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The Science, Research, and Innovation Budget Tables

What do they really show?

*The Science, Research, and Innovation Budget Tables: What do they really show?*

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# Introduction

On 15 February 2024, the Department of Industry, Science and Resources published the 2023-24 *Science, Research, and Innovation Budget Tables*[[1]](#footnote-1)*.*

A covering Message from the Minister of Industry Science and Resources (The Hon. Ed Husic MP) included some perfunctory remarks on the content of the Tables—

The 2023–24 Science, Research, and Innovation (SRI) Budget Tables show the Government will invest an estimated $12.6 billion in R&D in 2023–24, an increase of 2.7 per cent compared with 2022–23. This government is sending all the right signals ...

The Government is investing in priority industries that will support an uplift in R&D investment over the longer term, including through the $15 billion National Reconstruction Fund, the $392 million Industry Growth Program, and the National Quantum Strategy[[2]](#footnote-2).

The Minister considers that “these investments collectively provide the right frameworks so that business will be confident to invest in new research and innovations, supporting them to translate new knowledge into practical opportunities that drive economic growth and competitiveness”. Other announcements have been made concerning the defence industry and sovereign capability.

The Tables contain a wealth of information about the performance and (implied) priorities of Australia’s investment in R&D and what are termed “Other Innovation Programs”. The material is rich in detail and is a credit to the Departmental Officers responsible for compiling it and improving the data quality over the years.

*The SRI Budget Tables* do not represent a “budget” in the strictest sense of the term. However, there is potential to use them as an instrument to guide decision-making and resource allocation across portfolios in the future. Ideally, the SRI Budget should be presented to Parliament as a Budget Paper accompanying the Treasurer’s Budget Speech.

But will the investments foreshadowed by the Minister support an uplift in R&D investment over the longer term? Will they be enough?

The disappointing aspect of the Budget Tables is that they do not show a material improvement in the Commonwealth Government’s investment in R&D since 2011-12. In fact, the investment has been going backwards.

This Paper delves into the content of the SRI Budget Tables to find out what they mean for building Australia’s R&D capacity and capability.

# Background

The *Australian Universities Accord—Final Report*[[3]](#footnote-3) has raised the issue of whether the distribution of R&D investment among programs reflects the most appropriate allocation of resources to “maximise Australia’s R&D competitiveness for economic gain, and environmental, cultural, and social good”.

For example, questions are often asked about why the RDTI should take up 27% of the R&D Investment in the absence of any direction to targeted priority areas, and Health should take up 15% at the expense of areas of more interest to Australia’s high potential micro firm and SME population.

In this context, the *Accord Final Report* recommends that “the Australian Government develop a multi-agency government strategy that sets medium and long-term targets for Australia’s overall national spending on R&D as a percentage of GDP, requiring a significant increase to ensure Australia fully utilises the potential of its research sector … The strategy should also undertake a root and branch consideration of the suitability and sustainability of the national research funding and governance architecture”.

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This project would be expected to recommend substantial increases in Government support for R&D, particularly in new areas and areas currently underfunded or not funded at all. Attempting to shift resources from programs that currently appear generously funded (such as the RDTI, Health, and University Block Grants) might not be appropriate in the context of the systemic decline in Government support for R&D.

The Department of Industry, Sciences and Resources, through the Chief Scientist, is currently seeking feedback on a draft set of [National Science and Research Priorities](https://storage.googleapis.com/converlens-au-industry/industry/p/prj288de4406cc88bf67fdc9/public_assets/Australias-draft-National-Science-and-Research-Priorities.pdf) that cut across traditional discipline and sector boundaries—

1. Ensuring a net zero future and protecting Australia’s biodiversity
2. Supporting healthy and thriving communities
3. Enabling a productive and innovative economy
4. Building a stronger, more resilient nation.

The Chief Scientist is also working on several other projects, including refreshing the National Science Statement and strengthening Australia’s dialogue and cooperation with priority countries on research collaboration and skills for critical and emerging technologies.

The finalisation of the priorities might be expected to impact the distribution of Government R&D investment programs.

# The 3% target of R&D expenditure as a proportion of GDP

In November 2022, the Minister for Industry, Science and Resources announced a target of 3% of expenditure on R&D as a proportion of GDP[[4]](#footnote-4).

We are a long way off that target, and since 2008 and the Global Financial Crisis (GFC), Australia has been falling further behind relative to what we consider our R&D investing peers, as shown in Figure 1 (red line).

