Country Profile

OECD

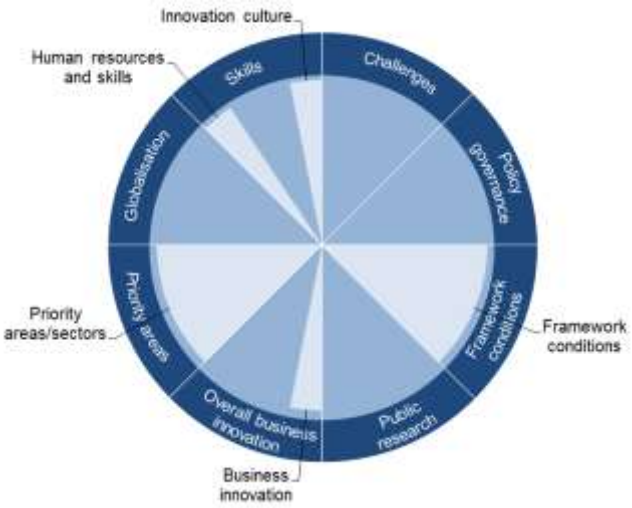
AUSTRALIA

Australia's economy has been one of the world's most resilient during the global economic crisis. Since 2005, labour productivity has increased faster in Australia than in many other OECD countries while income inequality has declined. However, since the fall in commodity prices in 2014, the country has faced considerable challenges in readjusting policies. Australia's economy relies relatively heavily on primary and resource-based industries; coal and iron exports accounted for 29% of total exports of goods and services in 2014-15. Although the economy is supported by strong macroeconomic frameworks and commodity price levels have tended to stabilise in 2016, maintaining growth in incomes and conserving the country's established position in terms of international competitiveness will require further efforts. In order to address these challenges, the Australian Government developed the National Innovation and Science Agenda (NISA). NISA aims to build a stronger, more productive and diverse economy, with more efficient government and more productive businesses. NISA intends to transform the country into a leading innovator with high wage standards and social welfare safety. NISA's subprogrammes and initiatives are divided into four key pillars: i) Culture and Capital, ii) Collaboration, iii) Talent and Skills and iv) Government as an Exemplar.

Table 1. Gross domestic expenditure on R&D (GERD)

	AUS	OECD
GERD		
USD million PPP, 2013	23 084	1 181 495
As a % of total OECD, 2013	2.0	100
GERD intensity and growth		
As a % of GDP, 2013	2.11	2.38
(annual growth rate, 2008-13)	(+2.2)	(+2.3)
GERD publicly financed		
As a % of GDP, 2018	0.78	0.61
(annual growth rate, 2003-08)	(+4.4)	(+2.5)

Figure 1. Major STI policy priorities, 2016



Hot issues

Encouraging business innovation and innovative entrepreneurship

In line with its industrial structure, Australia shows a modest BERD intensity, the relative contribution of high-technology manufacturing being considerably below the OECD median (Figures 5[d] and 6). Innovation output, as measured by triadic patents, is also below the median (figure 5[f]), while trademark registrations are slightly above (figure 5[g]). However, Australia has a large share of SMEs and start-ups. Young firms are fairly active in patenting, and administrative and regulatory conditions for entrepreneurship are as good as in most OECD countries (figure 5[i,j]). Two major policy instruments used to encourage business innovation are R&D tax incentives and equity funding (figure 9). The government actually encourages innovation and entrepreneurship in firms of all size and in all sectors of the economy, which is reflected in the radical shift in its policy mix towards non-discretionary R&D tax incentives (figure 9) and the more recent implementation of the NISA. But particular focus has been given in recent years to supporting R&D and innovation in small and young firms. The government replaced the R&D Tax Concession programme with the R&D Tax Incentive programme, which provided more support for SMEs relative to larger companies, in 2011. In 2015, the government committed to undertake a review of the R&D Tax Incentive programme to identify opportunities to improve the effectiveness and integrity of the programme, including how its focus could be sharpened to encourage additional R&D. The results of the evaluation were released in September 2016, with the review report noting the higher responsiveness to the programme of small companies relative to larger companies. Additional funding programmes also target young entrepreneurs and start-ups. A new component of the Entrepreneurs' Programme, the Incubator Support Programme, provides competitive matched funding in the amount of USD 5.5 million PPP (8 million Australian dollars – AUD) to accelerators in regions or sectors with high innovation potential. The Commonwealth Scientific and Industrial Organisation (CSIRO) Innovation Fund and the Biomedical Translation Fund have both been implemented in 2016. The former invests in new spin-out and start-up companies' products and in services created by Australian research institutions, while the latter supports promising biomedical discoveries. Young firms' difficulties to access skills are also addressed through the Incubator Support Programme, which assists them to find top-quality research and technical talent through secondments of national or international expert advisers. Employee Share Schemes (ESS) support start-ups by giving employees options to buy shares in their company as part of their remuneration – an advantage for start-ups, as they can avoid paying high salaries when they are in a financially vulnerable state. The government intends to make ESS more accessible and user-friendly.

