TechCouncil of Australia

DATACOM

FROM RESEARCH TO REALITY:

Lifting tech investment in Australia

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About the Tech Council of Australia

The Tech Council is the peak body representing Australia's tech sector. The Council represents companies throughout their life cycle, from early and growth stage companies through to large global firms. It also represents firms in the broader tech ecosystem, including venture capitalists, advisers and tech-enabled businesses outside the tech sector.

Authorship

This report was authored by the Tech Council. Deloitte Access Economics provided macroeconomic modelling on the economic impact of lifting tech investment that informed the scenarios presented in this report.

We would like to thank the Tech Council members and experts interviewed as part of this project for their expertise and time. In particular, we would like to thank our independent panel – which includes Catherine Livingstone, Roy Green, Arthur Sinodinos and Amit Singh – for their guidance.

Executive Summary

Technology is only becoming more important to being competitive as a business, delivering effective government services and keeping people safe. This is why many countries are consistently increasingly their investment in technology. Across the OECD, the median country investment in R&D is expected to rise to 2 per cent of GDP by 2035, up from 1.7 per cent today. But Australia isn't keeping up, and over the next ten years we're expected to fall further behind.

Australia's tech investment – defined as the sum of R&D and tech adoption spending – is currently equivalent to 3.9% of GDP. That's equivalent to $88bn in total investment, or $3,400 per capita, as shown in Figure I. Based on existing trends, this figure is forecast to fall to 3.5 per cent of GDP by 2030 due to the ongoing decline of R&D spending as a share of GDP and a lack of growth in tech adoption investment. Our modelling suggests that this decline would cost Australia around $8.2 billion dollars in 2035 alone and a total of $25.3 billion dollars between now and 2035 in foregone productivity benefits, relative to maintaining our current level of tech investment.

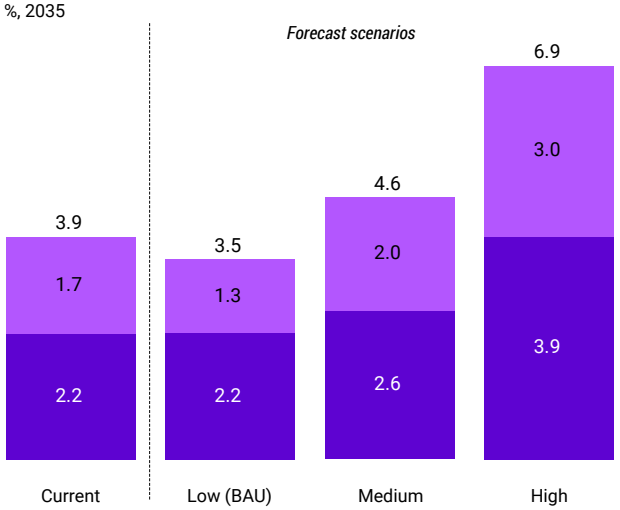
Higher levels of tech investment would deliver substantial benefits to the Australian economy. Lifting tech investment to 4.6 per cent in the medium scenario modelled would contribute an additional $39 billion to GDP from productivity gains in 2035. Going further to lift tech investment to 6.9 per cent would an contribute an additional $167 billion to GDP by 2035.

Accelerating businesses tech adoption has practical benefits for the businesses creating this uplift. ASX200 firms that actively invested in tech adoption were more likely to survive and grow compared to average firms across 2005-16, and small businesses actively adopting tech saw their revenue grow 3.5pp faster and their headcount grow 2.2pp faster than other small business according to the Office of Innovation & Science Australia[1].

Figure 1

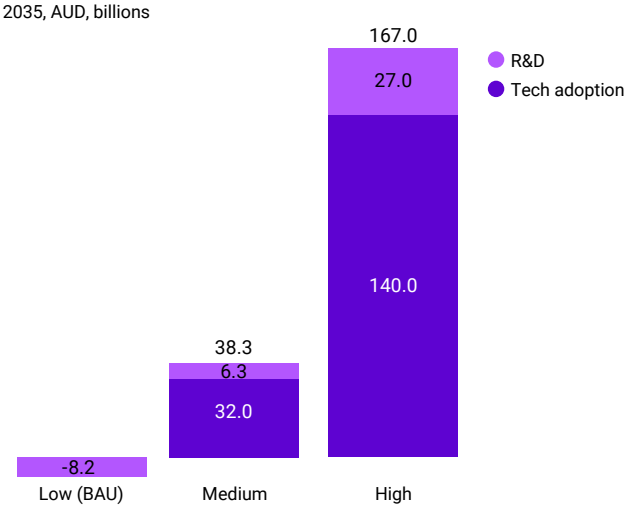
Tech investment as a share of GDP

%, 2035



Impact on GDP via productivity gains

2035, AUD, billions



Note: Deloitte Access Economics provided macroeconomic modelling that informed the estimates of the benefits under these scenarios.

Source: Deloitte Access Economics; TCA analysis

1 Office of Innovation & Science Australia and AlphaBeta (2020) Australian Business Investment in Innovation: levels, trends and drivers

Lifting tech investment is also critical to the long-term health of Australia's economy. Over the next few years, the drivers of Australia's economic growth are forecast to shift. In the 2030s, Treasury expects that GDP per capita will be entirely driven by productivity growth. Concerningly, productivity growth has been declining and if this trend continues, we risk seeing GDP per capita stall by the mid-2030s, as shown in Figure II.

Turning around Australia's productivity performance could be driven by higher tech investment, which will require us to address barriers to lifting R&D and tech adoption. Across both measures, we forecast that the uplift will need to be undertaken by business but Government also has an essential role to play as a policymaker and strategic investor.

There are already important policy measures from Federal and State Governments that support R&D and tech adoption activity across the economy. These include measures like the R&D Tax Incentive and the Industry Growth Program[2], which is particularly important to the startup ecosystem, the establishment of the National Reconstruction Fund which could be instrumental in enabling growth in scaleups. The Strategic Examination of the R&D system will be an important complement to better understanding the barriers to greater R&D in greater depth.

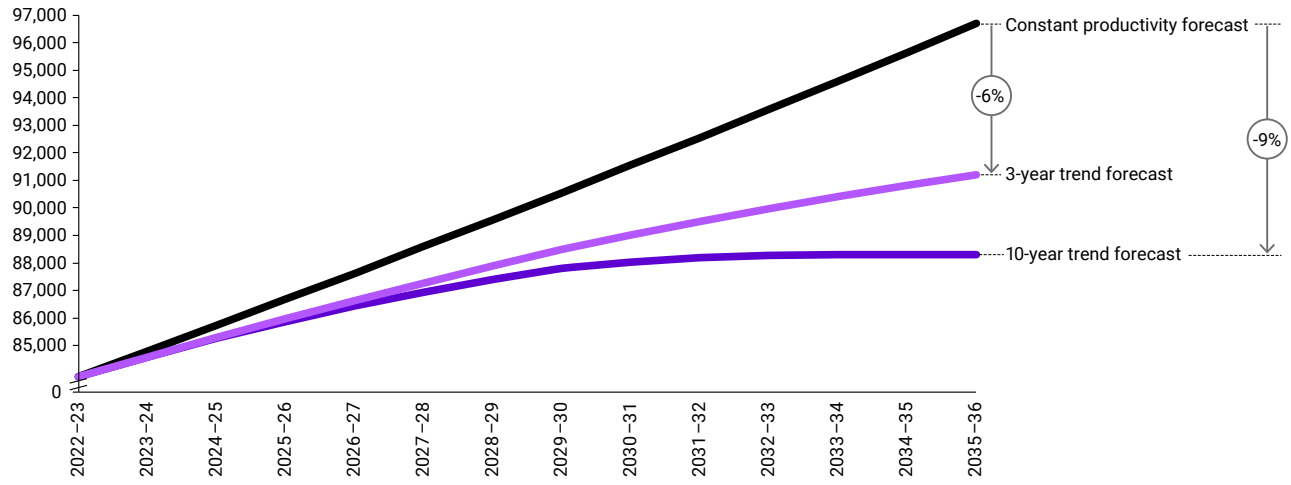
R&D

Lifting R&D investment will require a structural shift in the Australian economy enabling us to operate differently rather than doing marginally more of the same. We show that lifting R&D investment will require action from multiple groups across our economy. This is based on modelling of potential industry-specific growth and economy-wide activity in software and data science R&D. This activity is attributed to these four groups are shown in Figure III based on historical patterns in R&D contributions:

- **Startups** could contribute an additional 0.04 per cent of GDP to the uplift, which accounts for 6 per cent of the required change.
- **Scaleups** could contribute an additional 0.12 per cent of GDP in R&D and account for 18 per cent of the required change.
- **Multinationals** in the tech sector could contribute an additional 0.19 per cent of GDP and 27 per cent of the required change through attraction of greater investment in R&D from already-investing companies globally.
- **Established large businesses** operating outside the tech sector could contribute an additional 0.35 per cent of GDP and 49 per cent of the required change.

The modelled uplift across these groups would enable Australia to reach a total of 2 per cent of GDP invested in R&D by 2035, averting the business-as-usual outcome of R&D falling to 1.3 per cent of GDP from the current level of 1.7 per cent.

