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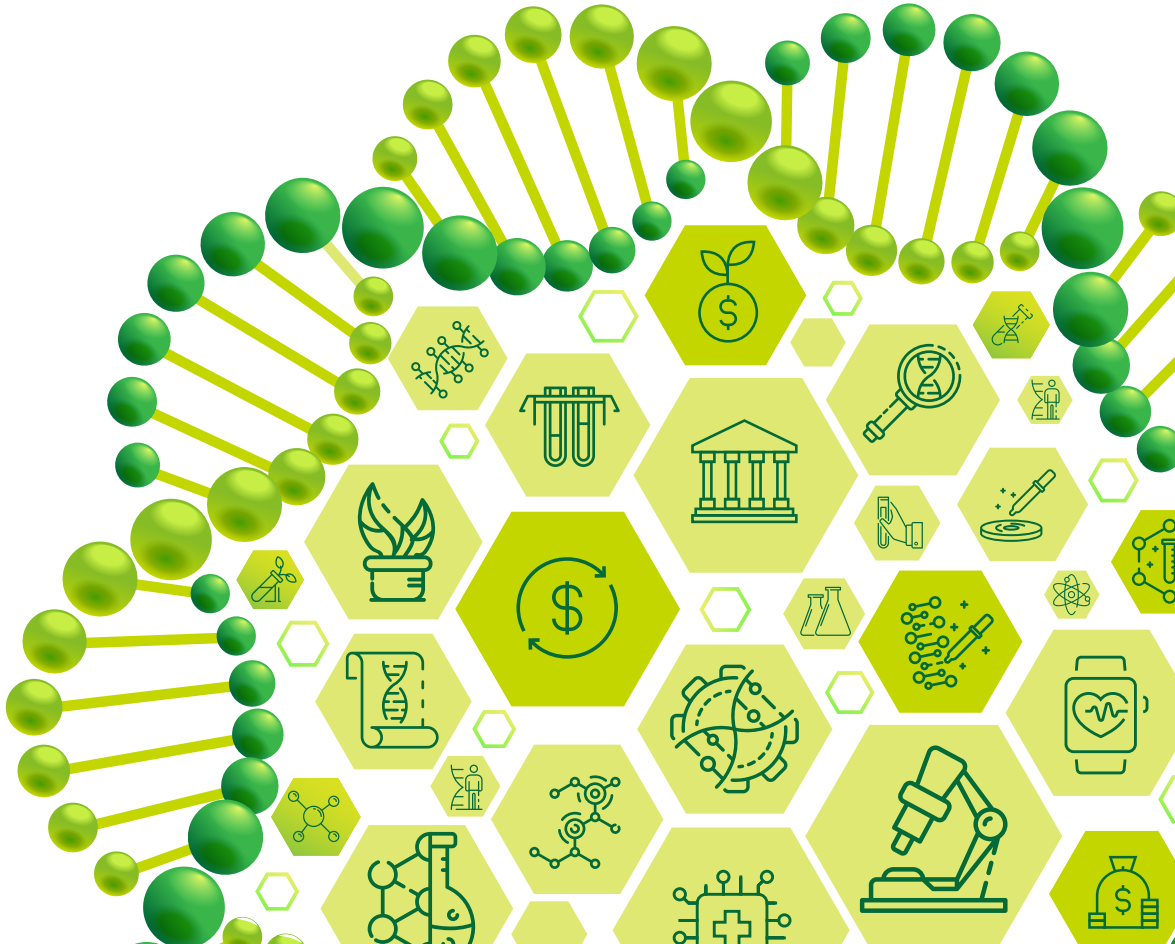
Economic impact of the Research & Development Tax Incentive for the biotech industry

Commissioned by AusBiotech Ltd. | October 2023



Deloitte
Access Economics

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Executive summary

The Australian biotech industry is a dynamic and rapidly growing sector. Biotech includes the use of living organisms, molecular and synthetic biology to produce healthcare products, therapeutics, diagnostics, and devices.[1]

This industry in Australia includes over 1,400 companies and employs over 260,000 people,[2] with 178 companies listed on the ASX representing a market capitalisation of $255 billion.[3] However, most of the sector is made up of small and medium-sized companies, with over 80% of companies within this category, and the majority of these being in the pre-revenue and pre-market stage.[4]

These relatively small companies have high research and development (R&D) intensity – for small companies, the average ratio of R&D expenditure to revenue in 2022 was around 43%, according to data collected by Capital IQ. The biotech industry thrives on its ability to engage in high value R&D activity. Supporting this, the Australian Government has provided various R&D tax incentives through the years, with the transition to the RDTI in 2011 providing more opportunities for smaller companies in the pre-revenue stages to access the incentive and undertake R&D – a favourable change for the biotech industry.

Deloitte Access Economics estimates that between 2011 and 2021, the Research & Development Tax Incentive (RDTI) for the biotech industry increased Australian GDP by an estimated $9.1 billion and supported an extra 3,455 FTE jobs (annual average) across the national economy. The economic impact has grown over time, increasing more than five times over the period 2011-2021, from $308 million in 2011 to more than $1.6 billion in 2021. This reflects a substantial expansion in company numbers and compounding productivity gains, with the growing R&D base of the industry adding to Australia's stock of knowledge.

The Australian biotech sector also serves as a catalyst for attracting both domestic and foreign investment. Over the period 2011 to 2021, the industry attracted an estimated $7 billion in additional investment.

For each dollar of forgone tax revenue, the RDTI has generated an average return of $2.18 for the economy. Similar to the GDP and employment impacts, the return to the economy increases substantially over time, from an estimated $1.32 in 2013 to $3.14 in 2021. This reflects increasing revenues earned by biotech companies over time, increased productivity, new product launches and increased sales. As increases in R&D expenditure spurred by the RDTI are expected to continue, so too will the productivity benefits continue to accumulate. This increased productivity will in turn drive further positive returns in the future from the forgone tax revenue.

However, the benefits of the RDTI for the Australian biotech industry extend beyond those that are quantified in terms of economic outcomes. The RDTI has supported an industry which provides broader social benefits for Australians and the world. The innovations from the biotech industry have supported and improved quality of life for many Australians. The case studies in this report demonstrate that the sector is responsible for innovations developed to combat health issues such as cancer detection, diagnosis and treatment, hearing loss and antibiotic resistance, just to name a few examples. The returns from the RDTI for biotech would be even higher if these social benefits were included.

The RDTI is a strategic government incentive that promotes the dynamism and modernising of the Australian economy through its support of the biotech industry. Although the biotech industry is generating significant benefits to the economy now, it is likely to be of greater importance in the future as Australia faces significant shifts in the years ahead, including slowing productivity growth, an ageing population and rising demand for health care and support services. In this context, the innovations developed by biotech can help to support the development and transformation of industries, while also supporting the health care needs of the population.

Reflecting its potential for growth, the Australian biotechnology ecosystem was estimated to be worth more than $8 billion in annual revenue growth in 2021, with annual growth projected at 3% from 2021 to 2026.[5] Indeed, the Australian biotech sector proves to be a high performing sector, with the potential to sustain and propel the Australian economy in the decades ahead.

$3.14 return for each dollar of forgone tax

For each dollar of forgone tax revenue, the RDTI has generated an average return of $2.18 for the economy between 2011 and 2021. The return to the economy increases substantially over time, from an estimated $1.32 in 2013 to $3.14 in 2021.

01— Introduction

1.1 About AusBiotech

AusBiotech is Australia's biotechnology industry organisation and has been operational since 1985. It represents the interests of over 3,000 members working in life sciences, including therapeutics, medical technology (devices and diagnostics), digital health, food technology and agricultural sectors. AusBiotech has representation in each major Australian state, with the aim to support members and promote the commercialisation of Australian life sciences in national and international marketplaces.

1.2 Purpose of this study

Deloitte Access Economics was engaged by AusBiotech to estimate the economic impact of the RDTI for the biotech industry in Australia. This includes the increase in economic activity enabled from each dollar of foregone tax revenue.

02—
Australia's biotech industry

Australia's dynamic and rapidly growing biotech industry has added nearly 1,000 companies since 2011, and is characterised by relatively small companies with high R&D intensity.

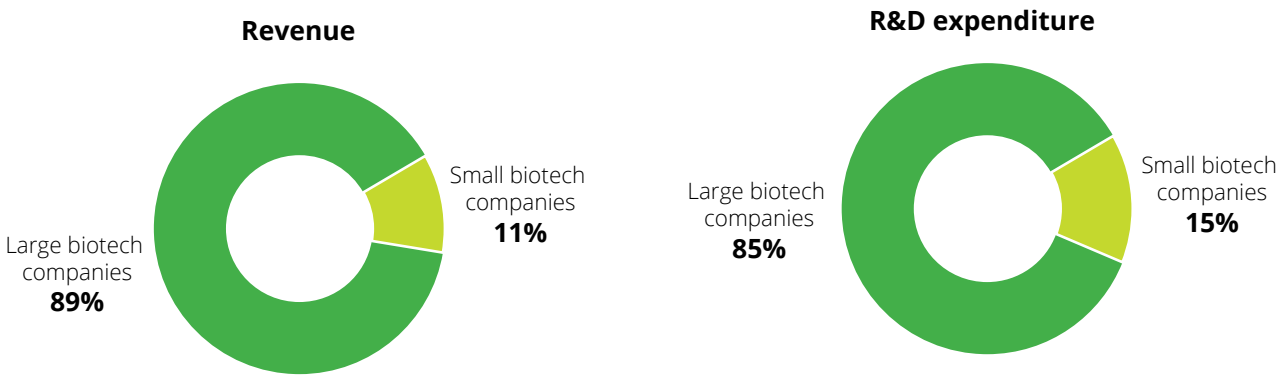
2.1 Australia's emerging and dynamic biotechnology sector

Biotech is a science-driven industry that uses living organisms, molecular and synthetic biology to produce healthcare products, therapeutics or processes, devices, diagnostics, genomics, food tech products and biofuels.[6] The wide range of products developed through biotech can be employed in a varied array of industries. Indeed, biotechnology is an important and emerging industry in health services, but also in rural supply chains, such as agriculture and industrial, and environmental industries.

Reflecting its diverse applications and uses, companies within the biotech industry in Australia can be grouped into three main categories. Of Australia's biotech companies, 577 are recognised as working in medical technology and digital health.[7] This is followed by biotherapeutics (548 companies) and agriculture and food technology (302 companies).

