
Universities and Smart Specialisation: challenges, tensions and opportunities for the innovation strategies of european regions

El artículo sugiere que los principios básicos del concepto de Especialización Inteligente representan un conjunto de retos, tensiones y oportunidades para el papel de las universidades en las estrategias de innovación regional. Todas esas potenciales cuestiones se discuten centrándose en tres aspectos de la especialización inteligente: el proceso colectivo de descubrimiento emprendedor; la creciente focalización en áreas específicas de I+D y la especialización en innovación que puede generar ventajas competitivas dentro de la economía regional; y el gran interés por las redes interregionales y la relación entre territorios de la Unión Europea que tienen diferentes especializaciones en el desarrollo y aplicación de las nuevas tecnologías. También se abordan las posibles barreras que pueden encontrar las universidades en su propósito de comprometerse con las estrategias regionales de especialización inteligente.

Artikulu honek iradokitzen duenez, espezializazio adimendunaren kontzeptuaren oinarritzko printzipioek unibertsitateek eskualdeko berrikuntza-estrategietan duten rolerako erronka-, tentsio- eta aukera-multzoa irudikatzen dute. Auzi horiek aztertzeko, espezializazio adimendunaren hiru alderdi hartu dira ardatz: aurkikuntza ekintzailearen prozesu kolektiboa; gero eta gehiago ardatzea I+Dko arlo espezifikokoan eta berrikuntzan espezializatzea, abantaila lehiakorrek sor baitituzke eskualde-ekonomiaren barruan; eta, azkenik, eskualde arteko sareekiko eta teknologia berrien garapenean eta aplikazioan espezializazio-maila ezberdina duten Europar Batasuneko lurraldeen arteko harremanarekiko interes handia. Gainera, unibertsitateek espezializazio adimendunaren eskualde-estrategiekin konprometitzerakoan topa ditzaketan oztopoak jorratu ditu.

This paper suggests that the core principles contained in the Smart Specialisation concept represent a set of challenges, tensions and opportunities for the position of universities in regional innovation strategies. These potential issues are discussed focusing on three particular elements of Smart Specialisation: the collective ‘entrepreneurial process of discovery’; the increased focus on specific areas of R&D and innovation specialisation within a regional economy that can generate distinctive competitive advantage; and the greater interest in trans-regional links and the relationship between territories in the European Union with different specialisations in the development and application of new technologies. The paper also identifies possible future barriers to the engagement of universities with regional Smart Specialisation Strategies.

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1. INTRODUCTION

Universities have long been recognised as central to national and regional innovation systems in the academic literature (for reviews see Mowery and Sampat, 2005; Uyerra, 2010). The translation of the regional innovation system concept into a European policy approach, albeit in a predominately loose discursive form (see de Bruijn and Lagendijk, 2005), has retained the prominent position given to this type of institution. This seems set to continue in the most recent iteration of research and innovation policy that has taken the concept of Smart Specialisation Strategies as a guiding principle. The documentation produced by the European Commission to accompany this new policy framework, as part of the wider Europe 2020 growth strategy, routinely refers to universities as a common part of the research infrastructure of regions. For instance, the *Guide to Research and Innovation Strategies for Smart Specialisations* states:

There is a range of mechanisms by which universities can contribute to regional innovation systems. Universities can, for instance, stimulate the entrepreneurial spirit of their staff and students, provide advice and services to SMEs, and participate in schemes promoting the training and placement of high level graduates in innovative businesses. They also host incubators for spin-offs in science and technology parks and provide valuable input to innovative clusters and networks... Furthermore, Universities and Businesses should directly cooperate in curricula design and curricula delivery to ensure that graduates have the right skills and transversal competences. By having businesses cooperating with the educational side of Universities, talent attraction and retention would be enhanced in the region.

(Foray *et al.*, 2012, p.12)

In addition, one of several thematic guides commissioned to support the Smart Specialisation Strategy platform addresses the subject of *Connecting Universities to Regional Growth* (European Commission, 2011a). The 'Knowledge for Growth' Expert Group from which the concept of Smart Specialisation emerged have also produced work dedicated to the contribution that universities can make to enhancing European innovative performance (e.g. David and Metcalfe, 2007).

