SECURING AUSTRALIA'S FUTURE

Translating research for economic and social benefit: country comparisons

PROJECT 9

EXTRACT

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SECURING AUSTRALIA'S FUTURE

Funded by the Australian Research Council and conducted by the four Learned Academies through the Australian Council of Learned Academies for the Australian Chief Scientist and the Commonwealth Science Council. *Securing Australia's Future* delivers evidence-based research and interdisciplinary findings to support policy development in areas of importance to Australia's future.

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Translating research for economic and social benefit: country comparisons

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ACOLA is the interface of the four Learned Academies:

Australian Academy of the Humanities

Australian Academy of Science

Academy of the Social Sciences in Australia

Australian Academy of Technological Sciences and Engineering

ACOLA

AUSTRALIAN COUNCIL OF LEARNED ACADEMIES

Australia's Learned Academies

Australian Academy of the Humanities

The Australian Academy of the Humanities advances knowledge of, and the pursuit of excellence in, the humanities in Australia. Established by Royal Charter in 1969, the Academy is an independent organisation of more than 500 elected scholars who are leaders and experts in the humanities disciplines.

The Academy promotes the contribution of the humanities disciplines for public good and to the national research and innovation system, including their critical role in the interdisciplinary collaboration required to address societal challenges and opportunities. The Academy supports the next generation of humanities researchers and teachers through its grants programme, and provides authoritative and independent advice to governments, industry, the media and the public on matters concerning the humanities.

www.humanities.org.au

Australian Academy of Science

The Australian Academy of Science is a private organisation established by Royal Charter in 1954. It comprises ~450 of Australia's leading scientists, elected for outstanding contributions to the life sciences and physical sciences. The Academy recognises and fosters science excellence through awards to established and early career researchers, provides evidence-based advice to assist public policy development, organises scientific conferences, and publishes scientific books and journals. The Academy represents Australian science internationally, through its National Committees for Science, and fosters international scientific relations through exchanges, events and meetings. The Academy promotes public awareness of science and its school education programs support and inspire primary and secondary teachers to bring inquiry-based science into classrooms around Australia.

www.science.org.au

Working Together—ACOLA

The Australian Council of Learned Academies (ACOLA) combines the strengths of the four Australian Learned Academies: Australian Academy of the Humanities, Australian Academy of Science, Academy of Social Sciences in Australia, and Australian Academy of Technological Sciences and Engineering.

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Academy of Social Sciences in Australia

The Academy of the Social Sciences in Australia (ASSA) promotes excellence in the social sciences in Australia and in their contribution to public policy. It coordinates the promotion of research, teaching and advice in the social sciences, promote national and international scholarly cooperation across disciplines and sectors, comment on national needs and priorities in the social sciences and provide advice to government on issues of national importance.

Established in 1971, replacing its parent body the Social Science Research Council of Australia, itself founded in 1942, the academy is an independent, interdisciplinary body of elected Fellows. The Fellows are elected by their peers for their distinguished achievements and exceptional contributions made to the social sciences across 18 disciplines.

It is an autonomous, non-governmental organisation, devoted to the advancement of knowledge and research in the various social sciences.

www.assa.edu.au

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ATSE advocates for a future in which technological sciences and engineering and innovation contribute significantly to Australia's social, economic and environmental wellbeing. The Academy is empowered in its mission by some 800 Fellows drawn from industry, academia, research institutes and government, who represent the brightest and the best in technological sciences and engineering in Australia. Through engagement by our Fellows, the Academy provides robust, independent and trusted evidence-based advice on technological issues of national importance. We do this via activities including policy submissions, workshops, symposia, conferences parliamentary briefings, international exchanges and visits and the publication of scientific and technical reports. The Academy promotes science, and maths education via programs focusing on enquiry-based learning, teaching quality and career promotion. ATSE fosters national and international collaboration and encourages technology transfer for economic, social and environmental benefit.

www.atse.org.au

By providing a forum that brings together great minds, broad perspectives and knowledge, ACOLA is the nexus for true interdisciplinary cooperation to develop integrated problem solving and cutting edge thinking on key issues for the benefit of Australia.