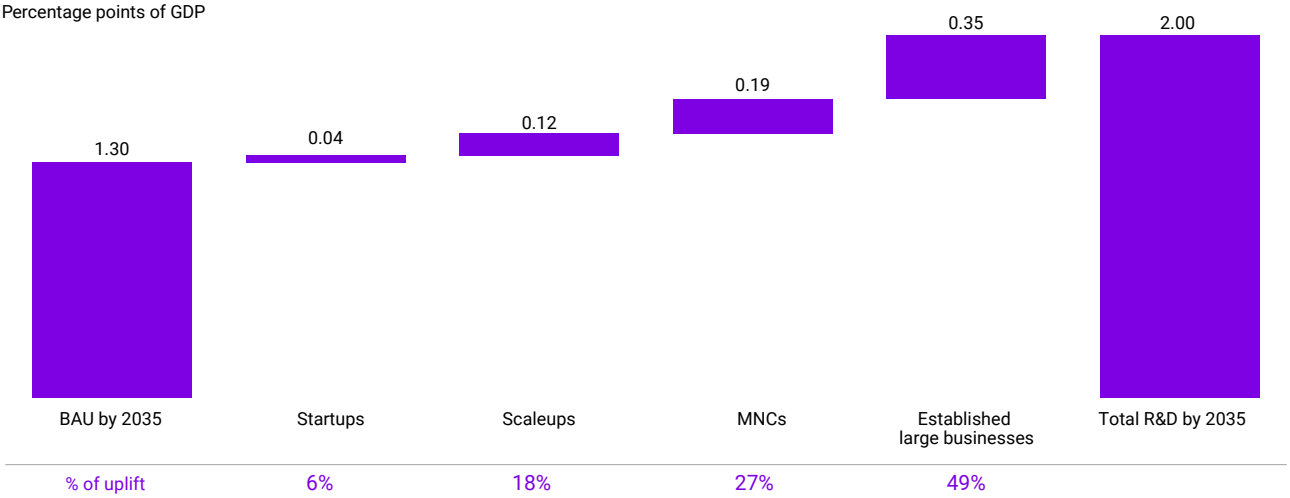
Figure II
Real GPD per capita, forecast
AUD



Source: Treasury, ABS

2 Previous iterations of this program were called 'Accelerating Commercialisation' and the 'Entrepreneurs' Programme'

Figure III
Pathways to higher R&D by 2035
Percentage points of GDP



Tech adoption

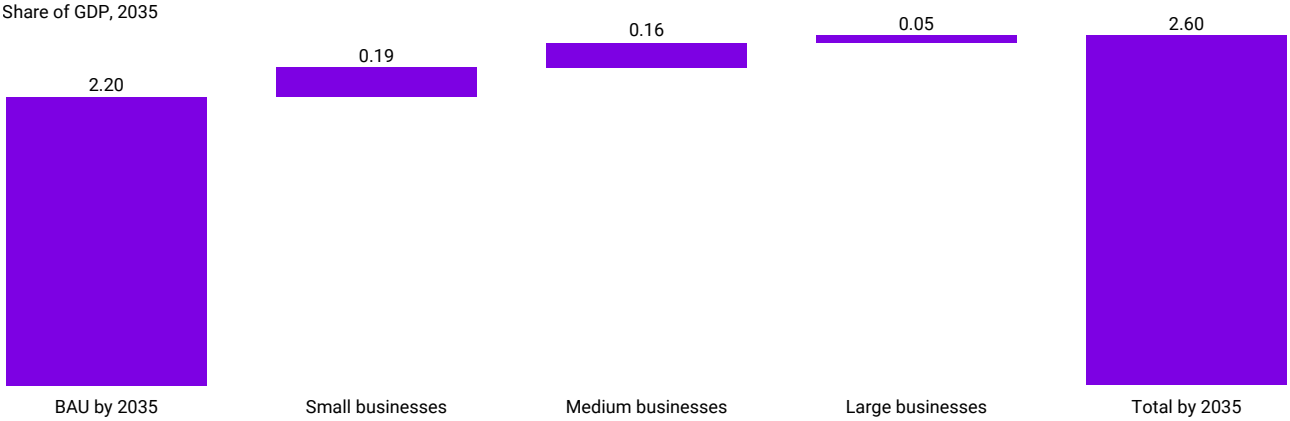
Tech adoption investment includes the activity to require technology that's new to the business but not necessarily their industry, country nor the rest of the world. That makes it distinct from R&D which involves developing new technology, and also makes this activity complementary because it supports commercialisation of that research and development.

Seeing a sustained rise in tech adoption investment will require action from businesses, of all sizes across the economy. This uplift is modelled based on the potential for Australian businesses to match their EU counterparts in tech adoption maturity, as measured by the Digital Intensity Index. We estimate that improving our tech adoption maturity could be realised through the following:

- The small business cohort could contribute an additional 0.19 per cent of GDP in tech adoption investment by 2035, as shown in Figure IV
- Medium-sized businesses could contribute an additional 0.16 per cent of GDP. This could be achieved by an uplift in technology adoption by existing medium-sized businesses, but it is likely that we will need to take measures that supportive innovative small businesses to scale given Australia's 'missing middle' problem[3].
- The large business cohort could contribute an additional 0.05 per cent of GDP

This modelled uplift would enable Australia to see a real (rather than nominal) increase in tech adoption investment reaching 2.6 per cent of GDP which provides commensurate growth to the modelled R&D uplift.

Figure IV
Pathways to higher tech adoption by 2035
Share of GDP, 2035



Source: ABS

3 IISA (2023) Barriers to collaboration and commercialisation

Summary of recommendations

In this report we've focused on outlining which actors in the economy can contribute to lifting tech investment. To enable this change, we put forward five recommendations for action. These recommendations are provided as an initial overview of changes to consider.

These recommendations are primarily focused on changes to support structural change across the Australian economy. This involves greater growth of the tech sector, an uplift in digitisation across traditional industries and stronger collaboration between tech and traditional industries.

1 **Ensure tech investment policies are fit-for-purpose** which could include measures to:

   a Reform the R&D Tax Incentive (RDTI) to better reflect modern forms of R&D and bring Australia in line with other markets

   b Adjust broad-based tax settings

   c Consider direct incentive measures to provide a short-term boost to tech adoption initiatives, including skilling opportunities

2 **Address barriers to scaling tech companies from Australia** which could include measures to:

   a Close the scaleup funding gap, building on existing initiatives like the National Reconstruction Fund and ASCA which we expect will contribute significantly to this solution

   b Improve operation of Employee Share Ownership Plans (ESOPs)

3 **Support greater attraction of investment activity from R&D-intensive global companies** – Australia has some of the best tech workers in the world and has historically been a net capital importer. But we haven't been able to fully match our technical potential with the kind of foreign investment that results in greater R&D activity.

4 **Examine opportunities for government to invest strategically to provide greater competition** – This could include:

   a Scaling programs like the Business Research and Innovation Initiative

   b Consider establishing place-based R&D centres, drawing on the success of models such as Catapault centres in the UK and the Fraunhofer institutes

5 **Examine opportunities to create tech industry-led executive education programs focusing on opportunities to adopt technology and manage technology risk** – Managerial skills have been found to have a significant impact on productivity[4], partly through the role that managers have in facilitating innovation and harnessing the benefits of technologies[5]. Establishing a vendor-agnostic executive education program that provides an opportunity for business leaders from across the economy to learn about technology, the associated opportunities and risks could help address some of the practical barriers to seeing greater tech investment.

4 World Management Survey (2024) Management matters in an era of ditruption

5 Productivity Commission (2020) Can Australia be a productivity leader?

1. Tech investment is critical to growing the Australian economy

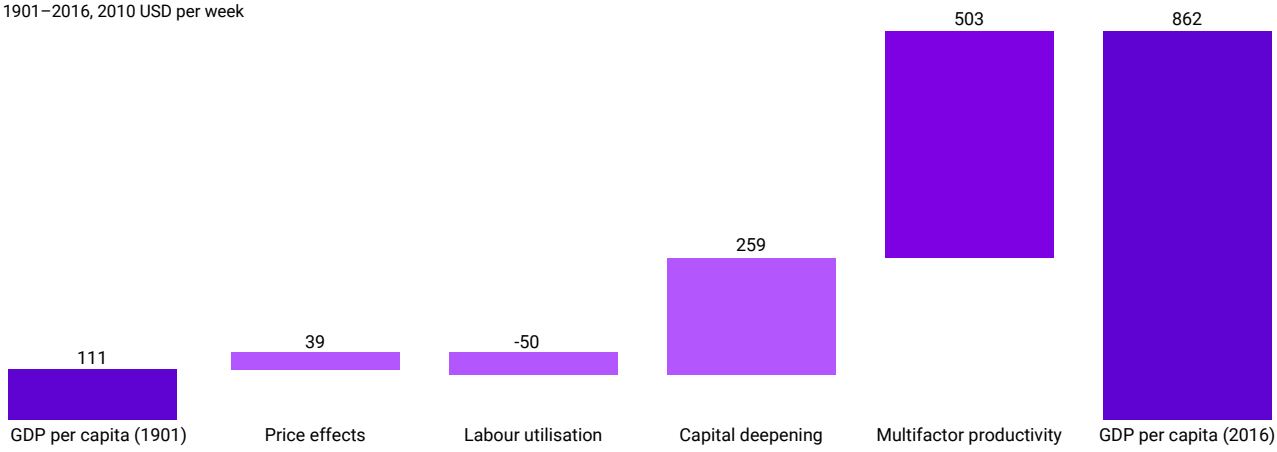
Productivity growth is a major determinant of material living standards in Australia. In this section, we demonstrate the imperative to raise labour productivity growth which could be realised through higher tech investment.

