Australia's National
Science Agency

Submission to the Productivity Commission Inquiry into Australia's Productivity Performance

October 2022

CSIRO welcomes the opportunity to make a submission to the Productivity Commission Inquiry into Australia's productivity performance. While Australia's economic recovery from the pandemic has been world leading, even before COVID-19, the Australian economy was showing signs of weakness, including stagnating productivity. Key to lifting productivity is refocusing attention on science and technology (S&T) innovation. Several challenges hinder Australia from maximising the impacts of S&T innovation and CSIRO sees several major opportunities for Australia to capture more value from S&T innovation. Ultimately, CSIRO believes increased productivity is achievable and worth striving for.

About CSIRO

At CSIRO, we solve the greatest challenges through innovative science and technology. We are Australia's national science agency and innovation catalyst, collaborating to boost Australia's innovation performance. CSIRO has recently published the following reports that examine how S&T innovation contributes to Australia's economic growth and productivity. The key themes examined are summarised in this submission.

- Australian National Outlook (2019)
- COVID-19: Recovery and Resilience (2019)
- Value of science and technology (2020)
- Thriving through innovation: Lessons from the top (co-developed with The University of Queensland in 2020)
- Unlocking the innovation potential of Australian companies (co-developed with the Business Council of Australia in 2021)
- Quantifying Australia's returns to innovation (2021)
- Enablers and barriers to industry-research collaboration – a small and medium sized enterprise perspective (2021)

Even before COVID-19, the economy was showing signs of weakness

In the years leading up to the pandemic, Australia's economy appeared to be losing its momentum and was facing long-term challenges:

- Low productivity, low business investment, and stagnation in several industries
- Low economic diversity in its industrial base and exports, and low diversity in its trade and investment partners
- Disruption risks from emerging technologies.

At the business level, continued uncertainty disincentivises investment. At the household level, low wage growth and high household debt leave Australians vulnerable to shocks. At the macroeconomic level, Australia's reliance on migration-driven labour productivity, as well as its low economic and export complexity (and low diversity) leave its markets vulnerable to shocks.

Refocusing attention on S&T innovation can lift Australia's productivity

S&T innovation can be part of the solution to solving Australia's significant economic, social and environmental challenges. There are many benefits of S&T innovation to businesses and Australia. Through innovation, businesses can create new products and services, increase the quality of existing goods and services, and be more productive and profitable. S&T innovation enables individuals, businesses, industries and economies to increase productivity and performance. At the individual level, innovation, particularly automation, digitisation and computing, allows workers to spend more time on more productive human-oriented tasks that require social, emotional and higher cognitive skills (as opposed to physical, manual and basic cognitive skills).

At the business level, Australian businesses that innovate are twice as likely to report increased productivity than non-innovating businesses, including Australian small- and medium-enterprises (SMEs). The share of businesses that innovate, including inventing and adopting new technologies and processes, is a stronger predictor of productivity growth than aggregate investment in innovation. Most Australian businesses that innovate experience benefits from innovation, with many finding that innovation improves their customer services. Globally, frontier businesses, defined as businesses within an industry with the highest rates of productivity growth, experience greater sales and profitability relative to their industry peers. In Australia, innovating businesses are more likely to experience income and profitability growth than non-innovating businesses.

Economy-wide, S&T innovation contributes to economic productivity and growth. For over 70 years, economists have recognised that S&T innovation plays an important role in driving long run economic growth. Solow analysed empirical data back in 1956 and found technological change is the dominant driver of long term economic growth. More recent studies, with robust empirical evidence, have confirmed S&T innovation leads to long term increases in productivity and economic growth at the business, state and national levels. Innovation accounts for the majority of Australia's overall productivity as measured by multifactor productivity, with recent studies estimating that at least 60% of productivity comes from innovation.

Innovation can also enable businesses to become more competitive internationally. Innovation aimed towards achieving social and environmental objectives can help businesses maintain a social licence to operate. Innovation can also help businesses manage their internal and external risks better and generate spill over effects within industrial clusters.

Several challenges hinder Australia from maximising the impacts of S&T innovation and lifting productivity

It is clear from the literature and our stakeholder consultations that translating research into impact and realising value (including productivity increases) from S&T investment requires significant work and coordination across many stakeholders in the innovation system. Several challenges hinder navigation through the innovation cycle and prevent businesses from maximising the economic, social and environmental impacts of S&T innovation. These include declining business investment in S&T innovation; a lack of translation of high-quality research into development and commercial outputs; gaps in skills, knowledge and capabilities; low adoption of overseas innovations and diffusion; and environmental and social costs.

Regarding adoption and diffusion specifically, CSIRO supports the Productivity Commission's focus on innovation diffusion in its third interim report. Although there are success stories of technologies being adopted and diffused across the Australian economy, they remain exceptions rather than the norm, indicating that Australia may be missing out on available innovation opportunities.