Figure 1: Gross Expenditure on R&D as a percentage of GDP—Australia and peer nations



Source: OECD [Dataset: Main Science and Technology Indicators](http://localhost/OECDStat_Metadata/ShowMetadata.ashx?Dataset=MSTI_PUB&ShowOnWeb=true&Lang=en)

Most of the countries represented in Figure 1 used the GFC as a call to *step up* their investment in R&D, but Australia did not.

|  |
| --- |
| **Why 3%?**The aspiration for countries to allocate 3% of their Gross Domestic Product (GDP) to Research and Development (R&D) expenditure is a widely recognised benchmark and policy goal. This objective is founded on the belief that a higher investment in R&D contributes significantly to economic growth, innovation, and overall competitiveness.Several reasons support the pursuit of this 3% target:* Innovation and Technological Advancement: Increased R&D spending fosters innovation, leading to the development of new technologies, products, and services. This, in turn, enhances a nation's competitiveness on the global stage.
* Economic Growth and Productivity: R&D investment is linked to economic growth and increased productivity. It fuels the development of cutting-edge technologies, which can have widespread applications across various industries, driving economic expansion.
* Job Creation: A thriving R&D sector generates employment opportunities. The development of new technologies and industries often requires skilled workers, contributing to job creation and economic development.
* Global Competitiveness: Nations with a robust R&D sector are better positioned to compete globally. The 3% target reflects a commitment to staying at the forefront of technological advancements, ensuring that a country remains competitive in the international arena.
* Quality of Research Output: Setting a specific percentage of GDP for R&D encourages countries to focus not only on the quantity but also on the quality of research. This can lead to more impactful discoveries and advancements.
* Scientific and Technological Leadership: Achieving the 3% goal is seen as a pathway to establishing leadership in science and technology. It enables countries to take the lead in critical areas, influencing global standards and developments.
* Addressing Societal Challenges: R&D investment is instrumental in solving pressing societal challenges, such as healthcare, climate change, and energy. The 3% target signals a commitment to leveraging research for the betterment of society.
* Knowledge-Based Economy: Emphasizing R&D expenditure aligns with the transition toward a knowledge-based economy. Countries investing in research and innovation are better positioned to adapt to rapid technological changes and capitalize on intellectual capital.
* Long-Term Economic Resilience: R&D is an investment in the future. Countries allocating 3% of GDP to research are better equipped to navigate economic uncertainties, as innovation becomes a driver of resilience and adaptability.
 |

While the 3% target is widely acknowledged internationally, its achievement requires a comprehensive policy framework, collaboration between government, academia, and industry, and a conducive environment for research and innovation to flourish.

For Australia to make the 3% target more than a rhetorical aspiration, serious investments are required by the business and government sectors.

A possible bright light is higher education investment in R&D, where the Australian investment as a proportion of GDP is among the highest in the world. Many have observed that higher education is doing the “heavy lifting” in Australia’s national R&D effort, enabled by fees paid by international students and the R&D recorded by overseas PhD and postdoctoral candidates[[5]](#footnote-5).

Others would argue that the higher education sector is not appropriate for leading Australia’s transformation from a commodity-based economy to a modern, vibrant, and dynamic industrial ecosystem. It is the business and government sectors that are not pulling their weight. All have distinct but complementary roles in the “triple helix” of business-higher education-government collaboration.

# Trends in Australian Government R&D investment as a proportion of GDP

The *SRI Budget Tables* report that Australian Government Investment in R&D now stands at 0.49% of GDP. It peaked at 0.73% in 1993-94, then trended down and up again to a new peak of 0.64% in 2012-13. It then trended down again to the current level—*two-thirds of what it was 30 years ago*. The trends are shown in Figure 2.

Figure 2: Total Government Investment in R&D as a proportion of GDP (current prices)



Source: SRI Budget Tables

Research has consistently shown that public (government) investment in R&D generates a large multiplier effect and positively impacts business expenditure on R&D—much greater than the effect produced by generic public expenditures[[6]](#footnote-6). However, in Australia, that commitment has been allowed to dissipate.

The fall in Government investment in R&D, particularly since 2012-13, is a major contributor to the overall fall in Australia’s R&D effort as a proportion of GDP. This downward trend is a serious concern and does not augur well for building strong R&D collaborations among actors in the national innovation system—industry, higher education, government research, and the broader community.

Government-funded research is often expected to take a lead role in—

* Creating and maintaining national scientific research facilities, expensive instruments (analytical, measurement, calibrating), equipment (scale up and testing, for example), and developing treatments for human, animal, and plant diseases.
* Reducing technical uncertainty and risk in adopting and applying new technologies in the industries of the future, including advanced manufacturing, Quantum Information Sciences, AI and Machine Learning, 5G and advanced communication, biotechnology.
* Updating and extending the stock of useful knowledge underpinning the education and training of the research workforce recruited to work on business R&D projects.
* Solving economic, societal, and environmental problems, mitigating climatic, biological, chemical, and physical risks.
* Leveraging participation in international R&D networks
* Supporting high-risk early-stage venture capital investment in new technology-based firms.
* Maintaining prescience and preparedness about the future impact of events we may face.

Successive Governments have achieved a great deal in these areas, but much more can be done.

# Inflation-adjusted R&D expenditure

## Overall trend

The *SRI Budget Tables* estimate an inflation-adjusted increase in R&D expenditure in 2023-24 of 2.9% (based on 2020-21 dollars). This arises because of the assumption in the Budget that the GDP deflator (generally used to calculate the effect of inflation in the National Accounts) would *fall* by something in the order of 0.25%.

The *Mid-Year Economic and Financial Outlook* (MYEFO), published six months after the Budget, revised the GDP deflator to an *increase of 2.5%* (page 37, Table 2.2)*.* This gives an inflation-adjusted increase of only 0.6% in the Australian Government's 2023-24 R&D investment.