Australia is among the wealthiest countries in the world, with one of the highest levels of GDP per capita which generally reflects the material living standards associated with the average income. Real living standards for the average Australian have historically been driven by productivity growth. Between 1901 and 2016, GDP per capita rose from $111 per week to $861 (both in 2010 USD), the largest contributor to that growth was multifactor productivity growth which accounted for 63 per cent of that change[6] ,as shown in Figure 1.

To sustain growth in real living standards, Australia will need to see strong productivity growth. Recent Treasury forecasts suggest that real incomes could be 15 per cent higher by 2035[7], fuelled almost entirely by labour productivity growth which is assumed to remain constant at the 20-year average rate in 2021-22 of 1.2 per cent.

However, if we see labour productivity growth continue to decline, we should also expect to see relatively lower GDP per capita. In Figure 2, forecasts for labour productivity are provided that inform our modelling of scenarios for real GDP per capita changes shown in Figure 3. These scenarios take into account both the different trends in productivity but also the expected changing contribution to real income growth per capita[8]. Under the scenario that assumes productivity growth follows the trend from the last 10 years, GDP per capita is 9 per cent lower by 2035 when material living standards begin to stagnate. A more moderate forecast based on the trend over the last three years in the labour productivity average would only result in GDP per capita being 6 per cent poorer by 2035, with real living standards still increasing. Both scenarios demonstrate that continued growth in real living standards for the average Australian will require an improvement in productivity growth.

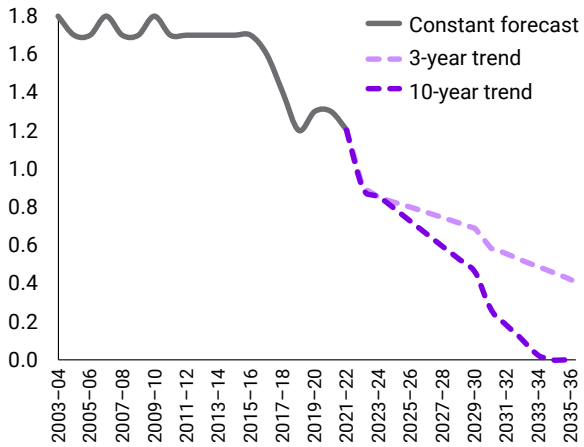
Figure 1
Factors contributing to GDP per capita growth
1901–2016, 2010 USD per week



Source: Productivity Commission

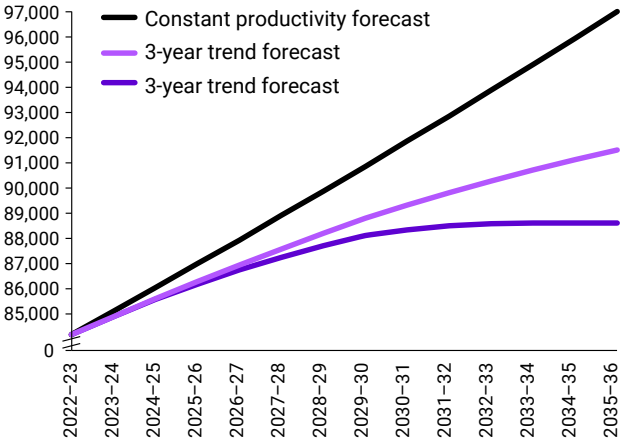
6 Productivity Commission (2020) PC Productivity Insights – Australia's long term productivity experience
7 The Treasury (2023) 2023 Intergenerational Report
8 The Treasury (2023) 2023 Intergenerational Report (Chart 1: Components of real income growth per capita)

Figure 2
Labour productivity growth
20-year average, constant forecast from 2021-22 and trend forecast



Note: The level step down at 2030 in the trend-based forecasts is due to a change in the decadal assumptions about the drivers of GDP per capita growth. These assumptions are drawn from the Australian Government's 2023 International Generational Report

Figure 3
Labour productivity growth
AUD



Source: Treasury, ABS

Meaningfully lifting productivity growth could be enabled through higher tech investment, which includes two components:

- **R&D investment** – this includes spending on 'creative work undertaken on a systematic basis in order to increase the stock of human knowledge and to devise new applications based upon it'.[9] This work can be thought of as the step in the value chain that connects more fundamental research to commercialisation.
- **Tech adoption investment** – this is spending on work that enables innovation which is 'a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process).'[10] This work can be thought of as the step that connects commercialisation to adoption.

R&D investment has been shown to have a persistent, positive impact on multifactor productivity that peaks around five years post-investment.[11] The work enabled by this investment brings can also bring products to market, like vaccines, that provide a fundamental uplift in quality of life – not just material living standards. While there's scope for more R&D activity in Australia, not all businesses or government departments need to engage in cutting-edge research. This motivates the second component of this tech investment definition.

Tech adoption investment is based on the Oslo Manual (2018) definition of innovation spending. Adoption of new technologies (subsequent to their development through R&D) is essential to businesses' efficiency which shapes macroeconomic productivity. It's also important for government to ensure that public services are delivered efficiently and safely. Accelerating digital adoption across Australian governments could save $15 billion over 10 years due to lower service delivery costs and improved cyber security[12].

These two components are distinct forms of activity and have a complex, mutually beneficial relationship. While R&D is an important input to tech adoption, it's not the only driver of innovation so these concepts are important to separate[13].

Through higher R&D and tech adoption investment, we can lift productivity across the Australian economy and ensure that over the next decade we see a sustained increase in real GDP per capita. This means higher real incomes and living standards, as well as greater collective resources to address systemic challenges like climate change and managing the impact of an ageing population.

9 OECD, Research and Development (R&D)
10 OECD, Oslo Manual 2018
11 Majeed et al. (2024) Do Monetary Policy and Economic Conditions Impact Innovation? Evidence from Australian Administrative Data
12 Mandala Partners (2024) Assessing the benefits of accelerated digital delivery of government services
13 Howard (2024) Beyond the Lab: The Critical Difference Between R&D and Innovation

2. Pathways to lifting tech investment

Higher productivity growth could be enabled through greater tech investment, which will require turning around the trend in R&D investment and boosting tech adoption. In this section, we examine the opportunities to uplift tech investment and provide greater clarity in which actors across our economy have a role to play.

Tech investment is currently 3.9 per cent of GDP, as shown in Figure 4. That's equivalent to $88bn in total investment, or $3,400 per capita. Based on existing trends, this figure is forecast to fall to 3.5 per cent of GDP by 2030 due to the ongoing decline of R&D spending as a share of GDP. Our modelling suggests that this decline would cost Australia around $8.2 billion dollars in 2035 alone and a total of $25.3 billion dollars between now and 2035 in foregone productivity benefits, relative to maintaining our current level of tech investment.

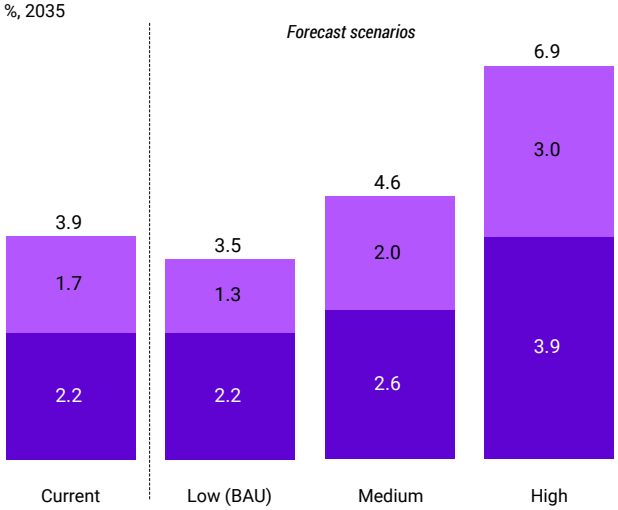
Turning these trends around will require significant action. We have modelled two additional scenarios to understand the potential benefits of changing existing trends, also shown in Figure 3. The first is a medium scenario which sees R&D rise to 2 per cent of GDP, which keeps Australian as the median country in terms of R&D spend in the OECD. We model tech adoption investment spending rising by the same proportion as R&D[14] which results in this figure reaching 2.6 per cent of GDP. In this medium scenario we forecast that this additional tech investment will contribute an additional $38 billion to GDP from productivity gains in 2035.

The second is a high scenario which sees R&D rise to 3 per cent and tech adoption investment similarly grow by the same proportion to reach 3.9 per cent. Under this scenario, we expect this activity to contribute an additional $167 billion to GDP from productivity gains in 2035.

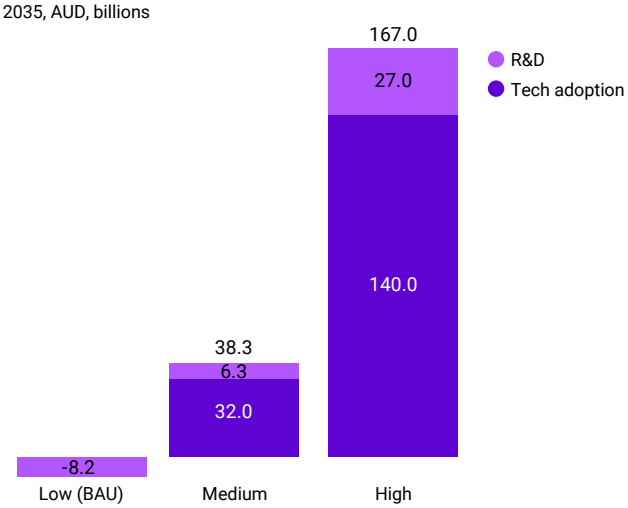
In all scenarios the economic benefits are primarily driven by tech adoption, rather than R&D. This is partly driven by the amount of activity. There is already a higher level of tech adoption investment compared to R&D and we expect that to continue. This activity also affects a much larger number of businesses, putting them on a higher growth path that results in greater economic value created.

