

Chapter 2

Innovation in Regional Australia: Effective, Lagging or Under-Utilised?

Kilian Perrem

Abstract This chapter examines the Australian National Innovation System (NIS), in the context of the potential for policy intervention designed to boost regional development. It explores the contributions that regional Australia makes to the national innovation system, as well as the unique challenges faced by regions in innovating—including problems of a low base in human resources and a lack of innovation assets—and the potential role of new technologies, such as the National Broadband Network (NBN), in ameliorating these. The chapter also explores regional development intervention in Australia, before examining the influence of geographic isolation on regional innovation success. The section on policy considerations examines regional development anchored in innovation, and concludes that this might best be developed through assistance for regional SMEs to develop better linkages, and support to maximise opportunities under the NBN.

2.1 Innovation: An Introduction

When considering the issue of what constitutes an effective innovation system in Australia, including regional areas, it is useful to first consider what such a system actually looks like—that is, what the principal components are. A wide body of literature has identified some fundamental actors that are common amongst innovation systems: these include firms of all sizes, universities and other tertiary institutions, public research facilities, technology centres, industry associations, governments and public sector agencies, financial institutions and other sources of investment, human capital, physical capital, and both formal and informal networks. There is also a general consensus in the literature that the pipeline in a given innovation system involves non-linear and thus often unpredictable

K. Perrem (✉)
Rivett, Canberra, ACT, Australia
e-mail: Kilian.Perrem.REPS@aph.gov.au

interactions between some or all of these components. In theory, therefore, regions lacking or deficient in any of these actors may suffer from an innovation deficiency unless they can forge the necessary linkages to bridge the gap (Collaborative Economics 2008).

There is a wide array of innovation actors, and the innovation pathway is non-linear with often unpredictable interactions between them.

It is widely perceived that regional Australia lacks a critical mass of innovation actors or assets, and that Australian regional businesses lack the sophistication to be as innovative as their metropolitan counterparts. However, regional innovation makes a crucial contribution to the Australian National Innovation System (NIS) in a number of ways. For example, agriculture and mining are regionally-based sectors that are vital to the Australian economy. Productivity growth will be critical in these areas into the future: this will require the regional actors in these industries to be continually innovative. Significantly, however, there have been no greenfield discoveries by mining companies in Australia for many years, due in no small part to a reduced investment in exploration. As a consequence, many of the mineral deposits that underpin the success of the resources sector in Australia are now depleting or experiencing declining grades (CSIRO 2011). Productivity growth in the Australian agricultural sector is also in decline due to a fall in R&D investment and there are challenges for primary producers in the face of climate change (Nossal 2011).

Regional innovation makes a crucial contribution to the Australian National Innovation System through its interface with agriculture and mining productivity; innovation activities in regional universities and other private and public sector assets; as well as through the participation of regional business and industry.

Both private and public sector innovation assets exist in regions, including 13 regional universities plus a number of regional campuses of metropolitan universities; Cooperative Research Centres (CRCs), Rural Research and Development Corporations (RDCs) that commission R&D for primary producers; regional CSIRO sites; State and Federal government agencies; the Australian Local Government Association (ALGA), regional business networks and non-government organisations such as Sustainable Economic Growth for Regional Australia (SEGRA). Additional assets necessarily include suppliers and customers, business R&D, and finance, all of which can contribute to the innovative capacity of the regions. However, in a geographical sense they are of course dispersed throughout a huge area and lack the concentration that cities possess. Enhanced networking is therefore critical and the rollout of the National Broadband Network (discussed further below), is almost certain to play a central role in this in the future.

Regional innovation assets are dispersed across a wide geographical expanse: linkages and networks (introduction of the national broadband network) are therefore critical for the optimal development all regional innovation systems.

The lack of sufficient human capital is a key barrier facing Australia's regions from an innovation perspective. The Australian census data from 2006 show quite clearly that most regions have fewer skilled professionals, higher unemployment and a larger proportion of workers in low-skilled jobs compared with the cities (ABS 2006). In terms of the current thinking on innovation geography metrics, these are regarded as negative indicators (Ratanawahara and Polenske 2007). On a more positive note however, recent Australian Bureau of Statistics (ABS) data from its business characteristics survey of 2008–2009 show that although product and operational innovation are lower in larger regional firms (>200 employees) compared with city-based businesses of comparable size, there are no such differences in terms of marketing and organisational innovation. Moreover, the same dataset clearly shows that regional small to medium enterprises (SMEs; <200 employees) are as innovative as their city counterparts across all four recognised categories (product, process, marketing and organisational). This is an encouraging statistic for the regions in Australia where SMEs are at the heart of wealth creation and employment and represent 99.8 % of all businesses (DTR 2003).

