



Executive Summary

Innovation is a key driver of business competitiveness, economic growth, and ultimately improved living standards. According to estimates by the Organisation for Economic Co-operation and Development (OECD), as much as 50 per cent of long-term economic growth in its member countries can be attributed to innovation, and this contribution is expected to grow. The annual *Australian Innovation System Report* brings together a body of evidence on the structure and performance of Australia's innovation system, based on a range of key indicators from new and existing sources.

The theme of this year's report is the evolution of Australia's innovation indicators. During the last year, the Department of Industry, Innovation and Science collaborated with the Australian Bureau of Statistics (ABS) to develop new questions to be included in the *Business Characteristics Survey*. Throughout the report we present new insights from this work.

The report also extends the existing evidence by incorporating novel indicators derived from the recently created Business Longitudinal Analysis Data Environment (BLADE). Following in the tradition of previous reports, the 2016 edition is supplemented by a number of case studies and feature articles to highlight specific aspects of Australia's innovation system.

The new indicators expand evidence of the economic value of innovation. The consistent finding is that innovation-active businesses outperform non-innovation-active businesses on a range of measures. Innovation-active businesses in Australia make up 45 per cent of all employing businesses but contribute to over 60 per cent of sales and employment. Compared to non-innovation-active businesses they are 40 per cent more likely to increase income and profitability, twice as likely to export, and two-to-three times more likely to report increased productivity, employment and training.

New analysis using BLADE shows that the frequency of innovation matters, as the positive impact of innovation gets stronger when businesses innovate more frequently. Persistent innovators significantly outgrow other businesses in terms of sales, value added, employment and profit growth. The data shows that in the period 2008–09 to 2010–11, persistent innovators generated:

- 18 times the value added growth of intermittent innovators
- four times the employment growth of regular innovators
- five times the sales growth of regular innovators

Australia ranks fifth out of 30 OECD countries in terms of its overall proportion of innovation-active businesses, reflecting the strong contribution of our innovative small- and medium-sized enterprises (SMEs; Australian large businesses rank relatively poorly on this measure, coming in 18th out of 29 countries). In terms of investment, total expenditure on innovation by Australian businesses in 2014–15 was between \$26 billion and \$30 billion. In terms of innovation novelty, new-to-business innovation — the adoption of innovations developed by others — is the most common type of innovation in Australian business.

Just as innovation can be a source of competitive advantage for businesses, a high-performing innovation system can underpin the overall competitiveness of an economy. It is worth noting that Australia earns only a relatively modest proportion of its total income from the sale of innovative goods and services compared to other OECD countries. In 2014–15, income from new or significantly improved goods and services was only around 7.2 per cent of total sales. With this estimate, Australia ranks 20th out of 23 countries in the OECD. The average of the top five OECD countries is 19.1 per cent. The discrepancy between Australia's poor performance on this measure, but its high proportion of innovation-active businesses may be explained by two factors: the size of the businesses innovating and the type of innovations being undertaken. Firstly, the proportion of large Australian businesses that are innovation-active is relatively small, this means that it is less likely that their sales will result from innovative goods or services. Secondly, many Australian businesses are process innovators. This means their innovations may reduce their operating costs or improve efficiency instead of producing a new product for market.

An important innovation activity is research and development (R&D). Literature suggests that R&D-related activities can explain up to 75 per cent of total factor productivity growth, once externalities are considered. The literature also shows that R&D has a significant rate of return, at 10–30 per cent for private return and more than 40 per cent for social return. Australia's gross domestic expenditure on R&D (GERD) to GDP ratio was 2.1 per cent in 2013–14, which is slightly above the OECD average of 2.0 per cent, but significantly lower than the top five OECD performers on this indicator. Following a period of strong growth, Australia's GERD as a percentage of GDP has been declining since 2008–09, driven by a steep reduction in business

R&D as a percentage of GDP. This is related to the reduction in mining R&D expenditure, which declined from \$4.3 billion in 2008–09 to \$2.8 billion in 2013–14.

Despite having a high proportion of innovation-active businesses, Australia has a relatively low proportion of businesses that are R&D-active. Manufacturing is the largest contributor to R&D in terms of net expenditure, although its share in R&D spending declined from 36 per cent in 2005–06 to 26 per cent in 2013–14. Notwithstanding its declining share of economic activity, R&D intensity of manufacturing increased from 3.5 per cent in 2005–2006 to 4.8 per cent in 2013–14, which represented an increase of \$1.1 billion over the period. In addition Professional, Scientific and Technical Services has become the second larger spender on R&D after Manufacturing, totalling \$3.75 billion in 2013–14, a 45 per cent increase over the last five years. R&D expenditure in this sector has been driven by SMEs.

The capacity of an economy to innovate relies on its stock of human capital — the skills, knowledge and expertise embedded in its workforce. Australian businesses report a lack of access to skilled personnel as a barrier to innovation, and this pertains to all kinds of skills — not just scientific, engineering or technical.

