

University Research Commercialisation

IRU Response

The Innovative Research Universities (IRU) strongly support the Government's intention to expand the transformation of Australia's research outcomes into business and social outcomes, as set out in Mr Tudge's speech of 26 February 2021.

Through improving commercialisation and translation outcomes, we can strengthen our national capacity to invest in research, creating a positive loop. The Commercialising Research discussion paper sets out several useful actions that target improving demand for research outcomes. Combined with ongoing support for universities' research capability, these actions could improve commercialisation outcomes.

The IRU submission supports that of Universities Australia, which sets out several particular proposals to improve outcomes.

Australia – research and its commercialisation

Australia's research output is high at 3.4% of world research publications in 2020 (in Scopus SciVal), well ahead of our proportion of world GDP or population. It represents a major contribution to research development and has increased 72% since 2010 when Australia produced 2.8% of world research publications. Australia's research growth rate has exceeded USA (18%), UK (31%) and Canada (34%). The research output of IRU members has grown 134% over the same period, a greater rate than China (121%).

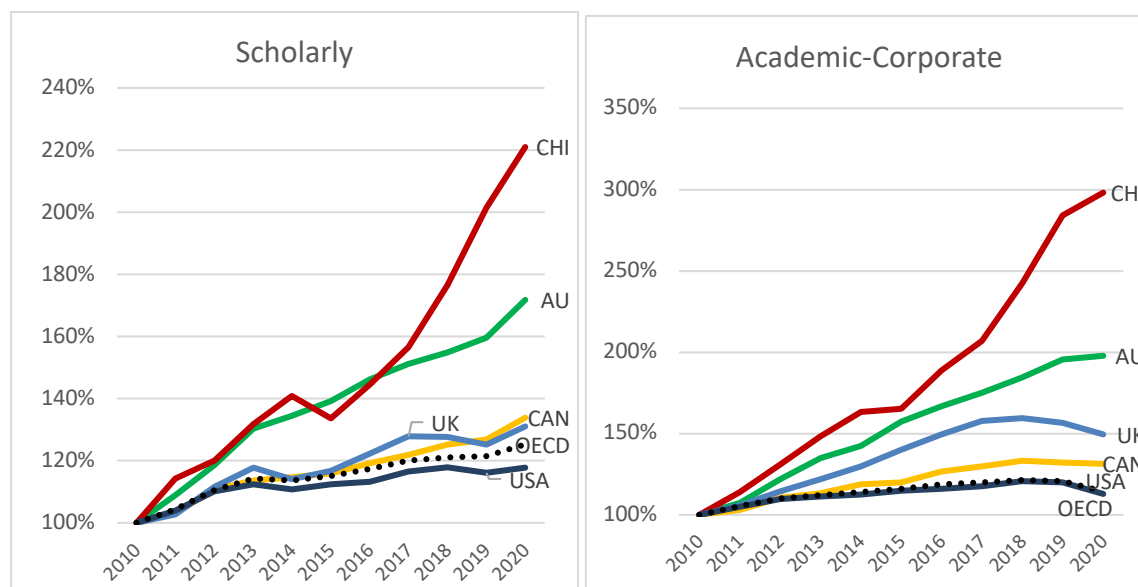
Data on the transformation of research indicates that Australia is less strong but improving. Australian authors contributed to 4.1% of world research publications involving university-corporate collaboration in 2020, a doubling since 2010 when Australia produced 2.7% of world output.

Australia's growth rate of corporate collaborations has also exceeded USA (13%), UK (50%) and Canada (31%). For IRU members, it has grown 268%, greater than China (198%).

These are indicators of a healthy public research system closely attuned to the needs of society and the economy, with great potential to do more.

A focus on commercialisation will only be successful if it ensures the whole ecosystem remains supported.

Figure 1. Growth in scholarly and academic-corporate collaborative research publications, selected countries, 2010 to 2020 (Source: Scopus SciVal)



Industry is increasingly investing in Australia's universities for their research. Direct industry funding increased from \$795 million in 2010 to \$1.5 billion in 2019, now accounting for one-third of total research income. This 90% increase in industry funding far outstrips growth in other research funding from competitive grants (38%) and government sources (39%) over the same period. Irrespective of who funds the research, the returns on the research far outweigh their costs. However, there are longer-term risks that can arise from overemphasising problem-oriented research directed by short-term industry needs.