Improving framework conditions for innovation

Australia has a reasonably favourable business environment. Although the domestic venture capital market is narrower than on average in the OECD area (figure 5[i,h]), a reform of the Early Stage Venture Capital Limited Partnerships (ESVCLP) increased the maximum fund size for new partnerships from USD 69 to USD 139 million PPP (AUD 100 to AUD 200 million). ESVCLPs will no longer need to divest a company when its value exceeds USD 173 million PPP (AUD 250 million), and participating companies will receive a 10% non-refundable tax offset on capital invested during the year. Furthermore, concerns over inadvertent breaches of insolvency laws are frequently cited as a reason why early-stage investors are reluctant to get involved in a start-up. As part of the NISA, insolvency laws are currently under review to reduce inter alia the current default bankruptcy period from three years to one year. New legislation is expected to be introduced in mid-2017.

Targeting priority areas/sectors

Australia maintains a clear international specialisation in biotechnologies, as measured by the patent-based revealed technological advantage (figure 7). The Australian Government aims to achieve a world-class economy by building on the country's areas and sectors of strength. Led by the former Chief Scientist, nine national science and research priorities and related services were developed in 2015 in consultation with

researchers, industry leaders and government representatives: 1) food, 2) soil and water, 3) transport, 4) cybersecurity, 5) energy, 6) resources, 7) advanced manufacturing, 8) environmental change and 9) health. The implementation of the priorities is expected, over time, to result in increasing the proportion of Australian Government research investment that is allocated on a strategic basis to areas of critical need and national importance. The Industry Growth Centres Initiative has established or is establishing Growth Centres in six sectors: advanced manufacturing, cyber security, food and agribusiness, medical technologies and pharmaceuticals, oil, gas and energy resources and mining equipment, technology and services). Growth Centres will boost the competitiveness, productivity and innovative capacity of Australia's key industry sectors by: i) identifying opportunities to reduce the regulatory burden, ii) increasing collaboration and commercialisation between research and industry, iii) improving capabilities to engage with international markets and global supply chains and 4) enhancing management and workforce skills. USD 172 million PPP (AUD 248 million) will be invested over four years from 2015-16.

Improving overall human resources and skills

Australia enjoys strong skills foundations and performs well on skills indicators. Australian 15-year-olds rank fourth in science on the PISA test in the OECD area (figure 5[v]). Likewise, the level of adult tertiary education attainment is above the OECD median (figure 5[i]). One of NISA's four pillars refers to the enhancement of talent and skills. Australia identified a need to raise STEM literacy among pre-schoolers, school students and communities following recommendations from the Office of the Chief Scientist. Between 2016 and 2021, USD 33 million PPP (AUD 48 million) will be allocated to increasing engagement in STEM, including through science prizes, the National Science Week and the "Makers Clubs Programme". A further USD 10 million PPP (AUD 13.7 million) scheme, "Women in STEM and Entrepreneurship (WISE)", is aimed at boosting the participation of girls and women in STEM education and careers. Embracing the Digital Age, part of the NISA, comprises several subinitiatives, such as: i) deploying ICT teachers to schools to provide intensive in-class support; ii) expanding the University of Adelaide's highly regarded Massive Open Online Course (MOOC); and iii) providing up to 100 grants over two years to enhance the implementation of the Australian Curriculum Digital Technologies.