Notwithstanding this marginal increase, there has been a continuous downward trend in inflation-adjusted Government R&D investment since 2011-12—by 6.3% to 2023-24 (Figure 3 below).

Figure 3: Government Investment in R&D ($m, current prices and inflation-adjusted)

2011-12—2023-24



  Source: SRI Budget Tables

The spike in 2020-21 is due to the *one-off* COVID-related $2 billion payment to universities under the Research Support Program. However, over the four years since 2020-21, there has been an inflation-adjusted reduction in Government R&D investment of 9.9%.

## Investments by sector

The long-term trends in Government inflation-adjusted R&D sectoral investment since 1993-94 are shown in Figure 4.

Figure 4: Australian Government investment in R&D by sector 1993-94 to 2023-24

($m, inflation-adjusted)



Source: SRI Budget Tables

Figure 4 shows that from 1993-94, there had been a substantial increase in business R&D investment. However, since 2012-13, the level of investment has been falling mainly due to changes in eligibility for the R&D Tax Incentives (RDTI) program. There was some increase from 2021-22, reflecting measures to improve access to the program by small to medium businesses.

Figure 4 also shows wide fluctuations in the level of Government investment in the higher education sector. In 2023-24, the investment will be equivalent to the level reached in 2003-04. Higher Education institutions are deeply concerned about this level of commitment.

Investment by the Government in its own research activities (principally CSIRO, ANSTO and the DST Group) has barely moved over the period. Internationally, government research institutes and laboratories are important partners in industrial research, as indicated by the 72 Fraunhofer Institutes in Germany and the 42 Government research laboratories in the USA. The Catapult Centres in the UK perform an important role.

There has been a very large increase in what is termed “multi-sector” investment since 2019-20. This covers the NHMRC, the MRFF, the CRCs, Rural R&D, and Energy and Environment investments.

## Investments according to socio-economic objective

Substantial investments in health show up in calculations of the Australian government's investment in R&D according to socioeconomic objectives. This is revealed in Figure 5.

Figure 5: Total Australian Government investment in R&D by socioeconomic objective

1993-94 to 2023-24 ($m, inflation-adjusted)



Source: SRI Tables. Smaller SEOs are not included in the Chart.

Figure 5 shows the extent to which Government investment in R&D in 1993-94 was dominated by Industrial production and technology (red line) *until 2011-12* and how investment in Health research (blue line) has increased since 2005-06. By 2021-22, Health R&D was equivalent to Industrial production and technology R&D.

Investments in Political and social systems, structures and processes (purple line) peaked in 2015-16 and have fallen away rapidly since then.

The ups and downs in General University funds, sourced principally from performance-driven block grants (the Research Support program and the Research Training program), are particularly significant in the SEO profile.

# The structural allocation of R&D expenditure

Under the Australian Westminster-derived public administration system and the principle of Ministerial responsibility, each government minister is *responsible* for a *specific portfolio and is* accountable to the Parliament for their department's performance.

Constitutionally, this principle means that Ministers are individually answerable for the expenditure programs and actions within their portfolio. Each expenditure program carries its own set of policy objectives, legislative authorities, eligibility criteria, administrative and organisational structures, funding arrangements and time frame.

In aggregate, the programs reflect a *de facto* implementation of a science, research, and innovation policy without an overarching strategy. These programs are loosely connected to the Government’s nine [Science and Research priorities](https://www.industry.gov.au/sites/default/files/2018-10/science_and_research_priorities_2015.pdf).

Ministers may have a *collective responsibility* when the Cabinet adopts and implements *cross-portfolio* or government-wide strategies.

## Investment among portfolios

*The SRI Budget Tables* show that in 2023-24, the Government’s $12.6 billion investment in R&D programs is distributed across 14 government portfolios. However, most investment is made within six portfolios: Industry Science and Resources, Education, Health and Aged Care, Climate Change, Energy, the Environment and Water, Defence, and Agriculture. Proportions for each portfolio, together with gains and losses in the 2023-24 Budget, are documented in Table 1.

Table 1: Australian Government investment in R&D by government portfolio

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Portfolio | Estimated Actual2022-23 ($m) | Budget Estimate2023-24 ($m) | Increase (%) | Percent of Total |
| Agriculture, Fisheries and Forestry | 532.79 | 469.73 | -0.1% | 3.7% |
| Attorney-General's | 5.24 | 4.54 | -13.3% | 0.0% |
| Climate Change, Energy, the Environment and Water | 679.91 | 673.14 | -1.0% | 5.3% |
| Defence | 632.23 | 561.10 | -11.3% | 4.4% |
| Education | 3,503.98 | 3,902.60 | 11.4% | 30.9% |
| Foreign Affairs and Trade | 103.87 | 116.26 | 11.9% | 0.9% |
| Health and Aged Care | 1,680.01 | 1,684.30 | 0.3% | 13.4% |
| Home Affairs | 8.61 | 7.50 | -12.9% | 0.1% |
| Industry, Science and Resources | 5,036.22 | 5,081.71 | 0.9% | 40.3% |
| Infrastructure, Transport, Regional Develt, Comms & Arts | 38.95 | 46.49 | 19.3% | 0.4% |
| Prime Minister and Cabinet | 1.87 | 2.05 | 9.5% | 0.0% |
| Social Services | 49.33 | 53.37 | 8.2% | 0.4% |
| Treasury | 1.94 | 1.98 | 2.5% | 0.0% |
| Veterans' Affairs | 7.45 | 6.04 | -18.9% | 0.0% |
| **Total** | **12,282.40** | **12,610.80** | **2.7%** | 100.0% |

