State of the Art Review of Smart Specialisation in Europe

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This review presents a description and analysis of literature regarding Smart Specialisation (S3) in Europe, as well as making observations about its application in other parts of the world, including Australia. It is one of the 'foundation' documents prepared to inform the commencement of the S3 process in Gippsland, Victoria.

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Executive Summary

- Providing an overview of the 'state of the art' in S3 and associated strategy and policy formulation is a challenging task, partly because of its scale and partly because it is so dynamic. There are over 160 regions that have prepared S3 strategies, and there are new dimensions in the policy and process emerging on an ongoing basis.
- S3 offers a much more comprehensive perspective on innovation than the more typical focus on firms, clusters and linkages with Research and Development (R&D) centres. The process seeks to connect place-based innovation with the evolving pattern of transnational economic activity.
  - The EU has made available a range of resources to assist regions in their development of a Regional Innovation Smart Specialisation (RIS3) Strategy. First and foremost, is the 'Guide' which sets out an introductory yet comprehensive account of the six key steps at the heart of the process.
  - These processes reflect the view that innovation eco-systems consist of a core set of building blocks and that there needs to be a connector to bring all the interdependent actors together; collaboration needs to be orchestrated and facilitated.
  - The capacity to make a significant contribution in diverse regions is consequently influenced by the social and political context, as well as the underlying commitment to, and capacity for collaboration.
  - Within the European literature there has been some criticism of underemphasising firms as the primary sites of knowledge development and innovation. Instead, a more firm-based, multi-layered perspective on knowledge production and diffusion is suggested.
  - Following this logic, specialised knowledge bases and organizational structures and modes of operation of firms in a region constitute the core of innovation systems, not university research, technology transfer schemes or individual (academic) entrepreneurs operating in isolation.
  - The importance of context is illustrated further in some of the new applications of S3 that are being implemented by the European Commission and the S3 Platform.
  - The importance of networks and linkages, and their weaknesses in the Australian context suggests that an integrated, systemic approach to innovation system development, such as S3, is strongly relevant to regions seeking to accelerate the re-engineering of their economies.
  - As part of the 'bottom-up' process of policy formulation, specific concerns regarding administrative and workforce capability, the distribution of R&D resources, infrastructure and previous experience with enabling technologies are all likely to arise. In addition, the importance of sensitivity to multilevel governance is another key learning emanating from the EU case studies.

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Introduction

As the world struggles to recover from the global financial crisis, there is intense interest in innovation which, it is assumed, will drive stronger economic growth, thus also increasing employment opportunities. In Europe, 'smart specialisation' (referred to within the discussion as S3) has become the principal focus of efforts to promote place-based innovation.

The rhetoric around S3 and its role in innovation has its origins in the European Commission's Directorate General for Research, and their concern to strengthen investment in research and innovation. Through collaboration with the Organisation for Economic Cooperation and Development (OECD) and academic scholars, the new policy framework focuses on processes, within regions, for increasing research and development activity, reducing fragmented initiatives, and promoting the ongoing development and robustness of regional innovation systems. This in turn is seen as a key EU investment in promoting economic growth and jobs.

Providing an overview of the 'state of the art' in S3 and associated strategy and policy formulation is a challenging task, partly because of its scale and partly because it is so dynamic. There are over 160 regions that have prepared S3 strategies, and there are new dimensions in the policy and process emerging on an ongoing basis. However, this deliverable provides: an overview of the innovation context, the policy framework and its importance in promoting regional innovation systems; some case studies of particular regions' experiences; an indication of the ways in which experimentation is part of the S3 culture; a brief review of some new policy developments; and some discussion of how S3 adds value to regional development in Australia.

Innovation in the Emerging Global Economy

S3 offers a much more comprehensive perspective on innovation than the more typical focus on firms, clusters and linkages with Research and Development (R&D) centres. The process seeks to connect place-based innovation with the evolving pattern of transnational economic activity. The sometimes radical, contemporary restructuring of global value chains carries

threats but also new opportunities for companies and regions which have seen themselves previously as being dependant on a sector, or specific phase in the value chain.

Relatively linear phases of production and distribution are now much more flexible so that activities integral to a production process (design, or component production, for example) can be applied to the production of other kinds of goods and services. Production processes have become more dispersed internationally because companies relocate activities through a network of their affiliates and independent suppliers. They do this to maximise efficiencies, either horizontally or vertically, in the links between various production activities and markets (see OECD 2013).

Global trends which create this dispersion and fluidity make "control" over the innovation process increasingly unproductive and impossible so that a far more open and connected approach to innovation has emerged, based on co-operation, complementarity and sharing of knowledge and resources. The principles underpinning this approach are that: learning and knowledge rest in the productive diversity of opinion; that learning is a process of connecting specialised nodes or information sources; that the capacity to know more is more critical than relying on what is currently known; that nurturing and maintaining connections is needed to facilitate continuous learning; that consequently the ability to see connections between fields, ideas and concepts becomes a core skill; and that currency (accurate, up to date knowledge) is at the core of all connected learning activities (Fratinni, 2017). In this evolved conceptualisation of innovation, the classic "know-how" increasingly is being replaced by "know-where".

