ATSE

SUBMISSION

Submission to the Department of Industry, Science and Resources

Submission to the Strategic Examination of Research and Development discussion paper

11 April 2025

The Australian Academy of Technological Sciences and Engineering (ATSE) is a Learned Academy of independent, non-political experts helping Australians understand and use technology to solve complex problems. Bringing together Australia's leading thinkers in applied science, technology and engineering, ATSE provides impartial, practical and evidence-based advice on how to achieve sustainable solutions and advance prosperity.

A well-managed and funded Research and Development (R&D) sector can help Australia meet its social, environmental and economic challenges, building resilience and capability, and securing our nations' prosperity. However, falling investment in R&D since 2010 has left some fields that are critical to solving Australian and world challenges vastly underfunded (World Bank 2024). For example, investment into energy research, vital to Australia's ability to prevent and adapt to climate change, is well below spending in comparable countries – both in absolute and relative terms (ACOLA 2022). Low research investment has serious consequences for the Australian economy and Australian society, with research showing that Australian R&D returns \$3.50 on average to the economy for every dollar invested (CSIRO 2021). In specific fields, such as health and medical R&D this return rises to \$5.80. Australia cannot rely on innovation through the adoption of technologies invented elsewhere – we need local solutions to our local challenges. Arresting these declines is vital to our nation's prosperity.

Improving Australia's research and development (R&D) system has been the subject of several reviews and inquiries over the last few decades that have led to little change in the overall trajectory of Australia's R&D ecosystem. Growing Australian R&D to keep pace with our international competitors is no small task. Many of our international competitors have better developed R&D ecosystems, and invest twice as much, proportionally, as Australia does in R&D. For example, South Korea, Germany and Japan all spend more than 3% of their GDP on R&D annually, while Australia currently spends just 1.68%. The scale of the task means a large-scale update of our R&D systems, funding models and support structures is needed. The Federal Government cannot act alone in this, but neither can the government expect more from less – the Federal Government will need to lead the way in investing in Australian R&D to stimulate greater investment from industry. This investment will need to be strategic and impactful to build business confidence in investing in Australian R&D.

Attached to this submission is ATSE's most recent report <u>Boosting Australia's Innovation</u>, which provides insights from targeted roundtables over several years with more than 150 senior representatives from industry, academia, government and others who are sophisticated R&D leaders - resulting in actionable recommendations to improve Australia's innovation ecosystem. Many of these recommendations can be implemented without significant new Government R&D investment. ATSE urges the review panel to consider the recommendations in that report in addition to the recommendations made in this submission.

In addition to the recommendations in the Boosting Australia's Innovation report, ATSE makes the following recommendations:

Recommendation 1: Establish a government agency to coordinate and guide all state, territory and federal government research funding (including research infrastructure funding), reducing red tape and ensuring efficient and strategic use of research funding to support national challenges.

Recommendation 2: Continue and expand the Cooperative Research Centres and CRC Projects grants.

Recommendation 3: Support academic secondments to industry through industry placements and updating academic hiring, promotion, grant assessment and award criteria to better recognise industry collaboration and experience.

Recommendation 4: Adopt a public access model for Australian research to ensure Australian industry and governments have access to the most up-to-date research possible.

Recommendation 5: Provide increased support and incentives for academic researchers to prioritise genuine and respectful collaboration with Traditional Knowledge holders.

Recommendation 6: Re-establish the Enterprise Connect program to support Small and Medium-size Enterprises to engage meaningfully with, and benefit from, R&D.

Recommendation 7: Use government procurement policy and accelerated grant application processes to support SMEs to engage in R&D.

Recommendation 8: Establish directed R&D rebates and Revenue Contingent Loan Schemes for companies that invest in collaborations with academia or government, or for R&D aligning with national science and research priorities.

Recommendation 9: Establish moonshot grant schemes that support researchers to conduct high-risk, high-reward research.

Recommendation 10: Leverage international funding schemes, like the Horizon Europe Research Fund, to support Australian R&D.

Level 2, 28 National Circuit Forrest ACT 2603 Australia ABN 58 008 520 394 ACN 008 520 394



Australian Academy of Technological Sciences & Engineering **Recommendation 11:** Leverage existing peer review processes to match potential philanthropic and notfor-profit research funders with high-quality research opportunities across all government research funding agencies and programs.