Figure 4

Tech investment as a share of GDP
%, 2035



Impact on GDP via productivity gains
2035, AUD, billions



Note: Deloitte Access Economics provided macroeconomic modelling that informed the estimates of the benefits under these scenarios.

Source: Deloitte Access Economics; TCA analysis

14 We have chosen to model tech adoption investment by the same proportion because we believe it will be important for there to at-least-commensurate uplift across the entire innovation value chain.

These estimates provide an overview of the expected benefits from turning around trends in tech adoption spending. In the following section, we explore these underlying trends and opportunities to realise higher levels of R&D and tech adoption investment.

R&D investment

R&D investment, as a share of GDP, has been falling since 2008, this is shown in Figure 5. Australia is now the 'median' country in the OECD, spending 1.7 per cent of GDP on R&D. However, if the prevailing downwards trend continues, we expect to only invest 1.3 per cent of GDP in R&D by 2035 which will be substantially lower than the forecast OECD median of 2 per cent of GDP.

For Australia to raise our R&D, we primarily need to see higher levels of business R&D. If Australia were to resemble an R&D-intensive country today[15], the required uplift (~1.8 percentage points) could be realised through higher business R&D as shown in Figure 6. Within the business sector, the uplift would almost entirely be driven by large businesses which are those employing more than 250 people.

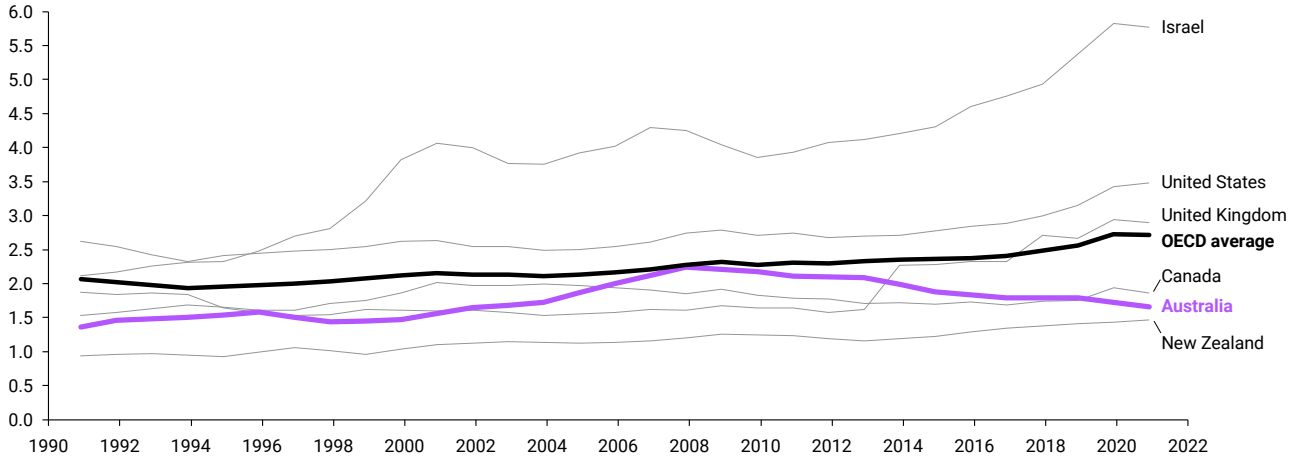
It would be easy to simply point the finger at existing large businesses and tell them to spend more on R&D – but we don't think that's the solution. Lifting R&D investment will require a structural shift in the Australian economy enabling us to operate differently rather than doing marginally more of the same.

To identify the practical pathways to lifting R&D, we've examined the potential to:

- lift investment in existing areas of strength – this includes the tech sector's R&D, manufacturing and the non-tech sector spending on R&D in software and data science. Many 'deep tech' industries in which Australia has strengths, like biomedicine, space and quantum will largely be captured in the manufacturing sector based on the methodologies underpinning these statistics.
- grow scaleups – which are inherently R&D-intensive businesses
- attract more investment from the largest global spenders on R&D – this involves examining the potential uplift from attracting a greater share of existing global R&D

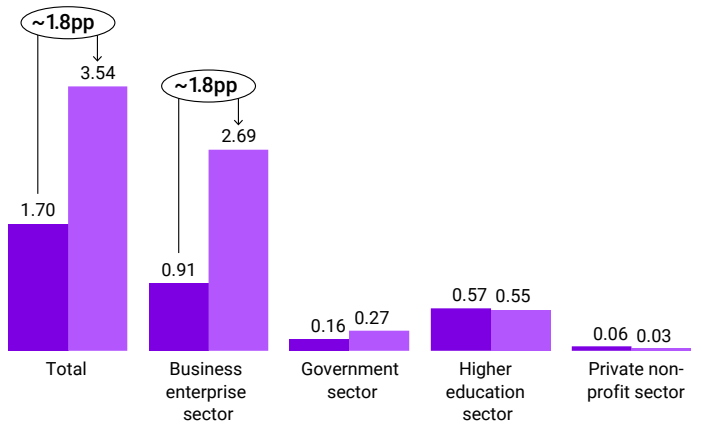
Examining these pathways allows us to understand the role that different parts of the Australian could play, alongside existing large businesses, in transforming our economy to become more innovative.

Figure 5
Factors contributing to GDP per capita growth
Selected OECD countries and OECD average, 1991 - 2021

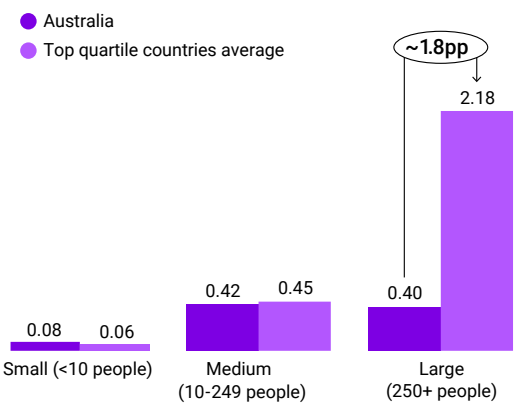


15 This is represented by the average levels of R&D across the top quartile of countries in the series on R&D spend as a percentage of GDP in 2021.

Figure 6
R&D spend, by sector
Share of GDP, 2021



R&D spend, by size of business
Share of GDP, 2021



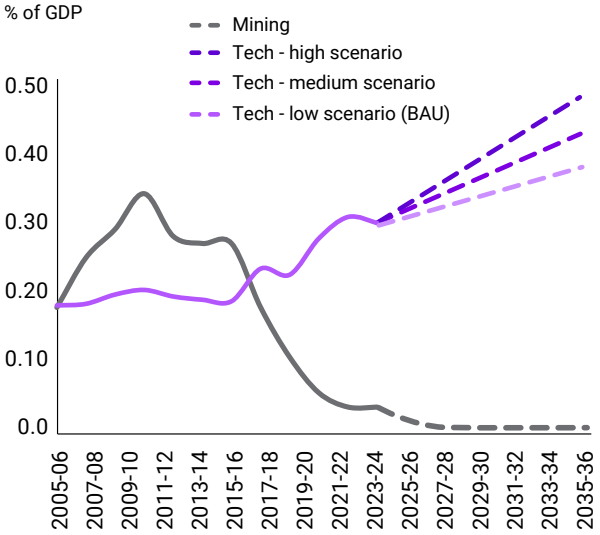
Source: OECD

Growing areas of strength

Australia's R&D is concentrated in a small number of areas. The largest source of R&D spending, by industry, comes from 'Professional, Scientific and Technical Services' ('Tech') which reflects the growing role of Australia's tech sector in driving this investment. Tech has largely replaced mining, as Australia's largest R&D industry, now contributing 0.3 per cent of GDP (or 34 per cent of business R&D spending) in 2021-22, as shown in Figure 7. Mining companies still a sizeable sum of R&D, having invested $885m in 2021-22, but this has become a relatively small proportion of all business R&D as the mining boom has ended and the tech sector has grown.

If tech R&D continues to grow at the current rate, it will reach 0.38 per cent of GDP by 2035. But there is likely scope to grow this investment faster. The high scenario modelled would involve growing this investment by the maximum growth rate observed over the past 10 years (+0.3 percentage points per year) reaching 0.48 per cent of GDP by 2035. A more conservative, medium scenario plots the middle road between BAU growth and the high scenario, and requires growth of 0.2 percentage points per year resulting in tech R&D reaching 0.42 per cent of GDP by 2035.