Source: SRI Budget Tables

The SRI Budget Tables report an aggregation of expenditure decisions made on a portfolio-by-portfolio basis through Ministerial Cabinet submission and Cabinet decision-making processes.

There are no formal arrangements for research and innovation policy coordination and collaboration across these portfolios, such as through a Science, Research, and Innovation Committee of Cabinet. [Industry, Innovation and Science Australia](https://www.industry.gov.au/science-technology-and-innovation/industry-innovation-and-science-australia) does not have that role. The [National Science and Technology Council](https://www.chiefscientist.gov.au/national-science-and-technology-council) is an advisory body only. This process differs from other countries with National Science/Research Foundations, such as the US, Germany, and Korea.

In 2023-24, the Education portfolio was a clear winner in this resource allocation framework, with budgeted expenditures up 11.4% on $3.5 billion in 2022-23. The Industry, Science, and Resources portfolio had a small increase of 0.9% on $5.1 billion, and the Health portfolio secured a marginal increase of 0.3% on $1.7 billion. Defence was a significant loser, with a reduction of 11.1% on an expenditure of $632m in 2022-23. Other portfolios had gains and losses, but the amounts were relatively small.

Frequent machinery of government changes and reallocation of ministerial responsibilities have introduced substantial instability into the system. *Fourteen* Ministers have had portfolio responsibilities for industry, science, and innovation functions since 2008[[7]](#footnote-7).

Program responsibilities have been shuffled between portfolios—particularly between Industry and Education. Newly appointed Ministers have different priorities impacting program design, continuity, and funding commitment.

## Investment among programs

The *Science Research and Innovation (SRI) Budget Tables* show that in 2023-23, the Government will be delivering 160 R&D programs. This is down from the 182 reached in 2016-17. Longer-term trends in the number of programs are shown in Figure 6.

Figure 6: Count of Government R&D programs/activities (number)



Source: SRI Budget Tables

The SRI Tables also report that in 2023-24, the proportion of large programs accounted for 90% of total investment, the medium ones seven per cent, the small ones three per cent and the very small ones only 0.2%.

Within this overabundance of programs, the *SRI Budget Tables* indicate what would appear to be a very uneven distribution of resources among investment priorities, with some showing very substantial increases in 2023-24. The distribution of investment in programs is shown in Table 1. Also shown is the proportion of each program in the total investment.

Table 2: Australian Government R&D programs and activities valued at over $100 million in 2022-23 to 2023-24 ($m current prices)

| Program / Activity  | Estimated Actual2022-23 | Budget Estimate2023-24 | Increase 2022-23 to 2023-24 | Percent of Total 2023-24 |
| --- | --- | --- | --- | --- |
|  Research Tax Incentives  |  3,276  |  3,365  | 2.7% | 26.7% |
|  University Block Grants  |  2,044  |  2,160  | 5.7% | 17.1% |
|  CSIRO  |  991  |  1,009  | 1.8% | 8.0% |
|  NHMRC Research Grants  |  898  |  946  | 5.3% | 7.5% |
|  Australian Research Council (ARC) - National Competitive Grants  |  832  |  900  | 8.2% | 7.1% |
|  Medical Research Future Fund  |  598  |  650  | 8.7% | 5.2% |
|  Defence Science and Technology Group (DST Group)  |  513  |  483  | -5.7% | 3.8% |
|  National Collaborative Research Infrastructure Strategy  |  286  |  402  | 40.6% | 3.2% |
|  Australian Renewable Energy Agency (ARENA)  |  312  |  319  | 2.2% | 2.5% |
|  Australian Nuclear Science & Technology Organisation (ANSTO)  |  264  |  267  | 1.0% | 2.1% |
|  National Institutes Program - ANU Component  |  217  |  229  | 5.7% | 1.8% |
|  Cooperative Research Centres (CRC) Program  |  199  |  201  | 0.6% | 1.6% |
|  Australian Antarctic Division  |  207  |  192  | -7.0% | 1.5% |
|  Australian Centre for International Agricultural Research (ACIAR)  |  102  |  113  | 10.6% | 0.9% |
|  Meat and Livestock Australia Limited  |  98  |  104  | 6.0% | 0.8% |
|  Australia's Economic Accelerator  |  10  |  100  |  | 0.8% |
| Total over $100m |  10,848  |  11,439  | 5.5% | 90.7% |
| Other programs |  1,435  |  1,172  | -18.3% | 9.3% |
|  Total  | 12,282 |  12,611  | 2.7% | 100.0% |

Source: SRI Budget Tables.