ACOLA receives Australian Government funding from the Australian Research Council and the Department of Education and Training.

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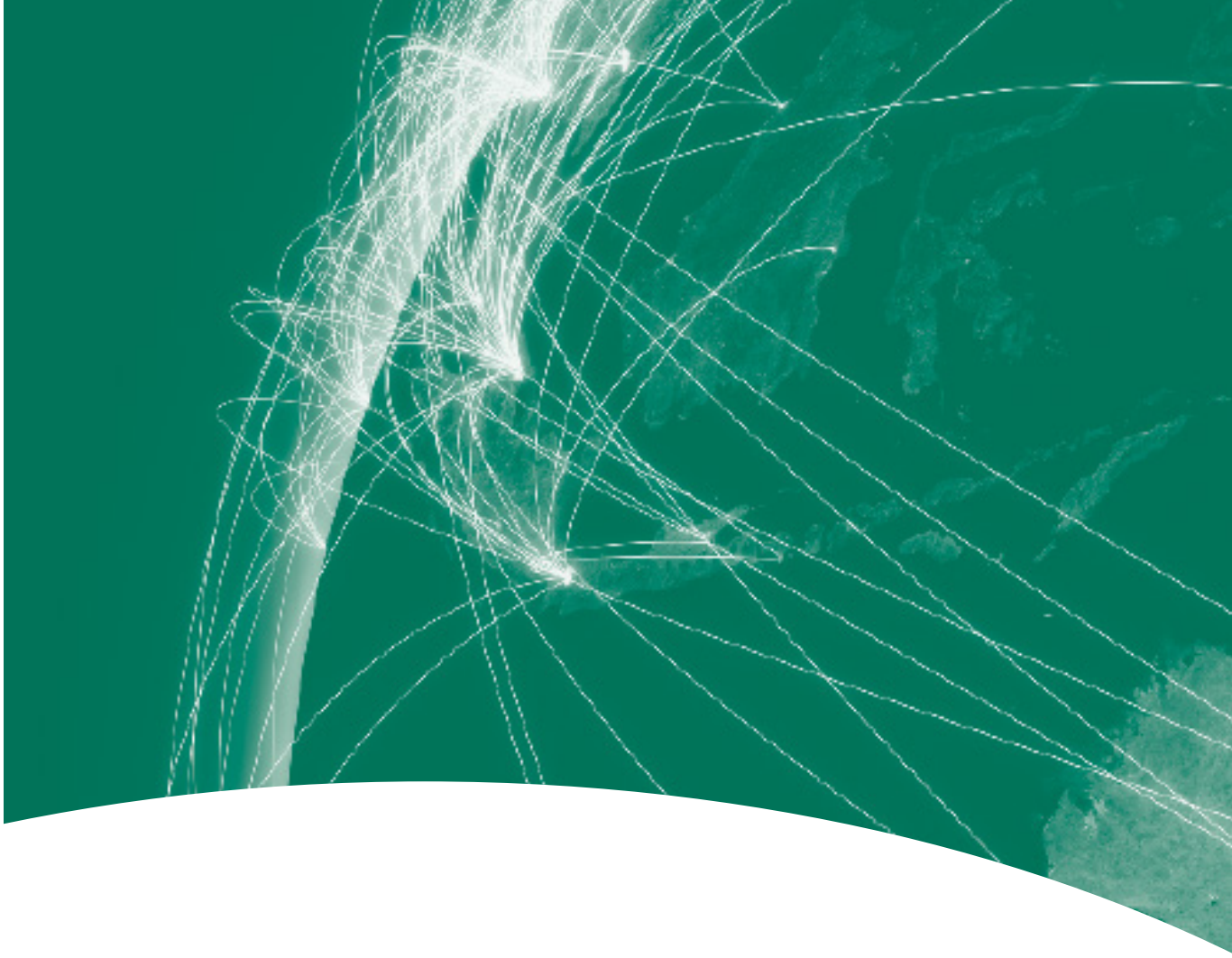
Project aim and objectives

Aim

Analyse international approaches to lifting research translation and business-researcher collaboration in countries deemed to be leading practice, and examine their applicability for Australia.