Census data shows that regional small to medium enterprises (SMEs; <200 employees) are as innovative as their city counterparts across all four recognised categories (product, process, marketing and organisational).

Despite these comparable innovation statistics for regional SMEs however, there is evidence also showing lower productivity and employment growth in regions compared with the cities: this suggests that regional SMEs are lagging behind their city counterparts in deriving outcomes from their innovations, or are perhaps facing larger problems (Infrastructure Australia 2010). In turn, this suggests that the national innovation system may not be optimal and that market failures possibly exist in relation to regional innovation. There are examples of regional sectors that have become innovative and that have connected very effectively with global markets, such as the wine industry which was built from the ground up on a foundation of tacit knowledge of wine producers (Scott-Kemmis et al. 2005). In principal therefore, regional sectors in Australia can and do innovate to become globally competitive and derive high value outcomes.

The available data also show that the value to the economy provided by regional innovation is less than that of the cities, even though regional small and medium sized enterprises (SMEs), which comprise the backbone of regional economies

(DTR 2003), appear to be no less innovative than metropolitan firms as determined by the ABS business characteristics survey. Australia's major cities contribute to approximately 80 % of GDP and employ 75 % of the national workforce (Infrastructure Australia 2010). Moreover, it is reported that 81 % of the economic growth and 84 % of the employment growth from 2003 to 2008 in Australia was in the major cities (Raskall 2010). This suggests that regional SMEs are lagging behind their city counterparts in terms of deriving optimal economic returns and that they may continue to rely on government assistance into the future.

This is further evidenced by data from recently published State of the Regions Report for 2011–2012 released by the Australian Local Government Association (ALGA 2011) on the gross local product of 67 regions. The figures provided in this report show that whereas most areas of the major capital cities are above the national gross local regional product average, almost all of the areas outside the capital cities are below this average. Central Sydney, for example, is 61 % above the national average whereas the NSW Mid-North Coast is 38.4 % below in terms of gross local regional product (ALGA 2011). It may be the case that regional businesses are often remarkably innovative and successful given the challenges they face; but the lack of innovation assets will continue to put these firms at a disadvantage into the future.

In terms of developing a skills base, data from Graduate Careers Australia show that graduates from regional universities are more likely to establish careers in the cities (the latest figures show that approximately 45 % move to a major city and only 30 % stay in the region; Graduate Careers Australia 2011). In addition, Australia's top ranked universities (collectively known as the Group of Eight) are all metropolitan. Although university qualifications are not essential for innovation per se, it has been reported that the ability of businesses to absorb new work practices or information that will foster innovation is increased by having a more highly educated workforce (Abreu et al. 2006). The R&D tax concession data from 2001 is also informative as it revealed that regional businesses only represented about 16 % of the firms that claimed the concession but accounted for less than 6 % of the reported R&D expenditure under this scheme.

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Based on current skills trends and absorptive capacity, regional businesses in Australia also appear to be at a distinct disadvantage compared with their metropolitan counterparts with respect to innovation output. In terms of all other actors in an innovation system, the cities have these in far greater abundance leading to a natural tendency for agglomerations to increase and newly form in cities. The question of whether modern technology has the capacity to reduce the tyranny of distance that impacts upon regional Australia from a skills, opportunities and knowledge perspective is further discussed below.

2.2 Regional Development in Australia: Past and Present Interventions

Regional development has been at the forefront of Australian government policy both prior to and following Federation. During the colonial period, government interventions in Australia were aimed at promoting the expansion of primary export industries including wool, cereal crops and natural resources. Following federation in the early twentieth century, the focus of the Commonwealth was to protect and enlarge secondary and tertiary industries through the imposition of a tariff regime (BTRE 2003). There were also various population decentralisation attempts during this time. Since the mid-1980s, however, (sometimes referred to as the post-trade liberalisation era) it has been more accepted that regional intervention policies could no longer be isolated from global trends and international market conditions.

Consequently, there has been a shift since the 1970s towards more targeted approaches and less dilution of funding in Australia. This is evidenced also in Europe and Asia by a reduced emphasis on ameliorating inequalities between regions and a focus instead on supporting regional diversity and enterprise (Hassink 2002). Expenditure on regional issues in Australia has been considerable in previous years. Between 1996 and 2001 alone, the Australian Federal government spent \$28.5 billion on supporting development activities in non-metropolitan Australia across a wide spectrum of areas with the intention of correcting market failures and providing social benefits. However, in many instances the effectiveness of these interventions has been uncertain due to the cumulative effects of a wide range of policies and both macroeconomic influences and regional diversity (BTRE 2003).