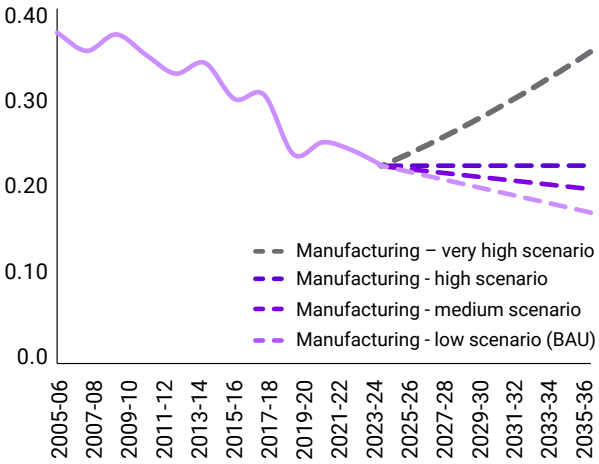
Figure 7
Factors contributing to GDP per capita growth
% of GDP



Source: Treasury, ABS

Manufacturing remains our second-largest R&D industry, but the intensity of R&D when measured as a share of GDP continues to fall, as shown in Figure 8. If manufacturing R&D as a share of GDP continues to fall it is expected to be equivalent to 0.17 per cent of GDP by 2035. Stopping the decline in manufacturing's contribution to our R&D intensity is modelled as the high scenario and would result in manufacturing continuing to contribute 0.22 per cent of GDP in R&D over the next decade. A medium scenario, which is the middle path between the BAU and high scenario would suggest that manufacturing contributes 0.20 per cent of GDP in R&D by 2035.

Figure 8
Factors contributing to GDP per capita growth
% of GDP



Note: *This is 'Professional, Scientific and Technical Services'. Computer Services and Design accounts for 25% of the GVA in 'Professional, Scientific and Technical Services'
Source: ABS; OECD

There is an additional 'very high' scenario modelled for the manufacturing industry. This involves a different approach that accounts for two underlying factors driving manufacturing R&D: the size of the industry and it's R&D intensity. These factors are further explored in Box 1. In Figure 8, the very high scenario illustrates the outcome for manufacturing R&D if:

- the industry's share of GVA (it's relative size) stops declining and remains constant at 6 per cent of GVA
- the industry's R&D intensity (measured by the share of GVA invested in R&D) returns to the average value between 2005 and 2010 of 2.3 per cent. Most recently, between 2016 and 2021, this value was 0.7 per cent.

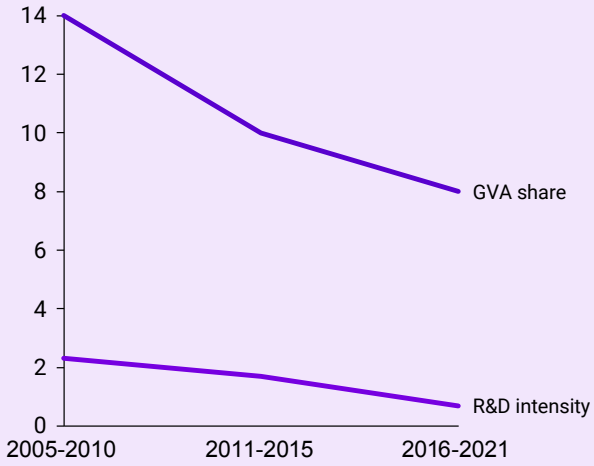
Most of the difference between the high and very high scenario is driven by holding the relative size of the industry constant. This is further explained in Box 1.

Box 1: Drivers of change in manufacturing R&D

Over the 15 year period examined, there have been significant changes in the industrial composition of the Australian economy. Manufacturing as an industry has shrunk, with it's share of Gross Value Added (GVA) falling from 17 per cent in 2005 to 7 per cent in 2021. In Figure 9, the average GVA shares across the three five-year periods are shown alongside the change in R&D intensity within manufacturing. R&D intensity is measured here as the share of GVA invested into R&D in the same year. Across 2005 to 2010, that share was 2.3 per cent on average for manufacturing. That has since fallen to 0.7 per cent on average across 2016 to 2021.

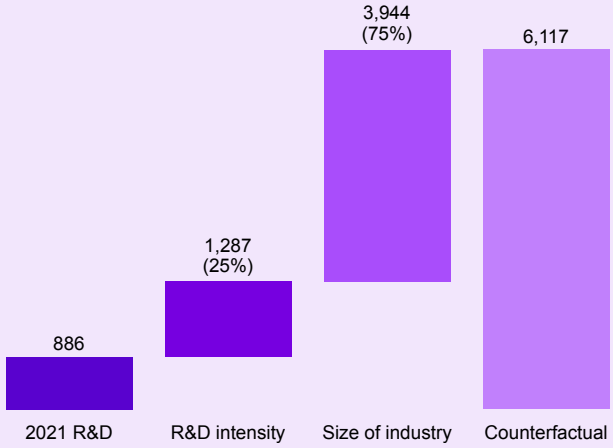
If the manufacturing industry was the same relative size (by GVA share) and had the same R&D intensity as across 2005 to 2010, then manufacturing R&D would have been approximately $6bn in 2021, up from the actual $886m. Approximately 25 per cent of this difference is explained by the change in R&D intensity and 75 per cent is explained by the industry shrinking, as shown in Figure 10.

Figure 9
Manufacturing industry, GVA share and R&D intensity
%, Average over periods



Source: Treasury, ABS

Figure 10
Factors contributing to GDP per capita growth
$, millions



Across the uplift forecast for our software-intensive industry and the manufacturing industry, we expect that startups and scaleups will continue to contribute most of this investment. Based on the SME vs. large company share of overall business R&D, we estimate that startups' total R&D uplift above BAU could range from 0.04 per cent to 0.09 per cent of GDP and scaleups could provide between 0.01 per cent and 0.02 per cent of GDP. This assumes that the composition of these industries – that is, the distribution of companies by size – stays the same. In the next section, we'll explore the potential to grow the number of scaleups in Australia. This enables us to account for the role of changing industry composition as a means to lifting R&D.

Scaleup growth

Scaleups – which are large and maturing startups – are already significant contributors to R&D in Australia. Scaleups account for 15 per cent of the top 100 R&D Tax Incentive claimants[16], but contribute an outsized 33 per cent of R&D spending under this scheme. This group is primarily composed of software companies (11 out of 15), which broadly reflects the composition of Australia's tech sector[17].

The number of scaleups has grown substantially over the last decade. In the 2020s, we have 124 per cent growth with 139 startups reaching a valuation of at least $100m up from 62 startups a decade earlier[18]. Despite this success, we know that Australia remains a difficult place to scale a tech company. This is driven by a number of factors, one of which is the potential scaleup funding gap of approximately $50b in 2030[19]. This forecast gap reflects contemporaneous disparities in funding opportunities in Australia relative to other countries with more mature tech ecosystems, such as the United States.

Recent policy changes, including the establishment of the National Reconstruction Fund and changes to the Industry Growth Program to better encompass scaleups, will help address that gap. Improvements to the operation of the Foreign Investment Review Board processes will also be essential based on previous estimates that show foreign investment will be an essential component of boosting scaleup funding levels [20].

If we could address the barriers to scaling in Australia and sustain the previous decade's growth in the number of scaleups working in software, these companies could contribute an additional 0.07 per cent of GDP in R&D investment. Under a more ambitious scenario that involves growing the number of scaleups at the rate seen between the 2000s and the 2010s (60 per cent), this contribution could sum to 0.09 per cent of GDP.

This only includes the companies that scale over the next decade and not existing scaleups' contribution because this should already be accounted for in the tech R&D figures examined in the previous section.

Forecasting the potential growth of hardware scaleups, which contribute to manufacturing R&D, is handled differently because the number of companies involved is much smaller and probably not well-measured by statistics that reflect growth in software companies. To understand the potential of growing scaleups in hardware, we have constructed two hypothetical counterfactuals that use existing companies as proxies for Australia's potential to grow hardware-based companies in tech industries. We provide two hypothetical counterfactuals:

1. **Replicating our existing success** – this would involve scaling three additional hardware companies to the combined size of the existing three large R&D-intensive hardware companies (CSL, Cochlear and Resmed). This would involve scaling three of the five hardware-intensive companies that are already on this path and appear between the top 100 – 250 RDTI claimants. Under this scenario, we forecast that hardware scaleups could collectively contribute 0.02 per cent of GDP in R&D by 2035. This also removes the contribution of existing hardware scaleups, consistent with the approach taken for software scaleups.

2. **Expanding on our existing success** – this would involve scaling all five hardware-intensive companies that are in the top 100 – 150 RDTI claimants. Under this scenario, we forecast that hardware scaleups could collectively contribute 0.03 per cent of GDP in R&D by 2035.

16 The companies included as scaleups are listed in Appendix 1.
17 Tech Council of Australia (2022) Turning Australia into a regional tech hub
18 Airtree (2024) Australian tech companies valued at $100m+
19 Tech Council of Australia (2023) Shots on Goal
20 Tech Council of Australia (2023) Shots on Goal

Together, the growth in software and hardware scaleups could contribute between 0.09 per cent and 0.12 per cent of GDP to R&D across the tech and manufacturing sectors. This adds to the estimated contribution of existing scaleups reported in the previous section. In total, we estimate scaleups could provide between 0.12 per cent and 0.16 per cent of GDP in R&D by 2035.

Scaling these software and hardware-intensive companies would result in a change of composition in the Australian economy. It would mean supporting the growth of inherently R&D-intensive companies, that have to keep investing, just to keep up (let alone out-compete) their global competitors.

Attracting more investment from global leaders in R&D

Australia has been able to attract significant presences from most of the world's largest tech companies. For instance, Microsoft entered in Australia via acquiring a local tech company in 1983 and in 2002 Google opened its first office outside the United States in Australia. These companies are large employers of tech workers and continue to invest substantially. Microsoft announced a $5 billion investment in computing capacity over the next two years, to meet growing demand for cloud computing services which is expected to almost double over the next few years[21]. Google is investing $1 billion in Australian infrastructure, research and partnerships which includes joint research with the CSIRO and investments in quantum computing research[22]. Amazon Australia has invested $15bn across all of its businesses in Australia, and is investing a further $490 million in opening two new fulfilment centres in Western Sydney by early 2026, creating 1,000 job[23].