Recommendation 12: Incentivise philanthropic and not-for-profit investment in R&D through a coordinated matched funding scheme.

Recommendation 13: Develop an integrated whole-of-lifecycle strategy that invests in programs that increase the number of students undertaking pathways to join an R&D-ready workforce

Recommendation 14: Fully implement and fund the recommendations of the Australian Universities Accord and the Diversity in STEM review.

Recommendation 15: Invest in creating permanent or long-term contract positions for early career researchers to create job security and maintain the R&D workforce.

Taking a strategic and long-term view of Government R&D funding

A strategic approach to R&D will need to focus funding on priority areas that enable research commercialisation and translation without neglecting the basic research that underlies these opportunities. A mission focused approach is recommended, in which investment is targeted at R&D that supports Australia to address our science and research priorities and develop economic opportunities that will benefit the Australian community. Such a mission-based focus requires a visionary long-term approach that invests across the research pipeline and nurtures the talent needed to maintain a strong innovation ecosystem.

Building this system will require a coordinated approach across state, territory and federal government. Currently there are too many separate schemes, opportunities and grants, with more than 200 programs across 13 separate portfolios at a federal level - each with their own objectives, timeframes, application and assessment processes, and rules - to effectively coordinate the long-term strategic growth of Australia's R&D sector (Industry Innovation and Science Australia 2021). This breadth of approaches leads to unnecessary duplication of work during application processes, both within government and for researchers and research administrators (who need to prepare new proposals to match new rules when applying for each scheme). On top of this, states and territories each have their own schemes and strategies that may not always align with federal priorities. A centralised body to coordinate and streamline research funding goals, timeframes, basic information, and approach to assessment across schemes and jurisdictions would improve efficiency for researchers, assessors and industry partners. This could be a new statutory authority or could be made a core function of the Australian Research Council, giving the national Council a 'lighthouse' or guidance role rather than administrative oversight. This new authority could help to increase efficiency and coordination, reduce duplication and set the bar for excellence in Australian research. Similar bodies have worked effectively internationally (see OSCHR case study) and could achieve strong efficiencies here in Australia. A potential additional benefit could be to support state governments to invest in worthwhile 'just missed out' research applications for federal grants.

This approach could also be used to improve efficiency and impact of research infrastructure funding. Research infrastructure, including data infrastructure, is a key enabler of Australia's R&D sector, but its funding and delivery is often piecemeal, with multiple programs across the federal, state and territory governments, the largest of which is the National Collaborative Research Infrastructure Strategy. Investment in research infrastructure must take into account long-term operational and maintenance costs of that infrastructure. Many of Australia's critical research facilities are operating on funding agreements that are relatively short (compared to the life of the infrastructure). Clear, long-term, funding arrangements help to secure co-investment from industry and support full utilisation of Australia's research assets. Digital infrastructure and data sets should be publicly available to researchers whenever possible to maximise impact. Ensuring that research infrastructure is managed in a planned and coordinated manner will enable the greatest possible impact for our research infrastructure investment.

Level 2, 28 National Circuit Forrest ACT 2603 Australia +61 2 6185 3240 info@atse.org.au atse.org.au ABN 58 008 520 394 ACN 008 520 394



Coordination Case Study: UK Office for Strategic Coordination of Health Research (OSCHR) Created after the 2006 review of funding in UK health research, OSCHR is an independent body containing representative from across the UK health and medical technologies sector across the National Health Service and UK Government to facilitate research translation into real world benefits and coordinate funding arrangements in support of that aim. OSCHR helps to coordinate research funding across the National Institute of Health Research, the MRC and regional health research programs (Cooksey 2006). Five years after the review was published, OSCHR had delivered most of the report's recommendations and demonstrated its efficacy in addressing many of the issues required to develop a strong health research ecosystem in the UK. Research Australia, a peak body for health and medical research, has held up OSCHR as a model for Australia (Research Australia n.d.).

Recommendation 1: Establish a government agency to coordinate and guide all state, territory and federal government research funding (including research infrastructure funding), reducing red tape and ensuring efficient and strategic use of research funding to support national challenges.

