely accompanied the process, “*some of this spin-offs, in principle, will go to the technology park*”, which is seen as a contribution to revert the distant relationship between the university and the TTP.

Against these unfavourable (internal and external) contextual conditions, the RC is striving to introduce and consolidate a new philosophy and modes of action, reflecting the “*desire and intent [...] to operate and act in an environment that enables it to locate allies, collocutors and people of a similar line of thinking, and thus promote its objectives more effectively*” (RC, 2002, p. 2). At the core of strategy making, at least as far as research and the third mission are concerned, the RC is in fact placed at the forefront of the whole process of academic change. Accordingly, it is a major actor in the university’s response to the regional dynamics of change. This signals an internal shift in scope, as the RC, in the late 1990s, to the mere management of research funding added the much more strategic task of promoting and coordinating the linkages between AUTH and the external world. The change-oriented determination is evidenced by the RC’s most recent operational plan, in which, on the one hand, the pursuit of excellence in research and human resources, and infrastructure and organisational systems is combined with the commitment to promote innovation and technology transfer, and, on the other hand, a commitment to regional development is made explicit (RC, 2002). The operational plan sets out a number of actions directed at accomplishing the stated objectives, such as, for instance, the development of internal interdisciplinary networks, the certification of service laboratories, the creation of excellence scholarships, the development of informational structures, and the establishment of new channels of communication between the RC and members of the

teaching and research staff¹⁵⁸. According to an informant, this set of actions is of “*critical importance not only to AUTH itself but for the linkages between the university and the region, particularly after the focus on specific productive clusters has been defined*”. Innovation, as approached in the operational plan, embraces both a response to the need for fostering within the university innovative ways of thinking and act, and guidelines and mechanisms dedicated to promote the transfer of innovation inputs to the productive fabric. An explicit link is made with the foresight activities undergoing in Central Macedonia, which are regarded as a relevant instrument to define “*the demand that must be met by the University’s scientific and research activities*” (id., p. 19).

The operational plan acknowledges regional engagement as an important objective to be pursued by AUTH. In this context, the reinforcement of alliances with URENIO is highlighted, namely in terms of the development of “*permanent forms and mechanisms*” (ibid.) of technology transfer. The hiring of an industrial liaison officer in 2005 is an organisational innovation stemming from the new strategic framework. Connections can also be made to the creation of AUTH’s Network of Innovation and Sustainable Development, which, gathering ten laboratories of six departments, is assuming the role of implementation agency of the Digital Research Centre coordinated by URENIO. These organisational innovations are being kept up with efforts to establish a more permanent and formal collaboration with the regional authorities, in order to ensure the “*planning and implementation of joint plans for the regional dimension of research and technology*” (ibid.). Organisational change took also a *physical* form, with the opening, in 2006, of a new building sheltering the RC and the new Centre for the Dissemination of Research Results.

Organisational change within AUTH is well acknowledged by the interviewees. One of them avers: “*new orientations are being set up clearly pointing to the establishment of stronger links with the regional administration and firms, and to the development of academic spin-offs. These new orientations have indeed induced change within the university, at least in many of its research units and, most importantly, in the strategic research steering bodies*”. As a result, in the words of other informant, “*the traditional*

¹⁵⁸ “*The development of a system of personal contacts between members and officials of the Research Committee and members of the TRS, in order to exchange ideas, record problems and their potential solutions, enhance the successful organisation or projects, promote their potential and opportunities for development, etc.*”, RC, 2002, p. 18.

laissez-faire attitude is being replaced by a more strategic and integrated way of undertaking academic research, which does not hinder academic freedom but makes concerns about the problems of the region more and more visible". To sustain the argument, the interviewee refers to "*the growing focus of AUTH's research strategy on the strengthening and combination of scientific areas that were identified as crucial for the development of Central Macedonia in such arenas as the regional foresight exercises*".

AUTH has not stayed immune to the institutional change that was ignited by one of its research units. In fact, there is evidence that, due either to the rise of new expectations of the region or to the internal influence of URENIO, the position of the university in relation to regional development has shifted in accordance. As a result, new organisational arrangements and guidelines concerning the third mission have been put in place (e.g., *the RC's operational plan and the hiring of an industrial liaison officer*). However, a number of hindering factors, both external and internal to the university, are still constraining the operation of AUTH as regional development agent (e.g., *the unfavourable higher education legal framework and the academic conservative attitudes of a large proportion of staff and students*). Evidence was collected showing a divide in terms of institutional cultures which, together with the relative distance of the rectorate *vis à vis* regional engagement and the fragmented decision-making processes, turn difficult the mainstreaming of the third mission across the complex set of faculties, departments and schools that form AUTH.

Although the issue of organisational turbulence is far from being settled, those units that are striving to balance regional engagement and academic recognition count on the support of AUTH's RC, which provides an encouraging guiding framework. In addition, the alliance between the RC and URENIO, aimed mainly at improving the links between research and the productive fabric, confers a reliable supportive basis for interacting and, above all, a means to access a variety of funding sources.

10.3.3

AUTH in a changing regional system of innovation: forging and co-evolving

The relationships between AUTH and Central Macedonia's regional system of innovation could be portrayed as an interaction involving a university and a "*non-functioning innovation system*", taking here the qualifying terms used by KYRGIAFINI and

SEFERTZI (2003, p. 904) to depict the situation of the region. However, although much of the typical LFRs' innovation problem, as identified by LANDABASO (1997), is still constraining the region, the developments occurred since the RTP launching opened up new regional development pathways, new ways of thinking and a stronger collective basis for action, i.e., streamered social innovation (MUMFORD, 2002). In this sense, it is perhaps fairer to talk about the relationships between a university and a *changing system of innovation* on the (slow) move upwards the systemic potential scale.

To this changing regional system of innovation corresponds an also changing university-region nexus. From the striving of URENIO to start building an innovation culture in a quite unfavourable ground, the nexus co-evolved with a system where change led to a situation in which, according to one of the interviewees, *"it is easier to bring people together and the innovation agents know each other better and share an innovation-prone culture and mentality, meaning that the region is better prepared to collaborative learning and acting"*. AUTH, taken as an organisational whole, was not immune to the surrounding dynamics of change, as argued above. In the words of an informant: *"the striving of URENIO to change the regional status quo would put under pressure AUTH itself, which, in face of a changing regional environment has been forced to follow new directions"*. AUTH's fresh orientation, following the interviewee, was, at first, due *"to the inclusive planning process initiated with the RTP"*. *"AUTH, as a whole, could not afford to stay out of the picture and to turn away from the process"*, he adds. Later, influenced, on the one hand, by the participation in the innovation planning process, and, on the other hand, by the increasing importance of the regional agenda in the EU, the university, though in a fragmented manner, has acknowledged that, using the words of the same source, *"there was a regional mission to be pursued"*. Furthermore, institutional change in the region forged new expectations towards the role of AUTH in the promotion of regional development.

The rise of these new expectations is mostly evident in what the regional authority demands from AUTH's. In the words of the current region's General Director: *"AUTH is expected to play a central role in the implementation of a number of core regional development policies, such as, for example, the creation of the Central Macedonia's Regional Pole for Innovation"*. According to the same informant: *"presently, there is a direct link and understanding between the Region and the academic community"*

concerning the development actions to be undertaken. Again, the Regional Pole for Innovation is a good illustration of this, as the Region decided to entrust the design and implementation of the project to a committee, led by the General Secretary and comprising representatives of universities, firms of the new and the traditional economy, technological parks, incubators and innovation centres, and so forth. There is a management unit, in which the academic community has an active role, and an evaluation unit coordinated by URENIO”.

The university, in turn, seems to be responding to the changing environment, as simply evidenced by the overall academic mission statement above reproduced, in which regional development was yoked to the traditional national development objectives, or, more soundly, both by the proposals suggested by AUTH to be included in the Regional Development Plan (2007-2013) – *“the objective of the proposed interventions is to strengthen the recognised role of AUTH as a basic factor of the regional innovation system and to create the essential conditions for the diffusion of its accumulated know-how for the benefit of the regional economy competitiveness”* (www.pkm.gr, translated from the original Greek text), - and the organisational arrangements highlighted in the previous section.

Profound changes marked the relationship between the regional policy design and delivery settings and AUTH. The old distant and even adversarial relationship was replaced by an open and collaborative interaction. In fact, this can be regarded as one of the most prominent distinctive feature of the *new* university-region nexus, from which mutual benefits are arising. The Region, on the one side, is gaining in terms of its access to strategic knowledge supporting decision-making, generated both within AUTH and upon national and international networks participated by the university. In addition, by adding the critical mass for acting, the new nexus strengthened the regional authority’s capacity to deliver. On the other side, a wide range of new opportunities for academic development opened up to AUTH. Among these new opportunities, improved funding is commonly highlighted as a prominent result, as shown by the words of an interviewee: *“while paying more attention to innovation, the regional Operational Programme allocated much more money to the university, namely supporting the creation of new infrastructures aimed at improving the collaboration with firms operating in the region”*. According to the same informant, the interaction with the regional authority *“is also improving the access of*

AUTH to EU and national financing programmes other than structural funds". He explains: "*AUTH's units can present themselves in Athens or Brussels in a much more powerful position because their close connection with the regional authority or with its programming*". In addition, the evolutionary process that brought near the university and the regional authority has also affected the fashion AUTH looks at the regional system of innovation. This is the reason why some interviewees talk about "*a renewed university*" resulting from an extension in the academic mission.

The regional third mission seems to be gaining room in AUTH. However, as argued before, the degree of willingness to regionally engage varies not only between departments and schools but also between individual academics within the same department or school. To the higher or lower willingness to cooperate with the region, one should add a different kind of constraint characterising the university-region nexus. It is based on the structure of the regional demand for university services. Central Macedonia's productive fabric is, as described earlier, predominantly made of SMEs operating in the so-called traditional and low technological content sectors. In addition, the sectors in which the need to collaborate with universities is increasingly felt or even already activated, do not cover the whole spectrum of scientific areas existing in AUTH. In the words of a member of AUTH's staff, "*even when there is openness to help regional firms, some research units cannot afford to engage in such activities, because if they did, it would be difficult to continue pursuing international scientific excellence and, most likely, attracting adequate research funding*".

Nevertheless, the innovation policy, support and infrastructure developments that took place along the planning continuum initiated with the RTP underpinned new perceptions and awareness of the productive fabric towards AUTH's potential. In addition, new activity sectors and new firms operating in already existing sectors, more likely to foster a cooperative relationship with the university, are emerging in the region. One can argue that this represents a window of opportunity for a better performance in terms of the still incipient relationships between research and industry. According to an interviewee, these developments "*increased the attention paid by the university, particularly by those departments and schools more technology-oriented, to what is going on in regional industry, and fostered in industry a new way of looking at the university*". The same source talks about a "*change in demand and awareness in relation to university knowledge*", which "*has already impacted on the university's funding structure*", he adds. In fact,

according to data provided by the RC, as compared to the last half of the 90s, during the first years of the new century, the number of financing bodies more than doubled (ca. 230%), and research funded by firms climbed up from about 10% to 20% of total funding. Obviously, due to the impossibility of accessing regionalised data on AUTH-industry linkages, insufficient light is shed over the extent to which regional firms weight in these developments. In other words, the empirical evidence on the growth of a mutually beneficial relationship between AUTH and regional industry, collected with basis on interviews and documental sources, is not as sound as it would be desirable.

Sound evidence, though, points to the spreading of an optimistic stance. As put by one of the interviewees: *“we still have structural bottlenecks in the region and an unfavourable national framework hampering interaction between higher education and society. Despite this, the environment is changing and new instruments and infrastructures for innovation promotion are being made available, allowing those academics who are for years eager to cooperate with the external world to render concrete their disposition and bringing new academic enthusiasts to the play”*.

In short, Central Macedonia’s development trajectory, in the last decades, was made of an institutional change process that owes much to AUTH (or, at least, parts of it) as triggering arena. The shift in the regional system of innovation would then impel the university to co-evolve and change as well. One can thus argue that a small fraction of the huge academic organisation has forged change in the regional policy and practice settings, activated, along the planning continuum, associative elements of the innovation system hitherto hide or latent, and, in the end, contributed for the involvement of larger fractions of AUTH in regional development. The ongoing breaking with a long tradition marked by a distant relationship with the region heralds much more than a kind of philanthropic attitude. It signals the identification of opportunities for academic development and acceding new funding sources within the new framework conditions that emerged in Central Macedonia from the RTP exercise initiated in the mid-90s.

Still acting with very limited autonomy in relation to the national government, either politically or financially, regional powers in Central Macedonia, though toeing the line of national development objectives and depending on external funding sources, were able to build up an operative framework focused on improving the innovation performance of the region, which mirrors a large consensus among key agents and relies on their

implementing capacities. The overall planning attitude, as well as the (absent in the past) focus on innovation, is contributing to endow the region with the ingredients necessary to climb up the innovation systemic potential scale and, thus, to start escaping the structural problems that affect the innovative capabilities of LFRs. AUTH, in a first instance responsible for forcing the change that would allow this achievement, assumes, together with the other higher education organisations operating in the region, a critical role in this overall framework for regional development (*e.g., the regional pole of innovation initiative*).

Under the new policy, expectations towards the role of AUTH are rising. Firstly, the university is increasingly expected to provide research results to feed the formation of new and highly innovative businesses in the region, as well as to improve the technological state of existing firms (*e.g., the regional operational programme*); secondly, it is being called forth to assist the regional authority in the design and management of development programmes (*e.g., the management and the evaluation units of the regional pole of innovation programme*). In other words, AUTH's knowledge is viewed as a strategic resource for policy-making and placed at the core of initiatives that are ought to be new effective ways of promoting regional development. The new expectations naturally coincide with a new university-region nexus, to which one can associate, on the one hand, an enhanced valuing of academic knowledge in the region, and, on the other hand, an increased acknowledgement of the regional mission within AUTH.

The triple helix arrangements in the region, however, are still fairly imbalanced, particularly when considering the industrial helix, whose demand for academic knowledge is weak. Moreover, even within the university, there are academic sectors not yet aware, or, if so, not valuing the new innovation-oriented regional policy framework. This signals that change tend to be gradual and slow, particularly in regions suffering from the ballast of structural problems typical of LFRs. In this sense, one can argue that the co-evolution of the regional system of innovation and the university-region nexus, as occurred in Central Macedonia, was mostly made of shifting targets and priorities for action, ways of acting, and, inherently, culture, attitudes and perceptions, or, as some would argue, of a struggle against institutional inertia. Arguably, it is this struggle, which, as it is worthy to recall, was started by AUTH, that is better preparing the region to endeavour in an innovation-

based development path and creating enhanced conditions for university-industry interaction, either at the infrastructural as superstructural levels.

Whereas the clearer benefits taken by AUTH from the changing environment relate to the increased access of academic research to public funding via EU and national programmatic lines (*e.g., the allocation of funds to the university by the regional operational plan*), other advantages can be identified. This is the case of the evolving organisational arrangements in AUTH, partly a deliberate attempt to cope with renewed regional expectations, which are providing the university with overall strategic guidelines and more solid bases to overcome fragmentation. In addition, the developing innovation infrastructure in the region augments the potential to open up new opportunities for AUTH's researchers to connect with regional production (*e.g., the new technology parks and incubators*).

Taking the picture depicted above, one can argue that the framework conditions to ensure a mutually beneficial relationship between the region and AUTH have significantly improved in the recent past, which, arguably, contributes for a better balance between the search for academic research excellence and regional engagement. What about teaching? The evidence collected, (or, perhaps more appropriately, the lack of information), suggests that AUTH's teaching activities, in general, are still far from being aligned with and benefiting from the enhanced conditions for regional engagement, due to both internal (*e.g., fragmented and sector-based decision making*) and external (*e.g., the Greek higher education legal framework*) hindering factors.

In sum, AUTH has been critical in the profound institutional process of change in Central Macedonia that led a typical LFR regional system of innovation to a higher point in the systemic potential scale. Knowledge and relational resources coming from or enlisted by the university have strengthened mobilisation capacity in the region. The university, which has changed with the system, continues to be instrumental, nowadays in more intensive and extensive fashions.

10.4

Cardiff University: “consciously” developing the third mission?



Cardiff University is the oldest of the three studied universities. The Royal Charter establishing the university dates back to 1884, when the then University College of South Wales and Monmouthshire was constituted and founded. The original designation would change to University College, Cardiff in 1972, and to University of Wales, Cardiff in 1996, with the public name of Cardiff University. From the 151 students and 13 academic staff at the foundation date, CU evolved to reach, in 2006/2007, over 25,000 students and 2,600 academic staff. These figures place CU within the top ten largest UK universities (see **Table 10.3**).

Table 10.3 – CU: basic figures (2006/2007)

Date of foundation	1883
Number of students	25,830
Undergraduate	20,344
Postgraduate	5,486
Staff (full-time and part-time)	5,487
Academic and research	2,669
Technical	211
Administrative support	1,070
Managerial, professional and specialist staff	1,165
Operational services	360
Academic schools	28
Graduate schools	4

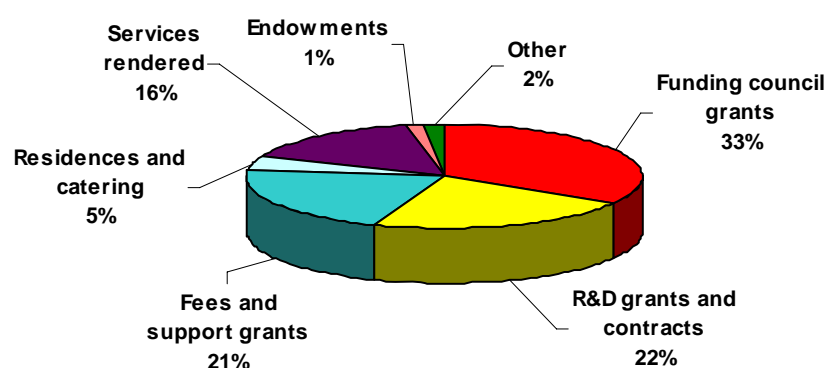
Source: CU

The top position of CU owes much to the merger with the University of Wales College of Medicine (UWCM), occurred in 2004. As “*an exciting development for the Universities and for the whole of Wales*”, as put by David Grant, CU’s vice-chancellor (www.cardiff.ac.uk), the merger improved the university’s potential to fulfil its stated vision, the one of being “*a world-class university*”, and mission, “*to pursue research, learning and teaching of international distinction and impact*” (CARDIFF UNIVERSITY, 2006a, p. 1). The impact of this institutional development goes beyond the size effect. For

instance, according to a university's source, "*significant growth in the University's research awards is one of the many areas providing evidence of the benefits of merger*". In fact, CU reached in 2006 a new record level of investment in research, with awards amounting to 96 million £, an increase of 17 million £ over the previous year (id., 2007). In the period 1999/2000, research grants and contracts in CU and UWCM, taken together, had amounted to approximately 36 million £ (ELWA, 2001). The merged university has also benefited from improvements in research equipment and facilities, particularly in health-related scientific fields. Moreover, it is expected that the merger will create over 3 thousand jobs, both inside and outside the university, and a range of new academic-based entrepreneurial ventures.

The merged institution reinforced its status of research-intensive university, ranked in eight among the Russell Group universities¹⁵⁹ for income generated by contract R&D (CARDIFF UNIVERSITY, 2003), which, as shown in **Figure 10.3**, weighted over 20% of total CU's income in the period 2005/2006.

Figure 10.3 – CU funding structure (2005/2006)



Source: CARDIFF UNIVERSITY (2007)

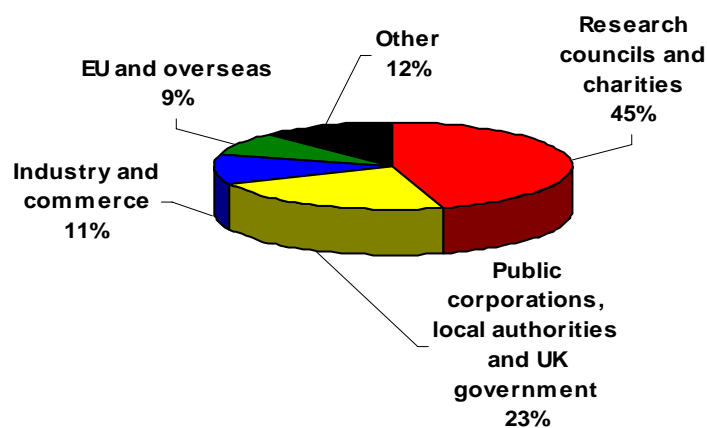
The "*continuing emphasis on research excellence*" (id., 2006a, p. i) is at the core of CU's development strategy. This focus, according to the university's Strategic Plan (id.),

¹⁵⁹ The Russell Group gathers 20 major research-intensive universities of the UK, which account for 65% of UK universities' research grant and contract income, 56% of doctorates awarded and over 30% of all students. The Group aims at promoting "the interests of universities in which teaching and learning are undertaken within a culture of research excellence, and to identify and disseminate new thinking and ideas about the organisation and management of such institutions" (www.russellgroup.ac.uk).

“does not in any way diminish [the] determination either to improve [...] teaching or to extend [the] already widespread innovation and engagement activities”. Research, in this document, is seen as permeating “these as well as every other aspect of the University’s ambition to become an institution known unequivocally throughout the world for its general excellence” (ibid.). In fact, the stated core strategic aims of CU are i) research – “to pursue research that is recognised as internationally distinguished in its quality and impact” (ibid., p. 3) -, ii) learning, teaching and assessment – “to pursue learning and teaching together with professional training and development that are recognised as internationally distinguished in their quality and impact” (ibid., p. 6) -, and iii) innovation and engagement – “to make a significant and sustainable contribution to health, economy, education and culture through the application of our strengths for the needs and good of societies throughout the world” (CARDIFF UNIVERSITY, 2006a, p. 9).

The focus on research excellence mirrors the pursuing of “a balanced portfolio of sustainable research funding support” (id., p. 4), namely from global sources, to secure growth and diversification in external funding. The current breakdown of R&D grants and contracts by funding source is presented in **Figure 10.4**.

Figure 10.4 – R&D grants and contracts (2005/2006)



Source: CARDIFF UNIVERSITY (2007)

What about the role of CU in the development of Wales? An unwary reader of the current CU’s Strategic Plan, though a number of references on the actual and foreseen impact of the university on regional development, could be disappointed if looking for clear evidence of such a focus on Welsh issues. Moreover, if compared to the former

strategic plan, issued in 2004 (www.cardiff.ac.uk), disappointment would raise. In fact, at the time, “*the university and the region*” was one of the four core referenced aims of the university (together with research, learning, teaching and assessment, and the supporting environment). It was then stated that CU aims “*to benefit society through making a significant and sustainable contribution to the health, economy, education and culture of Wales, thereby enriching and enhancing the profile of Wales in the UK and the world*”. The explicitness of CU’s commitment to regional development, in the most recent version of the strategy gearing the university, gives its place to statements such as those expressing the will of demonstrating “*the tangible benefits that an internationally recognised, research-intensive university brings to Wales and beyond*” (CARDIFF UNIVERSITY, 2006a, p. 3). An (unofficial) explanation for the change in strategic aims is provided by one of the informants: “*in 2004, CU was playing the ‘third mission’ game, in expectation that it would earn extra money from the Assembly Government. After the merger with UWCM, CU became a true ‘Russell Group’ university, which brought a reduction of funding coming from government, either in London or Cardiff. The big change was the diversion of foreign, mainly Chinese, students from the US to the UK, after Bush administration made it harder for them to enter the US. Foreign students are a very significant source of income for the university. As such, for instance, there has been a huge increase in size of the International Office of CU, aiming to attract students from abroad. With this in mind, ‘selling’ CU as a top international research university is the best way of ‘selling’ CU as a top international teaching university, especially in China, where these rankings, like the Shanghai league table, really matter*”. Another (also unofficial) source turns the attention to the cuts in the “*already low*” third mission public funding, as decided by the HEFCW in 2004. “*There were many complaints because the general feeling was that while the amounts of money to support the third mission shrank, the government expectations and demands on universities were raised*”, he adds. The official explanation comes from a planning officer of CU: “*The change in wording was intended to better reflect Cardiff’s international aspirations and impact, the benefits of which would accrue to Wales, rather than signalling any lessening of the University’s focus on regional development. The two sub-panels of the Innovation and Engagement Board felt, - during the revision of innovation and engagement strategy in 2005/2006 (which informed the University’s*

strategic plan) -, that the international perspective was underplayed in earlier plans and that this needed to be addressed”.

Following one of the interviewees, whatever the stated overall strategic goals and funding available, *“Cardiff University has a strong presence and a lot of fingers in regional development”*. As argued by a member of CU’s staff, this presence *“has been boosted by the RTP exercise”*, which, according to the same source, *“led, on the one side, policy makers to devise how strategic the university was to pursue innovation in Wales, and, on the other side, the university to acknowledge that it had a stake in the promotion of regional development”*.

The presence and *fingers* of CU in regional development is judged mostly bearing in mind its relationships with Welsh industry. Co-evolving with the variegated portfolio of regional programmes aimed at supporting linkages between higher education and firms (e.g. Help Wales and Know-how Wales) that were directly or indirectly nurtured by the RTP, CU gradually became what HUGGINS and COOKE (1997, p. 334) called a *“knowledge node of regional industrial clusters”*.

Sticking to the narrow perspective on the university-region nexus, and advancing to the present times, a flavour of controversy seems to wrap up the relationships between CU and regional industry. One of the interviewees states: *“Cardiff University, as well as the other Welsh universities, are not so relevant for industry as it could be expected, namely when in presence of a huge number of supportive programmes and policies. It is enough to look to the research contracts established with industry, most of them attach the university to large firms, the majority of which operate in the rest of the UK”*. This assertion partly matches pieces of quantitative evidence made available by surveys on university-business interaction. For instance, according to the results of a survey carried out in the period 2002-2004¹⁶⁰ (HEFCE, 2006), the number of R&D contracts signed by CU with SMEs amounted to 40, while with non-SMEs to 436, representing 729 thousand £ and 8,872 thousand £, respectively. The linkages to small Welsh firms, as averred by other interviewee, *“vary according to the academic discipline”*. Still, he adds, *“even for those disciplines most likely and showing more willingness to connect with businesses, there are more opportunities at the UK or international levels, because the demand for high standard R&D is bigger than in Wales”*. However, the same survey (id.) gives strong

¹⁶⁰ The survey has taken place before the merger of CU and UWCM. The used data refer only to CU.

indications that the work of CU with small firms is not negligible. For instance, when considered consultancy, during the period under analysis, CU signed consultancy contracts to assist 350 SMEs, most of them operating in Wales, (4,624 thousand £) and 106 non-SME companies (1,422 thousand £). The same can be said about facilities and equipment related services, involving 263 SMEs (3,467 thousand £) and 80 non-SMEs (1,067 thousand £). In addition, CU has a successful record in the creation of spin-off firms, although lacking a physical space for incubation for many years (the only university-based incubator in Cardiff, the *Medicentre*, is located at UWCM). Taking advantage from instruments like the Wales Spinout Programme, CU's research originated a significant number of firms in a wide range of scientific domains, from agro-environmental applications (e.g. *Ambiensis Ltd.*) and water and waste technologies (e.g., *Cell Engineering Ltd.*), to pest management (e.g., *Insect Investigations Ltd.*) and online education, training and science communication (*Learning Industries Ltd.*) (cf. FINANCE WALES, 2003; HEFCE, id.; www.cardiff.ac.uk). Additional evidence indicating that CU can be regarded as open to help Welsh SMEs to enhance their competitive capabilities comes from the university's position as knowledge partner of regional firms in 53 projects developed in the framework of the UK wide Knowledge Transfer Partnerships programme.

In short, it seems that to deny or even diminish the relevance of CU to the regional productive fabric is a hard task, even if the intensity of interaction is not so impressive as what could be expected taking into account the existing supportive policy framework. Both before and after devolution, with a significant compelling public policy dose, CU presents a relatively positive track record in terms of collaboration with existing firms and of promotion of new industrial ventures in Wales. Nevertheless, to take the full picture of CU's regional engagement, a wider lens is needed, in order to keep in the frame other dimensions of regional engagement. As argued by one of the interviewees, CU “*has an wider societal agenda that goes beyond R&D and technology transfer*”. He adds: “*the interaction with the external world encircles more than businesses*”. An attempt to take the *magnified* picture is made in the next section.

10.4.1

The presence and fingers in institutional capacity building...

The potential of CU to act as a regional institutional capacity builder has been enhanced during the 1990s by the RTP and subsequent innovation planning activities. Compelled by new societal and policy expectations and encouraged by a new range of programmes and funding streams, the university assumed a strengthened role in the regional knowledge flows and exchanges and interactive learning arenas.

As suggested above, this renewed and reinforced position of CU in Wales has been fundamentally looked at under the (narrow) framework of the knowledge it transfers to regional industries. Taking this point of view as a starting point to identify the range of knowledge resources the university provides the region, i.e., searching for the knowledge inputs CU taps into the productive fabric, what comes firstly to the forefront is the university's participation in the systemic learning and (technical) innovation arrangements that begun to operate in Wales in the 1990s (COOKE, 1997b), namely in two key manufacturing sectors and associated clusters, the automotive and electronics industries (id.). The university, in the words of HUGGINS and COOKE (1997, p. 334), "*has played a part in the development of these clusters acting as a local host for joint research and development programmes*". This part implied collaborative work with both large multinational companies and small endogenous firms, namely those operating in the sectoral supply chains. In the line of thought of MANNING and COOKE (1997), at the time, CU, as well as other Welsh higher education organisations, had realised the importance of SMEs to the regional economy and incorporated "*this realisation in the development of their initiatives targeting HEI-industry interaction*" (id., p. 36).

In this context, a significant number of cases involving knowledge transfer from CU to small Welsh firms could be highlighted. The case of a small manufacturer of Welsh harps – Concert & Celtic Harps working together with CU based Manufacturing Engineering Centre (MEC) is among the most famous and it is often used to illustrate how higher education and the supportive programmes for linking with industry in Wales can solve problems and introduce technological innovation in small traditional firms. Rather than telling the whole (interesting) story, because extensively documented (cf. www.knowhowwales.com; www.mec.cf.ac.uk), the point to highlight is that the

knowledge supplied, first, by CU's Business School (a market study that has identified worldwide potential for the firm if introducing innovative harp designs at competitive prices), and, second, by the MEC (meanwhile identified by Know How Wales as offering the most adequate expertise), namely in new materials and manufacturing techniques, allowed the small company to increase its annual production up to over 100 Celtic harps and 15 concert harps, while reducing by half the price. In the words of the managing director of Concert & Celtic Harps, Alan Shiers, "*this project has provided the impetus for the launch of a community company, Telynau Teifi, and the creation of new sustainable jobs in this part of rural Wales*" (www.knowhowwales.com).

An additional way of assisting Welsh firms is through consultancy activities, carried out by CU staff, both on their own or through the formal circuits of the university. Following one of the interviewees, "*the knowledge and expertise of academics working on a variety of disciplines is being increasingly demanded by local businesses*", which "*makes consultancy a growing activity throughout the university*". The regional utilisation of knowledge resources generated by CU's research, as mentioned before, is also originating new industrial ventures. In fact, according to the same informant, "*the promotion of start-ups based on research results and having high value added potential is a major concern in CU*".

The RTP process, which would root the building up of a fresh and innovation supportive environment, is *per se* an opportunity to start magnifying the view on the knowledge resources CU provides to the region. In fact, that innovation planning exercise can be regarded as a precursor of a close relationship between CU's knowledge and the process of policy making in Wales. Bearing in mind the effects it exerted on the ways of designing and delivering policies, one can argue that the university had in fact a stake in moulding the regional frames of reference for action. Members of CU staff, some of them undertaken research on regional innovation, in close co-operation with the WDA, have been involved in the process since the preparation phase (including the negotiations with Brussels), not only enveloping it with a sound theoretical and conceptual basis, but also participating in the project management structure and steering committee. This leads to HUGGINS and COOKE (1997, p. 336), who argue that CU holds a long tradition of participating "*in projects designed to upgrade and regenerate the local economy*", bringing "*local tacit knowledge which could not be obtained through consultants from elsewhere*".

In the post-devolution period, the proximity between CU and the new and reinforced power structure seems to have gained expression. Following an interviewee connected to the WAG: *“the process of devolution brought new opportunities to Wales in terms of policy making and policy integration. We are looking for Welsh solutions for Welsh problems. To achieve, the expertise existing in universities, often unexploited, is essential”*. The same informant, to whom universities are *“focal points of communities”*, avers that CU, as well as the other Welsh higher education organisations, are *“seen by the WAG as a critical resource to fulfil its commitment in promoting a knowledge-based society in Wales”*. CU, in turn, recognises *“the particular importance of a culture of research and development to provide evidence-based support for policy development”* (CARDIFF UNIVERSITY, 2006b, p. 3), and brings forward as key priority area to *“further strengthen the relationship with the Welsh Assembly Government”* (id, 2006a, p. 5).