While these global companies do invest in research and undertake some R&D in Australia, we believe there is more to be done in attracting investment from these kinds of companies which are global leaders in R&D. To provide an estimate of what this uplift could look like, we've estimated the amount of R&D spending that would be undertaken by the five largest R&D investors globally, if the amount of R&D they did in Australia was commensurate with our share of global GDP (1.6 per cent).

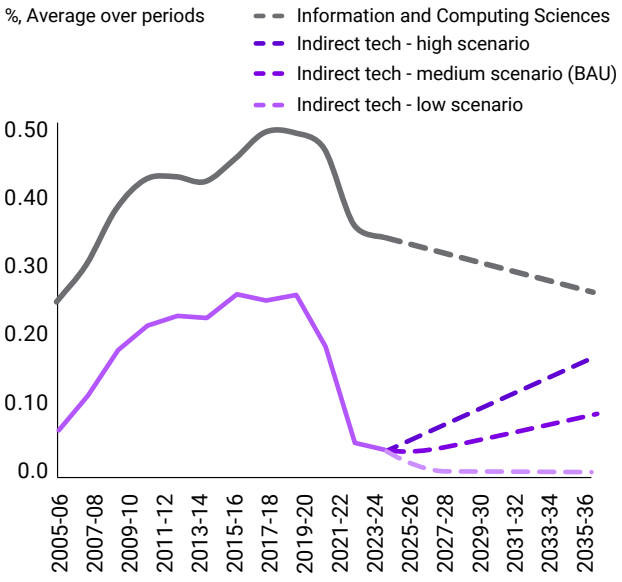
In 2022, the five largest R&D investors globally – Amazon, Alphabet, Facebook, Apple and Microsoft – invested a total of $291 billion in R&D globally. If 1.6 per cent (our share of global GDP) of that investment occurred in Australia, this would be equivalent to $4.7 billion or 0.19 per cent of GDP.

This estimated contribution of 0.19 per cent of GDP could be achieved in different ways. It could involve a greater number of R&D intensive multinational companies contributing smaller amounts, or a smaller number of these companies contributing larger amounts. In either case, this could provide a meaningful uplift to Australia's R&D performance by 2035 and the policy options to unlocking this investment are worth examining.

Supporting the cutting-edge of digitisation

The largest field (across all industries) of Australia's R&D is Information and Computing Sciences. This type of work is broadly applicable across the Australian economy. Innovation in data science and software solutions is relevant to businesses across all industries as the leading edge of digitisation. Despite its broad and increasing relevance, the role of businesses outside the tech sector ('indirect tech') in this type of R&D has plummeted in recent years. The indirect tech contribution to R&D is estimated by subtracting the tech sector's R&D spending from the total for Information and Computing Sciences. The remainder is the estimated indirect tech R&D spend which peaked in 2015-16 and declined sharply thereafter, as shown in Figure 11. Based on recent trends, indirect tech R&D is likely to fall to zero by 2035. A high scenario has been modelled which requires this investment to follow the same trend as observed between 2005 and 2015 for this series. A medium scenario provides the middle path between the near-zero BAU forecast and the high scenario, and would see indirect tech contribute 0.08 per cent of GDP to R&D by 2035.

Figure 11
Business R&D investment, Indirect tech



Source: Treasury, ABS

21 Microsoft (2023) Microsoft announces A$5 billion investment in computing capacity and capability to help Australia seize the AI era
22 Google (2024) Google's Digital Future Initiative
23 Amazon Australia (2024) Learn about Amazon Australia's plans to invest in two new Western Sydney fulfilment centres, creating 1,000 job

Greater R&D activity in Information and Computing Sciences by large firms across the economy will provide a useful boost, but it cannot be the entirety of the uplift in large firms' R&D if Australia is to meaningfully reach even 2 per cent of GDP in R&D by 2035. Under the medium scenario where indirect tech contributes 0.08 per cent of GDP to R&D, all other fields would need to contribute 0.26 per cent of GDP. Under the high scenario these fields would need to contribute 1.2 per cent of GDP to reach a total investment of 3 per cent of GDP in R&D. This means a substantial proportion of large firms' R&D would need to be focused on innovation in the fundamental product or service they provide, rather than the means to delivery – which digitisation often provides.

Pathways to uplifting R&D

The previous sections have examined several ways to build on our strengths in R&D through growing startups and scaleups, as well as unlock greater foreign investment in this space and the role of established large businesses. These four pathways to lifting R&D are shown in Figure 12.

- **Startups** - growing the startup ecosystem to expand the stock of R&D-intensive small and medium businesses. We estimate this could contribute at least 0.04 per cent of GDP to the uplift, which accounts for 6 per cent of the total change. This is a conservative estimate and could well be surpassed if we continue to similar growth in startup funding across the ecosystem as observed over the past ten years.
- **Scaleups** - scaling more R&D-intensive businesses from Australia. We estimate this could contribute 0.12 per cent of GDP in R&D and account for 18 per cent of the total required change.
- **Global leaders** - attracting more R&D investment from multinationals. We estimate this could contribute 0.19 per cent of GDP and 27 per cent of the required change.
- **Established large businesses** – making our economy more conducive to higher R&D levels among existing large Australian businesses. We estimate this could contribute 0.35 per cent of GDP and 49 per cent of the required change.

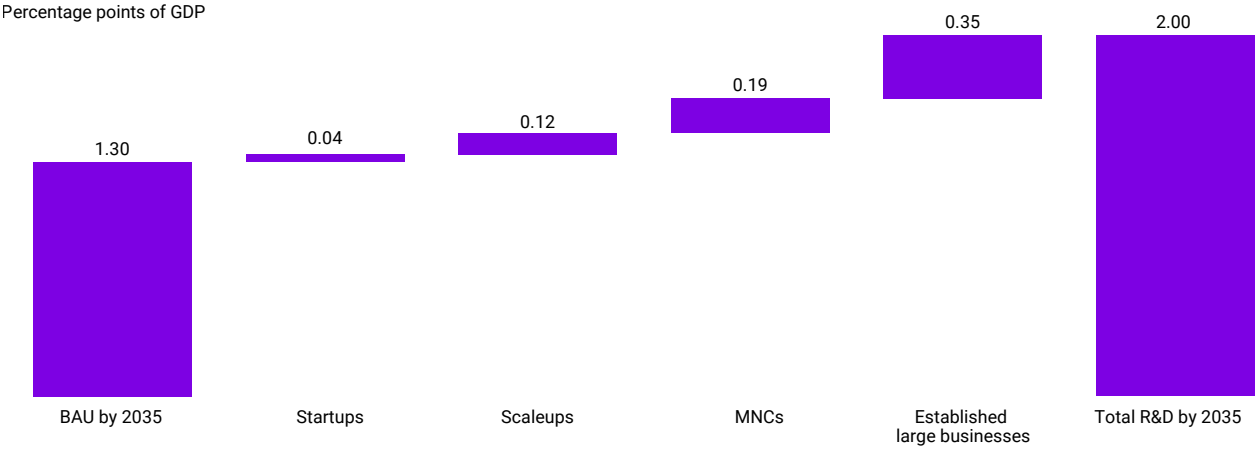
Established large businesses in Australia will still play a substantial role in the uplift, but these estimates show they don't need to contribute the entire solution. Startups and scaleups in the tech sector could contribute around a quarter (24 per cent) of the solution plus roughly a quarter more (27 per cent) of the solution from global leaders in R&D.

Tech adoption investment

Tech adoption investment includes the activity to require technology that's new to the business but not necessarily their industry, country not the rest of the world. That makes it distinct from R&D which involves developing new technology, and also makes this activity complementary because it supports commercialisation of that research and development.

Businesses' tech adoption investment is estimated to currently be 2.2 per cent of GDP. This is equivalent to $90 billion in total investment and approximately $2,100 investment per capita. This investment has increased on a per capita basis from $1,700 in 2016-17 (and on a nominal basis) but the share of GDP invested has stayed the same over this period.

Figure 12
R&D spend, by sector
Percentage points of GDP



Estimates of this investment by government suggest that this would amount to at least $2 billion in 2023- 24[24]. While this is a substantial level of investment, this estimate remains a relatively small share of GDP in comparison to the $90 billion spent over a similar period by businesses. At present, there is limited, comprehensive accounting of government expenditure on ICT in a manner that's comparable to the data series collected for businesses. Better documenting this investment by government would enable this activity to be reflected in modelling of the potential contribution to tech investment uplift. For the time being, this activity should still be considered an important part of potential solution – particularly where governments play a strategic role through investing in areas where private investors have historically underinvested and have a role in supporting growth in enablers of this adoption, particularly the growth of the tech workforce through commitments like the National Tech Jobs target of reaching 1.2 million tech workers by 2030.

