

Innovation, Regional Innovation Systems (RISs):

European Experiences and Regional Australia
application

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Introduction

This paper explores the potential revived research interest with the innovation process to inform potential new economic pathways for regional development in Australia, taking inspiration from the European experience. Globalisation has caused economic uncertainties that can undermine the ability of a regional economy to sustain economic growth and obtain the associated benefits to its community. The problem is significant because regional economies are vital to the prosperity of the national economy. Furthermore, the economic disparities between regions can cause economic stress, creating inequalities and the need to develop effective contemporary regional economic development policies and strategies.

The *absorptive capacity (AC)* deriving from Cohen and Levinthal (1990) literature examines the 'micro-economic' behaviour of individual economic actors (*enterprises, public or private, multinational or local, institutions of learning, R & D, and governments*) within a region in terms of location choices, productive and innovative capacity, competitiveness, and relations (collaborative networks) with the local system and the rest of the world (Capello, 2011, p. 11). Vitartas, Kinnear and Charters' (2013) study identifies the importance of innovation for regional Australia to remain internationally competitive and contribute to national productivity. Vitartas, et al, state there is limited research that reports on the levels of innovation in regional Australia, and few accounts of what support measures are likely to be most effective in terms of increasing innovation.

The Australian regional context will be important to appreciate in seeking to adopt findings from the European innovation systems and policy experience to combat the economic forces of globalisation. To a large extent the barriers for Australia in this regard include:

1. a weaker Federal Government policy due to:
 - o prevalence of 'neo-liberalism' policy;
 - o recent post 2010 GFC 'austerity measures' (with '*tighten the belt*' – '*everyone doing the heavy lifting*' Federal Government policy proclamations);
 - o recent decline and over-reliance upon the resource commodities boom;
2. a narrow understanding of the function, economic path dependency and organisation of regional Australia and the potential policy role of '*regional innovation systems*' to support' for regional economic development; and
3. the growing socio-economic geographical impacts of the '*regional – city/urban*' relationship (divide), particularly in light of:
 - o dealing with economic development, and
 - o the access and application of innovation, knowledge/learning and technological advancement.

The proposed research will draw upon European findings and lessons of the importance of innovation systems and the 'learning region.' The aim is to reframe the narrative of regional development in Australia to allow for recombination of knowledge with the prospective of renewed regional innovation and economic growth. This academic study is interested in the local (endogenous) economic factors to give better insight to

the pure 'classical' exogenous economic models of growth and development. Furthermore, there is an increased economic value attributed to knowledge creation as a factor of production and its commercial application (innovation) to improve the economic productivity and competitiveness of regions. The economic value of knowledge relates to the 'new knowledge' global economy in advanced technological industries such as Nano-technology and emerging new science and technologies and digital Information and Communications Technology (ICT).

Australia's investment in R&D is below the OECD average for both the government (GERD) and private business expenditure (BERD). Both figures have fallen since 2008-09 as a percentage of expenditure, private business investment dropped to 27th of all OECD countries in 2011 from 23rd in 2010 (Commonwealth of Australia, 2014a, p.80). Figure 1 below shows Australia's direction government expenditure on R&D, versus indirect support via taxation incentives. The taxation incentives are substantially high in comparison to direct government funding, and this figure should be reviewed in light of business innovation performance annually and in comparison to other OECD countries. This figure is particularly alarming as private business investment in R&D in comparison to OECD countries is also low and the government has increased the use of tax incentives to stimulate private investment. Obviously R&D investment was one of the first things Australian businesses decide to cut back on during a financial crisis, such as the recent 2008-10 GFC. This would seem to be plausible explanation for the down turn in investment, and with hindsight not the best strategic decision.