Improving collaboration across industry, custodians of Traditional Knowledge and academia

One of the collaboration success stories of the current R&D ecosystem is the Cooperative Research Centres (CRC) program. This program provides medium to long-term funding for industry led research collaborations. CRCs require collaboration across multiple industry organisations and research institutions and can receive funding for up to 10 years. CRC Projects grants also provide short-term funding to support the development of good ideas in collaboration with industry. CRCs were expected to provide \$32.2 billion to the Australian economy between 2012 and 2025, with CRC Projects producing a benefit-cost ratio of 7.73 for government contributions (ACIL Allen 2021). The CRC program is vital to support Australia's industry-academia collaborations, and expanding the program would allow for greater industry-academia collaboration.

Despite the success of the CRC program, industry experience and collaboration are not always valued. Currently, academic promotion and evaluation often prioritises traditional research outputs over industry experience. Developing and implementing evaluation metrics that explicitly value and reward industry engagement and experience alongside traditional academic achievements would help to better reward researchers for their industry engagement and normalise these collaborations. Flexible sabbatical or placement schemes would also enable academic staff to spend dedicated periods in industry settings, gaining firsthand experience and establishing collaborations. At the same time, industry would benefit from access to skilled researchers who can help them progress their R&D goals. Such a scheme, supported by appropriate academic recognition, could help to strengthen universities' ties with industry and support Australia's R&D growth.

Industry is often prevented from accessing research conducted by universities due to expensive paywalls erected by academic publishers. More than 60% of Australian journal articles sit behind paywalls – limiting industry and government access to research often funded by Australian taxpayers (Office of the Chief Scientist 2024). This can result in delays in research dissemination and duplication of research as industry unknowingly repeats work locked behind a paywall. Australia's previous Chief Scientist proposed a public access model through a national Read and Publish agreement that allows all Australians access to global research and ensures all Australian research is open access to the rest of the world (Office of the Chief Scientist 2024). Creating an open access environment would help to unlock industry investment, inform decision making and position Australia as a leader in freely available research.

Building a culture of research collaboration means working across knowledge systems to ensure the best outcomes for all. Integrating Traditional Knowledge systems creates opportunities for western science to learn from tens of thousands of years of connection with the land, while creating new economic opportunities for Aboriginal and Torres Strait Islander peoples. <u>ATSE's Traditional Knowledge Innovation</u> <u>Award winners</u> provide strong examples of how, through genuine partnership, Traditional Knowledge can be respectfully and authentically woven with western science for the benefit of all. Historically Traditional Knowledge has been viewed as less valid than western science and collaboration has not been genuine or equal (Ogar et al. 2020). More equal arrangements involve active inclusion of the custodians of Traditional Knowledge in planning and decision making through co-design arrangements, ensuring adherence to customary protocols and governance and protection of cultural and intellectual property (CSIRO 2020). This

Level 2, 28 National Circuit Forrest ACT 2603 Australia +61 2 6185 3240 info@atse.org.au atse.org.au ABN 58 008 520 394 ACN 008 520 394



Australian Academγ of Technological Sciences & Engineering

work takes additional time and resources that are often not recognised by academic metrics that focus on publication and citation counts. Providing greater resourcing and recognition of work conducted in partnership with custodians of Traditional Knowledge would help to incentivise more genuine and equal partnerships between custodians of Traditional Knowledge and western researchers.

Recommendation 2: Continue and expand the Cooperative Research Centres and CRC Projects grants.

Recommendation 3: Support academic secondments to industry through industry placements and updating academic hiring, promotion, grant assessment and award criteria to better recognise industry collaboration and.

Recommendation 4: Adopt a public access model for Australian research to ensure Australian industry and governments have access to the most up-to-date research possible.

Recommendation 5: Provide increased support and incentives for academic researchers to prioritise genuine and respectful collaboration with Traditional Knowledge holders.

Supporting industry to uplift its R&D intensity

The Australian Government has a major role to play in helping bring business investment into the R&D sector. Given Australia's reliance on small and medium sized enterprises¹ (SMEs), supporting them to engage with and adopt innovations will be crucial to building Australia's R&D investment while improving capability, economic resilience, and productivity. The Enterprise Connect program, a federally funded program that ran from 2008 to 2014, used to serve this role providing business advice and grants to SMEs to adopt innovation within the sector. Grants were also provided to allow SMEs to hire researchers to develop and implement new ideas with commercial potential. Businesses that took part in the program had higher growth, employment and capital expenditure and were more likely to survive (Bruno 2020). The reestablishment of this program would be a good start to supporting SMEs to invest in, and adopt emerging, innovations.