The flow of knowledge between CU and the government can be of an almost continuous nature or conveyed through sporadic and simple (but relevant) events. As an example of the latter, an academic involved in international research about school meals and personally engaged in the subject has been decisive to introduce the problem in the regional political agenda and to the subsequent establishment of the WAG’s chaired Food in Schools Working Group, which aims *“to take an holistic overview of school meals and in particular advise the Welsh Assembly Government on the extent to which more stringent nutritional standards are introduced”* (WAG, 2006b, p. 41). To illustrate the former, several examples could be highlighted, such as, for instance, the CU-based Welsh Governance Centre (WGC), which supports the National Assembly by offering a pool of legal and political expertise, and the academic networks, a steering group established in 2001 that brings together senior academics and senior policy makers to exchange knowledge in such areas as economic development, health and wellbeing, higher education and sustainable development. In addition, the government bodies also access CU generated knowledge through commissioning research projects, as it is the case, for instance, of the School of City and Regional Planning, in fields such housing, rural development and urban regeneration. The university is also partner of several other local and regional public organisations, as illustrated by the Police Science Institute, a collaboration between CU, the University of Glamorgan and South Wales Police aiming at integrating police research, policy and operations, and increasing professionalism in the police service.

Collaboration with public powers also involves the local level of government. As an example, CU and Cardiff City Council, building on a long tradition of interaction, developed a strategic collaborative framework that covers areas such as the international promotion of the city, urban economic development and employment, outreach community work and culture promotion, and environment challenges.

The overarching strategy for sustainable development established by the Assembly to fulfil the obligation imposed by the Government of Wales Act of 1998, constitutes an extra contact point with CU, which, in its latest strategic plan, acknowledging its “*corporate social responsibilities in their broadest sense*” (CARDIFF UNIVERSITY, 2006b, p. 5), assumed the commitment to support the WAG’s sustainability agenda. Within this broad agenda, CU is playing an outstanding part in helping the government in its struggle to transform the National Health Service (NHS), “*from an illness service geared to treatment into a health and well being service geared to prevention*” (MORGAN, 2004, p. 884). This part gains increased relevance when in presence of a region where territorial spots like the South Wales Valleys present a “*baleful state of public health*” (id.)¹⁶¹. The merger with UWCM brought in augmented critical mass in terms of education, research, and outreach and clinical service provision. The promotion of health and welfare, following one of the interviewees, “*has always been a concern of UWCM*”. This concern, he adds, “*has been transferred into the merged institution, which has a bigger potential to improve due to the enlarged span of knowledge and expertise and new conditions for interdisciplinary work*”. This matches the post-merger institutionalised view that “*a bigger, stronger, globally competitive university will be well-placed to make an ever greater contribution to the success of the NHS in Wales*” (www.cardiff.ac.uk).

The most recent developments in the area of health and welfare reveal a boom in terms of CU medical research funding, infrastructure and human resources (this will be tackled in more detail further on). In accordance, either in isolation or in partnership with other organisations, CU has reiterated and reinforced the tradition of co-operation with society held by the UWCM. This co-operation covers a wide range of fields and ways of interaction. For example, it can involve the use of CU’s medical knowledge on the revitalisation of primary care services in parts of Wales affected by a crisis in the recruitment of general practitioners; under the framework of the Heads of the Valleys

¹⁶¹ “[...] data on limiting long-term illness in the UK, which revealed that the South Wales Valleys dominated this league table, the league that no one want to win” (MORGAN, 2004, p. 884).

Project, clinical lecturers from the School of Medicine networked with community practitioners to attract and retain a highly motivated workforce in the Gwent Valleys and to ensure continuing professional development and training for healthcare professionals. It can also be based on the scientific developments achieved by research, as it is the case of the Wound Healing Research Unit, a top research and education unit of CU's School of Medicine recognised as Welsh Centre of Excellence; in close co-operation with regional healthcare providers, the unit applies its knowledge on clinical care, improving the quality of life of patients across Wales, because reducing their recovery time and discomfort, and, at the same time, diminishing a significant financial burden to the NHS and freeing up bed space in Welsh hospitals (www.cardiff.ac.uk). It can also take the form of policy advice to the WAG, as illustrated by the CU's Health Policy Group, aimed at bringing together academics and professionals to monitor policy developments and coordinate responses, or by the ongoing system of appraisal of Welsh general practitioners the School of Medical and Dental Studies set up and run for the government. An additional example adding up the broad range of interaction is the co-ordinating role assumed by CU, under the framework of the All Wales Alliance for Research and Development, in the Welsh Clinical Research Collaboration, involving ten thematic networks of researchers¹⁶² who support clinical trials and specific studies across Wales.

CU's interaction with the Welsh society in health and welfare sets out for recalling the business dimension. In fact, while working with the regional healthcare structure, the knowledge produced through research is underpinning academic entrepreneurship, namely spin-off and licensing activities. One can argue that this is not a full novelty, since the first spin-outs of UWCM date back to the 1980s (e.g., Molecular Light Technology Ltd.). Nevertheless, there appears to be a new breath, boosted by such events like the 25 million £ deal that CU signed in November 2006 with Biofusion Plc., a company established in 2002 to commercialise intellectual property rights of academic research results. The 10-year deal involves the provision of commercial managers to link with CU research able to be commercially developed and expects the creation of up to five new spin-off firms every year.

CU contributes to regional development also through *“very subtle initiatives, with subtle objectives and ways of functioning, to which there are no efficiency measures”*, as an

¹⁶² The thematic networks cover research on cancer, diabetes, epilepsy, learning disabilities, neurodegenerative disorders, mental health, children, gerontology, public health, and emergency care.

informant says. He talks about “*something that we cannot measure, but rather feel as very important for Wales*”, to introduce, as an illustrative example, the widely praised Cardiff University Innovation Network (CUIN). The network was established in March 1996, as a result of both internal and external factors. The renewed regional views on innovation promotion deployed by the planning dynamics associated with the RTP process is often seen as a most influential factor. At the internal level, MANNING and COOKE (1997, p. 7) highlight the “*university’s awareness of the successful networking activities adopted by some of the larger firms in the locality and elsewhere in developing extensive internal and external networks as a means to foster innovation*”, and the “*need for the university to undertake university-industry collaboration not only with large companies, but also with SMEs*”. When discussing the roots of CUIN, the name of Brian Smith, CU’s vice-chancellor at the time, is frequently cited, as shown by the same authors (id.): “*there was a strong push by the vice-chancellor towards developing an initiative which primarily builds linkages with industry. [...] He was aware of successful university-industry linkages at other universities (particularly his previous appointment at Oxford University) and considered it most appropriate for Cardiff University to promote linkages with SMEs due to the increasing importance of the SME sector within the Welsh economy*”.

The network activity, managed by CU’s Research and Commercial Division (RACD) and financed by CU¹⁶³, comprises the organisation of ten (free of charge) events per year, in which key topics relevant to Welsh businesses are addressed by invited speakers (academic and non-academic) and then discussed by the attendants. The typical event includes a free buffet after the formal meeting, which, according to one of the interviewees, has revealed to be “*a good opportunity to informally network and create bridges between academics and businesses that, otherwise, would not be very likely to happen*”. The blend of formal presentations and informal networking, following the same source, “*though the main goal of the network is the creation of linkages between the university and businesses, many times, it allows for the establishment of relationships between businesses*”. “*CUIN is a producer of social capital in Wales*”, he concludes.

The events promoted by CUIN since its creation have been attended by over 7500 people, 75% coming from the business sphere (particularly SMEs), 15% from both public

¹⁶³ During its first year, CUIN was funded entirely by the university. After a successful application for funding from the European Regional Development Fund, the network received this external support until 2001. Since then, CUIN is again wholly funded by CU.

and private business support organisations, and 10% from academia. Members of the WAG, among them the First Minister and the Minister for Economic Development and Transport, often attend CUIIN meetings, which are usually hosted by CU's vice-chancellor, confirming the high value that is attributed to the network by both the government and the university.

“CUIIN managed to keep at a very high level the interest of people, particularly of those belonging to the business world. In fact, though a melting pot, CUIIN is focused on the businesses”. This statement produced by an informant leads to the issue of how the agenda of each meeting is set up, which, as the same interlocutor avers, *“becomes crucial when trying to explain how CUIIN manages to keep high the interest of businesses in coming to the university”*. There is an industry group, formed by South Wales SME managers and multinational representatives, in a mix of young and more experienced entrepreneurs, that advises a steering group, composed by senior university officers (the vice-chancellor and a number of head of academic schools), about thematic areas that can be of interest to businesses. The discussion is underpinned by a basic question, taking the form, in the words of an informant, of *“what do we need to address in the future?”*. Basically, he adds, *“the aim is to search for answers to the challenges of the knowledge economy”*. In addition, the selection of themes and speakers, following another interviewee, is also *“very much based on the feedback of participants in previous events”*¹⁶⁴. Complementing: *“The themes and speakers are chosen taking into consideration what the attendants want to hear, which means that the agenda is in conformity with the prime concerns of businesses, rather than the interests of academics”*. A range of possible themes is proposed and the RACD comes forward to put together the events.

Besides the meetings, CUIIN organises an annual Innovation Marketplace, which includes exhibitions and workshops and allows for one-to-one meetings, a kind of *“speed-dating”*, as labelled by one of the interviewees, *“joining venture capitalists, academics, entrepreneurs, and so on”*. The same informant adds: *“when you have a very short time to meet, this speed-dating approach can be very useful. The RACD provides prior to the meeting a short profile of the two participants, with reference to their expertise, needs and problems, in order to ease the discussion. For instance, this speed-dating method was quite important to connect the researchers who are developing wound healing technologies with*

¹⁶⁴ At the end of each event, all participants fill in a feedback form.

health professionals and companies". In addition, CUIIN promotes the annual Innovation Awards meant to reward successful collaborative initiatives between academia and industry (there are awards for early stage projects and late stage projects, and the innovation prize).

Though difficult to measure in terms of efficiency, there are quantitative measures that mirror the relevant role CUIIN plays in Wales. This is the case of the more than 600 Welsh companies that engaged with CU for the first time in collaborative projects or the 300 consultancy contracts that CU signs every year as a result of the network. Moreover, CUIIN has revealed to be very important to the work of Wales wide programmes aimed at the development of university-industry linkages. This is the case of Know-how Wales, which, following an interviewee, "*uses the knowledge generated by CUIIN activities to match its work with the prevailing interests of industry*". "*In fact, Know-how Wales often starts its relationships with industry through contacts established during CUIIN events*", says the same informant.

This portrait of the presence and fingers of CU in regional development strongly indicates that the university is actively participating in the Welsh endeavour to strive in the so-called knowledge society. It also reinforces the argumentative line pointing to the need for looking beyond the technology transfer when investigating the role of higher education in socio-economic development processes. In fact, the knowledge resources CU taps into the region reach a much wider span. Moreover, the contribution of CU as a knowledge provider does not exhaust the university's role in the region, as it is a feeder of the regional pool of relational resources. Through its co-operative work with the regional organisational structure, CU plays also a part in enhancing the capacity to act collectively.

The knowledge resources tapped by CU into the region, as noted above, cover a broad range of types, disciplines, blends and aims. They comprise the knowledge transferred to the productive fabric and applied as a means to improve the innovative and competitive capacity of existing regional firms. This *productive* knowledge takes various forms, from new products and production technologies (*e.g., the co-operation between CU and the small manufacturer of Welsh and concert harps; the linkages between CU and the firms operating in the automotive and electronics clusters*), to *softer* insights on domains relevant for the operation of firms (*e.g., the identification of market opportunities, as in the case of the manufacturer of Welsh and concert harps*). *Productive* knowledge also

originates new entrepreneurial ventures, contributing thus for the renewal of Welsh industry (e.g., *the spin-offs established with basis on CU's research results*). New scientific knowledge generated by CU's research is directly affecting the quality of life of Welsh population, particularly health and wellbeing, because making available new means of diagnosis and therapeutics, and new organisational settings for healthcare provision (e.g., *the knowledge provided by CU to the NHS*). Knowledge resulting from research activities carried out in several disciplinary areas of CU becomes *productive* in the policy-making arenas, influencing and supplying a basis of evidence for policy developments in a variety of domains (e.g., *the support given by CU to the WAG's sustainable development agenda*). These dynamics of knowledge transfer rely on (and generate further) other types of knowledge resources, particularly of tacit embedded and embodied character. The generators and/or carriers of CU's knowledge applied in a wide range of fields of Welsh society, while interacting with a multiplicity of stakeholders, attempt to blend different types of knowledge, namely by mixing science-based with action-oriented knowledge (e.g., *the RTP process*).

The proximity between CU and the Welsh governing powers makes expectable a significant influence of the university's knowledge resources on the regional frames of reference for action. Expectations are turned into evidence when recalled the pre-devolution institutional change process forged by the RTP, which, involving a prominent intervention (and complicity, namely with the WDA) of CU academics, has made innovation a referent for action. Accordingly, renewed modes of designing and delivering development policies in Wales, and refreshed ways of thinking spread across a variety of public and private agents were set off. More recently, in a seemingly more formal and institutionalised relationship with the post-devolution political powers (e.g., *the networks of senior academics and policy-makers*), the government-led reiteration and/or reframing of referents is fed by the range of knowledge coming from CU, either as an input to shape the course or as an upholding scientific basis (e.g., *the WAG sustainability agenda*).

The integration of knowledge across different sectors of Welsh society is made upon networks bringing together CU and a variety of regional actors (e.g., *the integration of new health related knowledge across the multiplicity of organisational and individual actors in the NHS*). These networks can assume different forms, objectives and rationales, but they tend to become learning arenas influencing the permeability of the frames of reference for

action towards new knowledge, ideas and modes of acting (*e.g., the inspiring work of the CUIN in overcoming prejudices rooted both in academia and firms that hamper university-industry linkages*).

As the evidence about the knowledge resources provided by CU suggests, the university has a broad organisational spectrum of interaction. As for the business sector, though the overall propensity to work with large companies, mostly external to the region, the interaction with endogenous firms cannot be neglected, either in technical and technological terms (*e.g., the relevance of the work developed by the MEC and Welsh firms or the links of several CU's schools with new ventures resulting from university-based research*) or in terms of changing mindsets and identifying innovation opportunities (*e.g., the CUIN*). Nevertheless, when looking at the close and continuous relationships maintained by CU with Welsh public administration bodies, and outstandingly, with the regional health structures and partners, the conclusion is that the public sector in general and the private or semi-private organisations providing public services constitute a prominent co-operative ground.

The networks participated and directly or indirectly influenced by CU, as hinted before, present a diversity of morphologies and architectures. They can in fact largely vary in density (*e.g., the durable health related networks vs. the interaction taking place during CUIN events*), in their institutionalisation and formality (*e.g., the so called academic networks supporting policy-making vs. the participation of individual academics in groups of interest, such as in the school meals problem*), and spatial reach (*e.g., the all-Wales role of CU in the health related fields vs. the links with the Cardiff County Council*). The positioning of CU in this diverse web of relations varies accordingly. The university can assume the role of network node manager (*e.g., the Wound Healing Research Unit networking with Welsh healthcare providers*) and, in some cases, can combine this managing position with the role of switching point (*e.g., the close collaborative work "switching" CUIN and Know-How Wales*). Though still holding influence, CU can also position itself distantly from the steering level of networks, or, in other words, far from the foreground arenas that shape their course and goals, as it becomes (particularly) clear when taking into account the relationships between the university and the Welsh political structures (*e.g., the networks aimed at policy advice*).

CU can be regarded as a key partner in a multiplicity of regional networks, contributing with knowledge and relational resources that improve and sustain over time their operational capacity. The university does that in a variety of ways and intensity, depending namely on its position in-between the networks' core and periphery. In turn, the academic prestige and reputation of the university cultivated in the UK and beyond can be viewed as directly and indirectly influencing the region's access to supraordinate resource allocation powers, and, particularly, as improving the ability of Wales to attract development relevant ventures (*e.g., the Biofusion model*).

The multiplicity of regional networks participated by CU, meshed together with the *advisory power* it holds in the Welsh policy-making and policy delivering structures, allows for suggesting that the university has an important stake in the identification of development opportunities. This contribution, when attached to a presumably active role in reading and interpreting external signs and trends and the subsequent transfer of this knowledge, remains hard to sustain through the evidence gathered. However, a sounder evidence basis becomes available when dealing with the identification of development opportunities, as well as of arenas and networks to be targeted by the mobilisation efforts, which are internal to the region. This acquires particular relevance when noticed the range of activities promoted by CU that help to spot latent (or even hidden) resources (*e.g., the identification of opportunities to foster university-industry linkages through CUIN; the revitalisation of primary care services in several locations of Wales*). Recalling the proximity of CU towards the Welsh political sphere and its wide participation in networks of different nature and aims, the conclusion is that the interactive work developed by the university exerts a strong influence on the regional agendas for action. The influence of knowledge and relational resources generated within the university is felt either at the stage of agenda setting or at the stage of turning it operational (*e.g., the intervention of CU in the RTP and its influence on the evolution of the Welsh innovation agenda*).

Taking this picture of CU's *presence* and *fingers* in the regional processes of institutional capacity building, the university emerges as a core organisation not only in the generation of knowledge and relational resources relevant for the region's development but also as a *locus* where those resources are purposefully combined and mobilised to enhance the region's capacity to act collectively. Accordingly, CU has a prominent position in the set of actors that thrust institutional change in Wales, be it as a *broker* binding learning

networks together or as an *opener, developer and maintainer* of regional development initiatives. A comprehensive framework for regional engagement supports this presence and fingers of CU. This is the point at issue in the following sub-section.

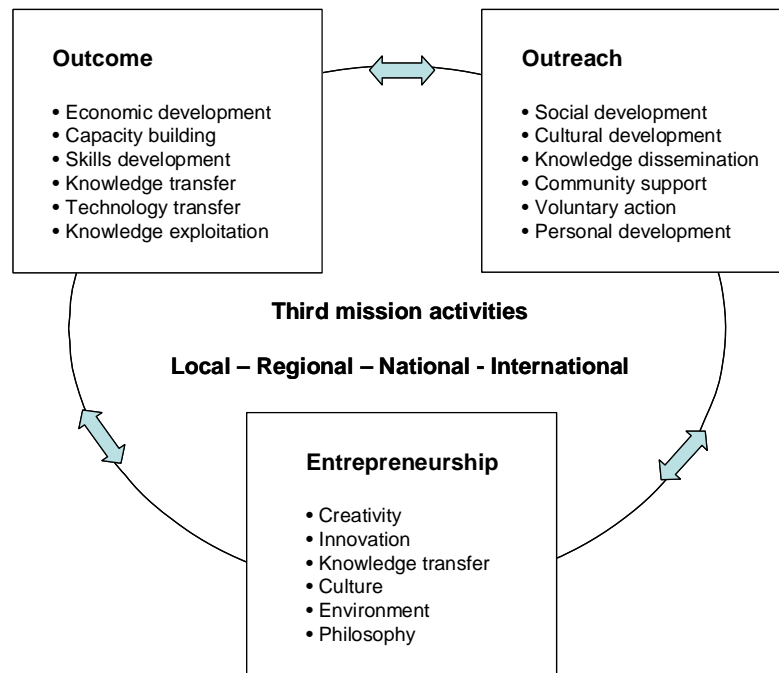
10.4.2

A comprehensive organisational framework for regional engagement

In the words of one of the interviewees, CU “*has for long a regional engagement agenda, at the beginning focused mainly on supporting industrial activities and, more recently, on wider societal objectives*”. As hinted before, the change dynamics introduced by the RTP process opened up a new cycle in the relationships of CU with the region, which, at the turn of the century, would be enhanced and enforced by a favourable environment for regional engagement of universities in the whole UK, and the pressure put by the post-devolution powers on Welsh higher education institutes to organise themselves in order to foster co-operation with society.

Responding to the requirements imposed by the policy framework (cf. HIGHER EDUCATION WALES, 2003), CU has started in 2003 the design and internal debate of its *Third Mission Strategy and Action Plan* (CARDIFF UNIVERSITY, 2004a). The document defines the objectives and principles, describes the contextual conditions of third mission activities, and acknowledges that CU’s strengths “*lie within the breath and depth of its research base and its extensive abilities within the learning and teaching arena*”, which “*enable the University to deliver Third Mission activities across an extensive range to benefit society, both culturally and economically*” (id.). It highlights the need for incorporating numerous types of third mission activities that can be delivered to private, public and voluntary organisations, as well as to individuals. Taking this view, third mission activities are broadly defined, as a means, on the one hand, to fully incorporate the extension of the research and teaching functions and, on the other hand, to encompass all third mission activities that can be developed by a research-driven university.

Figure 10.5 – The framework for third mission activities



Source: adapted from CARDIFF UNIVERSITY (2004a)

The strategy defines third mission activities as extending across a broad spectrum from outcome-oriented work to outreach-oriented work, including the stimulation and support to entrepreneurship (Figure 10.5). The “*innovative framework*” (CARDIFF UNIVERSITY, 2004a) is aimed at supporting “*the creation, acquisition, dissemination, transfer, application and exploitation of knowledge and other, related University capabilities outside the academic environment*” (id.). In parallel, it draws implementation plans, outlines the governance, management and leadership of CU’s third mission, and establishes evaluation guidelines. The implementation plans build on the acknowledgement of the requisite to create “*an appropriately motivated, trained and well-resourced management infrastructure, with clear incentives and rewards for individuals, groups and schools engaging in Third Mission Activities*” (ibid.). The recognition of the need for high-level leadership from the university evidenced in the strategic document has been translated into the formation of the Innovation and Knowledge Transfer Group (IKTG), chaired by the vice-chancellor and comprising a membership of key external stakeholders (about 50%). Two advisory groups to the IKTG were established, in the Business and Enterprise and the Social and Community areas. CU’s schools were meanwhile asked to

identify within the strategic plan what they currently contribute to third mission and how it will be developed, aiming to ensure the integration between the work of each school and the whole university plans. Performance monitoring has been put under the responsibility of the IKTG, and benchmarks were developed against both the Russell Group of universities and comparator international universities, in order “*to establish challenging, but realistic, targets over the planning period*” (ibid.). Under this guiding framework, in 2005/2006, CU ensured about 33% of the total third mission funding allocation made available in Wales, amounting to 1,347 thousand £ (www.hefcw.ac.uk).

The merger between CU and the UWCM brought, as mentioned above, a new impetus and strengthened potential to regional engagement activities. It has also underpinned a number of conceptual and organisational changes to those activities. Signalling these changes, the name *third mission* would be replaced in CU’s strategic documents by *innovation and engagement* in 2005, after a consultation promoted by the Merger Commission, which then “*agreed that a much more dynamic and relevant name was now needed for this important activity of the University*” (CARDIFF UNIVERSITY, 2004b, p. 5). The IKTG, in accordance, was renamed as Innovation and Engagement Board, which maintained the two advisory sub-panels referred to above. Moreover, CU has revised the model for allocation of HEFCW Third Mission Funding across the Schools, aiming “*to better support the full range of outcome and outreach focused activities undertaken within the institution*” (CARDIFF UNIVERSITY, 2006b, p. 11). The new model replaced a formula based allocation method, derived from contract research income, which, according to the same source (id.), “*failed to sufficiently reward some Schools for their work in advancing some areas of the innovation and engagement agenda which were not in themselves income generating*”. According to the new allocation model, which came into force in the academic period 2005/2006, the schools should submit bids in order to unlock third mission funds for a three-years time span. In parallel, CU is developing a set of metrics for measuring the impact of regional engagement activities that will allow the return to the original distribution of funds by formula in 2007/2008, “*thereby rewarding the commitment of schools to innovation and engagement*” (ibid.).

In this changing context, the *Third Mission Strategy* gave its place to the so-called *Innovation & Engagement Strategy*, issued in 2006 (CARDIFF UNIVERSITY, 2006b) in the overarching framework of CU’s new strategic plan. Though shading off the explicitness of

regional engagement as academic mission, as discussed earlier, the new strategy maintains much of the objectives and management and operational principles stated by its predecessor, namely concerning the implementation logic, based on the three-part framework of outcome, outreach, and entrepreneurship activities. Notwithstanding, a number of relevant novelties can be noticed, such as, for instance, the identification of critical success factors, which “*define the characteristics necessary for achievement of the objectives*” (id., p. 4), and the definition of key outputs/priorities for each one of the six stated objectives¹⁶⁵. In addition, the strategy establishes the lead responsibilities and management structures for developing and implementing action plans aimed at achieving the identified critical success factors. The major concern here is “*to ensure applicability across the full spectrum of innovation and engagement activities and to ensure integration with the Research and Learning and Teaching strategies*” (CARDIFF UNIVERSITY, 2006b, p. 5). This concern mirrors the acknowledgement that “*there is a significant overlap and integration between the three strategies (Innovation & Engagement, Research, and Learning & Teaching)*” (id., p. 4).

According to one of the interviewees, “*those academics who want to co-operate with the external world find in Cardiff a very favourable environment and a clear framework that establishes the rules and responsibilities, suggests modes of operation, identifies funding sources and structures the relationships*”. The same informant roots the comprehensive strategic framework encompassing engagement activities in “*a mix of internal and external factors*”. He adds: “*it is the result of combined doses of internal commitment to regional issues and of external political pressures and money allocation criteria, gathered up with the need to ensure coherence between the trilogy teaching-research-third mission*”.

The need to balance between teaching, research and external engagement does not seem to be taken unanimously among CU staff, namely concerning the relationships

¹⁶⁵ The six objectives of the Innovation and Engagement Strategy are the following: i) to work with stakeholders to identify where, as a corporate entity, CU can broaden its civic responsibility and work for the wider benefits of society; ii) to provide a range of high quality research and consultancy opportunities, and, where appropriate, to further develop the outcomes of its research for the benefit of the external community and the University; iii) to contribute to professional development locally to globally; iv) to apply those activities consistent with CU’s strategy and expertise that will help governments and national and international bodies worldwide to address particular problems and to contribute to policy development; v) to disseminate CU’s research and knowledge to increase public awareness of and engagement with Cardiff’s academic specialisms and expertise; vi) to contribute to the cultural enrichment of Wales, the UK and the world (CARDIFF UNIVERSITY, 2006b).

between scientific research and the third mission. *“Why should we try to do the balance between seeking international excellence in research and the need to address Welsh needs?”*. This question raised by one of the interviewees draws on his perception that *“research is driven by the international agenda, meaning that the researchers seek to achieve outputs of first quality when measured against international comparators”*. He continues: *“the agenda is not necessarily set by Welsh firms and other organisations, but by the inquisitive minds of investigators, and perhaps the funding councils who sponsor the research and set broad guidelines on the priorities. For example, taking Welsh SMEs, or indeed any commercial bodies, they sponsor contract research that first of all has to fit within the specialism and interests of the researcher, – otherwise he or she will not undertake the research -, but it does not necessarily need to be as ground breaking as his or her mainstream activities, mainly because it is probably only a small portion of the work”*. And, for concluding: *“if commercial work grows to take up too large a portion of an individual researcher’s time, then there is an argument that he ceases to be a ‘researcher’ and he would probably not be included in the reported statistics used to calculate the research assessment exercise gradings”*.

The official position seems to contradict the last set of arguments. It is expressed by CU’s strategic plan, according to which, *“although it is traditional to discuss research, teaching and learning, and innovation and engagement as separate activities, it should be firmly emphasised that, at Cardiff University, these are integrated activities that are inextricably linked and mutually dependent”* (CARDIFF UNIVERSITY, 2006a, p. i). Still, the integration of the academic missions, according to an informant, *“cannot be seen as spread across the whole academia”*. *“This is not something to be considered as unexpected, mainly because the criteria for career development are still very much centred on the number of papers you publish and the amount of research grants you get”*, he argues. An additional point made by other interviewee underscores *“the high independence of research units and even individual researchers”*, which, in some extent, *“raises difficulties to spread over and fully translate into practice the message coming from the university’s top government”*. One of the interviewees sums up: *“we have an encouraging and guiding strategy, as well as a purposeful supportive structure, but, as expected, there are fluctuations from school to school in terms of the contribution they give to the integration of teaching, research and third mission activities”*.

Notwithstanding, the case of CU units that are active in third mission activities strongly indicates that they are able to successfully integrate the threefold academic mission and, moreover, take advantage of the work they develop with Welsh society. For instance, the MEC balances quite well internationally relevant academic research and service provision with help to small companies operating in Wales. While helping firms like the small manufacturer of Welsh and concert harps, the unit is recognised as Centre of Excellence by the WAG, has been awarded by the UK government for its work with industry and, in the latest Research Assessment Exercise received the highest rate, thus signalling the development of research work of national and international excellence. Additional evidence comes from the healthcare sector, specifically from CU's Dental School. It works with large multinationals, such as Glaxo Smith Kline, runs highly rated teaching activities, and, simultaneously, engages in improving the oral health of Welsh population. Jeremy Rees, professor of restorative dentistry, about the work in the region, argues: "*it is not a profit-making activity for us. Our profit is in fact the knowledge we acquire through the work. That knowledge we can then use and publish*" (MEDIWALES, 2005, p.6). Accordingly, the school takes benefits from its regional engagement activities.

Much of this capacity revealed by units such as those mentioned above to integrate teaching, research and the third mission can be associated with the effectiveness of an internal bridging infrastructure already in place, which comprises a variegated set of organisational arrangements to support and facilitate interaction with the external world. It ranges from the University Careers Advisory Service, facilitating student entrepreneurship, and the University College Cardiff Consultants Ltd., monitoring intellectual property and licensing activities, to the already mentioned CUIN and the Cardiff Partnership Fund Ltd., aiming at the advancement of research commercialisation. These organisational arrangements underpin what is generally recognised as a quite proactive environment sustaining regional engagement initiatives, which, in addition, can rely on a multiplicity of programmes and funding schemes, both at the UK and the regional level, directed at fostering an effective university-region nexus, as well as on initiatives such as the Centres of Excellence for Technology and Industrial Collaboration (CETIC)¹⁶⁶, the Technium

¹⁶⁶ CU hosts 5 of the 18 CETIC operating in Wales: the Centre for Research in Built Environment; the Centre for Research in Energy Waste and Environment; the Manufacturing Engineering Centre; the Wolfson Centre for Magnetic Technology; and the Wound Research Healing Unit. CU also participates in the Centre for Advanced Software and Intelligent Systems, a joint venture between the CU's Computer Science Department and the Centre for Intelligent Systems at University of Wales Aberystwyth.

project or the Wales Gene Park. One of the interviewees uses the example of CETIC to illustrate the relevance of the external infrastructure: *“the programme provided the opportunity for CU to engage in a more organised fashion with industry, and, at the same time, brought in the right people to interact with industry, people with industrial research experience who are able to establish bridges with firms better than the academics”*.

To place the *right people* promoting and managing CU’s engagement activities is also an underlying element of the Research and Commercial Division (RACD), which can be regarded as the key university’s administrative unit within the organisational arrangements supporting interaction with society. The RACD centres the operational management of the third mission. It has a permanent staff of over 50 people, distributed by offices dealing with grants, research development, research policy and management, and commercial development, the latter running co-operation with society, in particular with industry and the NHS¹⁶⁷. Seven full-time members of staff, most of them with previous business experience, compose the RACD team that seeks, promotes and manages collaborative projects. According to one of the interviewees, *“the people working with collaboration projects have the knowledge that enables an understanding of the problems and needs of external partners, especially SMEs”*. *“They are very useful to inform the individual academics and the research units engaged in interaction activities how they can be more effective in helping the community”*, he says, before concluding: *“on top of this, they optimise relationships that already exist and, because owning project management expertise, free the academics from administrative tasks that they tend to dislike and even be ignorant of”*. Each one of the seven officers has specific scientific areas of responsibility. For instance, two officers are responsible, respectively, for the areas of engineering, computer science, physics and astronomy, and for the domains of medicine, biology and life and health sciences. A third one deals with all other areas of expertise existing at the university. Following the same informant this arrangement *“is essential to mapping the way that an external partner has to go through in order to find within the university the most adequate solutions for its problems”*.

The RACD, as put by one of the interviewees, *“under the motto ‘Cardiff University is open for business with you’, is also an instrument for marketing the university and its expertise”*, and it *“promotes and participates in exhibitions, outreach marketing activities*

¹⁶⁷ The interface with the NHS is shared with the RACD’s Research Policy and Management office.

and establishes strong links with the government, local authorities, business support organisations, and so on". "Obviously, - he reminds, - *one of the most effective marketing instruments of the university comes through the work developed by the CUIN, which is run by the RACD*".

CU, in short, can be considered as having reached a fairly advanced stage concerning the strategic framework influencing regional engagement activities, as well as the set of organisational arrangements supporting those activities. The university's development plans reveal an institutional *conscious* and committed stance towards the fostering of linkages between academia and the external world (*e.g. the Innovation and Engagement Strategy*). Although an increased focus on improving the university's global prestige, CU's consciousness and commitment turns also to the Welsh society expectations, needs and problems, mirroring the combined effect of a genuine acknowledgment of the university's regional role and the highly encouraging, even pressing, policy environment, both at the level of the Welsh post-devolution political powers and the government in London. Collaborative work relies on a variegated infrastructure, both internal and external, serving not only to render operational the engagement stated objectives but also to ensure the management levels needed to achieve the coveted integration of the three academic missions (*e.g., the RACD*).