The typical empirical evidence in terms of R&D intensity of an economy is measured on the percentage of GDP spent on R&D (or GERD - Gross Expenditure on R&D). To the year 2003 the average was 1.93% across Europe (Cooke et al; 2007, p.36), and the Australia figure around this time was about 1.73%*. Today there are still huge R&D investment and economic disparities between EU nations and its regions. The EU still falls behind the USA overall, with the exception of high performers from the Nordic region (Sweden, Finland, Denmark and Norway) that are at similar levels to that of USA and Japan. Other similar empirical studies (Capello and Lenzi, 2014) from more recent EUROSTAT data generally finds similar patterns with general improvements in Europe as EU works towards the target set under the Europe 2020 strategy target of 3% of all nations GDP to be spent on R&D. Australia's GERD as a proportion of GDP increased from 1.58% in 1996-97 to a 2008-09 peak of 2.25% that brought it closer to the OECD average of 2.33%. Since 2008-09, Australia's GERD intensity has fallen in successive years to 2.13% in 2011-12. This fall from its peak three years earlier has seen Australia's OECD ranking fall from 12th to 15th (Commonwealth of Australia, 2014a, p. 165). Source: ABS * <http://www.abs.gov.au/AUSSTATS/abs@.nsf/ProductsbyTopic/07E66F957A46864BCA25695400028C64?OpenDocument>

Research Problem

To be competitive in a global 'knowledge economy' the learning networks between all economic actors is fundamental for innovation to take place in regional Australia. Current absorptive capacity and traditional assets will be insufficient and form barriers to regional innovation. The proposed research is to examine the spatial location of the different modes or phases of the knowledge creation (learning, R&D activities), knowledge attraction and innovation diffusion' process, including the interactions between SMEs and other economic actors involved with regional economic development. The research is specifically interested with the absorptive capacity of industry (namely SMEs capabilities) to access or source new knowledge and how it is

commercially applied (innovation activity) to promote new economic development within or between industries and the spillover effects to the region.

