Towards 3%: Turbocharging Australia's Innovation Effort

Paper 1: The Statistics Do Not Lie

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In 1981, Australia spent 0.90% of its GDP on R&D—the lowest among its major trading partners (Japan, Korea, the UK, USA, China, and Taiwan). Forty years later, in 2021, the proportion is still the lowest, at 1.68%. Not only that, as shown in Figure 1, Australia (red line) is falling further behind in its commitment to R&D. The 3% “benchmark” is shown in Figure 1 for information.

Figure 1: Gross domestic spending on R&D as a proportion of GDP 1981-2021 (%): Australia’s and its major trading partners



Source: OECD [Main Science and Technology Indicators (MSTI database)](https://data-explorer.oecd.org/vis?fs%5b0%5d=Topic%2C0%7CInnovation%20and%20technology%23INT%23&pg=0&fc=Topic&bp=true&snb=14&vw=tb&df%5bds%5d=dsDisseminateFinalDMZ&df%5bid%5d=DSD_MSTI%40DF_MSTI&df%5bag%5d=OECD.STI.STP&df%5bvs%5d=1.1&pd=%2C&dq=USA%2BOECD%2BEU27_2020%2BGBR%2BKOR%2BJPN%2BISR%2BDEU%2BCAN%2BAUS.A.GV%2BH%2BG_FG%2BG_FB%2BB%2BG.PT_B1GQ..&ly%5brw%5d=REF_AREA&ly%5bcl%5d=TIME_PERIOD&ly%5brs%5d=MEASURE&to%5bTIME_PERIOD%5d=false), Accessed 9 Feb, 2024

Over the 40-year period, things looked good until 2008, when Australian R&D reached a peak of 2.24% of GDP (close to the OECD average of 2.28%). Then it collapsed.

Since 2008, the Australian economy has grown by exporting mineral and energy resources, which have paid for imports of manufactured products. These products are consumed by a growing population stimulated by high levels of immigration. Many of these resource companies made substantial investments in R&D in Australia.

R&D undertaken by the resources sector is now being undertaken globally through the innovation sourcing strategies of global corporations like Woodside, Shell, and Rio Tinto (a UK corporation). These companies have also shifted their focus to sustainable energy technologies; very little of this is done in Australia.

# The sectoral distribution of R&D expenditure

In Australia, as in most other countries, the business sector undertakes the largest proportion of R&D in GDP, but as shown in Figure 2, that proportion peaked in 2008—at 1.37%—and has since declined to 0.92% (recorded in 2019).

This collapse in business R&D, together with a trend decline in government expenditure on R&D since 1995, has been the major source of Australia’s R&D problem. If it hadn’t been for the growth in higher education expenditure R&D, which has trended upward since 2000, Australia’s overall R&D performance would have been much worse.

Figure 2: Gross domestic spending on R&D as a proportion of GDP:

Australia, by sector, 1981-2021 (%)



Source: OECD [Main Science and Technology Indicators (MSTI database)](https://data-explorer.oecd.org/vis?fs%5b0%5d=Topic%2C0%7CInnovation%20and%20technology%23INT%23&pg=0&fc=Topic&bp=true&snb=14&vw=tb&df%5bds%5d=dsDisseminateFinalDMZ&df%5bid%5d=DSD_MSTI%40DF_MSTI&df%5bag%5d=OECD.STI.STP&df%5bvs%5d=1.1&pd=%2C&dq=USA%2BOECD%2BEU27_2020%2BGBR%2BKOR%2BJPN%2BISR%2BDEU%2BCAN%2BAUS.A.GV%2BH%2BG_FG%2BG_FB%2BB%2BG.PT_B1GQ..&ly%5brw%5d=REF_AREA&ly%5bcl%5d=TIME_PERIOD&ly%5brs%5d=MEASURE&to%5bTIME_PERIOD%5d=false), Accessed 21 March 2024

The collapse in business R&D has occurred entirely in large companies[[1]](#footnote-1). Globally, within this large company cohort, business research and development investment is heavily concentrated in the motor vehicle, pharmaceuticals, and technology industries. Australia no longer has any global motor vehicle companies doing R&D in Australia, and only one global pharmaceutical company (CSL).