Building a broad innovation culture

Although Australia performs well on skills-related areas, national sources show that only 16% of its businesses have a high-performance innovation culture. The business sector is not outward-oriented, and business models lack comprehensive innovation strategies. Given the potential to contribute to growth, the government provides an array of initiatives to maintain and foster a culture of innovation under the "Culture and Capital" and "Talent and Skills" pillars of the NISA. Tax reforms are set to decrease risk aversion and spur a new innovation culture. As part of the government's efforts to raise STEM literacy, Australia targets broader communities – beyond the formal education system – and intends to strengthen community engagement in science and innovation and encourage citizen science.

Some key STI performance indicators

Figure 2. Economic performance

Labour productivity, GDP per hour worked, index 2005=100

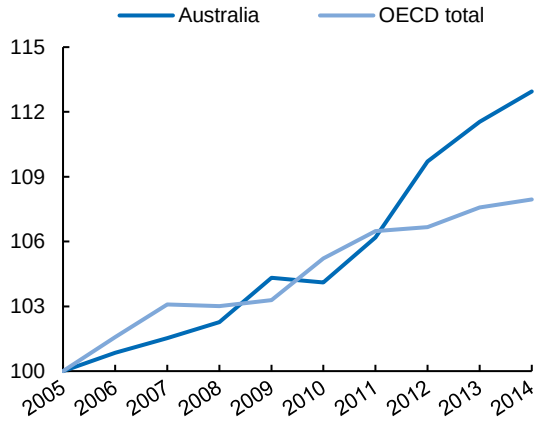


Figure 3. Environmental performance

Green productivity, GDP per unit of CO_2 emitted, index 2005=100

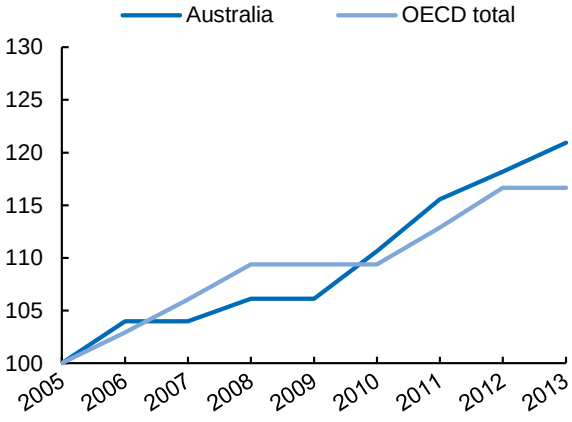
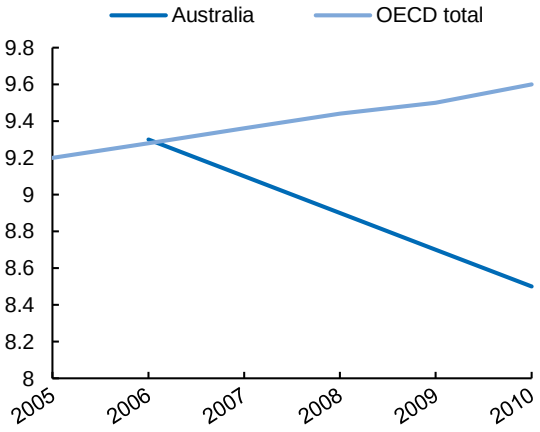