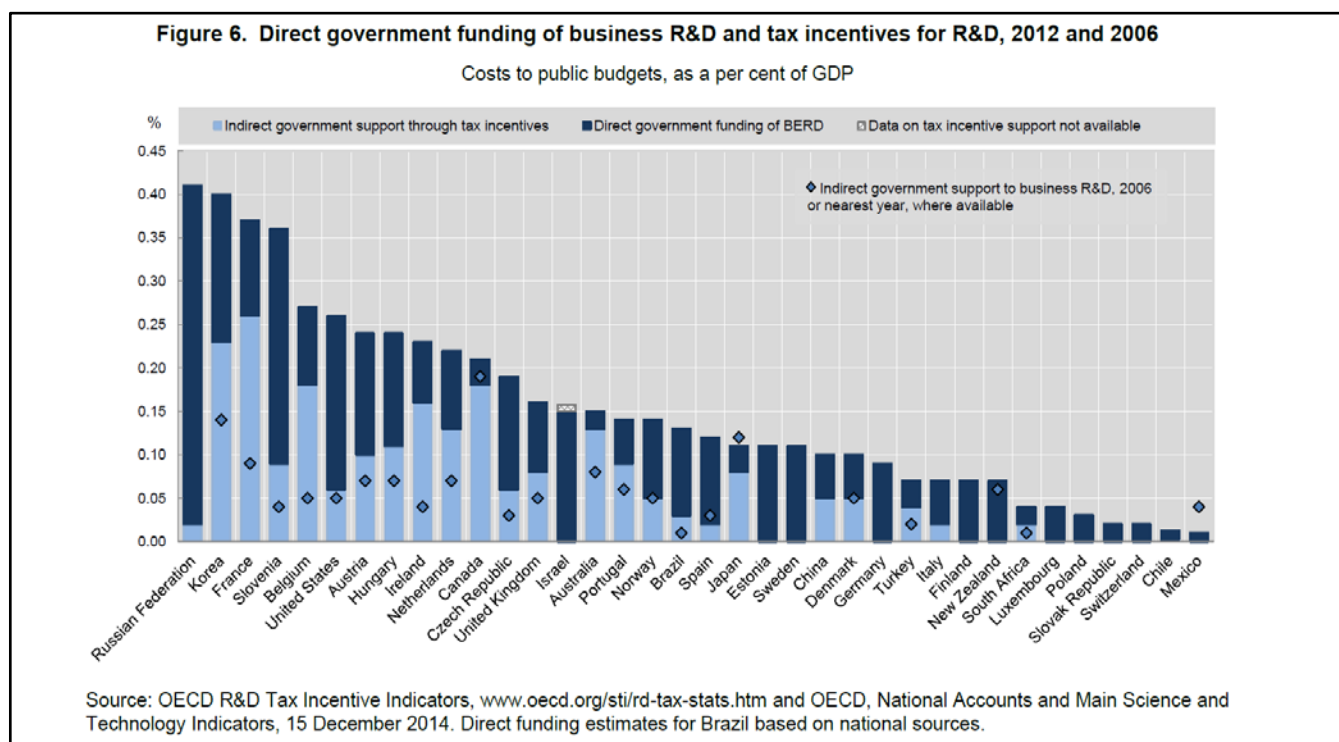


Figure 1: Direct Government funds and tax incentives for R&D 2013 and 2006

Understanding how inventions, new ideas and knowledge is applied commercially in the innovation process and their territorial (spatial) patterns is crucial in understanding the ways in which regions innovate and contribute to economic growth and development (Capello, 2013, p. 187). The proposed research explores endogenous factors of a 'placed based' approach to the study of regional economic development, innovation and knowledge. It is based on the 'micro-meso' level details of socio-economic behaviours and relationships between individual economic actors and territory and location or 'innovation systems'. Of significance is the identification of endogenous factors elements that pertain to the absorption capacity to innovate from the 'new knowledge economy' literature. This is embedded with the notion of 'regional innovation systems' (RISs) founded in theories of economic clustering, agglomeration and knowledge – learning networks.

Other factors have to be accounted for, because, despite all things being constant, regions show differential capabilities to *absorb, adapt, explore and exploit* available knowledge into endogenous economic growth, namely through innovation. This can depend on such things as:

- the rate of entrepreneurship and new firm formation in the region;
- the innovativeness of existing firms, and their ability and willingness to shift into new sectors and product lines;
- the access to finance (i.e. venture capital) for investment;
- the diversity of the region's economic structure; and
- the availability of labour of the right cognitive skills, *and similar factors*.

Regional Innovation Systems (RISs)

The research will give regard to the spatial aspect to a region's ability to access and maximise the innovation process through *Regional Innovation Systems* (RISs'). This has revealed the virtues of collaborative and networked regions of innovation practices adopted by RISs policies. These are defined as those policies able to increase the innovation capability of an area and to enhance local expertise in knowledge production and use. Such policies should look for targeted interventions to suit each single territorial innovation pattern, aiming to reinforce regional innovation processes and the characteristics of each innovation pattern. This is with the deliberate intent to upgrade the local specialisation and diversify the regional economy into related technological fields (Camagni and Capello, 2013). The role of innovation to regional economic development lies with its advocacy as a means to stimulate economic development and growth by diversifying struggling (lagging) regional economies, improving productivity and development of specialised industrial structures to create a 'constructed advantage' to a regional economy.

The ability to absorb knowledge is known as 'absorption capacity' originally coined by Cohen and Levinthal (1990). Crescenzi (2005, p. 475) states the capacity of a business to identify, absorb, transform and exploit external knowledge is an important way to achieve superior innovation and financial results over time. A recent unpublished Australian Government Department of Industry survey of 650 Australian businesses across Australia found that businesses that reported high levels of absorptive capacity significantly outperformed businesses with low absorptive capacity in almost all performance measures, including market share growth, employee productivity, the percentage of revenue from exports, the percentage of revenue from new goods and services, and the extent of world-first innovation (Commonwealth of Australia, 2014a, p. 127).

Perrem (2011, p. 12) suggests Australia's regions suffer from limited innovation assets and a low human capital base (education and skill levels) and that without connecting with knowledge flows and collaborative networks, regional innovation will not be successful. This reduces the absorptive capacity of regional businesses such as Small-Medium Enterprises (SMEs) and impacts upon productivity and employment growth (Perrem, 2011, p. 24). Australian regions must work hard to develop more effective linkages internationally, to increase the synergies between larger firms and SMEs, particularly as most regional businesses are SMEs, (Perrem, 2011, p. 34) to create effective innovative processes towards regional development (Perrem, 2011, p. 36).

The Commonwealth Government measures Australian business innovation each year in an annual report called the *Australian Innovation System Report* based on the ABS 8158.0 - Innovation in Australian Business Characteristics Survey (BCS). The proportion of businesses that were innovation-active (i.e. those that undertook any innovative activity) in 2012-13 was 42.2%, a decrease of nearly 4.5% from the previous year.