Objectives

- Review approaches in selected countries and Australia in regard to commercialisation of research and support for collaboration, including a comparison of what works and why. The project will also review examples of what has not worked and look at underlying reasons.
- Examine how successful countries measure the impact of research in terms of translation and engagement.
- Determine the common barriers to research translation internationally, and how have these been successfully overcome in other countries (e.g. access to finance).
- Analyse the applicability of international models to the Australian context.



Questions and themes to be addressed

- Compare models for enhancing collaboration between researchers and between researchers, business, government and other parties such as not-for-profit organisations. What are the benefits/costs of each model and what are the cultural elements that impact on these models?
- Examine Australian models for collaboration between organisations and businesses engaged in research.
- Examining the extent to which research collaboration programs can increase the translation of public sector research. What types of businesses and industries are being engaged? What outcomes are accruing?
- Evaluate the success of overseas programs that encourage industry-driven research collaboration and examine their potential applicability in Australia. What would be the outcome and/or benefits if specific measures were taken up in Australia?
- Incentivising the utilisation of intellectual property.
- Building a risk-tolerant business culture, and cultural aspects that affect translation in different countries.
- Government-led initiatives put in place to build a business innovation culture.
- Examining how institutional and business collaboration contributes to the application and translation of research outcomes.
- How is success measured in each country/by each model/differences across sectors (design, creative industries, etc.)?

Countries to be examined

- European Union (Finland, Denmark, Sweden, Germany, United Kingdom)
- Israel
- United States and Canada
- South Korea, Japan, Singapore, China
- Brazil and Chile
- Australia

Executive summary

The effective translation of public sector research lies at the core of Australia's future competitiveness and prosperity. Research translation also provides societal and cultural benefits. This project has explored ways in which the translation of public sector research in Australian can be enhanced.

Boosting the ways in which new ideas are disseminated and applied is an important priority in a modern knowledge-based economy, requiring increased levels of collaboration between researchers, businesses, not-for-profits and the government sector. To achieve these outcomes, Australia can leverage the skills and knowledge in public sector research institutions through collaborative research, driving closer engagement with other parties.

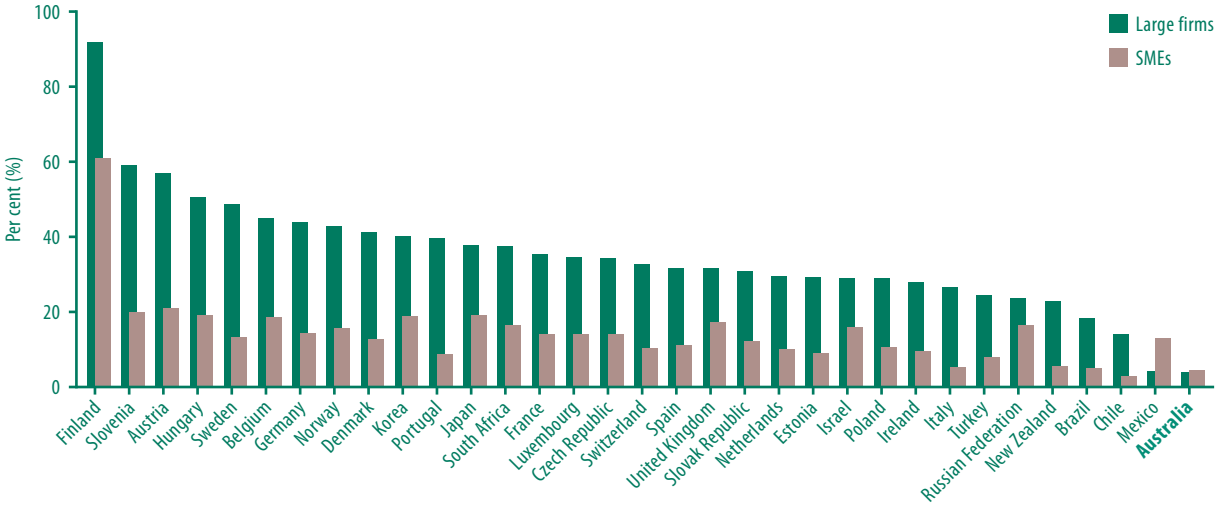
Australia is undergoing a necessary economic transformation, transitioning from high dependence on natural resources to a knowledge-based economy. In order to secure Australia's future, this transformation