Effective support businesses to engage in R&D would best be served by adapting Government processes to make existing research collaboration programs more effective at attracting business investment. Current grant schemes often take many months from application to disbursement of funds – with unpredictable timelines - which can cause major roadblocks in the R&D pipeline, stalling momentum and risking first-mover advantages. Streamlining and optimising application processes and reviews would ensure applying for grant funding becomes an enabler of, rather than a barrier to, success for SMEs. Governments can also improve the policy framework for specific procurement processes – these are often very risk averse – to support emerging domestic technologies to establish themselves within the marketplace.

The R&D Tax Incentive is Australia's largest mechanism supporting business investment in R&D, accounting for more than 75% of total government support for business R&D (OECD 2024). This makes the R&D Tax Incentive the most important program to support business R&D in Australia. However, the R&D Tax Incentive is a broad instrument and has been criticised as supporting business as usual with a lack of productivity benefits (Elnasri and Fox 2017). These tax benefits could be better targeted by improving incentives for industry R&D investments to align with science and technology priorities, or to foster collaboration with government departments or agencies and academic institutions.

Revenue Contingent Loan (RCL) schemes can also provide SMEs and start-ups with initial capital to invest in R&D. RCLs are akin to HECS for startups – they only need to be repaid once the company turns a profit and then only as a proportion of revenue (Baldwin et al. 2025). This provides initial capital in a way that helps the company remain viable until the benefits of R&D can be realised. This is particularly important for startups to help them traverse the 'valley of death' that often results in good ideas never reaching commercialisation. There are already small-scale RCL schemes running in Australia (see NSW case study) and similar schemes were employed during the COVID-19 pandemic to support the survival of small businesses (Chapman 2021). Internationally, long-term low interest loan schemes have been effective at providing startup capital to SMEs, helping to foster a strong innovation ecosystem (e.g. Germany's ERP Mezzanine for Innovation loans). Developing a national RCL scheme for collaborative R&D projects could help to bring more SMEs to the table and support links between industry and academia.

Level 2, 28 National Circuit Forrest ACT 2603 Australia ABN 58 008 520 394 ACN 008 520 394



Australian Academγ of Technological Sciences & Engineering

¹ SMEs make up 99.8% of all Australian businesses and accounts for 56% of Australia's GDP (Australian Small Business and Family Enterprise Ombudsman 2025).

Research Translation Case Study: NSW Physical Sciences Fund

The New South Wales Physical Sciences Fund (PSF), administered by the Office of the NSW Chief Scientist & Engineer, was established to bridge the gap between research and market readiness, providing financial support to NSW-based startups and businesses. Its core objective is to facilitate the development of technologies developed in New South Wales into marketable products that deliver economic growth and social and environmental benefits to the state. It does this by providing revenue contingent loans of between \$200,000 and \$2 million to Australian businesses headquartered in New South Wales. These grants are repaid to the New South Wales Government once the project achieves certain revenue levels and can be made as part of co-funding proposals. Projects previously supported include developing ceramic products from waste materials, chemical-free weed control technologies and robots to clean and inspect high-rise buildings.

The program has a relatively small budget of \$3.5 million (NSW Department of Enterprise Investment and Trade 2024), which limits the large-scale impact of the program on the overall research ecosystem. However, the program could provide a model for a larger scale, national, research translation program or other state-government led initiatives.

Recommendation 6: Re-establish the Enterprise Connect program to support Small and Medium-size Enterprises to engage meaningfully with, and benefit from, R&D.

Recommendation 7: Use government procurement policy and accelerated grant application processes to support SMEs to engage in R&D.

Recommendation 8: Establish directed R&D rebates and Revenue Contingent Loan Schemes for companies that invest in collaborations with academia or government, or for R&D aligning with national science and research priorities.