Academic research contributes to the generation and diffusion of new knowledge, and supports the development of human capital and knowledge. Australia ranks well internationally on measures relating to academic research, and Australian universities have risen in global rankings over the past decade. According to the Academic Ranking of World Universities, since 2003 Australia has increased the number of its universities in the top 500 worldwide from 13 to 23. The number of students completing higher degrees by research has grown slowly but consistently, almost doubling between 2000 and 2014.

Networking and collaboration are essential to a high-performing innovation system. Collaboration with research organisations such as the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and universities has been found to more than triple the likelihood of businesses reporting annual productivity growth. However, except in the resources sector, the data suggests that Australia's innovation system is weakly networked. Australia ranks poorly against OECD comparators in most business to research and business to business collaboration indicators. Australian businesses

also have comparatively low levels of international engagement with respect to intellectual property, joint R&D, and trade in goods and services.

In contrast, collaboration within Australia's research and university sectors is strong. Australia was ranked 7th in the OECD across all disciplines in terms of its share of the world's top 1 per cent of highly cited publications attributed to international collaboration. Australian academic publications accounted for 3.9 per cent of the global market share in 2015. This proportion has increased steadily over the past decade, and Australia now ranks 9th in the OECD on this measure. Australian research publications comprise over 7 per cent of the world's top 1 per cent most highly cited publications across all disciplines.