Pathways to lifting tech adoption investment

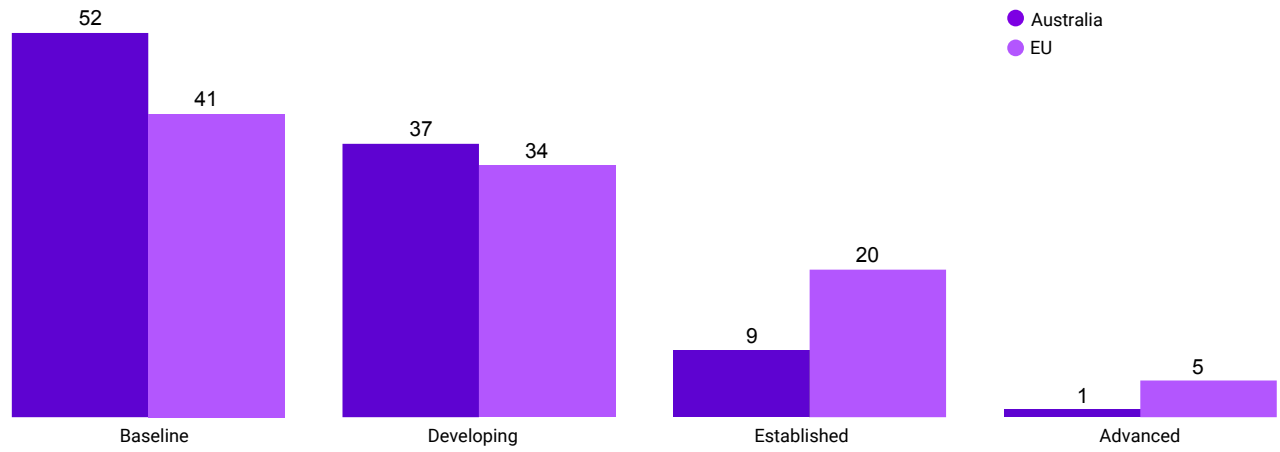
Australia and the EU have both recently begun collecting more detailed statistics on the state of our business communities' tech adoption in the form of a Digital Intensity Index. This is a composite index that businesses' relative maturity in tech adoption across fives areas: digital skills, cyber security, digital business management, digital technology and infrastructure, and e-commerce and online presence.

Australian businesses are further concentrated towards the bottom of this rating system compared to their EU counterparts, as shown in Figure 13. Just over half of all Australian businesses have a 'baseline' level of tech use, compared to 41 per cent of businesses in the EU. At the upper end of this index, there are significantly more EU businesses with either 'established' or 'advanced' ratings.

Accelerating businesses tech adoption has practical benefits for those businesses. ASX200 firms that actively invested in tech adoption were more likely to survive and grow compared to average firms across 2005-16, and small businesses actively adopting tech saw their revenue grow 3.5pp more than other small businesses[25].

The EU provides these measures for medium and large businesses, which allows us to examine which cohort of businesses in Australia are driving the differences shown in Figure 13. These disaggregated measures show that medium-sized Australian businesses are relatively mature in their technology adoption compared to their EU counterparts. Large businesses in Australia are more concentrated in the middle of these ratings, with fewer baseline businesses but also fewer businesses rated as 'advanced' in their use of technology. While the EU doesn't provide a comparable series to Australia's small business measure for this index, we can make some conclusions about what's driving our overall performance on this index through a process of elimination.

Figure 13
R&D spend, by sector
Share of businesses, by rating, 2021-22 (Australia) or 2023 (EU)



Source: ABS; Eurostat

24 Parliament of Australia (2023-24) Public sector: Staffing, capability, ICT and operations
25 Office of Innovation & Science Australia and AlphaBeta (2020) Australian Business Investment in Innovation: levels, trends and drivers

Improving Australian businesses' adoption of technology will require addressing the needs of distinct cohorts:

- The small business cohort can lift their adoption of technology with at least 12 per cent of these businesses (equivalent to 11 per cent of all employing businesses) moving from the Baseline to Developing category. This would mean Australia would have the same share of businesses at the Baseline level as the EU. This shift could contribute an additional 0.19 per cent of GDP in tech adoption investment by 2035, as shown in Figure 16.
- The large business cohort can lift their adoption of technology with 7 per cent of these businesses moving from Established to Advanced category. This would enable Australia to match the EU on this measure with a total of 5 per cent of all businesses in this Advanced category. We estimate this uplift could contribute an additional 0.05 per cent of GDP in tech adoption investment by 2035.
- Medium-sized businesses are doing well with their adoption to technology, but more of them (around 17 per cent) from Developing to Established would enable an additional uplift of 0.16 per cent of GDP in tech adoption investment by 2035. This could be achieved by an uplift in technology adoption by existing medium-sized businesses, but it is likely that we will need to take measures that supportive innovative small businesses to scale given Australia's 'missing middle' problem[26].

Enabling these kinds of uplift in tech adoption for small, medium and large businesses across the economy could collectively add 0.4 per cent of GDP in tech adoption spending. This would put us on track to reaching the medium tech adoption outlined in Figure 4.

A recent survey from Ai Group suggests that many Australian businesses are already seeking to improve their technology adoption. 84 per cent of business surveyed reported that they were actively adopting new technology in their operations. This result was particularly strong among large businesses with 100 per cent reporting new adoption underway, but also strong among medium-sized business (82 per cent) and small (63 per cent)[27]. These results are promising and suggest good awareness among businesses of all sizes about the benefits of technology adoption.

26 IISA (2023) Barriers to collaboration and commercialisation

27 Ai Group (2024) Technology Adoption in Australian Industry

Figure 14
Medium businesses, Digital Intensity Index
Share of businesses employing 20 - 199 people*, by rating, 2021-22 (Australia) or 2023 (EU)

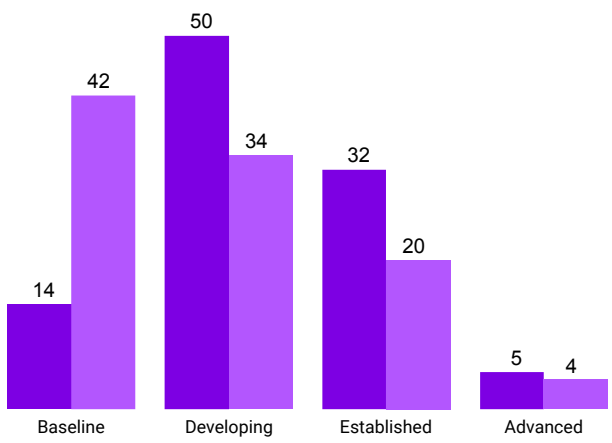
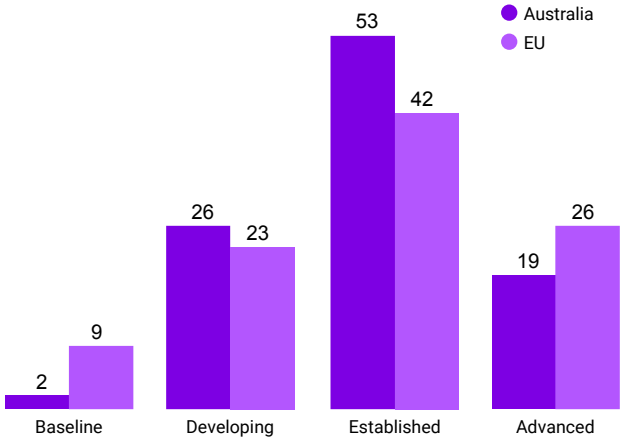
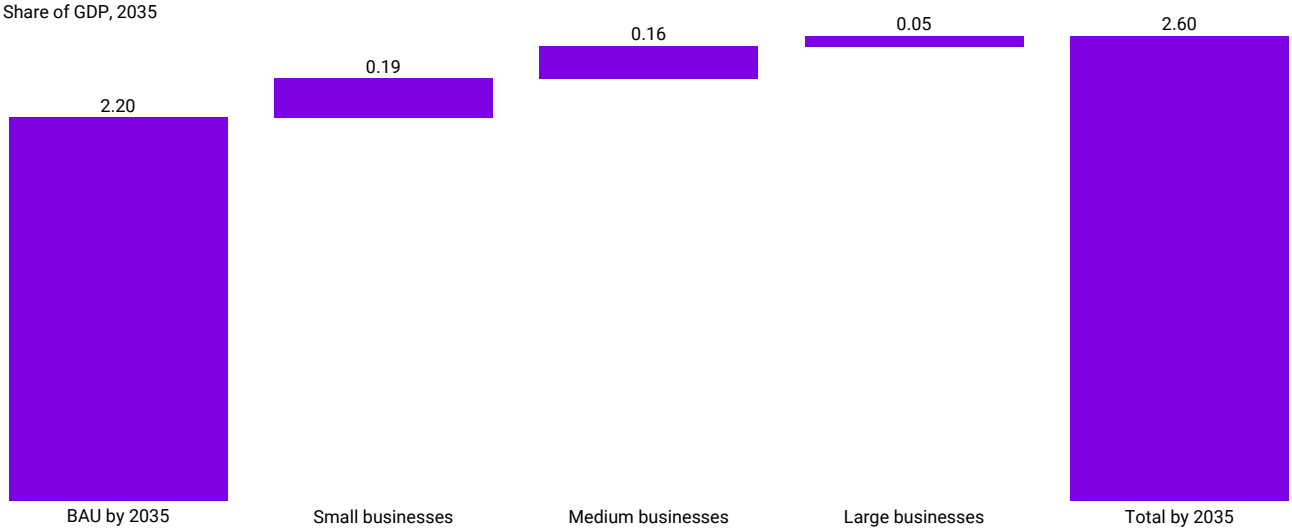


Figure 15
Large businesses, Digital Intensity Index
Share of businesses employing more than 200 people*, 2021-22 (Australia) or 2023 (EU)



Note: *The EU series includes those businesses employing more than 249 people. **The EU series includes those businesses employing 10-249 people.
Source: ABS; Eurostat