Regional engagement, as part of CU's mission, can be regarded as mainstreamed across the university's units. Concerns with mainstreaming, as a matter of fact, are revealed by the way the institutional engagement strategies are discussed and designed, involving the different academic and administrative units (*e.g., the integration of each school's strategy in the overall engagement strategy*). Even though the favourable framework and its mainstreaming, different intensities of interaction can be noticed between and within schools, depending not only on the nature of scientific domains, but also on individual cultures and objectives that mould the willingness of researchers to cooperate with external partners and/or their awareness of regional engagement as an integrative part of the university's mission.

10.4.3

CU and the potential to rebuild an unravelling regional system of innovation...

The Welsh regional system of innovation, in the last decades, underwent significant changes in terms of its components, relational structures and attributes, both public and private. As discussed earlier, among the major shifts are the lifting of innovation to the centre of development policy and the establishment of a variegated innovation supportive infrastructure, much of this under the influence of the RTP process; the devolution of political powers to Wales; and the transformation of the productive structure, from the foreign investment led system that helped Wales to escape the legacy of steel and coal to what COOKE (2004b) calls the *manufacturing meltdown*, which, according to the same author (id.), unravelled the qualities of the Welsh regional system of innovation. CU has, to a certain extent, co-evolved with the regional system of innovation, as far as its internal strategic guiding frameworks, interaction capabilities and organisational arrangements were largely influenced by the succession of change inducing events, particularly at the policy level.

Following one of the interviewees, *“the RTP is a very important piece when trying to understand the evolution of policy making in Wales and the effect it had on the ways universities look at their location places, and the same can be said about the perception of the Welsh society in relation to their higher education institutions”*. In addition, as the same informant argues, *“the process has shown that the links between Welsh universities and industry, at the time, were not working very well”*. However, she adds, *“the most important thing was the acknowledgment by key innovation agents that there was a huge development potential in Welsh universities that Wales should take advantage from”*. CU, which, as noted above, was already playing an important part in the consolidation of the two major productive clusters underpinning economic change in the country, has been challenged by new societal expectations. This, together with the growing awareness of academics in relation to the university’s regional role, brought a new impetus to the university-region nexus, particularly in the promotion of links with industry, as signalled, for instance, by the establishment of the CUIN.

In the post-devolution period, the need to take out the most of Welsh universities to foster regional economic development would be confirmed. According to an interviewee,

“after a historical speech of a minister of the London government, which, for the first time, has put science and technology amongst the most important arenas of economic development, the Welsh government drew out the RTP from the drawer where it had been placed in 1997 and, building on it, started to develop specific policies and to allocate money directed at improving the interaction between universities and industry”. The prolific production, - *repackaging* for some (e.g., COOKE, 2004b) -, of innovation policies, relying heavily on higher education to succeed, in conjunction with a number of infrastructural developments and the nature of funding instruments and allocation methods, induced further changes across Welsh universities. Once more, CU has mobilised itself in order to cope with a new political and policy environment. The refinement of internal strategic frameworks and organisational arrangements largely mirrored the pressures from the devolved political powers and new funding schemes, as shown, for example, by the university’s third mission strategy issued in 2004. The possibility of CU to take advantage from infrastructural developments taking place in Wales, of which the Wales Gene Park and the Technium incubation scheme are good illustrations, was not negligible as motivation for the introduction of strategic and operational novelties in the university’s framework sustaining co-operation with society. In addition, as sustained by an informant, *“the devolution of powers in Wales coincided with the UK wide acknowledgment of the third mission of universities as something that goes beyond the links between research and industry”*. This, following the same source, led CU *“to prepare for the new challenges raised by a broader societal agenda”*.

The way CU was affected by the changes in the business dimension of the Welsh system of innovation is an issue difficult to tackle, since the interviews and the consultation of documental sources did not shed enough light over the subject. However, the relocation of multinationals elsewhere and its shortening effect on the innovation potential attached to the endogenous supply chain of those companies, as reported in COOKE (2004b), can be certainly expected to have had an impact on CU relationships with industry, namely because this had been, for many years, a strong area of co-operation between the university and firms. The author (id., p. 219) helps to sustain this perception by arguing: *“Embryonic ‘Triple Helix’ relations among universities, businesses and government agencies atrophy and die with the loss of regional personnel to act as interlocutors and commissioners of research”*. Nevertheless, taking into consideration the

collected evidence, in the case of CU, this evolution did not mean that collaborative work with Welsh businesses simply vanished. In fact, while intensifying efforts to enter the set of knowledge suppliers of large companies located outside Wales, particularly in the UK, CU has kept a fairly successful track record in terms of its interaction with the region's economic fabric, though perhaps less sector or cluster specific.

CU's track record, in turn, cannot be interpreted as signalling any easiness in fostering university-industry linkages. As an interviewee reports, *"many entrepreneurs in Wales are still intimidated when in contact with an academic and many are still sceptical in relation to the role universities can assume in improving their innovation capabilities"*. *"These kind of perceptions persist, although significant changes can be noticed"*, she adds. In this context, the track record of CU is not detached from the significant changes the informant talked about, which, to a large extent, might be seen as resulting from the combined effect of external and internal efforts to reduce (namely mind related) barriers, as it is the case of such programmes as Know-How Wales and the CUIN, respectively. One can thus argue that, rather than in isolation, CU is pulling through the problem in close co-operation with the public sphere. A member of CU's staff confirms the argument using as example the *"mutual benefits that are being accrued from the linkages between the RACD and Know-How Wales"*. According to him, *"the RACD needs Know-How Wales to improve its linkages with industry and, in turn, Know-How Wales finds in university led initiatives, such as the CUIN, an important tool to achieve its objectives of facilitating the access of Welsh firms to knowledge available in Cardiff academia"*. The same informant, taking a broader view, argues: *"the strong links existing between CU, the government and related intermediary organisations, local authorities and business representative organisations is of great importance to the university, namely when it is being urged to strive for alternative funding sources"*. Collaboration with a wide range of regional actors *"acquires increased relevance when, politically, it is difficult to pump more money into Cardiff"*.

The close collaboration of CU with the WAG gains weight when realised that the government highly centralises the regional innovation administration (COOKE, 2006). In this context, one can argue that, on the one hand, the mobilisation of academic knowledge to help regional development policies to succeed is facilitated, and, on the other hand, the university has enhanced opportunities to better fulfil its regional innovation and engagement goals and access the yearned complementary funding. By recalling the three

priority areas upon which the regional innovation-focused science policy concentrates (WAG, 2006a), - low carbon economy, social and economic renewal, and health -, the argument finds illustrative ground. The policy document, concerning the first priority, states (id., p. 37): “*there are currently several departments in Welsh HEIs which are world-class and of a size to be significant in the energy sector, notably the Welsh School of Architecture and the Schools of Engineering at Cardiff University. [...] Wales is fortunate in having world-class behavioural science/psychology departments in University of Wales, Bangor and Cardiff University which can help develop programmes to influence the way energy is used*”. The same can be said about the enabling of sustained social and economic renewal, - “*each of our major HE institutions has a business school, and there are significant centres of relevant expertise in planning/regional development centres such as the Department of City and Regional Planning at Cardiff University [...]*” (ibid., p. 43) -, or the healthcare priority: “*Clinical research facilities are developing in Cardiff University [...]. Cardiff has a track record in this area [innovation and commercialisation] through the Medicentre on the University Hospital of Wales campus*” (ibid., p. 32).

Taking the case of health, as highlighted above, CU, particularly after the merger with UWCM, plays an instrumental role in the generation of new knowledge in the area of life sciences, which is at the basis of the introduction of innovations, both in terms of clinical care and health related technologies and products, as well as of new production units through spin-off activities. The WAG, in turn, is earnestly pursuing the ambition to “*create world class healthcare and social services in a healthy dynamic country*” (WAG, 2005c, p. 1). The pledge carries with it overlapping goals pointing to the growth of a bioscience-based cluster in Wales (id., 2006a), relying mainly on academic research and teaching, and the burgeoning sector developments that are taking place namely along the M4 corridor, in the South East, and in the Wrexham and Deeside areas, in the North East. In other words, one can argue that there is an attempt to integrate healthcare and social services with economic development aims. A number of infrastructural initiatives, mainly public-led and oriented towards offering production space, as well as specific public support programmes, are being made available in Wales directed at the sector’s growth. On top of this, networks binding together public and private organisations, such as *Team Wales* (a collaboration of Welsh government agencies and sector organisations), *Medi-Wales* (a contact point between the medical and the bioscience sector), the *Wales Cancer Trials Network*, and

BioWales, and new tools like the *Welsh Innovations in Healthcare* (WIsH), aimed at identifying, protecting and exploiting NHS intellectual property¹⁶⁸, are strengthening the sector specific relational structure. Experts in the field (e.g. SPARROW, 2006) state: “*the proximity of a stimulating academic and research environment and the availability of a skilled labour force are essential ingredients. In many cases, a commitment at the public level, manifested by targeted support and a sound infrastructure, is necessary. While all of these elements are present in Wales, a spirit of convergence, as much as anything else, has contributed to the emergence of a successful bioscience cluster*”. The same optimistic flavour can be found in the words of Gwyn Tudor, member of MediWales (id.): “*People have said that if you gathered together all the automotive companies in Wales, you could make an entire car. These days, you could almost make the same claim for a broad range of medical equipment*”.

These developments, with the reliance on the academic expertise and support of CU at the very core, might be regarded as the emergence of a new systemic basis for regional innovation. This matches the argument of COOKE (2004b, p. 233), pointing to a “*new type of public sector interaction involving healthcare and higher education*”, which, according to the same author, “*offers the possibility of evolution into an innovative, university-led type of innovation system designed to fit the demands of the new ‘knowledge economy’*”.

The core position of CU in the ongoing regenerative process of the regional system of innovation allows for suggesting that the integrated approach to health and socio-economic development grounds a strong, and mutually beneficial, university-region nexus. The benefits for the region, much of which have been described earlier, are of an almost self-evident nature, either from the point of view of the health system or the perspective of entrepreneurship and knowledge/technology transfer. As of the advantages CU can take from its regional collaboration activities, bearing in mind the wide span of fields that feeds the knowledge structure of health related science and, particularly the evolving association between objectives in welfare and social and economic development, one can argue that they not only relate to those schools and units working directly on life sciences, but also to

¹⁶⁸ Since 1999, funded by the DTI’s Public Sector Research Exploitation programme, ten regional NHS intellectual property hubs had been created in the UK, nine in England and one in Scotland. Wales did not benefit from this funding stream, but the WAG, through WORD- Welsh Office for Research and Development, in 2006, decided to fund on its own a similar initiative to exploit intellectual property in the Welsh NHS.

a variety of other scientific areas. Plenty of evidence could be put on view to sustain this argument. This is the case of the recent 30 million £ investment in the Wales Research and Diagnostic Positron Emission Tomography Centre, a facility that while boosting world-class biomedical research at CU, places the top diagnostic technologies at the service of thousands of Welsh patients. The centre resulted from a partnership between the university and the Cardiff and Vale NHS Trust and was funded as a joint project between the Welsh NHS and the WAG. Another piece of evidence, this one sustaining that the benefits are not limited to those schools working on life sciences, is offered by the MEC, which is finding additional funding sources for its teaching and research activities through engaging in collaborative projects with firms operating in the biotechnology sector. The Centre, for instance, as part of a network of Welsh engineering and design firms, provided Bayer HealthCare with a prototype for a device that analyses urine strips automatically (SPARROW, 2006). It has also helped Gyrus Medical, a Welsh-based manufacturer of electro-surgical equipment, to develop small ceramic components through laser technology, to be used as components of a device for keyhole surgery.

The prospects of a mutually beneficial university-region nexus are, notwithstanding, soundly expressed in CU's strategic documents: *"Experience shows, successful innovation and engagement activities can have a significant positive impact on the reputation of the individual, their academic School and the host university as well as on society. [...] As well as benefiting economy and society, the University recognises the value to itself of innovation and engagement activities. These activities may offer opportunities for significant new sources of revenue for the institution, the benefits of interaction of its staff and students with external organisations and communities [...]"* (CARDIFF UNIVERSITY, 2006b, p. 2/3). Additionally, as suggested by the case of the Wales Research and Diagnostic Positron Emission Tomography Centre, the work developed in and for Wales can be of utmost importance to ensure the recognition of CU's academic excellence, in the UK and beyond, or, in other words, to enable CU to progress towards its vision of being a world class university (id., 2006a).

The relationship between the Welsh regional system of innovation and CU cannot be dissociated from the relatively high level of political, policymaking and financial autonomy that, namely since the devolution process occurred in the late 1990s, enabled Wales to pursue socio-economic development goals under the guidance of policies and

support instruments indigenously produced. Drawing on the RTP experience, which had lifted innovation up in the regional development agenda and, simultaneously, raised the awareness of the role to be played by higher education, the Welsh devolved powers set up thorough public policies that counted on universities as instrumental to materialise stated objectives. CU co-evolved with the policy framework, preparing to face increased expectations and an emerging wider societal agenda for engagement, as expressed in the university's strategic planning documents (*e.g., the CU's third mission strategy*).

The strong and broad ranging collaborative ground existing between CU and public administration, signalling a situation of mutual dependence, is evidenced by the links aimed at overcoming obstacles raised by systemic debilities featured mainly by the business dimension of the regional system of innovation (*e.g., the joint work developed by the RACD and Know-How Wales to deal with the scepticism of Welsh SMEs towards the role of universities*), or by the reliance on CU to achieve primary policy objectives (*e.g., the three priority areas defined by the Welsh regional innovation-focused science policy*).

The weakness of the regional system of innovation seems to have been amplified recently by the outflow of a significant number of multinationals. In fact, while becoming stronger in its public dimension, the system suffered significant changes in the business dimension, levered by global trends against which the devolved power structures could not do much, unless attempting to seek for alternative development trajectories to the one underpinned by foreign direct investment. This ongoing search for alternative development routes is leading Wales to a distinctive regional evolution and opening opportunities that can lift the university-region nexus to a new level. At the forefront of the search is the policy effort to integrate the aims of meeting basic needs of Welsh people and improving social justice (*e.g., the ambition to create a top quality healthcare system and social services*) with economic development objectives (*e.g., the development of bioscience industry*). The expertise available at CU, as well as the long co-operative tradition it has with key regional actors, is placing the university, more and more, at the core of the integrative development trajectory, thus enhancing significantly the potential for accruing mutual benefits from the university-region nexus. CU is providing knowledge and relational resources and nourishing the regional capacity to change and act. It is a prominent piece in the associative governance of what could be called a regeneration process of an unravelled regional system of innovation.

10.5

The role of universities in LFRs: is there anything of particular?

As argued before, the relevance of the role universities can play in LFRs lies not only in the condition of academia as major source of productive knowledge generation and dissemination, but also in the contribution it can give to fight institutional inertial forces that lock lagging regions into low development stages. The case studies reported above soundly sustain the argument, and, in addition, show that greater importance can be attached to it when looking for something of particular about the role of universities in LFRs. They indicate that an exclusive focus on the links between academic research and the world of production leads to a quite incomplete picture, even in more advanced regions. They also suggest that, under this narrow perspective, the uniqueness of universities in LFRs can be derived mostly from the scarcity, on the one hand, of non-academic productive knowledge sources, and, on the other hand, of explicit demand for university knowledge. The intrinsic value of academic knowledge for production, when applied, is relevant either in less or in more favoured regions, as shown by the cases of TUT and CU in the more favoured Tampere region and the relatively less favoured Wales, respectively. It is thus reasonable to infer that a wider lens is needed, not only to get a more complete and sharp picture, but also to find the distinctive features marking the role of universities in LFRs.

The wider lens, reaching beyond knowledge transfer to industry, enables the influence universities exert on the processes of regional institutional change and capacity building to enter the picture, as otherwise recommended by the evidence collected on the field. This evidence, though, also prompts the idea that particularities of the role played by academia in LFRs do not unfold immediately. Actually, the contribution of universities to institutional change and capacity can be of great importance also in more favoured regions, namely to avoid deterioration caused by cyclic crises and/or lock-in to exhausted development trajectories, as suggested by the role of TUT in the reinvention of Tampere region. However, this type of regions are generally able to make use of their institutional and organisational ballast in order to usher in fresh development ideas and directions that allow them, all the more readily, to adapt to changing conditions and endure. In this sense, the distinctive features of universities' role in LFRs are more likely to emerge if brought

into the equation the strength of inertial forces, which tend to be significantly higher in territorial contexts lacking the tradition, the culture, the leadership, or the willingness and ability to change, as it was the case of Central Macedonia in the early 1990s. The extended equation draws particularities that can be taken according to two intertwined points of view. The first is the one of the region urged to change: in institutionally weaker regions, universities can be the energising and sense-making nucleus where change is ignited, shaped and steered. The second is the one of universities as regional change agents: engaged universities operating in those institutionally weaker regions, as nuclear arenas for fostering change and unlocking institutional inertia, are likely to endeavour in painstaking efforts to succeed. The challenges faced by universities acting under such unfavourable conditions acquire also a particular nature, enfolding a variety of differentiating elements, such as, for example, the arduousness to harmonize regional engagement activities, - tending to yield fewer academic and financial rewards -, with the strive for peers recognition, - more and more played at the national and international levels and dependent on research results that hardly fit the needs of lagging regions. In addition, and consequently, uncertainty envelops the extent to which academics can be motivated to renounce the safer environment appeased by the *ivory tower* to work in favour of an often suspicious or even antagonistic, hardly rewarding, environment.

Naturally, since the “*Less*” qualifier in the abbreviation *LFR* ranges along a relative scale of laggardness, the particularities of the university-region nexus are more or less intense in accordance to the position of the region on that scale, as otherwise suggested by the case studies. In other words, the lower the systemic qualities of the regional systems of innovation, the harder the effort and the challenges, the more difficult to take any rewards.

Universities acting in weaker regional systems of innovation tend to lack social and political supportive basis, both at the national and regional levels. Although concentrating the resources indispensable to give fresh directions to the region’s development trajectory, those universities can be left on their own if willing to and engaging in materialising the unique change potential they hold. Accordingly, somewhat extraordinary amounts of energy, mastery, depth, time, and even perseverance are needed to change mindsets, deep-rooted conservative and individualistic traditions and legitimate alternative ways of reasoning and acting. In this context, academic knowledge is not simply transferred upon a network, but rather it is mainly applied to build up the network itself. In turn, this implies

the generation of new and refinement of existing relational resources, in order to search for and motivate the right allies within institutional scarcity, i.e., to identify who in the region is more able to overcome cultural barriers and prejudices and set up the networks that support change. Moreover, as privileged and sometimes singular channel to connect LFRs to the global, universities are compelled to make a judicious use of their supra-regional networks to tap into their regions a variety of resources, namely knowledge that can influence the activation and nourishment of regional learning dynamics and funding streams that can support them. Sharp distinctions arise when comparing the huge challenges universities have to stand for in weaker regions with those of universities working in advanced regions, such as Tampere, where trustful relationships among agents empower the networks that facilitate and render natural the university-region nexus, and connectivity with the global is shared by a broad range of regional actors.

The case of AUTH acting in Central Macedonia as major agent of institutional change can be regarded as an illustration of the argument above. The same case, however, might also be called forth to produce two additional linked insights. Firstly, it is a somewhat heroic assumption to look at universities, taken as an organisational whole, as able to readily engage in such risky and, from the academic and financial point of view, scantily rewarding activities. The lack of internal innovation culture and networking capacity, eventually together with the void or even the antagonism of public laws and regulations, can constrain universities' regional engagement. Secondly, the agency of academic individuals or research units can be the crucial remedy to overcome the problems posed by such *constrained* universities, not only to intervene in the regional settings, but also to foster change within the academic organisation. A sound example is provided by the leadership of URENIO in the process of institutional change initiated in Central Macedonia with the RTP, which would also influence the mindsets and the organisational arrangements of AUTH.

The presence of regional powers with stronger political and financial autonomy, when acknowledging the development role of universities and accompanied by a supportive public policy, as it is the case of Wales, tends to mitigate the difficulties wrapping up the participation of academia in the orchestration of institutional change in LFRs, as well as to yield results in a shorter time span. The availability of and intermediary infrastructure, both internal and external to the universities, is an important mitigating factor, namely because

it provides specialised skills and competences to overcome difficulties, impact on the perception about the value of university knowledge, - increasing the demand for it -, and create and sustain fruitful bonds between the academic and non-academic spheres. The work developed by CUIIN or the mutual benefits stemming from the links between the RACD and Know-How Wales illustrate the assertion.

Under the framework conditions such as those existing in Wales, the “*contractual*” nature of the university-region nexus is likely to emerge, since academia is put under the pressure of expectations made explicit by regional public policy and of specific funding streams made available. The institutionalisation of regional engagement as an integrative part of the universities’ mission finds in this explicit social contract binding the academia and regions more solid foundations to make progress. Accordingly, the mainstreaming of the third mission across the academic settings becomes facilitated and eventual university strategic frameworks stating the willingness, defining objectives, establishing the rules, and outlining lines of action for regional engagement meet improved conditions to be translated into practice. Still, as the case of CU indicates, the availability of an overall strategic framework encouraging the involvement in third mission activities, under academic freedom, does not mean that academics and their research units will enthusiastically and automatically acknowledge it and act accordingly. This leads to the argument, supported by the same case study, that an attitude prone to regional engagement is more likely to spread with basis on the complementary effect of the “*selfish*” and the “*contractual*” nature of the university-region nexus, rather than on each one separately.

How many LFRs are endowed with the autonomy and decision-making power of Wales, and, simultaneously, with an explicit supportive policy framework directed at fostering the university-region nexus? They are not many, neither in Europe nor in the rest of the world. Two issues arise from this. Firstly, the extent to which a nationally defined policy supporting academic regional engagement can be as effective as a similar policy designed at the regional level. Secondly, the extent to which makes sense to generalise the virtuosities stemming from the combination of the “*contractual*” and the “*selfish*” nature of the university-region nexus.

The first issue does not find sound evidence in the two case studies undertaken in LFRs, since both Wales and Central Macedonia do not match the requisites to grasp an answer, the latter because lacking such favourable national framework, the former because

endowed with relatively strong regional powers. Curiously, the question can be tackled by resorting to the case of the more advanced region of Tampere, which benefits from a comprehensive and efficient national supportive framework. In fact, the lessons drawn from the Finnish region highlight the relevance of the national level to foster the interaction between universities and regions, but at the same time, and most importantly, show that the capacity to take advantage from the national framework is regionally constructed.

The insights provided by Tampere region establish a link with the second issue. Likewise, the combined effect of “*contractual*” and “*selfish*” stances towards regional engagement requires regionally constructed capacities to yield. Hence, in institutionally weaker LFRs, the chief task of universities engaged in regional development takes the form of a contribution to build up those capacities. One can argue that there is a different “*contract*” underpinning this task, one wrapped up by a good dose of voluntarism of universities, - when assumed at the outset regional development as making part of their obligations -, or, as in the case of ATh, of individual academics and research units. The fulfilment of that “*contract*” is crucial to allow self-interest of universities in regional engagement to enter the picture. In other words, by giving strength to the institutional qualities of their regions and helping them to escape laggardness, universities will certainly reap the academic and financial rewards of operating in a more attractive, socially and technologically advanced regional society. This matches the argument that fluid and systemic processes of technology transfer and spin-off development, to occur in LFRs, are largely dependent on previous efforts directed at regional institutional capacity building. It suggests as well that, as could be drawn from the case of CU, by contributing for the renovation and reinforcement of the regional system of innovation, the interaction between universities and their regions can become not only an additional source of funding, but a solid foundation supporting the pursuit of national and international academic recognition. Thus, ground is added to the assertion that mutual dependence can be established between a region’s stoutness and its university’s strength and growth capacity.

10.6

The second academic revolution in practice: outlining a synthesis...

This chapter was aimed at reporting the research findings resulting from the case studies undertaken in three universities operating in different European territorial contexts, ranking distinctly in terms of socio-economic development, and presenting varying levels of systemic potential of the respective regional systems of innovation. Answers were provided to the four questions that constituted the bottom line of the research work, namely how do universities help their regions' development and enhance their institutional capacity; how are universities organising themselves to foster their regional mission; how mutually beneficial interactions arise from the university-region nexus; and, finally, how particular is the part played by universities in LFRs.

The research has evidenced the agency of universities in regional development according to a perspective that goes far beyond the narrow, and traditional, technology-biased approaches to the second academic revolution. It did that by examining the nature of the knowledge and relational resources that the universities provide their regions with, and the ways those resources reach the regional settings and mesh together to nourish the region's capability to act collectively. In other words, the research work placed universities at the core of institutional capacity building efforts evolving in their regions of location.

The broad range of knowledge resources tapped into the region by a vast array of knowledge-generating academic activities associated with teaching, research and engagement, has been highlighted as instrumental to influence the permeability of the regional frames for action to new ideas and stimuli, contributing to question, invent, reinvent, legitimate and renovate perceptions, strategies and ways of thinking and acting. Hence, knowledge resources originated in the universities revealed to be of utmost importance to foster processes of learning conducive to institutional change.

The approach to the extent, nature, power and reach of networks supporting the interaction of the universities with their regions shed light over the part played by them in the processes of accumulation of social capital, enhancing thus the social mechanisms that allow knowledge to flow across the regional organisational settings. In other words, the research brought pieces of evidence corroborating the relevance of the part played by the universities in making regional networks denser, more capable of learning and receptive to

change and innovation. In addition, the universities stood as an enhancer of regional networks' capacity to interact with each other, as well as to use new or enlarged channels of communication connecting to supra-regional arenas, i.e., to a variety of resources external to the region, ranging from knowledge to funding streams, otherwise painfully accessible. Accordingly, convincing evidence has been collected about the significant role taken by the universities in establishing links between the local and the global.

The prominence of studied universities in supporting their regions to mobilise for innovative ways of acting was underscored. The contribution of the universities in meshing together and integrating across the regional settings knowledge and relational resources pervaded the three case studies. Either as an organisational whole or based on the initiative of individual academics and units, acting in tandem with other regional public and private agents or almost in isolation, using both formal and informal approaches, the universities are underpinning new or renewed views on the needs and challenges faced by the respective regions and empowering them to seize internal and external development opportunities. They are strongly influencing the regional awareness of the need for change, the definition of development targets to be pursued, and the disclosure of sometimes latent or even hidden arenas endowed with the transformative potential that, when materialised, become essential to make a good use of development resources and thus to ensure better regional futures. In this sense, the universities are augmenting their regions' capacity to act collectively, assuming a leading or a strong position within the set of regional agents mobilised to function as *animateurs* of institutional change.

The studied universities are nourishing the knowledge, relational and mobilisation qualities of their regions according to a variety of ways, facing multifaceted and distinct challenging conditions, and responding to different needs and pressures for regional change. The territorial contextual conditions, the respective history, culture, policy and political environment and development stage and trajectories, as well as the characteristics of the academic organisations, proved to impact strongly on the aims, nature, mechanisms, implications and obstacles enveloping the university-region nexus.

Distinctness came forth when dealing with the academic organisational arrangements supporting the work of the universities as institutional capacity builders. Research went over the infrastructure, the policy environment, both internal and external to the universities and the overall academic attitudes towards regional engagement, producing

evidence pairing i) a highly favourable infrastructural and policy settings with a long tradition and culture of interaction with society; ii) a quite adverse policy environment (namely at the national level) and a relatively poor infrastructure with a sharply fragmented view on and practice of the third mission; and iii) a strongly encouraging policy context and a fairly developed infrastructure with a *conscious*, planned, and highly mainstreamed approach to regional engagement. These pairs mirror, respectively, i) an institutional *spirit* that spares any explicit commitment to or strategy for promoting co-operation with society; ii) the search for internal and external alliances endeavoured by academic individuals and/or organisational units aiming at dealing with fragmentation and overcoming obstacles; and iii) the existence of good structural conditions to integrate teaching, research and engagement in the academic mission, as well as a high potential to effectively face the pressures to excel at the international and national level while regionally engaged. Within distinctness, though, a communality emerged: with or without formal strategic frameworks and internal infrastructures to foster the university-region nexus, encouraged or not by the policy settings, accessing variable amounts of money, and standing up to varying challenging conditions and turbulence, the three studied universities, in organisational terms, are evolving and/or co-evolving, - i.e. they are changing -, to better prepare for serving regional development purposes and tackle the inherent challenges.

Further differentiation came to light when assessing the ways the universities' third mission activities were affected by the features of the regional systems of innovation in which they operate. In fact, the detected systemic potential fluctuations, corresponding to diverging development ranks, revealed to be conditioning the conceptualisation and practicalities of the universities' engagement, namely in its aims and targets, and in its resources and instruments. The research covered third mission landscapes ranging from the enhancement of intrinsic qualities of a well-equipped regional system of innovation, such as trust and co-operation prone attitudes, which allowed the region not only to survive a crisis, but to come out of it reaffirming social and economic vitality, and the painstaking efforts to introduce change in a context marked by strong inertial forces, which, because quite successful, placed the regional system of innovation ranking higher in terms of its systemic potential. In between these polarised landscapes, a third one was portrayed to turn the spotlight on the contribution given to the search for conferring alternative development paths to a regional system of innovation loosing ground. The picture taken to these third

mission events has shown the relevance, on the one hand, of regional autonomy in terms of decision-making and finance to develop these third mission events, and, on the other hand, of an active public sector partnering universities and other regional agents in the change endeavour. The same picture has also displayed evidence revealing that the universities, by giving strength to their regions, are increasingly extending and turning to advantages, both in academic and financial terms, the beneficial potential offered by those strengthened regional systems of innovation. In other words, the argument pointing to the mutually reinforcing nature of the university-region nexus is mirrored by the three cases reported.

The last part of the investigation made the findings arising from the three third mission landscapes to converge, aiming the search for particularities in the role played by universities in LFRs. Rather than from the status of institutional capacity builders, which can be extended to academic organisations acting in more advanced territories, the particularities rose out from, on the one hand, the nuclear and eventually decisive position of universities in energising the processes of institutional change in institutionally fragile regions, and, on the other hand, the nature of the challenges and turbulence that those universities should face. The two-sided distinctiveness is thus grounded in the diligence and enormous effort of the arena endowed with the regionally scarce power to generate and disclose endogenous resources necessary to foster change, and to augment their accumulation by capturing extra resources, otherwise hardly attainable, through the supra-regional networks that universities are likely to maintain. In this context, as suggested by the research findings, the construction of regional capabilities to learn and change in order to escape laggardness should be at the forefront of the *social contract* binding universities and their regions. Fulfilled this contract, the accrued benefits will be reaped not only by a region empowered with increased innovative and socio-economic development capacity, but also by a university operating in a region that offer a new range of opportunities for academic development.

In short, the rich and variegated picture taken to the evolving experience of three higher education organisations interacting with their regions of location gave the reality-inherent substance to the inquiry line and statements that guided the research. Accordingly, the many-sided picture revealed the presence of universities that are increasingly functioning as agents of regional development, whose agency goes far beyond the supply of production and technological inputs to regional industry, assuming a crucial role in the building up of

regional institutional capacity. It has shown that the universities are developing organisational innovations in order to improve their regional engagement activities and to face the inherent challenges. It shed light over the strong influence exerted by the features of the regional system of innovation on the nature and implications of the university-region nexus, and provided ground for arguing that the nexus assumes a mutually reinforcing nature. It has also outlined the particular role of academia played in LFRs, namely as institutional capacity builder.

Taking the overall picture, the case studies provided sound evidence pointing to the insufficiency of the narrow, technology-biased, perspective on the second academic revolution when attempting to fully understand the role universities can play in regional development processes, not only, though particularly, in lagging regions.

Part IV

Conclusions

Universities, regional development and the new perspective on the second academic revolution: final remarks

11.1

The idea of the society and the idea of the university: a synthesis of an inextricable connection

The idea of the University is inextricably intertwined with *the idea of the Society*. Since times immemorial, universities have always co-evolved with society, in a dialectical connection underpinning transformative forces and pressures that would shape the societal expectations towards and uses of academia and the inherent adaptive evolution of the resilient academic institution. Despite resilience and thus predominantly smooth change, the dialectics between the university and society originated disruptive events that, because leading to a shift in the academic mission and to a new social contract between academia and society, acquire a revolutionary nature.

The first academic revolution occurred when the generation of new knowledge through research has been integrated in the mission realm of academia, hitherto centred on the dissemination of existing knowledge through teaching. The new social contract that came out of this revolutionary move paved the way to an increasing connection between science and technology and, in association, to growing prospects about the role of academia in wealth and welfare of societies. It would, indeed, place universities, as *loci* of teaching and research, at the institutional sustaining core of the post-war welfare state and, in this societal context, nourish a perception of the developmental role of academia derived from the aims of democratising access to higher education and learning, on the one side, and of

putting in motion a linear process of innovation fuelled by knowledge produced through university basic research and transferred, according to a one-way flow, to industry.