The *SRI Budget Tables* report that 173 of the 602 programs (29%) meet at least one of the nine Science and Research priorities: Seventy-three meet two or more—Food (14 programs), Soil and Water (50), Transport (13), Cybersecurity (9), Energy (28), Resources (31), Advanced Manufacturing (21), Environmental Change (61) and Health (22). Six programs meet all nine—including the ARC, CSIRO, the CRC program, and the Research and Development Tax Incentive (RDTI).

The largest 10 of the R&D programs in Table 1 comprise over 83% of the total investment. The longer-term trends in these programs are shown in Figure 7 below. The R&D Tax Incentives have continued to dominate the distribution of investment and are virtually the same in 2023-24 as in 2011-12. Payments had been trending down from 2013-14 following changes in eligibility arrangements but started trending up from 2020-21 with new arrangements that expanded access to SMEs.

Figure 7: Australian Government R&D programs and activities valued at over $100 million in 2023-24 the ten largest programs—trend from 2011-12, ($m inflation-adjusted)



Source: SRI Budget Tables.

Investments in university block grants have also been trending downwards and have effectively “made room” for the Medical Research Future Fund and the Australian Renewable Energy Agency (ARENA).

## Socio-economic (SEO) investments in major programs

The *SRI Budget Tables* provide detailed information about the allocation of R&D investment according to socio-economic objectives for several of the large programs listed in Table 2 above. Trends are shown from 2007-08, the onset of the Global Financial Crisis (GFC) and the collapse of business expenditure on R&D.

These allocation investment decisions reflect decisions made by made by Ministers, program advisory councils, and the management of each organisation, and in this way, become embedded in the *de facto* Science, Research and Innovation policy referred to on page 7 above.

In some cases, such as the current Research and Tax Incentive (see page 12 below), the allocations are *demand-*driven by program applicants. In other situations, such as the ARC and the Health programs, allocations are also application-driven although guided by internal processes and grants criteria.

#### Australian Nuclear Science & Technology Organisation (ANSTO)

The SRI Budget Tables reveal that over the period 200-08 to 2023-24, the inflation-adjusted Budget allocation to ANSTO (base year 2020-21) fell by 6.4%. The trends in investment over the period are shown in Figure 8.

Figure 8: Investment in R&D by SEO for ANSTO, 2007-08 to 2023-24, ($m inflation-adjusted)



Source: SRI Budget Tables.

Figure 8 reveals that the largest proportion of ANSTO expenditure is for General advancement of knowledge. Over the years, only a small amount has been allocated to Industrial production and technology. This has fallen further since 2016-17.

#### Australian Research Council (ARC)

Over the period 2007-08 to 2023-24, the inflation-adjusted payment to the ARC have increased by 2.2%. Investment trends are shown in Figure 9.

Figure 9: Investment in R&D by SEO for the ARC, 2007-08 to 2023-24, ($m inflation-adjusted)



Source: SRI Budget Tables.

Figure 9 reveals that the greater part of ARC expenditure is for General advancement of knowledge, increasing substantially from 2011-12. The commitment to Industrial production and technology has fallen considerably since that year.

#### Commonwealth Scientific and Industrial Research Organisation (CSIRO)

Over the period 2007-08 to 2023-24, the inflation-adjusted investment in CSIRO decreased by 0.9%. The changing distribution of investment is shown in Figure 10.

Figure 10: Investment in R&D by SEO for CSIRO, 2007-08 to 2023-24, ($m inflation-adjusted)



Source: SRI Budget Tables.

Figure 10 shows that the commitment to Industrial production and technology had fallen quite rapidly since 2007-08, although it started to recover in 2014-15. Investments in other areas have fluctuated widely.

#### National Collaborative Research Infrastructure Strategy (NCRIS)

The Government’s inflation-adjusted investment commitments to NCRIS have increased by 177.3% since 2007-08, although there have been significant fluctuations over the period, as illustrated in Figure 11.

Figure 11: Investment in R&D by SEO for NCRIS, 2007-08 to 2023-24, ($m inflation-adjusted)



Source: SRI Budget Tables.

The investment commitment increased substantially between 2016-17 and 2017-18, the period of the National Innovation and Science Agenda. The commitment also increased substantially in the 2023-24 Budget.

Investments have been classified principally as General advancement of knowledge.

#### R&D Tax Measures

Between 2007-08 and 2023-24, the inflation-adjusted investment in R&D Tax Measures has increased by 77.3%. The Increase has been predominantly in Industrial production and technology, as shown in Figure 12.

Figure 12: Investment in R&D by SEO for R&D Tax Measures, 2007-08 to 2023-24, ($m inflation-adjusted)



Source: SRI Budget Tables.

Figure 12 also shows significant fluctuations in other investment areas, including Political and social systems, structures and processes, Energy, and Health.

As indicated earlier, these investments are *demand-driven,* with the program guidelines being agnostic about the sector where the investments are made[[8]](#footnote-8).

## Distribution by program lifespan

Just under half of the current R&D programs have been operating between one and four years.