needs to be driven by innovation. Innovation relies on a number of factors, including strong engagement and collaboration between public sector researchers, business and other external counterparts. Improving this collaboration requires changes in policies and programs. Providing well targeted and funded incentives for each of the parties involved will not only increase research translation but will also bring about the cultural change necessary to make it a routine feature of research and business practice.

This project has found that, to be fully effective, policies and programs to encourage increased research translation need to be part of a stable national innovation strategy and administered by an independent agency.

This project has reviewed measures in fourteen countries and Australia to encourage and facilitate research translation and application. Selected measures to facilitate collaboration between researchers, businesses and other organisations have been analysed, focusing on government strategies as well as industry, institutional and sectoral approaches. The report has considered how Australia's research translation performance can be improved. A number of principles and leading practices have been identified, based on the policies and programs of countries with a successful track record in research translation.

Innovative firms collaborating with higher education/public research institutions



Source: OECD (2013b), DOI: <http://dx.doi.org/10.1787/sti_scoreboard-2013-graph110-en>.

Public sector research is a critical part of Australia's innovation system. Australian researchers perform well by international standards and some Australian universities are among the best in the world. However, no Australian university is ranked in the top 100 innovative universities worldwide. Engagement and research translation on the part of public sector researchers in Australia is low by OECD standards. This is despite Australian government funding for public sector research being slightly above the OECD country average.

By comparison with other OECD countries, Australia's research translation problems include:

- low collaboration between public sector researchers and business
- many public sector researchers not actively seeking involvement in translation activities
- a lack of demand on the part of business, industry and other potential users who are not motivated to engage
- a lack of effective intermediaries to facilitate links between public sector researchers and external parties.

This study has identified a number of reasons for these problems, including the absence of effective institutions, relationships and incentives. An analysis of Australian policies and programs commissioned for this report demonstrates that measures to support the translation of public sector research in Australia are fragmented, uncoordinated and under-resourced.

This report draws on the experiences of fourteen countries. These countries have been selected because of their strong performance in research translation, their novel approaches to encouraging translation and, in some cases, similarities with Australia. Most of the translation-related measures that have been selected for particular analysis have a strong record of success over a number of years, have been favourably reviewed, and are considered to be appropriate and leading-practice models that could be adopted in Australia.

Based on analysis of research translation policies and measures that have been implemented in the countries reviewed, this report provides the following findings:

Finding 1. Australia can improve the translation of public sector research for economic and social benefit by establishing a stable suite of well-funded and sustainable, leading-practice measures

While Australia's measures for encouraging the translation of public sector research have evolved over the last ten years, this has occurred in a piecemeal manner, involving a number of state and Commonwealth agencies offering measures, generally with very modest funding. As noted above, Australia's measures to support the translation of public sector research have been found to be inadequate. They are also often short term in nature. In many cases there has been inadequate reporting of program outputs and minimal evaluation of achievement.

This report provides a number of examples where stable, well-designed and funded measures in other countries have created jobs, increased business turnover and provided other benefits. The project has found that leading practice measures from other countries can be used to develop a carefully targeted suite of incentives to encourage Australian researchers, universities and business and other parties to work together.

Many of the most effective measures discussed in this report have operated over many years, continuing to maintain core objectives, branding and administrative arrangements. This stability has provided certainty for researchers, public sector research organisations and external counterparts. This report provides a number of examples, including the United States' Small Business Innovation Research Program and the Canadian NSERC's Engage Grants, where stable, well-designed and funded translation incentives have created jobs, increased business turnover and provided societal benefits.