However, the practical concerns of these early steps to outline the role of universities in the forthcoming period of European innovation policy means that they have largely been constrained to reflecting on existing experience of the multiple ways that universities can contribute to regional innovation (e.g. research and teaching links with industry, promoting enterprise through spin-off firms, human capital attraction and retention, etc.) and identifying best practice in using these as policy instruments. Smart Specialisation, however, represents a modification of previous approaches, and the implications of its novel elements for the fundamental role of universities in European innovation policy have yet to be explored in any detail. Notwithstanding continuities with the preceding Regional Innovation Systems paradigm, in this short conceptual article we suggest that the core principles contained in the Smart Specialisation approach represent a set of challenges, tensions and opportunities for the position of universities in regional strategies. We aim to identify and begin to discuss these issues focusing on three particular elements of Smart Specialisation: the collective 'entrepreneurial process of discovery'; the increased focus on specific areas of R&D and innovation specialisation within a regional economy that can generate distinctive competitive advantage; and the greater interest in trans-regional links and the relationship between territories in the European Union with different specialisations in the development and application of new technologies.

This paper has five further sections. Section two provides a general background to the paper by briefly describing existing lines of critique on the role of universities in regional innovation policies that resonate with some of the ideas underlying

Smart Specialisation. Section three outlines the origins and development of the Smart Specialisation concept. Section four proposes new roles and challenges for universities related to the three elements of Smart Specialisation mentioned above. Section five extends the discussion by identifying possible barriers to the engagement of universities in Smart Specialisation. Section six, the conclusion, emphasises the need for further thinking on the issues brought forward by the paper as the concept of Smart Specialisation itself develops further.

2. UNIVERSITIES AND REGIONAL INNOVATION POLICES

Although the concept of Smart Specialisation has developed out of a different context (see section 3), it has important resonances with earlier critiques of regional innovation policy approaches from the academic literature. These are best represented by the ‘one size fits all’ argument of Tödting and Trippl (2005), who observe that ‘a new policy model has emerged in the field of innovation and regional policy, often stressing the following elements: focus on high-tech, knowledge based or «creative» industries; building up of research excellence; attraction of global companies; and stimulation of spin-offs’ (p.1204). They explain that this model:

has without doubt many good and interesting elements ... [but] is often used in an undifferentiated manner for all kinds of regions. The specific strengths and weaknesses of regions in terms of their industries, knowledge institutions, innovation potential and problems are frequently not sufficiently taken into account. Furthermore, regions are often dealt with in an isolated manner, i.e. the interrelationships with other regions and with higher spatial levels (national, international) are left out of consideration.

(Tödting and Trippl, 2005, p.1204)

The authors go on to outline the different policy challenges faced by three types of regions (peripheral, old industrial, and fragmented metropolitan) with different economic development and institutional problems to show that there is not a single ideal type model that can be successfully followed by all regions.

While Tödting and Trippl’s argument is made at a general level, it is possible to read a more specific critique of the role of universities in regional innovation policies from their analysis. The ‘one size fits all’ model they refer to is based to a large degree on efforts to replicate the success of a relatively limited number of regional cases, of which Silicon Valley in northern California is probably the international archetype, and regions such as Cambridge (UK), Baden-Württemberg (Germany), and Emilia-Romagna (Italy) are amongst oft-cited European examples (Hospers, 2006). The presence of strong research universities, and associated features such as patterns of spin-off firm formation and successful science or technology parks, is often a key part of the influential growth narrative that has developed around these cases. Reinforced by

more positive academic accounts of the knowledge economy, such as the triple helix framework (Etzkowitz and Leydesdorff, 2000), this has supported the conviction that university research capabilities in areas such as medical or life sciences and mechanical engineering can be leveraged to build high-value clusters in broadly related industries, which is a frequent corollary of the 'one size fits all' model described above. The contradiction between this widespread adoption of similar sectoral foci in regional policies and the ability of a country, or even a transnational region such as Europe, to support only a limited number of leading clusters in areas such as biotechnology is central to the original Smart Specialisation argument in favour of regional differentiation and concentration of particular R&D capabilities in a smaller number of 'centres of excellence' (Foray and Van Ark, 2007).

The strategy of attempting to mobilise academic strengths for economic development may be of particular appeal in non-core regions that have local universities with some areas of research excellence, but little other R&D capacity in their public or private sectors. However, the success of a region in pursuing this science-led strategy will be dependent on the presence of other (non-university related) economic factors supporting entrepreneurship and industrial development (access to finance, supplies of human capital, supportive governance environment, etc.) that are less likely to be a feature of poorer developed regions (see David and Metcalfe, 2007). This highlights the dangers of equating 'research excellence' in universities with the ability of a regional economy to support innovation (Power and Malmberg, 2008). Taking an innovation systems perspective should exclude such remnants of linear innovation thinking from regional policies, but a broad awareness of these background issues can still usefully inform the positioning of universities in Smart Specialisation Strategies. This will be discussed below following a section briefly outlining the development of the Smart Specialisation concept.

