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A Proposal for Industry-Led Innovation Consortia

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Abstract

Australia has strengths in a number of industries and is well served by a number of government-led programs to encourage knowledge diffusion, knowledge absorption and innovation linkages. It would benefit however from more *industry-led* consortia — similar to the rural R&D corporation program — in the non-agricultural and non-mining industries. These R&D corporations embody the desirable features of stability, additionality, trust and connectedness. Furthermore, they have explicit channels of translation and industry buy-in that make them suitable architecture for industry knowledge creation and diffusion.

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Introduction

Innovation — the introduction of new-to-the-firm or new-to-the-world products and methods of production — is a necessary requirement for ongoing competition. Without innovation, other types of competitive action — advertising, training or price cutting — are subject to diminishing returns that quickly fall to zero. You cannot keep cutting prices without making your production method more efficient and there is little point forever increasing staff training if your products and production methods are static. Over the long haul therefore, businesses must change their product line-up or mode of production in order to remain competitive. The major side-effect of this competitive process is that businesses raise national productivity and thereby our standard of living. Empirical studies consistently find that spending on R&D raises productivity both in the business that undertakes the R&D and in surrounding businesses (Hall, Mairesse and Mohnen 2010).

However, from a policy perspective, new-to-the-world innovation is not just another business investment. Because frequently it is not possible for the business which has funded the up-front costs of innovation — chiefly the costs of creating and making the idea commercial-ready — to reap most of the benefits from the innovation, good ideas lapse and fall by the wayside. That is, many ideas that would have considerable benefit to society are not profitable for business. Moreover, new-to-the-world innovation is challenging for society in another respect: it is highly uncertain. The degree of uncertainty associated with investments into innovation dwarfs the uncertainty associated with investments into physical assets. There comes a point at which some investments are too risky for even the largest business to undertake (think of space exploration). In this situation, society as a whole, using government as their agent, bears the risk.

Whereas we have a clear rationale for public support for new-to-the-world innovation, there are some circumstances when assistance to promote new-to-the-firm innovation is also justified. When new-to-the-firm innovation spreads across a market, productivity rises, prices fall and consumers benefit. Accordingly, if an external intervention can hasten the path of laggard businesses towards the efficiency frontier, then there is a case for intervention.

How does Australia rank?

Successfully positioning oneself on the technological frontier is a high stakes game that requires businesses to adopt best practice behaviours and technologies all the way along the production chain. It is a myth that Australia's efficiency in mining and agriculture is principally due to our abundant natural advantages. Many countries in Asia and Africa also have substantial resources and rich pastures but have not been in a position to use them effectively. Our continued success in mining and agriculture is due to the combined efforts of specialist R&D, education and training, business service and finance sectors that deliver miners and farmers a high-performing innovation platform in which innovation can flourish.

However, there is a growing concern that we are not close to the technological frontier in other industries. Assessing how close Australia is to this frontier is not an exact science. Nonetheless, there are a number of regular international scorecards and benchmarking indices which give us an approximate clue as to how we rank next to our peers. The United Nations and the Organisation for Economic Co-operation and Development (OECD) are foremost in this activity and both produce regular reports that rank either our technologies or our innovation systems. In 2012, the OECD ranked Australia as 20th out of 26 countries on its patent quality index; the United Nations (UN) ranked us 23rd behind almost all other OCED countries on its Global Innovation Index. However, more worrying is that while the UN ranked us about 13th on the calibre of our innovation inputs (institutions, infrastructure, and knowledge workers), our innovation output was considered so low

that our innovation efficiency was ranked 107th in the world.[1] This was behind most OECD countries and many middle-income countries. What is letting us down is knowledge diffusion (86th), knowledge absorption (60th) and innovation linkages (36th). By contrast, our infrastructure and our political, regulatory and business institutions are ranked among the top dozen or so countries. We do well in some aspects but not others.

What I will argue here is that although we have strengths in a number of areas[2] and are well served by a number of government-led programs to encourage knowledge diffusion, knowledge absorption and innovation linkages (such as the Enterprise Connect, CSIRO, Australian Research Council and the medical research council industry cooperation programs), what is missing is industry-led programs in the non-agricultural and non-mining industries. In agriculture and mining we have a number of knowledge diffusion and linkage programs that industry leads such as AMIRA and the rural R&D corporations. However, equivalent institutional structures in other industries are scarce.