The effectiveness of incentives to encourage research translation described in this report has been demonstrated through evaluations and reviews. Incentives need to recognise the breadth of potential interactions between public sector researchers and other parties. They also need to accommodate the range of responsibilities and accountabilities within agencies at different levels of government.

Finding 2. Supporting SMEs and start-ups with high growth potential will help to increase the translation of public sector research in Australia

Small and medium-sized enterprises (SMEs) are important receptors for the translation of public sector research. They are often able to take up and adapt new ideas quickly. SMEs with high growth potential are the target for many of the government measures reviewed for this project. They are an important source of future jobs and economic growth. However, compared with larger firms, SMEs are often time and resource poor. They also often do not know where to go to find help, or to seek research outcomes, from universities. There are market failure arguments that are specific to SMEs and justify these companies getting special attention. Programs such as Germany's ZIM Program and Brazil's First Innovation Program (PRIME) are examples of effective measures that target research translation at business.

Start-up and spin-out companies from public sector research institutions represent a small proportion of research translation. However, evidence shows that they are an important source of new business opportunities and jobs (Anyadike-Danes *et al*., 2013). Countries as diverse as Canada and Finland both have well-established leading practice measures to assist such companies. Adopting some of these approaches in Australia will help ensure that we grow a new generation of technology-based firms to follow in the footsteps of Cochlear, Resmed, and CSL—all of which had public sector origins.

Finding 3. Australia can make greater use of direct support measures for business innovation to increase research translation

Firms that undertake R&D are more likely to become involved in the translation of public sector research. The project has found that Australia is overly reliant on indirect support for business R&D through the R&D tax incentive. Shifting the balance of government support

for business innovation to greater use of direct measures such as grants, loans and procurement contracts would allow a more focused and targeted approach to support for research collaboration and translation.

Loans, which in other countries are increasingly combined with grants, are becoming a significant source of finance for start-ups and SMEs with high growth potential. Australia can learn from other countries in this regard. International examples of loan schemes include The Zero Interest Rate Program (JURO ZERO) in Brazil, Korea's Industrial Technology Development Loan Fund and Germany's ERP Innovation Program.

Finding 4. Australia's business R&D tax incentive could be adjusted to encourage collaboration with public sector researchers

A number of the countries reviewed are using R&D tax incentives to encourage collaboration with public sector research institutions. Countries that have adopted this approach have higher rates of business collaboration with public sector research institutions. Examples of such countries include Denmark and Chile. This suggests that a more favourable incentive for such collaboration is an effective incentive for business. Australia's R&D tax incentive could be adjusted to provide companies with a greater benefit for collaborative work with public sector researchers.

Finding 5. Increasing funding for research collaboration programs and requiring rigorous engagement between the parties involved will increase research translation in Australia

There is a need to reform Australian research collaboration programs, such as ARC's Linkage Programs, by increasing funding and adopting the leading grant administration practices of programs reviewed for this report. To obtain optimal benefit from these programs, grant recipients should be required to adopt a milestone based approach to project management, develop IP strategies, and ensure active collaboration between all parties. For larger projects, grant payments should be made against the achievement of milestones.

At the same time, government should be encouraging universities to shift from project-based collaboration to building more substantial longer-term partnerships with external parties (including business and not-for-profits).

Finding 6. Measures to encourage public sector researcher engagement can be structured in ways that create opportunities for those in the humanities, arts and social sciences

Measures to encourage effective research translation should recognise the capacity of HASS researchers to deliver national benefit across a range of areas, including in the export of services, social enterprise innovation, and evidence-based social policy that strengthens the social fabric and supports those in disadvantaged positions. As the opportunities and challenges for translating research differs across the HASS and

STEM disciplines, consideration should be given to developing specific measures to encourage HASS engagement and collaboration with both the public sector and with industry, as have been developed in some of the countries featured in this study. At a minimum, it is important to ensure that HASS researchers are not excluded from generally available measures to encourage public sector researcher engagement with external parties.