This perception and inherent expectations towards academia has been shaken, particularly from the 1970s onwards, by the commonly labelled neo-liberal turn, which has challenged and gradually superseded the welfare state idea of the society. The societal turn evolved in and was accelerated by a context of globalisation-driven rapid and intense transformations in human activities. New modes of production and regulation, and a new techno-economic paradigm underpinned by the progress in information and communication technologies have emerged. Innovation, in this framework, was lifted to the forefront of the economic competitiveness game involving firms, nations and regions, pledged as the dominant societal goal. Knowledge, regarded as the most important resource, and learning, as the most strategic process, acquired renewed relevance in an intensified, global competition regime. The knowledge-driven society, the knowledge-based economy, or the learning economy, became the epithets of the new idea of the society. The corresponding idea of the university came through a second academic revolution, resulting from the integration of economic development in the mission realm of academia, together with teaching and research.

The second academic revolution, or the link between the contemporary idea of the university and the idea of the society, could be outlined as follows: if contemporary society is driven by knowledge, universities, as major generator and disseminator of the driving ingredient, while assuming the revolutionary role of economic development agency and ensuring the adequate channels to transfer knowledge to the productive fabric, will keep and, indeed, reinforce, their societal relevance. The point at issue is the extent to which that link can be addressed in such a simplistic and straightforward fashion. The nature, dynamics and challenges inherent to innovation-based development processes suggest that superficiality and straightforwardness are far from advisable when attempting to soundly understand the recent revolutionary move in academia. The reasoning founding the perception that the understanding of the second academic revolution implies a deeper, more cautious and complete approach is threefold: the nature of the innovation process, its territorial basis, and its institutional character.

Innovation-based development is a highly complex endeavour requiring high levels of social interaction and feedback mechanisms between a wide range of agents acting in a

variety of societal domains. It is this interactive endeavour that nourishes learning and thus knowledge creation and recombination. Whilst dependent on interactive learning, innovation becomes a socially determined phenomenon, underpinned by a social architecture harbouring a collective order and the mechanisms that configure the processes of knowledge generation, dissemination, and use. Accordingly, innovation can be regarded as an instituted process. The social architecture, in turn, shapes systems of innovation, within which a diversity of individual and collective agents interact to foster direct and indirect learning processes that deploy the dynamics of knowledge generation, dissemination and use and add up the system's ability to adapt to change. Hence, systems of innovation, in essence, are an institutional construct.

The interactive, thus social character of innovation brings to the forefront the territorial basis of innovative capabilities, or, in other words, establishes the relevance of geographic proximity between public and private agents engaged in systemic, learning-enabling, and knowledge-generating interaction. Besides stoutly sustaining the rejection of arguments pointing to the end of geography as consequence of globalisation forces, it makes the case for the *territorialisation* of systems of innovation, as spatial entities defining institutional *milieux* characterised by local embeddedness. Although borne by locally based institutions and organisations, these entities are far from being hermetic. Rather, they are moulded and governed by mutually influencing supra-local and local forces and pressures, that is, they are encrusted in and influenced by a multilevel scale of governance. Furthermore, as an institutional construct, they are not static, that is, both internal and external transformative powers force change over time and adaptation to new or renewed development challenges. The territorial basis of innovation makes to emerge the widely studied and measured problem of development inequalities. Research has established a strong connection between the regional development gap and the varying qualities of the social architecture underlying development trajectories and stages. In this sense, the problem of less favoured regions can be seen as rooted in the relative weakness of their institutional fabric, or, in a similar vein, in the lower systemic potential of the respective innovation systems, which curtails the capacity to foster both the internal and external learning-supporting networks that determine innovation capabilities. Accordingly, institutional inertia becomes the major problem to be tackled when attempting to create the conditions that allow less developed regions to escape laggardness.

By acknowledging that the localised social architecture supporting innovation can be constructed, i.e., that regional institutional change is possible, in ways that improve the qualities determining the systemic level and the development potential of a regional system of innovation, the whole constructive process can be described as one of regional institutional capacity building. As such, the dynamics of institutional change rely on the result of the interactive learning-driven combination of knowledge and relational resources, which feeds the capacity, on the one hand, to interpret and adapt to the global-local nexus evolution, and, on the other hand, to mobilise innovation agents for purposeful collective action courses.

The idea of the society associated with the threefold reasoning stoutly challenges any straightforward link with an idea of the university based on the possibility of establishing a spontaneous flow of knowledge between an undoubtedly privileged *locus* of knowledge generation and a knowledge eager societal context. In other words, the nexus encompassed by the second academic revolution requires far more than an immediate acceptance of a connection between the demand for knowledge of a given territory and the privileged position of its university or universities, as knowledge suppliers, to respond swiftly and consistently to that demand. Universities, as components of regional systems of innovation, are well positioned to help articulating and making sense of the global-local nexus, as well as to be active in the construction of the social architecture that supports innovation, or, similarly, in the processes of institutional change that shape the qualities of regional systems of innovation. In other words, universities can be institutional capacity builders, helping their regions to accumulate and combine the knowledge and relational resources that feed the regional capacities to act collectively. In this sense, there is ground not only to avoid straightforwardness but also to adopt a critic stance towards the views that focus almost exclusively on technology commercialisation of academic research results, in the form of either technology transfer between universities and firms, or the development of new high-technology productive units. This is amplified when brought into the debate the problem of less favoured regions. In a territorial context marked by laggardness, the simplistic view of universities as mere regional knowledge suppliers starts to be troubled by the low level of explicit demand for and value given to academic knowledge inputs generally featured by that kind of context. In addition, and more importantly, it also risks failing the major target to aim at, i.e., the identified imperative of unlocking institutional

inertia, because putting universities aside the challenging effort to set up conditions favouring institutional change.

The extended perspective on the second academic revolution, in sum, approximates the development agency of universities to the role they can play in regional processes of institutional capacity building. It encompasses the potential of academia to provide regions with a variegated set of resources, ranging from knowledge inputs directed at improving the performance of regional production, as in technology transfer activities, to knowledge aimed at legitimating and guiding policy options and social action, from intermediate structures linking research and firms to formal and informal, local and global, webs of relations that materialise the regional co-operation and mobilisation potential.

In this context, bearing in mind the narrow focus on technology transfer of the predominant approach on the second academic revolution, to know more about the extent to which universities' agency in regional development encloses a contribution to the building up of institutional capacities and, most importantly, how that contribution is rendered concrete, opened up a first inquiry line to be pursued. In addition, the development gap existing among different territories, attributed to varying institutional capacities, established the need to shed light over the expectably different roles and impacts of universities operating in different territorial contexts, i.e., in other words, to add knowledge on the contextual nature of the regional developmental role of academia.

This broader approach on the academic mission, treated as a revolutionary move, requires knowing more about the implications that it brings to the organisational and even ethical aspects of academia. Research on contemporary academic change is marked by a divide resulting from what could be labelled as a pessimistic and optimistic perception of the shifting situation of academia. The former argues that the growing emphasis on academic knowledge commercialisation, leading to the generation of knowledge in the context of application, is undermining the very ethical core of the academic endeavour. The latter, conversely, departs from the expectably privileged position of academia in a knowledge-driven society to look at the new societal role of higher education as an opportunity to sustain and consolidate its relevance, without forcibly provoking the dismissal of core academia values. However, despite diverging on what concerns the qualities and extent of the academic revolution implications, both the pessimistic and optimistic research approaches tend to converge on the perception that the assumption of a

third mission by academia, because revolutionary, generates turbulence and forces change. In fact, research results show that pervasive evidence of academic change can be derived from the organisational arrangements that are being put in place in order to, on the one hand, ensure fluid communication channels with society, and, on the other hand, cope with the need to ensure a balance between an increased interaction with the external world and the activities of teaching and research.

Accordingly, the picture of the second academic revolution, in its extended version, would not be complete if the organisational challenges raised to academia by its third mission were overlooked. Hence, other investigative path was outlined, aiming at knowing more about the ways universities are organisationally responding to these challenges and, in addition, about the coveted mitigation effects of these new organisational arrangements in the turbulence introduced by the growing operative linkages with an array of societal agents.

The argument pointing to the territorial contextualisation was called upon to cast up the research on the university-region nexus in ways that allow for the incorporation of concerns about the extent to which the relationships between academia and regions can produce mutual benefits, i.e., the twofold assumption that the more interactive the universities the stronger the region, and the stronger the region, the stronger its university or universities. The issue at stake here was to generate knowledge about the account of the development advantages sourced by regional systems of innovation from universities and the rewards that the academic settings accrue from a regional system, as larger as the system climbs up the systemic potential scale.

The acknowledgment of territorial differentiation, its causes and implications, taken together with the proposition that academic development agency includes a variety of objects and subjects and is shaped by contextual framework conditions, nourished the assumption that the role of universities, not only varies in accordance to the qualities of regional systems of innovation, but also is likely to assume particular contours when in presence of less favoured regions, in terms of the impacts that the university-region nexus can exert, the challenges raised to academia, and, if any, the type and amount of reaped mutual benefits. Hence, as the extended debate on the second academic revolution carried with it the imperative of searching for and dealing with the expectably particular relationships between universities and laggard regions.

Taking the picture together, four major research lines were empirically pursued attempting to enlarge the knowledge pool on: i) the universities' role of agents of regional socio-economic development, emphasising the participation in regional processes of institutional capacity building; ii) the dynamics of academic change, particularly in terms of their internal organisational arrangements directed at managing and materialising the interaction with society; iii) the influence of the territorial framework conditions on the university-region nexus and the assumption of a mutually beneficial relationship; iv) the particularities of the role universities play and the challenges they face in less favoured regions. Accordingly, this extended way of looking to the second academic revolution emerges as a contribution to know more about relevant parts of the contemporary developmental role of universities which are fully neglected or play a second fiddle in the predominant, technology-biased approach to that role.

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Discussing the research findings...

Three universities, featuring different organisational, management and working conditions and practices, and operating in quite distinct territorial and policy contexts, provided the testing ground of an extended perspective on the second academic revolution that shed light over relevant dimensions of a changing social contract between academia and society generally kept off the picture by the mainstreaming, technology-focused approaches to academic change. The search for sound answers to a set of interrogations mirroring the multidimensionality of the problem has allowed for generating knowledge about the nature and impact of development resources universities furnish their regions with; the *practicalities* underlying the interaction dynamics that shape the ways those resources flow; the reach, the risks, and the rewards of compelling academic change; the determining influence of *territoriality*. Though organisational and contextual diversity, the research findings on which the knowledge pool was built converge on a set of statements that, taken shortly but assertively, can be outlined as follows:

- the mission of universities can be extended in ways that integrate academic agency in socio-economic development processes, together with teaching and research;
- universities' agency in socio-economic development can take the form of a contribution to the building up of regional institutional capacities;
- academic change can be purposefully illustrated by the adoption of new or renewed organisational arrangements that equip universities to, on the one hand, ensure fluid channels and arenas of communication and interaction with the regional settings, and, on the other hand, deal with the multifaceted challenges associated to their third mission activities;
- the nature, reach, intensity, organisational challenges and implications of universities' third role are context-dependent;
- the university-region nexus can underpin a mutually beneficial relationship, which varies in nature, extent, and value according to contextual conditions;
- universities' agency in LFRs acquires particular importance, and, indeed, can be crucial to foster the institutional change processes necessary to open new development paths and help those regions to escape laggardness.

Taking this set of statements, an additional conclusive remark can be produced:

- when attempting to get a more complete picture of the role universities can play as agents of socio-economic development, there is the need for going beyond the provision of skills and competences nourished by university teaching and the transfer to the world of production of technological and technical inputs based on academic research, incorporating these kind of (important) resources into the wider realm of institutional capacity building.

To look at universities as development agents brings attached the possibility of regarding academic organisations as active participants in the societal dynamics shaping development trajectories. The view from the practice has confirmed this possibility and shown that universities, in a variety of ways, according to proactive and/or reactive stances, can be at the core of the complex social interplay that underpins developmental regional action. Universities' agency results from the materialisation of the huge

development potential inherent to the very nature of academia, which, in turn, depends on the deployment and effectiveness of a vast array of co-operative platforms and activities, featuring varying degrees of complexity and intensity.

Variety also marks the kinds of development resources stemming from academic agency and tapped into regions. A wide range of knowledge resources flowing from universities to the regions feeds the capabilities of knowing-what, who, why and how, that is, improves the synthetic and the analytical knowledge bases and adds the regional pool of both codified and tacit knowledge. An also broad span of relational resources, both generated by ongoing interaction and by a deliberate effort of universities to ignite and empower regional networking and transform it into routine behaviour, can be sourced from academic agency, which, in accordance, influences the regional capacity to engage in interactive learning and sustain such engagement over time. In addition, and consequently, universities' agency can be of great relevance to keep regions open to learning and thus able to mesh together internal and externally generated knowledge and the relational assets that underlie its dissemination and use, enhancing the regional mobilising capacities and the conditions for developmental action. Accordingly, universities, as development agents, have the potential to become a crucial organisation in the efforts to build up regional institutional capacities.

The three studied universities, in a variety of ways, illustrate how academia can assume a core, even leading, position in the processes of institutional capacity building. The expertise available at TUT, for example, proved to be crucial to ensure the knowledge critical mass that allowed Tampere to succeed in its reinvention process. Initiatives such as the Cardiff University Innovation Network are good examples of the role universities can play in enhancing the relational capabilities of a region, not only concerning the linkages between themselves and other regional organisations, but also in improving the openness of non-university agents towards networking. The RTP planning process in Central Macedonia, led by AUTH's research group URENIO, was instrumental to mesh together knowledge and relational resources and, thus, to mobilise the region for changing and pursuing new development paths.

Universities, taken as institutional capacity builders, are forcibly change agents. In fact, they can be instrumental to change mindsets, frames of reference for action, and ways of designing and implementing development policies, as well as to bring new, innovation-

prone directions to regional development agendas. New ideas, concepts and *images* of the regional futures, with the potential to change often deep-rooted ways of thinking and acting, can spring from the expectably creative environment that characterise universities and affect the regional policy *status quo*. To gain real transformative power, though, new ideas, concepts and images potentially driving change need to be borne on the knowledge that brings them the social legitimacy that underpins shared perceptions about key regional development challenges and leads to convergent thinking about the best ways to deal with them. This change empowering knowledge, actually, has in universities a privileged source or bypass. As an example, the knowledge on the requisites of systemic innovation owned by URENIO research group, accumulated through its international connections, proved to be an effective supportive and legitimating basis for the institutional change-oriented planning process that evolved in Central Macedonia.

As prominent part of the dynamics of regional institutional change, the enhancement of the ability of regions to read and interpret trends shaped in superordinate scales can be sourced in universities. Regions may take advantage from the universality that roots the academic institution to gain the interpretative power of globally defined trends that allows the local translation of external information and external pressures, the anticipation of threats, and the identification of development opportunities and assets accruing the internal ability to swiftly adapt to new challenges. This represents more than merely supplying knowledge inputs to the region. It implies to be active in the social construction combining an accurate perception about regions' development stage and potential with a vision of the world favouring sound understandings of the global-local nexus which raise the awareness of the need for changing and informs the outline of superior change directions and courses of action. In addition, turning the spotlight on the multidisciplinary nature of academia, the endeavour to make sense of the complex interplay of the local and the global is added by conditions that can turn regions better fitted to act in accordance with the multidimensional problems of contemporary development. Using again the illustrative ground provided by AUTH, the close connections with the European Commission, and the participation in a number of European academic networks focused on systemic innovation, allowed URENIO research group, through the knowledge it owned as a result of those international links, to inform, frame and legitimate the whole innovation planning process that was at the basis of regional change. The case of TUT in Tampere region also supports the

argument, as shown, for instance, by the decisive empowering effect that the expertise available at the university had on the capacity of the region to compete for the resources made available by the central government under the framework of the Centre of Expertise Programme.

Looking at the agency of academia in ways that embrace processes of institutional capacity building conveys the possibility of arguing that the interaction between universities and their regions is not necessarily aimed at an immediate transfer of scientific, namely technology related knowledge. An intertwined argument is that regional engagement of universities is not confined to the satisfaction of regions' today perceived needs. Taking these two assertions in tandem, the agency of universities, directed at fostering institutional change, can involve the opening of minds and the outlining of socially shared new ideas about the regional futures and development paths. The generation of tacit, both embedded and embodied knowledge is at the core of the change process and it is dependent on the deployment of efficient talks and conversations among the key regional actors. The bulk of university knowledge needed to ignite such talks and conversations falls upon the requisites, legitimacy and practicalities of the process itself, meaning that it is not a matter of knowledge transfer between two interacting but independent spheres. It is rather the use of universities' mastery in creating or consolidating regional learning platforms, in ways that blur the divide between the knowledge provider and the (lay) customer. In Central Macedonia, for example, the mastery and perseverance of URENIO was directed at mobilising the region to foster innovation in a hitherto almost virgin ground. The planning process underpinning change was made of a lot of talks and conversations that would support the establishment of strategic alliances binding together key regional innovation agents. Recall that the positioning of the parts of the university involved in the process towards the pool of agents participating agents was very much one of working among *equals*, which was regarded as a quite important aspect contributing for the success of the effort.

The dynamics of change in academic teaching and research activities associated with a shifting bond between the idea of the society and the idea of the university gain a more pressing nature, particularly at the organisational level, when brought into the discussion the third mission. The three studied universities, though in a variety of ways and even focuses, are organising themselves according to new or renewed arrangements. The targets

of this organisational change are twofold. Firstly, the establishment of bridges effective enough to overcome the (more or less intense) divide in culture, aims, interests and work practices, and thus laying a fluid relational structure. Illustrative ground of new organisational arrangements can be derived from cases such as the Cardiff University Innovation Network, explicitly aimed at bringing together the university and industry, or the ATh Research Committee, increasingly centralising the management of the third mission. Even in territorial contexts where collaboration between academia and society is something expected and natural, of which Tampere is a good example, the relational structure is placed upon a number of formal organisational arrangements bridging knowledge production and application. Recall the case of Tamlink Oy, the firm to which TUT subcontracts a substantial part of the commercialisation of research results. Focussing on the specific field of university-industry linkages, the enhancement of communication channels between universities and the world of production on the one side, and the mitigation of institutional turbulence on the other side, may benefit from external infrastructural developments, as it is the case of science and technology parks working closely to academic research and endowed with the skills and competences needed to take the best of both worlds. Invoking again the case of Tampere, the matching effect of those infrastructures is well reflected by the collaboration between TUT and the Hermia Science Park. However, as shown by the case of Central Macedonia, the presence of a physical infrastructure dedicated to technology development and transfer, *per se*, is not enough to guarantee fluid bridges between universities and industry. Still, as suggested by the evidence collected in the Greek region, these infrastructures can be used to override interaction restrictive rules and laws and, in fact, can be the place where dissenting parts of academia are sheltered, as it was the case of the Chemical Process Engineering Research Institute, which, because seeing its willingness to cooperate with industry restrained by the higher education legal framework, has abandoned ATh and established its research premises in the local science and technology park that the unit has indeed helped to found. This case suggests that when in presence of restrictive higher education legal framework or university regulations, there is the risk of dissension within and, consequently, debilitation of academia, particularly in scientific disciplines that are more keen to be called to fulfil specific needs of also specific industrial sectors (not necessarily regional).

Secondly, organisational change can mirror an attempt to keep untouched the ethos of academic teaching and research and, indeed, to find ways to enrich the two basic academic missions through third stream activities. Taking TUT as example, smooth interceptions of teaching, research and collaborative activities is pursued through the establishment of clear operational rules and procedures and, above all, the restriction of interaction initiatives, namely with industry, to spearhead fields of research. Sound evidence sustaining the possibility of an enriching relationship between the three basic academic missions was provided, for instance, by experiences such as those carried out by the Dental School or the Mechanical Engineering Centre at CU, whose interaction with society is bringing significant benefits to teaching and research in the respective fields. Additional pieces of evidence stemmed from the case of TUT, where the university's proximity to industry is exploited in ways that allow students to benefit from teaching and learning activities undertaken in the context of production.

An additional and related dimension is the extent to which those units and researchers involved in regional co-operation, thus, at least partly, *localising* their work, can simultaneously keep pace with the pursuing of international peer recognition, inherent to the academic endeavour. The evidence collected in the field allows for dismissing the pessimistic view on the university future, as it contradicts views holding that engagement in general and regional engagement in particular will automatically provoke the ruin of academia. A number of episodes detected and described in the case studies indicated that it does not necessarily set off an *either/or* situation. Recall, for instance, the case of the fields of automation and hydraulics and optoelectronics in TUT, deserving high international academic recognition while doing valuable co-operative work with the region. The same could be said of the mechanical engineering domains at CU. Nevertheless, in both cases, the research agenda is not determined by any detected external needs, but rather by academic criteria and motivations. Accordingly, the co-operative logic does not imply a match between the research agenda and immediate requirements of the region, but, instead, a joint construction and identification of (frequently hidden and latent) interaction opportunities opened up by an agenda for knowledge generation driven by academic interests and goals. This assertion allows for arguing that, very much under the narrow framework of the technology-biased approach to the second academic revolution, when the interaction between universities and the region is based on the marketing of academic

research products and services and the inherent search for customers in the region in order to sell research outputs, the risks of an undermined academic ethos are more likely to occur. To approach the region armed with a portfolio of technologies in an attempt to find answers for the question “*who wants to buy?*” would arguably fully *localise* the research agenda setting, because dependent on the preferences of local *customers*. Universities cannot afford to abandon the pursuing of academic international recognition and prestige at the expense of an attempt to reap financial benefits from their regions of location.

Change in universities’ organisational arrangements can be fostered by efforts transversal to the whole academic organisation or confined to specific parts of it. The former situation is likely to correspond to a top-down geared process underpinned by a deliberate effort of universities’ top administration. This is the case of CU, where strategic decision-making influencing the organisation of the third mission is very much centred on the top administrative bodies. The latter can be related to atomised responses to the organisational challenges of the third mission, taking place, simultaneously or not, in different academic units, from platforms of intermediation to individual faculties, schools or departments, and involving or not the administration. This approximates the case of AUTH, where much of the organisational shift passed by the university’s rectorate, having had its basis on the Research Committee and some of the highly autonomous academic departments and schools.

From an operational point of view, both situations referred to above tend to converge on fragmentation, since it is hardly expectable that the level of collaborative action can spread in fashions that encircle the whole university’s faculty or departmental structure. This brings about an additional question, the one of whether a strategic framework directed at providing an overall guidance to engagement activities is determinant to succeed, as suggested by some approaches to the theme. The evidence emerging from the differentiated academic settings addressed in the case studies does not validate that suggestion. The cases, in fact, empower the view that interaction with the external world tends to proceed independently of such a formal framework. Still, this does not mean to immediately argue in favour of its irrelevance. As shown by the case of CU, besides the power to build up an encouraging academic environment endowed with clear rules, an explicit policy focused on the third mission can give helpful contributions to improve the related organisational arrangements, namely when forcing the renewal and timely

adaptation of existing structures or the creation of new ones. Most importantly, the process of constructing such a framework can open up the opportunity to involve the academic community in the debate on the third mission, bringing internal legitimacy to engagement activities, harvesting new ideas about co-operation with society, and making to flourish (often latent) third mission enthusiasts within academia.

Organisational change in academia, in contexts where third stream activities and/or policy have already reached a fairly high level of development, seems to be accompanied by attempts to fulfil the need for making sense of all what is happening and about the scope of the changes being provoked. These attempts tend to bear on the deployment of third mission monitoring and evaluating, rather than controlling, mechanisms, follow different directions, motivations, intensity, formality and ambition. They are likely to result either from an internally perceived need to know more about engagement outcomes and implications, or from responses to the requirements of public policy and funding allocation, where available. For instance, TUT felt the need to keep up with the often barely traceable co-operative activities of its academics, and, in accordance, established new procedures that ensure the channelling of information about those activities to the central administration, and mechanisms aimed at systemically accompanying the whole process from the beginning. CU, in turn, influenced by a highly developed public policy framework, presents a complete and ambitious evaluating and monitoring arrangement, as indicated by the inclusion of a set of metrics and new methods of third stream funding allocation.

Both the role of academia in regional development processes and the dynamics and scope of organisational change can be regarded as highly dependent on contextual framework conditions, which are both internal and external to the universities. The type, history, openness, and work traditions of universities largely influence the state of affairs concerning regional engagement. For instance, invoking the case of TUT, from a technology-oriented university that has assumed, from the very beginning, the aim of contributing to regional industry development, one can expect a more prompt and systematic participation in collaborative initiatives, namely with the world of production. On the opposite side, AUTh, because immersed in a constraining legal framework, and affected by sceptic, even adverse academic mindsets, and by the absence of co-operative traditions, though improving, is still facing significant barriers to turn third mission

activities into a successful endeavour. Concomitantly, the organisational change effort is likely to require variable energy, respond to different challenges and acquire different configurations. This one-sided perspective, confined to factors internal to academia, though relevant to address context dependency of third mission academic activities, is far from providing a satisfactory explanation. The qualities of the regional system of innovation are determinant of the intensity, nature, focus and mechanisms of universities' regional engagement. In the narrow perspective on the second academic revolution this would converge on the (true) assertion that as more R&D intensive the productive fabric the stronger the linkages between universities and industry. A wider but general remark is that in systems of innovation ranking high in the systemic potential scale one can expect a more fluid and systematic university-region nexus. The investigation undertaken in this dissertation confirmed both the narrow and the wider remarks, but it added colours to the analytical palette, as it has uncovered details that, if sticking to the general views, would be left out of the picture.

One of such aspects that would be neglected concerns the expectations towards and valuing of the role universities can play in regional development. In territorial contexts where development agendas are not only solid but also widely shared by the public and private agents acting in a given region, as in strong systems of innovation, universities tend to be looked at as core, highly valued development partners, and thus societal expectations are kept high. As a result, third mission enthusiast universities find an encouraging ground to proceed and eventual third mission resistant universities are compelled to change. In institutionally weaker territorial contexts, this encouraging or compelling environment can be hard to find. Underestimation of and low kept expectations towards higher education are likely to occur when facing fragmentation and atomism, lack of co-operative traditions, and other features determining the less favoured status of those territories. In this context, third mission enthusiast universities are compelled to enter the painstaking fight directed at changing the debilitating regional settings and resistant universities receive further encouragement to keep distance in relation to the development process of their regions of location.

The interplay of features characterising academia and regions, in turn, relates to the varying positioning of universities within the regional development agenda. In stronger regional systems of innovation, universities are more likely to position themselves in the

sight of a regional development agenda built up by a stout public policy making infrastructure, both at the national and regional/local levels. In the presence of an equally sound policy delivery (public and private) infrastructure, benefiting from high levels of trust, and associative traditions and capacity, the third mission may acquire the contours of a leverage factor, i.e., the university-region nexus tends to be very much focused on augmenting the knowledge and relational critical mass that allows the region to successfully combine the power to decide and the power to transform. The leverage role of TUT in the reinvention process of Tampere can be seen as approximating this state of affairs. In weaker regional systems of innovation, the work of regionally engaged universities is likely to be one of mastering and forcing the introduction of innovation in the regional development agenda, and forging and consolidating the networks that sustain institutional change and the capacity to act over time. The part played by URENIO in Central Macedonia is a good illustration of such an effort, also reflecting the perseverance, energy, and mastery needed to make the change process to start and endure.

The introduction of innovation among the top priorities of a region's development agenda, together with a stouter willingness and commitment to change, are likely to foster in the regional society new ways of looking towards the role of academia. Accordingly, the pursuit of new policy agendas and objectives can augment the regional public and private demand for academic expertise, in order to fulfil the requisites of renewed development targets. On the one hand, new public policy routines, more knowledge demanding in principle, can imply a closer and more systematic interaction between the policy-making and academic research arenas. This was strongly signalled by the case of Wales, where CU is simultaneously an active partner of the devolved political powers in policy design and an asset on which the government rely to deliver. Additional evidence was produced in the account on the changing process in Central Macedonia, which brought AUTH closer to the regional public policy makers. On the other hand, and accepting that an improved innovation-supportive social architecture creates enhanced conditions for fostering firms' competitiveness and growth, the chances of an increase in the flows of technological inputs between academic research and regional firms are augmented as well. In other words, the enlarged view on the second academic revolution, designed in order to enclose the broad realm of institutional capacity building, encompasses a set of preconditions for making viable, at least in systematic terms, the interactive dynamics underlying the

commercialisation of academic research which are at the core of the narrower and dominant perspective on the universities revolutionary shift.

Taking this perspective, the extended and territorialised approach to the second academic revolution can provide ground for judging the strength of the virtuous circle made of the mutual benefits that are expected to arise from the university-region nexus. Bearing in mind the research results, there is sound support to the argument that regionally engaged universities can be instrumental to increase the systemic potential, in terms of both infra- and superstructure, of the regional system of innovation and, thus empowering its capacity for developmental action. Recall the reported contributes provided by TUT to sustain the continuous reinvention process undergoing in Tampere's innovation system, the work of AUTH in Central Macedonia that sowed the seeds of a new and more advanced innovation system in a quite virgin and stony ground, or the prominent part played by CU in the renovation of a unravelling innovation system. Pieces of evidence completing the virtuous circle were also produced, giving indication that there can be significant benefits for universities to reap not only in financial terms, but also in assets to improve, though in different degrees, the overall academic condition. For example, the internationally highly valued teaching and research work of TUT's automation and hydraulics sectors has in the linkages to local industry a major strengthening factor. Similarly, the role of CU in improving the healthcare system in Wales is being highly rewarding for the university in terms of the teaching and research capacity in the fields of life sciences. In the case of AUTH, despite the weakness of the evidential ground taken it in relation to the other two cases, advantages from linking to the region did occur, such as the enhanced access of academic research to public funding and the internal organisational change that endowed the university with a more strategic decision-making basis.

The argument according to which the stronger the region, the stronger the university can be regarded as mirrored by the research results. However, there was a shortcoming affecting the research work, which can be attached to the already tackled influence of contextual conditions on the shaping of the university-region nexus and inherently the virtuosity of the circle drawn upon the mutually beneficial relationship. A more cautious approach when attempting to generalise into theory is thus recommendable. In fact, the three studied universities operate in territories that, despite the differentials in development stage and capacity, did not offer the contextual conditions to find support for arguing in

favour of the possibility of occurrence of a mutually beneficial relationship between universities and regions in less favoured regions that were not so successful in institutional change, as it was Central Macedonia, or where public policy is not so strong and assertive in its support to regional engagement as it is in Wales. Even in these two cases, the results, though giving signals of the beneficial potential, can be criticised, particularly because they do not say much about the advantages taken by the universities as a organisational academic whole, or, in other words, the benefits accrued to the academic work in its full spectrum. Perhaps the field in which this research shortcoming strikes heavier is the harmonisation of third mission activities with teaching and research in ways that the academic core values and practices are kept untouched and, accordingly, with the pursuit of universality-inherent international prestige and peer recognition. The possibility of looking at the relationship between academia and an institutionally weak, resistant to change regional context as being antagonistic cannot be dismissed. Less knowledge demanding development agendas, as well as the type knowledge required, can in fact make the third mission collide with the search for high-level academic teaching and scientific development.

The need for uncovering this issue left in a veil becomes of utmost importance namely when bringing into the discussion the research results concerning the fourth major investigative line, which soundly sustain the argument pointing to the unique role that universities can play in less favoured regions. In such territorial contexts, universities, as institutional capacity builders, can be the leading arena with the vision, ideas and power to introduce and steer positive change in highly inertial laggard regions. Moreover, the universal nature of academia carries with it the perception that the supra-regional pool of relationships can help such ill-equipped territories to better link with both the national and global levels of governance and tap into the regional settings valuable development resources which otherwise would be inaccessible. This approximates the case of the igniting and maintaining part played by AUTH in the process of institutional change undergoing in Central Macedonia.

What about less favoured regions that are not endowed with a university? Resuming the notion of an academic overall mission that highlights a contribution to the cohesive development of the nation, universities can genuinely endeavour in making the national and local alliances and public and private partnerships that forge processes of institutional

capacity building in territories lacking the transformative potential provided by the knowledge and relational resources available in higher education organisations. This potential to assist territorial cohesion derives of examples like the one given by TUT, a prominent member of the alliances that brought together a number of universities and public and private key change agents, and, because carrying to depressed areas the benefits of a prompter access to new development resources, opened new paths to escape laggardness.

The discussion of the particularities that envelope the role of universities in less favoured regions reinforced the perception that universities' regional engagement, if taken seriously and beyond simple discourse or rhetoric, implies the commitment of academic individuals and organisations, skilled human resources, namely to bridge and take the best of both worlds, and also appropriate funding. Nevertheless, universities, if acting in isolation, would most likely fail the purposes of sustaining institutional change in laggard regions. The strength of public powers, the value they attribute to universities and the bridges established between them the academic sphere might be regarded as determinant in such territorial contexts, namely to mobilise the rest of societal realms. This can imply an additional, and in some cases almost heroic effort of universities to bring the public sphere into play. People at AUTH's research group URENIO acknowledged the importance of transforming public authorities into an ally, and the little chances of making the changing momentum to endure over time in the eventuality of a public sector keeping its distance. They succeed but at the cost of a hard, perseverance-requiring, and certainly risky endeavour.