Improving the functioning of Government grants

Australia's current government approach to investing in R&D is not working effectively. Large scale government grant schemes have extremely low success rates – as low as 9.5% for Industry Fellowship Laureates and 11% for National Health and Medical Research Council (NHMRC) Ideas Grants (NHMRC 2022). Success rates on ARC Discovery grants have been below 20% for nine years in the past decade (Australian Research Council n.d.), signalling significant additional potential to be leveraged in Australian research. These low success rates have led to high-risk high-reward research going unsupported while "safe" incremental advances are prioritised, with researchers increasingly concerned about ensuring research is "successful" to demonstrate its value to granting agencies (Conix et al. 2021).

If Australia is to incentivise and support groundbreaking and game-changing research, the government must be willing to invest in higher-risk research (adopting a fail-fast mentality), as well as longer-term research and incremental advances. The recent ARC proposal to overhaul ARC grant schemes and create a new category for innovative, high-risk research recognises this conundrum. Applying this approach across the breadth of R&D funding schemes will enable more cutting-edge research in all fields in which Australia boasts strengths. Some of the most successful R&D programs internationally, such as Defence Advanced Research Projects Agency (DARPA), adopt this higher risk, fail fast approach. A mission focused scheme that invests in these "moonshot" projects with partners in industry and academia is generally recognised internationally as the key to unlocking genuine breakthroughs. The proposed Initiate grant scheme, suggested as part of the ARC's National Competitive Grants Program review, may help with this. Australia would also benefit from greater support for research that builds critical capabilities at homes and strengthens international linkages.

The Australian Government could also leverage international programs to increase the range and impact of Australian research. The New Zealand Government, for example, has joined the Horizon Europe Research Fund – an international funding program with €95 billion (~AU\$164.5 billion) in research funding – giving New Zealand researchers access to international investment through Pillar 2 to support research into international challenges (Ministry of Business Innovation and Employment 2024). This funding is supported by domestic investment, topping up Horizon grant funding to ensure overheads are covered (Ministry of Business Innovation and Employment 2025). The Australian Government is currently missing the

Level 2, 28 National Circuit Forrest ACT 2603 Australia +61 2 6185 3240 info@atse.org.au atse.org.au ABN 58 008 520 394 ACN 008 520 394



Australian Academγ of Technological Sciences & Engineering

opportunity to leverage these international schemes² to develop stronger ties to our international partners, elevate Australian R&D and better support Australian researchers.

Case Study: US Department of Energy National Laboratories

The National Laboratories are a network of 17 labs spread across the United States with the goal of tackling challenges related to energy, energy security and environmental sustainability that are often beyond the scope of industry of any individual research institution. Built out of the work on the Manhattan Project and primarily funded by the US Department of Energy, each lab receives a financial allocation that is both used to support research within the lab and distributed to other research institutions to support a range of research projects supporting that lab's mission. They are government-owned labs that are operated by private contractors (typically academic, industry or not-for profit organisations), allowing lab decisions to be made by experts in the field, while direction on priorities is provided by the Department of Energy. Labs often collaborate with industry and other government agencies, providing additional funding and expertise.

This network has led to the discovery of 22 elements and the awarding of over 100 Nobel Prizes. Major breakthroughs by the National Laboratories network include the discovery of messenger RNA (which provide genetic instructions to cells and is vital to understanding cancers and birth defects), inventing technology to clean up oceanic oil spills, help developed moder wind turbines and even found the cause of the extinction of the dinosaurs.

Recommendation 9: Establish moonshot grant schemes that support researchers to conduct high-risk, high-reward research.

Recommendation 10: Leverage international funding schemes, like the Horizon Europe Research Fund, to support Australian R&D.

Leveraging philanthropy and not-for-profits to better support R&D

While the bulk of R&D expenditure is from governments and industry, nearly \$700 million is on record as having come from the not-for-profit sector in 2022-23 (Australian Bureau of Statistics 2024a). Snow Medical invested more than \$100 million in research in 2024, while the Minderoo Foundation invests in a range of research projects to address urgent challenges (with the total amount undisclosed). Atlantic Philanthropies helped to fund the establishment of several major research institutes based in the University of Queensland and Queensland University of Technology.

The NHMRC works with philanthropic funders³, allowing them to leverage the NHMRC's peer-review process to identify the best opportunities and match research to their interests. Philanthropic and not-for-profit funders receive a list of projects matching their requirements that missed out on funding through the NHMRC's normal grants program. However, this scheme is limited to the NHMRC, and therefore to medical research. There is no equivalent program for the Australian Research Council, nor a government-wide strategic approach to leveraging philanthropic funding to boost other existing programs. A national research coordination agency could be used to seamlessly link philanthropic and not-for-profit funders to research opportunities across funding agencies.