Commercialisation requires a vibrant research eco-structure from the fundamental basic research through to the applied. University research is well spread across basic research (41%), applied research (48%) and experimental development (11%). This is a major shift from 2000, when basic research predominated at 55%, and brings the higher education sector closer to the business sector where only 9% of R&D is for basic research, 32% is applied, and 60% is experimental development. However, whereas universities have increased their R&D expenditure, business R&D has been flat in nominal terms for the past decade and has declined in real terms.

In 2020-21, the Government will invest \$2.6 billion into business sector R&D. However, 99% of this is via the R&D tax incentive, essentially without strategic coordination. There are no direct incentives for industry to collaborate with our world-class universities.

Strategically directed government funding for business R&D research has steadily declined from \$382 million in 2010-11 (17% of total funding) to only \$35 million (1% of funding) in 2020-21. It is encouraging that the discussion paper recognises the lack of demand-side initiatives, offering an explicit opportunity to incentivise business to work with universities on R&D and commercialisation.

The following sections:

- place the drive for better commercial outcomes in its context in the whole research ecosystem;
- consider the five areas for action in the consultation paper; and
- list other initiatives for the Government to consider.

Recommendations

The Innovative Research Universities:

1. endorses the development of all four of the proposed areas for action, supported through a Research Translation Fund additional to current research programs;
2. proposes the Government works with the sector to provide support for the medium term while the sector remains impacted by the loss of income from international students; and
3. recommends a thorough revamp of the Research & Development tax incentive to stimulate industry use of university research capability and outputs as part of Incentives for Participation.

Improving commercialisation of university research outcomes

The use of research to stimulate better outcomes across business, government and not for profit services is essential for an effective research system. It is based in research productivity, the capability of university and researchers to pursue knowledge and its uses, directing resources and effort at new areas for development and responding to opportunities that emerge.

To improve commercial outcomes, we need to both ensure the root system is strong and also improve incentives for creators and potential users to exploit the results.

The discussion paper's comments against the real-world impact of achievement in international rankings based on pure research outcomes misunderstands the importance of the academic quality of research to underpin future use of the research. The challenge is to maintain the quality and increase subsequent use.

Industry is used broadly here to include private enterprise, government, not for profit organisations, and other third parties which use research to improve their outcomes. Many universities have productive relationships with hospitals or schools, driving strong outcomes and economic benefit.

Direct commercial outcomes are part of a broad suite of ways in which research is used for economic and social benefit. Policy changes should support the breadth of mechanisms, with the aim to make research-driven innovation part of the natural order across most enterprises. This can be achieved through three main types of industry engagement.

1. Commercialisation of research outputs and intellectual property

For the university sector to benefit directly, the financial revenue must remain with the university or shared by the university and industry partners. University revenue from contracts, royalties, trademarks and licences increased from \$1.3 billion in 2010 to \$2.0 billion in 2019. Retaining more of the financial benefits within the higher education sector is the main focus of the discussion paper. However, the commercialisation of university R&D can also create economic benefits purely for the

industry partner. Universities may not be acknowledged or directly benefit from this, yet it does support the broader R&D intensity of industry, their productivity, profitability (and taxation revenue to government), and capacity to employ university graduates in knowledge-intensive roles.

2. Advice and paid consulting activity of academics and researchers

Universities provide advice and consultancy to industry, broadly defined to include private enterprise, government, not for profit organisations, and other third parties.

University revenue from consultancy and contracts increased from \$885 million in 2010 to \$1.6 billion in 2019, but this underestimates the full suite of benefits from this growing external engagement. As publicly spirited institutions, universities and academics engage in knowledge transfer activities and support local communities and industries even when short-term financial returns are uncertain or minor. This also helps ensure the university education mission aligns with community needs and expectations, such as through industry-informed curriculum development and work-integrated learning activities that build upon existing research partnerships.

3. Productivity of graduates within enterprises

Universities' most important contributor to industry productivity and R&D is through the training of graduates. In 2020 over 90% of employers of new university graduates were satisfied with their graduates' foundational, adaptive and technical skills. The highest levels of employer satisfaction are found in the STEM-related fields of engineering, science, technology, IT and health, where satisfaction with technical skills ranges from 94% to 98%. Many of the best relationships with an enterprise are developed over time with regular interactions, allowing all parties to see the areas in which research can assist and then do so. An effective system will encourage long-term relationships and support specific projects.

An important element of this is to provide the physical space to support interactions. Many IRU members have created innovation and enterprise precincts, often part of broader urban renewal that integrates campuses with surrounding city areas through a mix of innovation enterprises, health and retail services, and accommodation. These developments are critical to improving the use of research across all of Australia, breaking out of the inner city bubbles to offer opportunity to all Australians.