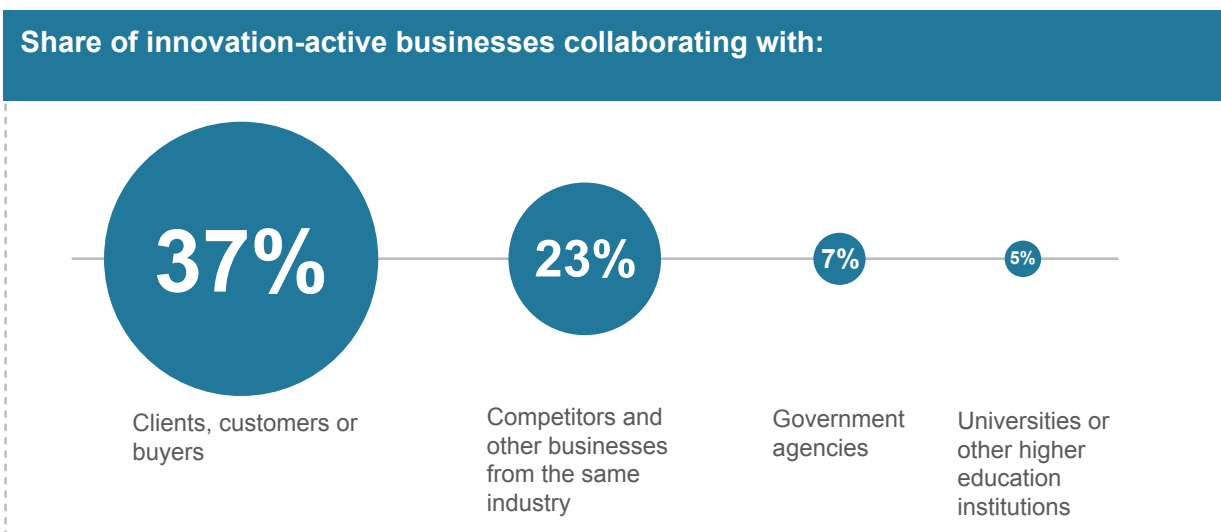
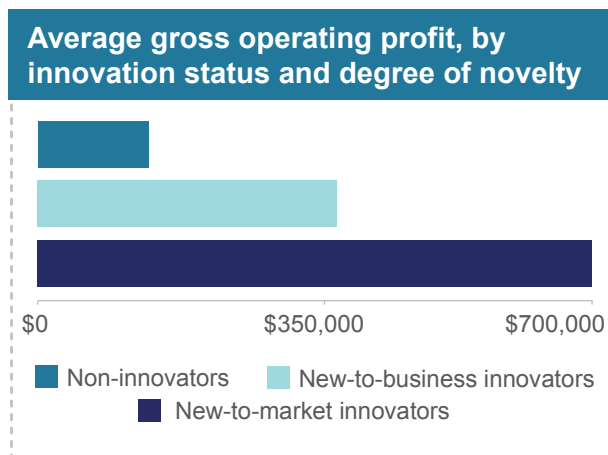
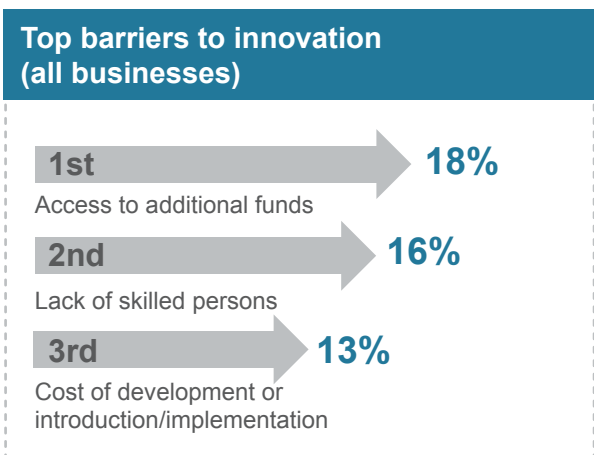
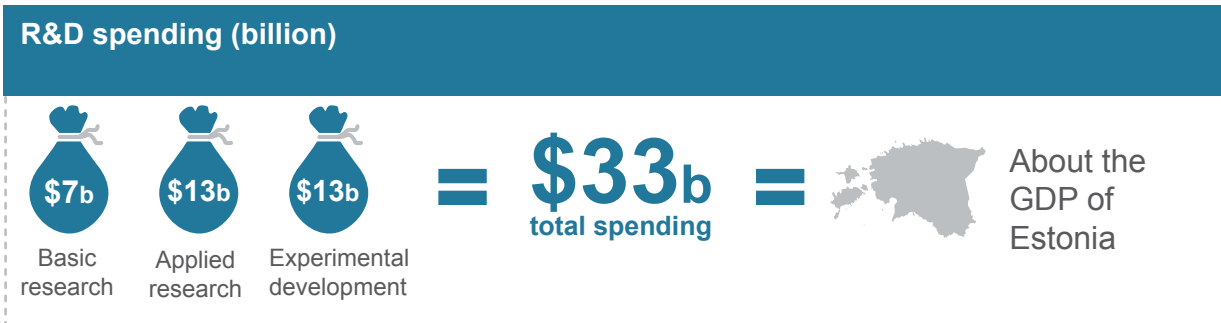
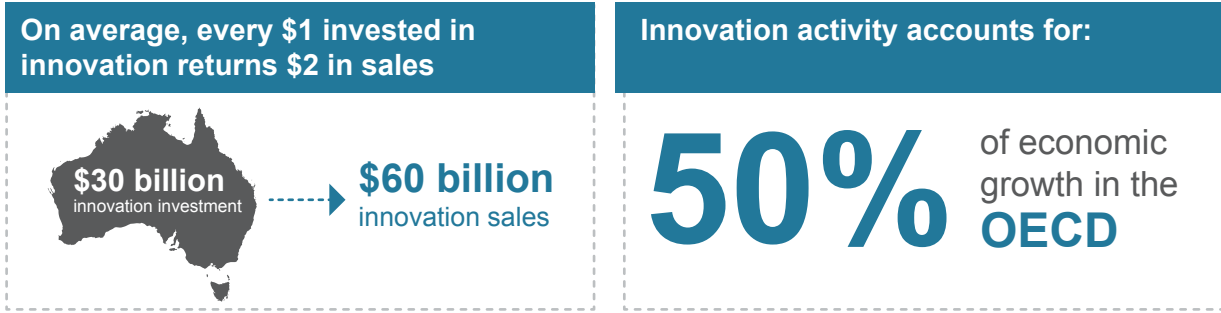
Framework conditions influence the capacity of an economy to create and sustain an environment conducive to innovation. Framework conditions in Australia are strong overall. One of the many framework conditions that are relevant to innovation activity is intellectual property (IP) protection, as several types of IP protection are significantly associated with greater levels of innovation novelty.

Due to the nature of innovation and large spillover effects associated with knowledge, governments around the world play an active role in fostering and shaping framework conditions that support innovation activity. The Australian Government's most significant influences on the innovation system are indirect — its policy and regulatory settings and its investments in infrastructure, health care, education and research. Governments can also play a major role in stimulating private R&D. Most of the direct investments made by government are in research and education. The focus of public R&D investment is primarily on areas that are high risk, for basic research, or where private investment is relatively limited, for example, in defence, health and environmental protection.



Just as innovation can be a source of competitive advantage for business, a high-performing innovation system can underpin the overall competitiveness of an economy

Australian Innovation System



Source: Source: ABS (2016) *Innovation in Australian Business 2014–15*, cat. no. 8158.0; OECD (2015) *The OECD Innovation Strategy 2015*, OECD Publishing; ABS (2016) Customised ABS data commissioned by the Department of Industry, Innovation and Science; ABS (2015) *Research and Experimental Development, Business, 2013–14*, cat no. 8104.0; ABS (2016) *Government and Private Non-Profit Organisations, 2014–15*; ABS (2016) *Higher Education Organisations, 2014*, cat no. 8111.0

Australian innovation-active businesses

The ratio of innovation-active businesses that reported increases in performance was:



compared to non-innovation-active businesses