Between 1996 and 2001 alone, the Australian Federal government spent \$28.5 billion on supporting development activities in non-metropolitan Australia across a wide spectrum of areas with the intention of correcting market failures and providing social benefits.

Regional development in Australia is currently the principal policy focus of a number of dedicated public sector agencies at the Federal, State and Local Government levels. At the Federal level, a new department, Regional Development Australia¹ (RDA), has been formed to oversee the economic advancement of the regions and provides central support for 55 committees that have been formed to address regional issues across Australia. State and local governments also have direct responsibility for providing services to regions and supporting regional development and are closer to the points of policy delivery in this respect. Education, agriculture, health, and Indigenous policies that have direct relevance to the regions are the remit of their respective departments at the State and Federal levels.

¹ see <http://www.rda.gov.au/>

In 2010, the Federal Government committed \$10 billion to regional development, due in no small part to the unusual political circumstances involving a minority Government and regional members of parliament holding the balance of power in the House of Representatives. It remains to be seen what the actual impact of this funding will be and it is noteworthy that the OECD view is that infrastructure spending must be combined with investment in human capital, R&D and education, and that an integrated policy approach is critical for sustainable economic outcomes and enhanced innovation in regions (OECD 2009).

According to the OECD, infrastructure spending must be combined with investment in human capital, R&D and education to create sustainable economic outcomes and enhanced innovation in regions.

The national broadband network (NBN) is a significant ongoing investment by government that has significant implications for regional innovation. The internet has now been valued at \$70–\$80 billion to the Australian economy (almost equivalent to the retail sector). The promise of the NBN is that it will enable faster knowledge exchange to and from the regions and will create business and growth opportunities. However, this infrastructure may also be detrimental to some regional firms who are forced to compete in new markets (ALGA 2011). As stated above however, human capital investment is regarded in many quarters as a vital adjunct to infrastructure spending in order to maximise the returns to the economy. This will almost certainly be true also of the NBN and training for regional businesses is essential to take full advantage of this infrastructure.

2.3 The Geography of the Australian Innovation System: Are the Regions Stranded?

Kajikawa et al. (2008) report that networking among innovation actors and trust building is a critical indicator of regional cluster performance. The importance of knowledge flow and collaborative networking for successful regional innovation systems is evidenced by a number of seminal examples from overseas. The Emilia Romagna regional cluster of clothing and footwear businesses in Italy is a striking example of collaborative networking and a community of practice that enables multiple SMEs in this sector to share knowledge, overcome size disadvantages through partnerships, and thereby innovate strongly (Mitra 2000). Silicon Valley in the US is the quintessential example of a high technology innovative regional cluster that has deeply embedded tacit knowledge networks (Kolko 2002). Many governments have attempted to replicate the achievements of Silicon Valley (Mason et al. 2005) but with very limited success, possibly due in the main to policy and governance barriers (Charnock 2011).

The motor sports valley region of the UK has been regarded as highly innovative due to the ease of staff movement between firms (Henry and Pinch 2000).

The characteristics of a learning region that have been described by Hospers and Beugelsdijk (2002) are:

- SMEs simultaneously competing and cooperating;
- A unique physical, knowledge and legal infrastructure;
- Enhanced regional collective learning; and
- Improved competitive positioning of individual SMEs.

In terms of skills, the OECD has cited six categories that are required for innovation, based on the current literature (OECD 2011b): basic digital, academic, technical, generic, ‘soft’ skills, and leadership. There are no hard and fast rules regarding the balance of these skills needed as the requirements for innovation to flourish are context-dependent. However, the ability of businesses to adopt innovations i.e. their absorptive capacity, has been reported to be directly related to the education and knowledge levels of their managers (in OECD 2011b). This capacity is further increased by firms who invest in R&D and who involve their suppliers and customers in their decision making (so called ‘user involvers’). Indeed, West (2006) emphasises that innovation usually begins with a customer problem and not a technical advance or R&D breakthrough. Considerable value can be gleaned also by firms who devise business strategies that incorporate the acquisition of different skills and training with innovation in mind.

The OECD skill set for innovation includes digital, academic, technical, generic and soft skills and leadership.

A core question that arises is whether regional SMEs in Australia are in fact geographically stranded from an innovation perspective and whether they can realistically replicate the knowledge and learning networks that characterise successful regional innovation clusters. Australia’s particular population demographics and geography are unlike almost any other nation or international region, with 70 % of the population is concentrated in the five major cities, there are few other population centres of appreciable size, and the physical distances on average between Australia’s cities and towns are very large in relative terms. Indeed, ABS figures show that only 18 non-capital cities in Australia have populations exceeding 70,000, which rises to 36 for populations above 30,000 (SEGRA 2011).