Finding 7. Australia can increase research translation through the placement of students and new graduates in business and other organisations

Programs that support the project-based placement of students and new graduates within external organisations will help to transfer new creative and technical skills to the business, government and not-for-profit sectors. Work integrated learning placements can also help build relations between universities and external parties that can lead to future collaborations.

The UK's Knowledge Transfer Partnerships Program has been identified as a leading practice measure to increase links between universities and business, to translate research outcomes through the knowledge and skills of new graduates, and to increase the recruitment of science and engineering graduates by business. Australia could establish a similar program, with resources and commitment on a scale comparable to the UK. Under such a program, placements could involve students and new graduates from all disciplines including the social sciences, humanities and the arts.

Finding 8. Increased assistance for collaborative research will enhance translation in Australia

Research collaboration between public sector researchers and external parties is an important means of transferring knowledge and skills. Many of the countries reviewed for this project have programs that are similar to Australia's Cooperative Research Centres (CRC) Program, designed to bring together public sector researcher, industry and other partners. Most other countries provide this type of support on a larger and more generous scale than Australia. Australia needs a range of university-business collaboration models that includes research centres, networks, clusters, hubs, precincts, and better-funded CRC and Linkage Programs.

Finding 9. Providing targeted incentives to Australian universities is a proven method of increasing their engagement with external parties

Incentives to increase university engagement need to recognise the breadth of interactions between universities and external parties, which go well beyond commercialisation of research. Other forms of engagement are also important and can involve all disciplines, including the humanities, arts and social sciences.

Introducing metrics for university engagement with external parties, and rewarding this engagement has played a key role in increasing research translation in the UK. The UK is a leading practice country in terms of engagement

incentives for universities. It provides support for university engagement through Higher Education Innovation Fund (HEIF). The evidence shows that HEIF has generated jobs and economic growth. Another UK initiative, requiring *Pathways to Impact* statements for research grant applications, is also bringing about change in public sector researcher attitudes to engagement with external parties.