To a large extent, systemic approaches to innovation, are designed to address system failures (Laranja et al., 2008). They draw upon academic theories or concepts to inform policy design, implementation and evaluation. However, they have increasingly gone beyond diagnosing failure, toward the understanding that innovation processes are social learning processes that take place in a context of networks and institutions, and which can pro-actively influence the innovation capacity of firms, regions and nations. This implies that public intervention is legitimate and needed not only if the complex interactions that take place among the different organisations and institutions involved in innovation do not function effectively, but

basically to promote a dynamic, innovation-based competitiveness trajectory or what is often referred to as 'high road strategy' of competition (Coenen, 2016). As an example of public policy which recognizes these developments, S3 is applied to regions at both ends of the spectrum, from failure to relative effectiveness of the innovation system, with a focus upon differentiation of policy according to a region's distinct characteristics.

Various authors (Klein Woolthuis et al., 2005; Smith, 1998; Weber and Rohracher, 2012) have identified a number of structural issues, which inform and shape system-oriented public policy support for innovation:

- Capabilities' failure: The lack of appropriate competencies and resources at the firm and organisational level may limit and/or prevent the generation of, access to and exploitation of knowledge.
- Infrastructural failure: Lack of physical and knowledge infrastructures due to large scale, long time horizon of operation and ultimately too low return on investment for private investors.
- Hard institutional failure: Absence, excess or shortcomings of formal institutions such as laws, regulations and standards (in particular with regard to IPR and investment).
- Soft institutional failure: Lack of informal institutions such as social norms and values, culture, entrepreneurial spirit, trust and risk-taking that impede collaboration for innovation.
- Strong network failures: Intensive cooperation in closely tied networks leads to myopia and lack of infusion of new ideas.
- Weak network failures: Too limited interaction and knowledge exchange with other actors inhibits exploitation of complementary sources of knowledge and processes of interactive learning (see Coenen, 2016).

Given the increased potential of regions to pursue opportunities in emerging global value chains, the critical issue for regions wanting to improve their competitiveness is how to develop the policy intelligence necessary for identifying domains of present or future competitive advantage. This involves addressing these structural issues to varying degrees and as required by the regional context. The S3 process brings together the experience and

insights gained from more than two decades of the implementation of regional innovation systems in Europe regarding approaches to addressing these issues. In this respect, S3 is not so much new, but rather a comprehensive policy framework and process for enabling regional authorities to adapt that learning to maximise the impact of their decisions about R&D and other diverse forms of investment in emerging niches.

The importance of regions and regional innovation systems

The EU approach of developing and applying the S3 process to regions is one of its significant features. This approach is adopted by many other strategic frameworks relevant to innovation system development and reflects the presence in regional contexts of some of the elements which create the foundation for system change. Coenen and Moodysson observe that:

> It is important not to interpret a regional system as a national system writ small. Even though the definition of a regional innovation system certainly resembles that of a national innovation system, i.e. the specific national interplay between the prevailing economic structure and the institutional set-up (Lundvall & Maskell, 2000, p. 362).

The central role of personal relations and networks in shaping and driving economic action and outcomes ingrained in a social and cultural context through social integration (Granovetter, 1985) means that regions are key scales for analysis and action. They provide the potential for a more grounded approach to empirical analysis of innovation systems, acknowledging the role of embeddedness of actors within their specific contexts (Coenen and Moodysson, 2008). This does not conflict with recognition of the significance of the national environment for innovation nor does it downplay the importance of extra-local knowledge.

S3 processes

The EU has made available a range of resources to assist regions in their development of a Regional Innovation Smart Specialisation (RIS3) Strategy. First and foremost, is the 'Guide' which sets out an introductory yet comprehensive account of the six key steps at the heart of the process. These six steps encompass:

- analysis of the regional context and potential for innovation (including an assessment of technological infrastructures, local, inter-regional and global linkages, the entrepreneurial environment, and potential for collaboration across the business and wider community);
- development of appropriate governance arrangements to provide 'collaborative leadership', encompassing all types of stakeholders, including industry, government, education and research, community and workers – representing both the market and civil society;
- development and communication of a long-term vision of the regional economy, society and environment that can be shared by all stakeholders;
- through a process of 'entrepreneurial discovery', setting priorities for investment in a limited number of innovative research areas and technologies, including social and organisational innovation. Insights obtained through the foundational regional analysis and ongoing information and intelligence gathering, about where the region could generate niche opportunities underlie this prioritisation processes;
- development of a road map and action plan for implementation, exploring collaboration with other regions, and encouraging some experimentation through pilot projects and evaluation before more substantial investment is made; and
- mechanisms for formative, developmental and summative monitoring and evaluation need to be embedded from the outset, allowing for ongoing adaptation and refinement of the Strategy (see Foray et al, 2012, 18-25).