It is important not to lose sight of the successful programs in place, notably the Cooperative Research Centre program. In each round, the Government knock back several good and viable proposals because it limits the number of CRCs it will support rather than supporting all clearly viable proposals.

Discussion paper proposals

1. Mission-driven research

The IRU sees considerable value from the Government setting major themes to lead its investment in better commercial outcomes, subject to keeping open potential for support across all areas. The proposal echoes the approach taken with the Medical Research Future Fund, which has been of value in directing MRFF investment. It is important that the missions approach does not leach into directing investment in universities base research capability and support for the best projects

through the Australian Research Council but targets the subsequent translation of that research into actions.

In defining missions, the Government should target areas emphasising their broad value to Australia's future and their relevance to major industry challenges and opportunities. The approach to a given mission will be influenced by the current state of industry and research relevant to the mission.

The nature of the combination will influence what actions are needed to drive a mission to successful outcomes. There may be strong alignment in industry and research capability with a potential mission that requires a further stimulus to produce better commercial outcomes. Others may align with areas where current research or industry demand is moderate, with the mission's aim to strengthen both.

The selection of the missions and then how support is targeted are major challenges to give effect to the idea. As shown with the MRFF, it is important to have robust means in place to encourage and select the projects to be supported. In particular, it needs to avoid any sense of whim or action that rewards those first in with broadly suitable proposals.

MRFF experience points to keeping the scope of the mission broad to allow a wide variety of options for take-up across research and industry players. To make the missions operative the process will need a mix between top-down preselected project areas and bottom-up initiatives from the industry and research community that will advance the mission.

This will support the breadth of research that feeds into progress on major issues. IRU analysis of the 240 projects assessed by the ARC to be 'high impact' as part of the Engagement and Impact Assessments 2018 shows that economic impact is derived from a range of inter-disciplinary combinations. For example, the 128 HASS high impact case studies had a strong and credible impact across all 17 socioeconomic objectives (SEO) codes, including health, energy, transport, mineral resources, defence and ICT.

Broadly defined missions that allow a majority of universities to engage will strengthen collaboration across and within the university and industry sectors that mission-driven research requires, that will provide lasting connections allowing Government to target funds elsewhere in the medium term. It would also increase the potential for identifying new ideas and supporting commercialisation wherever it is most likely to be successful.

2. Stage-gated Scheme design

The second proposal from the consultation paper is to monitor progress through several stages, from useful research output to commercially viable operation. Funding and other supports would only continue where there is sufficient progress through major stages of development. The approach is intended to permit a larger number of plausible projects to get started but ensure that support is withdrawn if progress is not sufficient.

The approach addresses a major problem for support for commercialisation projects: selection inevitably will miss some ideas that would succeed and approves some to many that do not. The staged approach allows many more to be approved for stage one and allows further support to be concentrated on fewer, clearly progressing projects.