With respect to the role of geography and clustering in fostering innovation, this presents some significant challenges for regional Australia. The fundamental actors in an innovation have been identified as inventors, transformers, financiers and brokers (Collaborative Economics 2008). There is no theoretical difference between cities and regions in their innovation system requirements in this regard.

Social capital is also recognised in many quarters as a positive component of innovation (Gudergan 2007). Australia’s regions may have a general advantage in

this area and a comprehensive study by Onyx and Bullen (2001) has reported that social capital was generally higher in rural communities compared with urban centres, particularly in relation to community connections, feelings of trust and safety and neighbourhood ties. These authors also reported, however, that ‘tolerance of diversity’, which can be understood as a willingness or propensity of people to forge bridging ties, was lower on average in the two rural communities under study than in the urban localities. The possibility that social capital may be a barrier to innovation has also been discussed in the literature in terms of the resistance to change that strong ties can engender (Florida et al. 2002).

Given that fact that the physical agglomerations that satisfy the current definition of an innovation cluster are much less likely to form in Australia’s regions, a different form of innovation architecture is likely to be needed for regional SMEs. Hence, it is the recipe for innovation that will probably differ between regions, which will in part be dependent on spatial/geographic considerations and the inputs of physical and human capital. However, the spatial and geographical aspects of innovation cannot be readily changed in the short to intermediate term. It is noteworthy in this regard that regional universities are argued to be necessary but not sufficient for regional innovation (Feldman and Kogler 2010). The presence of a university however can make a significant contribution to a region in conjunction with other innovation actors.

Innovation clusters are traditionally formed by physical agglomerations; but Australia’s regions will need a different form of innovation architecture.

A notable example of an Australian region that has been quite successful in terms of building its innovation capacity is Townsville–Thuringowa. Townsville outperformed the national average (as did Queensland) in terms of jobs created between 1981 and 2001 (BTRE 2003). Among the key drivers of this performance has been identified as the ability of this region to diversify its economy, maintain a well developed infrastructure, the presence of knowledge clusters including James Cook University and the CSIRO, a skilled labour force (tertiary qualifications grew from 4.6 % to 10.8 % of the population between 1986 and 2001) and stable local governments.

It is notable also that Townsville is among the few regional areas to show a higher GRP than the national average, albeit slight (ALGA 2011). In contrast, Albury–Wodonga has in the past represented the most ambitious plan for a deliberate federal government intervention in terms of regional growth. An initial population target of 300,000 by the year 2000 from a base of 37,931 residents in 1971 was set (BTRE 2003) but the population of this region is still less than 100,000 today. The initial government investment was intended to provide “attractive conditions for industry, including low priced land, a skilled labour force, efficient transport and communications facilities and high quality living standards for residents” (BTRE 2003). However, the lack of diversity in the skills and industry base and an over reliance on public investment has been cited by BTRE as some of the reasons why the growth targets for this region were not reached.

These examples from Australia lend strong credence to the current thinking on regional policy, particularly from the OECD (2011c), which is that only endogenous strategies will yield long term sustainable growth (see section on ‘place-based’ approaches below) and that the attempt to create a favourable business environment through direct government policy alone will ultimately fail. Innovative regional SMEs do exist across all sectors and there is no theoretical reason why networks of knowledge could not develop in Australia’s regions that could circumvent innovation geography barriers in the same way as the wine industry has done so successfully. It could be argued based on the economic data mentioned above that innovative regional SMEs are not reaching their potential within the NIS, and this has implications for key national challenges as discussed below.

2.4 Role of Australia’s Regions in Addressing National Innovation Priorities

Regional Australia has a particularly important role to play in the NIS in the areas of food security, the future efficiency and sustainability of the resources sector, and the response to climate change. In addition, two of Australia’s key industry sectors, agriculture and mining, are principally located in regions. In addition, a predicted population of 36 million (an increase of 14 million) in Australia by 2050 with a higher age demographic (IGR 2010) will put severe resource pressure on Australia’s cities if the regions cannot support a higher percentage of this increase.

Food security is a complex national and international challenge that will require a multi-pronged approach (PMSEIC 2010). Innovation will need to be a central plank of most solutions to this global issue and regional Australia will have a critical role to play in ensuring that the nation has continuing access to safe, affordable and nutritious foods. The ‘green revolution’ of the 1970s cannot be replicated to deal with food security as large scale increases in land use for agriculture and irrigation are no longer feasible.