These processes reflect the view that innovation eco-systems consist of a core set of building blocks (Van Agtmael & Bakker, 2016) and that there needs to be a connector to bring all the interdependent actors together; collaboration needs to be orchestrated and facilitated. In addition, the production of new ideas and their implementation requires a diverse but complementary set of actors to maximize the fruits of collaboration, given that no actor or small set of actors, such as those from one sector, have a comprehensive view or vision for the region. Within this milieu a focus on a certain set of *disciplines or activities*, rather than industries, facilitates avoidance of path-dependence and the adoption of approaches to learning and development based on extant perspectives (Foray et al, 2012). It is not enough

to simply bring these groups together, they need to collectively be focussed around a certain *theme*, such as enabling technologies, or specific functionalities. The importance of providing, through prioritisation, a focus for investment highlights the observation that no innovation eco-system can exist without a further vital building block. Unless there is a fertile and rich environment, the system will either remain struggling or will collapse.

As a public policy intervention to promote these processes, S3 strategy formulation is an engaged planning process that builds upon and reflects this growing understanding of the circumstances, conditions and assets that are required support creative thinking and idea development, and transformation based upon this new knowledge. The key to this process is 'entrepreneurial discovery', the mobilisation of key stakeholders within a region in a 'bottom up' process (see Kyriakou et al, 2017).

Within Europe, the EU facilitates another layer of regional innovation by encouraging and supporting cross-regional interchange, particularly where regions have similar knowledge assets, to strengthen competitive advantage through collaboration rather than competition. Through its activities, a large network of regions and individuals committed to the successful evolution and implementation of S3 has formed to promote mutual learning http://s3platform.jrc.ec.europa.eu/activities. The emphasis upon collaboration and ensuring that S3 processes build upon, rather than displace, other policy and initiatives is evident from the effort to build 'horizontal' linkages (those which influence and support a wide range of initiatives across sectors) with other EU initiatives, such as Horizon 2020, the work on digital Europe, key enabling technologies, creative industries, green growth, social innovation, regional research infrastructures and science parks. This integrative approach is another important characteristic of the smart specialisation approach to regional development, and necessary for its successful adoption internationally.

The contribution of S3 as a regional innovation policy framework

Given the comprehensiveness of its approach to development of regional innovation systems S3 has introduced a distinct, strategic approach which distinguishes it from other policy frameworks. As such, it has the potential to make a significant contribution in diverse

contexts. Several characteristics, and principles underlying the process which reflect its contribution are:

1. The *key role for the public sector* creating favourable conditions for innovation and legitimising appropriate 'collaborative leadership'. Bringing together diverse stakeholders and ensuring that all interests are heard underpins the collaborative, inclusive approach. The public-sector becomes an appropriate point of accountability for systematic monitoring and evaluation, maintaining a focus on shared learning and ongoing development of the regional innovation system (see Mazzucato 2013). Further, public sector investment and policy can be used to shield and nurture new technologies and niches from competitive pressures while they develop, and assist and empower their upscaling (Bugge et al, 2017);

2. The importance of the public sector and its focus upon ensuring that the *skills and capabilities* of the regional population, as well as the *knowledge, hard and technological infrastructure,* are adapted to changes in the regional economic and social 'landscape', and the nature of the industries and enterprises emerging in a region. This allows local people and firms to benefit from new economic activity whilst improvements in the amenity and liveability of a Region add to the likelihood that key intellectual property will not be exported;

3. The *focus on place-based analysis* of the regional economy. This is integral to setting priorities for innovation, and the identification of unique 'knowledge assets'. Importantly, these assets include those which can emerge from new combinations of local know-how ('related variety') and cross-sector partnerships. While some argue that global networks and communication lessen the importance of place, the S3 process affirms that 'place', and exchange of tacit knowledge through local networks, continues to be an important frame of reference for innovation;

4. The entrepreneurial discovery process ensures that stakeholders agree on a *comprehensive vision* for the economic, social and environmental future of the

region. One important implication of this requirement is that it recognises differences in regional context and capability, so that each region's vision will vary from others'. Innovation itself is construed broadly, encompassing social and environmental, as well as technological or sectoral, initiatives. In cases where innovation directly involves social and technological elements, such as in the development of novel models of assisted care, a sharp distinction between social and technological innovation is not very productive, as their implementation necessarily involves both (Bugge et al 2017);

5. The understanding that *collaborative processes,* which bring together diverse perspectives, are central to the creative problem-solving needed for innovation to occur. This may be applied to new inventions, or to enhancement of product quality, production process, technological support, or organisational structures. Barriers to the realisation of these improvements may also be identified and addressed. Collectively these activities create the potential for competitive advantage in specific areas of activity;

6. The assessment of regional strengths in which *attention to global trends* and emerging market opportunities is a central feature;

7. The focus on *networks* leads to the identification and recognition of linkages that may be beneficial for the realisation and commercialisation of new ideas. Such linkages may include those between research and education institutions and business, or those which involve both vertical and horizontal co-operation, which have the potential to catalyse transformative change;

8. *Recognition of Universities and R&D centres as being integral partners* in the entrepreneurial discovery and innovation process. There is explicit acknowledgment that the increasing intensity of knowledge and the potential of its digitisation has significant potential for generating new market opportunities and social innovations such as the 'sharing economy'. The EU articulates the crucial role which universities can play, not only skilled labour supply and research

expertise, but also contributing to regional analysis, governance and global connectedness.