Figure 16
Pathways to increasing tech adoption investment
Share of GDP, 2035



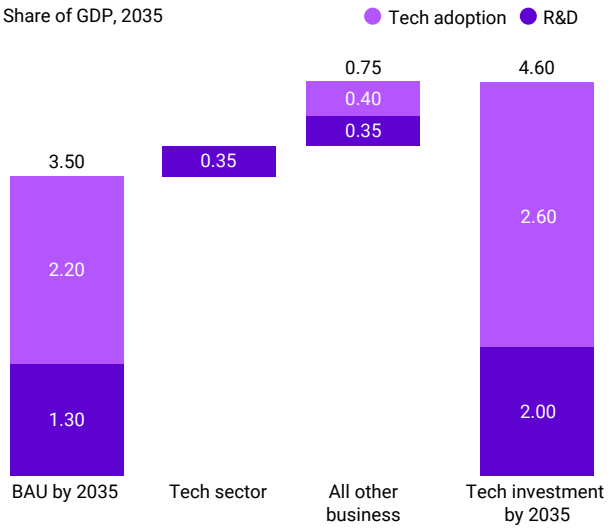
Source: ABS

3. Recommendations

Meaningfully lifting tech investment will require an uplift in R&D and tech adoption by businesses in the tech sector and across the economy. To realise this change, we need business and government to work together and address barriers. In this section, we provide recommendations to support work towards addressing these barriers.

Lifting tech investment in Australia will require businesses to make some significant changes. The trend in R&D investment needs to be turned around and tech adoption requires a boost from businesses of all sizes. The tech sector is expected to play a significant role as it continues to grow and reshape Australia's industrial structure. Tech could contribute 0.35 per cent of GDP in R&D by 2035 – half of what's required to reach 2 per cent of GDP by that time, as shown in Figure 17. Uplifting R&D activity and tech adoption across the rest of the economy is a significant component of the overall change, contributing 0.75 per cent of GDP in uplift towards a combined target of 4.6 per cent in tech investment by 2035. While Government does not explicitly appear in this chart, it will have an important role to play as policymaker, technology adopter and as a strategic investor.

Figure 17
R&D spend, by sector
Share of GDP, 2035



Source: Treasury, ABS

Directions for change

In this report we've focused on outlining which actors in the economy can contribute to lifting tech investment. Through understanding which actors are critical to change, we can identify the barriers they face to realising higher tech investment and prioritise action to address these barriers. This leads us to highlight five areas for potential action. These recommendations are provided as an initial overview of changes to consider.

There are already important policy measures from Federal and State Governments that support R&D and tech adoption activity across the economy. These include measures like the R&D Tax Incentive and the Industry Growth Program [28], which is particularly important to the startup ecosystem, the establishment of the National Reconstruction Fund which could be instrumental in enabling growth in scaleups. The Strategic Examination of the R&D system will be an important complement to better understanding the barriers to greater R&D in greater depth.

These recommendations build on existing work and are primarily focused on changes to support structural change across the Australian economy. This involves greater growth of the tech sector, an uplift in digitisation across traditional industries and stronger collaboration between tech and traditional industries.

1 **Ensure tech investment policies are fit-for-purpose** – there are several policy levers that can significantly shape the tech investment activity across both R&D and tech adoption. We need to ensure that our tax settings incentivise the activity we need to grow. This could include measures to:

   a Clarify the scope of R&D Tax Incentive (RDTI) – to provide greater certainty and streamline administration for businesses by better reflecting modern forms of R&D and bringing Australia's approach in line with other markets. Software and data science R&D is now the primary form of R&D in Australia and globally, however, Australia's definition of R&D has been largely unchanged since the 1980s. Updating Australia's R&D Tax Incentive policy settings to better recognise software development will boost more Australia-based innovation and help businesses lift R&D activity.

28 Previous iterations of this program were called 'Accelerating Commercialisation' and the 'Entrepreneurs' Programme'

b Adjust broad-based tax settings – we suggest the government consider how structural incentives in our tax system can shape investment flows. At present, depreciation schedules still provide greater incentive to invest in physical capital over intangibles – currently there is twice the incentive to invest in forklifts over software[29]. Updating these policy settings is part of ensuring that all policy measures are setting the same incentives for businesses across the economy.

c Consider direct incentive measures to provide a short-term boost to tech adoption initiatives, including skilling opportunities – adopting technology can make businesses more productive thus profitable, which in turn makes it easier for them to further invest in new technology adoption. Government could help more businesses start this virtuous cycle of tech adoption by providing a short term boost incentivising this activity.

2 **Address barriers to scaling tech companies from Australia** – startups and scaleups are already innovation-intensive businesses and could contribute a useful boost to R&D activity. Addressing barriers they face to scaling from Australia means we can keep more of those businesses and their workforces here as they grow globally. Actions to address these gaps could include:

a Closing the scaleup funding gap – without significant action, we expect there to be a $53bn scaleup funding gap by 2030[30]. Existing initiatives such as the National Reconstruction Fund and ASCA will help close part of this gap, but our research has shown that further work will be required.

Encouraging greater superannuation funding into tech, particularly into later-stage ventures, could help address this issue. Australia's private capital pool is one of the largest in the world, and much progress has been made over the past decade in unlocking scale capital from the superannuation sector.

Australian tech investments already produce outsized returns that present a unique access opportunity for Australian superannuation vehicles, and are well-suited to funds' investment time horizons. Australian VC and PE investments have provided almost double the return of the ASX300 over the last 20 years[31]. Normalising tech scale capital as a superannuation asset class would allow Australians to gain powerful exposure to the outsized returns earned through investing in globally-scalable tech companies, in a manner entirely consistent with the existing sole purpose test and best financial interest duties. Moreover, if the super sector were to invest one per cent of funds under management in this asset class, this alone would address two-thirds of our tech ecosystem's scaleup funding gap forecast for 2030.

While we have seen a small number of super funds invest meaningfully in Australian technology in recent years, there is an important opportunity to address perceived risk that many funds still attach to the asset class. Signalling from government and regulators that funds can invest with confidence in scaling tech companies, in line with their existing legislative obligations, would be meaningful. We also call on government to explore further structural initiatives to de-risk domestic tech investment through the super system, which could involve benchmarking or tax measures.

b Improving operation of Employee Share Ownership Plans (ESOPs) – employee-owned business structures enhance talent retention and attraction, a factor particularly relevant for dynamic tech start-ups facing fierce global competition for skilled professionals. By improving the operation and accessibility of ESOPs means that the economic gains of high-growth businesses can also be distributed more evenly, and entrepreneurs are incentivised to stay in Australia.

3 **Support greater attraction of investment activity from R&D-intensive global companies** – Australia has some of the best tech workers in the world and has historically been a net capital importer. But we haven't been able to fully match our technical potential with the kind of foreign investment that results in greater R&D activity. While time-limited initiatives, such as the Global Business and Talent Attraction Taskforce, have been important steps forward, we should look to other leading digital economies as exemplars in establishing large-scale, long-term investment attraction programs.

29 Tech Council (2023) Shots on Goal
30 Tech Council of Australia (2023) Shots on Goal
31 Tech Council of Australia (2023) Shots on Goal

4 **Examine opportunities for government to invest strategically to provide greater competition** – R&D intensive firms in Australia not only face more challenges attracting investment compared to other markets like the US, but they can also find it difficult to attract early customers who are willing to wear the risk of experimental or innovative technologies. Government can play a larger role as an early customer to provide young, innovative firms with opportunities to demonstrate their capabilities and providing new forms of infrastructure that level the playing field. This could include:

   a Scaling programs like the Business Research and Innovation Initiative – International experience, particularly from the US, shows that large, specialised government procurement programs, such as the US Small Business Innovation and Research program (SBIR), play an important role in addressing this problem. These specialised programs are often created because traditional procurement processes and rules are not well suited to dealing with these circumstances. Australia has a policy gap in this area, having only established limited-scale, pilot-style initiatives, including the Business Research and Innovation Initiative (BRII). A meaningful expansion of the BRII is required for it to contribute to structural change as the SBIR has done in the US. Generally, it is important for government to institute cultural change in respect of procurement risk. The public sector has a unique opportunity to be less risk-averse in procurement than other parts of the economy, and making innovation a clear priority as part of the procurement process will give public sector decision-makers greater confidence in looking beyond the lowest-risk tenderers.

   b Consider establishing R&D centres – bridging the gap between research and commercialisation will require bringing together interested parties, with subsidised infrastructure to foster stronger place-based innovation ecosystems. Models such as the Catapault centres in the UK and Fraunhofer institutes, have been found to work via repeated and extensive reviews by expert panels[32]. We recommend examining this success and considering how these models could be applicable in Australia, including through consolidating existing industry programs across portfolios into cohesive, whole-of-government initiatives.

5 **Examine opportunities to create tech industry-led executive education programs focusing on opportunities to adopt technology and manage technology risk** – Managerial skills have been found to have a significant impact on productivity[33], partly through the role that managers have in facilitating innovation and harnessing the benefits of technologies[34]. Establishing a vendor-agnostic executive education program that provides an opportunity for business leaders from across the economy to learn about technology, the associated opportunities and risks could help address some of the practical barriers to seeing greater tech investment.

32 UK Department for Business, Energy & Industrial Strategy (2021) Catapult Network Review

33 World Management Survey (2024) Management matters in an era of ditruption

34 Productivity Commission (2020) Can Australia be a productivity leader?