Charles Sturt University

Submission to

The Senate Inquiry into Australia's Innovation System

July 2014

Front Cover:
TOP: CSU Rhyzolysineter Laboratory, Wagga Wagga; CSU Biomedical Science Building, Orange
BOTTOM: CSU Vineyard, Orange; CSU National Life Sciences Glass Houses, Wagga Wagga

Introduction

The primary driver of productivity growth, both at the national and at the firm level, is the ability to innovate and do things differently. While there can be strong incentives for the private sector to innovate, private markets left to themselves would generally underinvest in research and development because of the spill-over benefits to the broader community.[1]

It is therefore crucial that governments foster a culture of innovation through significant public investments in research and development and appropriate policy settings which encourage private investment in research. It is also crucial that these investments are geographically focussed in areas where industry is located so that strong partnerships between researchers and firms can occur.

At the community and individual levels, new technologies and ways of doing things can have an extraordinary impact on people's lives. Charles Sturt University contributes in a range of areas to its communities through research and innovation. Examples include the research of Professor Sharynne McLeod, which is helping multilingual children who suffer with speech sound disorders and the work of Dr Maree Bernoth on the conditions in residential aged care. CSU also plays a leading role in agriculture research, environmental management and wine science (see below for further detail).

Innovation, application and extension

It is important here to have a broad view of innovation, one which not only recognises the creation of new technologies and ways of doing these things but also recognises the importance of applying this research in practice. Without application of innovations into the practices of firms and industries, the benefits of research are not fully captured.

Research application is most evident where there is strong collaboration between industry and researchers. The importance of collaboration and its links to location is important to explore. The application of research can often be best achieved where there are location based clusters of researchers and industry. Such clusters often circle around a university, as a university provides the research capacity and graduates needed by industry. In addition, universities can generally be relied upon to be a continuing presence in the region, which can see long term research through and are trusted within the community. Universities are also large employers and bring revenues to local business.

Two high profile examples of university contributions to regional clusters are Stanford University's role in Silicon Valley with CISCO, Yahoo and Google and the region around Cambridge with the St John's Innovation Centre. Another relevant example in a regional setting is that of Dundee in Scotland, where a strong life science industry has formed (employing over 4,000 people) located around two universities with strong life science research reputations. However, universities are not always successful in adapting their research into commercial initiatives and forging links with industry. This 'gap' between research activity and industry application is particularly evident in Australia.

[1] See Productivity Commission, 'Public support for Science and Innovation', Research Report, 2007, chapter 3.

Overcoming barriers to research application

A key to overcoming this 'gap' or barrier to research application is to implement geographically focussed research strategies which concentrate research in particular locations so as to build critical mass for successful collaboration between researchers and industry.

Short term and one-off funding for projects in particular locations is unlikely to result in ongoing collaboration with industry. Such an approach fails to provide certainty to businesses considering research collaborations, nor does it provide the certainty needed for universities and research institutes to develop their research infrastructure or to formulate commercial spin-offs.

A geographic focus is also important in terms of proximity to relevant industries. Collocation of research and industry ensures that the research is well informed by business practice and targeted towards the problems that industry is facing. Collocation also maximises the chance of research being implemented.

Rural areas in Australia face particular challenges in innovation because geographic distribution limits the opportunities for businesses to cluster in a single location, which in turn limits the speed of dispersion of innovations into industry practice. This highlights the important role that regional universities play in acting as hubs for research activity and knowledge dispersion, with a multi-campus presence allowing for linkages across locations.

Charles Sturt University is particularly well placed to foster successful regional innovation ecosystems, being strategically located at the centre of many rural industries. For instance, the Graham Centre for Agricultural Innovation (which is run in partnership with the NSW Department of Primary Industries) has leveraged off its proximity to the grain and livestock industries by developing strong partnerships between growers and industry groups, and researchers. The Graham Centre plays a role throughout the research, development, extension and training continuum, and by doing so, enhances on-farm profitability and enriches rural communities in Australia and across the developing world.

For example, the Graham Centre's weed management research is leading to new non-chemical control tactics that will help growers combat widespread herbicide resistance in weeds in crops and pastures. Graham Centre researchers are also developing new annual hard seeded legumes as break crops that improve soil nitrogen and provide an animal feedbase, which will improve resource use efficiency, reduce costs of nitrogen inputs and increase animal production.

Ongoing industrialisation in Asia and the rapid growth of the middle class is presenting many opportunities for the Australian agricultural sector. Growth in incomes in Asia is likely to lead to increased global demand for agricultural products such as vegetables and fruit, meats, dairy products, cereals and fish.[2] Through appropriate investments in research and development from government and grower groups, research centres with strong industry links such as the Graham Centre can help improve agricultural productivity so that Australia can take advantage of this extraordinary export opportunity.

[2] Linehan V, Thorpe S, Andrews N, Kim Y & Beaini F 2012, Food demand to 2050: opportunities for Australian agriculture, Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) Outlook conference paper no. 12.4, Canberra.

The importance of collocation of research and practice also applies in areas of public policy such as environmental management. Researchers from CSU's Institute for Land, Water and Society, who live and work within the Murray-Darling Basin, are gaining new insights into the relationships between water delivery and downstream water quality and ecology which is informing government decisions on the management of water flows. This research has informed critical interventions with environmental water, such as contributing to the successful breeding of the threatened southern bell frog in the Murrumbidgee catchment, and improving water quality to prevent hypoxic blackwater and associated fish deaths in the Edward-Wakool system.