Additionally, there appears to be a disconnect between innovation and productivity reflecting the slowdown in productivity globally despite the rapid development of information technologies and computers (the productivity paradox). Several hypotheses try to explain this disconnect:

- Waning of a boom that began in the 1990s with the first ICT revolution together with the subsequent phase of restricting and offshoring
- Global financial crisis after-effects, including persistent weak demand and uncertainty
- False hopes where inventor, investor or media-generated optimism may create a disconnect between expected versus actual impact
- Concentrated distribution of benefits where benefits from certain innovations may be concentrated in small fractions of the economy without increasing total output, for instance among large businesses while most businesses (which are smaller) do not see these benefits
- Adoption, diffusion and implementation lag where it may take a long time to fully capture the benefits of technologies since adoption and implementation involve some combination of development, learning, restructuring and complementary investments
- Businesses' competitive environment and the dynamism of markets (particularly market entry, competitiveness and insolvency rates) may also influence the productivity dividend from technology adoption and wider innovation.

CSIRO sees several major opportunities for improvements in productivity

As the national science agency and a connector between research and industry, CSIRO sees several opportunities to overcome the current challenges and capture more value from S&T innovation in Australia. Two key ways to address low business investment were identified in our consultations. Firstly, businesses can collaborate more with research institutions, government and the community sector to agree on shared mission-oriented S&T innovation and secondly, they can more strategically target investment in what will be a constrained investment environment for some time.

Businesses, in collaboration with government and research organisations, can create purposeful, impactful and strategically balanced approaches that better encourage investment in innovation. These approaches can encourage increased investment and more efficiently allocate existing investment. They can also seize emerging market and technological opportunities in areas of comparative and competitive advantage. Australian businesses can extend beyond traditionally competitive sectors (mining, agriculture, education and tourism) and strategically diversify their focuses to increase economic complexity, support emerging industries and carve out niches in global value chains. There are considerable short, medium and long term growth opportunities in advanced technological industries such as advanced manufacturing, medical technologies and quantum technologies, which directly address social needs in areas of health, food and sustainability.

CSIRO sees significant potential for national level purposeful or 'mission-led' innovation, whereby industry, research organisations, government and the community work together to solve major challenges facing society using timebound objectives and measurable goals. CSIRO has developed a mission-led innovation program, guided by six broad challenges it seeks to solve using innovative S&T. The Missions Program seeks to co-design new solutions with others to address the most complex and urgent national priorities, and accelerate deployment of those solutions to deliver large-scale impact. This program assesses Australia's opportunities for competitive advantage and increases the level of knowledge diffusion and commercialisation those areas. This type of innovation has a number of spill over benefits that are relevant to increased productivity, including the creation of novel business and commercialisation models, new avenues for accelerating deployment of advanced stage R&D and increase collaboration between the research sector and SMEs.

To shift innovations from inception to full commercialisation, collaboration is also key, through forging enduring connections throughout the innovation cycle, creating closer links between the early stages of S&T innovation, and realising innovation impacts on wider society, the economy and environment. To address workforce gaps, businesses can directly support upskilling and continuous work-based learning and improve collaboration with educational institutions to shape the supply of skilled graduates in a way that aligns with industry's innovation and technology goals.

Adopting more S&T innovations from overseas and diffusing via continuous, incremental improvements and non-R&D innovation can help capture greater benefits from innovation. At the economy-wide level, Australia can further develop its innovation clusters and industry growth centres to increase productivity, reduce costs and promote knowledge sharing.

Increased productivity is worth striving for

Modelling from CSIRO's Australian National Outlook (ANO) showed the power that decisive transformational change of Australia's broader economy, society, and environment, and the adoption of technology have on driving productivity and economic growth in Australia.

The ANO report modelled two contrasting scenarios (Outlook Vision and Slow Decline) that are plausible, evidence-based narratives exploring a range of causes and effects, as well as the trade-offs between different outcomes. In the Outlook Vision scenario, Australia reaches its full potential. Economic growth remains strong and inclusive as Australian companies use technology to move productivity towards the global frontier and create new globally competitive, export-facing industries. By contrast, in the Slow Decline scenario, Australia fails to take strategic action and drifts into the future under business as usual. Economic growth, investment and education outcomes are all relatively weak. Total Factor Productivity (TFP) growth remains well below the global frontier and wage growth is relatively low.

The productivity difference between the scenarios is significant and the positive outlook is worth striving for. Under the Outlook Vision scenario, Australia achieves its full potential with a technology-enabled workforce and private sector, and Australia rises steadily to almost 2% productivity in 2060. In contrast, under the Slow Decline scenario, economy wide TFP growth in Australia remains stuck below 1%.

As Australia's national science agency and innovation catalyst, CSIRO is solving the greatest challenges through innovative science and technology.

CSIRO. Unlocking a better future for everyone.

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