Matching philanthropic donations to research could encourage additional donations and elevate the impact of those donations. A matched funding arrangement, where the Government tops up research fundings from philanthropic or not-for-profit sources by an equal or proportionate amount would help to encourage more philanthropic investments – as donors would achieve more impact for every dollar. For its part, the Government could target a matched funding scheme to national priority areas like the Science and Research Priorities or towards supporting major policy objectives (e.g. the Future Made in Australia initiative). Combined with project matching through a central coordination agency, this would allow the

Level 2, 28 National Circuit Forrest ACT 2603 Australia ABN 58 008 520 394 ACN 008 520 394



Australian Academγ of Technological Sciences & Engineering

² Other opportunities for possible international funding that Australian R&D can leverage include the UK International Science Partnerships Fund, the Bill and Melinda Gates Foundation Global Grand Challenges Grants and the Eureka Network.

³ For example, the McCusker Charitable Foundation, Cancer Australia and Beyond Blue

Federal Government to increase investment in R&D while directing the focus of philanthropic giving towards research areas of greatest impact for Australians.

Recommendation 11: Leverage existing peer review processes to match potential philanthropic and notfor-profit research funders with high-quality research opportunities across all government research funding agencies and programs.

Recommendation 12: Incentivise philanthropic and not-for-profit investment in R&D through a coordinated matched funding scheme.

Building Australia's future R&D workforce

A thriving R&D ecosystem will rely on a workforce of highly skilled researchers and entrepreneurs who have the skills, networks, creativity and drive to develop and commericalise new ideas. Beyond researchers and entrepreneurs, employees with an understanding of science, technology, engineering and mathematics (STEM) will be crucial for the adoption of new R&D into Australian industry. This will require a focused investment across the learning and development lifecycle, ideally based on an integrated R&D-ready workforce strategy that supports the development of this workforce from early schooling to higher education to measures to workforce retention.

The first stage of such a strategy could be directed towards increasing the number of young people interested in STEM subjects and considering STEM careers. While R&D extends beyond STEM, enrolments in Year 12 STEM-related classes, that teach the fundamentals of research design, have stagnated over the last decade⁴. Ensuring that students are understanding and engaging with inquiry-based learning and fundamental sciences is essential to ensuring we have the R&D-ready workforce needed to underpin Australia's R&D sector. ATSE's <u>Our STEM skilled future</u> report outlines a series of recommendations to improve the quality and status of STEM education in primary and secondary schooling that provides a starting point for boosting both the quality and status of STEM and entrepreneurship education.

To create a large R&D ready workforce, all students need the best possible opportunity to succeed. In many core fields for expanding the R&D workforce, a lack of diversity persists. For example, women account for 37.3% of students in STEM degrees and only 20.8% of graduates (Dangar 2021). This indicates a greater need to support students from diverse backgrounds to enrol R&D related fields and ensure they complete their studies. The recent Diversity in STEM Review provides a strong direction for boosting the engagement of diverse people across education and the workforce. The review highlights several educational programs that clear and consistent funding to achieve a diverse R&D-ready workforce. Ensuring the adoption of the review's recommendations, including around programs that support under-represented but highly motivated students to study and thrive in STEM, like <u>ATSE's Elevate program</u> which supports students to succeed with a wrap-around approach as well as finances, will be fundamental to ensuring a large and diverse R&D-ready workforce.

Most career paths for R&D workers involve research training through post-graduate research degrees. These degrees are a significant commitment, many taking 4 years on top of undergraduate studies, and come with the opportunity-cost of missed income during that time. The Research Training Program provides many domestic research students with stipends, to support them as they undertake this study. Unfortunately, these stipends are woefully inadequate for Australian students to live on - providing below minimum wage stipends as research student provide 54% of the human resources devoted to R&D in Australia (Australian Bureau of Statistics 2024b). The Australian Universities Accord found that the low level of research stipends for domestic students was "discouraging the best students from becoming the next generation of researchers" and recommended that the stipend rate be increased (O'Kane 2023, p.12). ATSE supports this position, noting that increases to stipend rates should ideally be supported by commensurate increases in total funding for the Research Training Program. Failing to do so will lead to fewer students receiving support, leading to more students choosing different career pathways.