Summary of innovative activity in Australian business(a), key indicators, 2010-11 to 2012-13				
		2010-11	2011-12	2012-13
Estimated number of businesses	'000	764	776	770
Businesses that introduced any new or significantly improved(b):				
goods or services	%	17.3	20.4	20.0
operational processes	%	16.4	19.1	16.9
organisational/managerial processes	%	18.9	23.0	20.2
marketing methods	%	16.8	19.9	18.8
Businesses that introduced innovation (innovating businesses)	%	33.3	41.3	36.6
Businesses with innovative activity that was(b):				
still in development(c)	%	19.6	24.9	22.8
abandoned	%	5.7	6.9	5.9
Businesses with any innovative activity (innovation-active businesses)	%	39.1	46.6	42.2

Consistent with previous results, the proportion of innovation-active businesses was greater for each successive employment size range. Results show businesses with 200 or more persons employed were more than twice as likely as businesses with 0-4 persons employed to be innovation-active (74% compared with 35%). It is important for users to note that the population varies considerably between each employment size range. For example, 74% of businesses with 200 or more persons employed being innovation-active represent approximately 3,000 Australian businesses, while 35% of businesses with 0-4 persons employed being innovation-active represent approximately 163,000 businesses.

Summary of innovative activity in Australian business, by employment size(a), 2012-13						
		0-4 persons	5-19 persons	20-199 persons	200 or more persons	Total
Estimated number of businesses(b)	'000	466	243	58	4	770
Businesses that introduced innovation (innovating businesses)	%	28.9	45.8	58.3	66.8	36.6
Businesses with innovative activity that was(c):						
still in development(d)	%	18.3	27.8	35.6	51.4	22.8
abandoned	%	5.3	6.9	6.3	4.4	5.9
Businesses with any innovative activity (innovation-active businesses)	%	34.7	51.0	63.4	74.3	42.2

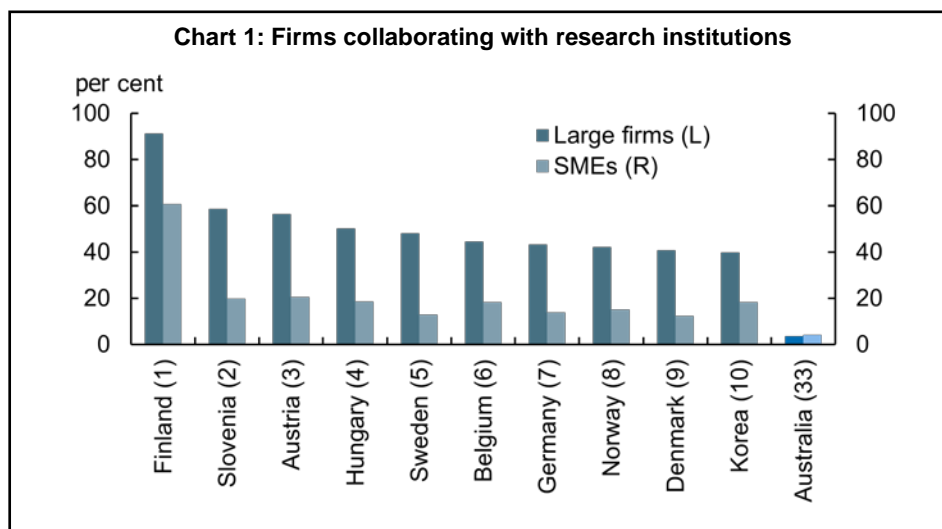
(a) Proportions are of all businesses in each output category.
(b) Business counts are provided for contextual information only, and the total may not sum to the total of the components due to rounding. Refer to Explanatory Notes 19 and 20.
(c) Businesses may be counted in more than one category.
(d) As at the end of the reference period 30 June 2013.