There are some well established government agencies that foster R&D and innovation in food and agriculture such as CSIRO, the RDCs and specific CRCs. However, agricultural productivity is in decline in Australia and enhanced regional innovation in this area is regarded as critical to address this and contribute to food security (Nossal 2011). Innovation and knowledge flow metrics for agriculture are currently sparse in Australia and the impacts of R&D can take many years to be realised (Nossal 2011). However, the promotion of an innovation system framework among primary producers is regarded as key (Nossal 2011) and this would be entirely consistent with an innovation architecture that fosters enhanced networking and tacit knowledge spillovers.

The resources sector is another regionally based industry that is vital to the national economy. The development of local expertise in mining and exploration is however a potential platform from which regions could develop place-based

innovative strategies. In terms of innovation assets in this sector in Australia, AMIRA International Ltd is an independent association of minerals companies which develops, brokers and facilitates collaborative research projects. In addition, two public agencies, CSIRO and Geoscience Australia, conduct research that provides the minerals industry with new mining and exploration technologies.

Adaptation to climate change will also require significant regional innovation inputs. Australian water supplies, coastal settlements, agriculture and natural ecosystems are particularly vulnerable to climate change (CSIRO 2010). Of note also, urban and industrial development, population growth, recreation and tourism and environmental decline is having a profound impact on Australia's coastal regions and with the risk of coastal inundation expected to increase over the next few decades, more people, property and infrastructure will become exposed (CSIRO 2010).

2.4.1 The National Broadband Network (NBN) as an Innovation Asset

A detailed analysis of the NBN and its possible future impact is beyond the scope of this review. This new infrastructure is however worthy of discussion from the point of view of regional innovation, as it is regional areas that will experience the greatest step change in terms of internet access.

The information technology (IT) age has had a transformative effect on many types of business and business practices and the internet has been at the forefront of these developments since the 1990s. Investment in IT is now regarded as crucial for modern businesses from both an operational perspective and indeed as a component of innovation. The 2006 census statistics for regional areas are intuitive i.e. there are fewer homes with internet access outside of the major cities, in some cases less than 50 % of the national average, and the use of dial up is higher in the regions (ABS 2006). Whilst the rollout of the NBN will plug this infrastructural gap in the regions, its long-term impact on regional innovation is not yet certain.

The NBN is likely to have a clear impact on the geography of innovation as it pertains to regional Australia. The capacity for knowledge flow will be increased by the effective use of the NBN and the skills needed to maximise the benefits of this enhanced flow must be provided in conjunction with the roll out of this infrastructure. Measuring and evaluating knowledge flow are problematic and is the subject of much interest worldwide. A paper by Gardner et al. (2010) suggests that the measurement of the number and quality of outputs instead of inputs and a detailed assessment of the fundamental causes of these outputs are better knowledge transfer metrics as they reflect successes. Some consideration of this is warranted in evaluating the future impacts of the NBN.

The extent to which the NBN may have a detrimental effect on some regional businesses is also not clear at this stage. For example an increase in the provision of competitively priced goods or services in regional areas from distant companies

may affect local providers. The ALGA has stated in its recent State of the Regions report (2011) that there will be benefits to regions in terms of more service options and competition but also that some businesses may suffer. Innovations that arise as a result of the NBN will therefore provide both opportunities and threats to regions as there will be greater exposure to global systems and vice versa.

2.5 Fostering Regional Innovation in Australia: Considerations for Policy Makers

In considering the types of regional innovation policy interventions that are warranted in the future, there are some key considerations. The evidence presented in this paper shows that Australian regional businesses are often innovative, are vital for key national challenges such as climate change, food security, sustainable resources and population, but are in many cases disconnected from each other and from the metropolitan parts of the NIS. This likely underpins the lower returns to the national economy from most regions despite comparable reported levels of innovation between regional and city-based SMEs. The evidence from both Australia and overseas also shows that any policy interventions to foster regional innovation will have to be carefully designed and that endogenous strategies are more effective. This is further discussed below.

Regional innovation is a topic of much discussion and interest in the international policy arena, and a significant body of work in this area has been disseminated to date, particularly by the EU and the OECD (OECD 2011a, c). The literature on the geography of innovation shows that places are not all equal and are defined over time by an evolutionary process. Knowledge flow and access to tacit knowledge are the foundations of innovation, with codified knowledge playing an important complementary role (Gertler 2003). Hence, agglomerations of tacit knowledge and local spatially concentrated knowledge spillovers between firms and other actors in the innovation pipeline is fundamental (Feldman and Kogler 2010). Linkages and networks are therefore critical for all innovation systems. Indeed, multinational enterprises have begun to recognise that R&D needs to be conducted in different locations to take advantage of local knowledge. The evidence discussed above suggests also however that the value of the tacit knowledge in Australia's regions to the cities and vice versa may not be fully realised under the current innovation system architecture i.e. that there are insufficient linkages in the system between the regions.