3. SMART SPECIALISATION

'Smart specialisation' will be a key underpinning concept governing European Structural Fund investments in research and innovation in the 2014-2020 programming period. It is defined by the European Commission's Smart Specialisation Platform (hosted by the Joint Research Centre IPTS in Seville) as «a strategic approach to economic development through targeted support to Research and Innovation».

The concept was first aired by Foray and Van Ark in 2007, in a policy briefing (no. 1) prepared for the Knowledge for Growth Expert Group, an independent advisory group to the European Commissioner for Research and Innovation. While Foray and Van Ark were primarily concerned with developing strategies aimed at addressing the transatlantic gap in R&D investment, the «Barca Report» (Barca, 2009) looked at the territorial dimensions of cohesion policy, making a number of recom-

mendations for the post 2013 programme, including the need to focus on fewer priorities and better coordination of place-based policies across the Commission. This facilitated the transition of Smart Specialisation from a wholly sectoral concept to one that is also applicable to regional policy (McCann and Ortega-Argilés, 2011).

In 2009 Foray *et al.* developed their concept further in another policy briefing (no. 9). In this they introduced the notion of the ‘entrepreneurial discovery process’, a ‘bottom up’ learning process aimed at identifying areas for future specialism that build on a region’s existing assets. Rather than the ‘top down’ public authority led process for developing previous regional innovation strategies which is heavily critiqued in the emerging literature on smart specialisation, the role of public authorities in Smart Specialisation should be one of creating the right conditions for and supporting the entrepreneurial discovery process.

Europe 2020, the European Commission’s 10 year strategy for growth launched in 2010, reflects the findings of Foray, Barca and their collaborators by setting out a streamlined set of objectives focusing on ‘smart, sustainable and inclusive growth’. Innovation Union is one of the three flagship initiatives for ‘smart’ growth. Its publication in 2010 saw the adoption of ‘smart specialisation’ as a key element of a Europe wide approach to promoting innovation and growth over the next decade.

Innovation Union sets out a self assessment tools for national and regional research and innovation systems. Taking a ‘smart specialisation’ approach to innovation is one of the ten conditions for well performing places. Furthermore it is proposed ex-ante conditionality for the use of the European Regional Development Funds 2014-2020, which mean it is an approach that is likely to be adopted across Europe in the coming year.

The move to the new processes of Smart Specialisation will not be simple. The method in its purist forms proposes a new and more leading involvement of different actors in the entrepreneurial search process. It demands a level of global awareness and partnerships beyond regional boundaries. It also introduces the concepts of embeddedness and relatedness across functional economic areas. It calls for evidenced identification of competitive advantages around which inputs of regional stakeholders and resources can be concentrated. On top of this, it asks for measures to strengthen regional innovation systems in order to maximise knowledge flows and spread the benefits of innovation throughout the entire regional economy.

As already stated, universities have long been seen as important actors in regional innovation systems, and the emerging literature on smart specialisation reinforces and even amplifies this role. However there are some key underpinning principles that make smart specialisation distinctive from previous iterations of regional innovation strategy development, and it will be necessary to understand the implications of these for the actors in the process, including universities.

4. UNIVERSITIES AND SMART SPECIALISATION

This section will explore the implications of the adoption of Smart Specialisation Strategies for the position of universities in regional innovation policy. It will do this for three related elements of the Smart Specialisation approach: the collective ‘entrepreneurial process of discovery’; the increased focus on specific areas of R&D and innovation specialisation within a regional economy that can generate distinctive competitive advantage; and the greater interest in trans-regional links and the relationship between territories in the European Union with different specialisations in the development and application of new technologies.

4.1. Participation of universities in the entrepreneurial process of discovery

At the core of Smart Specialisation is the collective strategy formation process that, because it is focused on the identification of science and technology areas with distinctive market potential in the region, is referred to as an ‘entrepreneurial process of discovery’ (Foray *et al.* 2009). The intended bottom-up nature of this exercise, arising from collaboration and discussion within the region, means that it should diverge somewhat from the observed practice in urban and regional policy for aspects of common ‘mobile’ policy concepts or models to be imported from outside a territory, and only translated or reproduced within its particular local settings (see Lagendijk and Cornford, 2000; Peck and Theodore, 2010; McCann, 2011). The necessarily collective basis of this process, due to the incentive problems faced by individual investors in innovation, means that a broader range of local actors than just conventional market-based entrepreneurs are mobilised as participants. The inclusion of universities in this category stretches their role in regional innovation beyond just being a source of indigenous scientific research and development capacity for the region, and provides a potential route through which expertise and local intelligence the institution may contain in other policy-relevant knowledge domains (e.g. economics, business, regional development) can become of direct value to its region. As the EU guide *Connecting Universities to Regional Growth* states:

Universities can ... play a key role in defining a regional smart specialisation strategy by contributing to a rigorous assessment of the region’s knowledge assets, capabilities and competencies, including those embedded in the university’s own departments as well as local businesses.

