GROUP OF EIGHT AUSTRALIA

THE NEED FOR A NATIONAL RESEARCH STRATEGY

Defined by the critical importance of Australian research and development to increased productivity and prosperity

BACKGROUND

Australia requires a National Research Strategy if it is to secure its economic future through increased productivity and prosperity. This must not be just a portfolio-by-portfolio target and initiatives approach, but a coherent, long-term bipartisan strategy. A strategy that sets a dedicated framework to support research in Australia for generations to come.

The why is obvious, because the answer to the question below is known and has been for many years. It simply requires being acted upon, and urgently – something that cannot occur without national commitment to embracing R&D.

In Australia a lot of R&D takes place within our universities (unusual for an advanced economic nation).

The question: How does Australia maintain, enhance and pay for the prosperity of its total population, including meeting growing demands for high quality services such as education, health care, aged care, environmental protection, and defence?

The answer: productivity growth.

Productivity growth is the **only** way to achieve long-term improvement in living standards, including having the means to meet the many required social and environmental objectives.

The Productivity Commission confirms this. It points to the benefits of productivity which materialise as better quality or new products and services at reduced costs, and/or higher incomes and real wages concurrently with more resources being available for leisure and wellbeing.[1]

Put simply, without strong productivity Australia would be a poorer nation where people would struggle to achieve a good standard of living.

PRODUCTIVITY STEMS FROM INNOVATION

Achieving productivity growth depends in large part on technological progress and efficiency improvements. This goes beyond more than simply the next generation of computers or iPhones. It encompasses improved human 'know-how' and innovation in the form of discovering and applying new and improved ways of doing things, including in new products, processes, and markets.

Many innovations come from our R&D, broadly defined as investment in new knowledge to improve products and production processes.

There are different forms of R&D, from basic (sometimes called 'fundamental' or 'blue sky') to applied research. All add to the stock of human knowledge people can draw on to become more productive and achieve improvements to their living standards. This breadth of R&D also tackles existing and new challenges, be they health, environmental or social.

Research is conducted each and every day in Australia and at many levels – from individuals solving problems; businesses looking to expand and become more profitable, to governments and not-for-profits working to address public policy challenges, and international collaborations to address shared global challenges such as antibiotic resistance, food and water security and solutions to new diseases, such as COVID-19.

Research is conducted and shared at scale and in a systematic way by organisations specially designed for such activities – namely Australia's research-intensive universities and associated research institutes.

The Productivity Commission notes several inventions, such as vaccines, antibiotics and statins that have had widespread application and saved and improved countless lives. Almost any invention that has contributed to improvement in people's lives and productivity has originated from research, including the systematic research conducted entirely or in part by universities.

1 Productivity Commission, 5-year Productivity Inquiry: The Key to Prosperity, Interim Report, Canberra, July 2022.

PRODUCTIVITY STEMS FROM INNOVATION CONTINUED

In Australia the bulk of university-based research funding from industry and other non-government sources – some 70 percent – flows to the Go8 universities which employ world-leading researchers to expand the frontiers of human knowledge and capability across a wide range of diverse fields, such as biomedical and clinical sciences and health sciences.

Research outcomes are also shared ('knowledge diffusion') – for example, between businesses which learn from each other, through industry 'hubs', and by people throughout their working lives.

Research that takes place in Australian universities is diffused through publications in leading peer-reviewed journals; by our university researchers engaging with industry and governments; and by the dissemination of knowledge through teaching students who then become the future generators of the next big breakthrough to improve lives.

The business gains from university R&D are enormous – businesses can use university research to change their business practices and become more productive, or partner with university researchers on new collaborations that have broad commercial applications. Hence Australian university research that underpins innovation and productivity is often shared widely, adding to the 'global stock of human knowledge'. This stock is also contributed to by universities, research institutes and businesses conducting research around the world.

The shareable nature of knowledge (or more broadly 'ideas') created by university research is why it can lead to economy-wide innovation and productivity benefits. That is, much of the knowledge created by university research is a 'non-rivalrous' good that can be used by multiple people simultaneously, allowing productivity gains to be widespread.