Technology companies with substantial product sales in Australia do little, if any, R&D in Australia. In 2018, Microsoft had a global 2018 R&D spend of $US14.75 billion), Intel ($US 13.10 billion), Apple ($11.58 billion), Oracle ($US6.09 billion), Cisco ($US6.06 billion), and IBM ($5.79 billion).

These and other large corporations outsource aspects of their R&D, and countries compete intensely for a slice of this investment. However, unlike other countries, Australian Commonwealth and State foreign direct investment strategies do not target R&D investment. The focus tends to be on “creating jobs”—any jobs. States tend to compete with each other rather than take a “one Australia” approach.

Global corporations have choices, and the availability of collaborative research infrastructure at higher education institutions and public research organisations are a major influence on those choices.

A further paper in this series will more fully explore the reason for the collapse in business R&D.

Growth in Higher Education Expenditure on R&D was sustained by strong policy interest in the sector—until 2013.

In 2003, the Education Minister (The Hon. Brendan Nelson) released the White Paper *Our Universities: Backing Australia's Future*. Initiatives such as the Howard Government’s *Education Endowment Fund and* Gillard’s *Higher Education Investment Fund (EIF)* sustained the upward trajectory until 2014 when it stalled. International student fees have largely financed the recovery from 2016.

It is disappointing that the proportion of Government expenditure on R&D has fallen from 0.41% of GDP in 1981 to 0.17% in 2020. This reflects the Commonwealth Government's failure to support its own research institutes and laboratories, including CSIRO, ANSTO, and DST, and State Governments failing to maintain support for their agricultural research institutes and laboratories.

It is not hard to conclude that the Australian sectoral distribution of R&D is unsatisfactory. Australia’s national R&D mix fundamentally differs from our trading partners, where business R&D is a more significant component of the national R&D profile.

In 2019, Australian higher education expenditures on R&D amounted to 37.1% of national research investment (compared to 24.8% in 2008), with business contributing 53.0% (62.8%) and government 9.9% (12.4%). On these metrics, higher education appears to be doing the “heavy lifting” in Australia’s R&D commitment and, in many ways, setting the pace for national R&D investment priorities.

Higher education priorities are reflected in health and medical research investments, with 30% of publications in life sciences fields—biological, biomedical, clinical, and health sciences. This compares with an output of 19.2% in the Natural Sciences (Chemistry, Physics and Earth Sciences), 19.8% in Engineering and Information and Computing Sciences, and 18.5% in the HASS disciplines.

These investments may or may not reflect a national R&D strategy. Since we do not have one, we would not know.

# Business Expenditure on R&D

Figure 3 shows Business Research and Development expenditures for Australia’s major trading partners. In 1981, the Australian proportion was 0.23% of GDP and increased to 1.37% in 2008 (OECD average of 1.57%). But by 2019, it had fallen to 0.92%—half the OECD average of 1.84%.

Figure 3: Business Enterprise Expenditure on R&D (BERD)

as a proportion of GDP (%)—Australia’s major trading partners



Source: OECD [Main Science and Technology Indicators (MSTI database)](https://data-explorer.oecd.org/vis?fs%5b0%5d=Topic%2C0%7CInnovation%20and%20technology%23INT%23&pg=0&fc=Topic&bp=true&snb=14&vw=tb&df%5bds%5d=dsDisseminateFinalDMZ&df%5bid%5d=DSD_MSTI%40DF_MSTI&df%5bag%5d=OECD.STI.STP&df%5bvs%5d=1.1&pd=%2C&dq=USA%2BOECD%2BEU27_2020%2BGBR%2BKOR%2BJPN%2BISR%2BDEU%2BCAN%2BAUS.A.GV%2BH%2BG_FG%2BG_FB%2BB%2BG.PT_B1GQ..&ly%5brw%5d=REF_AREA&ly%5bcl%5d=TIME_PERIOD&ly%5brs%5d=MEASURE&to%5bTIME_PERIOD%5d=false), Accessed 9 Feb, 2024

Figure 3 also demonstrates that most countries progressively increased their business R&D commitment after the GFC (2008).

Within the OECD dataset, the only other countries to record significant reductions in business expenditure on R&D post-GFC were Canada, Denmark, Finland, and Sweden. Several other EU countries increased their R&D commitment, including France, Ireland, Italy, and the Netherlands, possibly reflecting the impact of the EU Horizon program.