I believe businesses need to take the initiative to build knowledge creation and diffusion architecture for their specific industrial niche. Industries need to take the lead in identifying themselves as potential areas of national strength. Research has consistently shown that the qualities of management matter most as a driver of change rather than the industry.[3] If businesses take this initiative, the Government should be ready to provide matching funds in recognition that the benefits of this structure will extend to the community at large. The Australian R&D corporation model is one such collaborative structure that deserves closer inspection.[4]

An R&D corporation for all industries

R&D corporations are cooperative industry-owned groups that fund R&D for the benefit of the members. Source funds typically come from a mix of industry levies, membership fees and government funds.[5] This leaves industry free to design the mechanism by which these funds are allocated to R&D projects. Strategic R&D priorities are identified by the industry through a range of consultative activities and the research is targeted at specific industry needs. For this system to work, members must have similar technological needs and be able to find areas of common technological interest. As Australia becomes progressively integrated into the global economy, we are finding that our direct competitors come not from within Australia, but elsewhere in the world.

There are five desirable features that should be embedded in any knowledge creation and diffusion architecture: industry buy-in, stability, trust and connectedness, explicit channels of translation, and additionality. Our current rural R&D corporation model embodies most of these desirable features.

Industry buy-in. The R&D corporations are industry owned; they are funded by industry levies (with matching public money); industry decides on the R&D projects; and industry owns the resulting IP. Since the R&D corporations are owned by the industry, they have strong incentives to actively engage with their members. Members can potentially benefit without expending managerial resources on monitoring research projects or engaging with government policy; that is, each and every member does not have to be actively engaged in order to benefit from research. In addition, members tend to resist funding research projects that only benefit one business and focus on projects with maximum intra-industry benefits. R&D corporations have a significantly higher level of

[1] The authors of The Global Innovation Index 2012, p22 are quick to point out that high or low efficiency is not a goal per se but should be used to indicate where an economy is performing poorly.

[2] According to the Office of the Chief Scientist, Australia is above the European average in veterinary science, energy, engineering, earth and planetary sciences, and medicine (see West 2013).

[3] Bloom et al. (2007) and Green (2009).

[4] For further information, see Productivity Commission (2011).

[5] Rural R&D corporations are funded by industry and government in the ratio 1:1. Other industry groups differ.

industry funding than other collaborative schemes, such as Collaborative Research Centres and ARC and NHMRC Linkage grants, which leads to a much greater buy-in from industry.

Stability. Long-term durability in innovation architecture is essential to building a core of Australian R&D and commercialization expertise in specialist areas. Expertise is essential to being on the world frontier of research and technology and, to access this, R&D corporations typically outsource their research to public sector research bodies. Stability is also necessary for the knowledge about how to access and use the innovation system to penetrate throughout industry. Because the R&D corporation model is established by an Act of parliament, it is very stable. This enable players in the industry to plan ahead; a feature that is critical for developing efficient long term R&D and innovation responses to industry needs.

Trust and connectedness. Trading knowledge, know-how and other forms of intellectual property is fraught with uncertainty and vagueness which can often make it difficult for two parties to exchange knowledge and collaborate. Specialisation and exchange are however vital to sustaining a position on complex technological frontiers. Research has shown that trust, informal relationships and connectedness between people in the industry, and its broader constituent parts, is one way these costs to trade can be minimized (Jensen et al. 2013). The R&D corporation model builds networks which form the basis for trust.

Explicit channels of translation. Creating new ideas and technologies does not automatically mean they will be used and exploited. The R&D corporation model has an in-built extension program that ensures that ready-to-use ideas are transmitted to the end-user (for example, farmers). A similar model for other industries should also build in pathways for ensuring that new R&D and innovation results are delivered to firms.

Additionality. Public monies should aim to leverage business spending on innovation, and not replace it. There has been a lot of academic and government research, especially overseas, which seeks to quantify whether public monies create additional business spending on innovation. However, there is no consensus among the results which suggests it depends on program design.[6] Selecting R&D projects based on industry consensus, as in the case of R&D corporations, provides a clever solution to the additionality issue, since members will resist jointly funding research projects they are performing individually and will tend to focus on projects with maximum intra-industry spillovers.

How much government support should be given?