The *SRI Budget Tables* report that in 2023-24, of the 602 programs/activities contained in the R&D database—

* 16 (2.7%) have been present for over 40 years. They include CSIRO, NHMRC grants, ANSTO, DST Group, GRDC, the Antarctic Division, and the National Institutes Program at the ANU.
* 8 (1.3%) have lasted between 30 and 39 years, including the CRC program, Horticulture Research, Meat Research (ceased 2015-16), RIRDC (Agrifutures), Land and Water Research (ceased 2009-10) and the former 125% R&D Tax Concession.
* 19 (3.2%) have operated between 20 and 29 years, including the ARC, the ACIAR, the Institute of Criminology and NCRIS. Seven of those 19 programs are no longer operating.
* 109 (18.1%) have lasted between 10 and 19 years, including the RDTI, the university Research Training and Research Support Programs and the MRFF. Just under half of the programs in this grouping no longer operate due to the termination of funding agreements, absorption into other programs, or budget decisions not to continue.
* 153 (25.4%) programs have operated between 5 and nine years
* 222 (36.9%) have operated between two and four years
* 75 (12.5%) were in existence for one year. These later programs are predominantly for one-off payments.

A profile of the life span of programs/activities and the average value in each category is provided in Figure 13.

Figure 13: The comparative lifespan of R&D investment programs



Source: SRI Budget Tables

Figure 13 indicates several programs are firmly embedded in the profile of R&D investment. However, there has been a transitory element of small, short-term activities.

## Investment trends in other SRI programs

An important component of the *SRI Budget Tables* is investment in *Other (non-R&D)* programs. These include the Industry Growth program, the Moon to Mars initiative, the Business Research and Innovation Program, Questacon, and the previous Entrepreneurs program. It does not include estimates of expenditures or loans relating to the National Reconstruction Fund. Geoscience Australia was added to the tabulation in 2021-22.

Total investment peaked in 2020-21. Trends are shown in Figure 14.

Figure 14: Investment Other SRI Programs 2016-17—2023-24. $m (current prices, inflation-adjusted)



Source: SRI Budget Tables; Includes Geoscience Australia expenditure of $218.3m 2021-22, $279.6m in 2022-23, and $289.5m in 2023-24

The SRI data indicates that there has been an increase in the number of *Other (non-R&D)* programs—from 54 in 2016-17 to 81 in 2023-24. The trends since 2016-17 are illustrated in Figure 15.

Figure 15: Count of Other Innovation programs/activities (number)



Source: SRI Budget Tables

These numbers have been impacted by the shuffling of the funding deck and the loss of a few cards since NISA in 2016. As we all know, there was no new funding for NISA, and there hasn’t been for the latest iteration of the Industry Growth Program. Trends in program expenditures are shown in Figure 16.

Figure 16: Trends in program items in Other SRI Programs $m (current prices)



Source SRI Tables. This does not include Geoscience Australia's expenditure of $218.3m in 2021-22, $279.6m in 2022-23, $289.5m in 2023-24, $ 264.5m in 2024-25, $272.7m in 2025-26, and $346.7m in 2026-27.

Included in the Other Category are relatively small amounts for: Automotive Innovation Lab Access Grants, Boosting Female Founders Initiative, Cyber Security Skills Business Connect and Protect, Daintree Microgrid Program, Data Integration Partnership for Australia, Digital Careers, Digital Directors, Digital Skills Finder Platform, Empowering Business to Go Digital ,Industry 4.0 Testlabs for Australia, Industry Innovation and Science Australia (IISA) Board, Inspiring Australia | Science Engagement Programme, International Science Council Asia Pacific Regional Office Program, International Space Investment Initiative, Local Industry Grants - Flinder's University Factory of the Future, National Quantum Strategy ($28m over 4 years), the National Science and Technology Council, Open Geocoded National Address File, Protecting Australia's National Interest in Critical ad Emerging Technologies Standards, Resources Methane Abatement Fund, Soil Carbon Measurement Innovation Challenge, Space Infrastructure Fund, Using blockchain technology to reduce business compliance costs, and Women in STEM initiatives.

Commitment to industry growth programs has been particularly unstable, as indicated in Figure 17.

Figure 17: Investment commitment to growth programs 2014-15—2026-27 $m (current prices)



Source: SRI Budget Tables

# Tourism or Technology: Where to from here?

Should the expenditure trends described in this Paper continue, and in the knowledge of the complementarity of government and business research investment, the 3% target would appear to be a little more than a rhetorical aspiration.

To reach 3%, substantial increases in *both* public and business investment in R&D are required. Continuing to rely on universities through their international student fee income and overseas PhD students as the major component of national R&D investment is a very high risk in the intensely competitive global higher education market and unlikely to deliver the 3% outcome. It is even more risky as governments impose tighter visa requirements[[9]](#footnote-9).

Based on trends in the OECD data (Figure 18), Australia is heading into the league of the European tourism, sport, and entertainment-driven economies.