The regional innovation policy paradigms that have been promoted in recent years, most notably by the OECD, are underpinned by endogenous or place-based strategies that seek to build on the comparative strengths of each region for more sustainable development (OECD 2011c). Good governance is at the heart of these approaches. The cumulative evidence now suggests that from an economic and innovation standpoint, this is a more effective strategy than subsidy-based incentives (Tomaney 2010). In Australia also, the regions that have performed

above the national average economically have a stronger and more durable innovation architecture with fewer deficiencies in terms of innovation actors and better long term planning processes at a local level (BTRE 2003).

In addition to developing a sustainable resource sector and ensuring food security, population and climate change are other key national challenges where regional innovation will be critical. Adaptation and mitigation strategies for carbon emissions require regional expertise in land management, coastal erosion, etc. The capacity of the regions to support an increased future population will also be vital to prevent unacceptable levels of congestion and resource constraints in the major cities. The ability of Australia's regions to contribute to these challenges at an effective level is uncertain however, although the evidence suggests that the regions do have this potential and that this will be realised if regional innovation is better utilised and linked within the NIS.

Developing a sustainable resource sector and ensuring food security; and meeting population, climate change and other key national challenges are examples where regional innovation will be critical.

The regions have long been a policy focus of the Commonwealth Government in terms of fostering sustainable economic growth (BTRE 2003). At the time of writing, the Australian Federal Government is developing a scheme whereby regionally based businesses will be able to sponsor an additional 16,000 skilled migrant workers. A doubling of the loading received by regional university campuses has also been announced in the 2011–2012 federal budget; \$500 million from the education investment fund will be directed to regional universities to pay for infrastructure. However, the possible implementation of a demand-driven system allowing metropolitan universities to increase their student intake may affect the numbers of talented students that the regional universities are able to attract which will have an impact on the quality of their R&D output and the long term viability of these institutions.

The innovative capacity of the regions and the value derived from this does not seem to have been a major focus of many past or present government interventions. It is almost universally accepted that innovation is fundamental to economic growth and prosperity. A fresh look at whether innovation in regional Australia is effective or in need of assistance is therefore warranted as this may assist policy makers to better design future programs that are aimed at regional development and sustainable future growth.

The broad OECD definition of innovation encompasses four pillars: product, process, marketing and organisational (OECD 2011a) and has gained wide acceptance. This definition is readily applicable to the Australian context, and is adopted in this review. Whilst there are some useful lessons for Australia with respect to the global experiences with regional issues and innovation, Australia's regions as defined in political/policy settings are geographically and socially quite distinct

from OECD definitions. This has to be reflected in considering any activities to foster regional innovation in Australia that seek to use a wide evidence base in their design. It is also the case that regions in Australia and elsewhere are diverse and have different strengths and weaknesses in terms of capturing opportunities and capacity for change. It is for this reason that the place-based approach is gaining wide acceptance as an underlying policy paradigm (Tomaney 2010).

Australia's regions as defined in political/policy settings are geographically and socially quite distinct from EU/OECD definitions—this must be reflected when considering policy interventions to foster regional innovation in Australia.

What can be done to boost regional innovation capacity in Australia from the perspective of the State or Federal policy maker? This review argues that there are three core strands that should be central to the approach of government to regional interventions in order to foster innovation and hence more sustainable economic outcomes:

- Assist innovative regional SMEs to grow by fostering new linkages with larger businesses as potential new suppliers/business partners;
- Maximise the NBN-readiness of regional businesses by providing advice and training, including an understanding of both the opportunities and potentially detrimental effects of this infrastructure; and
- Enable regional businesses to develop a vastly enhanced networking capacity, beginning with existing networks that will link regional innovation actors with each other and with metropolitan innovation networks for greater knowledge transfer. Seek also to foster communities of practice and virtual communities of practice through the use of NBN and other technologies.

2.5.1 Barriers to Regional Innovation

Because there are fewer skilled workers in the regions (ABS 2006) there is less access to a critical mass of accessible tacit knowledge. There will be fewer opportunities for skilled professionals in regions as a consequence of this which may be a circular problem in terms of attracting these individuals to bolster innovative capacity. Regions vary in terms of their degree of remoteness and the most rural and sparsely populated regions have the least local innovation assets. Regional business networks do exist (some are described later in this book) but anecdotal evidence from AusIndustry and others suggests that they are not as well linked with each other or with external networks as they should be.

An over reliance on local knowledge and lack of trust in external expertise is also an issue which is not insurmountable in the regions but will require better networks with trusted points of contact for regional businesses. Finance is also a problem in

the regions with very little access to venture or start-up capital. Regional markets also commonly lack the sophistication of their metropolitan counterparts and so suffer from a lack of user-driven innovation. In addition, because most regional businesses are SMEs, there are fewer firms with the capacity for R&D and the absorptive capacity for change innovation.