BUSINESSES OF ALL SIZES BENEFIT FROM RESEARCH

One excellent Australian example is the knowledge underpinning Wi-Fi technology. Wi-Fi technology can be simultaneously applied in any number of workplaces around the world. Use of Wi-Fi in one workplace, does not reduce its availability and use in a completely different workplace.

Another example is the knowledge that underpins a vaccine, such as for human papillomavirus. The 'blueprint' on how to create the vaccine does not need reinvention every time it is produced – indeed the vaccine for human papillomavirus is concurrently used in over 130 nations.[2]

Compare these 'non rival' examples to traditional physical goods or services used in production – such as a transport vehicle or a building. Whilst the latter may still make a worker or business more productive, the use of any single one of these in one workplace precludes its simultaneous use in another workplace (e.g., the same transport vehicle cannot be used simultaneously at two different workplaces). The *nonrivalry* nature of research gives rise to what is known as 'increasing returns to scale' and effectively productivity growth (i.e., doubling the amount of physical/rivalrous goods together with non-rival knowledge during production more than doubles the quantum of what can be produced).

2 https://www.cancercouncil.com.au/news/australian-success-story-hpv-vaccine/

RESEARCH HAS ECONOMY-WIDE IMPACT

Evidence suggests that the positive economy-wide innovation and productivity benefits of research in Australia, while difficult to measure, are significant. Recent estimates from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) on the societal returns to national R&D investment finds a benefit-cost ratio of 3.5.

This suggests R&D investment has a worthwhile return to Australia.[3]

Examining specifically Australian universities' contribution to R&D productivity spillovers, research by Elnasri & Fox (2017) indicates strong evidence of productivity benefits from higher education R&D expenditure (HERD) amongst four classes (research agencies, higher education sector, business enterprise sector, and multisector) of public funding for research and innovation. Specifically, the elasticity of multifactor productivity (MFP) with respect to public funding of higher education R&D is 0.175. This means an increase of one per cent in public funding of higher education R&D can increase MFP by 0.175 per cent.[4]

Further, London Economics (2022) finds that for every $1 billion invested in Go8 university research, an estimated additional in-year economic output of $9.2 billion is generated across the rest of the Australian economy.[5]

Globally, many economies have seen a drop in their recent productivity performance, and Australia is no exception with the Productivity Commission pointing to Australian productivity growth at its lowest rate in 60 years.[6]

This has coincided with a period where Australia's expenditure on R&D as a percentage of GDP stands at 1.8 per cent, **well below the OECD average of 2.7 per cent,** and reflects a decline by 0.45 percentage points since 2008 when Australia stood at 2.25 per cent – in line with the then OECD average of 2.24 per cent.

3 CSIRO Futures (2021). Quantifying Australia's returns to innovation. CSIRO, Canberra.

4 Elnasri, A., & Fox, K.J. (2017). The contribution of research and innovation to productivity. Journal of Productivity Analysis, 47, 291–308.

5 London Economics. (2022). The economic impact of research and innovation: Group of Eight universities. Forthcoming.

6 Productivity Commission, ibid.

RESEARCH HAS ECONOMY-WIDE IMPACT CONTINUED

In other words, **Australia is going in the wrong direction as it relates to commitment to R&D and productivity.** It is research conducted by Australian universities which is propping up the national R&D effort, whereas growth in business sector and government research activity has been weak. **The Australian university share of total R&D has risen by 12 percentage points since 2008 to 37 per cent of total R&D expenditure in 2020 (the latest figures available).** The research intensive Go8 universities contributed 61 per cent of the total HERD in 2020 and the Go8 share of research funding from industry and other non-government sources was 70 per cent in 2021.

The chart below shows the positive association between gross domestic product (GDP) per capita and national expenditure on R&D (GERD) per capita over a cross section of economies.

Australia is below the OECD average with respect to R&D per capita but above it on GDP per capita. Australia appears to have a relatively good GDP position for its level of per capita investment in R&D.

So, what is the problem? What matters is the direction and cumulative progress (or regress) in productivity over time – Australia's productivity performance has been trending downwards, and this is exacerbated by the decline in national investment in R&D.