The biotech industry in Australia is characterised as consisting of many smaller companies, with a smaller number of very large companies. According to Capital IQ, around 94% of biotech industry companies had revenues of less than $20 million in 2022, with this industry subset accounting for just 11% of biotech revenue in Australia (see Chart 2.1). Larger companies are estimated to have a substantially greater revenue footprint, despite including only an estimated 70 biotech companies with a revenue of more than $20 million in the industry. The shares of small and large firms in the biotech industry in part reflect the long lead times and limited success rates in developing novel technologies.

Chart 2.1 Share of biotech industry revenue and R&D expenditure across small and large companies



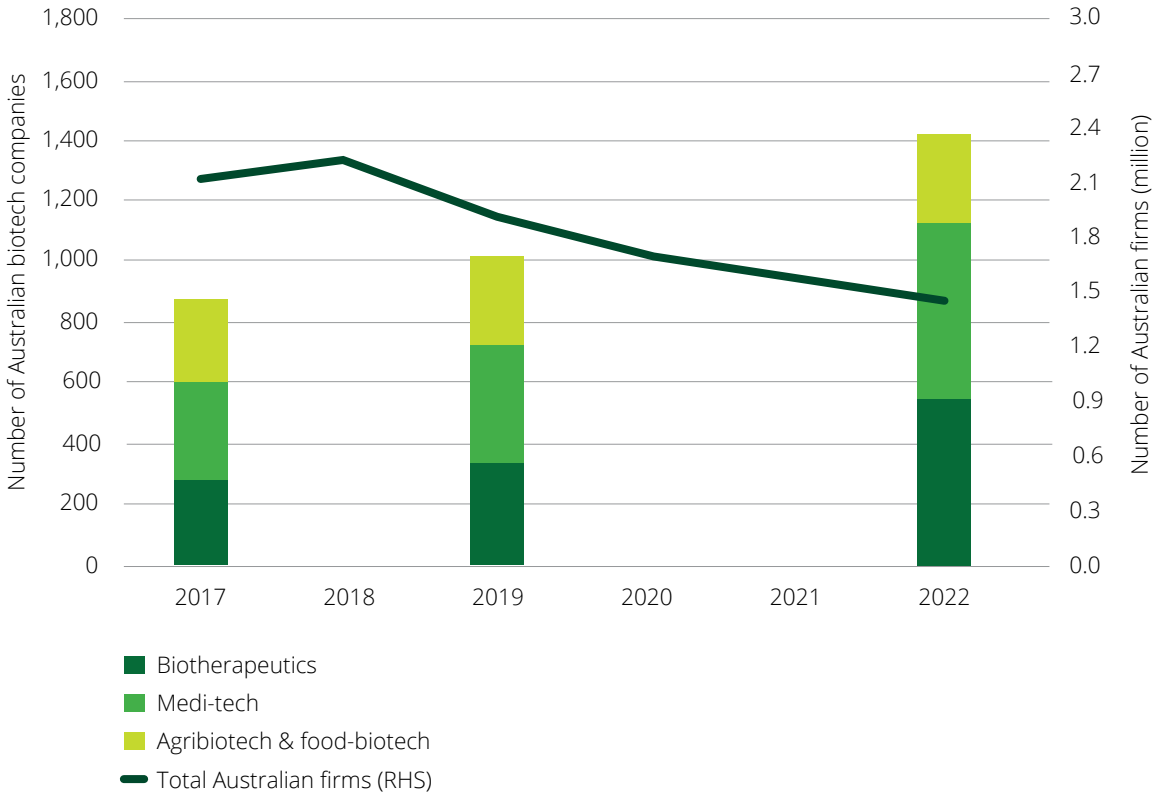
Source: Capital IQ, IBIS World data

2.2 Recent growth

Although characterised by smaller companies, the biotech sector has undergone remarkable growth in recent years. Between 2011 and 2022, the industry added around 1,000 new companies. In contrast, total company numbers in Australia have been highly variable during this period, with two large contractions between 2011 and 2014 (falling 31.6%) and 2018 and 2022 (down 35%).[8] The growing path for Australian biotech company numbers is even more startling in a relative sense, with company numbers expanding by 62.9% (or 12.6% per annum) in the 5 years to 2022 (see Chart 2.2).[9]

Most of the growth in biotech company numbers has come from the biotherapeutics sector. In 2022, the number of biotech companies in biotherapeutics totalled 548, a nearly two-fold increase from 2017. Medical technology and digital health observed a similarly large increase during this period.

Chart 2.2 Company numbers, biotech industry and Australian total, 2011 to 2022



Sources: Deloitte Access Economics adaption[6] of AusBiotech data; ABS.

Note: Biotech company numbers were only published for the years 2017, 2019 and 2022.

2.3 R&D intensity

Research and development (R&D) underpins innovation, a key long-term driving force of economic prosperity and welfare throughout the economy. For the biotechnology industry, innovation is of central importance, with most firms heavily engaged in R&D supporting innovation in biotechnology products, processes and methods. Australia's small biotechnology companies, for example, had an average ratio of R&D expenditure-to-revenue in 2022 of around 43%, according to data collected by Capital IQ.

The R&D intensity of Australia's biotech industry contrasts with that of the rest of the Australian economy. Between 2011-12 and 2021-22 for example, the average R&D expenditure-to-revenue ratio across all industries was an average of 0.45%.[10] Additionally, the average for biotechnology masks even higher indicators of R&D intensity for a portion of the industry. When ranked by the ratio of R&D expenditure-to-revenue, the upper quartile of biotechnology companies had an upper bound R&D intensity ratio of 217%. This substantial figure reflects both the vast amount of money required to develop new products – which, for the biopharmaceuticals sector, can be measured in the billions[11] – as well as the fact that it can often take about 10 years to get a product to market.[12]

Demonstrating their relatively intensive R&D expenditure, small biotech companies account for approximately 17% of the biotech industry's total R&D spending. For larger companies, R&D expenditure is larger in absolute terms, reflective of the scale of those companies. However, relative to revenue, the R&D expenditure of larger biotech companies is much more modest compared to that of smaller biotech companies.

43%

Australia's small biotechnology companies had an average ratio of R&D expenditure-to-revenue in 2022 of around 43%, according to data collected by Capital IQ. This compares with 0.45% across all industries (10-year average)

03—
The role of R&D in supporting innovation

Supporting R&D activity is critical for the success of the biotech sector. The benefits of investment in R&D are not confined to the sector alone, and can support the transformation of other industries.

3.1 Understanding the importance of R&D

Research and development (R&D) is an important driver of innovation in Australia. R&D enables businesses to identify areas of improvement, key areas of growth and to respond by developing innovative products or services. As a result, R&D can lead to the growth and improvement of businesses through improved processes leading to productivity gains, and new products and services that support long term growth of the business.[13]

R&D strategies may vary across different-sized businesses, with some focusing on the improvement of existing products, and some devoting more time and resources towards developing new products or services.[14] These new and improved innovations support businesses to maintain a competitive edge in the markets in which they operate; however, the benefits of investment in R&D are not confined to businesses themselves.

A strong pipeline of R&D supports innovation, and over time this leads to wide-reaching benefits that enhance society's well-being; for example, increased living standards through developments in industries such as healthcare, education, and communication.[15] Beyond the benefits that can be realised in the short term, innovation is important to support Australia to identify and create pathways for future economic and social opportunities. The Australian Government's *Australia 2030: Prosperity through Innovation Plan* emphasises the importance of innovation as a source of productivity and growth to maintain living standards while navigating economic and social shifts, such as an ageing population and the easing of the resources investment boom.[16]

3.2 R&D and innovation in the biotech industry

By its very nature, the biotech industry relies on its ability to innovate new products and processes that positively impact society and offer the potential of a commercial return for businesses. Illustrating this, biotech companies are responsible for 70% of the clinical trials that have taken place globally.[17]

Innovation in the biotech sector has supported improved patient outcomes through higher cure rates for diseases, lower mortality rates, improved effectiveness of medications and improved quality of life.[18,19] For example, Australian biotech breakthroughs include the Gardasil vaccine for HPV and spray-on-skin for burn treatments, all of which are used globally.[20] Innovations within the biotech industry can also have a variety of applications outside of a specific field, which may serve as a platform for future R&D programmes in biotech and other industries. In this way, R&D within biotech can feed into the development and transformation of other industries using medicines, biofuels, or production of other functional products.[21]

Over 80% of the biotech industry in Australia is made up of small and medium companies, with most of these companies being pre-revenue and the pre-market stage.[22] R&D has been a critical component of these companies to date, and will continue to be needed to mobilise these products to market. As the industry grows, continuing to invest in R&D will strengthen Australia's position as an attractive location for biotech companies to conduct research, clinical trials and develop new products that are beneficial for Australians and the world.[23]

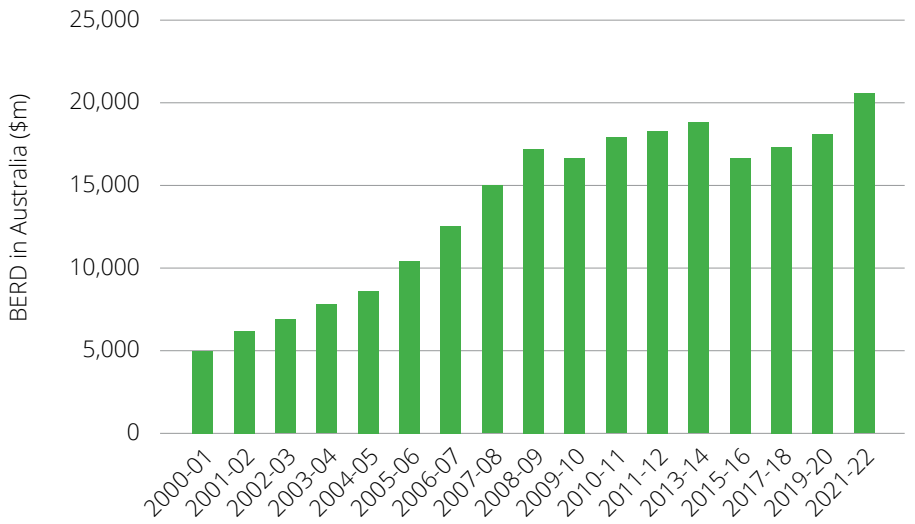
3.3 R&D trends in Australia

Over the years, business expenditure on R&D (BERD) in Australia has increased substantially, with an average annual growth rate of 9.7% in the two decades to 2021-22 compared to a 7.7% growth in GDP over the same period (see Chart 3.1). Despite a reduction in 2015-16, spending has continued to increase in the years thereafter.

The continued R&D investment is essential to support companies' innovation levels. Innovative companies are more likely to increase their market share and employment, which feeds into the national economy and GDP level.[24] This makes increasing business R&D expenditure a strategic government priority. Beyond these economic benefits, governments recognise the importance of R&D in biotech because the outputs can be life saving.