In less favoured regions, particular relevance is attributed to the availability of a clear public policy framework, encouraging, regulating, guiding and financing the third academic mission. The rich set of policies and programmes put in place by the Welsh Government, as well as a number of supportive instruments already available before the devolution process, revealed to be of utmost importance to overcome barriers and prejudices, rooted both in academia and in society, that were hampering the university-region nexus. The acknowledgment of public policy relevance challenges the belief, often configuring the policy approach to the regional role of universities, that it is possible to make regions (particularly those marked by laggardness) to enter new development trajectories just because there is an university supplying those regions with the right doses

of advanced knowledge, normally in the form of science and technology inputs. In other words, public policy approaches that find exclusive inspiration in the narrow perspective on the second academic revolution are likely to become as more ineffective as lesser developed is the territorial context which they focus, or, similarly, as more pressing the need for institutional change and capacity building. Besides the mismatch between a public policy pursuing exclusively the promotion of technology transfer and spin-off activities and the nature of the change needs of a region, the shaping of the academic settings underpinning third mission action would tend to use the narrow framework, thus extending the mismatch with regional needs to the interior of academia. Hence, particularly in LFRs, the potential of universities to unlock institutional inertia and set off processes of institutional change is likely to be jeopardised. Moreover, it is unlikely that universities, both as an organisation or as individual academics, look at their regions with enough enthusiasm without the incentive of public policy.

At this stage, a kind of precautionary argument needs to be produced. The somewhat aggressive tone that can appear to be present through the dissertation is not directed at technology transfer and activities alike in themselves, but rather at the perspective that locks the approach in the technical and technological aspects of university-industry relationships. Concomitantly, the variety of interactions between academia and regions that form what generally is understood by technology transfer is not judged as an unimportant part of the role universities play in regional development processes. On the contrary, it is acknowledged as a relevant facet of the process of regional change. The crux of the matter is that the nature of contemporary regional development challenges, and inherently the understanding of the role universities can play, require the consideration of a multiplicity of additional aspects that go far beyond the more technical and technological realm. Moreover, a more comprehensive approach reveals to be crucial to effectively grasp the dynamics of academic change, or, in other words, to fully capture reach of the second academic revolution. A related argument, taken shortly, is that the social sciences, often considered as a kind of shabby-genteel part of the academic world in the context of the second academic revolution, in the extended version of the revolutionary move of academia have conversely good changes of becoming a valuable scientific field in pushing forward the knowledge frontier of the contemporary developmental role of higher education.

Finally, a short remark about the virtuosities of the research methodology adopted in this dissertation should be made. The case study approach revealed to be an appropriate methodological tool to search for evidence supporting the creation of knowledge on the extended mission of universities and the attached new perspective that looks at them as institutional capacity builders. It also provided an opportunity to detail the motivations and nature of academic organisational change and unveil often hidden or neglected qualities of the university-region nexus, as well as identify the reasons why universities operating in less favoured regions can assume a particular role. The approach allowed for uncovering, in a quite minutely fashion, the diversity of challenges, vicissitudes, perseverance, practicalities and outcomes of universities working in favour of their regions' development. It provided the wide-angle lens needed to sharpen, widen and colour the picture of the contribution given by universities to the building up of the institutional capacities that underpinned the reinvention of a region which had crossed a acute crisis, the transformation of a conservative, individualistic and sclerotic regional context into a promising innovation environment, and the refreshing of a waning regional innovation system. In sum, the case study methodology was crucial to capture and give empirical sustenance to the intricate realm of a more encompassing perspective on the second academic revolution.

11.3

Prospects for further research...

The discussion of the research findings provided useful hints to identify relevant questions that remained unanswered in this dissertation, and thus to tackle the prospects for further research. Two major intertwined issues map out the way: firstly the acknowledged research shortage concerning the possibility of the occurrence of an antagonistic relationship between the search for international prestige and peer recognition that is inherent to the academic ethos and practice and an effort to engage in institutionally weaker, resilient less favoured regions; secondly, the recognised relevance of regional policy contexts in the promotion of closer linkages between universities and the processes of regional development.

Accepting that universities cannot overlook the innovation and development problem of their regions of location, and adding the notion that a stronger region can be a rewarding ground to academia, there is the need for knowing more about the ways, in unfavourable, resistant to change (and hardly rewarding) territorial contexts, the university-region nexus can take place without ruining the academic aims, ethos and work traditions. Hence, there is room to endeavour in researching further the issue.

Universities acting alone would not be able to revert the situation of regional contexts featuring the debilities pointed out above, and thus, to solve the conundrum reflecting more pressing needs for engaging in regional institutional capacity building processes, on the one side, and the risky and reward-lacking that most likely would wrap up such engagement. Taking this last assertion together with the acknowledgment that a sound encouraging public policy framework is crucial to appropriately foster the university-region nexus, expectations can be set concerning the prominent role that a committed public sector can play in helping to overcome the significant barriers raised to the establishment of fruitful links between universities and institutionally fragile regions.

In this context, the scope of further investigation is very much configured under the framework of a planning approach to the problem. The knowledge produced in this dissertation, bringing new conceptual and analytical devices to address the positioning and role of universities in the processes of regional development, provides a good basis for following this new research path. The crux of the matter is the design and set up, that is the *planning*, of the contextual conditions to ensure that, on the one hand, a given region can take the best of universities, and, on the other hand, that universities can reap benefits from a regional engagement practice. By turning the spotlight to the realm of planning, drawing heavily on HEALEY (1997), the effort is one of interrelating conceptions of the qualities and social dynamics of places and their academic settings with notions of the social processes shaping those places (and, inherently, their academic organisations), through the articulation and implementation of public policies, strategies and programmes.

The planning focus envisaged to give sequence to the attempt to push forward the knowledge frontier about the role of universities in society made in this dissertation is expected to open up the opportunity to contribute to translate knowledge into action. This brings also the additional opportunity to redirect the attention to the *backyard*, i.e., to the Portuguese region of Aveiro and its University. The hope is that the augmented pool of

knowledge can help the University to be active in the change processes that make human development and social justice to flourish, while enhancing its qualities as a *locus* of scientific knowledge-based critical and universal thinking.

Bibliography

- ABRAMOVITZ, Moses (1956), *Resource and output trends in the United States since 1870*, American Economic Review, Papers and Proceedings, Vol, 46, pp. 5- 23.
- ACS, Zoltan; DE LA MOTHE, John; PAQUET, Gilles (2000), *Regional innovation: in search of an enabling strategy*, in ACS, Zoltan (ed.), Regional innovation, knowledge and global change, Pinter, London, UK.
- ACU (2001), *Engagement as a core value for the university: a consultation document*, Association of Commonwealth Universities.
- ADLER, Niclas; HELLSTRÖM, Tomas; JACOB, Merle; NORRGREN, Flemming (2000), *A model for the institutionalisation of university-industry partnerships*, in JACOB, Merle; HELLSTRÖM, Tomas (eds.), The future of knowledge production in the academy, Open University Press, Buckingham, UK.
- ALLISON, Janelle; KEANE, Julie (2001), *Evaluating the role of the Sunshine Coast University (USC) in the regional economy*, Local Economy, Vol. 16, no. 2, pp. 123-141.
- ALI-YRKKÖ, Jyrki; HERMANS, Raine (2004), *Nokia: a giant in the Finnish innovation system*, in SCHIENSTOCK, Gerd (ed.), Embracing the Knowledge Economy, Edward Elgar, Cheltenham, UK, pp. 106-127.
- ALLEN, Peter (1988), *Evolution, innovation and economics*, in DOSI, Giovanni, FREEMAN, Chris, NELSON, Richard, SILVERBERG, Gerard, SOETE, Luc (eds.), Technical change and economic theory, Pinter, London, UK.
- ALTBACH, Philip (2004), *Globalisation and the university: myths and realities in an unequal world*, Tertiary Education and Management, Vol. 10, pp. 3-25.
- AMDAM, Jørgen (2003), *Structure and strategy for regional learning and innovation: challenges for regional planning*, European Planning Studies, Vol. 11, no. 4, pp. 439-459.
- AMIN, Ash (2002), *Spatialities of globalisation*, Environment and Planning A, 34, pp. 385-399.
- AMIN, Ash (1999), *An institutionalist perspective on regional economic development*, International Journal of Urban and Regional Research, Vol. 23 (1), pp. 365-378.
- AMIN, Ash, (1994), *Post-Fordism: models, fantasies and phantoms of transition*, in AMIN, Ash (ed.), Post-Fordism, a reader, Blackwell, Oxford, UK.
- AMIN, Ash; HAUSNER, Jerzy (eds.) (1997), *Beyond market and hierarchy: interactive governance and social complexity*, Edward Elgar, Aldershot, UK.
- AMIN, Ash; THRIFT, Nigel (1995), *Globalisation, "institutional thickness" and the local economy*, in HEALEY, Patsy, CAMERON, Stewart, DAVOUDI, Simon, GRAHAM, Stephen, MADANIPOUR, Ali (eds.), Managing cities, John Wiley, Chichester, UK.
- AMIN, Ash; THRIFT, Nigel (1995), *Institutional issues for the European regions: from markets and plans to socioeconomics and powers of association*, Economy and Society, Vol. 24, no. 1, pp. 41-66.

AMIN, Ash; THRIFT, Nigel (1994), *Globalization, institutions, and regional development in Europe*, Oxford University Press, Oxford, UK.

AMIN, Ash; ROBBINS, Kevin (1990), *Industrial districts and regional development: limits and possibilities*, in PYKE, Frank; BECATTINI, Giacomo; SENGENBERGER, Werner (eds.), *Industrial districts and inter-firm co-operation in Italy*, International Institute for Labour Studies, Geneva, Switzerland.

ANDERSEN, Esben Sloth (1997), *Innovation systems: evolutionary perspectives*, in EDQUIST, Charles (ed.), *Systems of innovation: technologies, institutions and organizations*, Pinter, London, UK.

ANTONELLI, Cristiano (2003), *The economics of innovation, new technologies and structural change*, Routledge, London, UK.

ANTONELLI, Gilberto; DE LISO, Nicola (eds.) (1997), *Economics of structural and technological change*, Routledge, London, UK.

ARBO, Peter; BENNEWORTH, Paul (2006), *Understanding the regional contribution of higher education institutions: a literature review*, Organisation for Economic Co-operation and Development, Paris, France.

ARCHIBUGI, Daniele; HOWELLS, Jeremy; MICHIE, Jonathan (1999), *Innovation systems in a global economy*, *Technology Analysis & Strategic Management*, Vol. 11, no. 4, pp. 527-539.

ARMSTRONG, Peter (2001), *Science, enterprise and profit: ideology in the knowledge-driven economy*, *Economy and Society*, Vol. 30, no. 4, pp. 524-552.

ARROW, Kenneth (1974), *The limits of organization*, Norton, New York, USA.

ARROW, Kenneth (1962a), *The economic implications of learning by doing*, *Review of Economic Studies*, Vol. 29, pp. 155-173.

ARROW, Kenneth [1962b] (2002), *Economic welfare and the allocation of resources for invention*, in MIROWSKI, Philip; SENT, Esther-Mirjam, *Science bought and sold: essays in the economics of science*, University of Chicago Press, Chicago, USA.

ARS (2002), *The practice of stewardship: developing leadership for regional action*, Alliance for Regional Stewardship, Monograph Series, Mountain View, USA.

ARS (2001), *The triumph of the commons: governing 21st century regions*, Alliance for Regional Stewardship, Monograph Series no. 4, Mountain View, USA.

ARTHUR, W. Brian (1988), *Competing technologies: an overview*, in DOSI, Giovanni, FREEMAN, Chris, NELSON, Richard, SILVERBERG, Gerard, SOETE, Luc (eds.), *Technical change and economic theory*, Pinter, London, UK.

ASH, Mitchell (1999), *Scientific changes in Germany 1933, 1945, 1990: towards a comparison*, *Minerva*, no. 37, pp. 329-354.

ASHEIM, Bjørn (2003), *The learning firm in the learning economy: broad participation as social capital*, in ASHEIM, Bjørn; MARIUSSEN, Åge (eds.), *Innovations, regions and projects: studies in new forms of knowledge governance*, Nordregio, Stockholm, Sweden.

- ASHEIM, Bjørn (2000), *Industrial districts: the contributions of Marshall and beyond*, in CLARK, Gordon, FELDMAN, Maryann P. and GERTLER, Meric (eds.), *The Oxford Handbook of Economic Geography*, Oxford University Press, Oxford, UK.
- ASHEIM, Bjørn (1999), *Interactive learning and localised knowledge in globalising learning economies*, *GeoJournal*, 49, pp. 345-352.
- ASHEIM, Bjørn (1996), *Learning regions in a globalised world economy: towards new competitive advantages of industrial districts?*, paper presented at the European Urban and Regional Studies, Exeter, April 1996.
- ASHEIM, Bjørn (1995), *Industrial districts as 'learning regions': a condition for prosperity?*, STEP Report 3/95, Oslo, Norway.
- ASHEIM, Bjørn; COENEN, Lars (2004), *The role of regional innovation systems in a globalising economy: comparing knowledge bases and institutional frameworks of Nordic clusters*, paper prepared for the conference "Regionalization of Economic Policy – Options and Experiences", German Institute for Economic Research- DIW, Berlin, June 2004.
- ASHEIM, Bjørn; ISAKSEN, Arne (2002), *Regional innovation systems: the integration of local 'sticky' and global 'ubiquitous' knowledge*, *Journal of Technology Transfer*, 27, pp. 77-86.
- AUTH (2005), *AUTH guidebook*, Aristotle University of Thessaloniki, Thessaloniki, Greece.
- AXELROD, Robert (1984), *The evolution of cooperation*, Basic Books, New York, USA.
- AYDALOT, Philippe (1986), *Milieux innovateurs en Europe*, GREMI, Paris, France.
- BAGNASCO, Arnaldo (1977), *Tre Italia : la problematica territoriale dello sviluppo economico italiano*, Il Mulino, Bologna, Italia.
- BAKOUROS, Yiannis ; MARDAS, Dimitri ; VARSAKELIS, Nikos (2002), *Science park, a high tech fantasy ? : an analysis of the science parks of Greece*, *Technovation*, Vol. 22, pp. 123-128.
- BARNETT, Ronald (2000a), *The university is dead, long live the university*, *The Times Higher Education Supplement*, 11th February 2000.
- BARNETT, Ronald (2000b), *University knowledge in an age of supercomplexity*, *Higher Education*, vol. 40, pp. 409-422.
- BARNETT, Ronald (1994), *The idea of higher education*, Open University Press, Buckingham, UK.
- BAUMAN, Zygmunt (1997), *Universities: old, new and different*, in SMITH, Anthony; WEBSTER, Frank (eds.), *The postmodern university? Contested visions of higher education in society*, Open University Press, Buckingham, UK.
- BECATTINI, Giacomo (1990), *The Marshallian industrial district as a socio-economic notion*, in PYKE, Frank; BECATTINI, Giacomo; SENGENBERGER, Werner (eds.), *Industrial districts and inter-firm co-operation in Italy*, International Institute for Labour Studies, Geneva, Switzerland.
- BECATTINI, Giacomo (1989), *Sectors and/or districts: some remarks on the conceptual foundations of industrial economics*, in GOODMAN, Edward, BAMFORD, Julia;

SAYNOR, Peter (eds.), *Small firms and industrial districts in Italy*, Routledge, London, UK.

BECATTINI, Giacomo (1979), *Dal settore industriale al distretto industriale: alcune considerazioni sull'unità d'indagine dell'economia industriale*, *Revista di Economia Industriale*, no. 1, pp. 8-32.

BECHER, Tony; TROWLER, Paul (2001), *Academic tribes and territories: intellectual enquiry and the culture of disciplines*, Open University Press, 2nd Edition, Buckingham, UK.

BECK, Ulrich (1992), *Modern society as risk society*, in STEHR, Nico; ERICSON, Richard (eds.), *The culture and power of knowledge*, de Gruyter, New York, USA.

BELLET, Michel; COLLETIS, Gabriel; LUNG, Yannick (1993), *Introduction au numéro special : économie de proximités*, *Revue d'Économie Régionale et Urbaine*, no. 3, pp. 357-361.

BELLINI, Nicola ; FERRUCCI, Luca (eds.) (2002), *Ricerca universitaria e processi di innovazione : le piccole e medie imprese nel Progetto Link*, FrancoAngeli, Milan, Italy.

BENKO, Georges; LIPIETZ, Alain (1998), *From the regulation of space to the space of regulation*, *GeoJournal*, Vol. 44, no. 4, pp. 275-281.

BENSON, Lee ; HARKAVY, Ira (2000), *Higher education's third revolution : the emergence of the democratic cosmopolitan civic university*, *Cityscape*, Vol. 5, no. 1, pp. 47-57.

BIANCHI, Giuliano (1998), *Requiem for the Third Italy? Rise and fall of a too successful concept*, *Entrepreneurship & Regional Development*, no. 10, pp. 93-116.

BIGGIERO, Lucio (1998), *Italian industrial districts: a Triple Helix pattern of problem solving*, *Industry & Higher Education*, Vol. 12, no. 4, pp. 227-234.

BOOHER, David; INNES, Judith (2002), *Network power in collaborative planning*, *Journal of Planning Education and Research*, Vol. 21, pp. 221-236.

BORRÁS, Susana (2004), *Introduction to special issue on a European system of innovation*, *Research Policy*, Vol. 31, no. 6, pp. 422-424.

BOSCHMA, Ron (2005), *Proximity and innovation: a critical assessment*, *Regional Studies*, Vol. 39.1, pp. 61-74.

BOUCHER, Gerry; CONWAY, Cheryl; VAN DER MEER, Els (2003), *Tiers of engagement by universities in their region's development*, *Regional Studies*, Vol. 37, no.9, pp. 887-897.

BOURDIEU, Pierre (1983), *Ökonomisches Kapital, kulturelles Kapital, soziales Kapital*, in KRECKEL, Reinhard (ed.), *Soziale Ungleichheiten (Soziale Welt, Sonderheft 2)*, Otto Schartz , Göttingen, Germany, pp. 183-98 (translated into English by Richard Nice; downloaded from <http://www.viet-studies.org>).

BOYER, Robert (1996), *State and market: a new engagement for the twenty-first century*, in BOYER, Robert; DRACHE, Daniel (eds.), *States against markets: the limits of globalization*, Routledge, London, UK.

- BOYER, Robert (1988), *Technical change and the theory of 'Régulation'*, in DOSI, Giovanni, FREEMAN, Chris, NELSON, Richard, SILVERBERG, Gerard, SOETE, Luc (eds.), *Technical change and economic theory*, Pinter, London, UK.
- BRYSON, John; CROSBY, Barbara (2005), *Leadership for the common good: building cross-sector regimes of mutual gain*, paper presented to the Center for Organizational Research Initiative, University of California- Irving, January 2005.
- BUSH, Vannevar (1945), *Science the endless frontier*, US Government Printing Office, Washington DC, USA.
- CAMAGNI, Roberto (2002), *On the concept of territorial competitiveness: sound or misleading?*, *Urban Studies*, Vol. 39, no. 13, pp. 2395-2411.
- CAMAGNI, Roberto (1991a), *Introduction: from the local 'milieu' to innovation through cooperation networks*, in CAMAGNI, Roberto (ed.), *Innovation networks: spatial perspectives*, Belhaven Press, London, UK.
- CAMAGNI, Roberto (1991b), *Local "milieu", uncertainty and innovation networks: towards a new dynamic theory of economic space*, in CAMAGNI, Roberto (ed.), *Innovation networks: spatial perspectives*, Belhaven Press, London, UK.
- CAMAGNI, Roberto; MAILLAT, Dennis; MATTEACCIOLI, Andrée (2004), *Ressources naturelles et culturelles, milieux et développement local*, EDES, Neuchâtel, Switzerland.
- CAPELLO, Roberta (1999), *Spatial transfer of knowledge in high technology milieu: learning versus collective learning processes*, *Regional Studies*, Vol. 33, no. 4, pp. 353-365.
- CARDIFF UNIVERSITY (2007), *Annual review 2006*, Cardiff University, Cardiff, UK.
- CARDIFF UNIVERSITY (2006b), *Innovation & engagement strategy 2006/07 to 2010/11*, Cardiff University, Cardiff, UK.
- CARDIFF UNIVERSITY (2006a), *Strategic Plan 2006/07 to 2010/11*, Cardiff University, Cardiff, UK.
- CARDIFF UNIVERSITY (2004a), *Third mission strategy and action plan 2004/05 to 2006/07*, Cardiff University, Cardiff, UK.
- CARDIFF UNIVERSITY (2004b), *Third mission – new name?*, *Cardiff University News*, Vol. 10, no. 8, p. 5.
- CARDIFF UNIVERSITY (2003), *Third mission strategy: consultation draft for the merged Cardiff University Strategic Plan*, Cardiff University, Cardiff, UK.
- CARLSSON, Bo; JACOBSSON, Staffan; HOLMÉN, Magnus; RICKNE, Annika (2002), *Innovation systems: analytical and methodological issues*, *Research Policy*, Vol. 31, pp. 233-245.
- CASTELLS, Manuel (1999), *Information technology, globalization and social development*, United Nations Research Institute for Social Development, Discussion Paper no. 114.
- CASTELLS, Manuel (1996), *The information age: economy, society and culture*, Vol. 1, *The rise of the network society*, Blackwell, Oxford, UK.

CASTELLS, Manuel (1989), *The informational city: information technology, economic restructuring and the urban-regional process*, Blackwell, London, UK.

CASTRO, Eduardo; RODRIGUES, Carlos; ESTEVES, Carlos; ROSA PIRES, Artur (2000), *The triple helix model as a motor for the creative use of telematics*, Research Policy, Vol. 29, pp. 193-203.

CASTRO, Eduardo; JENSEN- BUTLER, Chris (1993), *Flexibility, routine behaviour and the neoclassical model in the analysis of regional growth*, Institute of Political Science, University of Aarhus, Aarhus, Denmark.

CEC (2006), *Constructing regional advantage: principles, perspectives and policies*, Commission of the European Communities, Directorate-General for Research, Brussels, Belgium.

CEC (2005a), *Key figures 2005 on science, technology and innovation: towards a European Knowledge Area*, Commission of the European Communities, Brussels, Belgium.

CEC (2005b), *Building the will for excellence*, European Innovation, no. 1, Commission of the European Communities, Brussels, Belgium.

CEC (2004a), *A new partnership for cohesion: convergence, competitiveness, cooperation*, Commission of the European Communities, Brussels, Belgium.

CEC (2004b), *Innovation in Europe: results for the EU, Iceland and Norway*, Eurostat, European Commission, Brussels, Belgium.

CEC (2004c), *Study on the financing of higher education in Europe*, Commission of the European Communities, Brussels, Belgium.

CEC (2003a), *Competitiveness, sustainable development and cohesion in Europe: from Lisbon to Gothenburg*, Commission of the European Communities, Brussels, Belgium.

CEC (2003b), *The role of universities in the Europe of knowledge*, COM (2003) 58, Brussels, Belgium.

CEC (2003c), *European Trend Chart on Innovation*, DG Enterprise, European Commission, Brussels, Belgium.

CEC (2001a), *The regional dimension of the European Research Area*, Commission of the European Communities, COM (2001) 549, Brussels, Belgium.

CEC (2001b), *The regions and the new economy: guidelines for innovative actions under the ERDF in 2000-2006*, Commission of the European Communities, COM (2001) 60, Brussels, Belgium.

CEC (2000), *Towards a European Research Area*, Commission of the European Communities, COM (2000) 6, Brussels, Belgium.

CEC (1999), *Sixth Periodic Report on the Social and Economic Situation and Development of the Regions of the European Union*, Commission of the European Communities, Luxembourg, Luxembourg.

CEC (1998), *Universities, technology transfer and spin-off activities- academic entrepreneurship in different European regions*, Final report, TSER Programme, Project 1042, Commission of the European Communities, Brussels, Belgium.

CEC (1997), *Practical guide to regional innovation actions*, Commission of the European Communities, Brussels, Belgium.

CEC (1996), *First report on economic and social cohesion*, Commission of the European Communities, Brussels, Belgium.

CERTH (2006), *Technology transfer through technology clinics*, Center for Research and Technology Hellas, <http://www.techpath.gr/clinics/>.

CHARLES, David (2006a), *Universities as key knowledge infrastructures in regional innovation systems*, *Innovation*, Vol. 19, no. 1, pp. 117-130.

CHARLES, David (2006b), *Regional development, universities and strategies for cluster promotion*, in HARDING, Alan; SCOTT, Alan; LASKE, Stephan; BURTSCHER, Christian (eds.), *Knowledge factories*, Ashgate, Aldershot, UK.

CHARLES, David (2003), *Universities and territorial development: reshaping the regional role of UK universities*, *Local Economy*, Vol. 18, no. 1, pp. 7-20.

CHARLES, David; BENNEWORTH, Paul (2001), *The regional mission: the regional contribution of higher education*, Higher Education Funding Council for England, London, UK.

CHARLES, David; NAUWELAERS, Claire; MOUTON, Benedicte; BRADLEY, David (2000), *Assessment of the regional innovation and technology transfer strategies and infrastructures (RITTS) scheme*, First evaluation report, MERIT and CURDS.

CHARLES, David; HOWELLS, Jeremy (1992), *Technology transfer in Europe*, Belhaven Press, London, UK.

CHASKIN, Robert (2001), *Building community capacity: a definitional framework and case studies from a comprehensive community initiative*, *Urban Affairs Review*, Vol. 36, no. 3, pp. 291-323.

CHASKIN, Robert; BROWN, Prudence; VENKATESH, Sudhir; VIDAL, Avis (2001), *Building community capacity*, Walter de Gruyter, New York, USA.

CHATTERTON, Paul; GODDARD, John (2003), *The response of HEIs to regional needs*, in RUTTEN, Roel; BOEKEMA, Frans; KUIJPERS, Elsa (eds.), *Economic geography of higher education: knowledge infrastructure and learning regions*, Routledge, London, UK.

CITY OF TAMPERE (2006a), *Tampere is building the future*, *Tampere News*, no. 1.

CITY OF TAMPERE (2006b), *New environs for business activity*, *Tampere Business, Science and Life*, no. 1, pp 20-21.

CITY OF TAMPERE (2006c), *Annual report 2005*, City of Tampere, Tampere, Finland.

CITY OF TAMPERE (2005a), *Facts and figures*, City of Tampere Information Office, Tampere, Finland.

CITY OF TAMPERE (2005b), *Tampere seizes creative economy*, *Tampere Business, Science and Life*, no. 2, p. 7.

CITY OF TAMPERE (2003), *Top expertise and business development in the Tampere region*, Tampere Business Development Centre, Tampere, Finland.

- CLARK, Burton (2003), *Sustaining change in universities: continuities in case studies and concepts*, Tertiary Education and Management, no. 9, pp. 96-116.
- CLARK, Burton (1998), *Creating entrepreneurial universities: organizational pathways of transformation*, Pergamon, New York, USA.
- CLARK, Burton (1996), *Case studies of innovative universities: a progress report*, Tertiary Education and Management, Vol. 2, no. 1, pp. 52-61.
- CLARK, Burton (1995a), *Places of inquiry: research and advanced education in modern universities*, University of California Press, Berkeley, USA.
- CLARK, Burton (1995b), *Leadership and innovation in universities: from theory to practice*, Theory of Education and Management, Vol. 1. no. 1, pp. 7-11.
- CLAVAL, Paul (1998), *Politics and the University*, in VAN DER WUSTEN, Herman (ed.), *The urban university and its identity: roots, locations, roles*, Kluwer Academic Publishers, Dordrecht, The Netherlands.
- COHENDET, Patrick; LLERENA, Patrick (1997), *Learning, technical change, and public policy*, in EDQUIST, Charles (ed.), *Systems of innovation: technologies, institutions and organizations*, Pinter, London, UK.
- COLEMAN, James (1988), *Social capital in the creation of human capital*, American Journal of Sociology, 94, supplement, pp. S95-S120.
- COLEMAN, James (1987), *Norms as social capital*, in RADNITZKY, Gerard; BERNHOLZ, Peter (eds.), *Economic imperialism: the economic approach applied outside the field of economics*, Paragon, New York, USA.
- COMMONS, John R. (1931), *Institutional economics*, The American Economic Review, Vol. 41, pp. 648-657.
- COOKE, Philip (2006), *Regional innovation systems as public goods*, (in cooperation with MEMEDOVIC, Olga), United Nations Industrial Development Organization, Vienna, Austria.
- COOKE, Philip (2004a), *Systemic innovation: triple helix, scalar envelopes, or regional knowledge capabilities, an overview*, paper prepared for the International Conference on Regionalisation of Innovation Policy – Options and Experiences, Berlin, June 2004.
- COOKE, Philip (2004b), *The Regional Innovation System in Wales: Evolution or Eclipse?*, in COOKE, P., HEIDENREICH, M. & BRACZYK, H. (eds.), *Regional Innovation Systems* (2nd edition), Routledge, London, UK, pp. 214-233.
- COOKE, Philip (2003a), *Varieties of Devolution: Visionary and Precautionary Economic Policy Formulation in Scotland and Wales*, ESRC Devolution and Constitutional Change Programme, Birmingham, UK.
- COOKE, Philip (2003b), *Devolution and innovation: the financing of economic change in the devolved administrations*, in Proceedings of the Regional Studies Association Annual Conference.
- COOKE, Philip (2002) *Regional innovation systems: general findings and some new evidence from biotechnology clusters*, Journal of Technology Transfer, Vol. 27, pp. 133-145.

- COOKE, Philip (2001), *Regional innovation systems, clusters, and the knowledge economy*, Industrial and Corporate Change, Vol. 10, no. 4, pp. 945-974.
- COOKE, Philip (1998a), *Introduction: origins of the concept*, in BRACZYK, Hans-Joachim, COOKE, Philip, HEIDENREICH, Martin (eds.), *Regional Innovation Systems*, UCL Press, London, UK, pp. 2-25.
- COOKE, Philip (1998b), *Global clustering and regional innovation: systemic integration in Wales*, in BRACZYK, Hans-Joachim, COOKE, Philip, HEIDENREICH, Martin (eds.), *Regional Innovation Systems*, UCL Press, London, UK, pp. 2-25.
- COOKE, Philip (1997a), *Institutional reflexivity and the rise of the region state*, in BENKO, Georges; STROHMAYER, Ulf (eds.), *Space & social theory: interpreting modernity and postmodernity*, Blackwell, Oxford, UK.
- COOKE, Philip (1997b), *Regions in a global market: the experiences of Wales and Baden-Württemberg*, *Review of International Political Economy*, 4 (2), pp. 349-381.
- COOKE, Philip (1992), *Regional innovation systems: competitive regulation in the new Europe*, *Geoforum*, 23, 365-382.
- COOKE, Philip; LEYDESDORFF, Loet (2006), *Regional development in the knowledge-based economy: the construction of advantage*, *Journal of Technology Transfer*, Vol. 31, pp. 5-15.
- COOKE, Philip; CLIFTON, Nick (2005), *Visionary, precautionary and constrained varieties of devolution' in the economic governance of the devolved UK territories*, *Regional Studies*, Vol. 39, no. 4, pp. 437-451.
- COOKE, Philip; SCHIENSTOCK, Gerd (2000), *Structural competitiveness and learning regions*, *Enterprise and Innovation Management Studies*, Vol. 1, no. 3, pp. 265-280.
- COOKE, Philip; BOEKHOELT, Patrick; TÖDTLING, Franz (2000a), *The governance of innovation in Europe: regional perspectives on global competitiveness*, Pinter, London, UK.
- COOKE, Philip; MANNING, Claire; HUGGINS, Robert (2000b), *Industrial liaison and academic entrepreneurship in Wales*, *Zeitschrift für Wirtschaftsgeografie*, no. 44, no. 3-4, pp. 246-260.
- COOKE, Philip; MORGAN, Kevin (1998), *The associational economy: firms, regions, and innovation*, Oxford University Press, Oxford, UK.
- COOKE, Philip; GOMEZ URANGA, Mikael; ETXEARRIA, Goio (1998), *Regional systems of innovation: an evolutionary perspective*, *Environment and Planning A*, Vol. 30, pp. 1563-1584.
- COOKE, Philip; GOMEZ URANGA, Mikel; ETXEARRIA, Goio (1997), *Regional innovation systems: institutional and organisational dimensions*, *Research Policy*, 26, pp. 475-491.
- COOKE, Philip; MORGAN, Kevin (1994), *The creative milieu: a regional perspective on innovation*, in DODGSON, Mark; ROTHWELL, Roy (eds.), *The handbook of industrial innovation*, Edward Elgar, Cheltenham, UK.
- COOKE, Philip; REES, Gareth (1981), *The industrial restructuring of South Wales: the career of a state-managed region*, *Policy Studies Journal*, Vol. 10, no. 2, pp. 284-296.

CORIAT, Benjamin; WEINSTEIN, Olivier (2002), Organizations, firms and institutions in the generation of innovation, *Research Policy*, Vol. 31, p. 273-290.