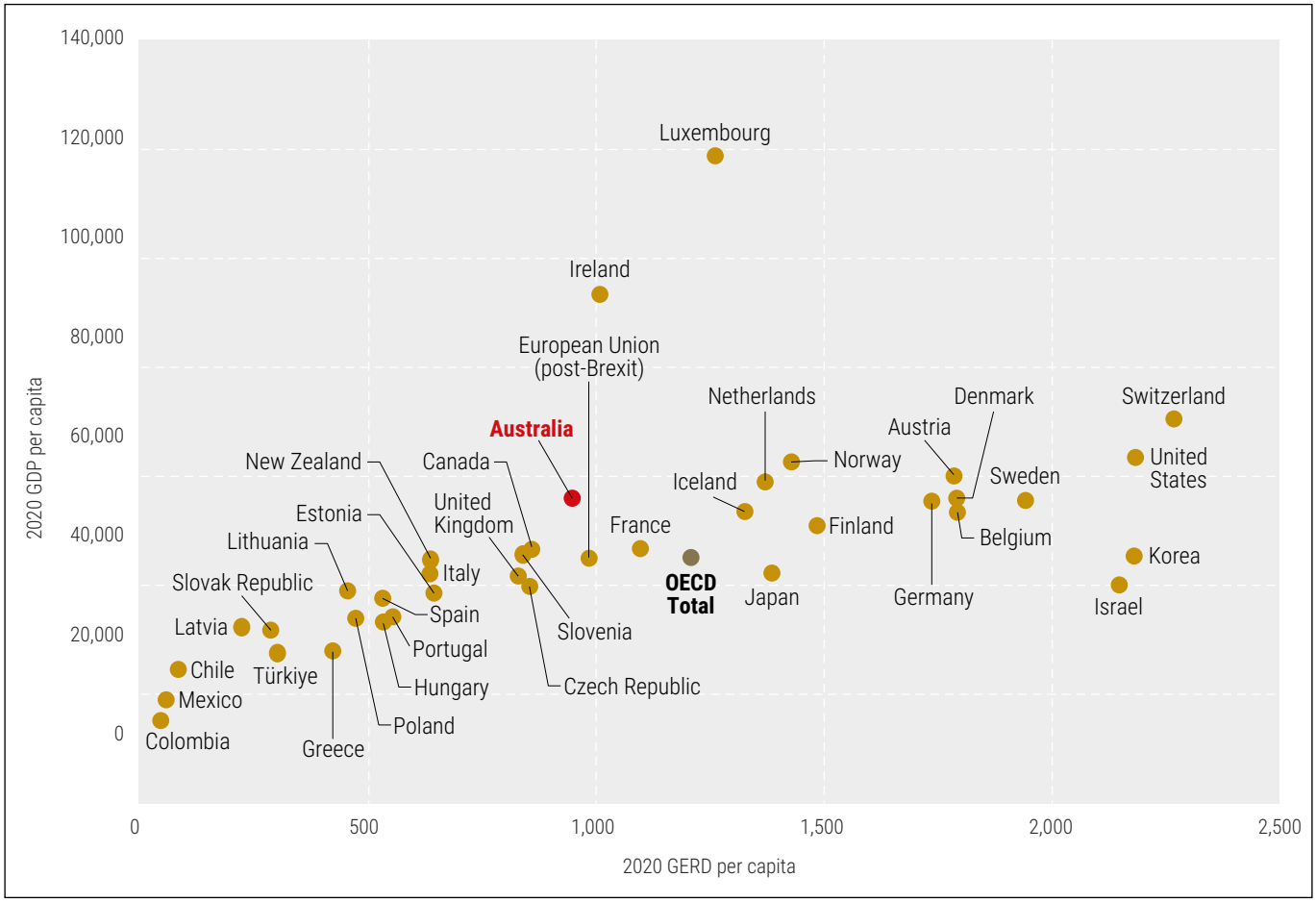
The United States, with its world leading research-intensive universities, is widely regarded as the global leader in knowledge and productivity – it is at the frontier that other nations, including Australia aspire to. It continues to renew its investment in R&D. Other nations such as Korea and Israel are also investing heavily in their knowledge economies. As these nations invest more in R&D, it will further improve their productive capacity. Moreover, the UK which on this chart sits below Australia, has recognised this, recently announcing significant public investment in science and technology.