Large companies are likely to still conduct R&D without a tax incentive, but a tax incentive gives companies the opportunity to conduct more R&D or conduct it at a higher intensity. In Australia, the key method to increase R&D spending by businesses is through various forms of tax incentives, including the current RDTI. The Government recognises the need to support business R&D because it leads to spillovers which produce social benefits for society.

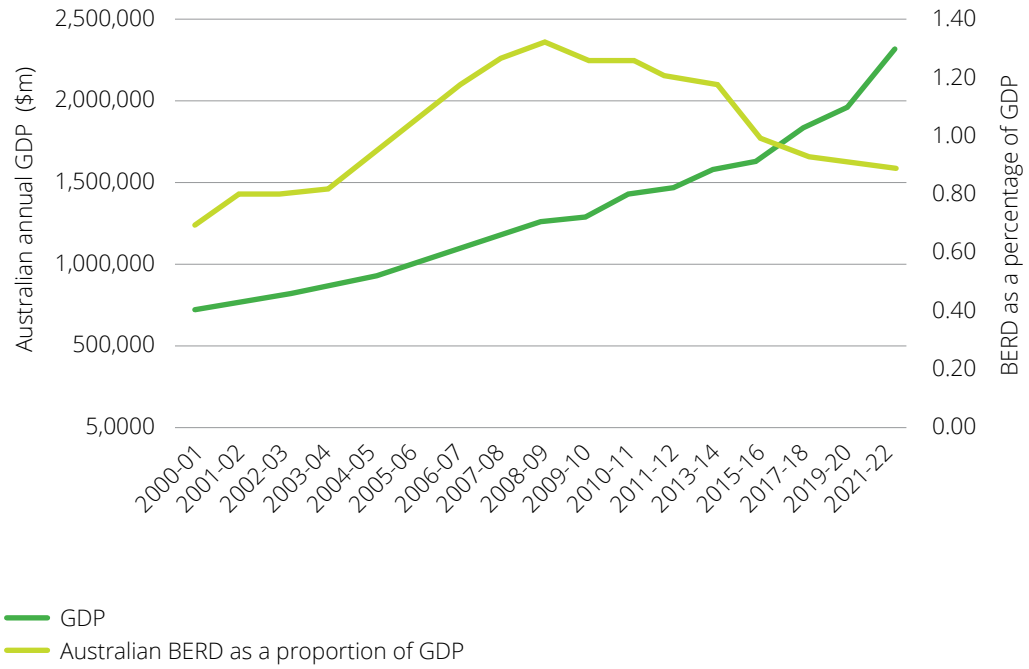
Chart 3.1 Business expenditure on R&D (BERD) in Australia (biennially), 2000-01 to 2021-2022



Source: Australian Bureau of Statistics (2021-22), Research and Experimental Development, Businesses, Australia.
Note: The data presented is from the Survey of R&D, Businesses. Up until 2011-12, the data was reported for every financial year, after which it was reported biennially.

As shown in Chart 3.2, BERD as a proportion of GDP has remained below 1.5% for the last two decades. From 2008-09, BERD as a proportion of GDP has declined further to below 1% in 2021-22. Australia's BERD as a proportion of GDP is below the OECD average; in 2020 Australia's BERD as a percentage of GDP was 0.9%, compared to the OECD average of 1.92%.[25] R&D tax incentives enable governments to offset the costs associated with undertaking R&D activities, with the aim of prompting more businesses to increase their R&D spending.

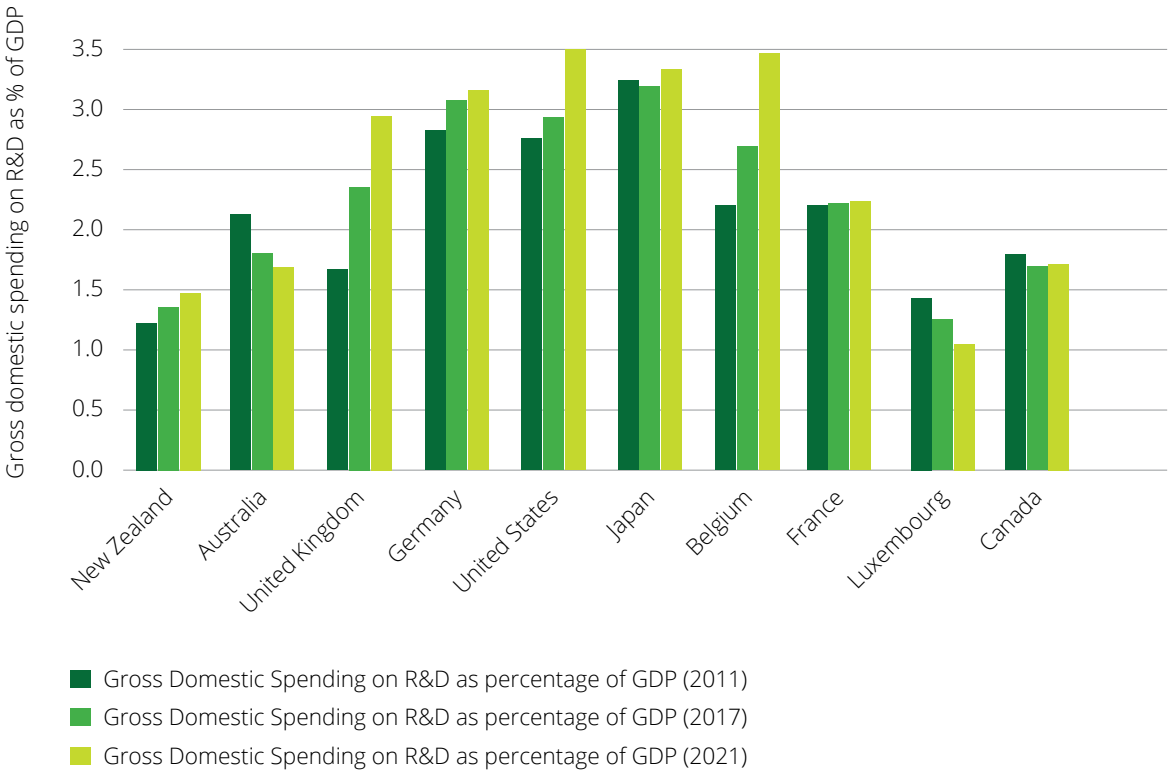
Chart 3.2 Business expenditure on R&D (BERD) as a proportion of GDP



Source: Australian Bureau of Statistics (2021- 2022), Research and Experimental Development, Businesses, and Australian National Accounts: National Income, Expenditure and Product.

In terms of gross domestic expenditure on R&D, in 2021, Australia's expenditure was 1.7% of GDP, compared to an average of 2.7% across the OECD,[26] with many countries increasing their spending on R&D as a proportion of GDP over time (see Chart 3.3). In line with the decline in spend on R&D, Australia has also seen a decline in its Global Innovation Index (GII) score. The score reveals the most innovative economies ranks them according to their performance.[27] Australia's GII score dropped from 53.1 in 2016 to 48.3 in 2021,[28] further demonstrating the importance of R&D activity in increasing innovation across all Australian industries.

Chart 3.3 Gross domestic spending on R&D as a percentage of GDP and GII score, 2011 - 2021

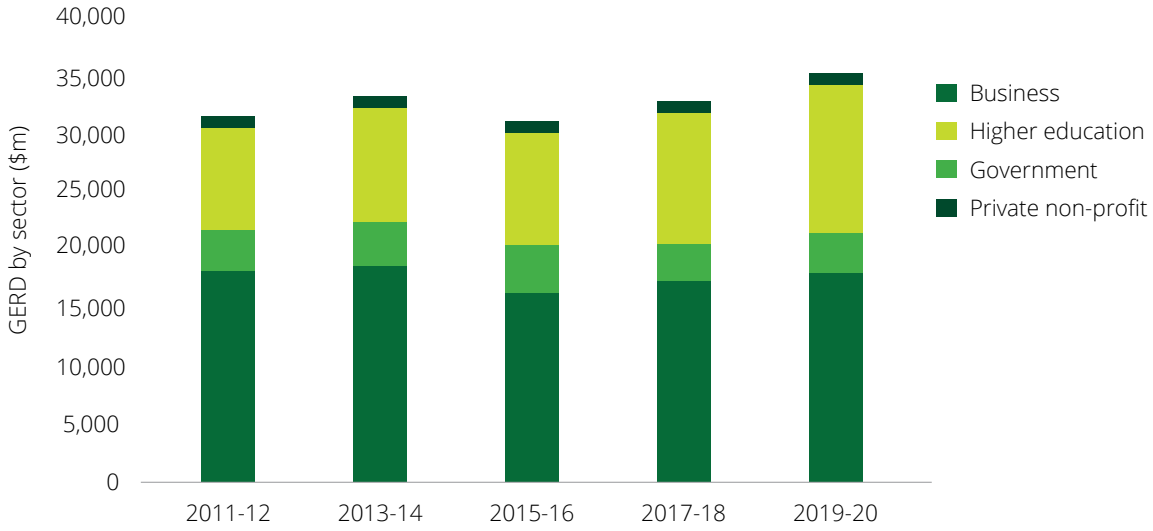


Source: Deloitte Access Economics using data from OECD.[29]

Although R&D is an essential component of many industries, including biotech, bearing all the costs for developing innovative solutions coupled with the uncertainty of success can discourage companies from investing in R&D. As a result, the costs and lengthy timeframes – which, for biotech, may be upwards of 10 to 15 years – to develop new products also play a part in Australian companies' underinvestment in R&D.[30]

As shown in Chart 3.4, businesses are the largest contributor to gross expenditure on R&D in Australia. To ensure that businesses continue spending on R&D, government incentives are crucial in stimulating industry investment in R&D. The main mechanism provided by the Australian Government for this purpose is the Research & Development Tax Incentive (RDTI), which offsets some of the costs and risks associated with R&D activities for Australian companies.

Figure 3.4 Gross expenditure on R&D (GERD) by sector



Source: Australian Bureau of Statistics, Research and Experimental Development, Businesses, Australia 2019-20.

Case study — Telix Pharmaceuticals

Telix's Illuccix product is enabling doctors and clinicians to provide more accurate diagnoses for prostate cancer patients, leading to more informed clinical decision-making. The RDTI has supported Telix to advance from a clinical-stage company to commercialisation with this product.

Telix is a biopharmaceutical company focused on the development and commercialisation of diagnostic and therapeutic ('theranostic') radiopharmaceuticals using targeted radiation.