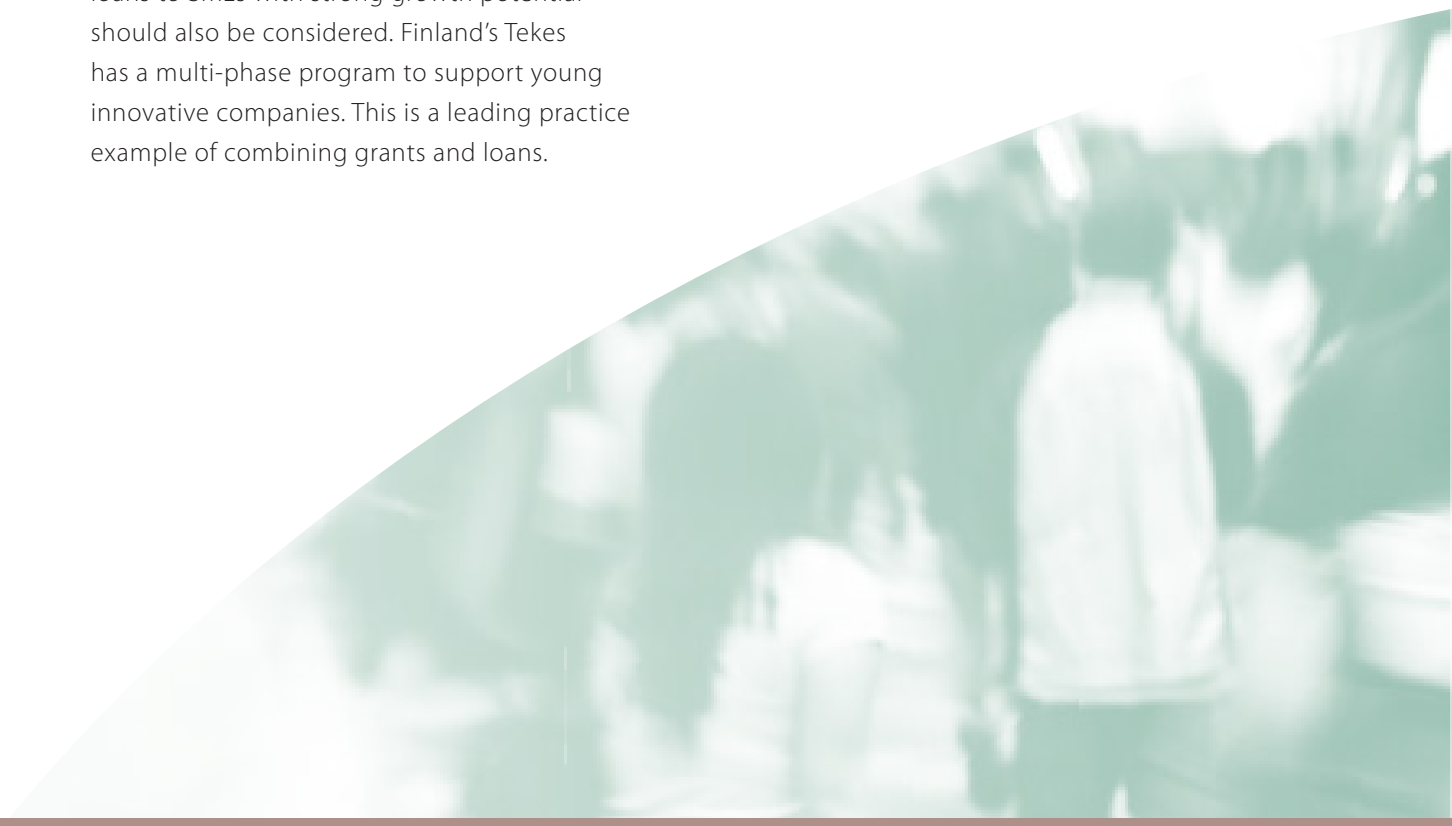
Finding 10. Measures to support the financing of commercial outcomes from public sector research would address a major gap in Australia's innovation system

Many of the countries examined in this report have adopted measures to help the outcomes of public sector research find their way to the market. Examples include Singapore's Early Stage Venture Fund, Japan's A-STEP and Germany's SIGNO Program. Australia lacks sources of capital to enable commercialisation of outcomes from public sector research. Governments in other countries such as Israel and Denmark facilitate or provide such capital. The US Small Business Innovation Research Program is another example.

Programs that offer combinations of grants and loans to SMEs with strong growth potential should also be considered. Finland's Tekes has a multi-phase program to support young innovative companies. This is a leading practice example of combining grants and loans.

Finding 11. Greater use of innovation intermediaries would enhance collaboration and increase research translation in Australia

Innovation intermediary organisation can facilitate the flow of public sector research skills and knowledge to SMEs. They can interpret research findings for businesses and articulate to researchers the needs of businesses in ways each of these parties cannot. However they need to be adequately funded if they are going to make a difference and it will take some time for these organisations to have measurable impact. As such, bipartisan support for their development and operation is essential to ensure that stable funding and support for these organisations is provided. The UK's Catapult Centres seek to align industry, university and government needs. Scotland's Interface Program provides another leading practice example of an intermediary organisation.



Finding 12. Australia can emulate leading countries' consistent support of successful research translation by adopting a coherent national strategy for innovation and establishing a national innovation agency to manage it

Countries achieving high levels of public sector research translation provide a sound institutional context for this activity by making it a key element of a national innovation strategy. Most leading practice countries have well-resourced and coordinated innovation strategies, which provide a reference point to guide the selection of policy and program options. Such strategies can define which measures are best addressed at a national level and which are better delivered by sub-central government. They can also help to minimise overlap and duplication between levels of government.