2.5.2 Effectiveness of the Intervention

Government needs to carefully consider the types of innovation policies and investments that will be optimal for regional Australia, otherwise commitment of resources could result in low returns.

Government needs to carefully consider the types of innovation policies and investments that will be optimal for regional Australia, particularly in lagging regions for which the commitment of resources could result in a low return if other components of innovation are fundamentally lacking, particularly human capital. The OECD policy brief ‘Regions and Innovation Policy’ (OECD 2011c) also warns against a ‘one-size fits all’ approach (i.e. not all regions can become biotech hubs or the next Silicon Valley!) and emphasises that the involvement of the private sector as essential for a regional innovation strategy. The development of a shared vision and strategic framework within the actors of a given region is seen as key (OECD 2011c), and indeed the examples of Townsville and Albury-Wodonga cited earlier are consistent with this view.

2.5.3 Current Policy Paradigms for Regional Innovation: the Placed-Based Approach

Innovation policy measures for the regions should look in the first instance to grow the most innovative businesses that are already in existence and that are constrained by lack of finance, skills, access to potential new markets and other impediments. These may represent the ‘lowest hanging fruit’ in terms of beginning to stimulate regional innovation.

The OECD has recently updated its Regions and Innovation Policy Brief (OECD 2011c) and emphasises that regions need to adopt the mantle of ‘change agents’ and that to implement such a strategy will need to:

- Develop a shared vision and strategic framework based on sound analysis to encourage innovation in the context of a regional development strategy;
- Design a smart policy mix that mobilises relevant assets drawing from different policy fields;

- Establish multi-level, open and networked governance structures that include public and private actors; and
- Foster policy learning through better metrics, evaluation and experimentation, as well as enhanced policy capacity.

The place-based approach to regional policy in the Australian context is discussed by Tomaney (2010) in a report commissioned by the Australian Business Foundation and is consistent with the OECD view. The central tenets of this report are that:

- Placed-based thinking is being adopted in many places around the world and it could be applied with equal value both in metropolitan regions and regional Australia;
- Place-based approaches require strengthened local and regional institutions that are able to assess and develop local economic assets in ways that amount to more than “tailoring national policies”;
- The active role of local stakeholders is critical to the success of place-based approaches but this places new demands on local business and other bodies to actively shape local policy, rather than merely make demands on State and Federal agencies;
- Successful place-based approaches place the development of human capital and the promotion of innovation at their centre; and
- Successful place-based economic development is generally a long-term process.

Australia’s system of fiscal federalism potentially provides a supportive framework for the emergence of place-based approaches.

2.5.4 Possible Approaches to Regional Innovation Policy

One interesting example of a program that has been in existence since 2005 in France that seeks to grow innovative SMEs is ‘SME Pact’. In this scheme, large companies, and some large public agencies that have significant procurement budgets, are linked with innovative SMEs that may be able to supply new and valuable goods and services. This brokering role played by the program helps to create linkages that would otherwise not occur. The risk for the large companies in engaging with SMEs for the first time (the ‘liability of newness’ aspects of young firms in particular; Kajikawa et al. 2008) is reduced by the due diligence role that the program plays and expertise that it provides in identifying these smaller firms from its extensive networks, not just in France but also in other European countries. The larger companies pay a subscription for this service and it is intended that the number of members will increase sufficiently for the program to become self-funding. The French Government has provided funding for a period of time to establish the scheme.

In an SME 'Pact', large companies are linked with regional, innovative SMEs that may be able to supply new and valuable goods and services.

A similar type of program in Australia could be very useful for regional SMEs, and indeed for many SMEs in the cities, who find it difficult to enter new markets and therefore to grow. The Commonwealth government runs a variety of programs to assist regional firms and could devise a scheme like SME pact through various agencies such as Enterprise Connect or AusIndustry. It would in the first instance require the development of an active and live database of innovative SMEs but this information could be gleaned from a variety of sources and existing contacts and networks. A list of large companies to invite into the scheme and pitch the benefits of the program would then need to be developed.

As innovation often begins with a customer problem (West 2006), a strategy to create new customer supplier relationships may in itself be a driver of innovation. Courvisanos (2003) also states that 'the most exciting developments in RIS (regional innovation systems) are how the synergies between large and small firms are creating strong effective innovative processes towards regional development. This type of synergy allows the R&D and network strengths of large firms to be linked with the more flexible and creative elements of small innovative firms'.