(European Commission, 2011a, p.2)

While universities have come to assume the status of entrepreneurial actors themselves through their by now well established economic practices of research commercialisation and new spin-off firm formation, this role in regional strategy formation relies as much on their territorial embeddedness as local civic institutions. Gunasekara (2006) has conceptualised the contribution of universities to ter-

ritorial-based innovation in this field of regional ‘associative governance’ as taking two forms. In a ‘generative’ role:

Universities generate growth opportunities directly through knowledge capitalization activities such as spin-offs, licensing and participation on company boards. Universities analyse gaps in regional innovation environments and play a leading role in organizing networks for the development of a regional innovation strategy.

(Gunasekara, 2006, p.730)

The emphasis here on the university actively ‘analysing gaps in regional innovation environments’ perhaps corresponds to the ‘entrepreneurial discovery’ process promoted through the concept of Smart Specialisation. This should, however, also be considered alongside the alternative ‘developmental’ role, which in the accompanying empirical research, Gunasekara finds is far more prevalent amongst the Australian university case studies as a means of fostering associative regional governance. In a ‘developmental’ role:

Universities shape the development of regional institutional and social capacities. This is accomplished by fostering regional networking and institutional capacity, through staff participation on external bodies; provision of informed and unbiased information and analysis; brokering networking between national and international contacts and key regional actors.

(Gunasekara, 2006, p.730)

This developmental role may have a less direct link to a process of ‘entrepreneurial discovery’, but the regional institutional capacity building to which it refers will underpin the types of social relations and norms of collaborative trust and reciprocity upon which a successful regional Smart Specialisation Strategy is ultimately likely to be reliant. Therefore, any active ‘generative’ university role in the formation of Smart Specialisation Strategies needs to be seen in a broader context that encompasses the more supportive ‘developmental’ role of universities.

4.2. **Universities and Regional Specialisation**

The implementation of austerity programmes by governments across the European Union reinforces the principle carried by the concept of Smart Specialisation that scarce public resources and investment to support knowledge-based economic development should be concentrated in targeted priority areas where it is likely to have the greatest impact. In practical terms, this means that regions developing Smart Specialisation Strategies are required to prioritise certain indigenous R&D and innovation strengths, identified through the ‘entrepreneurial discovery’ process, in which they have potential to develop genuine and distinctive competitive advantages in the future. Hence, this shift in policy approach can be interpreted as countering ‘one size fits all’ regional innovation policies (section 2). As argued above, this

could represent a challenge to the central position of universities as leading ‘generative’ actors in regional innovation strategies. The ‘one size fits all’ tendency can be linked in-part to the aspiration shared by many regions to build clusters in new knowledge-based industries (e.g. biotechnology, renewable energies) based on broad research capabilities in local universities that may represent significant scientific excellence but are not unique to that region. Smart Specialisation implies a shift away from this kind of science-driven policy making for most regions. The greater emphasis put on the link to actual or potential industrial capabilities will involve a more selective (‘smarter’) match with research capabilities in regional universities that may not necessarily correspond with leading areas of scientific strength in these institutions.

A further related challenge is that the focus on specialisation may exist in tension with the diverse nature of scientific strengths in universities that are distributed between decentralised academic structures. In recent work we have argued that it is as a source of this diversity, in conjuncture with the ability granted by public funding to perform more basic and experimental forms of research, which should be seen as the distinctive value of universities in regional innovation systems, as this can rarely be emulated by private sector R&D that is typically more constrained by narrow short-to-medium term commercial concerns. This type of ‘slack’, we suggest, may add to the long-term adaptability of a regional economy that prevents specialisation from industrial path dependency turning into ‘lock-in’ to ageing technologies and a failure to support ongoing innovation (Goddard and Vallance, 2013).