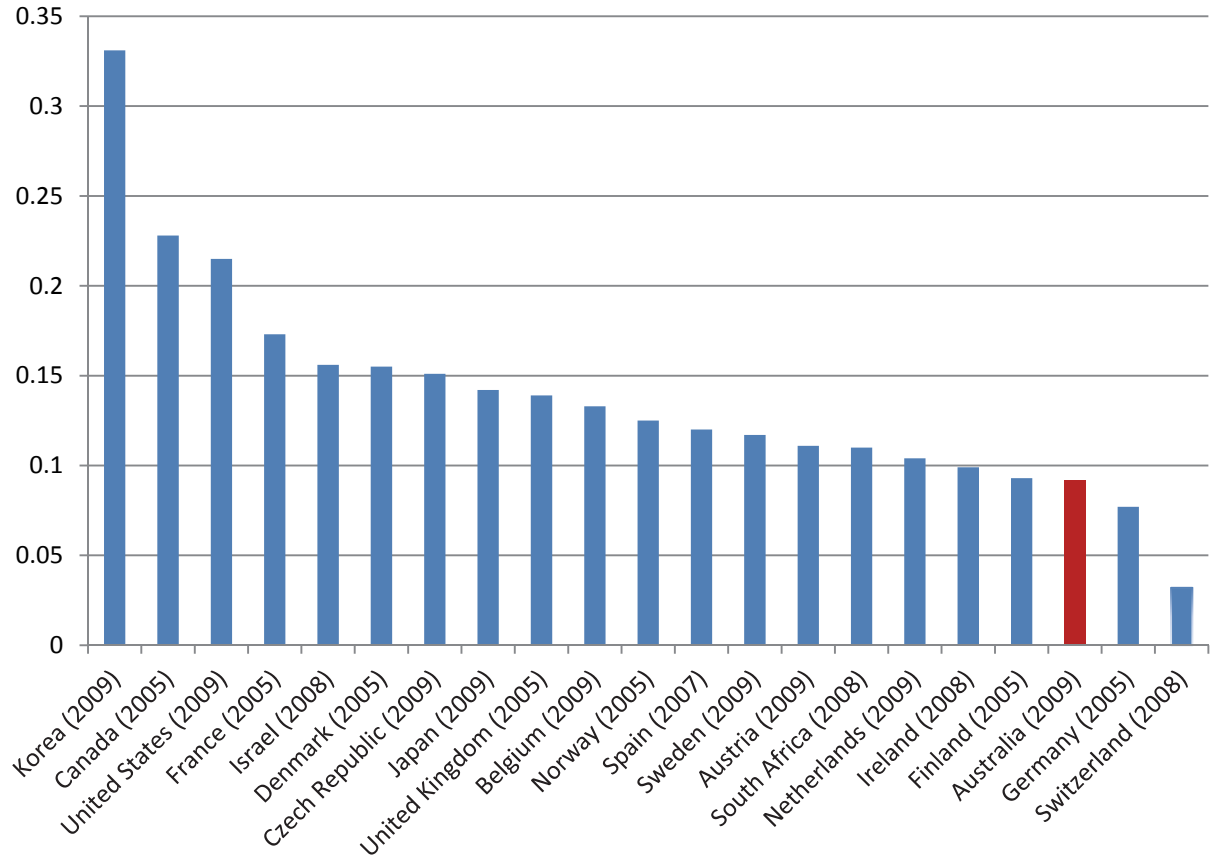
There are very strict principles in economics about what justifies government (tax payer) support for business activities. For the main part, public support demands the presence of substantial benefit to third parties from the activity. For innovation activities, the 'third party' consists of all people other than the business conducting the initial R&D and their customers. By far the largest third-party group is the general body of consumers who benefit, in perpetuity, from lower prices or better products as a result of the innovation spreading via imitation to other businesses. In the first instance following an innovation, there are probably few external beneficiaries. When one business develops a more efficient machine or new and improved product, the business will have some advantage over its competitors and should receive higher profits through better prices, more sales or lower costs of production. These are the direct rewards to the innovator. However, as the idea behind this new method or product spreads across the market, prices gradually fall with the ultimate

[6] See Thomson and Webster (2012).

beneficially being the mass of consumers who have made no direct investment into the innovation. Because these benefits are in perpetuity (ideas do not wear out) these benefits are large.[7]

Analysts often overlook the benefits received by third party consumers and this may explain why the Productivity Commission believed governments should not subsidise the existing rural R&D corporations.[8] However, the view that third party benefits are very large is not only consistent with deductive logic but also the substantial body of international empirical studies recently summarised by Hall, Mairesse and Mohnen (2010). The presence of high levels of external benefits in these studies suggests that the current level of government support for business R&D and innovation is, on average, too low.

Figure 1: Direct government funding of business R&D and tax incentives for R&D as % GDP



Source: OECD, Main Science and Technology Indicators (MSTI) Database, June 2012; OECD R&D tax incentives questionnaires, January 2010 and July 2011, and national sources, based on OECD (2011), OECD Science, Technology and Industry Scoreboard 2011, OECD, Paris.

