Universities, the second academic revolution and regional development: a tale (solely) made of "*techvalleys*"?

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1. Introduction

The role universities play in socio-economic development is predominantly depicted with basis on the status attributed to higher education organisations (HEOs) as major *loci* of (scientific) knowledge generation and dissemination. The basic idea is that in a context where knowledge is regarded as the most important development resource and learning as the most strategic process (LUNDVALL and JOHNSON, 1994), universities emerge as crucial organizations in a so-called knowledge-driven society. As such, it is argued (e.g., ETZKOWITZ et al, 1998) that the contemporary condition of higher education is no longer compatible with the *ivory tower* organisational and behavioural related forms. In fact, responding to the pressures of a rapidly changing globalised society, universities are changing as they are increasingly engaged in processes of knowledge transfer that provide the inputs needed to foster and sustain high levels of innovation-driven competitiveness. An ongoing second academic revolution - (being the first revolution dated back to the 19th century and associated to the full integration of research into the academic mission realm) – is said to be in progress. It is identified as

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the emergence of "*the translation of research findings into intellectual property, a marketable commodity, and economic development*" (ETZKOWITZ and WEBSTER, 1998, p. 21). In this line of thought, 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 became 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.

Because technology-biased, the dominant perspective on the so called second academic revolution tends to restrict the university-society nexus to the links between academia and the world of production, i.e. to the dynamics of university-industry relationships. Accordingly, the analytical emphasis is placed on technology transfer between academic research and existing firms and the creation of new entrepreneurial ventures with basis on academic knowledge, as well as on the organizational settings that support those activities. The inspiration came from such places like the Silicon Valley and the Route 128, in the US, or Cambridge, in the UK (e.g., SAXENIAN, 1994), where the interaction between academic research and industry paved the way for well succeeded and widely praised (technology-driven) development trajectories. Moreover, the study of these cases, showing the importance of territorial determinants in the innovation process, has also contributed to setting forth a widespread analytical framework directed at the understanding of the role universities can play in regional development. Concomitantly, the expectations towards universities as regional development agents were very much shaped by the contribution academic knowledge can give to open and sustain development trajectories that attempt to replicate the experiences of the "*totemic sites*" (ARMSTRONG, 2001, p.525) referred to above, often neglecting the varying geographies of context.

This paper argues that the approaches based on technology transfer and spin-off firms' promotion, though important, are not enough to fully capture the role universities can play in territorial development processes. Drawing on the results of a case study research carried out by the author in three European universities operating in different territorial contexts (Tampere University of Technology, in Finland, Aristotle University of Thessaloniki, in Greece, and Cardiff University, in the UK). It points out that, due to the socially embedded, thus territorially-bounded, nature of innovation, and its reliance on systemic relationships among a wide range of actors and networks, the development potential associated to universities goes beyond the mere transfer of (technological)

as suggested by the field research results, universities can play a crucial role in the regional efforts to build up the social architecture upon which interactive learning and innovation develop (COOKE and MORGAN, 1998). It takes stock of planning theory, by equating this social architecture building effort to a process of institutional capacity building.

1. **Universities, academic revolutionary change and regional development: the need for an extended analytical framework**

The idea of the University is inextricably linked 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 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, acquired a revolutionary nature (ETZKOWITZ and WEBSTER, 1998).

The first academic revolution occurred when, in the first quarter of the 19th century, the generation of new knowledge through research has been integrated into 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. Accordingly, the perception of the developmental role of academia derived from the aims of democratising access to higher education and learning (SANTIAGO and CARVALHO, 2004) 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 (ETZKOWITZ et al, 1998).

This perception and inherent expectations towards academia have 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 (LUNDVALL and JOHNSON, 1994). 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.

In this context, a third academic mission has been set off, carrying tighter links between universities and users of knowledge and establishing the university as an economic actor in its own right (ETZKOWITZ, 2004). This third 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 revolutionary move arguably transforms the research university into the entrepreneurial university (CLARK, 1998), giving rise to a new type of academic institution, which, following ETZKOWITZ and WEBSTER (1998, p. 39), "*is oriented much more directly to playing a role on behalf of the state as an agency of economic development*". The subsequent argument is that the assumption of a new mission 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 (id.).

The second academic revolution, or the contemporary link between the 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 diversity of agents acting in several societal domains (EDQUIST, 1997). It is this interactive endeavour that feeds learning and thus knowledge creation and recombination (LUNDVALL & JOHNSON, 1994). 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 (COOKE and MORGAN, 1998). 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. One can argue that 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 (COOKE, 2001). 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 (MORGAN, 1997).

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 (HEALEY et al, 1999). 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 a 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, arguably, requires 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, seem to be 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 this sense, the point at issue is to look at universities as institutional capacity builders, helping their regions to accumulate and combine the knowledge and relational resources that feed the regional capacities to act collectively.

2. A methodological note

The attempt to find support to the argument in favour of the need to extend the analytical framework of the second academic revolution, as mentioned above, was based on a case study approach to three universities operating in different territorial contexts (Tampere University of Technology- TUT, in Finland, Aristotle University of Thessaloniki- AUTh, in Greece, and Cardiff University- CU, in the UK). Following 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 characteristics, be they economic, political and administrative, or in terms of innovation and development policy frameworks. A most relevant criteria for selection has been that, among those three regions, the so called less favoured ones were represented. Moreover, in order to ensure information about the influence of territorial contexts on the way universities interact with their regions and mutual benefits are yielded, a more developed region was also 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 regions.

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. Basically, political, policy making, and regional development officers, firm owners, university third mission officers and academics were interviewed.