Figure 18: Gross Expenditure on R&D as a percentage of GDP: Australia and European tourism-oriented nations



Source: OECD [Dataset: Main Science and Technology Indicators](http://localhost/OECDStat_Metadata/ShowMetadata.ashx?Dataset=MSTI_PUB&ShowOnWeb=true&Lang=en)

Figure 13 also suggests that many countries that have been historically tourism-oriented (or countries devasted by war) have committed to increasing their R&D investment—albeit from a very low base. Australia, Spain, and Portugal are distinguished in the grouping as the only countries that reduced their R&D commitment from 2008. The commitment by Turkiye to R&D since 2005 and by Czechia from 2011 is particularly impressive. *Horizon Europe* funds have been important in driving these changes[[10]](#footnote-10).

Tourism, including educational tourism, is a significant contributor to the Australian economy and accounted for 2.5% of GDP in 2022-23, below the pre-COVID level of 3.1%[[11]](#footnote-11). Deloitte has reported that Tourism represents nearly 15% of total exports[[12]](#footnote-12).

Growing the tourism industry is a high priority for the Australian and state/territory governments and is driven hard by the tourism operators and lobbies, and the higher education sector. Governments provide extensive support for the industry through various subsidies, infrastructure and facilities development, and fast-track development approvals.

Manufacturing, by contrast, contributes 5.7% to GDP and 7.4% to exports[[13]](#footnote-13). To secure its transformation and growth and a place in the global competitive environment, the industry requires substantial investment in R&D. But apart from the support that flows through the R&D Tax Incentive, the level of support is minimal.

Substantial investments by government and business are required to leapfrog into the future: digital infrastructure, AI and machine learning, robotics, virtual and augmented reality, cyber security, and green technologies. Commitments are being made, but progress is serpentine. A sense of urgency is absent.

Perhaps Australians and many of our political leaders are comfortable with this. But it is not a path to economic prosperity, social cohesion, higher living standards, and social equity, particularly with the limitations posed by our narrow trade and industrial structure. Our place at number 93 on the *Harvard Atlas of Economic Complexity*, measuring the diversity and research intensity of our export mix, has been widely noted.

The legacy of tourism in industrial policy is indicated by its placement alongside industry and science functions, such as the Minister for Industry, Science and *Tourism* (John Moore, March 1996—October 1998, which was associated with a *substantial decline* in R&D as a percentage of GDP (Figure 18). Nick Minchin was the Minister for Industry, Science and Resources from 1998 to 2001, but the situation did not improve.

Ian McFarlane was Minister for Industry, *Tourism* and Resources (2001-2007), which was associated with a substantial increase in R&D as a percentage of GDP—principally in the mining sector. In 2008, after the government change and the GFC's onset, Gross Expenditure on R&D as a proportion of GDP collapsed. That year also marked the beginning of a period of sustained political instability, badly impacting the business investment climate. Unlike overseas governments, Australia did not prioritise R&D investment as a response to the GFC.

The current Minister now assures us that the Government is investing in priority industries supporting an uplift in R&D over the longer term, including the National Reconstruction Fund, the Industry Growth Program, and the National Quantum Strategy. These are *innovation* programs with strong diffusion and commercialisation objectives, not R&D delivery. Nonetheless, these programs will require strong R&D capability to draw upon to succeed.

Of course, as the Productivity Commission (PC) proposes, we could simply import the R&D and the associated IP surrounding it from elsewhere. But IP owners may have a different view; in any case, this cannot be a serious option from a sovereign capability perspective.

The PC’s history is distinguished by its opposition to programs that support high-value, high-skill manufacturing while overlooking subsidies and tax concessions for primary commodities because of their perceived “comparative advantage”. This perception is rarely tested compared to other global commodity producers, including the USA, Canada, China, and some European States.

Australia suffers quite a number of comparative *disadvantages*, such as drought, water supply and management, and low levels of agricultural R&D (compared to the US and Europe), notwithstanding the commitment of Rural R&D Corporations.

Few global agtech corporations undertake R&D in Australia or have relationships with Australian public research organisations and universities—apart from students. Companies, like Bayer, Syngenta, and BASF, have global R&D programs, and competition between countries to access them is intense[[14]](#footnote-14).

# Towards a “whole of government” strategy

Lifting R&D is not a matter of shifting funds from one portfolio to another. It requires genuinely new and sustained public and private investment commitment of all Ministers and business leaders to see what is at stake.

These are matters for the Prime Minister to take the lead, with the support of his Cabinet colleagues, through a Cabinet sub-committee at the very least but preferably through a “whole of government” tripartite industrial strategy or competitiveness council.

The Business Council of Australia, the Australian Investment Council, and other financial institutions must be seriously on board as part of a national joined-up strategy. It cannot be a lobbying exercise to be orchestrated by the broad-based industry associations whose major purpose is to extract favour, concessions, and subsidies from the Government.

We can no longer rely on the “bottom-up” aggregation of the decisions and submissions of six (and possibly 14) individual Ministers and their portfolio advisers to “coordinate” Australia’s science, research, and innovation investment policy. It must be “top-down”, as seen in several of our “peer” countries—for example, Germany, Netherlands, Israel, Korea, and the USA – combined with a national network of place-based innovation ecosystems.