Source: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/06B08353E0EABA96CA25712A00161216?opendocument> accessed 15/08/2015

Collaboration between Universities, R&D organisations and industry in Australia is one of the lowest in the OECD. Australia performs well on measures of research excellence, which is an important factor for achieving research translation. More than 3.5 per cent of the world's top highly cited international research publications involving Australian researchers. As such they perform above their weight relatively speaking on a per capita basis. However, Australia challenges in turning ideas and research into commercial results. According to the Global Innovation Index, we are 81st out of 143 countries on how effectively we get returns from research, ideas and institutions. Australia ranks last out of the 33 countries listed by the OECD on the proportion of businesses who collaborate with research institutions on innovation (Chart 1). Source: *OCED, 2013 and Commonwealth of Australia 'Industry Innovation and Competitiveness Agenda' An action plan for a stronger Australia, 2014b, p.74.*

The level of assistance and forms of intervention with regional economic development from the Federal government has varied over the last two centuries; much of the attention has been to address a wide raft of issues and concerns (key challenges) namely the high variability of regional economic performance; and

the emerging two speed economy (growth of resource boom and decline of manufacturing) (Beer, 2012, p. 273).



In light of all the changes occurring within Regional Australia, the theme for this research pertains to capacity to adapt and innovate to continue and sustain economic development and growth. Cocklin and Dibden (2005) in Beer 2012, p. 274 note two key concerns with rural (regional) industries and in many respects the failure of rural economies to:

- either foster the development of new industries, or
- enhance the profitability of existing production systems, which has contributed to the decline of these regions (O'Connor et al, in Beer, 2012, p. 274).

In the absence of significant innovation or new enterprise development, many regions and centres face bleak prospects (Cameron and Gibson, 2001 in Beer, 2012, p. 275).

Sources of ideas or information for innovation(a)(b), by employment size, 2012-13					
	0-4 persons %	5-19 persons %	20-199 persons %	200 or more persons %	Total %
Within the business or related company	55.0	61.7	68.0	88.9	59.4
Clients, customers or buyers	42.2	36.8	46.0	34.3	40.5
Suppliers	25.1	26.8	31.6	24.0	26.5
Competitors and other businesses from the same industry	27.8	31.1	35.5	32.7	30.1
Consultants	15.6	20.6	29.4	35.7	19.4
Universities or other higher education institutions	3.1	2.8	2.7	6.4	3.0
Government agencies	2.8	2.1	5.4	11.0	2.9
Private non-profit research institutions	1.4	np	1.1	1.3	0.9
Commercial laboratories/research and development enterprises	1.0	0.9	1.3	2.0	1.0
Websites, journals, research papers, publications	31.5	27.7	28.5	21.8	29.6
Professional conferences, seminars, meetings, trade shows	20.7	25.3	26.7	28.6	23.3
Industry associations	16.5	15.9	24.0	18.8	17.2

Source: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Latestproducts/8158.0Main%20Features62012-13?opendocument&tabname=Summary&prodno=8158.0&issue=2012-13&num=&view=> accessed 16-08-2015

European Regional Innovation Policy and Economic Innovation Performance – ‘Closing the Gap’ or ‘Mind the Gap’?

Regional innovation policies have been a prominent economic solution to address the economic differences and disparities between European regions. Pylak observes...

In Europe, regional economic differences have persisted or even increased following the implementation of the European Union's (EU) Cohesion Policy. The Cohesion Policy originally been seen as a redistribution (1970–86) and catch up (1988–2013) tool has yet to achieve economic convergence between nations. Despite their efforts, less developed regions have for centuries faced difficulties when it comes to matching the economic growth of the more developed regions (Pylak, 2015, p.46).

The European Union with its single currency has needed a way to ensure a strong cohesive economic force against major global economies and trading partners. The amalgamation of the union from a variety of different countries and socio-economic backgrounds and conditions, with varying degrees of economic performance, has meant the EU has sought to ensure member states improve their economic competitiveness and productivity. The role of innovation in regional economic development and specifically the creation and nurturing of existing and new industries (economic pathways) is at the forefront of European economic policies and strategies.

The review of economic data for the NUTS 2 and NUTS 3 European regional statistical areas reveals a number of trends on the impact and performance of the level of 'cohesive investment' in peripheral or lagging regions of Europe. As supported by the *Europe 2020 Strategy* a target for domestic R&D expenditure was set to be increased to 3% of a nation's GDP expenditure. Data results showed a strong variation across regions on R&D expenditure in Europe as a percentage of GDP, ranged from values lower than 0.5% to more than 6.0%, with only 12% of NUTS2 level regions meeting the target (Capello and Lenzi, 2014). The majority of regions have yet to achieve this outcome, and furthermore there are a large number of regions below the 0.5% mark, making the target both an optimistic and worthwhile goal to pursue with a number of observations moving forwards.