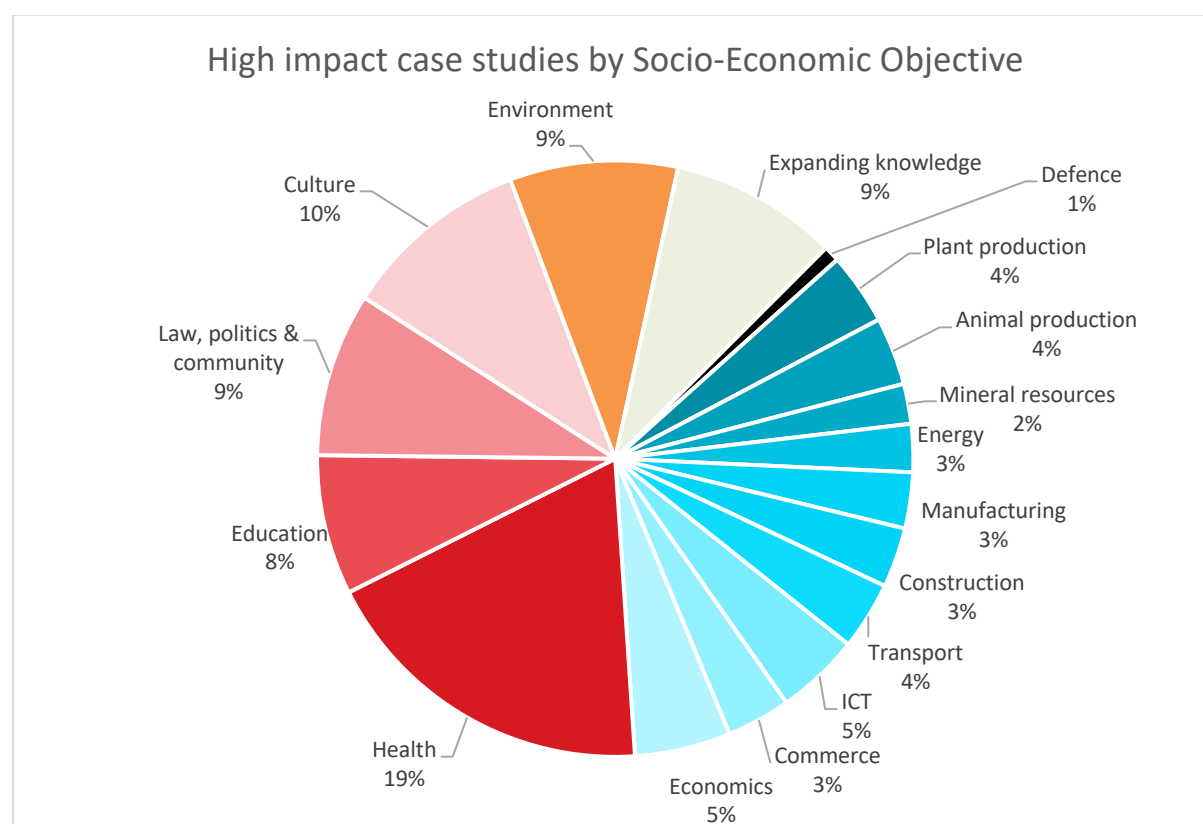
The stage-gate approach would be even stronger if it set out to fund the first stage for all proposals that met a threshold standard of potential value. This puts the focus on assessing initial suitability rather than relative strengths against other proposals. The total cost would be a question, requiring the threshold to be set sufficiently high. However, high take-up (above predictions) would suggest the array of opportunities are not currently being supported and the value to be gained from an ambitious program.

3. Incentives for participation

The demand side is fundamental to any serious transformation of research commercialisation in Australia. Universities have been actively seeking industry and other research end-user support for a long period. While university actions should continue to improve, the greater challenge in Australia is to ramp up the business and industry interest.

Analysis of the case studies put forward for the Engagement and Impact Assessment of 2018 shows that certain parts of industry are much more likely to invest in industry-relevant research than others (see Figure 2). There is much for the Government to do to push all potential research end-users to take up the opportunity.

Figure 2: Distribution of high Impact case studies, 2018, by industry area



One part of this is to improve ways and places for the two elements to interact and identify the potential projects. A Research Translation Fund would provide one necessary stimulus to improve industry take-up by making available direct supports.

The incentives tied to the Research and Development R&D Tax Incentive have been much discussed but little changed for a decade or more. The government has invested around \$2.6 billion per year into the business sector over the past decade via the incentive. The decline of other business-related schemes means it now comprises 99% of all Government investment.

There is no direction to this major program, and the Government has not acted on the major elements of the 2016 review by Bill Ferris, Alan Finkel and John Fraser. Crucial to its improvement is to require that the business's claimed research is explicitly tied to either research from a university or other research agency, or, if inhouse, to medium to longer term changes of significance to the business. Smaller ongoing improvements should be given lesser standing for the purposes of the incentive. Otherwise it will not stimulate the level of changed business behaviour that the Government seeks.

4. Industry-university collaboration

The importance of location

The massive increase in digital technologies and operations can lead to assumptions that the capacity to meet, talk, explore and alter plans is not improved through physical precincts that are intended to stimulate such interaction.

IRU members have invested heavily to create innovation precincts at the edge of campuses, bringing in the external parties and providing a location for former students and staff to remain linked to the universities as they turn research outcomes into commercial returns.

After several decades of development, the industry parks and precincts have begun to work. They are particularly important around the IRU members for our location in the mid to outer suburbs of the major Australian cities and several of the larger provincial cities and towns.

The use of research to drive commercial outcomes should not be an inner-city habit. Its reach has to be national.

Industry and PhDs

Increasing the number of PhD trained staff in industry, and the training of new PhDs in collaboration with industry, is a sound long-term strategy to address the skills and cultural gaps inhibiting research translation. Depending on the structure of an industry PhD, this may improve university-industry collaboration.