In many of the countries reviewed, the delivery of national innovation strategies is the responsibility of an independent agency, which operates at arm's length from government. Australia can look to successful innovation agencies, such as Finland's Tekes, Sweden's VINNOVA and Innovate UK as models for an Australian innovation agency.

Initiatives to enhance research translation need to be multifaceted, incentivise multiple actors and work on multiple levels. When these initiatives are part of a national innovation strategy and are based on a coherent set of policies, they can achieve real results. The establishment of a national innovation strategy and an implementation agency needs bipartisan support.

Finding 13. Independent reviews and evaluations of research translation measures are necessary to ensure that they are achieving their objectives

The project has found that leading practice countries regularly commission independent evaluations of innovation and research translation measures and make the evaluations public. For example the UK's Knowledge Transfer Partnerships Program has undergone a number of independent evaluations over its 40-year existence. Program reviews can demonstrate the benefits of successful measures. Israel's Magneton Program underwent an independent review in 2009, which found that around 80 per cent of projects involved a high level of innovation and achieved breakthroughs or new knowledge. In leading practice countries, adjustments to policies and programs are informed by such evaluations. Australia should use independent reviews and evaluations to ensure the continual effectiveness of research translation measures.

Finding 14. Streamlining internal university policies and procedures can improve university engagement with business and other external parties

Many universities in other countries have simplified and streamlined arrangements for collaboration between businesses and university faculties, research centres and staff. Australian universities should 'fast-track' approval procedures, review of delegations, and appoint executive staff with business experience to facilitate engagement with external parties.

Finding 15. Assisting the development of research translation and entrepreneurial skills in Australia's public sector research institutions will improve their performance

Several countries that have been reviewed for this project have provided targeted assistance to develop research translation skills in public sector research institutions. For example, Chile's Program to strengthen human capital for technology transfer is improving the performance of research commercialisation in its research institutes and universities. Such skills development should not be limited to university technology transfer office staff.

Providing university students with opportunities to develop entrepreneurial skills as part of their studies is a means of increasing interest in start-up company formation. Germany for example, developed The Start-ups from Science (EXIST) initiative to improve the entrepreneurial environment at universities and research institutes. Government can assist public sector research institutions by providing support for innovation contests, start-up programs (including incubators and accelerators), internships and placements, and innovative workspaces.

The report provides an important evidence base for the development of new policy measures that can be used to increase the translation of Australian public sector research for economic and social benefit. Many of the examples provided in the report have been found to generate significant benefits.

About Securing Australia's Future

In June 2012 the Australian Government announced *Securing Australia's Future*, a $10 million investment funded by the Australian Research Council in a series of strategic research projects. Projects are delivered to the Commonwealth Science Council by the Australian Council of Learned Academies (ACOLA) via the Office of the Chief Scientist and the Australian Chief Scientist.

Securing Australia's Future is a response to global and national changes and the opportunities and challenges of an economy in transition. Productivity and economic growth will result from: an increased understanding in how to best stimulate and support creativity, innovation and adaptability; an education system that values the pursuit of knowledge across all domains, including science, technology, engineering and mathematics; and an increased willingness to support change through effective risk management.

Six initial research topics were identified:

i. Australia's comparative advantage
ii. STEM: Country comparisons
iii. Smart engagement with Asia: leveraging language, research and culture
iv. The role of science, research and technology in lifting Australian productivity
v. New technologies and their role in our security, cultural, democratic, social and economic systems
vi. Engineering energy: unconventional gas production

Five further research topics have been identified:

vii. Australia's agricultural future
viii. Delivering sustainable urban mobility
ix. Translating research for economic and social benefit: country comparisons
x. Capabilities for Australian enterprise innovation
xi. Business diasporas in Australia: maximising people to people relationships with Asia

The Program Steering Committee responsible for the overall quality of the program, including selection of the Expert Working Groups and the peer review process, is comprised of three Fellows from each of the four Learned Academies:

Professor Michael Barber FAA FTSE (Chair)

Mr Dennis Trewin AO FASSA (Deputy Chair—Research)

Professor James Angus AO FAA

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