The importance of networks to innovation is widely discussed in the literature and Australia's regions will likely need to work particularly hard to develop more effective linkages given the geographical constraints that they face. A report produced in the United States for the Bay Area Council Economic Institute (Collaborative Economics 2008) is of interest in this regard as it states unequivocally that regions need active innovation 'brokers' and also that 'regions still vary by their relative strengths and weaknesses from which regional specializations and comparative advantages emerge—creating spikes in a flat world.'

A region's challenge as stated by this report is to recognize its own strengths, identify other regional "spikes" based on their strengths, and then connect to those "spikes" for mutual benefit' (Collaborative Economics 2008). Although, as stated earlier, Australia's regions are socially and geographically distinct from those of Europe and the US, there are some useful paradigms with regards to regional networking and innovation described in this study that are worth consideration in an Australian context. For example:

- The most effective (innovation) brokers often come from the ranks of business service professionals;
- Innovation is everyone's business and needs a human face;
- Assets are critical building blocks but traditional assets (raw materials, low cost labour) are no longer sufficient to succeed in a knowledge-driven global economy;
- Regions may have different amounts of assets but every region has basic innovation assets or the ability to identify and cultivate them;

- Culture is an intangible cornerstone of innovation and views failure as a lesson in how to succeed and encourages reinvention when necessary;
- The drivers of innovation will primarily come from the private sector; and
- Forget worrying about institutions and programs per se and focus on connecting people.

The importance of networks cannot be understated for innovation to occur and in Australia's regions these need to be greatly expanded and incorporate all of the available innovation actors. Regional universities should be involved in all of the innovation networks in their areas to assist with problem solving and develop an understanding of what regional businesses need beyond R&D.

In a detailed analysis of the importance of networks to innovation from a European medium technology perspective, Cappellin (2008) states that 'the development of knowledge and networks in medium technology sectors requires a modern governance approach, rather than to rely on the traditional free market approach' and that promoting integration between key nodes and weakly connected nodes is vital.

2.6 Conclusions

In considering the core issues examined in this review, the evidence suggests that Australia's regions have made and continue to make significant contributions to the NIS but face barriers to innovation that likely underpin their lower returns to the economy. However, critical national challenges will require a vibrant regional innovation system and much of this will need to be provided by SMEs which are central to wealth creation and growth in the regions. The innovation and regional policy literature is overwhelmingly of the view that bottom up or place-based policies are more effective than subsidy-based exogenous interventions that have had very mixed results. Government interventions that do not take this approach are likely to produce marginal outcomes only. Regional businesses must foster increased internal linkages and form stronger connections with other parts of the national and global innovation systems to derive greater value from their innovations and generate new opportunities for growth. Finally, the NBN will have a major impact on regional firms and they will need to adapt to this technology.

Regional Australia already has innovative SMEs but may struggle to compete with cities from an innovation output perspective in the future under the current spatial framework, which will continue put pressure on the Australian economy when political pressure to support lagging regions is periodically brought to bear. Increased regional innovation will reduce the necessity to subsidise lagging regions, will boost the economy, and will increase the capacity of regions to support a larger percentage of the population.

Regional Australia already has innovative SMEs, but they may struggle to compete with cities from an innovation output perspective.

Regional inventions and innovative ideas with the potential for high impact are less likely to be commercialised under the spatial framework of current national innovation system. Regional tacit knowledge and enhanced regional innovation will however be essential in the future for solutions to the challenges that Australia faces including climate change, food security, and environmental issues. However, these innovations will require a continuing supply of skilled professionals but the wine industry has shown that this barrier can be overcome through enhanced knowledge flows. Achieving the required critical mass of human capital in the regions in other sectors however will require both lifestyle and career opportunities to be available. This will only come about if regional businesses continue to innovate and grow.

Accordingly, three policy recommendations platforms, as for this field might be discussed earlier, are recommended in this review:

- Assist innovative regional SMEs to grow by fostering new linkages with larger businesses as potential new suppliers/business partners;
- Maximise the NBN readiness of regional businesses by providing advice and training, including an understanding of both the opportunities and potentially detrimental effects of this infrastructure; and
- Enable regional businesses to develop a vastly enhanced networking capacity, beginning with existing networks that will link regional innovation actors with each other and with metropolitan innovation networks for greater knowledge transfer. Seek also to foster communities of practice and virtual communities of practice through the use of NBN and other technologies.

These recommendations are consistent with place-based policy paradigm, drawing on the innovative capacity that is already present in regional SMEs. They harness the vital role of knowledge networking in an innovation geography/architecture. They also take account of the NBN which will have potentially large step change impacts in the regions. Significantly, they also facilitate the growth of existing businesses and potential emergence of new businesses which will be critical to achieving sustainable regional innovation and growth in Australia.

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