COURAULT, Bruno; ROMANI, Claudine (1992), *A re-examination of the Italian model of flexible production from a comparative point of view*, in STORPER, Michael; SCOTT, Allen J. (eds.), *Pathways to industrialization and regional development*, Routledge, London, UK.

CREVOISIER, Olivier; CAMAGNI, Roberto (eds.) (2000), *Les milieux urbains: innovation, systèmes de production et ancrage*, EDES/GREMI, Neuchâtel, Switzerland.

CREVOISIER, Olivier; MAILLAT, Dennis (1991), *Milieu, industrial organization and territorial production system: towards a new theory of spatial development*, in CAMAGNI, Roberto (ed.), *Innovation networks: spatial perspectives*, Belhaven Press, London, UK.

DASGUPTA, Partha (2003), *Social capital and economic performance: analytics*, in OSTROM, Elinor, AHN, Toh-Kyeong (eds.), *Foundations of social capital*, Elgar, Cheltenham, UK, pp. 309-339.

DASGUPTA, Partha (2000), *Trust as a commodity*, in GAMBETTA, Diego (ed.) *Trust: making and breaking cooperative relations*, electronic edition, Department of Sociology, University of Oxford, pp. 49-72, <http://www.sociology.ox.ac.uk/papers/dasgupta49-72.pdf>.

DAVID, Paul (1985), *Clio and the economics of QWERTY*, *American Economic Review*, Vol. 75, no. 2, pp. 332-337.

DAVID, Paul; FORAY, Dominique (1995), *Assessing and expanding the science and technology-base*, *STI Review*, n° 16, OECD, Paris, France.

De BOER, Harry; HUISMAN, Jeroen; KLEMPERER, Anne; Van der MEULEN, Barend; NEAVE, Guy; THEISENS, Henno; Van der WENDE, Marijk (2002), *Academia in the 21st century: an analysis of trends and perspectives in higher education and research*, AWT – Adviesraad voor het Wetenscahps-en Technologiebeleid, Achtergrondstudie no. 28, Den Haag, The Netherlands.

De la MOTHE, John (2004), *The institutional governance of technology, society, and innovation*, *Technology in Society*, vol. 26, pp. 523-536.

De la MOTHE, John; PAQUET, Gilles (2000), *National innovation systems and instituted processes*, in ACS, Zoltan (ed.), *Regional innovation, knowledge and global change*, Pinter, London, UK.

De la MOTHE, John; PAQUET, Gilles (1996a), *Evolution and inter-creation: the government-business-society nexus*, in de la MOTHE, John; PAQUET, Gilles (eds.), *Evolutionary economics and the new international political economy*, Pinter, New York, USA.

De la MOTHE, John; PAQUET, Gilles (1996b), *In search of a new international political economy*, in de la MOTHE, John; PAQUET, Gilles (eds.), *Evolutionary economics and the new international political economy*, Pinter, New York, USA.

De MAGALHÃES, Cláudio; HEALEY, Patsy; MADANIPOUR, Ali (2002), *Assessing institutional capacity building for city centre regeneration: Newcastle's Grainger Town*, in CARS, Göran; HEALEY, Patsy; MADANIPOUR, Ali; De MAGALHÃES, Cláudio (eds.), *Urban governance, institutional capacity and social milieux*, Ashgate, Aldershot, UK.

De TOCQUEVILLE, Alexis ([1840] 1945), *How the Americans combat individualism by the principle of self-interest rightly understood*, in BRADLEY, Phillips (ed.), *Democracy in America*, Vol. 2, Random House, New York, USA.

DEEM, Rosemary (2001), *Globalisation, new managerialism, academic capitalism and entrepreneurialism in universities: is the local dimension still important?*, *Comparative Education*, Vol. 37, no. 1, pp. 7-20.

DELANTY, Gerard (2001), *Challenging knowledge: the University in the knowledge society*, Open University Press, Buckingham, UK.

DENIOZOS, Dimitris (2006), *Annual innovation policy trends and appraisal report, Greece*, Enterprise Directorate-General, European Commission, Brussels, Belgium.

DENIOZOS, Dimitris; DAOULTZI, Vicki (2004), *Annual innovation policy report for Greece*, Enterprise Directorate-General, European Commission, Brussels, Belgium.

DEPARTMENT OF EDUCATION (1996), *Green paper on higher education transformation*, Ministry of Education, Government of South Africa.

DEPARTMENT OF SCIENCE AND TECHNOLOGY (2003), *Science and technology policy 2003*, Government of India, <http://dst.gov.in>.

DfES (2003), *The future of higher education*, Department for Education and Skills, London, UK.

DILL, David (2003), *Allowing the market to rule: the case of the United States*, *Higher Education Quarterly*, Vol. 57, no. 2, pp. 136-157.

DiMAGGIO, Paul (1998), *The new institutionalisms: avenues of collaboration*, *Journal of Institutional and Theoretical Economics*, no. 154, pp. 696-705.

DiMAGGIO, Paul; POWELL, Walter (1991), *Introduction*, in POWELL, Walter; DiMAGGIO, Paul (eds.), *The new institutionalism in organizational analysis*, The University of Chicago Press, Chicago, USA.

DOLOREUX, David; PARTO, Saeed (2004), *Regional innovation systems: a critical synthesis*, INTECH discussion paper 2004/17, United Nations University, Maastricht, The Netherlands.

DOSI, Giovanni (1988), *The nature of the innovative process*, in DOSI, Giovanni, FREEMAN, Chris, NELSON, Richard, SILVERBERG, Gerard, SOETE, Luc (eds.), *Technical change and economic theory*, Pinter, London, UK.

DOSI, Giovanni; ORSENIGO, Luigi (1988), *Coordination and transformation: an overview of structures, behaviours and change in evolutionary environments*, in DOSI, Giovanni, FREEMAN, Chris, NELSON, Richard, SILVERBERG, Gerard, SOETE, Luc (eds.), *Technical change and economic theory*, Pinter, London, UK.

DRAPER, Hal (1964), *The mind of Clark Kerr*, published as a pamphlet by Independent Socialist Club, Berkeley, USA.

DRUCKER, Peter (1968), *The age of discontinuity: guidelines to our changing society*, Harper and Row, New York, USA.

- DTI (2002), *A practical guide to cluster development*, Department of Trade and Industry, London, UK.
- DTI (2000), *White paper on science and innovation*, Department of Trade and Industry, London, UK.
- DTI/DfES (2001), *White paper on enterprise, skills and innovation*, Department of Trade and Industry/Department for Education and Skills, London, UK.
- DUDERSTADT, James (1998), *Transforming the university to serve the digital age*, Cause/Effect, Vol. 20, no. 4, pp. 21-32.
- DUKE, Chris (2000), *Regional partnership: building a learning region*, Perspectives, Vol. 4, no. 3, pp. 61-67.
- DUKE, Chris (1999), *Lifelong learning: implications for the university of the 21st century*, Higher Education Management, Vol. 11, no. 1, pp. 7-33.
- EDQUIST, Charles (1997), *Systems of innovation approaches – their emergence and characteristics*, in EDQUIST, Charles (ed.), *Systems of innovation: technologies, institutions and organizations*, Pinter, London, UK.
- EDQUIST, Charles; HOMMEN, Leif (1999), *Systems of innovation: theory and policy for the demand side*, Technology in Society, Vol. 21, pp. 63-79.
- EDQUIST, Charles; JOHNSON, Björn (1997), *Institutions and organizations in systems of innovation*, in EDQUIST, Charles (ed.), *Systems of innovation: technologies, institutions and organizations*, Pinter, London, UK.
- ELAM, Mark (1994), *Puzzling out the post-Fordist debate: technology, markets, institutions*, in AMIN, Ash (ed.), *Post-Fordism, a reader*, Blackwell, Oxford, UK.
- ELWA (2001), *Higher education, further education, and training statistics in Wales 1999/2000*, Education and Learning Wales, Cardiff, UK.
- ENRIGHT, Michael (1996), *Regional clusters and economic development: a research agenda*, in STABER, Udo; SCHAEFER, Norm; SHARMA, Basu (eds.), *Business networks: prospects for regional development*, Walter de Gruyter, Berlin, Germany.
- ERNSTE, Huib (2003), *About unlearning and learning regions*, in RUTTEN, Roel; BOEKEMA, Frans; KUIJPERS, Elsa (eds.), *Economic geography of higher education*, Routledge, London, UK.
- ETZKOWITZ, Henry (2004a), *The evolution of the entrepreneurial university*, International Journal of Technology and Globalisation, Vol. 1, no. 1, pp. 64-77.
- ETZKOWITZ, Henry (2004b), *The triple helix and the rise of the entrepreneurial university*, in GRANDIN, Karl; WORMBS, Nina; WIDMALM, Sven (eds.), *The science-industry nexus – history, policy, implications*, Science History Publications, Sagamore Beach, USA.
- ETZKOWITZ, Henry (2003a), *Innovation in innovation: the triple helix of university-industry-government relations*, Social Science Information, Vol. 42, no. 3, pp. 293-337.
- ETZKOWITZ, Henry (2003b), *Research groups as “quasi-firms”: the invention of the entrepreneurial university*, Research Policy, Vol. 32, pp. 109-121.

ETZKOWITZ, Henry (2002a), *MIT and the rise of entrepreneurial science*, Routledge, London, UK.

ETZKOWITZ, Henry (2002b), *Incubation of incubators: innovation as a triple helix of university-industry-government networks*, Science and Public Policy, Vol. 29, no. 2, pp. 115-128.

ETZKOWITZ, Henry (2002c), *The triple helix of university-industry-government: implications for policy and evaluation*, SISTER working paper 2002-11, Stockholm, Sweden.

ETZKOWITZ, Henry (1999), *Bridging the gap: the evolution of industry-university links in the United States*, in BRANSCOMB, Lewis; KODAMA, Fumio; FLORIDA, Richard (eds.), *Industrializing knowledge: university-industry linkages in Japan and the United States*, The MIT Press, Cambridge, USA.

ETZKOWITZ, Henry (1997), *The entrepreneurial university and the emergence of democratic corporatism*, in ETZKOWITZ, Henry; LEYDESDORFF, Loet (eds.), *Universities and the global knowledge economy: a triple helix of university-industry-government relations*, Pinter, London, UK.

ETZKOWITZ, Henry (1996), *Conflict of interest and commitment in academic science in the United States*, Minerva, no. 34, pp. 259-277.

ETZKOWITZ, Henry (1994), *Academic-industry relations: a sociological paradigm for economic development*, in LEYDESDORFF, Loet; van den BESSELAAR, Peter (eds.), *Evolutionary economics and chaos theory: new directions in technology studies*, Pinter, London, UK.

ETZKOWITZ, Henry; ZHOU, Chunyan (2006), *Triple helix twins: innovation and sustainability*, Science and Public Policy, Vol. 33, no. 1, pp. 77-83.

ETZKOWITZ, Henry; KLOFSTEN, Magnus (2005), *The innovating region: toward a theory of knowledge-based regional development*, R&D Management, Vol. 35, no. 3, pp. 243-255.

ETZKOWITZ, Henry; ASPLUND, Patrik; NORDMAN, Niklas (2001), *Beyond Humboldt: emergence of academic entrepreneurship in the US and Sweden*, WP 27:2001, CERUM-Centrum för Regionalvetenskap, Umeå, Sweden.

ETZKOWITZ, Henry; WEBSTER, Andrew; GEBHARDT, Christiane; CANTISANO TERRA, Branca Regina (2000), *The future of the university and the university of the future: evolution of ivory tower to entrepreneurial paradigm*, Research Policy, Vol. 29, pp. 313-330.

ETZKOWITZ, Henry; LEYDESDORFF, Loet (2000), *The dynamics of innovation: from national systems and 'mode 2' to a triple helix of university-industry-government relations*, Research Policy, Vol. 29, pp. 109-123.

ETZKOWITZ, Henry; LEYDESDORFF, Loet (1999), *The future location of research and technology transfer*, Journal of Technology Transfer, 24, pp. 111-123.

ETZKOWITZ, Henry; WEBSTER, Andrew; HEALEY, Peter (1998), *Introduction*, in ETZKOWITZ, Henry; WEBSTER, Andrew; HEALEY, Peter (eds.), *Capitalizing knowledge: new interactions of industry and academia*, State University of New York Press, Albany, USA.

- ETZKOWITZ, Henry; WEBSTER, Andrew (1998), *Entrepreneurial science: the second academic revolution*, in ETZKOWITZ, Henry; WEBSTER, Andrew; HEALEY, Peter (eds.), *Capitalizing knowledge: new interactions of industry and academia*, State University of New York Press, Albany, USA.
- ETZKOWITZ, Henry; KEMELGOR, Carol (1998), *The role of research centres in the collectivisation of academic science*, *Minerva*, no. 36, pp. 271-288.
- ETZKOWITZ, Henry; LEYDESDORFF, Loet (1998), *The endless transition: a 'triple helix' of university-industry-government relations*, *Minerva*, no. 36, pp. 203-208.
- ETZKOWITZ, Henry; LEYDESDORFF, Loet (1997), *Introduction: universities in the global knowledge economy*, in ETZKOWITZ, Henry; LEYDESDORFF, Loet (eds.), *Universities and the global knowledge economy: a triple helix of university-industry-government relations*, Pinter, London, UK.
- EUA (2005), *EUA institutional evaluation programme: University of the Aegean*, European University Association.
- EURYDICE (2000), *Two decades of reform in higher education in Europe: 1980 onwards*, Eurydice European Unit, Brussels, Belgium.
- FARREL, Henry; KNIGHT, Jack (2003), *Trust, institutions and institutional change: industrial districts and the social capital hypothesis*, *Politics & Society*, Vol. 31 (4), pp. 537-566.
- FEATHERSTONE, Mike (1991), *Consumer culture and postmodernism*, Sage, London, UK.
- FELDMAN, Maryann (1994), *The geography of innovation*, Kluwer Academic Publishers, Dordrecht, The Netherlands.
- FELDMAN, Maryann; DESROCHERS, Pierre (2004), *Truth for its own sake: academic culture and technology transfer at Johns Hopkins University*, *Minerva*, no. 42, pp. 105-126.
- FELDMAN, Maryann; FELLER, Irwin; BERCOVITZ, Janet; BURTON, Richard (2002), *University technology transfer and the system of innovation*, in FELDMAN, Maryann; MASSARD, Nadine (eds.), *Institutions and systems in the geography of innovation*, Kluwer, Norwell, USA.
- FINANCE WALES (2003), *Spinout spins on: a 3 year report 2000-2003*, Wales Spinout Programme, Cardiff, UK.
- FINE, Ben (2001), *Social capital versus social theory: political economy and social science at the turn of the Millennium*, Routledge, London, UK.
- FINNISH MINISTRY OF THE INTERIOR (2002), *Regional Development Act, 602/2002*, unofficial translation.
- FLECK, James (1992), *Configurations: crystallising contingency*, *The International Journal of Human Factors in Manufacturing*, Autumn.
- FLEXNER, Abraham (1930), *The Idea of a Modern University*, New York, USA.

FLORIDA, Richard (1999), *The role of the university: leveraging talent, not technology*, Issues in Science and Technology Online, Summer 1999, www.nap.edu/issues/15.4/florida.htm.

FLORIDA, Richard (1995), *Toward the learning region*, Futures, Vol. 27, no. 5, pp. 527-536.

FLYVBJERG, Bent (2004), *Five misunderstandings about case-study research*, in SEALE, Clive; GOBO, Giampietro; GUBRIUM, Jaber; SILVERMAN, David (eds.), *Qualitative research practice*, Sage, London, UK.

FORAY, Dominique (2004), *The economics of knowledge*, MIT Press, Cambridge, USA.

FORAY, Dominique (1997), *Generation and distribution of technological knowledge: incentives, norms, and institutions*, in EDQUIST, Charles (ed.), *Systems of innovation: technologies, institutions and organizations*, Pinter, London, UK.

FORAY, Dominique (1993), *Feasibility of a single regime of intellectual property rights*, in HUMBERT, Marc (ed.), *The impact of globalisation in Europe's firms and regions*, Pinter, London, UK.

FREEMAN, Christopher (1988), *Introduction*, in DOSI, Giovanni, FREEMAN, Chris, NELSON, Richard, SILVERBERG, Gerard, SOETE, Luc (eds.), *Technical change and economic theory*, Pinter, London, UK.

FREEMAN, Christopher (1987), *Technology and economic performance: lessons from Japan*, Pinter, London, UK.

FREEMAN, Christopher; PEREZ, Carlota (1988), *Structural crises of adjustment: business cycles and investment behaviour*, in DOSI, Giovanni, FREEMAN, Chris, NELSON, Richard, SILVERBERG, Gerard, SOETE, Luc (eds.), *Technical change and economic theory*, Pinter, London, UK.

FUKUYAMA, Francis (2002), *Social capital and development: the coming agenda*, SAIS Review, 22 (1), pp. 23- 37.

FUKUYAMA, Francis (2000), *Social capital and civil society*, International Monetary Fund, working paper WP/00/74.

FULLER, Steve (2001), *A critical guide to knowledge society newspeak: or, how not to take the great leap backward*, Current Sociology, Vol. 49 (4), 177-201.

GAMBETTA, Diego (2000), *Can we trust trust*, in GAMBETTA, Diego (ed.) *Trust: making and breaking cooperative relations*, electronic edition, Department of Sociology, University of Oxford, pp. 213-237, <http://www.sociology.ox.ac.uk/papers/gambetta213-237.pdf>.

GEELS, Frank (2004), *From sectoral systems of innovation to socio-technical systems: insights about dynamics and change from sociology and institutional theory*, Research Policy, Vol. 33, pp. 897-920.

GELLERT, Claudius (1991), *The emergence of three University models: institutional and functional modifications in European higher education*, European University Institute, WP ECS 91/5, Firenze, Italia.

GERTLER, MERIC (2001), *Tacit knowledge and the economic geography of context or the undefinable tacitness of being (there)*, paper presented at the Nelson and Winter DRUID Summer Conference, Aalborg, Denmark, June 2001.

GERTLER, MERIC; VINODRAI, TARA (2004), *Anchors of creativity: how do public universities create competitive and cohesive communities?*, paper presented at the conference "Building excellence: graduate education and research; taking public universities seriously", University of Toronto, Toronto, Canada.

GERTLER, MERIC; WOLFE, DAVID (2004), *Local social knowledge management: community actors, institutions and multilevel governance in regional foresight exercises*, *Futures*, Vol. 36, pp. 45-65.

GEUNA, ALDO (1999), *The economics of knowledge production: funding and the structure of university research*, Edward Elgar, Cheltenham, UK.

GEUNA, ALDO (1998), *The internationalisation of European universities: a return to medieval roots*, *Minerva*, 36, pp. 253-270.

GIBBONS, MICHAEL (2001), *Globalisation in higher education: a view for the South*, *SRHE International News*, no. 46, pp. 4-12.

GIBBONS, MICHAEL; LIMOGES, CAMILLE; NOWOTNY, HELGA; SCHWARTZMANN, SIMON; SCOTT, PETER; TROW, MARTIN (1994), *The new production of knowledge- the dynamics of science and research in contemporary societies*, Sage, London, UK.

GIDDENS, ANTHONY (2000), *O Mundo na era da globalização*, Presença, Lisboa, Portugal.

GIDDENS, ANTHONY (1984), *The constitution of society*, Polity, Cambridge, UK.

GIDDENS, ANTHONY (1979), *Central problems in social theory: action, structure and contradiction in social analysis*, University of California Press, Berkeley and Los Angeles, USA.

GODDARD, JOHN; CHATTERTON, PAUL (1999), *Regional development agencies and the knowledge economy: harnessing the potential of universities*, *Environment and Planning C*, Vol. 17, pp. 685-699.

GODDARD, JOHN; CHARLES, DAVID; PIKE, ANDY; POTTS, GERALD; BRADLEY, DAVID (1994), *Universities and communities*, Committee of Vice-Chancellors and Principals, London, UK.

GODIN, BENOIT; GINGRAS, YVES (2000), *The place of universities in the system of knowledge production*, *Research Policy*, vol. 29, pp. 273-278.

GRABHER, GERNOT (ed.) (1993), *The embedded firm: on the socio-economics of industrial networks*, Routledge, London, UK.

GRAHAM, GORDON (2002), *Universities, the Recovery of an Idea*, Imprint Academic, Thorverton, UK.

GRANOVETTER, MARK (1973), *The strength of weak ties*, *American Journal of Sociology*, Vol. 78, no. 6, pp. 1360-1380.

GREGERSEN, BRIGITTE; JOHNSON, BJÖRN (1997), *Learning economies, innovation systems and European integration*, *Regional Studies*, Vol. 31.5, pp. 479-490.

- GRILICHES, Zvi (1958), *Research costs and social returns: hybrid corn and related innovations*, *Journal of Political Economy*, Vol. 66, pp. 419-431.
- GSRT (2000), *Research & Development in Greece*, General Secretariat for Research and Technology, Ministry of Development, Athens, Greece.
- GUALINI, Enrico (2002), *Institutional capacity building as an issue of collective action and institutionalisation: some theoretical remarks*, in CARS, Göran; HEALEY, Patsy; MADANIPOUR, Ali; DE MAGALHÃES, Cláudio (eds.), *Urban governance, institutional capacity and social milieux*, Ashgate, Aldershot, UK.
- GULBRANDSEN, Magnus (1997), *Universities and industrial competitive advantage*, in ETZKOWITZ, Henry; LEYDESDORFF, Loet (eds.), *Universities and the global knowledge economy: a triple helix of university-industry-government relations*, Pinter, London, UK.
- GUNASEKARA, Chrys (2006), *Reframing the role of universities in the development of regional innovation systems*, *Journal of Technology Transfer*, Vol. 31, p. 101-113.
- HABERMAS, Jürgen (1984), *The theory of communicative action, Vol. 1*, Polity Press, Cambridge, UK.
- HADDAD, Georges (2000), *University and society: responsibilities, contracts, partnerships*, in NEAVE, Guy (ed.), *The universities' responsibilities to society*, Pergamon, New York, USA.
- HADJIMICHALIS, Costis (1987), *Uneven development and regionalism: state, territory and class in Southern Europe*, Croom Helm, London, UK.
- HÄMÄLÄINEN, Timo (2004), *Towards a theory of social innovation and structural change*, in SCHIENSTOCK, Gerd (ed.), *Embracing the Knowledge Economy*, Edward Elgar, Cheltenham, UK, pp. 28-44.
- HAMILTON, Walton (1932), *Institution*, in SELIGMAN, Edwin; JOHNSON, Alvin (eds.), *Encyclopaedia of the social sciences*, Vol. VIII, Macmillan, New York, USA.
- HANE, Gerald (1999), *Comparing university-industry linkages in the United States and Japan*, in BRANSCOMB, Lewis; KODAMA, Fumio; FLORIDA, Richard (eds.), *Industrializing knowledge: university-industry linkages in Japan and the United States*, The MIT Press, Cambridge, USA.
- HARRINVIRTA, Markku; KEKKONEN, Sirpa (2004), *Evaluating effectiveness of the horizontal policy programmes of the Finnish government: a novelty or an attempt once again*, paper presented at the EGPA 2004 Annual Conference, Ljubljana, Slovenia.
- HARVEY, David (1998), *University, Inc.*, *The Atlantic Monthly*, Vol. 282, no. 4, pp. 112-116.
- HASHIMOTO, Takehiko (1999), *The hesitant relationship reconsidered: university-industry cooperation in postwar Japan*, in BRANSCOMB, Lewis; KODAMA, Fumio; FLORIDA, Richard (eds.), *Industrializing knowledge: university-industry linkages in Japan and the United States*, The MIT Press, Cambridge, USA.
- HASSINK, Robert; LAGENDIJK, Arnoud (2001), *The dilemmas of interregional institutional learning*, *Environment and Planning C*, Vol. 19, pp. 65-84.

- HASTAOGLOU-MARTINIDIS, Vilma (1997), *A Mediterranean city in transition: Thessaloniki between the two world wars*, Facta Universitatis, Vol. 1, no. 4, pp. 493-507.
- HEALEY, Patsy (2004), *Creativity and urban governance*, Policy Studies, Vol. 25, no. 2, pp. 87-102
- HEALEY, Patsy (2003), *Collaborative planning in perspective*, Planning Theory, 2 (2), pp. 101-123.
- HEALEY, Patsy (1998), *Building institutional capacity through collaborative approaches to urban planning*, Environment and Planning A, Vol. 30, pp. 1531-1546.
- HEALEY, Patsy (1997), *Collaborative planning: shaping places in fragmented societies*, Macmillan Press, London, UK.
- HEALEY, Patsy; CARS, Göran; MADANIPOUR, Ali; De MAGALHÃES, Cláudio (2002), *Transforming governance, institutionalist analysis and institutional capacity*, in CARS, Göran; HEALEY, Patsy; MADANIPOUR, Ali; De MAGALHÃES, Cláudio (eds.), *Urban governance, institutional capacity and social milieux*, Ashgate, Aldershot, UK.
- HEALEY, Patsy; De MAGALHÃES, Cláudio; MADANIPOUR, Ali (1999a), *Institutional capacity-building, urban planning and urban regeneration projects*, Futura, 18 (3), pp. 117-137.
- HEALEY, Patsy; De MAGALHÃES, Cláudio; MADANIPOUR, Ali; PENDLEBURY, John (1999b), *Urban governance, institutional capacity and regenerating city centres*, ESRC End-of-Grant Report, R000222616, www.esrc.ac.uk.
- HEFCE (2006), *Higher education-business and community interaction survey 2003-2004*, Higher Education Funding Council for England, London, UK.
- HEFCE (2003), *Higher education-business interaction survey 2000-2001*, Higher Education Funding Council for England, London, UK.
- HEFCW (2004), *Annual report to the Higher Education Funding Council for Wales from the Chair of the Third Mission Committee 2003/2004*, Higher Education Funding Council for Wales, Cardiff, UK.
- HEINER, Donald (1988), *Imperfect decisions and routinized production: implications for evolutionary modelling and inertial technical change*, in DOSI, Giovanni, FREEMAN, Chris, NELSON, Richard, SILVERBERG, Gerard, SOETE, Luc (eds.), *Technical change and economic theory*, Pinter, London, UK.
- HELD, David; MCGREW, Anthony; GOLDBLATT, David; PERRATON, Jonathan (1999), *Global transformations: politics, economics and culture*, Polity Press, Cambridge, UK.
- HELLENIC PARLIAMENT (2004), *The Constitution of Greece*, Hellenic Parliament, Athens, Greece.
- HENDERSON, Dylan (2000), *EU regional innovation strategies: regional experimentalism in practice?*, European Urban and Regional Studies, Vol. 7, no. 4, pp. 347-358.
- HENDERSON, Dylan; THOMAS, Meirion (1999), *Learning through strategy-making: the RTP in Wales*, in MORGAN, Kevin; NAUWELAERS, Claire (eds.), *Regional innovation strategies: the challenge for less-favoured regions*, The Stationery Office, London, UK.

- HENDERSON, Jennifer; SMITH, John (2002), *Academia, industry and the Bayh-Dole act: an implied duty to commercialize*, CIMIT- Center for Integration of Medicine and Innovative Technology, downloaded from www.chemistry.org.
- HIGHER EDUCATION WALES (2003), *Final Report*, Joint HEW-HEFCW Working Group on Third Mission, Higher Education Wales, Cardiff, UK.
- HIRSCHMAN, Albert (1958), *The strategy of economic development*, Yale University Press, New Haven, USA.
- HIRST, Paul; ZEITLIN, Jonathan (1992), *Flexible specialization versus post-fordism: theory, evidence, and policy implications*, in STORPER, Michael; SCOTT, Allen J. (eds.), *Pathways to industrialization and regional development*, Routledge, London, UK.
- HODGSON, Geoffrey (2006), *What are institutions?*, *Journal of Economic Issues*, Vol. XL, no. 1, pp. 1-25.
- HODGSON, Geoffrey (2002), *The evolution of institutions: and agenda for future theoretical research*, *Constitutional Political Economy*, no. 13, pp. 111-127.
- HODGSON, Geoffrey (1988), *Economics and institutions: a manifesto for a modern institutional economics*, Polity Press, Cambridge, UK.
- HOLLINGSWORTH, J. Rogers (2000), *Doing institutional analysis: implications for the study of innovations*, *Review of International Political Economy*, Vol. 7, no. 4, pp. 595-644.
- HONADLE, Beth Walter (1981), *A capacity-building framework: a search for concept and purpose*, *Public Administration Review*, Vol. 41, no. 5, pp. 575-580.
- HOUNSHELL, David (1996), *The evolution of industrial research in the United States*, in ROSENBLOOM, Richard; SPENCER, William (eds.), *Engines of innovation: US industrial research at the end of an era*, Harvard Business School Press, Boston, USA.
- HUDSON, Christine (2000), *The university and regional reciprocity*, CERUM working paper no. 18, Umeå University, Umeå, Sweden (downloaded from www.umu.se/cerum).
- HUDSON, Ray (2003), *Fuzzy concepts and sloppy thinking: reflections on recent developments in critical regional studies*, *Regional Studies*, Vol. 37, nos. 6-7, pp. 741-746.
- HUDSON, Ray (1999), *The learning economy, the learning firm and the learning region: a sympathetic critique of the limits to learning*, *European Urban and Regional Studies*, Vol. 6, no. 1, pp. 59-72.
- HUGGINS, Robert; COOKE, Philip (1997), *The economic impact of Cardiff University: innovation, learning and job generation*, *GeoJournal*, 41:4, pp. 325-337.
- HULL, Angela (2004), *'A Winning Wales': an integrated strategy for sustainable economic development?*, *Planning, Practice & Research*, Vol. 19, no. 3, pp. 329-343.
- INNES, Judith (1996) *Planning through consensus building*, *Journal of the American Planning Association*, Vol. 62, no. 4, pp. 460-472.
- INNES, Judith; BOOHER, David (2003), *The impact of collaborative planning on governance capacity*, Working Paper 2003-03, Institute of Urban and Regional Development, University of California, Berkeley, USA.

INNES, Judith; GRUBER, Judith; THOMPSON, Robert; NEUMAN, Michael (1994), *Co-ordinating growth and environmental management through consensus-building*, Report to the California Policy Seminar, University of California, Berkeley, USA.

IOAKIMIDIS, Panagiotis (2002), *The Europeanization of Greece: an overall assessment*, Hellenic Centre for European Studies, www.ekem.gr.

IWA (2006), *New powers, new beginning?*, Monitoring the National Assembly May-July 2006, Institute of Welsh Affairs, Cardiff, UK.

IWA (2004a), *Quango cull falters but continues*, Monitoring the National Assembly September-December 2004, Institute of Welsh Affairs, Cardiff, UK.

IWA (2004b), *Universities are failing Wales*, Press release, Institute of Welsh Affairs, Cardiff, UK.

JACOB, Merle (2000), *'Mode 2' in context: the contract researcher, the university and the knowledge society*, in JACOB, Merle; HELLSTRÖM, Tomas (eds.), *The future of knowledge production in the academy*, Open University Press, Buckingham, UK.

JENCKS, Christopher; RIESMAN, David (1968), *The academic revolution*, Doubleday, Garden City, USA

JESSOP, Bob (2001), *Institutional re(turns) and the strategic-relational approach*, *Environment and Planning A*, Vol. 33, pp. 1213-1235.

JESSOP, Bob (1994), *Post-fordism and the state*, in AMIN, Ash (ed.), *Post-Fordism, a reader*, Blackwell, Oxford, UK.

JESSOP, Bob (1992), *Tatcherism and flexibility: the white heat of a post-Fordist revolution*, in JESSOP, Bob; KASTENDIEK, Hans; NIELSEN, Klaus; PEDERSEN, Ove, (eds.), *The politics of flexibility*, Edward Elgar, Aldershot, UK.

JOHNSON, Björn (1992), *Institutional learning*, in LUNDVALL, Bengt-Åke (ed.), *National Systems of Innovation: towards a theory of innovation and interactive learning*, Pinter, London, UK.

JOHNSON, Paul (1991), *Birth of the modern*, Harper Collins, New York, USA.

JONES, Charles (1998), *Introduction to economic growth*, Norton & Company Inc., New York, USA.

JONES, Gareth (2002), *The third mission: creating a business culture for higher education in Wales*, Institute of Welsh Affairs, Cardiff, UK.

JONES-EVANS, Dylan (2002), *Research and development in Wales*, paper presented to the Economic Development Committee, Welsh Assembly Government, Cardiff, UK.

JONGBLOED, Ben (2003), *Marketisation in higher education, Clark's triangle and the essential ingredients of markets*, *Higher Education Quarterly*, Vol. 57, no. 2, pp. 110-135.

KAFKALAS, Gregoris; KOMNINOS, Nicos (1999), *The innovative-region strategy: lessons from the Central Macedonia Regional Technology Plan*, in MORGAN, Kevin; NAUWELAERS, Claire (eds.), *Regional innovation strategies: the challenge for less-favoured regions*, The Stationery Office, London, UK.

KAGHAN, William; BARNETT, Gerald (1997), *The desktop model of innovation in digital media*, in ETZKOWITZ, Henry; LEYDESDORFF, Loet (eds.), *Universities and the*

global knowledge economy: a triple helix of university-industry-government relations, Pinter, London, UK.