9. Construction of an S3 Strategy as a *living document* subject to monitoring, evaluation and iterative refinement. This ensures that innovation policy is continuously refined as part of the learning process. This creates an environment where adaptive capacity and strategic investments are maximised.

10. The emphasis on '*collaborative leadership*' as a driver of place-based innovation. This is important in several respects:

    a) it recognises that the change process associated with innovation can be difficult. The legitimacy of the governance process, and the opportunity for two-way communication, is necessary for choices to be made, priorities set, and implemented;
    b) the involvement of stakeholders representing different sectors and interests presumes that diversity in perspectives will lead to more imaginative thinking about how local knowledge assets can be reshaped to maximise their value;
    c) engagement in priority-setting is not only expected to prompt innovative thinking, but also to strengthen commitment to, and speed up, implementation of road maps;

Taken together, these 'innovation principles' underscore the significance of a comprehensive approach to regional development policies, linking economic, social and environmental concerns so that the outcomes in one domain support those of another. They also presume effective coordination of different authorities in the same geographic space.

The capacity to make a significant contribution in diverse regions is consequently influenced by the social and political context, as well as the underlying commitment to, and capacity for collaboration.

The importance of policy mixes

Within the European literature there has been some criticism of underemphasising firms as the primary sites of knowledge development and innovation. Instead, a more firm-based, multi-layered perspective on knowledge production and diffusion is suggested. This approach places emphasis upon new combinations of knowledge originating in different 'cognitive domains' (different ways of thinking about issues and problems). Industry segments thus become the focus of systemic exploration rather than, arguably, over-emphasising the role of universities. This leads to an important re-assessment for policy-making in terms of what can be realistically expected from universities and research institutes (Herstad and Brekke, 2012). Rather than considering these kinds of organisations as principal components, as often is the case in regional innovation strategies and policies, it re-asserts firms and industrial sectors as principal components of regional innovation systems.

Following this logic, specialised knowledge bases and organizational structures and modes of operation of firms in a region constitute the core of innovation systems, not university research, technology transfer schemes or individual (academic) entrepreneurs operating in isolation. It is argued that the role of universities has perhaps been overstated, at the expense of the more basic function of providing training for skilled and qualified personnel (Bristow et al., 2011).

This, in turn, points to the importance of acknowledging that critical mass may have to be built bottom-up based on a set of complementary instruments and policies that target, at the outset, firms and thus the domain of industry itself (Guerzoni and Raiteri, 2015; Herstad et al., 2010). These include inward FDI attraction, the supply of public seed or venture funding, direct or indirect selective support for industry intramural R&D, demand-side intervention such as active public procurement policies and market regulation, dense coordination between private industrial owners and government, and direct public establishment and ownership of activities assumed to be critical for the transformative capacity of the economy. They extend into specialised educational programs; university-industry collaborative linkages seeking to supplement the output of experience-based industrial (application-oriented) knowledge development processes with R&D-based (technological platform) knowledge which reflect their long-term needs (Asheim and Parrilli, 2012). Last, such industry-oriented

initiatives may also include instruments by which pre-existing local demand and knowledge resource constraints are overcome by linking regional firms to extra-regional markets and providers of competences. These types of policy intervention have been instrumental in the establishment of the technological development paths of the most advanced economies during the post-war period (Mazzucato, 2013; Coenen et al 2016).

Other initiatives that regional stakeholders may support and benefit from include science parks and incubators. They may be identified as priorities in a region which sees considerable potential for start-up enterprises, and some value in providing a supportive milieu and infrastructure for them to build the foundations of their business.

While the process of developing a S3 Strategy is a systemic process, the importance of appropriate policy mixes, is a central feature of bottom up policy formulation. Differentiation of approaches between regions is once again a critical issue which must be addressed, with the instruments which are ultimately applied shaped by the nature of the portfolio of projects which reflect the prioritisation process.

S3 'Experiments'

The importance of context is illustrated further in some of the new applications of S3 that are being implemented by the European Commission and the S3 Platform. As experience with implementing the S3 process has developed, interest has grown in how it might be applied in specific contexts where circumstances might complicate its implementation. Three examples are presented here.

S3 in Lagging Regions

This project has recognised that S3 could be most relevant in those regions which are lacking the institutional resources that are necessary for the S3 process to be effective. This project has provided direct support to regions in southern and eastern Europe which were either low-growth or low-income regions, and appeared to be struggling to implement an effective S3 process. The Lagging Regions project has three main aims:

- Improve understanding of slow and limited growth in EU regions and links to macro-economic framework conditions, taking S3 as an entry point;
- Develop and disseminate lessons and a tool box for other EU regions; and
- Contribute to advancing relevant theory on (implementation of) smart specialisation by codifying hands-on experiences (see the S3 Platform, http://s3platform.jrc.ec.europa.eu/ris3-in-lagging-regions).