Examples of such ecosystems include the Fraunhofer Institutes, Catapult Centres and most recently, the US National Science Foundation (NSF) Regional Innovation Engines, Regional Technology Hubs, ManufacturingUSA Institutes, and the Microelectronics Commons. Their success is based on the engagement of large global knowledge-driven companies, local SME supply chains, universities and other research and education institutions.

1. Department of Industry Science and Resources (2024), *Science, Research, and Innovation (SRI) Tables*, 2023-24 <https://www.industry.gov.au/publications/science-research-and-innovation-sri-budget-tables> [↑](#footnote-ref-1)
2. The National Reconstruction Fund and the Industry Growth Program are not R&D investment programs, although they will potentially “pull through” existing, additional, or new R&D. In the SRI Tables, they are classified as *Government investment in science, research & innovation (not including R&D*). They are, therefore, not included in the $12.6 billion R&D investment. The National Quantum Strategy has not yet been funded, and no budget or forward estimates are included in the *SRI Budget Tables*. [↑](#footnote-ref-2)
3. Australian Government, *Australian Universities Accord Final Report*, 2024. <https://www.education.gov.au/accord-final-report> [↑](#footnote-ref-3)
4. The Hon Ed Husic MP, 2022. Speech at the UTS Vice-Chancellor's Innovation Showcase, 3 November 2022, University of Technology Sydney <https://www.minister.industry.gov.au/ministers/husic/speeches/speech-uts-vice-chancellors-innovation-showcase> [↑](#footnote-ref-4)
5. Almost 55% of human resources devoted to R&D (person-years of effort (PYE)) in Higher Education Organisations are PhD students. Source: ABS, 2020 [Research and Experimental Development, Higher Education Organisations](https://www.abs.gov.au/statistics/industry/technology-and-innovation/research-and-experimental-development-higher-education-organisations-australia/latest-release#:~:text=Data%20downloads-,Key%20statistics,2018%20to%200.61%25%20in%202020.), Australia, 2020. Only 32% of human resources are academic staff. In 2022, 49.6% of the 47,349 PhD students were from overseas. In Engineering and related technologies, 72.6% were from overseas, and 70.6% in Information Technology were from overseas. Source: <https://www.education.gov.au/higher-education-statistics/student-data/selected-higher-education-statistics-2022-student-data>, sections 4 and 7. [↑](#footnote-ref-5)
6. Giovanna Ciaffi, Matteo Deleidi, Mariana Mazzucato, Measuring the macroeconomic responses to public investment in innovation: evidence from OECD countries, Industrial and Corporate Change, 2024. <https://doi.org/10.1093/icc/dtae005> [↑](#footnote-ref-6)
7. The Ministers were Kim Carr (twice), Greg Combet, Chris Evans, Chris Bowen, Craig Emerson, Ian Macfarlane, Christopher Pyne, Greg Hunt, Arthur Sinodinos, Karen Andrews, Christian Porter, Angus Taylor, Melissa Price, and Scott Morrison. [↑](#footnote-ref-7)
8. See Howard, J, January 2024, [Taxation deductions available for R&D expenditure in Australia: Past and present](https://taxpolicy.crawford.anu.edu.au/sites/default/files/uploads/taxstudies_crawford_anu_edu_au/2024-01/complete_policy_brief_j_howard_jan_2024.pdf), paper no: Policy Brief 1 /2024 [↑](#footnote-ref-8)
9. Hans de Wit and Philip G Altbach, 2024. “Chaos as headwinds hit international student recruitment”, *University World News*, 20 Feb 2024. <https://www.universityworldnews.com/post.php?story=20240220125648569> [↑](#footnote-ref-9)
10. See <https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en> [↑](#footnote-ref-10)
11. ABS, 2023*. Australian National Accounts: Tourism Satellite Account.* <https://www.abs.gov.au/statistics/economy/national-accounts/australian-national-accounts-tourism-satellite-account/latest-release#:~:text=Data%20downloads-,Key%20statistics,%2D19%20level%20of%203.1%25>. [↑](#footnote-ref-11)
12. Deloitte, 2021*. The Value of Tourism: Exploring the challenges and optimism of Australian tourism as it embarks on the recovery journey.* [*https://www.deloitte.com/au/en/services/economics/perspectives/value-of-tourism.html*](https://www.deloitte.com/au/en/services/economics/perspectives/value-of-tourism.html) [↑](#footnote-ref-12)
13. Reserve Bank of Australia,2024. Composition of the Australian Economy

SNAPSHOT. <https://www.rba.gov.au/education/resources/snapshots/economy-composition-snapshot/#:~:text=Mining%2014.3%25%2C%20Finance%207.4%25,5.7%25%2C%20Construction%207.1%25>. [↑](#footnote-ref-13)
14. In 2022 Bayer reported over 700 collaborations, twelve of which were in Australia but none involved Agriculture. This compares with 14 in Canada, two of which involved crop science. <https://www.bayer.com/en/sustainability/transparency-in-science-collaborations> In 2019, Bayer generated sales of A$1.3 billion in Australia and New Zealand. [↑](#footnote-ref-14)