The way that universities are integrated into Smart Specialisation policies should vary between regions depending on the strategic objectives adopted in each specific case. Beneath the overarching tenet of focusing on particular R&D and innovation strengths linked to existing economic assets, the possible content of Smart Specialisation Strategies have been defined widely enough to accommodate appropriate goals for the different types of regional economies found in the EU. For instance, the European Commission factsheet on Research and Innovation Strategies for Smart Specialisation highlights five possible pathways for regional innovation and development:

- a) rejuvenating traditional sectors through higher value-added activities and new market niches;
- b) modernising by adopting and disseminating new technologies;
- c) diversifying technologically from existing specialisations into related fields;
- d) developing new economic activities through radical technological change and breakthrough innovations; and
- e) exploiting new forms of innovation such as open and user-led innovation, social innovation and service innovation.

(European Commission, 2011b, p.4).

The third of these pathways, ‘diversifying technologically from existing specialisations into related fields’, is especially emphasised in the documentation accompanying the Smart Specialisation platform (e.g. Foray *et al.*, 2012). In recent economic geography literature the concept of ‘related variety’ has become influential as a theory of regional growth that builds on the well-established evolutionary understanding of industrial variety increasing the potential adaptability of the local economy, but argues that because ‘spillovers’ are more likely to occur between firms with complementary knowledge bases, it is variety amongst related sectors that is most conducive to innovation (Frenken *et al.* 2007; Boschma and Iammarino 2009; Asheim *et al.* 2011). In this way, related variety offers, at least in part, a reconciliation of the competing notions of specialisation and diversity as the foundation of a successful urban or regional economy (see Duranton and Puga, 2000 for a review of this debate). Although the concept of related variety has been defined in quantitative empirical work as a property of relations between populations of firms at a regional level, the idea has also been illustrated through reference to cases of well-developed clusters which contain research-intensive universities as well as overlapping industries as a crucial part of the institutional make-up:

We might think of the design-intensive clusters of north-central Italy, the related variety of semiconductors, microprocessors, computers, software, search engines, bioinformatics and biotechnology in northern California’s Silicon Valley, or the varieties of printing machinery, machine tools, automotive and electronics engineering industries in Southern Germany as exemplars of related variety. On a smaller scale, similar «platform technology» industries are found in Cambridge, Massachusetts and Cambridge, UK or Leuven, Belgium and Rehovot, Israel, each of which combines numerous strands of ICT and biotechnology with world class research institutes or universities such as Harvard, MIT, Cambridge University, KU Leuven or the Weizmann Institute at its cluster heart.

(Cooke, 2007, p.188)

Hence, the rationale for integrating universities into Smart Specialisation Strategies based on related variety is clear. This is particularly when multiple related industries are seen to develop upon the ‘platform’ of common technology areas that universities can help to build as a regional specialisation through their research and development capabilities (Cooke, 2007; Asheim *et al.* 2011). For instance, regional expertise in biotechnology, that as Feldman (2000, p.345) describes is less a distinct industry than a developing «scientific knowledge base», potentially has «economically valuable applications in such diverse industries as pharmaceuticals, medical diagnostics, agriculture, bioenvironmental remediation, and chemical processing». Although Feldman (2000) finds that different biotechnology clusters in the USA have distinctive areas of specialisation in these various industries, the potential for knowledge spillovers across them, and new industries in related areas emerging in the future, seems a promising dynamic in regional development. Indeed, in an em-

pirical contribution to the urban economics literature on diversity and specialisation mentioned above, Feldman and Audretsch (1999, p.411) «find a tendency for innovative activity in complementary industries sharing a common [academic] science-base to cluster together in geographic space». However, this type of diversification through evolutionary 'branching' from established paths (Boschma and Frenken, 2011) is only likely to be available as a policy option for regions with already existing advanced technology specialisations and clusters of knowledge-intensive industries, and possibly in old industrial regions that are able to transform a historic legacy of place-specific engineering skills and physical assets from declining to emerging sectors, such as from shipbuilding to off-shore wind renewable energy (see Fornahl *et al.* 2012; Dawley and Pike, 2012). For other regions, where the policy objective will be to upgrade basic research and technology capabilities or engender a transition towards new knowledge-based industries, different approaches may need to be adopted. In those regions that lack leading R&D capacity, the alternative forms of innovation (user-led, social, service) mentioned in the fifth pathway above may also form the basis of a specialised industrial niche. In terms of universities, this corresponds with a broader view of the potential contributions they can make to regional economies beyond new technological development, which encompasses different fields of knowledge and societal engagement (Goddard and Vallance, 2013).