The project team worked closely with stakeholders in specific regions to support their implementation of the S3 process, particularly the assessment of key local knowledge assets, and the management of the entrepreneurial discovery process involving key local actors. The EDP process indicated that stakeholders in the research and business sectors of the region had limited experience of collaboration, and did not generally explore international business opportunities or international networks. This led to the development of a range of resources and approaches to assist local stakeholders to explore the opportunities offered by cross-sectoral collaboration and internationalisation (see Boden et al, 2016).

The importance of capability building in this project was highlighted by Marques and Morgan (2018), who drew attention to the dramatic implications of the crisis in the Greek economy – a much bigger constraint on implementation of S3 in Greece than simply institutional capacity. They suggested that in situations like these, S3 could actually support larger agendas beyond the specific focus on regional innovation systems.

> A regionally nuanced economic renewal strategy would help to create a more polycentric state in Greece, where the regional governments and their partners in business and civil society could design and deliver locally-attuned strategies for innovation and regional development, providing they were empowered to do so. Far from being immaterial or irrelevant to the goal of national economic renewal, regional devolution of power could help to empower local knowledge beyond Athens and compensate for the lack of trust in the institutions of central government. (Marques and Morgan, 2018)

The resources from the Lagging Regions project are available on the S3 Platform website.

S3 in Coal Transition Regions

The EU's efforts to support transition from coal-based power to renewables has drawn attention particularly to the challenge of generating alternative prospects for the future economies of these regions. Consequently, the European Commission's Joint Research Centre, where the S3 Platform is based, has initiated an investigation into the potential for S3 to contribute practically to the European Commission's "Coal Regions in Transition Initiative".

The methodology was adapted to set out a 10-step process for coal-transition regions. These steps are:

1. Clear definition of the energy policy and the planned energy mix;
2. Identification of partners at regional and national level;
3. Identification of strategic mandates (the existing strategic framework);
4. Detailed analysis of economic, innovative and scientific potential;
5. Identification of good practice and possible barriers, as a means of inspiring local stakeholders to see new possibilities;
6. Entrepreneurial discovery process (mobilisation of key stakeholders);
7. Definition of needed changes in skills profile;
8. Social change management (mobilisation of civic society);
9. Preparation of S3 coal transition strategy; and
10. Design of implementation system (see JRC 2017, 3).

While this project is at an early stage, a number of factors that are critical to the effective application of the S3 methodology in coal transition regions have been observed. These include:

- The importance of forming a coherent strategic outlook, connecting national and regional perspectives;
- The active participation of key actors;
- A bottom-up approach and active involvement of regional governments throughout the process;
- A long-term perspective – structural transformation takes time;

- Institutional capacity needs to be strengthened from the beginning;
- Constant monitoring and evaluation to support ongoing learning; and
- A willingness to combine different financing sources, instruments and programs, linking public and private investors (see JRC 2017, 5).

S3 in EU Neighbourhood Countries

There is an ongoing process of negotiation with countries in the EU neighbourhood about the possibility of them joining the EU as Member States at some point in the foreseeable future. In recognition that involvement in the implementation of the EU's Regional Policy, with its conditionality of a S3 strategy (required as a condition of funding), the S3 Platform has initiated a project with the national governments of Ukraine, Serbia and Moldova to explore the readiness of those countries to participate in the processes of allocating structural funds, should they become Members at some point in the future.

In Serbia, the first stage has been to map the economic, scientific and innovation potential of subnational regions as preparation for identifying domains for public investment, and for beginning the entrepreneurial discovery process. This stage revealed significant variation across subnational regions in the relative capacity of the innovation systems which could be clarified and more fully understood through entrepreneurial discovery. The other important insight was the importance, in an economy like Serbia's that still strongly depends on agriculture and various light industries, of leveraging potential in these areas and not focussing on the high-tech sectors (see Kroll et al, 2017).

Each of these projects underscores the sense that S3 is work in progress: exploring and testing the appropriateness and the effectiveness of the approach in generating and consolidating regional innovation systems. Other specific projects have been established to look at the implementation of S3 in sparsely populated areas, and in areas which necessarily lend themselves to interregional cooperation, such as the Danube and the Baltic areas. The S3 Platform has also established thematic projects focused on industrial modernisation, energy and agri-food to facilitate cooperation and sharing of insights amongst policy makers, researchers and businesses. The agri-food focus includes partnerships on high-tech farming,

traceability, bio-economy and agri-food and smart electronic systems. This work is necessarily at an early stage, so current reporting describes work in progress.

The following pages outline some case studies of S3 strategy development in Europe. They are extracted from reports by the project leaders compiled in 2015. Work is ongoing in each of the Regions, with recalibration of policy occurring over time.