KAHKEE, Abdul (2002), *Assessing institutional capital building in a local Agenda 21 process in Göteborg*, Planning Theory and Practice, Vol. 3, no. 1, pp. 53-68.

KATZ, Paul (1988), *The information society: and international perspective*, Praeger, New York, USA.

KAUFMANN, Alexander; TÖDTLING, Franz (2001), *Science-industry interaction in the process of innovation: the importance of boundary-crossing between systems*, Research Policy, Vol. 30, pp. 791-804.

KAUKONEN, Erkki; NIEMINEN, Mika (1999), *Modelling the Triple Helix from a small country perspective: the case of Finland*, Journal of Technology Transfer, 24, pp. 173-183.

KAUTONEN, Mika (2006), *The regional innovation system bottom-up: a Finnish perspective*, academic dissertation, University of Tampere, Tampere, Finland.

KAUTONEN, Mika; KOSKI, Pasi; SCHIENSTOCK, Gerd (2004a), *From the national industrial heartland towards a node in the global knowledge economy: the case of Tampere region*, in SCHIENSTOCK, Gerd (ed.), *Embracing the Knowledge Economy*, Edward Elgar, Cheltenham, UK, pp. 169-195.

KAZAMIAS, Andreas; STARIDA, Assimina (1992), *Professionalisation or vocationalisation in Greek higher education*, European Journal of Education, Vol. 27, no. ½, pp. 101-109.

KEANE, Julie; ALLISON, Janelle (1999), *The intersection of the learning region and local and regional economic development: analysing the role of higher education*, Regional Studies, Vol. 33, no. 9, pp. 896-902.

KEEBLE, David; WILKINSON, Frank (1999), *Collective learning and knowledge development in the evolution of regional clusters of high technology SMEs in Europe*, Regional Studies, Vol. 33, no. 4, pp. 295-303.

KELLOGG COMMISSION (2001), *Returning to our roots*, National Association of State Universities and Land-Grant Colleges, Washington DC, USA.

KERR, Clark (2001), *The uses of the university*, 5th edition, Harvard University Press, Cambridge, USA.

KITAGAWA, Fumi (2005), *Entrepreneurial universities and the development of regional societies: a spatial view of the Europe of Knowledge*, Higher Education Management and Policy, Vol. 17, no. 3, pp. 65-89.

KLINE, Stephen; ROSENBERG, Nathan (1986), *An overview of innovation*, in LANDAU, Ralph; ROSENBERG, Nathan (eds.), *The positive sum strategy: harnessing technology for economic growth*, National Academy Press, Washington DC, USA.

KLUTH, Michael; ANDERSEN, Jørn (1997), *The globalization of European research and technology organizations (RTOs)*, in AMIN, Ash; HAUSNER, Jerzy (eds.), *Beyond market and hierarchy: interactive governance and social complexity*, Edward Elgar, Aldershot, UK.

KOMNINOS, Nicos (2002), *Intelligent cities*, Spon Press, London, UK.

- KOMNINOS, Nicos (1997), *The innovative region: the Regional Technology Plan of Central Macedonia*, Gutenberg, Athens, Greece.
- KOMNINOS, Nicos; SEFERTZI, Elena (1998), *Neo-industrialisation and peripherality: evidence from regions of Northern Greece*, *Geoforum*, Vol. 29, no. 1, pp. 37-49.
- KOSTIAINEN, Juha (2002), *Learning and the “ba” in the development network of an urban region*, *European Planning Studies*, Vol. 10, no. 5, pp. 613-631.
- KOSTIAINEN, Juha; SOTARAUTA, Markku (2003), *Great leap or long march to knowledge economy: institutions, actors and resources in the development of Tampere, Finland*, *European Planning Studies*, Vol. 11, no. 4, pp. 415-438.
- KRUGMAN, Paul (1995), *Development, geography and economic theory*, The MIT Press, Cambridge, USA.
- KRUGMAN, Paul (1991), *Geography and trade*, The MIT Press, Cambridge, USA.
- KUHN, Thomas [1963] (1970), *The structure of scientific revolutions*, 2nd edition, Oxford University Press, Oxford, UK.
- KUNZMANN, Klaus (2001), *The Ruhr in Germany: a laboratory for regional governance*, in ALBRECHTS, Louis; ALDEN, Jeremy; ROSA PIRES, Artur (eds.), *The changing institutional landscape of planning*, Ashgate, Aldershot, UK.
- KUTINLAHTI, Pirjo (2005), *Universities approaching market: intertwining scientific and entrepreneurial goals*, Espoo 2005, VTT Publications, no. 589, Helsinki, Finland.
- KWASNICKI, Witold (1996), *Knowledge, innovation and economy: an evolutionary exploration*, Edward Elgar Publishing Ltd., Cheltenham, UK.
- KWIEK, Marek (2001), *Globalization and higher education*, *Higher Education in Europe*, vol. 24, no. 1, pp. 27-38.
- KYRGIAFINI, Lina; SEFERTZI, Elena (2003), *Changing regional systems of innovation in Greece: the impact of regional innovation strategy initiatives in peripheral areas of Europe*, *European Planning Studies*, Vol. 11, no. 8, pp. 885-910.
- LAFFIN, Martin (2004), *Is regional centralism inevitable? The case of the Welsh Assembly*, *Regional Studies*, Vol. 38, no. 2, pp. 213-223.
- LAGENDIJK, Arnoud (2003), *Towards conceptual quality in regional studies: the need for subtle critique – a response to Markusen*, *Regional Studies*, Vol. 37, nos. 6-7, pp. 719-727.
- LAGENDIJK, Arnoud (1997), *Will new regionalism survive? Tracing dominant concepts in economic geography*, EUNIT Discussion Paper no. 10, Newcastle upon Tyne, UK.
- LAGENDIJK, Arnoud; CORNFORD, James (2000), *Regional institutions and knowledge – tracking new forms of regional development policy*, *Geoforum*, Vol. 31, pp. 209-218.
- LÄHTEENMÄKI-SMITH, Kaisa (2003), *Innovation through programming? The Finnish Centres of Expertise Programme as an instrument of networking and knowledge building*, paper presented at the DRUID Summer Conference, Copenhagen, June 2003.
- LÄHTEENMÄKI-SMITH, Kaisa; STEINEKE, Jon Moxnes (2003), *eTampere: building an electronic pathway to the future? Evaluation of eTampere*, Nordregio electronic paper 2003:4, Stockholm, Sweden (www.nordregio.se).

- LAM, Alice (1998), *Tacit knowledge, organisational learning and innovation: a societal perspective*, DRUID working paper no. 98-22, Aalborg University, Aalborg, Denmark.
- LAMBERT, Richard (2003), *Lambert review of business-university collaboration*, HM Treasury, London, UK.
- LAMBOOY, Jan (2005), *Innovation and knowledge: theory and regional policy*, European Planning Studies, Vol. 13, no. 8, pp. 1137-1152.
- LANDABASO, Mikel (1997), *The promotion of innovation in regional policy: proposals for a regional innovation strategy*, Entrepreneurship and Regional Development, Vol. 9, pp. 1-24.
- LANDABASO, Mikel; OUGHTON, Christine; MORGAN, Kevin (1999), *Learning regions in Europe: theory, policy and practice through the RIS experience*, Paper presented at the 3rd International Conference on Technology and Innovation Policy: Global Knowledge Partnerships. Creating Value for the 21st Century, Austin, USA.
- LANDABASO, Mikel; REID, Alasdair (1999), *Developing regional innovation strategies: the European Commission as animateur*, in MORGAN, Kevin; NAUWELAERS, Claire (eds.) (1999), *Regional innovation strategies: the challenge for less-favoured regions*, The Stationery Office, London, UK.
- LANDRY, Réjean; AMARA, Nabil; LAMARI, Moktar (2001), *Social capital, innovation and public policy*, Isuma- Canadian Journal of Policy Research, Vol. 2, nr. 1, pp 73-79.
- LARÉDO, Philippe; MUSTAR, Philippe (2004), *Public sector research: a growing role in innovation systems*, Minerva, no. 42, pp. 11-27.
- LAWTON SMITH, Helen (2004), *The biotechnology industry in Oxfordshire: enterprise and innovation*, European Planning Studies, Vol. 12, no. 7, pp. 985-1001.
- LEINONEN, Jaana; JUNTUNEN, Pekka (2004), *A few years after Finnish public administration reform: regional and municipal administration in comprehensive perspective – the current situation, critiques and discussion*, paper presented at the EGPA 2004 Annual Conference, Ljubljana, Slovenia.
- LEMOLA, Tarmo (2004), *Finnish science and technology policy*, in SCHIENSTOCK, Gerd (ed.), *Embracing the Knowledge Economy*, Edward Elgar, Cheltenham, UK.
- LEMOLA, Tarmo (2002), *Convergence of national science and technology policies: the case of Finland*, Research Policy, 31, p. 1481-1490.
- LEVIN, Richard; KLEVORICK, Alvin; NELSON, Richard; WINTER, Sydney (1987), *Appropriating the returns from industrial research and development*, Brookings Papers on Economic Activity, no. 3 (special issue), pp. 783-831.
- LEYDESDORFF, Loet (2005), *The triple helix model and the study of knowledge-based innovation systems*, International Journal of Contemporary Sociology, Vol. 42, no. 1, pp. 1-16.
- LEYDESDORFF, Loet; ETZKOWITZ, Henry (2003), *Can “the public” be considered as a fourth helix in university-industry-government relations? Report on the Fourth Triple Helix Conference, 2002*, Science and Public Policy, Vol. 30, no. 1, pp.55-61.

- LEYDESDORFF, Loet; COOKE, Philip; OLAZARAN, Mikel (2002), *Technology transfer in European regions: introduction to the special issue*, Journal of Technology Transfer, Vol. 27, pp. 5-13.
- LIPIETZ, Alain (1994), *Post-fordism and democracy*, in AMIN, Ash (ed.), *Post-Fordism, a reader*, Blackwell, Oxford, UK.
- LIST, Friedrich [1841] (1966), *The national system of political economy*, A.M. Kelley, New York, USA.
- LOVERING, John (2000), *Hoping for a honeypot*, Planet, no. 139, pp. 6-16.
- LOVERING, John (1999), *Theory led by policy? The inadequacies of the "new regionalism"*, International Journal of Urban and Regional Research, 23, pp. 379-395.
- LUHMANN, Niklas (2001), *Familiarity, confidence, trust: problems and alternatives*, in GAMBETTA, Diego (ed.) *Trust: making and breaking cooperative relations*, electronic edition, Department of Sociology, University of Oxford, pp. 94-107, <http://www.sociology.ox.ac.uk/papers/luhmann94-107.pdf>
- LUNDEVALL, Bengt-Åke (2002), *The university in the learning economy*, DRUID working paper, no. 02-06, Aalborg University, Aalborg, Denmark.
- LUNDEVALL, Bengt-Åke (2000a), *The learning economy: some implications for the knowledge base of health and education systems*, in OECD (ed.), *Knowledge management in the learning society*, Organisation for Economic Co-operation and Development, Paris, France.
- LUNDEVALL, Bengt-Åke (2000b), *Europe and the learning economy: on the need for reintegrating strategies of firms, social partners and policy makers*, background notes for presentation at the conference "Towards a Learning Society", Lisbon, May 2000.
- LUNDEVALL, Bengt-Åke (1996), *The social dimension of the learning economy*, DRUID working paper, no. 96-1, Aalborg University, Aalborg, Denmark.
- LUNDEVALL, Bengt-Åke (1992) (ed.), *National systems of innovation : towards a theory of innovation and interactive learning*, Pinter, London, UK.
- LUNDEVALL, Bengt-Åke; BORRÁS, Susana (1999), *The globalising learning economy: implications for innovation policy*, European Commission, DG Science, Research and Development, Luxembourg.
- LUNDEVALL, Bengt-Åke; JOHNSON, Björn Johnson (1994), *The learning economy*, Journal of Industry Studies, Vol. 1, no. 2, pp. 23-42.
- LUSTHAUS, Charles; ADRIEN, Marie.Hélène; PERSTINGER, Mark (1999), *Capacity development: definitions, issues and implications for planning, monitoring and evaluation*, Universalia Occasional Paper, no. 35, pp. 1-21.
- LYOTARD, Jean-François (1984), *The postmodern condition: a report on knowledge*, University of Minnesota Press, Minneapolis, USA.
- MACHLUP, Fritz (1962), *Function and distribution of knowledge in the United States*, Princeton University Press, Princeton, USA.

MacKINNON, Danny; CUMBERS, Andrew; CHAPMAN, Keith (2002), *Learning, innovation and regional development: a critical appraisal of recent debates*, Progress in Human Geography, Vol. 26, no. 3, pp. 293-311.

MacLEOD, Roy (1997), *Science and democracy: historical reflections n present discontents*, Minerva, no. 35, pp. 369-384.

MAGALHÃES, António (2004), *A identidade do ensino superior: política, conhecimento e educação numa época de transição*, Fundação Calouste Gulbenkian and Fundação para a Ciência e Tecnologia, Lisboa, Portugal.

MAILLAT, Dennis (1995), *Milieux innovateurs et nouvelles générations de politiques régionales*, in FERRÃO, João (coord.), Políticas de inovação e desenvolvimento regional e local, Instituto de Ciências Sociais da Universidade de Lisboa, Lisbon, Portugal.

MAILLAT, Denis; KEBIR, Leïla (2001), *Conditions-cadres et compétitivité des régions : une relecture*, Canadian Journal of Regional Science, Vol. 24 (1), pp. 41-56.

MAILLAT, Denis; QUÉVIT, Michel; SENN, Lanfranco (1993), *Réseaux d'innovation et milieux innovateurs*, in MAILLAT, Denis; QUÉVIT, Michel; SENN, Lanfranco (eds.), Réseaux d'innovation et milieux innovateurs : un pari pour le développement régional, GREMI/EDES, Neuchâtel, Switzerland.

MALECKI, Edward (1999), *Knowledge and regional competitiveness*, paper prepared for the International Symposium "Knowledge, Education and Space", Heidelberg, September 1999.

MALECKI, Edward (1991), *Technology and economic development*, Longman, Harlow, UK.

MANNING, Claire; COOKE, Philip (1997), *Academic entrepreneurship in Wales*, Centre for Advanced Studies in the Social Sciences, Cardiff University, Cardiff, UK.

MANSFIELD, Edwin; SCHWARTZ, Mark; WAGNER, Samuel (1981), *Imitation costs and patents: an empirical study*, Economic Journal, Vol. 91, pp. 907-918.

MANSFIELD, Edwin; RAPOPORT, John; ROMEO, Anthony; WAGNER, Samuel; BEARDSLEY, George (1977), *Social and private rates of return from industrial innovations*, Quarterly Journal of Economics, Vol. 91, pp. 221-240.

MANTZAVINOS, Chrysostomos; NORTH, Douglass; SHARIQ, Syed (2003), *Learning, institutions and economic performance*, Preprints of the Max Planck Institute for Research on Collective Goods, no. 13.

MARCH, James; OLSEN, Johan (1989), *Rediscovering institutions: the organizational basis of politics*, Free Press, New York, USA.

MARKUSEN, Ann (2003), *On conceptualization, evidence and impact: a response to Hudson, Lagendijk and Peck*, Regional Studies, Vol. 37, nos. 6/7, pp. 747-751.

MARKUSEN, Ann (1999), *Fuzzy concepts, scanty evidence, policy distance: the case for rigour and policy relevance in critical regional studies*, Regional Studies, Vol. 33, no.9, pp. 869-884).

MARSHALL, Alfred (1952), *Principles of economics*, Macmillan, London, UK.

MARSHALL, Alfred (1919), *Industry and trade*, Macmillan, London, UK.

- MARTIN, Ben; ETZKOWITZ, Henry (2000), *The origin and evolution of the university species*, VEST, nr. 3-4, Vol. 13, pp. 9-34.
- MARTINEZ-VELA, Carlos; VILJAMAA, Kimmo (2004), *Becoming high-tech: the reinvention of the mechanical engineering industry in Tampere, Finland*, paper presented at the DRUID Summer Conference, Elsinore, Denmark, June 2004.
- MARX, Karl; ENGELS, Fredrick [1848] (1969), *Manifesto of the Communist Party*, Progress Publishers, Moscow, USSR.
- MASKELL, Peter (2001), *Social capital, innovation and competitiveness*, working paper 2001-2, CEBR- Center for Economic and Business Research, Copenhagen, Denmark.
- MASKELL, Peter; LORENZEN, Mark (2004), *The cluster as market organisation*, Urban Studies, Vol. 41, nos. 5/6, pp. 991-1009.
- MASKELL, Peter; TÖRNQVIST, Gunnar (2003), *The role of universities in the learning region*, in RUTTEN, Roel; BOEKEMA, Frans; KUIJPERS, Elsa (eds.), *Economic geography of higher education: knowledge infrastructure and learning regions*, Routledge, London, UK.
- MASKELL, Peter; MALMBERG, Anders (1999), *Localised learning and industrial competitiveness*, Cambridge Journal of Economics, Vol. 23, pp. 167-185.
- MASSEY, Doreen (2004), *The responsibilities of place*, Local Economy, Vol. 19 (2), pp. 97-101.
- MASSEY, Doreen (1979), *In what sense a regional problem?*, Regional Studies, Vol. 13, pp. 233-243.
- MATHUR, Ajeet (2005), *The future of international business in the Tampere region*, in ANTTIROIKO, Ari-Veiko; KASVIO, Antti (eds.), *eCity: analysing the efforts to generate local dynamism in the City of Tampere*, Tampere University Press, Tampere, Finland.
- MATTEACCIOLI, Andrée; TABARIÉS (undated), *Historique du GREMI*, downloaded from www.unine.ch/irer/Gremi/accueil.htm.
- MAYER, Margit (1994), *Post-fordist city politics*, in AMIN, Ash (ed.), *Post-Fordism, a reader*, Blackwell, Oxford, UK.
- McDOWELL, George (2003), *Engaged universities: lessons from the Land-Grant universities and extension*, Annals AAPSS, 585, pp. 31-50.
- McKEE, Jasper (1996), *A University for the next Millennium*, Physics in Canada, Vols. 52(3), pp. 3-4.
- McKELVEY, Maureen (1997), *Using evolutionary theory to define systems of innovation*, in EDQUIST, Charles (ed.), *Systems of innovation: technologies, institutions and organizations*, Pinter, London, UK.
- McWILLIAM, Erica (2004), *Changing the academic subject*, Studies in Higher Education, Vol. 29, no. 2, pp. 151-163.
- MEDIWALES (2005), *Accessing academic expertise: Cardiff Dental School*, MediWales Newsletter, Spring 2005.

- MELODY, William (1997), *Universities and public policy*, in SMITH, Anthony; WEBSTER, Frank (eds.), *The post-modern university? Contested visions of higher education in society*, Open University Press, Buckingham, UK.
- MERTON, Robert [1942](1973), *The normative structure of science*, in STORER, Norman (ed.), *The sociology of science*, Chicago University Press, Chicago, USA.
- METCALFE, J. Stanley (1997), *Economic evolution and technology strategy*, in ANTONELLI, Gilberto; DE LISO, Nicola (eds.), *Economics of structural and technological change*, Routledge, London, UK.
- METCALFE, J. Stanley (1981), *Impulse and diffusion in the study of technical change*, *Futures*, Vol. 13, no. 5, pp. 347-359.
- MEYER-KRAHMER, Frieder; SCHMOCH, Ulrich (1998), *Science-base technologies: university-industry interaction in four fields*, *Research Policy*, Vol. 27, pp. 835-851.
- MEYER-THUROW, Georg (1982), *The industrialization of invention: a case study from the German chemical industry*, *Isis*, Vol. 73, pp. 363-381.
- MIETTINEN, Reijo (2002), *National innovation system: scientific concept or political rhetoric*, Edita, Helsinki, Finland.
- MILLIKEN, John (2004), *Postmodernism versus professionalism in higher education*, *Higher Education in Europe*, Vol. 29, no. 1, pp. 9-18.
- MINISTRY OF EDUCATION FINLAND (2005), *Universities 2004 - annual report*, Ministry of Education, Helsinki, Finland.
- MINISTRY OF EDUCATION FINLAND (2004), *Management and steering of higher education in Finland*, Ministry of Education, Helsinki, Finland.
- MNERA (2003), *National report on the implementation of the Bologna process*, Ministry of National Education and Religious Affairs, Athens, Greece
- MOK, Joshua; LO, Eric (2002), *Marketization and the changing governance in higher education: a comparative study*, *Higher Education Management and Policy*, Vol. 14, no. 1, pp. 51-81.
- MORALES, Rebecca (2000), *Towards a conceptualization of super-regional systems of innovation*, in ACS, Zoltan (ed.), *Regional innovation, knowledge and global change*, Pinter, London, UK, pp. 133-165.
- MORGAN, Bob (2002), *Higher education and regional economic development in Wales: an opportunity for demonstrating the efficacy of devolution in economic development*, *Regional Studies*, Vol. 36, no. 1, pp. 65-73.
- MORGAN, Kevin (2006a), *The challenge of polycentric planning: Cardiff as a capital city region?*, *Papers in Planning Research* 185, School of City and Regional Planning, Cardiff University.
- MORGAN, Kevin (2006b), *Devolution and development: territorial justice and the north-south divide*, *Publius: the Journal of Federalism*, Vol. 36, no. 1, pp. 189-206.
- MORGAN, Kevin (2004), *Sustainable regions: governance, innovation and scale*, *European Planning Studies*, Vol. 12 (6), pp. 871-889.

- MORGAN, Kevin (2003), *How Objective 1 arrived in Wales: the political origins of a coup*, Contemporary Wales, Vol. 15, pp. 20-29.
- MORGAN, Kevin (2001), *The exaggerated death of geography: localised learning, innovation and uneven development*, paper presented to The Future of Innovation Studies, Eindhoven Centre for Innovation Studies, Eindhoven University of Technology, September 2001.
- MORGAN, Kevin (2000), *The multilevel polity: subsidiarity in the European Union*, Report based on Wilton Park Conference WP617, "A Europe of the regions", November 2000.
- MORGAN, Kevin (1997a), *The learning region: institutions, innovation and regional renewal*, Regional Studies, 31 (5), pp. 491-503.
- MORGAN, Kevin (1997b), *The regional animateur: taking stock of the Welsh Development Agency*, Regional and Federal Studies, Vol. 7, no. 2, pp. 70-94.
- MORGAN, Kevin; HENDERSON, Dylan (2002), *Regions as laboratories: the rise of regional experimentalism in Europe*, in GERTLER, Meric; WOLFE, David (eds.), *Innovation and social learning: institutional adaptation in an era of technological change*, Palgrave-MacMillan, Basingstoke, UK, and New York, USA.
- MORGAN, Kevin; MUNGHAM, Geoff (2000), *Redesigning democracy: the making of the Welsh Assembly*, Seren, Bridgend, UK.
- MORGAN, Kevin; NAUWELAERS, Claire (1999), *A regional perspective on innovation: from theory to strategy*, in MORGAN, Kevin; NAUWELAERS, Claire (eds.), *Regional innovation strategies: the challenge for less-favoured regions*, The Stationery Office, London, UK.
- MOULAERT, Frank; AILENEI, Oana (2005), *Social economy, third sector and solidarity relations: a conceptual synthesis from history to present*, Urban Studies, Vol. 42, no. 11, pp. 2037-2053.
- MOULAERT, Frank; MARTINELLI, Flavia; SWYNGEDOUW, Eric; GONZÁLEZ, Sara (2005), *Towards alternative model(s) of local innovation*, Urban Studies, Vol. 42, no. 11, pp. 1969-1990.
- MOULAERT, Frank; SEKIA, Farid (2003), *Territorial innovation models: a critical survey*, Regional Studies, Vol. 37, no. 3, pp. 289-302.
- MOULAERT, Frank; SEKIA, Farid (1999), *Innovative region, social region? An alternative view of regional development*, communication to the European Meeting on Applied Evolutionary Economics, June 1999, Grenoble, France.
- MOWERY, David; NELSON, Richard; SAMPAT, Bhaven; ZIEDONIS, Arvids (1999), *The effects of the Bayh-Dole act on US university research and technology transfer*, in BRANSCOMB, Lewis; KODAMA, Fumio; FLORIDA, Richard (eds.), *Industrializing knowledge: university-industry linkages in Japan and the United States*, The MIT Press, Cambridge, USA.
- MOWERY, David; ROSENBERG, Nathan (1998), *Paths of innovation: technological change in 20th century America*, Cambridge University Press, Cambridge, UK.

- MOWERY, David; LANGLOIS, Richard (1996), *Spinning off and spinning on (?): the federal government role in the development of the US computer software industry*, Research Policy, Vol. 25, pp. 947-966.
- MUMFORD, Michael (2002), *Social innovation: ten cases from Benjamin Franklin*, Creativity Research Journal, Vol. 14, no. 2, pp. 253-266.
- MYTELKA, Lynn; SMITH, Keith (2001), *Innovation theory and innovation policy: bridging the gap*, paper presented to DRUID conference, Aalborg, Denmark.
- NAUWELAERS, Claire; MORGAN, Kevin (1999), *The new wave of innovation-oriented regional policies: retrospect and prospects*, in MORGAN, Kevin; NAUWELAERS, Claire (eds.), *Regional innovation strategies: the challenge for less-favoured regions*, The Stationery Office, London, UK.
- NAW (2000a), *Betterwales*, National Assembly for Wales, Cardiff, UK.
- NAW (2000b), *A Sustainable Wales: Learning to Live Differently*, National Assembly for Wales, Cardiff, UK.
- NAW (2000c), *Entrepreneurship Action Plan for Wales: the sky is the limit*, National Assembly for Wales, Cardiff, UK.
- NEALE, Walter (1987), *Institutions*, Journal of Economic Issues, Vol. 21, no. 3, pp. 1177-1206.
- NEAVE, Guy (2002), *On looking through the wrong end of the telescope*, in DE BOER, Harry; HUISMAN, Jeroen; KLEMPERER, Anne; VAN DER MEULEN, Barend; NEAVE, Guy; THEISENS, Henno; VAN DER WENDE, Marijk (eds.), *Academia in the 21st century: an analysis of trends and perspectives in higher education and research*, Adviesraad voor het Wetenschaps-en Technologiebeleid, no. 28, Enschede, The Netherlands.
- NEAVE, Guy (2000), *Universities' responsibility to society: an historical exploration of an enduring issue*, in NEAVE, Guy (ed.), *The universities' responsibilities to society*, Pergamon, New York, USA.
- NEGROPONTE, Nicholas (1995), *The digital being*, Coronet, London, UK.
- NELSON, Richard (ed.) (1993), *National systems of innovation: a comparative study*, Oxford University Press, New York, USA.
- NELSON, Richard (2002b), *Technology, institutions, and innovation systems*, Research Policy, Vol. 31, p. 265-272.
- NELSON, Richard (2002a), *Bringing institutions into evolutionary growth theory*, Journal of Evolutionary Economics, Vol. 12, pp. 17-28.
- NELSON, Richard (1995), *Recent evolutionary theorizing about economic change*, Journal of Economic Literature, 33, pp. 48-90.
- NELSON, Richard (1988), *Institutions supporting technical change in the United States*, in DOSI, Giovanni, FREEMAN, Chris, NELSON, Richard, SILVERBERG, Gerard, SOETE, Luc (eds.), *Technical change and economic theory*, Pinter, London, UK.
- NELSON, Richard (1987), *Understanding technical change as an evolutionary process*, Elsevier, Amsterdam, The Netherlands.

- NELSON, Richard (1981), *Research on productivity growth and productivity differences: dead ends and new departures*, Journal of Economic Literature, Vol. 19, pp. 1029-1064.
- NELSON, Richard (1959), *The simple economics of basic scientific research*, Journal of Political Economy, Vol. 67, pp. 297-306.
- NELSON, Richard; ROSENBERG, Nathan (1993), *Technical innovation and national systems*, in NELSON, Richard (ed.), National systems of innovation: a comparative study, Oxford University Press, Oxford, UK.
- NELSON, Richard; WINTER, Sidney (1982), *An evolutionary theory of economic change*, Harvard University Press, Cambridge, USA.
- NEWMAN, John Henry [1899](1996), *The Idea of a University*, Yale University Press, New Haven, USA.
- NIEMINEN, Mika (2004), *Academic research in change: transformation of Finnish policies and university research during the 1990s*, academic dissertation, Faculty of Social Sciences, Department of Sociology and Social Psychology, University of Tampere, Tampere, Finland.
- NIEMINEN, Mika; KAUKONEN, Erkki (2001), *Universities and R&D networking in a knowledge-based economy: a glance at Finnish developments*, SITRA Report Series no. 11, Helsinki, Finland.
- NIEMINEN, Mika; KAUKONEN, Erkki (1998), Evaluation at the Tampere University of Technology, case study report, EVALUE project, Programme TSER, European Commission, D.G. XII.
- NONAKA, Ikujiro; TOYAMA, Ryoko; NAGATA, Akiya (2000), *A firm as a knowledge-creating entity: a new perspective on the theory of the firm*, Industrial and Corporate Change, Vol. 9 (1), pp. 1- 20.
- NORTH, Douglass (1991), *Institutions*, Journal of Economic Perspectives, Vol. 5. no. 1, pp. 97-112.
- NORTH, Douglass (1990), *Institutions, institutional change, and economic performance*, Cambridge University Press, New York, USA.
- NOWOTNY, Helga; SCOTT, Peter; GIBBONS, Michael (2003), *“Mode 2” revisited: the new production of knowledge*, Minerva, no. 41, pp. 179-194.
- NSO (1998), *Digest of Welsh Historical Statistics 1974-1996*, National Statistics Office, London, UK.
- O’BRIEN, Richard (1992), *Global financial integration: the end of geography*, Pinter, London, UK.
- OECD (2004a), *Innovation in the knowledge economy: implications for education and learning*, OECD, Paris, France.
- OECD (2004b), *On the edge: securing a sustainable future for higher education*, Organisation for Economic Co-operation and Development, Paris, France.
- OECD (2002a), *Science, technology and industry outlook*, Organisation for Economic Co-operation and Development, Paris, France.

- OECD (2002b), *Benchmarking industry-science relationships*, Organisation for Economic Co-operation and Development, Paris, France.
- OECD (2001), *Cities and regions in the new learning economy*, Organisation for Economic Co-operation and Development, Paris, France.
- OECD (1999a), *University research in transition*, Organisation for Economic Co-operation and Development, Paris, France.
- OECD (1999b), *The response of higher education institutions to regional needs*, Organisation for Economic Co-operation and Development, Paris, France.
- OECD (1998a), *Industrial performance and competitiveness in an era of globalisation and technological change*, Organisation for Economic Co-operation and Development, Paris, France.
- OECD (1998b), *Public/private partnerships in science and technology*, STI Review no. 23, Organisation for Economic Co-operation and Development, Paris, France.
- OECD (1997), *Reviews of national policies for education: Greece*, Organisation for Economic Co-operation and Development, Paris, France.
- OECD (1996), *The knowledge-based economy*, Organisation for Economic Co-operation and Development, Paris, France.
- OECD (1992), *Technology and the economy: the key relationships*, TEP Programme, OECD, Paris, France.
- O’GORMAN, Colm; KAUTONEN, Mika (2004), *Policies to promote new knowledge-intensive industrial agglomerations*, Entrepreneurship & Regional Development, Vol. 16, pp. 459-479.
- OHMAE, Kenichi (1990), *The borderless world*, Harper, New York, USA.
- OKSANEN, Juha; KUTINLAHTI, Pirjo (2003), *Innovation policy governance structures of Finland*, in STEP- Centre for Innovation Research (ed.), Good practices in Nordic Innovation Policies, STEP, Oslo, Norway.
- OMAN, Charles (1996), *The policy challenges of globalisation and regionalisation*, OECD Policy Brief 11, OECD, Paris, France.
- OSMOND, John (1981), *Wales: will unemployment breed unrest or apathy?*, The Political Quarterly, Vol. 52, no. 1, pp. 127-134.
- OSTROM, Elinor (1989), *Microconstitutional change in multiconstitutional political systems*, Rationality and Society, Vol. 1, no. 1, pp. 11-49.
- OSTROM, Elinor; AHN, Toh-Kyeong (eds.) (2003), *Foundations of social capital*, Elgar, Cheltenham, UK.
- OSWALD, Andrew (2002), *A victim of vocabulary*, The Times Higher Education Supplement, 24th May 2002.
- OUGHTON, Christine; LANDABASO, Mikel; MORGAN, Kevin (2002), *The regional innovation paradox: innovation policy and industrial policy*, Journal of Technology Transfer, 27, pp. 97-110.