Many existing cancer therapies are non-selective, impacting healthy tissue and vital organs at the same time as treating disease. Existing external beam radiation therapy (EBRT) approaches are effective but typically only deliver localised treatment and also cause damage to surrounding tissue. Localised therapeutic approaches rely on the treating physician making assumptions about the extent of disease, but missing even small amounts of surviving cells can lead to the cancer or disease recurring over time.

Telix's technology delivers molecularly targeted radiation to cancer cells with precision, regardless of where the cancer is in the body. It is intended that imaging and therapy are used together to 'see and treat'. The theranostic approach is a powerful new way to tackle unmet need in cancer and rare diseases.

One of Telix's lead products is Illuccix (^{68}Ga-PSMA-11), a diagnostic imaging agent for prostate cancer. Illuccix is administered as an injection and contains the radioisotope Gallium-68, which is used to target prostate-specific membrane antigen (PSMA) found on the surface of prostate cancer cells. Illuccix is used in combination with PET imaging and CT. When injected into the body, Illuccix can locate prostate cancer by identifying the PSMA. This method provides more accurate detection and imaging compared with traditional CT or MRI.

The use of PSMA PET/CT is included in several clinical guidelines globally, which over time is expected to increase the adoption of Illuccix. Illuccix has already been approved for use in Australia, USA, and Canada.

Through the improved imaging and diagnosis provided through Illuccix, doctors and clinicians can provide more accurate diagnoses. A prospective study conducted by Telix revealed through a follow-up on approximately 200 patients, that 70% of the patients had their cancer re-staged due to increased imaging accuracy using Illuccix. In addition, through this follow-up, about 60% of patients had their treatment plans changed.

Increased accuracy in prostate cancer identification and diagnosis is important in Australia, as it has one of the highest rates of prostate cancer globally. In the 12 months to September 2022, diagnoses of prostate cancer increased by 34%, making it the most common cancer in Australia.[1]

Beyond Illuccix, Telix has identified areas of future theranostic applications that could address several types of cancers. These include areas such as glioblastoma and renal cancer, where Telix has invested heavily in R&D and clinical activity. During the COVID-19 pandemic, Telix used funds received from the RDTI to re-invest into continuous research and conduct a Phase III global clinical trial for its investigational kidney cancer imaging agent TLX250-CDx. At that time, the RDTI was its main source of revenue.

Based on highly positive results in this study, a biologics license application is currently being finalised for submission to the US FDA, with commercialisation anticipated during 2024. Through the tax incentive, Telix has been able to move from being a clinical-stage company to commercialisation with one product and another two commercial imaging agents on the horizon, with the RDTI pivotal to this success.

[1] PRNewswire, 'First Patient in Australia Dosed with Illucix – Telix's Approved Prostate Cancer Imaging Agent', Australian Associated Press, (28 September 2022), <https://www.aap.com.au/aapreleases/cision20220927ae69111/>

04—
R&D tax incentives in Australia

The transition from the R&D Tax Concession to the RDTI has been favourable for the biotech industry. The RDTI broadened the threshold for companies to access the refundable tax offset, supporting many small companies to continue engaging in R&D.

4.1 R&D Tax Concession

The Australian Government recognises the need for and importance of supporting R&D and innovation in the Australian economy. Over the years, it has implemented tax offsets to encourage companies to conduct R&D activities. In 1985, the initiative was introduced as an R&D Tax Concession, and this was later replaced by the R&D Tax Incentive in 2011. The tax offset has been modified and altered through the years to achieve government objectives (see Figure 4.1).

Upon its introduction in 1985, the R&D Tax Concession enabled companies to claim 150% of the cost of their R&D as an expense against taxable income. In the 1996-97 Budget, the tax concession was reduced to 125%.[31] The tax concession was successful in stimulating additional R&D expenditure; the introduction of the tax concession led to a more than doubling of business expenditure on R&D from approximately $1.5 billion in 1985 to $4.2 billion in 1995-96.[32]

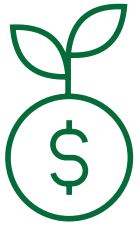
For entities that had claimed the R&D Tax Concession for more than three years, they received a tax deduction rate of 175%. Small eligible companies had the option of receiving cash amounts of the eligible expenditure plus an additional tax deduction and offsetting it against available tax losses.[33]

From 1 July 2011, the R&D Tax Incentive replaced the R&D Tax Concession with the aim of attracting more companies to engage in R&D.[34] The *Venturous Australia: Building Strength in Innovation* report suggests that the R&D Tax Concession had limited benefit for companies until they were in a tax profit, which would exclude a significant proportion of innovative start-up companies with limited funds and in a tax loss for many years.[35] As a result, this limited the benefits that the biotech sector could access, given the level of R&D biotech companies engage in prior to commercialisation. The transition to the R&D Tax Incentive was therefore favourable to the biotech industry, given the large number of small companies that are pre-revenue and engage in R&D.

4.2 R&D Tax Incentive

The R&D Tax Incentive (RDTI) is now the primary tax initiative used by the Australian Government to encourage businesses to undertake R&D activities. The RDTI encourages R&D investment, reducing the costs to businesses by providing a tax offset.

The tax offset is available to entities conducting R&D activities that are above $20,000,[36] and is available for R&D expenditure of up to $150 million each financial year. For annual R&D expenditure above the threshold, entities can obtain the tax offset at the prevailing company tax rate.



From $1.5bn to $4.2bn

The introduction of the tax concession led to a more than doubling of business expenditure on R&D from approximately $1.5 billion in 1985 to $4.2 billion in 1995-96.

The offset rate is determined by the aggregate annual turnover of the R&D entity and is either refundable or non-refundable depending on the entity's turnover. When compared to the R&D Tax Concession, the RDTI expanded the threshold for companies receiving the refundable tax offset from $5 million to $20 million. As shown in Table 4.1, the RDTI is applied across two thresholds.

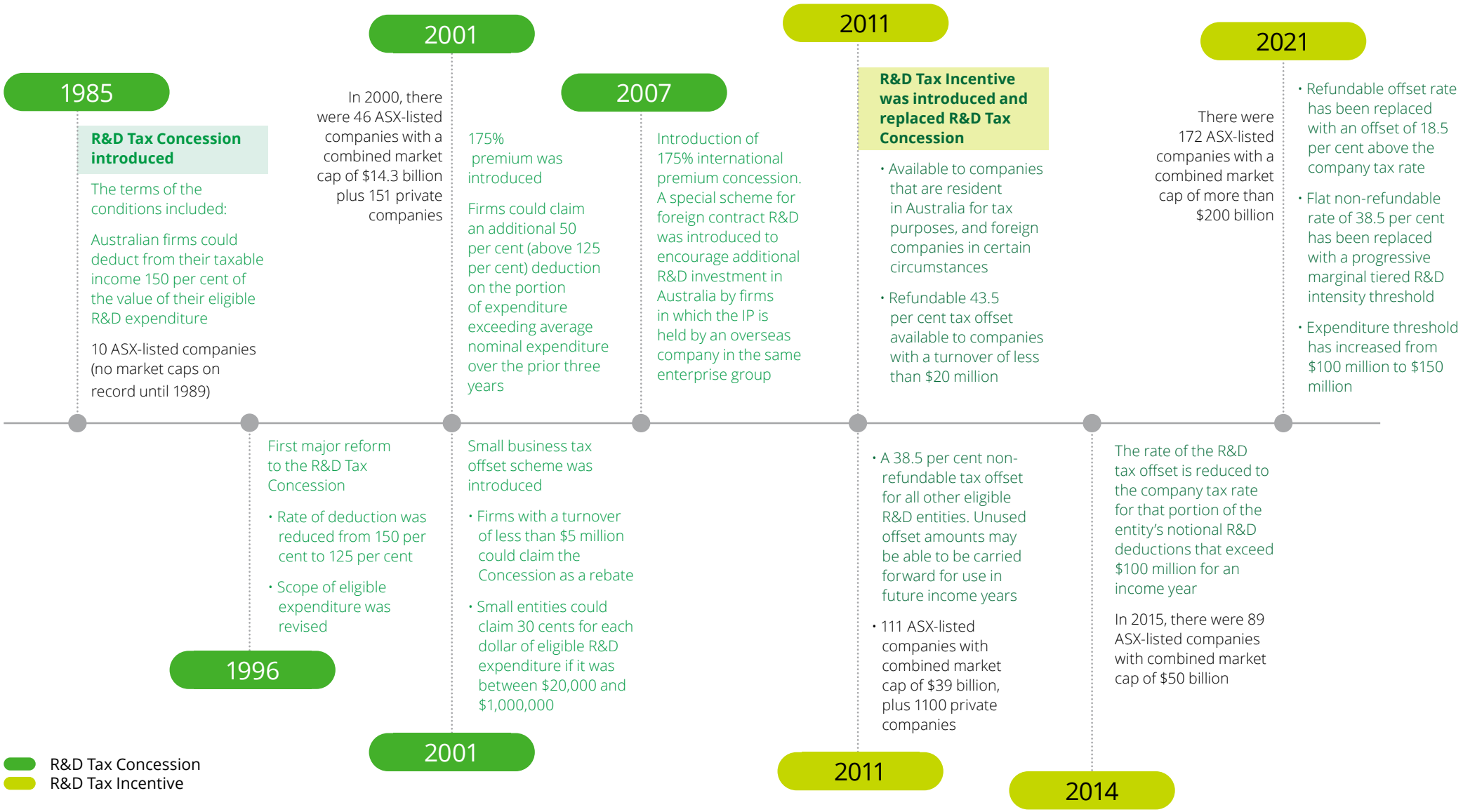
R&D is important to Australia, in the year 2019-20 the RDTI programme recorded over 12,400 registrations and a total R&D expenditure of $12.6 billion.[37] The RDTI programme has helped and continues to help many businesses averaging 3,000 new registrants each financial year. The incentive enables businesses to increase the value of their R&D by engaging in riskier and high-value R&D activity, which is more likely to have longer term impacts and increase industry-wide innovation.[38]

Table 4.1 R&D Tax Incentive rules as of 1 July 2021

R&D TAX INCENTIVE CONDITIONS	
Companies with an aggregated turnover of less than $20 million	A company can receive a refundable R&D tax offset rate equal to its corporate tax rate plus an 18.5% premium, provided it is not controlled by income tax-exempt entities.
Companies with an aggregated turnover of $20 million or more	A company can receive a non-refundable R&D tax offset rate equal to its corporate tax rate plus two-tiered premium determined on the R&D expenditure as a proportion of total expenditure for that income year. The two premium rates are: • 8.5% for R&D expenditure that is up to 2% of total expenditure. • 16.5% for R&D expenditure that is above 2% of total expenditure.