Early career researchers (ECRs) face a great deal of uncertainty stemming from short-term, highly competitive, insecure research contracts in academia that are linked with uncertain grant funding. Contract extensions often rely on securing new funding – a position that is, at best, a stressful and time-consuming

Level 2, 28 National Circuit Forrest ACT 2603 Australia ABN 58 008 520 394 ACN 008 520 394



Australian Academγ of Technological Sciences & Engineering

⁴ There were nearly 17,000 fewer year 12 enrollments in STEM subjects in 2022 as there were in 2013 (DISR 2023).

process, and at worst, doomed to failure by untenably low grant acceptance rates. This is a major cause of attrition for early career researchers (particularly those from underrepresented backgrounds) who often leave academia citing career instability (McKenzie 2016; Christian et al. 2021). The ARC has proposed changes to its National Competitive Grants Program (through a review that is running concurrently with this examination), but these changes fail to ensure career certainty for ECRs. Despite the uncertainty of academia, leaving the uncertainty of academia for industry – even temporarily – can permanently close the academic career pathway by putting researchers behind on metrics not valued in industry settings: publication and citation counts. This can limit both employment opportunities within academia, as well as grant opportunities that enable continuation in such roles. More secure employment conditions for ECRs and increased ability for researchers to leave and rejoin academia is needed. As a stopgap, greater career mentoring and support for ECRs can help to support these emerging experts to stay in the R&D sector.

Recommendation 13: Develop an integrated whole-of-lifecycle strategy that invests in programs that increase the number of students undertaking pathways to join an R&D-ready workforce

Recommendation 14: Fully implement and fund the recommendations of the Australian Universities Accord and the Diversity in STEM review.

Recommendation 15: Invest in creating permanent or long-term contract positions for early career researchers to create job security and maintain the R&D workforce.

ATSE thanks the Department of Industry, Science and Resources for the opportunity to respond to the Strategic Examination of Research and Development Discussion Paper. For further information, please contact academypolicyteam@atse.org.au.

PO Box 4776 Kingston ACT 2604 Australia



8

Australian Academy of Technological Sciences & Engineering

References

ACIL Allen (2021) Cooperative Research Centres Program impact evaluation, https://www.industry.gov.au/publications/cooperative-research-centres-program-impactevaluation#:~:text=CRCs%20will%20generate%20an%20estimated,of%20government%20funding%20sinc e%202016.

ACOLA (2022) Australian Energy Transition Research Plan, https://acola.org/wpcontent/uploads/2021/06/acola-2021-australian-energy-transition-plan.pdf, accessed 21 November 2022.

Australian Bureau of Statistics (2024a) '81090D0005_202223', https://www.abs.gov.au/statistics/industry/technology-and-innovation/research-and-experimentaldevelopment-government-and-private-non-profit-organisations-australia/latest-release, accessed 8 April 2025.

Australian Bureau of Statistics (2024b) *Research and Experimental Development, Higher Education Organisations, Australia*, https://www.abs.gov.au/statistics/industry/technology-and-innovation/researchand-experimental-development-higher-education-organisations-australia/latest-release#data-download, accessed 3 April 2025.

Australian Research Council (n.d.) *NCGP Trends: Success Rates*, https://www.arc.gov.au/funding-research/funding-outcome/grants-dataset/trend-visualisation/ncgp-trends-success-rates, accessed 12 December 2022.

Australian Small Business and Family Enterprise Ombudsman (2025) *Number of small businesses in Australia, Australian Small Business and Family Enterprise Ombudsman*, https://www.asbfeo.gov.au/small-business-data-portal/number-small-businesses-australia, accessed 3 April 2025.

Baldwin KGH, Chapman B, Howard JH and Withers G (2025) *Breaking the R&D Funding Barrier: The Case for Revenue-Contingent Loans*, https://www.actoninstitute.au/post/breaking-the-r-d-funding-barrier-the-case-for-revenue-contingent-loans, accessed 20 March 2025.

Bruno A (2020) Business performance of Enterprise Connect participants, www.industry.gov.au/OCE.

Chapman B (2021) *Ideas Forum: Can revenue contingent loans* support the small business recovery, www.mckellinstitute.org.au.