The conclusions from the work of Capello and Lenzi (2014 p.208) for Europe are many. Essentially a 'one fit size' regional innovation policy as a blanket approach for addressing regional economic differences will only work once the specific patterns of regions are understood. These patterns are unique to 'place' and relate to the historical growth pathways, the capacity between economic actors to operative in a system of innovation to support the flow and interchange of knowledge and willingness form all participants in a regional system of innovation to deliberately encourage absorption of knowledge by firms and industry. Specially, the narrative of knowledge and industry innovation moves to matters of firm's absorption capacity to access a 'related variety' (Frenken et al. 2007) of differentiated knowledge bases and sources (Cappello and Lenzi, 2014, p.189), both existing and emerging technologies, to engage in the process of knowledge recombination as per Schumpeter theory.

The above discussion provides a prelude to the revolution of a wide range of evolutionary economic geography theory and discourse, too ambitious for this paper. The creation of local responses to unique innovation opportunities for industry is seen as a process of re-creating new economic pathways. This is expressed in terms of moving away from historical path dependency towards path inter-dependency and constructed regional advantage.

Constructing regional advantage is based on several platform pillars and emerging concepts to re-framing regional economic development. Within a systematic approach still (as per RISs theory) industrial and innovation policy are merging into a multi-industry sector discussion regarding the role of new knowledge and technology bases to creating new industrial pathways for regional areas. This new knowledge is re-created by the process of combining knowledge in traditional allied and non-allied industry sectors and the emerging '*next production revolution*' industries (OECD, 2015, p.3). Examples include regions in core and peripheral parts of Europe such as Swedish regions as Västra, Götaland and Skåne. These examples show regional systems adapting due to the exercise of 'transversality' and 'related variety' as regions and firms sought innovation by stimulating information flow and knowledge appreciation among unlike kinds of industrial clusters (Cooke, in Fischer and Nijkamp (Eds), 2014 p.471). See also (Cooke 2013), (Cooke 2012a), (Cooke 2012b), (Cooke 2011) and (Asheim, Boschma & Cooke 2011) for further information.

Current Federal Government Initiatives

The Industry Growth Centres Initiative (the Initiative) is the centrepiece of the Government's new industry policy direction and part of the Industry Innovation and Competitiveness Agenda. The Initiative will enable national action on key issues such as deregulation, skills, collaboration and commercialisation. The Initiative is ongoing with \$225 million in Australian Government funding over the four years from 2015/16 to 2018/19. Industry Growth Centres are being established to deliver the Initiative in five growth sectors in which Australia already has a competitive advantage, these are:

- Advanced Manufacturing;
- Food and Agribusiness;
- Medical Technologies and Pharmaceuticals;
- Mining Equipment, Technology and Services; and
- Oil, Gas and Energy Resources.

The Centres will enable businesses with winning strategies to self-select and grow, by removing impediments and unlocking potential at the industry level. The Centres will encourage organisations to work closely together to unlock commercial opportunities and reduce risk. Among other things, the Centres will encourage businesses in these industries to form commercial research and development partnerships with each other, and with the research sector, which international evidence shows occurs at a significantly lower rate in Australia than in other OECD countries (OECD, 2013).

Conclusions

The European regional innovation experience and research has some interesting applications that will be further developed in the proposed research. The interest relates to the potential application of the European regional innovation policy framework and 'systems approach' to regional Australia. Regional Australia, which is namely the non-metropolitan areas are somewhat different to European regions. If I compare the European statistical regional area known as 'NUTS 3' to the 'SLA 4 'regional level' used in Australia for the ABS Labour Force Surveys' there is some relevancy for comparison purposes. However, our regions tend to have smaller population sizes and obviously with lower densities sparsely spread over larger land mass than in Europe.

