Online submission

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Australian Academy of Science submission to the Select Committee on Productivity in Australia

The Australian Academy of Science (the Academy) welcomes the inquiry into Productivity in Australia.

Australia's research activity underpins our nation's ability to generate knowledge and ideas, innovate, and adopt new technologies. Research is a powerful productivity lever that is neglected in Australia's policy discourse on improving national productivity, to our national detriment.

Australia significantly underinvests in research and development (R&D), presenting a barrier to productivity growth. In 2023-24 Australia's investment in R&D was 1.69% of GDP. This is well below the OECD average of 2.7% and much lower than peer nations.

Research and scientific capabilities equip our nation to develop and harness emerging technologies that enable Australia to boost productivity, stay competitive and secure in a tech-driven world, develop new medicines to stay healthy, understand and adapt to the impacts of climate change on our economy and our way of life, and create opportunities for new industries and ways of working.

The Academy recommends that the Australian Government:

- Recognises the value of R&D as an important driver of productivity growth and considers making new interventions to stimulate R&D activity, as part of the productivity agenda.
- Develops a 10-year R&D investment plan to restore national research investment. The Academy's budget-positive proposal to establish a Research Fund using revenue from an R&D levy should form part of the plan.
- Implements the findings of the Strategic Examination of R&D (SERD) to reform our research system and reverse the decline in R&D investment in Australia.
- Creates a 10-year strategy for high performance computing and data (HPCD) with focused capability building in next generation HPCD infrastructure. Such infrastructure is essential for progress in both research and industry.
- Adopts a national STEM workforce strategy to build a strong, diverse and mobile STEM capability. This will help generate the skilled workforce to create and use innovations that boost productivity.
- Establishes enforceable indoor air quality performance standards in public buildings to enable clean indoor air that improves productivity by reducing the transmission of disease, reducing absenteeism, and improving cognitive performance.
- Adopts a national circular economy and resource efficiency framework.

The Academy's comprehensive analysis, *Australian Science, Australia's Future*, assessed the science capabilities needed to tackle the challenges shaping Australia's economy presented in 2023 Intergenerational Report.

Research underpins productivity, but Australia chronically underinvests

Research and development (R&D) drives the creation and diffusion of new knowledge, technologies and processes that enable entities to improve efficiency and productivity, innovate and be competitive. Nations with higher R&D intensity consistently demonstrate stronger multifactor productivity growth, high value-added industries, and diverse economies which improve resilience to economic crisis.

In an interview for Issues in Science and Technology, Marcia McNutt, President of the US National Academy of Sciences, highlighted the role of research in economic growth and resilience: *"Since 1945, 75% of all global economic growth is derivative of technological advance. And since 1990, 90% of that technical advance is*

derivative of fundamental scientific understanding… if we look around the world at which countries are prosperous, there are two classes of them. There are those nations that have invested in science and technology, and they are doing well. They are creating entire new industries, new disciplines, new ways to advance the welfare of humans on this planet. The other kind of country that is doing well economically is the kind with a lot of natural resources to exploit—but that source of wealth is not sustainable. Science is still the endless frontier of knowledge and advancement."[1]

Despite this clear imperative, research was barely mentioned in recent national productivity discussions, including the Productivity Commission's Five Pillars inquiry (which discusses the need for 'ideas' without mention of research) and the Treasurer's economic reform roundtables (which narrowly focussed on technologies such as AI). Ignoring research in Australia's productivity agenda will not prepare our nation for the future in an era of technological, environmental and geopolitical disruption.

Australia's investment in research has been in decline for over a decade. Government expenditure on R&D has stagnated at 0.17% of GDP, below the OECD average of 0.23%, a $1.8 billion difference. Funding for Australia's research funding councils, the Australian Research Council and National Health and Medical Research Council, has declined in real terms since 2014. Australian business investment is also weak comparatively, at 0.89% of GDP compared to the OECD average of 1.99%, a gap of $28.78 billion.

This chronic underinvestment limits opportunities for productivity growth and the translation of knowledge into economic and societal benefits and weakens Australia's capacity to compete in an increasingly technology driven global economy. The economic and fiscal case for investment in research is strong, with a 1:3 return on investment, and sustained investment in basic research raising productivity per year by 0.3%.[2,3]

Robotics and automation provide one illustrative example of how investment in science and research can contribute to productivity growth, alongside advances in other areas such as digital capability, health and advanced manufacturing. Australian research organisations are generating high quality innovations in robotics and automation, however Australia ranks 32nd globally in robotics adoption. Automation and the transition to a net-zero economy have been identified as a key opportunity to lift national productivity, with data suggesting a 1% increase in robotics use could increase productivity per year by approximately 0.8%.[4,5]

To capture the productivity benefits of research, the Academy calls on governments to consider policies and investment to stimulate R&D activity and provide sustained support for research.

A clear opportunity is for the Australian Government to implement the recommendations of the Strategic Examination of R&D to reform Australia's R&D system architecture to make it more cohesive. Alongside this, the Academy recommends the Government develop a 10-year investment strategy to raise national investment in research and support partnership between the public and private sectors, to build the research capability Australia needs in times of geopolitical uncertainty and technological change.