How far too low is a difficult issue deal with in such as short article, and I would like instead to simply compare Australia's record with other comparator countries. The data are clear: compared with other developed Western nations, Australian governments' support for business sector innovation is low. Although R&D is only one part of total innovation spending, it represents the most consistent and universal data we have on innovation activities. Figure 1 shows the percentage of business R&D that is financed by government in a range of developed economies. It shows that for the most recent year, the US government committed over 0.22% of GDP to business R&D and the UK Government

[7] Even if the products are exported the Australian householder benefits since our national ability to export allows us to import. For example, the more efficient our agriculture and mining sectors, the higher is our dollar and the greater is our ability to import TVs, computer and overseas holidays.
[8] http://www.pc.gov.au/projects/inquiry/rural-research/report.

0.14%. Other high government support countries include Israel, France, Denmark, South Korea and Canada. By contrast, Australian governments only provided 0.09% of GDP which is only higher than Germany and Switzerland. One should not put too much emphasis on this sort of gross comparison. Other countries may be overcommitting public monies, or the manner in which public support is given may matter more than the amount. But it is worth bearing in mind when people erroneously suggest that Australian governments are generous in this area.

In Australia, significant proportion of government support for R&D is provided to publicly funded institutions and a large minority of direct for business innovation comes via the R&D taxation concession. We have little evidence — of the sort an economist would regard as rigorous and objective — on the effectiveness of comparative programs. The little evidence we do have relates almost entirely to the R&D tax concession. In this respect, research by economists, both here and overseas, suggests that for each $1 government spends via the concession on tax incentives, business raises their R&D spending by $1 (Thomson 2013). In other words, the R&D tax concession does not lead to a net increase in R&D spending overall; its effect on innovation is through changing which party decides how the money is spent (innovative businesses cf government). With respect to other forms of public support, we have to rely on overseas evaluations for evidence. Two of the most consistently evaluated innovation programs in the world are the US-based innovation-procurement SBIR and DARPA programs.[9] The evaluations are consistently positive. For example, one key study found that participation in the program led to a 5-fold increase in employment (and a 2.5-fold increase in sales) compared with an equivalent business which did not participate.[10]

Conclusion

The alarm bells should be ringing about the rate at which our non-primary sector industries are slipping behind not just other high-income countries but increasingly middle-income countries such as Malaysia, South Korea and the Czech Republic. Our greatest deficiency is about how we diffuse and transmit our knowledge throughout industry: the calibre of our political and regulatory institutions and the quality of our physical infrastructure is by contrast quite respectable.

Improving the diffusion and transmission of knowledge around and within industry is a matter that should be led by industry. There is only so much governments and their public servants can do directly. I recommend industry consider adapting the rural R&D corporation model and appeal to government to come to the party with matching funds.

The independence of R&D corporations and their mission to operate strictly in the industries' interests represent key advantages of industry R&D corporations. However, R&D corporations are costly to establish and government influence appears to have been important in establishing existing corporations.[11] The R&D corporation model has been designed to meet the needs of export-orientated industries producing largely undifferentiated commodities and would need to be adapted to meet the needs of the non-rural sector. However, its major features of permanence and ownership by industry are so compelling that we should not overlook the potential for this model to work in other settings.

While R&D corporations share similar features with recently announced industry-led innovation precincts, the advantage of the R&D corporation model is its comparative permanence. A program that is established under an act of parliament is less prone to annual budget cuts. It is this distinction that sets it apart from the recently announced 'Industry Innovation Precincts' program. Whereas precincts propose to share many of the features of the R&D corporations, they are not protected by

[9] The Victorian Government operates a similar program called the Market Validation Program.

10 National Research Council (2008) .

[11] Rural R&D corporations were established by an act of parliament (*Primary Industries and Energy Research and Development Act 19*89). Government played an important role in establishing most R&D corporations.

an Act and are thus vulnerable to changes of Government, or Ministerial, direction. Confidence in the longevity of a program gives the industry, and the research community that services it, the reassurance it needs to establish the serious research, development and translational capabilities and the architecture that supports them. It is a non-trivial task to establish institutions and train people who are expert in converting research findings into useful knowledge for industry and who ensure that all relevant businesses are kept abreast of these developments. Businesses will benefit from having a dedicated cadre of people who liaise and transmit information between researchers and business, peak bodies and isolated units, and industry and government.

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