To create new economic pathways for regional Australia as part of the research proposal investigations could consist of the following points:

- Ensuring the integrity of R&D investment and expenditure directly gets to regional industries and benefits them in terms of *exploration and exploitation of knowledge and technology*. As demonstrated by Capello and Lenzi (2014) it is very dependent on human skills and capacity (cognitive proximity as per Boschma, 2005) and the ability to commercialise new ideas and inventions into innovation.
- Placing an emphasis on the need for a 'systems approach', with enhanced knowledge networks of collaboration between regional actors, particularly in light of current restrictions on R&D investment in Australia and the knowledge spillover implications for regional Australia.
- Examining opportunities for Australian Industrial sector policy to look within and between existing industries to combined and re-combine knowledge and technological bases to form the basis to developing new industries through product development and innovation.
- Focussing upon SME's absorptive capacity in regional Australia to be innovative as an important role for SME's within the Australian business and economic landscape.

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Appendix 1: Research Methodology

It is proposed to examine up to 3-4 different regional locations in Australia to research the absorptive capacity of SMEs across specific high technology industry sectors and knowledge intensive business services to be innovative. It will examine a wide range of factors to regional capacity to be innovative and develop potential policy directions for adopting RISs policies. There has been substantial and clear change in industrial development and employment patterns (growth rates by different industries) across the regions of Ballarat, Bendigo and Geelong. The strongest (highest) employment growth trends have been recorded with the following patterns:

- (a) **Agriculture, Forestry and Fishing** in Ballarat with a 5 year growth rate of 10.3%; and
- (b) **Manufacturing** in Bendigo with a 5 year growth rate of 4.8%;
- (c) **Education and Training** in Geelong with a 5 year growth rate of 3.5%.

The research will explore by case studies, structured and semi-structure interviews and focussed group interviews the role of innovation and presence of a regional system (s) to support innovation between the economic actors of the specific region and/or industry representatives within high employment growth industries in attempt to answer the research statement/question. Survey methods, interviews and questionnaires following methodologies deployed by Doloreux (2004), Hemert et al (2011), other innovation survey examples that are based on the OECD Oslo Manual will be developed.

Table 1: Selected Regional Employment Growth #

Region	Measure	Industry change (positive - growth)	Industry change (negative - decline)
Ballart	Industry Employment Growth - year to November 2014 ('000)	Agriculture, Forestry and Fishing + 7.3%	Manufacturing - 2.2 %
	Industry Employment Growth - 5 years to November 2014 ('000)	Agriculture, Forestry and Fishing +10.3 %	Manufacturing-4.0%
	Industry Share of Region Employment - year to November 2014 (%)	Agriculture, Forestry and Fishing +15.3 %	Mining 0.7%
	Region Share of Australian Employment - year to November 2014 (%)	Agriculture, Forestry and Fishing +3.4 %	Electricity, gas, water and waste services 0.1%
Bendigo	Industry Employment Growth - year to November 2014 ('000)	Manufacturing + 5.3%	Transport, Postal and Warehousing -2.2%
	Industry Employment Growth - 5 years to November 2014 ('000)	Manufacturing +4.8%	Transport, Postal and Warehousing -2.2%
	Industry Share of Region Employment - year to November 2014 (%)	Manufacturing +13.7% Health Care & Social Assistance +14.1% Retail +14.5%	Information Media and Telecommunications 0.8%
	Region Share of Australian Employment - year to November 2014 (%)	Manufacturing 1.1%	Information Media and Telecommunications 0.3% Transport, Postal and Warehousing 0.3%

Geelong	Industry Employment Growth - year to November 2014 ('000)	Education and Training + 3.5%	Manufacturing -4.2%
	Industry Employment Growth - 5 years to November 2014 ('000)	Education and Training +3.9%	Manufacturing -4.6% Retail -6.4%
	Industry Share of Region Employment - year to November 2014 (%)	Education and Training 10.9% Health Care & Social Assistance 16.2%	Electricity, gas, water and waste services 1.0% Rental, Hiring and Real Estate Services 1.0%
	Region Share of Australian Employment - year to November 2014 (%)	Education & Training +1.4% Arts & Recreation Services +1.9%	Financial and Insurance Services 0.4%

Source: ABS Labour Force Surveys 6291.0.55.003 - Labour Force, Australia, Detailed, Quarterly, Nov 2014

#Employment / labour data as a measurement of economic growth and development, rather than such measures as regional gross domestic product (regional GDP), which are difficult to calculate and can be unreliable. Martin (2012) states employment growth data is a more accurate measure of regional economic performance, particularly after an economic impact or shock.