# Higher education expenditure on R&D

Higher education research plays a significant role in the national R&D effort in Australia, Korea, and the UK. Figure 4 provides the proportion of higher education expenditure on R&D (HERD) in GDP Australia’s major trading partners.

Figure 4: Higher Education Expenditure on R&D (HERD)

as a proportion of GDP (%): Australia’s major trading partners



Source: OECD [Main Science and Technology Indicators (MSTI database)](https://data-explorer.oecd.org/vis?fs%5b0%5d=Topic%2C0%7CInnovation%20and%20technology%23INT%23&pg=0&fc=Topic&bp=true&snb=14&vw=tb&df%5bds%5d=dsDisseminateFinalDMZ&df%5bid%5d=DSD_MSTI%40DF_MSTI&df%5bag%5d=OECD.STI.STP&df%5bvs%5d=1.1&pd=%2C&dq=USA%2BOECD%2BEU27_2020%2BGBR%2BKOR%2BJPN%2BISR%2BDEU%2BCAN%2BAUS.A.GV%2BH%2BG_FG%2BG_FB%2BB%2BG.PT_B1GQ..&ly%5brw%5d=REF_AREA&ly%5bcl%5d=TIME_PERIOD&ly%5brs%5d=MEASURE&to%5bTIME_PERIOD%5d=false), Accessed 9 Feb, 2024

The Australian proportion steadily increased from 0.23% in 1981 to 0.61% in 2019 (reaching 0.64% in 2018). The proportion in the UK reached 0.66 in 2019, having shot up rapidly since 2017 due to a change in collection methodology that added R&D that is both funded and performed by HE institutions, as in Australia.

ABS data shows that international postgraduate students undertake a substantial proportion of higher education R&D. The international student fee bonanza is not reflected in the appointment of permanent academic research staff. Causal and short-term project-funded appointments have carried a heavy workload.

# The Government’s own expenditure on R&D

Government research facilities are essential institutions in a national R&D capability—working with businesses to commercialise and market R&D outcomes created in government organisations established to discover and explore new knowledge and take on a higher level of risk.

Government research institutions also perform important research contracting roles and participate in global technology markets. Many US technological innovations originated in government research laboratories, a major characteristic of the Silicon Valley ecosystem.

Figure 7 shows trends across Australia’s trading partners in Government expenditure on R&D.

Figure 5: Government Expenditure on R&D as

a proportion of GDP (%): Australia’s major trading partners



Source: OECD [Main Science and Technology Indicators (MSTI database)](https://data-explorer.oecd.org/vis?fs%5b0%5d=Topic%2C0%7CInnovation%20and%20technology%23INT%23&pg=0&fc=Topic&bp=true&snb=14&vw=tb&df%5bds%5d=dsDisseminateFinalDMZ&df%5bid%5d=DSD_MSTI%40DF_MSTI&df%5bag%5d=OECD.STI.STP&df%5bvs%5d=1.1&pd=%2C&dq=USA%2BOECD%2BEU27_2020%2BGBR%2BKOR%2BJPN%2BISR%2BDEU%2BCAN%2BAUS.A.GV%2BH%2BG_FG%2BG_FB%2BB%2BG.PT_B1GQ..&ly%5brw%5d=REF_AREA&ly%5bcl%5d=TIME_PERIOD&ly%5brs%5d=MEASURE&to%5bTIME_PERIOD%5d=false), Accessed 9 Feb, 2024

Across our trading partners, there has been a steady decline in Government R&D expenditure on R&D, with the notable exceptions of Korea and China. The decline in Australia has been particularly marked, from a peak of 0.41% for most of the 1990s to 0.17% in 2020.

# Concluding comment

Australian R&D investment is in a poor state:

* Business R&D has collapsed.
* The government has failed to support R&D in its own research facilities.
* Higher Education R&D has increased on the back of international student fees.

Paper 2 explores the reasons for the collapse of business R&D. Without that understanding, we cannot develop solutions to our current problems. Looking back, we can tell what happened and why. Nonetheless, business organisations, lobby groups, and commentators will continue to act in ignorance and promulgate bad or inappropriate policy prescriptions.

1. Jones. Brad, 2024. Financing SME Innovation in Australia – Challenges and Opportunities, Speech to the COSBOOA National Small Business Summit, Sydney, 4 April 2004. <https://www.rba.gov.au/speeches/2024/sp-ag-2024-04-04.html> [↑](#footnote-ref-1)