Source: Department of Industry, Science and Resources, 'RDTI tax offset benefits,' AusIndustry R&D Tax Incentive.

Figure 4.1 Australian Government R&D tax measures over the years, 1985-2021



Source: Deloitte Access Economics using AusBiotech data[39] and Centre for Transformative Innovation report.[40]

Case study — Cochclear

Cochlear has continued to advance its implantable hearing solutions over the years to benefit people with various types of hearing loss. Many of these advancements are underpinned by R&D supported by the RDTI.

Cochlear is a global leader in implantable hearing solutions. Cochlear's products fall into three main categories: Cochlear Nucleus System, Cochlear Baha System and Cochlear Osia System. Through these product categories, Cochlear has been able to provide products tailored to meet a variety of hearing needs.

The Cochlear Nucleus system is tailored for people that have moderately-severe to profound sensorineural hearing loss and includes a cochlear implant and an external sound processor. Unlike hearing aids, cochlear implants don't just amplify sounds, they provide electrical stimulation directly to the hearing nerve helping people to hear sound. Both the Baha and Osia Systems use bone conduction to carry sound through vibrations to the inner ear and are intended as a treatment for those with conductive hearing loss, mixed hearing loss and single-sided sensorineural hearing loss.

Cochlear has estimated that in 2022-23, it had helped over 44,000 people to hear using an implant; this is estimated to have provided a net societal benefit of more than $7 billion over the recipient lifetimes from improved health outcomes, educational cost savings and productivity gains.[3]

Claiming R&D tax offsets since 1994, Cochlear's investment in R&D has led to the advancements of its products and development of market-leading technology; it has invested over $2 billion to date in R&D activity, with most of this in Australia. In 2022-23 alone, Cochlear spent more than $240 million on R&D.

Cochlear's R&D focus spans four key areas – improving hearing outcomes, making life easier for customers, integrating its ecosystem of products and services with connected care solutions, and exploring options to expand its portfolio.

Research supported by the R&D tax offsets saw Cochlear launch the first Made for iPhone hearing implant in 2015 with the Baha 5 Sound Processor allowing people to stream music, phone calls and entertainment directly to their sound processor. In 2023, all of Cochlear's latest generation sound processors are equipped with wireless technology and connected to the cloud. This allows Cochlear to offer a suite of digital healthcare solutions providing new ways to deliver convenient, evidence-based care for patients at every stage of their journey, spanning surgical care, self-managed care, in-clinic care and remote care.

Other recent examples include the introduction in 2020 of the Osia system, a transcutaneous bone conduction implant system – which revolutionised Cochlear's bone conduction technology - and Cochlear's new partnership with Google through the Australian Hearing Hub. The partnership will explore new applications of artificial intelligence and machine learning solutions to its hearing technology.

[1] Lupo et al, (2020) 'Comprehensive hearing aid assessment in adults with bilateral severe-profound sensorineural hearing loss who present for Cochlear implant evaluation' 41 PubMed.

[2] National Acoustic Laboratories (2019), 'Longitudinal Outcomes of Children with Hearing Impairment (LOCHI) study, <https://www.outcomes.nal.gov.au/_files/ugd/13b4ea_196c9ae6bc014a4d804281243916eac8.pdf>

[3] Cochlear (2022) FY 22 Annual Report. Cochlear estimates based on the published economic model findings of Neve et al 2021. Dollar amount relates to all recipients implanted with one or more cochlear implants in FY22 across the developed markets.

05—

Economic impact of the R&D Tax Incentive

Between 2011 and 2021, the RDTI increased Australian GDP by $9.1 billion dollars and supported the creation of approximately 3,500 additional FTE jobs (annual average) across all industries in Australia.

5.1 Introduction

The economic impacts of the RDTI are estimated in a CGE (Computable General Equilibrium) framework, using Deloitte's in-house CGE model, which is described in more detail in Appendix 1. The base case of this analysis represents a scenario where the RDTI remains in place. The policy case represents a world where the access of Australia's biotech industry to the RDTI is removed in 2011, with the modelling horizon covering the period 2011 to 2021.

The removal of the RDTI as stylised in the policy case is represented by two direct effects as follows:

- Activity for the biotech industry is assumed to be lower than it otherwise would be
- Australia's productivity growth is reduced because less R&D is delivered.

The reduction in biotech industry activity is assumed to occur principally through the exit of smaller companies. As outlined in section 2.3, the smaller companies of Australia's biotech industry are typically very R&D intensive, and so the RDTI is a material incentive that supports their ongoing operations. It is assumed that 61% of small biotech companies exit the industry in the absence of the RDTI. This assumption is based on a survey of industry participants which indicated their company would face survival risks were the RDTI to be removed.[41]

Alongside industry activity, the assumed change in biotech company numbers also affects the amount of R&D undertaken in Australia. This affects the stock of knowledge and ultimately Australia's productivity growth.[42] The timing of productivity impacts mirror that of the industry activity impacts described above, with an additional two-year lag assumed to account for time delays in knowledge diffusing throughout the economy as productivity gains.

5.2 Economic impact of the RDTI

The biotech sector's use of the RDTI provides significant economic impacts for the Australian economy. The estimated impacts on GDP reflect the net economic impact of the use of the RDTI by the biotech sector on the Australian economy, and incorporate crowding-out impacts that occur due to the reallocation of productive inputs (such as labour and capital) across sectors to support economic activity in the biotech sector. A summary of the impacts is outlined in Table 5.1.

Table 5.1 Summary economic impacts of the biotech sector, 2011-2021

IMPACT	UNITS	TOTAL DEVIATION	AVERAGE ANNUAL DEVIATION	IN 2021
GDP	$ million	9,100	917	1,666
Employment	FTE jobs	-	3,455	5,524

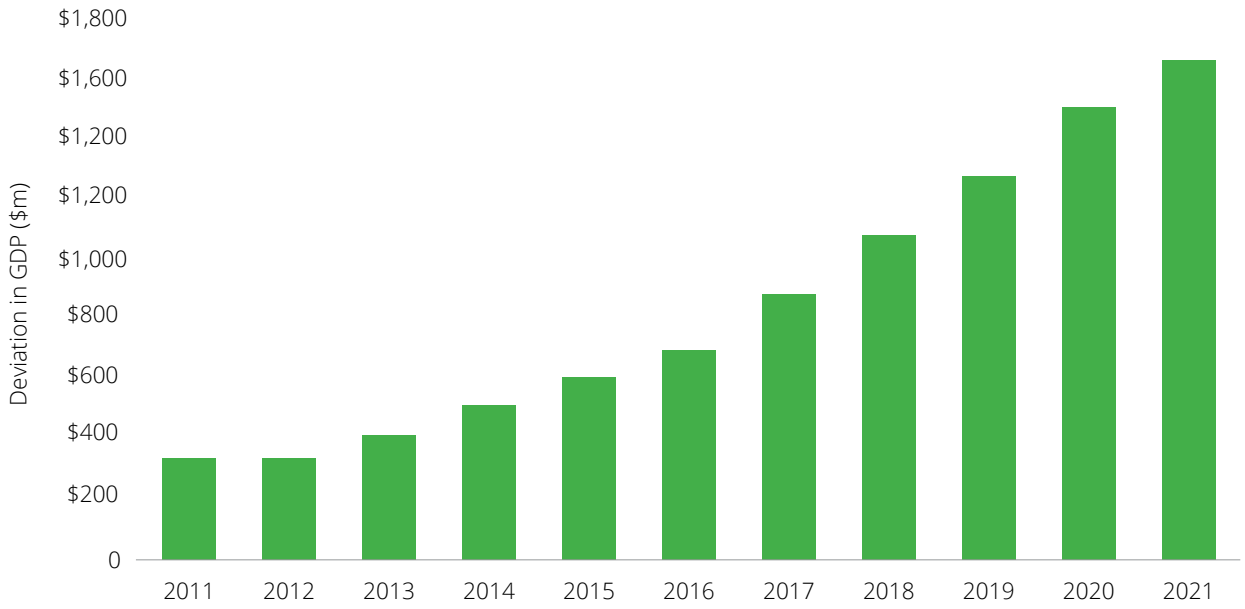
Source: Deloitte Access Economics.

5.2.1 Impact to economic activity

Between 2011 and 2021, it is estimated that Australian Gross Domestic Product (GDP) is $9.1 billion higher (relative to the base case) as a result of the use of the RDTI by the biotech sector. This increase in GDP equates to $917 million (2022 dollars) of average GDP per annum. The per annum additional GDP generated by the biotech sector has increased more than five times over the period 2011-2021, from $308 million in 2011 to more than $1.6 billion in 2021 (see Chart 5.1).

The increase in impacts over time mainly reflects the substantial expansion in company numbers for the biotech sector, where a growing industry footprint adds directly to value-added and supports wider economic activity. It also reflects compounding productivity gains, with the growing R&D base of the biotech industry adding to Australia's stock of knowledge every year after 2011 and increasingly adding to productivity growth in subsequent years (after a two-year lag).

Chart 5.1 Deviation in Australian GDP (2011-2021)



Source: Deloitte Access Economics.

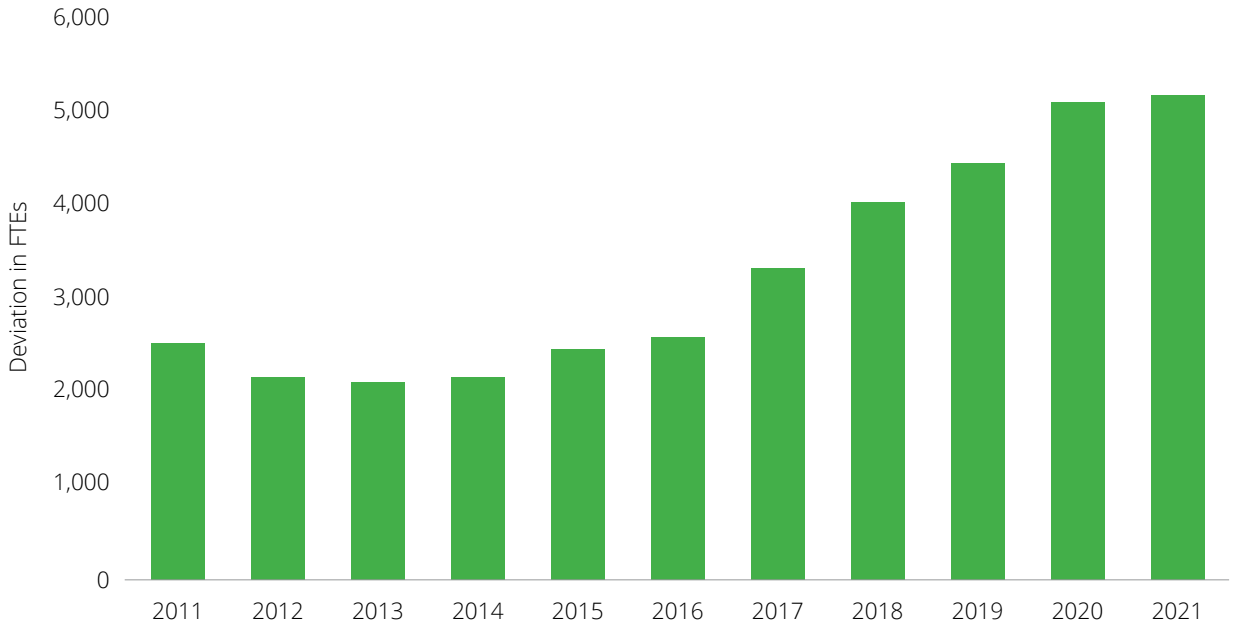
5.2.2 Impact to employment

Alongside the impact to economic activity, the RDTI has a material effect on Australian employment. The modelling estimates the additional jobs added to the economy because of economic growth, which is different to the number of people directly employed in the sector.