Incentivising business investment in R&D is an opportunity for Australia

Business investment drives R&D intensity in advanced economies.[6] Australia's business R&D investment remains narrow and concentrated among small and medium enterprises. In 2022-23, 45.7% of Australian businesses engaged in innovative activities, slightly below the peak during the COVID-19 pandemic.[7] Business expenditure on R&D was $24.41 billion in 2023-24, at 0.89% of GDP compared to the OECD average of 1.99%.[8]

Australia can update its tax and incentive frameworks to reward productivity-enhancing investment and innovation. The Academy supports reforms to the R&D Tax Incentive to sharpen eligibility conditions, to improve additionality and spillover effects, and to promote research collaboration and business growth.

The Academy has proposed implementing a temporary R&D levy to incentivise business investment in R&D. We have costed the application of a 0.25-0.5% levy to businesses with $100 million or more in annual revenue, which would be discounted for businesses who invest in R&D activities. The revenue from the levy would be used to create a Research Fund to invest in discovery research. The Academy's economic analysis for this proposal is available here. We strongly encourage Treasury to undertake additional analysis that explores

other levy rates and the intersection of this proposal with possible changes to the RDTI or the corporate tax rate.

Commitment for a decadal strategy and investment for Australian high-performance computing and data is overdue

Despite the rising demand for supercomputing capability for research, there is no long-term plan to maintain or expand Australia's high-performance computing and data (HPCD, also referred to as supercomputers) infrastructure and capabilities. This capability affects research capability, pace of artificial intelligence (AI) and quantum technology development, and the ability to use advanced modelling and analytics for research and industry applications. The Academy proposes an investment of $200 million per year over 10 years to support sector planning, upgrade facilities, and coordinate investment in Tier-0 capability.

Developing and implementing such a strategy will enable sovereign AI development and use, climate resilience and productivity growth. Shifts toward building digital technology capability in AI and high-performance computing could increase labour productivity by 4.3% over the next decade, adding an estimate $116 billion to GDP.[9]

The government must commit to a long-term, coordinated infrastructure roadmap and strategy that underpins national productivity and innovation capability in high performance computing and data.

Australia needs a strong STEM workforce to deliver on its ambitions

Australia's ability to lift productivity and realise the benefits of emerging technologies depends on the availability of a capable, adaptable STEM workforce. While advances such as artificial intelligence illustrate this skills challenge, the underlying constraint is broader: Australia lacks a coherent national strategy to ensure the STEM capabilities required across the economy.

The benefits are enormous. Industries that employ PhD graduates typically exhibit a high absorptive proficiency (the ability to identify, assimilate, and apply external knowledge for commercial or public benefit). PhD graduates are essential for bridging the gap between knowledge and practical application, particularly in sectors with high R&D intensity.

A strong STEM workforce underpins technology adoption, industry transition, and public sector capability in critical areas including health, energy and national security. Analysis from the Academy's initiative, *Australian Science, Australia's Future*, showed the current pipeline and study choices of students is not aligned with the needs of our future workforce, with declining STEM participation and teacher shortages a looming threat. The Academy recommends the development of a national STEM workforce strategy to train, attract and retain talent, and to support mobility across education, research, industry and government.

Additional opportunities to support productivity

Develop a national strategy for indoor air quality

Poor indoor air quality negatively impacts the health, wellbeing and productivity of Australians. Improved indoor air quality can provide immediate benefits to wellbeing, comfort, cognition and performance, and reduce airborne transmission of viruses. We have an opportunity to implement low-cost, high-return measures to reduce sickness in the workforce and the community, improving productivity and quality of life for all Australians.

Presently, Australia does not monitor indoor air quality in public spaces to evidence-informed standards. As a result, we cannot safeguard indoor air quality, nor capture the health, productivity and wellbeing benefits from doing so. When measured, indoor air quality is frequently found to be of poor quality in many public places including schools, hospitals and transport. Last year, the Academy published a report, Indoor air: The science of indoor air and pathways to improve indoor air quality in Australia, which outlines the scientific evidence base and policy pathways to deliver healthier indoor air.

The Academy recommends that the Australian Government establish a national indoor air quality strategy and multidisciplinary advisory council to establish enforceable indoor air quality performance standards in public buildings and launch a national public awareness and education campaign for indoor air quality.

Develop value creation opportunities toward a circular economy

Australia has a primarily linear approach to resource use, missing opportunity for value creation through circular economy solutions. Circular economy approaches present an opportunity to decouple economic output from raw material use, thereby reducing costs, waste, and environmental pressures. Research is the enabling mechanism that makes circular systems feasible, viable and scalable. Opportunistic research areas for this initiative include materials science, advanced manufacturing, systems engineering and digital technologies. Scalability of circular economy approaches requires coordination across research capability, skills development, policy and circular economy initiatives. The Academy recommends the government develop a national circular economy framework which incentivises waste reduction and prioritises material reuse, and the productive use of waste as a resource.

To discuss or clarify any aspect of this submission, please contact Lauren Sullivan, Manager Science Policy and Advice at science.policy@science.org.au.

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