4.3. External connections

One of the more interesting, but as yet little explored, features of Smart Specialisation is its explicit recognition of the importance of external connections for a region's innovation policy (European Commission, 2011b). This counters the primary focus on internal relations in territorial innovation system analyses and a consequent tendency to treat regions in isolation from others. It could also offer the potential to more effectively link innovation systems on different scales (see Fromhold-Eisebith, 2007) in a multi-level governance perspective. The rationale for this feature of Smart Specialisation is the belief noted above that, due to varying science and innovation capabilities between European regions (see Capello 2012), they will occupy different positions in spatial divisions of labour for the development and exploitation of new technologies. Foray *et al.* (2009) in particular seek to understand the relationship between regions that specialise in the invention or novel combination of technologies and those that specialise in the development (or 'co-invention') of subsequent applications through reference to the concept of General Purpose Technologies (GPTs):

[T]he characteristics of a GPT are horizontal propagation throughout the economy and complementarity between invention and application development. ... [I]nvention of a GPT extends the frontier of invention possibilities for the whole economy, while application development changes the production function of a particular sector. Application co-invention increases the size of the general

technology market and improves the economic return on invention activities relating to it. There are therefore dynamic feedback loops in accordance with which inventions give rise to the co-invention of applications, which in their turn increase the return on subsequent inventions. When things evolve favourably, a long-term dynamic develops, consisting of large-scale investments in research and innovation whose social and private marginal rates of return attain high levels. *This dynamic may be spatially distributed between regions specialised in the basic inventions and regions investing in specific application domains.*

(Foray *et al.*, 2009, p.3; emphasis in original)

Various work in economic geography over the previous decade have also emphasised trans-regional links as a challenge to dominant territorially bounded views of innovation (e.g. Allen, 2000; Bunnell and Coe, 2001; Amin and Cohendet, 2004; Bathelt *et al.* 2004). Although counter-arguments have reaffirmed the embeddedness of hard to imitate tacit knowledge in place-specific social and institutional contexts (Gertler, 2003; Morgan, 2004), the idea that forms of non-geographical 'relational proximity' based on organisational or other network ties can sustain knowledge transfer across larger scales has become established in the economic geography literature. Amongst this work, of particular relevance here is Oinas and Malecki's (1999; 2002) argument that technologies do not develop fully in a single place, but in wider geographic configurations of interlinked territorial (national and regional) and sectoral innovation systems that they call 'Spatial Innovation Systems'. This trans-regionality is not just a result of collaborative network links and knowledge flows between organisations or individuals in different nations and regions, but of the highly complex evolution of technology paths in time and space which means that, because of the kind of spatial divisions of functions highlighted by Foray *et al.* (2009), different components of the same technology can be developed in multiple places simultaneously (Oinas and Malecki, 2002).

While these debates have not included direct discussion of universities, their agency in these processes should be self-evident because, notwithstanding their institutional role in the territorial governance and innovation systems of their regions (section 4.1), the work of their academic researchers is organised to a large degree by systems and practices that operate on an international scale, such as collaborative networks and teams, conferences, peer review journals and publishers, job markets, visiting fellowships, and in some cases research funding. Indeed, the European Commission itself promotes this principle in its science policy through the common European Research Area (European Commission, 2007), and schemes to encourage international academic mobility such as Marie Curie Fellowships (Ackers, 2005; Morano-Foadi, 2005). These systems of academic knowledge exchange mean that universities will likely contribute to technological development across national and regional boundaries regardless of economic development focused innovation policies. The question is whether regional Smart Specialisation Strategies should attempt to (and whether the mechanisms are available for them to) encourage these links in

a more coordinated way by using universities as a policy instrument to make external connections and access new sources of knowledge that relate to and can strengthen their areas of local industrial or technological specialisation (see Benneworth and Hospers (2007) for an empirical description of a similar process in Twente, the Netherlands). This could also possibly be a route for the value contained in academic research capabilities that do not match the specialisation of their regional economies to still be capitalised on, if effective incentives and mechanisms can be developed for universities to leverage this knowledge to support innovation in other regions with the corresponding industrial strengths.

5. BARRIERS TO ENGAGEMENT OF UNIVERSITIES IN SMART SPECIALISATION

The OECD reviews of higher education institutions and regional development have revealed a number of barriers to regional engagement (OECD, 2007; Goddard and Puukka, 2008). These reviews and much of the academic and policy literature on the engagement of universities with regions has considered their contribution to innovation in a generic sense and not in terms of the targeted approach that is central to the smart specialisation. In this section of the paper we address these barriers to regional engagement through a smart specialisation lens. We do this under four inter-related headings where there are underlying tensions between regional and academic drivers.