On average between 2011 and 2021, higher economic growth supported the creation of approximately 3,455 Full-time Equivalent (FTE) additional jobs across the Australian economy. As with economic activity, an expanding biotech sector and rising productivity gains mean that employment impacts grow over time with the number of additional FTE jobs in 2021 (5,524 FTE jobs) larger than the average for the 2011-2021 period.

The employment estimates indicate that the net additional employment generated by the RDTI via the biotech sector experienced a modest decline during the initial years of 2011 to 2013 (see Chart 5.2). This can be attributed to a decline in company activity in the Capital IQ data, which is likely due to the tight capital markets at the time.[43] The biotech industry was not alone in this, with the number of companies declining in almost all industries in Australia in 2013.[44]

Chart 5.2 Deviation in employment (FTEs) in Australia (2011-2021)



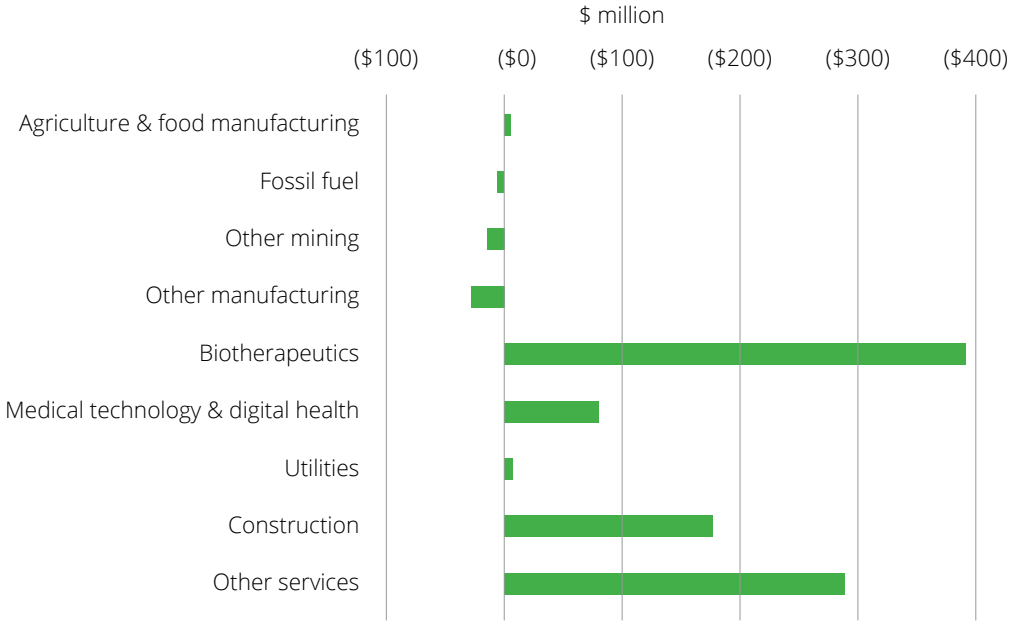
Source: Deloitte Access Economics.

5.2.3 Impact to Australian industries

The aggregate economic impact of the biotech sector's use of the RDTI is comprised of differing effects across Australia's industries (see Chart 5.3). The output effect of the RDTI is introduced as 'shocks' to three sectors relevant to biotech, namely agriculture and food manufacturing, medical technology and digital health and biotherapeutics.

In addition to growth in the biotech sector, the sector's use of the RDTI is expected to support positive economic spill-overs, supporting economic growth in other industries. The associated positive-spill overs are primarily concentrated in non-biotech service sectors (with an additional annual average gross value added of $292 million) and construction sector (additional annual average gross value added of $179 million). These positive impacts reflect the increased demand for investment, relative to the base case.

Chart 5.3 Average deviation in industry value added (2011-2021)



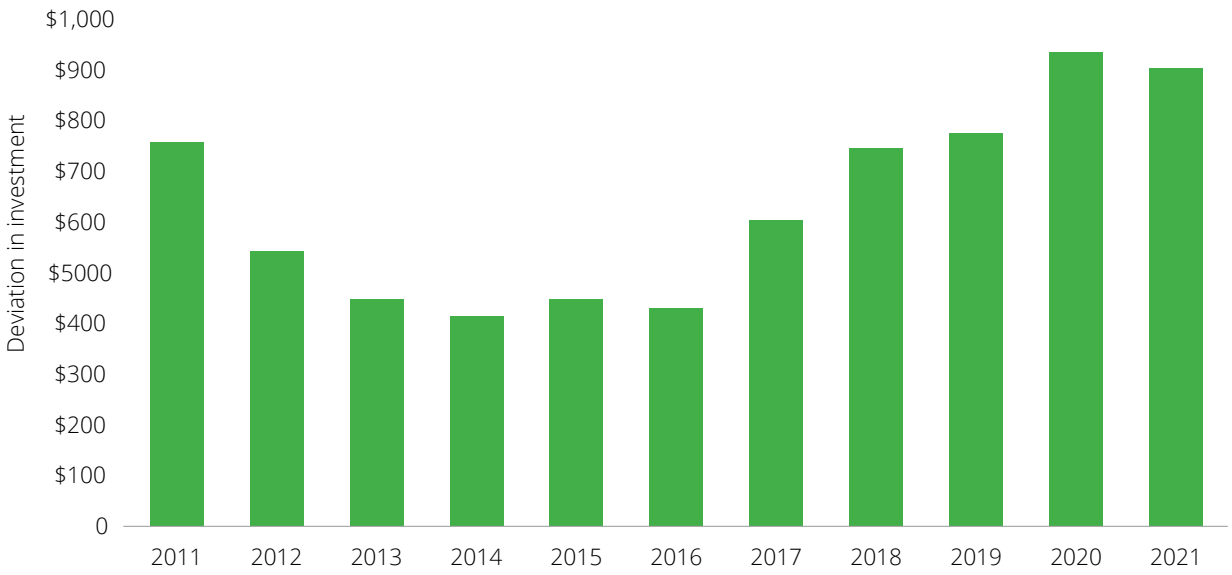
Source: Deloitte Access Economics.

While most industries gain alongside the biotech sector, some industries see lower value added than they would in the base case (where the RDTI is not removed). These industries are 'crowded out' and include the relatively capital-intensive manufacturing, fossil fuels and other mining. The estimated crowding-out impacts largely reflect the reallocation of productive inputs (particularly capital) towards the biotech sector, but are relatively limited in the context of wider industry impacts. This is because the productivity gains associated with the RDTI-supported R&D increase the economy's ability to increase output while facing limited resources.

5.3 Investment impact

The CGE estimates suggest that Australia's biotech sector serves as a substantial catalyst for attracting both domestic and foreign investments, with around $7 billion additional investment in the period 2011 to 2021 (see Chart 5.4). This equates to an annual average additional investment of $634 million. When the RDTI was introduced in 2011, it led to a significant investment increase, which resulted in crowding out of further investment until 2013. Additional investment due to RDTI intervention shows an increasing trend from 2014 onwards, with around $892 million in 2021.

Chart 5.4 Deviation in investment (2011-2021)



Source: Deloitte Access Economics.

Case study — SpeeDx

SpeeDx provides diagnostics tests that inform clinicians about not only what infection a patient has, but also which antibiotics the infection is resistant to. This enables more effective use of antibiotics. The RDTI has supported the company to undertake the R&D needed to develop and commercialise its products.

SpeeDx is a medical diagnostics company that develops and commercialises clinical tests centred around its innovative DNA and RNA analytical technologies. SpeeDx focus on multiplex diagnostics for conditions including cancers, sexually transmitted infections (STIs), respiratory viruses, also developing accessories, controls, and research reagents. Using multiplexed tests, SpeeDx can detect multiple targets in a single test, and have applied this approach to growing concerns about antibiotic resistance in infectious disease organisms.

SpeeDx specialises in combatting antimicrobial resistance. With increased use of antibiotics, medications may over time lose their effectiveness to treat bacterial infections. SpeeDx develops innovative assays that simultaneously detect bacterial infection and genetic markers for antibiotic resistance in a single diagnostic test, providing valuable additional information to clinicians on the resistance status of patients' infections.

Since its inception, SpeeDx continues to address two major problems: antibiotic resistance and cancer. SpeeDx has distributed over 45 types of diagnostic tests in 19 countries for various infectious diseases such as STIs, respiratory infections, and fungal skin infections.[1]

R&D has been a critical component to develop the products that SpeeDx offers. Over the years, SpeeDx has received over $20 million through government tax initiatives, which has supported the company to conduct the necessary R&D to develop and commercialise its products.

The ***Resistance****Plus*® MG assay was the first test commercialised by SpeeDx that addresses antibiotic resistance. It was developed to simultaneously detect Mycoplasma genitalium (MG) and a number of genetic markers for macrolide antibiotic resistance (e.g. azithromycin). One study reported cure rates of between 92% and 95% for relevant resistant infections through the use of the SpeeDx ***Resistance****Plus*® MG test.[2] This pivotal study and

others, have also led to the introduction of new international guidelines in Australia, USA, UK and Europe that recommend antibiotic resistance testing.[3-6] The use of tests that incorporate antibiotic resistance status informs clinicians about what infection a patient has and which antibiotics the infection is resistant to. Improving the use of effective antibiotics can also help minimise the spread of resistant infections in the community.