A narrow industry PhD program, in isolation of existing PhD programs, is unlikely to generate change at scale. It is better to fund industry engagement with PhD training more broadly. The Government has pursued increased engagement from industry in PhD training via internships and included this in its NPILF metrics, but to date, there has been no additional funding to support this ambition.

The Industry PhD program would not address the broader lack of research-trained staff in industry. Australian domestic PhD completions have increased at a rate of less than 2% per year over the past

15 years. While this is sufficient to support the growth in the university workforce, it is not sufficient to address skills gaps and absorptive capacity in business inhibiting collaboration.

5. Governance arrangements

The need for all parties to be involved in the governances of major schemes is clear. The challenge is how to make that work in practice. Industry is renownedly cautious about getting caught up in administering and overseeing Government schemes since it takes people away from business imperatives. University representatives may not always see the commercial challenge and opportunity.

The Government should work with representative bodies to make involvement in governing such programs part of the industry culture. The more effective the programs are, the better that involvement will be.

Selection issues run risks of conflicts of interest, especially when the test is to identify to best of a set of good proposals rather than support those ahead of a threshold where determining which have done so reduces risks of conflicts.

Forums to engage industry and private investors with universities, highlighting the Government objectives, may be useful even though the actual content may be repetitive and rarely novel. They can be part of getting the expectation set.

An annual Government-sponsored high-level roundtable would ensure an ongoing conversation between university and business leaders. It would create the opportunity for bold ideas to be heard and receive the kind of support required for those ideas to become commercial successes.

Other areas for action

Funding the change: A Research Translation Fund

To support the initiatives outlined in the discussion paper, notably for missions and to stage gate likely commercial product development, the Government should create a Research Translation Fund additional to current research programs.

There are several proposals for such a fund, which would balance support for medical research translation through the Medical Research Future Fund (MRFF).

One recent example is from Science Technology Australia in their 2021-22 Pre-Budget Submission. STA outlines a Fund that could be achieved through savings from the R&D tax incentive or through a long-term and stable endowment fund.

The fund must be additional to existing programs to ensure Australia's research outcomes remain world standard and capable of being transformed into short to medium term productive uses. Universities have responded effectively to past changes to incentivise privately sourced research revenue. The challenge lies primarily in incentivising demand from industry to stimulate knowledge transfer and commercialisation in partnership with universities.

The problem of commercialisation data indicators

Industry-university collaboration is a vital mechanism translation and commercialisation of research, but we need to be careful not to incentivise improvement in metrics that have weak reliability and validity.

The consultation paper states that “metrics on the extent of collaboration indicate that Australia needs to improve its performance in industry-university collaboration if we want better commercial outcomes”, but the Government’s 2019 Innovation Metrics Review found that most of the quality-assessed metrics contained problems. These were particularly acute in knowledge application, collaboration (accuracy and precision) and metrics for startups, startup activity, inventions and disclosures (inconsistent definitions across universities). Even when metrics reliably measure frequency, they may fail to measure depth or quality of interactions, or are time-lagged.

The risk is that the scheme may incentivise improvement on metrics rather than collaborative activities that underpin longer-term commercialisation benefit. This is of greater risk for the targeted commercialisation objectives rather than the broader translational activities.

The IRU supports Universities Australia’s recommendation for reinstating a high-quality national data collection, building upon the previous National Survey of Research Commercialisation (NSRC), which ceased in 2016.

Support university research capability

The discussion paper is predicated on there being a vibrant, capable and interested research system, keen to see its outcomes taken up and to adjust its research programs to follow up opportunities that emerge.

An effective commercialisation strategy requires an effective research base. A multi-year increase to the Research Support Program would underpin Australia’s research capability and maintain the impact of the Government’s \$1 billion Covid-19 research response package for 2021.

The impact of Covid-19 was to highlight the contribution of international students to the research that is essential to the university they pay to attend. Those funds have been reduced, with the flow on to research capability. The funds are among the few that are not tied to any particular project or research issue but are open to the university to direct to best effect. Government funding for this purpose has constantly reduced as a proportion of all research income; a reduction reinforced by the Government’s message that the Commonwealth grant scheme should not be used for research.

In response, the Government committed an additional \$1 billion to Research Support Program for 2021. It now needs to underpin that important immediate action with a medium-term increase to universities’ capacity to drive up the most interesting research.

This additional support is needed until the future level of international students is clear and there is sustainable support for Australian research.

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