The 25 interviews, though organised according to "*a less formal, less standardized and more interactive*" way (SAYER, 1992, p. 245), had four structuring questions: i) how are universities contributing for the development of their regions and to what extent might that contribution be considered as enclosing the participation in and enrichment of regional institutional capacity building processes, ii) how are universities organising

themselves to interact with their regions of location, iii) 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; and iv) why the role of academia in LFRs is particularly important, and *how* this role swells up the organisational challenges.

The evidence collected through interviewing was complemented by, and often compared with, an extensive 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 search for knowledge on the actual causal, structural, and substantial relations (SAYER, 1992) configuring 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. The conceptualisation of institutional capacity building borrowed heavily from the work of the well-known planning theorist Patsy Healey and colleagues (HEALEY et al, 1999). Accordingly, it has been depicted as a process resulting from the combination of a wide range of knowledge and relational resources, nourishing the capacity to mobilise the components of regional innovation systems for collective action. The research framework was made operative setting 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: i) the knowledge dimension, - range, frames of reference, knowledge integration, and openness (learning), ii) the relational dimension - range, network morphology, network integration, and power relations, and iii) the mobilising capacity dimension - opportunity structure, arenas and change agency.

The need for bringing over the contextual dimension and the assumption that a mutually influencing relationship between the regions and the universities exists implied the definition of criteria to qualify the systems of innovation in terms of their systemic potential. Accordingly, drawing from COOKE (2001), the infrastructural and superstructural levels defining the systemic potential were 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 – e.g., at the infrastructural level, the political, policy-making and financial autonomy, the availability of a regional innovation policy framework, the regional embeddedness of universities, the co-operative culture, labour relations, networking capacity, etc..

Finally, the organisational challenges faced by the universities when engaging in third mission activities were tackled by addressing the evolutionary changes occurred over time and the respective motivations, together with an assessment of the current situation. The approach did not focus exclusively 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. It has also embraced the policy environment, both internal (e.g. universities strategic third mission plans) and external (e.g. the national higher education policy) to the academic organisation and the culture and working practice traditions, as well as the extent to which regional engagement trespasses the various functions configuring the academic organisation, or, in other words, the mainstreaming of the so called third mission.

This research framework shaped the study of the three universities mentioned above, which provided the testing ground for the argument claiming that an extended perspective on the second academic revolution was needed when attempting to get a more complete understanding of the role academia plays in regional development. Accordingly, light was shed over relevant dimensions of a changing social contract between academia and society generally kept off the picture by the mainstreaming, technology-focused approaches.

4. Taking stock from the practice to go beyond the technological dimension

The search for sound answers to 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; and the influence of *territoriality*. Though organisational and contextual diversity, the research findings converge on a set of statements that, taken shortly, 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 capacity;
- academic change can be purposefully illustrated by the adoption of new or renewed organisational arrangements that endow 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 less favoured regions 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.

Accordingly, one can argue that 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.

The studied universities, in a variety of ways, provide stout evidence showing a variety of ways through which 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 the reinvention process occurred in the aftermath of the early 1990's Finnish economic and financial crisis. Initiatives such as the Cardiff University Innovation Network illustrate how universities can be of utmost relevance in enhancing

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the relational capabilities of a region, not only concerning the linkages between academia and other regional organisations, but also in improving the openness of non-university agents (e.g. firms) towards networking. The Regional Technology Plan 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

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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 make 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 change in Central Macedonia. 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 several programmes launched by the national government (e.g. the Finnish 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 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 manners 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 territorial context that, as TSIPOURI (1998) states, was 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. It is worth noticing 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*. This 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. 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 AUTh Research Committee, increasingly centralising the management of the third mission. Even in territorial contexts where collaboration between academia and society is 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. This is the case, for instance, 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 Hermia Science Park. However, as shown by the case of Central Macedonia, the presence of a physical infrastructure directed at technology development and transfer, *per se*, is not enough to ensure 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 AUTh and established its research premises in the local science and technology park that the unit has actually 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).

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 the example of TUT, smooth interceptions of teaching, research and collaborative activities are 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 academically inherent effort of pursuing international peer recognition. The evidence collected in the field contributes for dismissing a pessimistic stance, as it contradicts views holding that engagement in general and regional engagement in particular will automatically provoke the ruin of academia. It shows that the university-region nexus does not necessarily set off an *either/or* situation (e.g., 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 case 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. 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 author's research confirmed both the narrow and the wider remarks, but it allows for adding colours to the analytical palette, as it uncovers 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 overcome what MORGAN (2004) calls the gap between the power to decide and the power to transform. The leverage role of TUT in the development 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 stronger 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. 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 systematically, 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. The argument is 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 what has been characterised as a unravelling innovation system (COOKE, 2004). 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 analysis of the igniting and maintaining part played by AUTh in the process of institutional change undergoing in Central Macedonia provided evidence sustaining the argument pointing to the unique role that universities can play in laggard regions. Uniqueness relates to the work of universities as institutional capacity builders. In fact, academia can be the leading arena with the vision, ideas and power to introduce and steer positive change in typically highly inertial 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.

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 devolution in 1999, 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 less favoured regions, 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 in these lines 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 the 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.

5. Final comments

This paper gave empirical sustenance to the intricate realm of a more encompassing perspective on the second academic revolution. It has detailed the motivations and nature of academic organisational change and unveiled often hidden or neglected qualities of the university-region nexus, as well as identified the reasons why universities operating in less favoured regions can assume a particular role. It has uncovered the diversity of challenges, vicissitudes, perseverance, practicalities and outcomes of universities working in favour of their regions' development. It has 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 an acute crisis (Tampere), the transformation of a conservative, individualistic and sclerotic regional context into a promising innovation environment (Central Macedonia), and the refreshing of a waning regional innovation system (Wales).

The paper provided 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.

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.

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