Through its innovations, SpeeDx aims to create tools that inform and empower clinicians with respect to their patients, save costs for the health service and save the effectiveness of antibiotics for future generations. Because the tools and technology developed by SpeeDx are transferrable, SpeeDx expects that the same methods can be used to provide resistance-informed solutions for other areas of the body. The company is currently exploring solutions to address enteric infections.

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06—
Measuring return on investment

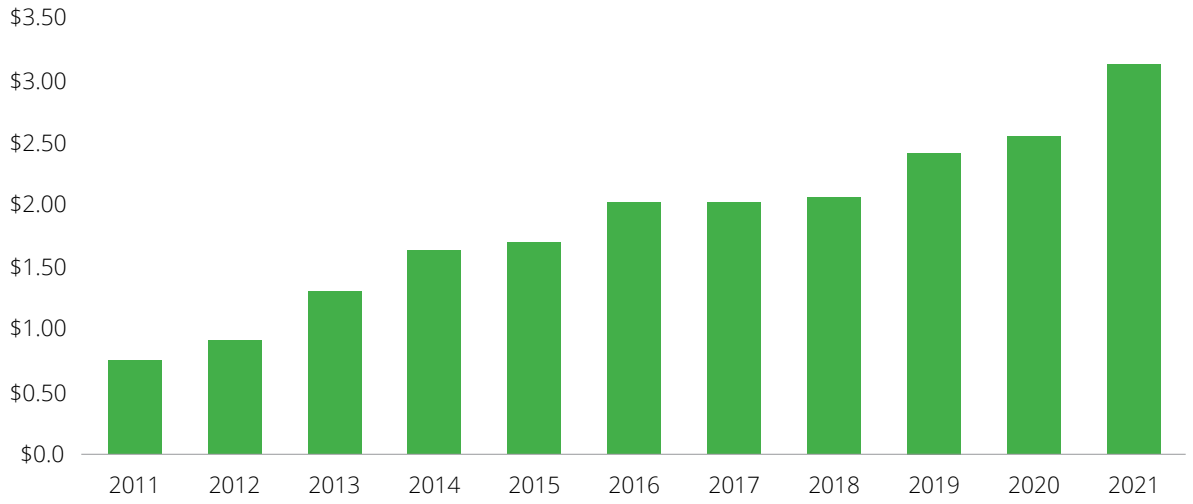
For each dollar of forgone tax revenue over the period 2011-2021, the RDTI generated an average return of $2.18 to the Australian economy.These returns have increased over the years. In 2021, the returns were $3.14 for each dollar of forgone tax revenue.

6.1 Introduction

The estimation of return on investment (ROI) of the RDTI aims to gauge the effectiveness of the RDTI in promoting broader economic growth, in addition to its contribution to secure financial health of biotech companies in Australia. The ROI is estimated as the deviation in GDP between the policy case and base case (see section 5.1) relative to the deviation in RDTI tax.

Relative to the base case, the CGE model estimates the change in GDP due to the change in biotech sector output and change in productivity due to the RDTI investment. Data reflecting the tax forgone due to the RDTI for the biotech sector is not publicly available. To estimate these values, the results from the economic modelling in section 5.1 are used. The model estimates the change in production taxes required to produce the changes in industry activity presented in section 5.1. The forgone tax is then computed as the difference between the (lower) production tax revenue estimated to have been paid in the scenario with higher biotech output induced by the RDTI, and the model estimates of production tax revenue in the scenario without the RDTI.

Chart 6.1 Increase in GDP per dollar of forgone tax revenue (2011-2021)



Source: Deloitte Access Economics.

6.2 Results

As shown in Table 5.1, it is estimated that GDP is approximately $917 million higher each year on average in the period 2011-2021. This results in the government forgoing $420 million per year on average during that period, or $4.6 billion over the entire period. As a result, the biotech sector in Australia is estimated to have generated an increase in Australia's GDP of approximately $2.18 for each dollar of forgone tax revenue over the 2011-2021 period.

As illustrated in Chart 6.1, the RDTI incurs a cost to the Australian Government (with increases in GDP of less than $1 for each dollar of forgone tax revenue) over the initial years from 2011 to 2012. However, positive returns are realised in subsequent years; the return to the economy for each forgone tax dollar has drastically increased from $1.32 in 2013 to $3.14 in 2021. This can be attributed to increasing revenues earned by biotech companies over time, increased productivity, new product launches and increased sales.

As increases in R&D expenditure spurred by the RDTI are expected to continue, so too will the productivity benefits continue to accumulate. This increased productivity will in turn drive further positive returns in the future from the forgone tax revenue.

6.3 Conclusion and implications

The RDTI within the biotech sector has yielded substantial and positive returns, as evidenced by the estimates of the RDTI's economic impact for Australia. The biotech sector in Australia is far from business-as-usual due to its dynamic nature, and is characterised by rapid advancements in relevant technologies, pioneering research and an increasing contribution to the broader economic landscape. This demonstrates the pivotal role of the RDTI for the growing biotech sector in Australia in stimulating growth and innovation, in addition to its role in assuring the financial viability of biotech companies.

The estimated return on RDTI investment of $3.14 within the biotech sector is similar to analysis by CSIRO Futures (2021),[45] which finds that $1 of R&D investment in Australia creates an average of $3.50 in economy-wide impacts, noting that if the broader social benefits of biotech innovations were included, the benefits would be greater still. The estimates presented in the CSIRO Futures (2021) are based on gross expenditure on R&D over the 1984-85 to 2019-20 period. As highlighted in CSIRO Futures (2021), a return to investment ratio greater than 1 indicates that the intervention has economic merit.

07—
Biotech's role in the future economy

Innovations by industries like biotech feed into the development and transformation of other industries, which is essential in a slowing productivity environment.

The biotech sector has played a valuable role in supporting the Australian economy since 1985. This sector has an opportunity to continue growing in importance in the years ahead as a solution to the anticipated problems in the future Australian economy.

Australia is anticipated to face significant shifts in the years ahead, such as an ageing population, rising demand for health care and support services, as well as technological and digital transformation.[46] Similar to other advanced economies, productivity in Australia has slowed over time and is projected to continue slowing in the years ahead. Over the decade to 2020, the average annual labour productivity growth was the slowest in 60 years and dropped to 1.1% per year.[47] Industries like biotech can address this, as the innovations created in this sector are likely to feed into the development and transformation of other industries.

With the ageing population, it is crucial for biotech advancements to accommodate the health needs of the population in the decades ahead. For every successful advancement in medical science, society has the potential to benefit in both the present and in the future. Technological advancements and inventions, such as vaccines and antibiotics, have promoted increases in the quality and length of life over the past century.

In 2019, the global bioeconomy – which consists of all activity in life sciences and biotechnology – accounted for nearly 6% of global GDP.[48] Reducing the cost of developing these applications and products could lead to an even higher contribution to GDP growth in the years ahead. For Australia in particular, the RDTI serves as a mechanism to reduce these costs for businesses, making it more attractive for them to innovate, resulting in applications and products that would help address future challenges. This highlights the need and the importance of continued policy support for business investment in R&D, which supports the sustainability of the future economy.

Illustrating the potential for growth in the Australian biotech sector, in 2021 the Australian biotechnology ecosystem was worth more than $8 billion in annual revenue growth, with annual growth projected at 3% from 2021 to 2026.[49] In 2022, the biotech sector recorded 43% growth and an overall employment increase of 8% since 2019.[50]

The biotech sector is not expected to slow down in the years ahead. Australia's synthetic biology industry could generate $27 billion in revenue and 44,000 jobs by 2040, including servicing the developing Asia-pacific market for synthetic biology products, which is expected to be worth $3.1 billion by 2024.[51] Additionally, Australia has an opportunity to grow its cell and gene industry, which is potentially worth $6 billion in revenue and could create 6,000 new jobs for Australia by 2035.[52] The Australian biotech sector proves to be a high performing sector with the potential to sustain and propel the Australian economy in the decades ahead.

Appendix A | Methodology

A.1 Summary of modelling scenarios

Deloitte Access Economics' CGE model (DAE-RGEM) estimates the economic impact of the RDTI by comparing a policy scenario against a baseline scenario. The baseline refers to a historical 'business as usual' scenario in which the RDTI remains in place.

The RDTI was introduced in 2011. The policy scenario is developed by introducing shocks to mimic an abrupt removal of access to the RDTI for the biotech sector from 2011 onwards, mimicking a scenario in which the RDTI was not introduced. The simulation period covers the years from 2011 to 2021.

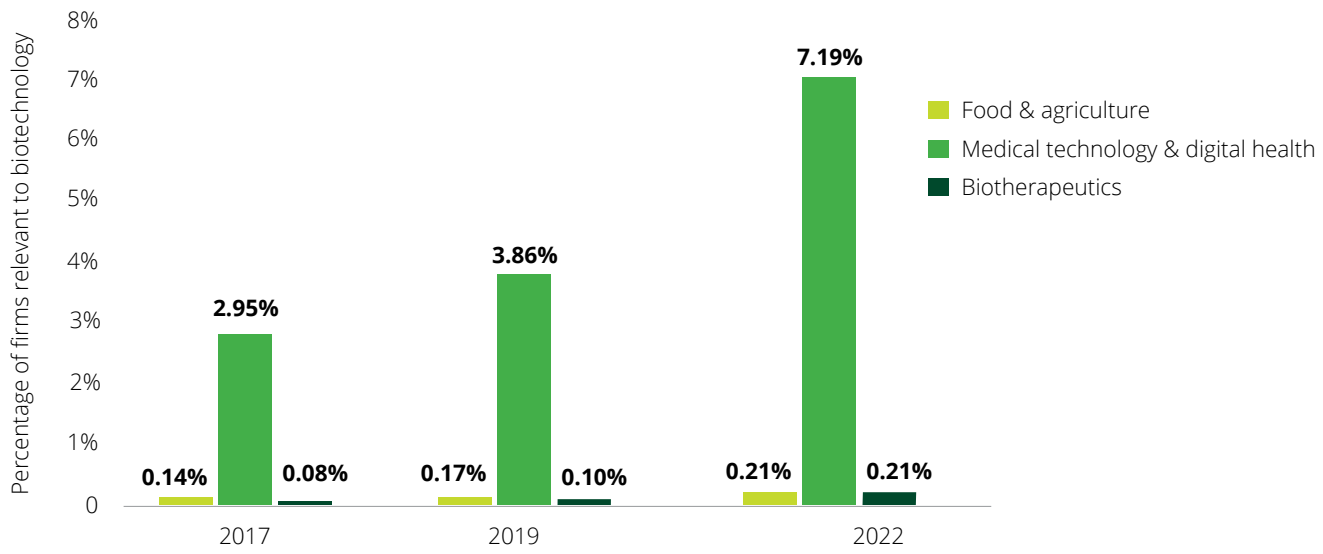
A.2 In-scope industries

The biotech sector comprises components of several sectors. According to the Australian Biotech Sector Snapshot 2022,[53] three main sectors are defined with the following number of companies within each category:

- Agriculture and food technology (302)
- Medical technology and digital health (577)
- Biotherapeutics (548).