First, the involvement (or otherwise) of universities in regional governance and policy making that is required to inform strategic choice. Second, a possible mismatch between the current academic profile of universities in a region – the knowledge domains within which teaching and research is undertaken – and the specific industrial and locational assets of the region which are the focus of smart specialisation. Third, the synergy (or lack of it) between globally defined academic excellence and spatially blind higher education and research policies and geographically bounded regional needs/opportunities. Finally, and underpinning each of the preceding headings are questions about the nature of the university as a ‘loosely coupled’ institution which has often been ‘black boxed’ in much of the regional development literature and related regional policy and practice. (For a notable exception see the excellent review by Pinheiro *et al.* 2012a).

5.1. Universities and regional governance

The EU *Guide to Research and Innovation Strategies for Smart Specialisation* attaches great importance to governance so as to ensure widespread participation and ownership of the strategy (Foray *et al.*, 2012). It highlights the range of stakeholders that need to be involved – enterprises, investors, public authorities, representatives

of civil society, and international experts as well as universities. It argues that such a wide range of organisations have to participate in the entrepreneurial discovery process to ensure that the regional innovation system is not considered in isolation and that public investment in R&D is in tune with regional needs and capacity and is not captured by vested interests either on the knowledge supply or demand sides. The related EU Guide *Connecting Universities to Regional Growth* seeks to ensure that universities are not excluded from (or chose not to engage with) the shaping of regional innovation strategies (European Commission, 2011a).

Such exclusion or non-engagement can arise for a number of reasons. From the perspective of local and regional authorities in many member states, higher education is not within their domain of responsibility and as a result they have little understanding of its drivers or leverage over it in terms of achieving regional outcomes (as distinct from supporting knowledge generating activities of a local anchor institution otherwise poorly linked to regional needs). From the perspective of the research intensive university the region is unlikely to be a statutory entity to which it is accountable and regional outcomes such as job generation or enhanced business competitiveness are not a core performance indicator. Moreover, if the region's businesses have limited demand or absorption capacity for new knowledge due to an underinvestment in R&D, supplying new knowledge may not be a smart strategy. And linking this barrier to the previous discussion of academic profiles, can a university be objective in assessing regional competitive advantages that do not correspond to its own scientific strengths?

5.2. Matching the academic profile of universities and regional smart specialisation priorities

In most European higher education systems the areas of research and teaching specialisation undertaken in leading universities have evolved over a long period of time and with very little regard to regional needs or opportunities. These institutional profiles are remarkably stable. As Pinheiro *et al.* note:

Universities are deeply embedded in *national* systems which have emerged over a long period and which demonstrate remarkable stability [D]espite drastic changes in (German) higher education policy discourse, there was little «real change» within universities, the result of path-dependence within universities' structures, practices and identities.

(Pinheiro *et al.* 2012a, p.15, *our emphasis*)

Growing support across Europe for greater institutional autonomy from the state is enabling universities to defend these profiles, including resisting any attempt to steer a university towards shifting its profile in a direction that might overtly underpin current regional specialisation. Indeed such steerage may be undesirable since as we have already argued an excellent and diverse research (and teaching)

base not specifically related to the current regional business and labour market needs has the *potential* to contribute to the long term adaptability of a regional economy by providing some 'slack' capacity in the regional innovation system 'at a distance' from the market and distinct from current human capital needs. It is for this reason that regional authorities have often invested in specialist institutions like technology and innovation centres outside of universities. Although these may be designed to act as bridge between a region's established industrial base and universities this does not always happen in practice, not least because of differences in the underlying business drivers of such centres and universities (Goddard *et al.*, 2012a). However such institutions generally do not undertake teaching and this does raise the question of bridging in relation to enhancing the human capital needed to underpin smart specialisation.

Alongside the long established universities in many member states are newer universities established with a clear regional mission and strong links to local businesses. These often lack the research capacity to generate new knowledge to underpin a high technology strategy but nevertheless are able to play a key role in supporting the diffusion of general purpose technologies especially in to traditional industries in cohesion regions, an approach which may be the most smart way ahead for some of these regions. Such largely teaching institutions can more directly contribute to skills development in smart specialisation niches and promote social innovation based on expertise in the creative arts, humanities and social sciences as distinct from the laboratory sciences found in the traditional universities; they can also provide a bridge to knowledge generated elsewhere. Indeed those in newer universities and the arts, humanities and social sciences are more likely to look to the region for research impacts than those in older universities and the natural, applied or formal sciences (Goddard and Vallance, 2013).