Research, innovation and regional development

Innovation and clustering also has important links to regional development. The factors which influence innovation systems such as learning capability, research and development intensity and inter firm relationships all vary from region to region – hence there is a need to focus on the regional perspective. The success of the regional economy depends ultimately on these evolutions. A successful region is one in which significant numbers of local businesses adapt to new market opportunities by introducing commercially successful new products or services innovations repeatedly over time. Not all regions adapt with equal success and within a region, different businesses perform differently.

The absorptive capacity of research and development is an important factor in determining economic performance and the importance of being able to absorb the knowledge generated by public institutions. This is referred to as the Regional Innovation Paradox, in which there is 'an apparent contradiction between the comparatively greater need to spend on innovation in lagging regions and their relatively lower capacity to absorb public funds earmarked for the promotion of innovation and to invest in innovation related activities compared to more advanced regions'.[3]

The term "region" could even apply to a country or continent. That is, the more innovation is needed in poorer regions to increase competitiveness of the firms, the more difficult it is to absorb public funds for the promotion of innovation in these regions. Such regions also tend to have few large multinational firms undertaking research and development with poor links to local economy and a concomitant difficulty in assessing expert need. Lagging regions tend to under invest in research and development and innovation activities and appear to face difficulties in utilising public resources for innovation. Business in lagging regions demonstrate little demand for research and development or innovation activity and lack a tradition of cooperation between business and other universities. Business do not demand innovation inputs and the research and technological infrastructure is not embedded in the regional economy, so that providers of capabilities of the firms. Hence a fragmented Regional Innovation system.

In the United Kingdom a number of approaches have been undertaken by the Technology Strategy Board (TSB) to address this issue and the gap between research activity and industry implementation. The approach of the TSB is to sculpt, guide, direct and develop leadership for the linkage from innovation and discovery to application and act specifically when necessary to gain market readiness. Three approaches which would be worthy of the Committee's consideration are:

[3] Oughton, C., Landabaso, M., & Morgan, K., *The Regional Innovation Paradox: Innovation Policy and Industrial Policy*, The Journal of Technology Transfer, 02/2002; 27(1):97-110.

1. Knowledge Transfer Partnerships – see http://www.ktponline.org.uk
2. Knowledge transfer networks – see https://www.innovateuk.org/-/knowledge-transfer-networks
3. Catapults – see https://www.catapult.org.uk/

Funding models which promote innovation and collaboration

A particularly successful model for research funding and collaboration are the arrangements in place for rural research and development corporations, where revenues raised from industry levies are matched by Commonwealth funding. The co-funding arrangement acknowledges both the private benefits that accrue to industry and the broader public benefits that arise from the research.

The model provides for industry to have a say in guiding research priorities and directing public investment to priority areas. The close involvement of industry also provides for greater likelihood of the application of the research in practice.

The Australian Research Council plays a strong role in facilitating research collaboration through its Linkage Projects. There is also an ongoing fundamental role for the Australian Research Council to support pure research across all disciplines.

Professional practice and management

One aspect of innovation that is often underappreciated is research into professional practice. While technological innovations often grab the headlines, improvements in professional practice and management can have just as critical impacts on peoples' lives. For example, improvements in primary school teacher practice can have dramatic effects on the educational attainment of students which can have enormous impacts on post-school career outcomes.

The same can be said for research into management in areas such as agriculture, the environment and health. For example improvements in regional natural resource management decision making, can have profound impacts on the agricultural sector, environmental amenity and the broader wellbeing of regional communities. CSU Professor Alan Curtis has played a leading role in this area, conducting groundbreaking research into the adoption of conservation practices by rural landholders, the evaluation of natural resource management programs and using social data to underpin catchment management. It is critical that government policies and research funding bodies acknowledge the importance of research into professional practice and management and fund them accordingly.

Human Capital

Another aspect of university contributions to innovation is the role that university graduates play in the creation, application and diffusion of knowledge. Mowrey and Sampat argue that the:

> "… joint production of trained personnel and advanced research may be more effective than specialization in one or the other activity. For example, the movement of trained personnel into industrial or other occupations can be a powerful mechanism for diffusion of scientific research, and demands from

> students and their prospective employers for 'relevance' in the curriculum can strengthen links between the academic research agenda and the needs of society."[4]

The extension of knowledge to undergraduate and postgraduate students by universities, and knowledge transfers between universities and private collaborators, create and sustain the knowledge workforce that supports continuous micro-innovations in the workplace environment. For example, Charles Sturt University was a pioneer in the use of screwcaps for wine in the 1970s, and successive graduates from CSU have promoted the use of screwcaps when they took up employment in the industry.

Equipping graduates with the necessary innovation skills through exposure to research environments at University is essential to addressing critical innovations in health delivery and promotion, export expansion and agricultural extension on the ground.[5]

Regional universities play a particularly important role in this regard in providing skilled and innovative graduates who then apply their talents in regional areas. For instance, 88 per cent of CSU on-campus graduates from regional areas then go onto work in regional or remote areas.

Conclusion

Charles Sturt University appreciates the opportunity to provide a submission to this inquiry and has senior representatives who are more than happy to appear at inquiry hearings.

The University would also be happy to host hearings at one of its campuses, or to host a delegation of Inquiry members. We believe this would give Committee members the opportunity to see first-hand the important research that is being conducted at the University and how this research is being applied to the benefit of communities.

[4] Mowrey, D., & Sampat, B. (2003) Universities in national innovation systems, Presentation to the Globlics Academy. Downloaded from http://www.globelicsacademy.net/pdf/DavidMowery_1.pdf
[5] See CSU Submission to 2008 Review of National Innovation Systems for further detail, http://www.csu.edu.au/division/vcoffice/papers/submissions/Submission-National-Innovation-Review.pdf