S3 Case Studies from Europe

Basilicata, Italy

The Basilicata Region is a small peripheral Region located in the south of Italy. Its population of approximately 576,000 has been declining and is also aging rapidly. It is a lesser performing Region within Italy due to its relatively low GDP per capita and its high levels of unemployment. It is also a Region that displays low entrepreneurial density, with the typical firm having less than four employees, underdeveloped transport infrastructure, and weak extra-regional links.

Within Europe it is classed as a 'moderate' innovator due to relatively good performance in bringing new products to market, and high level of research intense activity. This intensity derives principally from the presence of the large automobile manufacturer, Fiat, in the Region. Despite this activity, the level of innovative activity such as R&D and patent applications is low, with collaborative activity often missing from the business eco-system. While there are some innovation, technology and research focused institutions, their reach, and effectiveness in promoting innovation across different sectors is limited.

The automotive and petrochemical sectors employ a large part of the local labour force, with further employment generated within the oil supply chain. Large firms conduct their R&D and value-adding activities outside of the Region. Nevertheless, there is some cluster activity in the field of sofa manufacturing and in agro-food production. The tourism sector is also important but is not used as a strategic driver for the local economy.

One of the core strengths of the Region identified through the S3 process is the presence of research institutes. Efforts to create connections between research and business have

involved a census of the skills of the researchers, alongside consideration of the industry structure, to locate areas where they may be matched, and subsequent promotion of these areas. Some of the activities launched to build on these complementarities have included personalised technological check-ups for small businesses operating in key sectors and partnering with them to leverage innovative ideas created through research. In addition, the regional governance body has been involved in the establishment and management of new incubators (creative industries and culture, agro-biotech), created a new technology district, created linkages to promote the internationalization of small businesses in key areas and become actively involved in supporting innovative projects through funding and participation.

The policy processes which have taken place over a five-year period show a clear learning process which has involved business, research institutions and policy makers. Policy-making institutions have become actively involved in innovation system development. More systemic methods, and identification of priority areas of investment (alongside more generic policies intended to benefit a wide variety of sectors) have replaced the more piecemeal, firm based approached to innovation policy. A wide range of stakeholders agreed that there had been significant improvements in the economic structure of the Region over the previous years. One of the core ongoing issues is how to develop a Strategy that builds local capabilities, especially in the field of technology transfer, that require less public support and are able drive the long-term process of economic restructuring. The importance of defining clear, achievable objectives and relevant actions within priority areas has also been highlighted.

Eszak-Alfold, Hungary

Eszak-Elfold, known as the Northern Great Plain, is the second largest Region in Hungary, with approximately 538,000 inhabitants. It has ongoing structural problems including low GDP compared with the rest of Hungary and the EU more generally, declining population, and relatively high unemployment. The Region has a large agricultural and food-processing sector (mainly sugar) that has limited competitive advantage within the EU.

There are significant inter-regional differences within the counties which make up the Region. Hadju-Bihar has high numbers of research and development employees and significant expenditure upon R&D, as well as excellent research capacities and facilities, but still suffers

from high unemployment and below average growth. It is the economic driver of the whole Region, which is, overall, considered within the EU framework as being a 'moderate' innovator, arising from its research intensity as opposed to innovation outcomes.

The three areas of specialisation are health (including medical instruments, pharmacy, and biotechnology), the food industry and ICT. There is also a vibrant tourist sector based on the curative thermal waters in the Region. There are some strong innovation, technology and research institutions in the Region which have the capacity to drive and support the formulation of innovation policy such as an S3 Strategy. Some of the other key strengths include international technology leadership in some areas, effort and willingness to collaborate, and substantial agricultural and food industrial capacities and traditions. Nevertheless, the general innovativeness of most of the small and medium businesses was, at the outset of the S3 process very low.

The focus of policy developed during the S3 process, was upon technology transfer within the three key sectors, enhancing the capabilities of small and medium enterprises (for example focussing on technological, market intelligence and extra-regional linkages) and establishing a platform for collaboration between small and medium enterprises and multinational corporations. Generally, there was mistrust between the smaller enterprises and the regional university and efforts were made to break this down and create new linkages and spin-offs. The activities of various clusters created a sound foundation for the development of supporting policy frameworks in key areas.

The process of developing an S3 strategy was highly collaborative, with facilitated workshops and round-tables playing a key role in the prioritisation process. Some of the key issues that had to be overcome were the lack of time that participants had to devote to the process and the complications of multi-level governance. The S3 strategy included actions such as founding a technology transfer office to diffuse an innovation culture in the Region (which is now supported by the activities of various university spin-off enterprises), identification of seven key 'thematic' priority areas (which has been acknowledged to be too broad but included an emphasis on food, health and ICT). Stakeholders identified that one of the key contributions of the S3 process was the creation of networks, linkages and collaborative

frameworks which have had benefits in the short-term and have created the basis for long-term change.

Bremen, Germany

Bremen is the smallest German state with a population of approximately 650,000. Its population declined slightly between 2009 and 2013 and the Region has historically experienced high rates of unemployment compared with the German average. Nevertheless, the standard of living in the Region is relatively high. This prosperity is, however, increasingly moderated by falling gross regional product. Its industry specialisations are in the areas of advanced manufacturing including the areas of automotive, aeronautics, electrical engineering, and the food industry.