5.3. Global excellence and regional needs/opportunities

The third tensioned area is that between borderless academic excellence as defined by international peer review and reflected in institutional league tables and generating and applying knowledge to meet specific regional specialisation opportunities. At a European Union level these tensions are deeply embedded in the different procedures adopted for the *award* through open competition of Framework Programme research grants to *individual* teams with the expectation of peer reviewed academic *outputs*. This has resulted in a concentration of research funds in the most prosperous regions where the strongest universities in terms of excellent research can be found. This approach contrasts with the *allocation* of European Structural Funds to universities in cohesion regions as *institutions* with the expected *outcome* of enhanced regional growth. To what extent can a future smart specialisation perspective achieve a synergy between these two approaches as advocated by

European Commission's Synergy Group and contribute to inter-regional convergence? (European Commission, 2011c).

Horizon 2020 which supersedes the Framework Programmes places particular emphasis on research to meet societal challenges, for example sustainable development. Sustainable development is both a global and local challenge. Different regions have different natural assets and productive capacities and can act as 'living labs' for university researchers, businesses, public authorities and civil society to evaluate new approaches to reducing the carbon footprint of an area and adaptation to climate change. We have noted elsewhere that some universities are adopting a societal or grand challenge approach across the whole institution as a way of organising some of their research and teaching activities and that those academics who orientate research impacts towards such multi-disciplinary challenges are more likely to use a wider range of mechanisms for engaging with those outside the academy than those undertaking 'normal' disciplinary based science (Goddard *et al.*, 2012b; Goddard and Vallance, 2013). Although such endeavours are not necessarily regionally bounded they nevertheless meet an essential requirement of the smart specialisation approach, namely to link high level science objectives and regional needs and opportunities (i.e. connecting top-down and bottom-up approaches) through user inspired basic research.

5.4. The university as an institutional actor in smart specialisation

In making a distinction in the preceding sections between academic teams and their host institution we are highlighting one of the principle challenges regional policy makers have in linking universities to smart specialisation, namely 'the university' as a 'loosely coupled' organisation. Research intensive universities are characteristically composed of relatively independent academic units with only limited co-ordination mechanism between their activities such that responding to external demands and opportunities, including those originating from the region, is easier at the academic unit level rather than the entire university. Set against this as Pinheiro *et al.* (2012b, p.4) argue: «Regional development perspectives assume all too easily that universities are simple organisations, with hierarchical decision-making and interest-representation structures, overlooking entirely universities' organizational complexity».

However the same authors go on to suggest this can be strength of the university: «the very idea of a university rests on its capacity to balance competing tensions and hold together diverse constituencies in ways that help to address multiple goals» (Pinheiro *et al.*, 2012a, p.11). Furthermore they suggest that «loose coupling is advantageous for organizations in complex and turbulent environments, since semi-autonomous units are more capable of responding to emerging external demands, as compared to more centralized or tightly coupled systems» (p.16). While such

characteristics may make it possible for individual academic units to engage in the entrepreneurial discovery process it could remain a challenge for regional policy-makers who need to mobilise an institutional response across disciplines and to contribute to framework conditions such as human capital development and social cohesion. So for universities to play an active role in shaping and implementing smart specialisation strategies they may need to adopt 'loose-tight' structures.

6. CONCLUSION

Smart Specialisation is still at an early stage of its development as a both a theoretical concept and a policy framework. Whilst universities seem destined to have a prominent role to play in regional Smart Specialisation Strategies, the precise nature of this role (and how it differs from previous periods of European innovation policy) will only become clear as the concept itself develops further and is put into practice in different territorial contexts. This paper has concentrated on identifying a number of potential challenges, tensions and opportunities that may be faced by the various actors that will be involved in this process – for instance, the architects of the Smart Specialisation framework, the public authorities that will be responsible for implementing the approach in the innovation policy of their region, and the university managers and academics concerned with ensuring their institution is represented in the strategy.

In identifying these issues and barriers we have concentrated on three broad elements emphasised by the Smart Specialisation approach that may be a useful focus for future research: the 'entrepreneurial discovery process' and the role of universities in regional governance; the selection of regional smart specialisation priorities and their match to scientific research strengths in universities; the need for inter-connections between the strategies of different regions and the relationship of this to the 'global' nature of leading academic research practice. This final element could in particular be a fruitful area of enquiry. The differences in science and technology capabilities that underpin the need for external connections between regions, in an evolving spatial division of labour for the invention and application of new technologies, will require the development of different strategic objectives between regions, and in turn, different orders of contribution to regional innovation by universities in different contexts.

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