As a simple count of companies, biotech has a relatively small footprint in the above sectors. This is demonstrated in Chart A.1, which shows biotech's share of total company numbers in each sector. It also shows that the biotech sector has grown significantly in recent years, with an expanding share of total company numbers between 2017 and 2022.

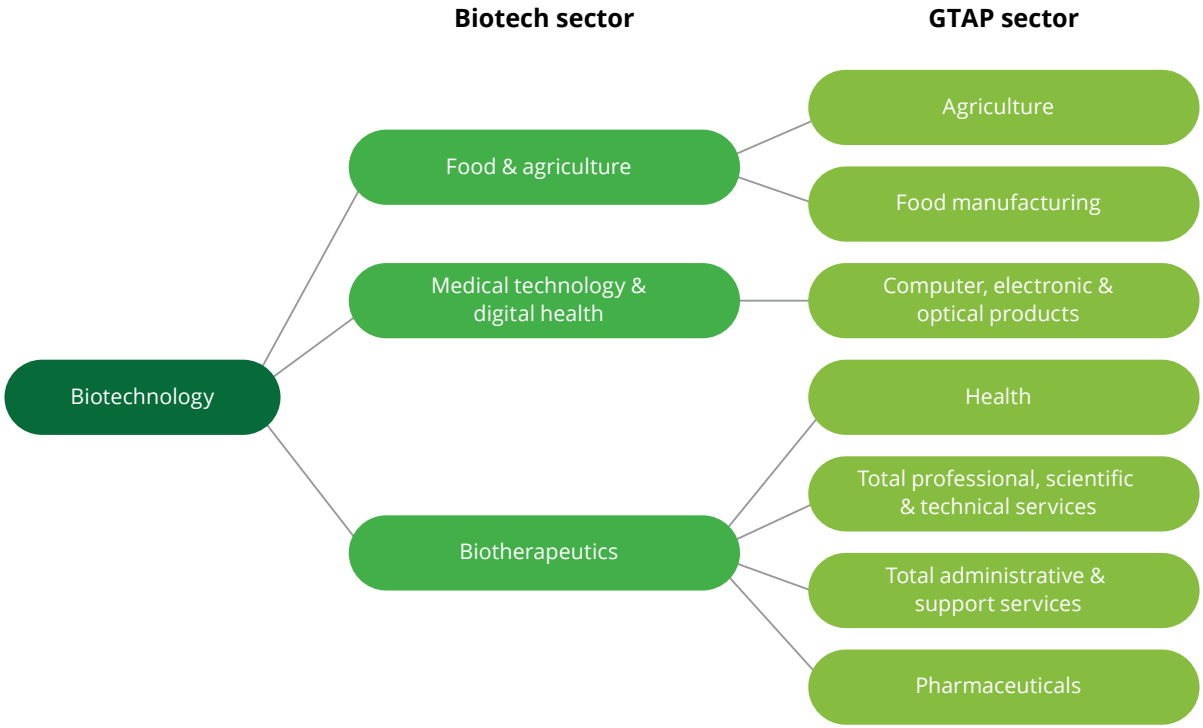
Chart A.1 Biotech company shares in selected sectors



Sources: Australian Biotechnology Sector Snapshot 2019, 2022; ABS, Counts of Australian Businesses.

Deloitte Access Economics' CGE model follows the industry classification adopted by the Global Trade Analysis Project (GTAP), which includes a detailed breakdown of 65 industries. As the model shocks are implemented to individual GTAP industries, the biotech-relevant sectors identified in Figure A.1 are mapped with the relevant industries. The three biotech sectors are aligned with six GTAP industries. The shock values for potential decline in productivity for each GTAP industry are estimated based on the number companies within that industry.

Figure A.1 Industry mapping for CGE modelling



Source: Deloitte Access Economics.

A.3 Data sources

The Capital IQ and IBIS World databases were employed to extract R&D spending and operational expenditure data for Australian biotech companies. A summary of how each database was used to inform the CGE modelling is described below.

A.3.1 Capital IQ

The Capital IQ database is used to gain an understanding on the R&D spending and economic activity in the biotech sector. The database provides annual financial statement data, including R&D expenditure and company revenue. The R&D data in the Capital IQ database includes both expensed and capitalised R&D investment. The Capital IQ data is filtered based on two screening criteria: geographical location for Australia and industry screening for biotech sectors. This allowed the analysis to focus on biotech-related R&D statistics within Australia.

A.3.2 IBIS World database

The IBIS World database was used to obtain R&D and operational expenditure data for Australian biotech companies, which are not covered by the Capital IQ database.

A.4 The policy scenario

The policy scenario is defined as a scenario in which the RDTI was not introduced in 2011. In the absence of the RDTI, it is assumed that the output and investment of biotech companies would be reduced. It is also assumed that the counterfactual is different for small companies (companies with expenses less than $20m) and other, larger companies.

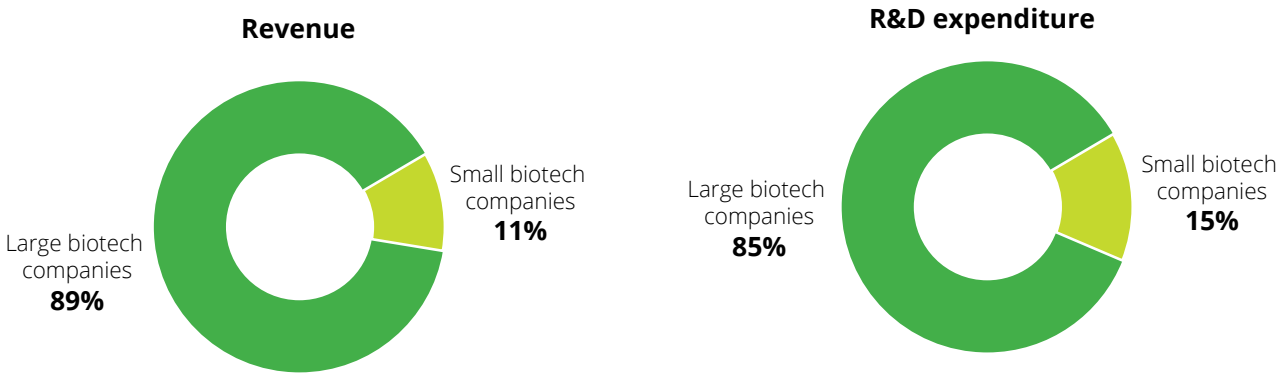
A.4.1 Small biotech companies

The biotech industry can be largely characterised as consisting of a majority of small companies. Small biotech companies are considered to have less than $20 million revenue per annum. Based on the Capital IQ and IBIS World databases, in 2022 around 94% of biotech companies were small companies.[54] Small companies contribute to around 15% of total R&D expenditure in Australia's biotech sector (see Chart A.2).

As the industry is characterised by a relatively significant number of small companies, it is concluded as reasonable that the removal (or absence) of the RDTI would reasonably affect the structure of the biotech industry.

Around 61% of biotech companies have stated that sustainability of their companies would be significantly affected if the RDTI was removed (Survey question: '*what would happen to your R&D expenditure in the absence of the RDTI?*').[55] According to 2022 data, this equates to 870 biotech companies affected by a removal of the RDTI. It is assumed that the R&D expenditure of large biotech companies will be unaffected due to the removal of the RDTI. Thus the removal of the RDTI is estimated to cause around 65% of small biotech companies to exit the industry.

Chart A.2 Share of biotech industry revenue and R&D expenditure across small and large companies



Source: Capital IQ, IBIS World data

A.4.2 Larger biotech companies

The Capital IQ and IBIS World databases indicate that there are 86 biotech companies with a revenue of more than $20 million in 2022. For these companies, R&D expenditure is larger, and the ratio of R&D expenditure to revenue is moderately smaller.

In the policy scenario, it is assumed that for these larger companies, RDTI-eligible R&D expenditure will not be affected. It is also assumed that for these companies, no change to revenue (and therefore output) occurs.[56]

A.5 The policy shocks

The policy scenario is conceptualised in a CGE framework as two distinct shocks. These are as follows:

1. A reduction in output for the biotech industries, which mimics lower revenue and operating footprint. For larger companies, it is assumed that the reduction in output is compensated for by an increase in business services.
2. A reduction in productivity, which mimics reduced R&D expenditure and lowers the productive stock of knowledge.[57]

The shocks are summarised in the sections below.

A.5.1 Change in revenue

The change in output is informed solely by the absence of small biotech companies. The total loss in revenue in 2022 is estimated at $461 million. The sector breakdown is presented in Table A.1.

Table A.1 Output shock values

BIOTECH SECTOR	ESTIMATED REVENUE LOSS ($M)
Agriculture & food technology	-3
Medical technology & digital health	-158
Biotherapeutics	-300
Total	**-461**

A.5.2 Change in business services imports

According to survey results reported by AusBiotech,[58] R&D is expected to fall by 29% in response to a removal of the RDTI. This analysis assumes that this reflects locally conducted R&D, but that large companies will compensate by undertaking R&D offshore. In the analysis, the amount of R&D undertaken locally is reduced by the same amount as the amount of imported R&D services is increased.

A.5.3 Change in R&D expenditure (and productivity)

The change in productivity is informed by lower R&D expenditure of small companies. A survey finds that it takes six years on average to complete the initial R&D and get biotech products to market globally with the RDTI in place.[59] The estimated reduction in R&D reflects this lead time.

For the absent smaller companies, the total forgone R&D expenditure is estimated at $122 million in 2022. Following the approach detailed by Shanks and Zheng (2006), this expenditure contributes to a larger knowledge stock and supports productivity growth in selected industries.[60] It is assumed that the decline in R&D expenditure results in a subsequent reduction in factor productivity, with a lag of one year. The change in productivity for these industries is presented in Table A.2.

Table A.2 Summary productivity shock for 2021

BIOTECH SECTOR	PERCENTAGE DECLINE IN PRODUCTIVITY IN 2021
Agriculture & food technology	0.000010%
Medical technology & digital health	0.015023%
Biotherapeutics	0.006796%

Source: Estimated using Capital IQ R&D data and ABS Business Expenditure on R&D (BERD) data.

Limitation of our work

General use restriction

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Endnotes

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