Figure 4. Income inequality

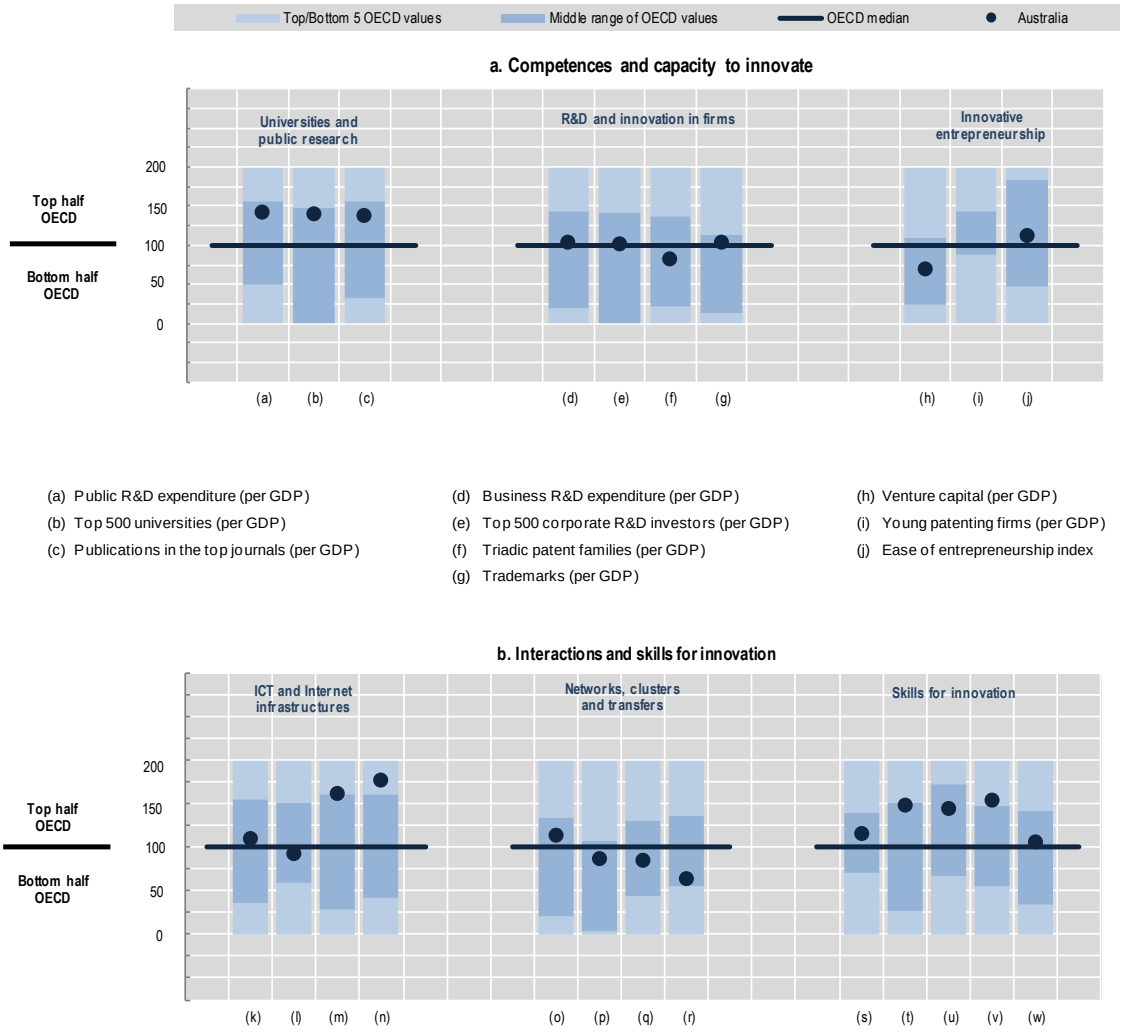
Ratio top decile/first decile of real household net disposable income



Benchmarking national STI systems

Figure 5. Science and Innovation in Australia

Comparative performance of national science and innovation systems, 2016



(a) Public R&D expenditure (per GDP)
(b) Top 500 universities (per GDP)
(c) Publications in the top journals (per GDP)
(d) Business R&D expenditure (per GDP)
(e) Top 500 corporate R&D investors (per GDP)
(f) Triadic patent families (per GDP)
(g) Trademarks (per GDP)
(h) Venture capital (per GDP)
(i) Young patenting firms (per GDP)
(j) Ease of entrepreneurship index

(k) ICT investment (per GDP)
(l) Fixed broadband subscriptions (per population)
(m) Wireless broadband subscriptions (per population)
(n) E-government development index
(o) Industry-financed public R&D expenditure (per GDP)
(p) Patents filed by universities and public labs (per GDP)
(q) International co-authorship (%)
(r) International co-invention (%)
(s) Tertiary education expenditure (per GDP)
(t) Adult population at tertiary education level (%)
(u) Top adult performers in technology problem-solving (%)
(v) Top 15 year-old performers in science (%)
(w) Doctoral graduate rate in science and engineering (%)

Note: Normalised index of performance relative to the median values in the OECD area (Index median=100).