Bremen has consistently received a 'moderate' rating on the European Regional Innovation Scoreboard. One of the factors contributing to this performance is the location of the headquarters of many of its major firms elsewhere in Germany, and some internationally. This means that formalized R&D activities are often not integrated into the local innovation system, despite the presence of a large number of knowledge producing organisations. There are also divergent opinions regarding the quality of the linkages between research institutions and industry, suggesting a failure to create and leverage vital collaborative relationships. Countering these negatives is the extremely high quality of decentralized regional governance. Well-developed cluster policy, and firm level innovation supports and incentives, have been formulated and implemented, as part of the S3 process, at the regional level. The potential to drive change, and create foundations for new sources of endogenous growth, is consequently high.

The Bremen government has worked consistently as a mediator to try to stimulate local firms and research institutes to work together, particularly in areas where there is overlap across different sectors. Initiatives developed during the S3 process, intended to enhance innovation performance and increasing systemic vitality, include: the construction by the regional development agency of a purpose-built space to co-locate its aeronautics businesses and associated research institutes, alongside organisations involved in development of advanced materials; and attracting FDI into its emerging offshore wind-energy sector. Generally, the

approach is to bring together researchers working on a specific set of *activities*, from various economic sectors, to drive the emergence of new areas of expertise. The extant cluster activity provides a crucial foundation for this approach.

The case study demonstrates an approach to regional innovation system development which leverages collaboration and learning and recalibrates policy over time to reflect change needs and priorities. Some of the main criticisms of the S3 Strategy and policy framework concern the reliance on 'people' who have been important influences in the region for some time, as opposed to focusing on institutions, the exclusion of representatives of firms or organisations that are not linked to the three main clusters, and the propensity for 'path extension' rather than 'transformation'. To counter this criticism efforts have been made to stimulate the emergence of new areas through investment in projects related to maritime safety and security, marine exploration and the development of underwater mining robots.

Emerging Policy Initiatives

The S3 process and its place in EU Regional Policy is a subject of ongoing debate in the EU, involving program managers, regional authorities, policy makers, and the Member States. In preparation for the decisions about the EU's next multiannual financial framework (to cover the years 2021-2027), the European Commission has prepared a policy paper which was adopted by the Council of Ministers (a key part of the EU legislative structure) and forwarded to the EU institutions in July 2017 (see EC 2017).

The Communication proposes that S3 be taken further to consolidate European work on key challenges. It concludes that the early evidence suggests that S3 strategies have already reoriented the EU's regional policy. However, challenges remain because:

> "… Europe's competitive edge relies on its capacity to promote new growth models at regional level, by targeting investments in innovative sectors with significant growth potential and high added value. To achieve this, four challenges have been identified and need to be addressed:
>
> - Further reform of research and innovation systems within regions;

- Increasing cooperation in innovation investment across regions;
- Leveraging research and innovation in less developed and industrial transition regions;
- Harnessing synergies and complementarities between EU policies and instruments" (EC 2017, 4).

The Commission spells out a number of initiatives that will be taken in each of these areas, in preparation for the next iteration of S3 in 2021-2027. Each of the new initiatives reflects a priority on facilitating exchange of knowledge and experience and efforts to foster greater interregional collaboration. The key underlying focus is on improving EU competitiveness of global markets.

The potential of S3 beyond Europe

A key question is whether the smart specialisation idea, and entrepreneurial discovery process to regional innovation, can be successfully translated to support place-based innovation in other parts of the world, including Australia. One important issue is the lack of incentives. In Europe, as previously noted, the development of a S3 Strategy is a condition for receiving structural innovation funds. This is a crucial driver to engage regional authorities, and to support their efforts to build regional coalitions of stakeholders to engage with the entrepreneurial discovery processes. The question then becomes: "does the process offer regional authorities that wish to promote place-based innovation, the ability to formulate effective strategy and policy, and support and promote innovation, that cannot be derived from other approaches?"

United States

One interesting comparator comes from the Brookings-Rockefeller Project on State and Metropolitan Innovation (PSMI) in the United States. Carlson reports on work undertaken during 2011 to 2015 and the growing implementation of the S3 framework noting that 22 metropolitan regions and seven states have used the approach to create:

"……economic development strategies designed to grow and retain high-quality jobs in innovative, productive industries that expand opportunity for all." (2015, 1).

The key, distinctive attributes of the model adopted in the PSMI include:

a) a key role for the *public sector* in forming cross-sectoral coalitions of diverse interests;
c) a focus on a *new paradigm* of economic development that focuses on investment in the assets and capacities with the greatest capacity for growth, with attention to global trade and investment;
d) significant promotion of *skills* and workforce development;
e) emphasis on developing *civic capacity for governance* to implement the new paradigm;
f) a commitment to *scaling up* the implementation of new arrangements; and
g) while there was no substantive fund underpinning the PSMI, city and state-regions were successful in bidding for various kinds of *major federal grants*, including the Comprehensive Economic Development Strategies program (see Carlson 2015).