- PAPADIMITRIOU, Antigoni (2004), *The Greek higher education system: a short overview of Aristotle University and University of Macedonia, Thessaloniki, Greece*, paper prepared for the Association for the Study of Higher Education Meeting, Kansas City, USA.
- PARTO, Saeed (2003), *Economic activity and institutions: taking stock*, MERIT-Infonomics Research Memorandum Series 2003-007, Maastricht, The Netherlands.
- PAVITT, Keith (2004), *Changing patterns of usefulness of university research: opportunities and dangers*, in GRANDIN, Karl; WORMBS, Nina; WIDMALM, Sven (eds.), *The science-industry nexus – history, policy, implications*, Science History Publications, Sagamore Beach, USA.
- PAVITT, Keith (1998), *The social shaping of the national science base*, *Research Policy*, Vol. 27, no. 8, pp. 793-805.
- PECK, Jamie (2003), *Fuzzy old world: a response to Markusen*, *Regional Studies*, Vol. 37, nos. 6-7, pp. 729-740.
- PELIKAN, Pavel (2003), *Bringing institutions into evolutionary economics: another view with links to changes in physical and social technologies*, *Journal of Evolutionary Economics*, Vol. 13, pp. 237-258.
- PERKIN, Harold (1984), *The historical perspective*, in CLARK, Burton (ed.), *Perspectives on higher education*, University of California Press, Berkeley, USA.
- PERROUX, François (1955), *Notes sur les poles de croissance*, *Economie Appliquée*, Vol. 1, no. 2, pp. 302-320.
- PIORE, Michael (1995), *Beyond individualism*, Harvard University Press, Cambridge, USA.
- PIORE, Michael; SABEL, Charles (1984), *The second industrial divide: possibilities for prosperity*, Basic Books, New York, USA.
- POLANYI, Karl (1992), *The economy as an instituted process*, in GRANOVETTER, Mark; SWEDBERG, Richard (eds.), *The sociology of economic life*, Westview Press, New York, USA.
- POLANYI, Michael (1966), *The tacit dimension*, Anchor Day Books, New York, USA.
- PORTER, Michael (2002), *Regional Foundations of Competitiveness: Issues for Wales*, Harvard Business School, Cambridge, USA.
- PORTER, Michael (1998), *Clusters and the new economics of competition*, *Harvard Business Review*, Vol. 11, pp. 77-90.
- PORTER, Michael (1990), *The competitive advantage of nations*, The Free Press, New York, USA.
- PORTER, Roy (1996), *The scientific revolution and the universities*, in RÜEGG, Walter (ed.), *A history of the University in Europe*, Vol. II, *Universities in the Middle Ages*, Cambridge University Press, New
- PORTES, Alejandro (1998), *Social capital: its origins and applications in modern sociology*, *Annual Review of Sociology*, 24, pp. 1-24.

- HFUTA (2006), *Campaign for the public university*, unpublished document, Hellenic Federation of University Teachers' Associations.
- POWELL, Walter (1996), *Trust-based forms of governance*, in KRAMER, Roderick; TYLER, Tom (eds.), *Trust in organizations*, Sage, London, UK, pp. 51-67.
- POWELL, Walter (1990), *Neither market nor hierarchy: network forms of organization*, *Research in Organizational Behavior*, Vol. 12, p. 295-336.
- PSACHAROPOULOS, George (2003), *The social cost of an outdated law: Article 16 of the Greek Constitution*, *European Journal of Law and Economics*, Vol. 16, pp. 123-137.
- PURDUE, Derrick (2001), *Neighbourhood governance: leadership, trust and social capital*, *Urban Studies*, Vol. 38 (12), pp. 2211-2224.
- PUTNAM, Robert (1995), *Tuning in, tuning out: the strange disappearance of social capital in America*, *PS: Political Science and Politics*, XXVIII (4), pp. 664-683.
- PUTNAM, Robert (1993), *The prosperous community: social capital and public life*, *American Prospect*, 13, pp. 35-42.
- PYKE, Frank; BECATTINI, Giacomo; SENGENBERGER, Werner (eds.) (1990), *Industrial districts and inter-firm co-operation in Italy*, International Institute for Labour Studies, Geneva, Switzerland.
- PYKE, Frank; SENGENBERGER, Werner (1990), *Introduction*, in PYKE, Frank; BECATTINI, Giacomo; SENGENBERGER, Werner (eds.), *Industrial districts and inter-firm co-operation in Italy*, International Institute for Labour Studies, Geneva, Switzerland.
- QUÉVIT, Michel (1991), *Innovative environments and local/international linkages in enterprise strategy: a framework for analysis*, in CAMAGNI, Roberto (ed.), *Innovation networks: spatial perspectives*, Belhaven Press, London, UK.
- RANTANEN, Jorma (2004), *Yliopistojen ja ammattikorkeakoulujen tutkimuksen rakenneselvitys*, Ministry of Education Finland, Helsinki, Finland.
- RATTI, Remigio (1991), *Small and medium-sized enterprises, local synergies and spatial cycles of innovation*, in CAMAGNI, Roberto (ed.), *Innovation networks: spatial perspectives*, Belhaven Press, London, UK.
- RC (2002), *Strategic Plan of AUTH's Research Committee*, Aristotle University of Thessaloniki Research Committee, unpublished document.
- READINGS, Bill (1996), *The University in ruins*, Harvard University Press, Cambridge, USA.
- REINHARTSEN, C.J. (Jim) (2003), *Higher education – a factor in the founding of knowledge societies - views from partners and stakeholders: economic partners*, *Higher Education in Europe*, Vol. 28, no. 1, pp. 71-73.
- RHISIART, Martin; ROBERTS, Gareth; THOMAS, Meirion (2000), *Technology clinics*, Report produced for the EC funded project Innoregio, Observatory of Innovation and Business Development, Cardiff University, Cardiff, UK.
- RHODES, Rod (1996), *The new governance: governing without government*, *Political Studies*, Vol. 44, pp. 652-657.

RIP, Arie (2000), *Fashions, lock-ins and the heterogeneity of knowledge production*, in JACOB, Merle; HELLSTRÖM, Tomas (eds.), *The future of knowledge production in the academy*, Open University Press, Buckingham, UK.

RODRIGUES, Carlos; SANTINHA, Gonçalo; SANTOS, Raquel; CASTRO, Eduardo (2006), *The role of higher education in less favoured regions: grasping the paradox in the Portuguese region of Centro*, in VIDICKIENE, Dalia; MACIULEVIČIŪTE, Marytė, *Žinių vadyba: Europos regionų partirtis ir problemos*, Naujos Ekonomikos Institutas, Vilnius, Lithuania.

RODRIGUES, Carlos; ROSA PIRES, Artur (2006), *The Innovative Actions Programme and policy learning: lessons from a Southern European region*, paper presented at the Innovation Pressures Conference, March 2006, Tampere, Finland (www.proact2006.fi).

RODRIGUES, Carlos; ROSA PIRES, Artur; CASTRO, Eduardo (2002), *Can innovative universities build up regional institutional capacity? The case of the University of Aveiro*, in SCHUTTE, Frits; van der SIJDE, Peter (eds.), *The university and its region: examples from the European Consortium of Innovative Universities*, Twente University Press, Twente, The Netherlands.

RODRIGUES, Carlos; ROSA PIRES, Artur; CASTRO, Eduardo (2001), *Innovative universities and regional institutional capacity building: the case of Aveiro, Portugal*, *Industry & Higher Education*, Vol. 15, no. 4, pp. 251-255.

RODRIGUES, Maria João (2003) (ed.), *European policies for a knowledge economy*, Edward Elgar Publishing, Cheltenham, UK.

RODRIGUES, Maria João (2002), *Introduction: for a European strategy at the turn of the century*, in RODRIGUES, Maria João (ed.), *The new knowledge economy in Europe: a strategy for international competitiveness and social cohesion*, Edward Elgar, Cheltenham, UK.

ROMER, Paul (1990), *Endogenous technical change*, *Journal of Political Economy*, Vol. 98, no. 5, pp. S71-S102.

ROMER, Paul (1986), *Increasing returns and long-run growth*, *Journal of Political Economy*, Vol. 94, no. 5, pp. 1002-1037.

ROSA PIRES, Artur (2002), *Universidade, sociedade e mudanças institucionais*, Opening lecture academic year 2002/2003, University of Aveiro, Aveiro, Portugal.

ROSA PIRES, Artur; RODRIGUES, Carlos; CASTRO, Eduardo (2002), *Universities and innovation in regional strategic planning culture: the need for a broader analytical framework for university-industry linkages*, *Industry & Higher Education*, Vol. 16, no. 2, pp. 113-116.

ROSA PIRES, Artur; CASTRO, Eduardo (1997), *Can a strategic project for a university be strategic for regional development?*, *Science and Public Policy*, Vol. 24, no. 1, pp. 15-20.

ROSENBERG, Nathan (1982), *Inside the black box: technology and economics*, Cambridge University Press, Cambridge, UK.

ROSENBERG, Nathan; NELSON, Richard (1996), *The roles of universities in the advance of industrial technology*, in ROSENBLUM, Richard; SPENCER, William (eds.), *Engines*

of innovation: US industrial research at the end of an era, Harvard Business School Press, Boston, USA.

ROSENFELD, Stuart (1997), *Bringing business clusters into the mainstream of economic development*, European Planning Studies, Vol. 5, no. 1, pp. 3-23.

RUDY, Willis (1984), *The universities of Europe 1100-1914: a history*, Associated University Press, Cranbury, UK.

RÜEGG, Walter (1996), *Themes*, in RÜEGG, Walter (ed.), *A history of the University in Europe*, Vol. 1 Universities in the Middle Ages, Cambridge University Press, New

RUTHERFORD, Malcom (2001), *Institutional economics: then and now*, Journal of Economic Perspectives, Vol. 15, no. 3, pp. 173-194.

RUTTEN, Roel; BOEKEMA, Frans; KUIJPERS, Elsa (2003), *HEIs, regions and the knowledge-based economy*, in RUTTEN, Roel; BOEKEMA, Frans; KUIJPERS, Elsa (eds.), *Economic geography of higher education: knowledge infrastructure and learning regions*, Routledge, London, UK.

SABEL, Charles (2001), *A quiet revolution of democratic governance: towards democratic experimentalism*, in OECD (ed.), *Governance in the 21st century*, Paris, France.

SABEL, Charles (1995), *Experimental regionalism and the dilemmas of regional economic policy in Europe*, in OECD (ed.), *Local systems of small firms and job creation*, Paris, France.

SABEL, Charles, (1994a), *Flexible specialisation and the re-emergence of regional economies*, in AMIN, Ash (ed.), *Post-fordism, a reader*, Blackwell, Oxford, UK, pp. 101-156.

SABEL, Charles (1994b), *Learning by monitoring: the institutions of economic development*, in SMELSER Neil; SWEDBERG, Richard (eds.), *Handbook of economic sociology*, Princeton University Press, Princeton, USA, pp. 137-165.

SALMI, Jamil (2001), *Tertiary education in the 21st century: challenges and opportunities*, Higher Education Management, Vol. 13, no. 2, pp. 103- 130.

SANTIAGO, Rui; CARVALHO, Teresa (2004), *Effects of managerialism on the perceptions of higher education in Portugal*, Higher Education Policy, no. 17, pp. 427-444.

SAVIOTTI, Pier Paolo (1997), *Innovation systems and evolutionary theories*, in EDQUIST, Charles (ed.), *Systems of innovation: technologies, institutions and organizations*, Pinter, London, UK.

SAXENIAN, AnnaLee (1994), *Regional advantage: culture and competition in Silicon Valley and Route 128*, Harvard University Press, Cambridge, USA.

SAYER, Andrew (1992), *Method in social science*, Routledge, 2nd edition, London, UK.

SCHIENSTOCK, Gerd (2000), *The Centre of Expertise Programme*, paper prepared for the OECD Focus Group on Innovative Networks.

SCHIENSTOCK, Gerd; KAUTONEN, Mika; KOSKI, Pasi (2004), *Escaping from path dependency: the case of Tampere, Finland*, in COOKE, Philip; HEIDENREICH, Martin; BRACZYK, Hans-Joachim (eds.), *Regional innovation systems: the role of governance in a globalized world*, Routledge, 2nd edition, London, UK.

SCHIENSTOCK, Gerd; KOSKI, Pasi; RÄSÄNEN, Petri (1998), *The regionalization of the Finnish innovation system: the case of Pirkanmaa*, in BRACZYK, Hans-Joachim; COOKE, Philip; HEIDENREICH, Martin (eds.), *Regional innovation systems*, UCL Press, London, UK.

SCHUMPETER, Joseph (1939), *Business cycles: a theoretical, historical and statistical analysis of the capitalist process*, McGraw Hill, New York, USA.

SCHUMPETER, Joseph [1911] (1934), *The theory of economic development*, Harvard University Press, Cambridge, USA.

SCHUTTE, Frits; van der SIJDE, Peter (eds.) (2000), *The university and its region: examples of regional development from the European Consortium of Innovative Universities*, Twente University Press, Twente, The Netherlands.

SCOTCHMER, Suzanne (1991), *Standing on the shoulders of giants: cumulative research and the patent law*, *Journal of Economic Perspectives*, Vol. 5, no. 1, pp. 29-41.

SCOTT, Alister (2000), *The influence of social science on innovation: a significant missing element in mode2/triple helix debates?*, *VEST*, Vol. 13, no. 3-4, pp. 7- 25.

SCOTT, Allen J. (1997), *From Silicon Valley to Hollywood*, in BRACZYK, Hans-Joachim, COOKE, Philip, HEIDENREICH, Martin (eds.), *Regional Innovation Systems*, UCL Press, London, UK.

SCOTT, Allen J. (1996), *Regional motors of the global economy*, *Futures*, Vol. 28, no. 5, pp. 391-411.

SCOTT, Allen J. (1992), *The role of large producers in industrial districts: a case study of high technology homes in Southern California*, *Regional Studies*, Vol. 26, no. 3, pp. 265-275.

SCOTT, Allen J. (1988), *Flexible production systems and regional development: the rise of new industrial spaces in North America and Western Europe*, *International Journal of Urban and Regional Research*, Vol. 12, no. 2, pp. 171-186.

SCOTT, Allen J.; STORPER, Michael (2003), *Regions, globalization, development*, *Regional Studies*, Vol. 37 (6&7), pp. 579-593.

SCOTT, Allen J.; STORPER, Michael (1992), *Industrialization and regional development*, in STORPER, Michael; SCOTT, Allen J. (eds.), *Pathways to industrialization and regional development*, Routledge, London, UK.

SCOTT, Allen J.; STORPER, Michael (1986), *Industrial change and territorial organization: a summing up*, in SCOTT, Allen J.; STORPER, Michael (eds.), *Production work, territory: the geographical anatomy of industrial capitalism*, Allen and Unwin, London, UK.

SCOTT, Peter (2005), *Universities and the knowledge economy*, *Minerva*, Vol. 43, pp. 297-309.

SCOTT, Peter (2004), *The knowledge society and the production of knowledge*, *Industry & Higher Education*, Vol 18, no. 5, pp. 293-298.

SCOTT, Peter (2000a), *Science, society and the university*, in SCOTT, Peter (ed.), *Higher education re-formed*, Falmer Press, London, UK.

SCOTT, Peter (2000b), *A tale of three revolutions? Science, society and the university*, in SCOTT, Peter (ed.), *Higher education re-formed*, Falmer Press, London, UK.

SCOTT, Peter (1999), *Globalisation and the university: challenges for the twenty-first century*, Conference of European Rectors, Action 115.

SCOTT, Peter (1997), *The post-modern University?*, in SMITH, Anthony; WEBSTER, Frank (eds.), *The post-modern University? Contested visions for higher education in society*, Open University Press, Buckingham, UK.

SCOTT, Peter (1995), *The meaning of mass higher education*, Open University Press, Buckingham, UK.

SCOTT, W. Richard (1995), *Institutions and organizations*, Sage, London, UK.

SCOTT, W. Richard (1987), *The adolescence of institutional theory*, *Administrative Science Quarterly*, Vol. 32, pp. 493-511.

SEARLE, John (2005), *What is an institution?*, *Journal of Institutional Economics*, Vol. 1, no.1, pp. 1-22.

SEIDL, Peter R.; PIRRO E LONGO, Waldimir (1999), *Comments on the application of the triple helix of innovation to developing countries*, *Science and Public Policy*, Vol. 26, no. 2, pp. 137-138.

SENKER, Jacqueline (1998), *Rationale for partnerships: building national innovation systems*, in OECD (ed.), *Public/private partnerships in science and technology*, STI Review, no. 23, Organisation for Economic Co-operation and Development, Paris, France.

SEPPÄLÄ, Raimo (1998), *Hyökkäävä puolustaja: maakunnan selviytymistaistelu ja Tampereen kaupakamari 1918-1998*, Otava, Helsinki, Finland.

SHATTOCK, Michael (2003), *Managing successful universities*, Open University Press, Buckingham, UK.

SHATTOCK, Michael (1989), *Tatcherism and British higher education*, *Change*, Vol. 21, no. 5, pp. 31-39.

SHINN, Terry (2002), *The triple helix and new production of knowledge: prepackaged thinking on science and technology*, *Social Studies of Science*, Vol. 32, no. 4, pp. 599-614.

SLAUGHTER, Sheila; LESLIE, Larry (1997), *Academic capitalism: politics, policies, and the entrepreneurial university*, Johns Hopkins University Press, Baltimore, USA.

SMITH, Adam [1776] (1976), *An inquiry into the nature and causes of the wealth of nations*, Oxford University Press, Oxford, UK.

SMITH, Anthony; WEBSTER, Frank (1997), *Changing ideas of the university*, in SMITH, Anthony; WEBSTER, Frank (eds.), *The post-modern university? Contested visions of higher education in society*, Open University Press, Buckingham, UK.

SMITH, Keith (2002), *What is the "knowledge economy"? Knowledge intensity and distributed knowledge bases*, Discussion paper 2002-6, The United Nations University/Intech, Maastricht, The Netherlands.

SOBRAL, Nuno (2005), *The university-society cooperation and regional innovation strategies: policies and practices on the mobilisation for collective action*, MSc dissertation, Cardiff University, Cardiff, UK.

- SOETE, Luc (2002), *The challenges and the potential of the knowledge-based economy in a globalised world*, in RODRIGUES, Maria João (ed.), *The new knowledge economy in Europe: a strategy for international competitiveness and social cohesion*, Edward Elgar, Cheltenham, UK.
- SOLOW, Robert (1999), *Notes on social capital and economic performance*, in DASGUPTA, Partha and SERAGELDIN, Ismail (eds.), *Social capital: a multifaceted perspective*, The World Bank, Washington DC, USA.
- SOLOW, Robert (1957), *Technical change and the aggregate production function*, *Review of Economics and Statistics*, Vol. 34, pp. 312-320.
- SOLOW, Robert (1956), *A contribution to the theory of economic growth*, *Quarterly Journal of Economic*, no. 70, pp. 65-94.
- SOTARAUTA, Markku (2000), *Building knowledge-based core competencies in the flowing world: the Finnish Centre of Expertise Programme as a case in point*, paper presented in the 3rd Triple Helix International Conference, Rio de Janeiro, Brasil, April 2000.
- SOTARAUTA, Markku; KOSONEN, Kati-Jasmin (2004), *Strategic adaptation to the knowledge economy in less favoured regions: a South Ostrobothnian University network as a case in point*, in COOKE, Philip; PICCALUGA, Andrea (eds.), *Regional economies as knowledge laboratories*, Edward Elgar Publishing, Cheltenham, UK.
- SOUSA SANTOS, Boaventura (1994), *Pela mão de Alice: o social e o político na pós-modernidade*, Afrontamento, Porto, Portugal.
- SOUTH EAST WALES ECONOMIC FORUM (2005), *South East Wales development strategy*, South East Wales Economic Forum, Cardiff, UK.
- SPARROW, Norbert (2006), *Bioscience cluster takes root in Wales*, *European Medical Device Manufacturer*, January 2006.
- SPINNER, Helmut (1993), *Althoff and the changing constitutions of science: bureaucratic, economical or cognitive?*, *Journal of Economic Studies*, Vol. 20, no. 4/5, pp. 134-166.
- SPRU (2000), *Talent, not technology: publicly funded research and innovation in the United Kingdom*, Science and Technology Policy Research Unit, University of Sussex, Brighton, UK.
- STANKIEWICZ, Rikard (1986), *Academics and entrepreneurs - developing university-industry relations*, Pinter, London, UK.
- STECK, Henry (2003), *Corporatization of the university: seeking conceptual clarity*, *The Annals of the American Academy*, no. 585, pp. 66-83.
- STEHR, Nico (2002), *Knowledge and economic conduct: the social foundations of the modern economy*, University of Toronto Press, Toronto, Canada.
- STEHR, Nico (1992), *Practical knowledge: applying the social sciences*, Sage, London, UK.
- STEIER, Francis (2003), *The changing nexus: tertiary education institutions, the marketplace and the state*, *Higher Education Quarterly*, Vol. 57, no. 2, pp. 158-180.
- STIGLITZ, Joseph (2002), *Globalization and its discontents*, Penguin Books, London, UK.

STOKER, Gerry (1998), *Governance as theory: five propositions*, International Social Science Journal, Vol. 55 (155), pp. 17-28.

STORPER, Michael (1997), *The regional world*, The Guilford Press, New York, USA.

STORPER, Michael (1993), *Regional 'worlds' of production: learning and innovation in the technology districts of France, Italy and the USA*, Regional Studies, Vol. 27, no. 5, pp. 433-455.

STORPER, Michael (1992), *The limitations to globalization: technology districts and international trade*, Economic Geography, Vol. 68, no. 1, pp. 60-93.

STORPER, Michael; SCOTT, Allen J. (1989), *The geographical foundations and social regulations of flexible production complexes*, in WOLCH, Jennifer; DEAR, Michael (eds.), *The power of geography: how territory shapes social life*, Unwin Hyman, Boston, USA.

STPCF (2003), *Knowledge, innovation and internationalisation*, Sixth triennial review of the Science and Technology Policy Council of Finland, Helsinki, Finland.

STPCF (2000), *Review 2000: the challenge of knowledge and know-how*, Fifth triennial review of the Science and Technology Policy Council of Finland, Helsinki, Finland.

STPCF (1993), *Finland: knowledge and skills*, Science and Technology Policy Council of Finland, Helsinki, Finland.

SUTZ, Judith (1997), *The new role of the university in the productive sector*, in ETZKOWITZ, Henry; LEYDESDORFF, Loet (eds.), *Universities and the global knowledge economy: a triple helix of university-industry-government relations*, Pinter, London, UK.

SWANN, John Patrick (1988), *Academic scientists and the pharmaceutical industry*, Johns Hopkins University Press, Baltimore, USA.

TAYLOR, Marilyn (2000), *Communities in the lead: power, organisational capacity and social capital*, Urban Studies, Vol. 37, nos. 5-6, pp. 1019-1035.

TECHNOLOGY CENTRE HERMIA (2006), *Annual report 2005*, Technology Centre Hermia Ltd., Tampere, Finland.

TECHNOLOGY CENTRE HERMIA (2002) *Daring dreams: Tampere Technology Centre Hermia 15 years*, Technology Centre Hermia Ltd., Tampere, Finland.

TECHNOPOLIS (1998), *The evaluation of the pre-pilot actions under Article 10: innovative measures regarding Regional Technology Plans*, Evaluation Report to the European Commission, DG XVI.

TEECE, David, (1988), *Technological change and the nature of the firm*, in DOSI, Giovanni, FREEMAN, Chris, NELSON, Richard, SILVERBERG, Gerard, SOETE, Luc (eds.), *Technical change and economic theory*, Pinter, London, UK.

TEKES (2004), *TEKES annual review 2003*, TEKES – The National Technology Agency, Helsinki, Finland.

THANKI, Róisín (1999), *How do we know the value of higher education to regional development?*, Regional Studies, 33.1, pp. 84-89.

TSIOTRAS, Georgios (2005), *Structural Funds, the Greek experience: administrative skills at a regional level*, paper presented at the seminar "Promotion of regional

collaboration between Greece and the Czech Republic for the efficient use of European Structural Funds”, Athens, March 2005.

TSIPOURI, Lena (1998), *Promoting coordination at regional level: the case of Northern Greece*, in STORPER, Michael; THOMADAKIS, Stavros; TSIPOURI, Lena (eds.), *Latecomers in the global economy*, Routledge, London, UK.

TSIPOURI, Lena; PAPADAKOU, Mona (2005), *Profiling and assessing innovation governance in Greece: do increased funding and the modernisation of governance co-evolve?*, in OECD (ed.), *Governance of innovation systems, Volume 2: case studies in innovation policy*, Organisation for Economic Co-operation and Development, Paris, France.

TSIPOURI, Lena; DAOULTZI, Vicki (2003), *Country report Greece*, Enterprise Directorate-General, European Commission, Brussels, Belgium.

TUSCHHOFF, Christian (1998), *Do territories compete?*, in IMMERFALL, Stefan (ed.), *Territoriality in the globalising society*, Springer-Verlag, Berlin/Heidelberg, Germany.

URENIO (2006), *Central Macedonia monograph*, RKMNET- Réseau Européen pour la Gestion des Connaissances au Niveau Régional, Interreg IIIc.

URENIO (2004), *Strategic intelligence and cluster building*, STRATINC report, Thessaloniki, Greece.

URENIO (2002), *RIS+ Central Macedonia final report*, Report to the European Commission, DG Regio.

VAESSEN, Peter; VAN DER VELDE, Martin (2003), *University knowledge transfer through social and professional embeddedness*, in RUTTEN, Roel; BOEKEMA, Frans; KUIJPERS, Elsa (eds.), *Economic geography of higher education: knowledge infrastructure and learning regions*, Routledge, London, UK.

VAN DE VEN, Andrew; HARGRAVE, Timothy (2004), *Social, technical and institutional change: a literature review and synthesis*, in SCOTT POOLE, Marshall; VAN DE VEN, Andrew (eds.) *Handbook of organizational change and innovation*, Oxford University Press, New York, USA.

VAN DER WUSTEN, Herman (1998), *A warehouse of precious goods: the University in its urban context*, in VAN DER WUSTEN, Herman (ed.), *The urban university and its identity: roots, locations, roles*, Kluwer Academic Publishers, Dordrecht, The Netherlands.

VARGAS, Attila (2000), *Universities in local innovation systems*, in ACS, Zoltan (ed.), *Regional innovation, knowledge and global change*, Pinter, London, UK.

VICKERY, Graham; CASADIO, Claudio (1996), *The globalization of investment and trade*, in de la MOTHE, John; PAQUET, Gilles (eds.), *Evolutionary economics and the new international political economy*, Pinter, New York, USA.

YIN, Robert (1994), *Case study research: design and methods*, Sage Publications, 2nd edition, Thousand Oaks, USA.

WAG (2006a), *A science policy for Wales*, Welsh Assembly Government, Cardiff, UK.

WAG (2006b), *Appetite for life*, Welsh Assembly Government consultation document, Cardiff, UK.

WAG (2005a), *Wales: a vibrant economy – the Welsh Assembly Government’s strategic framework for economic development*, Welsh Assembly Government, consultation document, Cardiff, UK.

WAG (2005b), *Welsh Assembly Government’s Economic Development and Transport Committee’s review of Wales science policy: written information from the Welsh Development Agency*, Welsh Assembly Government, Cardiff, UK.

WAG (2005c), *Designed for life; creating world class health and social care for Wales in the 21st century*, Welsh Assembly Government, Cardiff, UK.

WAG (2004), *Knowledge economy nexus: role of higher education in Wales*, Report of WAG’s Higher Education and Economic Development Task and Finish Group, Welsh Assembly Government, Cardiff, UK.

WAG (2003a), *Digest of Welsh Statistics 2003*, Welsh Assembly Government, Cardiff, UK.

WAG (2003b), *Wales for Innovation- The Welsh Assembly Government’s Action Plan for Innovation*, Welsh Assembly Government, Cardiff, UK.

WAG (2002a), *A winning Wales: the national economic development strategy of the Welsh Assembly Government*, Welsh Assembly Government, Cardiff, UK.

WAG (2002b), *Reaching Higher – Higher Education and the Learning Country*, Welsh Assembly Government, Cardiff, UK.

WDA (1998), *Wales Regional Technology Plan: review and update*, Welsh Development Agency, Cardiff, UK.

WDA (1996), *Wales Regional Technology Plan, an innovation and technology strategy for Wales: action plan*, Welsh Development Agency, Cardiff, UK.

WELSH OFFICE (1998), *Pathway to prosperity: a new economic agenda for Wales*, Welsh Office, Cardiff, UK.

WHITFORD, Josh (2001), *The decline of a model? Challenge and response in the Italian industrial districts*, *Economy and Society*, Vol. 30, no. 1, pp. 38-65.

WILLIAMSON, Oliver (2000), *The new institutional economics: taking stock, looking ahead*, *Journal of Economic Literature*, Vol. 38, pp. 595-613.

WILLIAMSON, Oliver (1996), *The mechanisms of governance*, Oxford University Press, New York, USA.

WILSON, Patricia (1997), *Building social capital: a learning agenda for the twenty-first century*, *Urban Studies*, Vol. 34, nos. 5-6, pp. 745-760.

WILSON, Patricia (1996), *Empowerment: community economic development from the inside out*, *Urban Studies*, Vol. 33, nos 4-5, pp. 617-630.

WINTER, Sidney (1986), *Comments on Arrow and on Lucas*, *Journal of Business*, vol. 59, no. 4, pp. S427-S434.

WINTER, Sydney (1971), *Satisfying, selection, and the innovating remnant*, *Quarterly Journal of Economics*, 85 (2), pp. 237-261.

WOLFE, David (2005). *The role of universities in regional development and cluster formation*, in JONES, Glen; McCARNEY, Patricia; SKOLNICK, Michael (eds.), *Creating Knowledge, Strengthening Nations*, University of Toronto Press, Toronto, Canada..

WOLFE, David; GERTLER, Meric (2002), *Innovation and social learning: an introduction*, in GERTLER, Meric; WOLFE, David (eds.), *Innovation and social learning: institutional adaptation in an era of technological change*, Palgrave-MacMillan, Basingstoke, UK, and New York, USA.

WOOLCOCK, Michael (2001), *The place of social capital in understanding social and economic outcomes*, *Isuma- Canadian Journal of Policy Research*, Vol. 2, nr. 1, pp 11-17.

WOOLCOCK, Michael (1998), *Social capital and economic development: toward a theoretical synthesis and policy framework*, *Theory and Society*, 27, pp. 151-208.

WORLD BANK (2002), *Constructing knowledge societies: new challenges for tertiary education*, The World Bank, Washington D.C., USA.

ZIMAN, John (2003), *Non-instrumental roles of science*, *Science and Engineering Ethics*, Vol. 9, no. 1, pp. 17-27.

ZIMAN, John (2000) *Real science: what it is, and what it means*, Cambridge University Press, Cambridge, UK.

ZIMAN, John (1994), *Prometheus bound: science in a dynamic steady state*, Cambridge University Press, Cambridge, UK.

Seminar documents and conference presentations

DAVIES, Jarmila (2003), *Know-How Wales: turning opportunities into success*, Welsh Development Agency, Swansea, November 2003.

ERIKSSON, Jarl-Thure (2003), *Technology foresight and its use for political decision-making and economic development in the Tampere Region*, Tampere University of Technology, Tampere, October 2003.

HÄMÄLÄINEN, Pentti (2004), *Challenges for building up the innovative region*, Council of Tampere Region, Tampere, November 2004.

JUSSILA, Pekka (2004), *eTampere eAccelerator*, Technology Centre Hermia Ltd., Tampere, November 2004.

KAUTONEN, Mika; KOHLEMAINEN, Jari; SOTARAUTA, Markku (2004b), *Tampere-city region: towards a knowledge economy*, Newcastle.

KOKOROTSIKOS, Paris (2006), *Evolution of innovation and entrepreneurship in Thessaloniki: from research institutes to the Innovation Zone*, Euroconsultants SA, Thessaloniki, March 2006.

KOMNINOS, Nicos; MILOSIS, Dimitris; TRAMANTZAS, Costas (2003), *Technology transfer methodologies: the case of Central Macedonia region (Greece)*, URENIO, Conference on Technology Transfer and Technology Clinics, Helsinki, May 2003.

MAULA, Marjatta (2004), *Universities and industries, the web of knowledge in action: the case of Tampere Region*, conference presentation, Albacete, February 2004.

NIEMI, Olli (2004), *Tampere as a case of Information Society*, Technology Centre Hermia Ltd., Tampere, November 2004.

VITELI, Jarmo (2004), *eTampere : building a humanly sustainable knowledge society*, eTampere Office, Tampere, November 2004.

Websites

www.cardiff.ac.uk – Cardiff University

www.eurydice.org – Eurydice: the Information Network on Education in Europe

www.finnmediresearch.com – Finn-Medi Science Park

www.hefcw.ac.uk – Higher Education Funding Council Wales

www.knowhowwales.com – Know How Wales Programme

www.mec.cf.ac.uk - Manufacturing Engineering Centre, Cardiff University

www.pepkm.gr- Operational Plan Region Central Macedonia

www.pirkanmaa.fi – Pirkanmaa Regional Council

www.pkm.gr – Region of Central Macedonia

www.rcm.gr- General Secretariat Region Central Macedonia

www.stats.fi- Statistics Finland

www.tampere.fi- City of Tampere

www.tut.fi- Tampere University of Technology