Christian K, Johnstone C, Larkins JA, Wright W and Doran MR (2021) 'A survey of early-career researchers in Australia', *ELife*, 10:1–19, doi:10.7554/ELIFE.60613.

Conix S, De Block A and Vaesen K (2021) 'Grant writing and grant peer review as questionable research practices', *F1000Research*, 10, doi:10.12688/f1000research.73893.2.

Cooksey David (2006) A review of UK health research funding, Stationery Office.

CSIRO (2020) Our knowledge our way in caring for Country: indigenous-led approaches to strengthening and sharing our community knowledge for land and sea management: best practices guidelines from Australian experiences, CSIRO.

CSIRO (2021) *Quantifying Australia's returns to innovation*, https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/CSIRO-futures/Innovation-Business-Growth/Quantifying-Australias-returns-to-innovation.

PO Box 4776 Kingston ACT 2604 Australia ABN 58 008 520 394 ACN 008 520 394



9

Australian Academγ of Technological Sciences & Engineering Dangar K (2021) Women, policy and the STEM pipeline: Bridging the gap between tertiary education and the workforce for female STEM students Kate Dangar, https://arts.unimelb.edu.au/school-of-social-and-political-sciences/our-research/gender-equity-initiative, accessed 7 March 2025.

DISR (2023) 'Year 12 subject enrolment in STEM and other fields', https://www.industry.gov.au/publications/stem-equity-monitor/primary-and-secondary-school-data/year-12subject-enrolment-stem-and-other-fields, accessed 16 August 2024.

Elnasri A and Fox KJ (2017) 'The contribution of research and innovation to productivity', *Journal of Productivity Analysis*, 47(3):291–308, doi:10.1007/s11123-017-0503-9.

Industry Innovation and Science Australia (2021) *Driving effective Government investment in innovation, science and research*, Organisation for Economic Co-operation and Development, https://www.industry.gov.au/iisa.

McKenzie L (2016) 'A Precarious Passion: Gendered and Age-Based Insecurity Among Aspiring Academics in Australia', In A Pressland and R Thwaites (eds) *Being an Early Career Feminist Academic: Global Perspectives, Experiences and Challenges*, Springer.

Ministry of Business Innovation and Employment (2024) *Horizon Europe Research Fund*, https://www.mbie.govt.nz/science-and-technology/science-and-innovation/internationalopportunities/horizon-europe-research-fund, accessed 2 April 2025.

Ministry of Business Innovation and Employment (2025) *MBIE Horizon Europe top-up funding scheme*, https://www.mbie.govt.nz/science-and-technology/science-and-innovation/international-opportunities/horizon-europe-research-fund/mbie-horizon-europe-top-up-funding-scheme, accessed 2 April 2025.

NHMRC (2022) Summary of Scores for 2022 Ideas Grant Applications.

NSW Department of Enterprise Investment and Trade (2024) *Physical Sciences Fund-Round Five Program Guidelines*, https://www.chiefscientist.nsw.gov.au/__data/assets/pdf_file/0004/607675/Guidelines-Physical-Sciences-Fund-PSF-program.pdf, accessed 7 March 2025.

OECD (2024) *R&D tax incentives*, https://www.oecd.org/en/topics/r&d-tax-incentives.html, accessed 10 March 2025.

Office of the Chief Scientist (2024) Advice on open access models Unlocking knowledge for national benefit, https://www.chiefscientist.gov.au/news-and-media/advice-open-access-models.

Ogar E, Pecl G and Mustonen T (2020) 'Science Must Embrace Traditional and Indigenous Knowledge to Solve Our Biodiversity Crisis', *One Earth*, 3(2):162–165, doi:10.1016/j.oneear.2020.07.006.

O'Kane M (2023) Australian Universities Accord Final Report, https://www.education.gov.au/australianuniversities-accord/resources/final-report.

Research Australia (n.d.) *Strategic coordination of funding for health and medical research*, https://researchaustralia.org/health-and-medical-research-australia-can-do-better/strategic-coordination-offunding-for-health-and-medical-research/, accessed 6 March 2025.

World Bank (2024) *Research and development expenditure (% of GDP) - OECD members*, https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?locations=OE&most_recent_year_desc=false, accessed 21 August 2024.

ABN 58 008 520 394 ACN 008 520 394