These characteristics illustrate that while the central aspects of S3 processes remain intact, there is necessarily modification of emphasis and design, subject to contextual factors. These differences are also, to some degree, evident in regions across Europe, where the level of endowment of resources and development paths, as well as the social and political environments vary considerably. Nevertheless, there is a consistent focus on the key elements which define S3 including the role of the public sector, the importance of place, collaborative partnerships and leadership, assets-based linkages with global markets, and the requirement for a wide range of stakeholders to be involved in an inclusive, participatory process.

Australia

Transforming regional economies is something of great importance to Australia. Long-term dependence on natural resources, the fact that coal-fired power stations are, from an ecological perspective, and more recently from an economic perspective, no longer sustainable, and the growing realisation that our traditional manufacturing base is often not a source of competitive advantage in a globalised world, makes this transformation a pressing

imperative. In this context, effective innovation eco-systems become more than just academic concepts. They become the vehicles are that needed to drive socio-economic transformation.

The most recent Australian Innovation System Report (Department of Industry, Innovation and Science, 2016), provides evidence that Australia does not have a strong foundation of large-scale, multi-national industries, but is primarily a country of small and medium sized enterprises (SME), with a strong concentration in the services sector. According to ABS 2016 data 68% of employment in Australia is in the SME sector, 85% in the services industries (everything excluding agriculture, forestry, fishing, mining and manufacturing), which also is responsible for 77% of industry value-add. This has a major impact on the nature of innovation in the country, being driven by SMEs and predominantly of a process-type nature rather than a 'new product' to market. This strongly suggests that widely-heralded innovations such as Wi-Fi, the Cochlear ear-implant and the cervical cancer vaccine are exceptions rather than the rule. According to the Australian Innovation System Report, part of the problem is in a weakly networked innovation system: "Australia ranks poorly against OECD comparators in most business to research and business to business indicators" (ibid, p.2).

This problem of a weakly networked system also was at the heart of the Australian Academy of Technological Sciences and Engineering (ATSE) 2013 position paper "Translating research into economic benefits for Australia; rethinking linkages", which points to the cultural differences between SMEs and academia as one of the factors inhibiting stronger collaboration. Assertion of the importance of universities is based on their frequently vital developmental roles, which involve the university constructively interacting with broader regional governance structures that seek to shape future economic development trajectories, leaving long-lasting regional impacts and engendering complex institutional changes. (Benneworth et al, 2008). However, as discussed above, this must be considered within the context of a wide range of policy choices to determine where emphasis should be laid.

The importance of networks and linkages, and their weaknesses in the Australian context suggests that an integrated, systemic approach to innovation system development, such as

S3, is strongly relevant to regions seeking to accelerate the re-engineering of their economies. A contrasting approach is to rely more heavily upon cluster and sector based strategies. It is important to note, however, that they are often complementary rather than mutually exclusive. A long-term strategic approach is clearly necessary. Developing foundational capabilities to: underpin formation of networks, linkages and collaboration; overcome the difficulties of multi-level and complex governance; and engage small and medium sized business, present significant challenges to the implementation of the process which must be addressed at the outset.

As part of the 'bottom-up' process of policy formulation, specific concerns regarding administrative and workforce capability, the distribution of R&D resources, infrastructure and previous experience with enabling technologies are all likely to arise. In addition, the importance of sensitivity to multilevel governance is another key learning emanating from the EU case studies. In Australia this would require consideration of power and influence across local area (LGA) governance, regional institutions, state and national governance and global institutions such as multi-nationals, which have a large impact on regional communities. The dearth of policy-making power at the regional level is a central issue which means that effort must be directed toward 'on-boarding' a wide array of influential stakeholders. Ensuring the integrity of collaborative leadership, avoidance of short-termism which is antithetical to the smart specialisation process, and of 'rent-seeking' by powerful vested interests, are all crucial for locating and realising emergent regional potentials, and restructuring economies over the long-term.

Conclusions

In conclusion, the remarkable features of S3 which have the potential to provide benefits to regions internationally, are:

- its comprehensive character and emphasis on a continuous learning process,
- the embedding of collaborative frameworks which create a legacy and changed way of operating and creating policy in regional contexts,

- the inclusivity engendered by inclusion of the quadruple helix of actors, which includes civil society, and
- the legitimacy it provides to public sector authorities in invigorating regional innovation systems.

The scale of its implementation is also striking, as it encourages investment in knowledge assets and innovation in very different kinds of regions in varying stages of development.

S3 is useful in regions where regional authorities see unfulfilled potential in their regional economy, and prospects for intervention to promote innovation in activities as diverse as products, processes, institutions, markets, supply chains, governance or workforce development. Through bringing together stakeholders from diverse sectors, regional authorities can set the foundations for collaborative leadership that can highlight opportunities and priorities focused on local assets, and develop a comprehensive framework for innovation in which a range of initiatives can be mutually reinforcing. Such an approach is a significant advance on previous innovation policy settings.

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