The global stock of publicly available human knowledge can be drawn on at any time by any nation. Moreover, research and knowledge also disseminates globally through trade (embodied in traded goods and services as well as intangible capital) and through foreign direct investment and broader international partnerships.

Hence one response to Australia's below average R&D expenditure is that we can simply tap into global knowledge rather than create it here. Australia has indeed benefited significantly from trade and foreign direct investment and can continue to use these sources to tap into research and knowledge created internationally.

However, relying on this approach to compensate, or instead of investing in more domestic R&D, overlooks that Australia's research-intensive universities are recognised knowledge creators at the global technological frontier. A virtuous circle in fact whereby our research contributes to global R&D which in turn can later benefit us.

Figure 1: GDP per capita versus GERD per capita (current PPP $)



ADVANCING AUSTRALIA'S ECONOMIC SOVEREIGNTY

Our universities are and can be leaders in Australia's productivity revival through their research that drives domestic innovation and productivity and which adds to the global knowledge base. This is not to diminish the scale and benefits of industry linkages with overseas knowledge creation and technologies. Rather, and importantly, it is a recognition that Australia is not solely reliant on international developments for its productivity revival. Australia can have the economic sovereignty to influence the likelihood of its future prosperity by not only adopting the best of global research and knowledge, but also by being a global leader in fields and industries where Australian university research is world-class and, above world class, such as that of the Go8 – just as Australia is a leader in traditional markets such as agricultural and mining exports.

Australia as a leading global research and knowledge creator is not some fanciful national aspiration – Australian universities already are showing signs of comparative advantage in knowledge creation and diffusion. For example, Australia has a significantly higher share of highly-cited publications than its share of world population – an indication the quality of Australia's university research is well above the world average.[7] In 2020, Australia produced around 3,533 publications per million population, which is above the OECD average of 2,090 and ranking Australia sixth in the OECD. The Go8 alone is responsible for approximately 57 per cent of Australian publications – almost the same as the OECD average when calculated in terms of publications per million of population.

Much of this research is basic or foundational research that may not have an immediate commercial application – but this misses the point that basic research expands the knowledge base needed for breakthrough scientific progress. That is, the nature of basic research is that there is the potential for it to be "combined in unpredictable ways and used in different fields. This means that it spreads more widely and remains relevant for a longer time than applied knowledge".[8]

The policy implications of research, and in particular Australian university research, in driving innovation and productivity are many:

- Australia has choices. We can continue down the same path with below average investment in R&D, and predominantly rely on being global knowledge followers ('importers') and hope that knowledge diffusion globally will assist our productivity. Or we can be far less beholden and more sovereign in our policy framework and recognise and back the talents and potential of our domestic research capability, including our world-class universities, to influence our economic destiny.

  To do the latter requires a coherent national research strategy, not simply a portfolio-by-portfolio target and initiatives approach, but a coherent, long-term bipartisan strategy.

- **A national research strategy should:**
  - » Recognise, prioritise, and enhance funding of research in Australian universities as an essential component of Australia's economic future.
  - » Be discipline agnostic, recognising research is valuable in all its forms, basic to applied, HASS through to STEM.
  - » Improve the incentives for Australian universities to conduct research by providing secure and sustainable funding to university research programs.
  - » Support further collaboration between industry and universities on R&D effort to build scope and scale.
  - » Enhance the quantum and quality of domestic researchers – through PhD training support, as well as migration policy settings to attract and retain world-leading university researchers and educators.
  - » Support Australian university researchers' access to international collaboration and funding, including through free trade agreements and access to large international research funding sources such as *Horizon Europe*.

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7 Australian Government Department of Industry, Sciences and Resources. (2021). Australian Innovation System Monitor, October 2021 edition.
8 International Monetary Fund. (2021). Research and innovation: fighting the pandemic and boosting long-term growth. World Economic Outlook. October.