Highlights of the Australian STI system

New challenges

The Australian government, Northern Territory governments, rural R&D corporations, CSIRO and universities are jointly implementing the National Primary Industries Research, Development and Extension (RD&E) Framework. This consists of 22 RD&E strategies intended to address key societal challenges for rural industries, including food, sustainable agriculture, fisheries and forestry, climate change, and soil and water use. The level of patented environment-related technologies in Australia is slightly below the OECD median (figure 7). Stimulating green growth through better energy productivity requires more efficient investment across both the supply and demand side of energy markets, including primary energy sources, energy supply assets, energy use assets and avoided energy use. The National Energy Productivity Plan (NEPP) provides a framework and an economy-wide work plan of existing and new measures designed to coordinate efforts and accelerate improvements to deliver a 40% boost in Australia's energy productivity between 2015 and 2030. This includes improvements in energy productivity so as to boost Australia's competitiveness, help consumers manage their energy costs and reduce Australia's greenhouse gas emissions.

STI policy governance

The Australian Government has implemented strategic whole-of-government co-ordination mechanisms for science, research and innovation with a view to providing strategic advice on all aspects of the STI system. Two new public bodies have been founded since 2014. The Commonwealth Science Council, which held its inaugural meeting in 2014, aims to advise the government on STI issues. Legislation to establish a new body, Innovation and Science Australia (ISA), was introduced into Parliament in September 2016. ISA is an independent body responsible for strategic advice on innovation and science. ISA will also directly engage international, business and community sectors to improve the performance of the national innovation and science system. In addition, the Public Data Policy Statement of December 2015 creates better conditions for open government by making open access to public non-sensitive data mandatory, including through data.gov.au, an online repository of government data.

Universities and public research

Australia has a strong science base, with a high intensity of public R&D expenditure, several world-class universities and high-quality scientific publications (figure 5[a,b,c]). The NISA announced funding of USD 1.6 billion PPP (AUD 2.3 billion) over 10 years for reinforcing the national-scale research infrastructure. This includes operational funding for the National Collaborative Research Infrastructure Strategy (NCRIS). A further USD 17 million PPP (AUD 25 million) over five years is going to be invested in the development of silicon quantum computing technology by the Centre for Quantum Computation and Communication Technology (CQC2T), headquartered at the University of New South Wales. New research funding arrangements will also be provided to universities. Australia has strongly increased competitive project-based funding in past years (figure 8). The current suite of six research block grants will be replaced by the new "Research Support Programme" (USD 609 million PPP – AUD 879 million) in 2017 so as to cover parts of the research costs. In addition, the Research Training programme (USD 693 million PPP – AUD 1 billion – in 2017) will support the training of the next generation of researchers and innovators. The public research capacity will also be assessed. Australia's Chief Scientist will chair an expert group in 2016 to identify future needs for national research infrastructure capability and determine where funding is required in future years. The Australian Research Council will continue to administer Excellence in Research for Australia, a programme to establish evaluation frameworks and identify excellence across the full spectrum of research areas.

ICT and Internet Infrastructures

Internet and ICT infrastructures are relatively well developed. Wireless broadband subscriptions rank very high compared to other OECD countries (figure 5[m]). In order to maintain or even improve this performance, the government intends to spend USD 3.5 billion PPP (AUD 5 billion) a year on ICT dissemination. The Digital Marketplace, based on a successful UK model, will be an online directory of digital and technological services for government agencies to procure ICT solutions from SMEs. These new digital services will go hand in hand with measures to ensure cyber security. The new industry-led Cyber Security Growth Centre will, as part of the NISA, provide USD 21 million PPP (AUD 30 million) to 2019-20 in order to: i) bring together industry, researchers and governments to create a national cyber security innovation network, ii) develop a national strategy for Australia's cyber security industry to become a global leader and attract investment from multinationals, and iii) coordinate cyber security research and innovation to reduce overlap and maximise impact. Similarly, Australia will invest USD 52 million PPP (AUD 75 million) in the CSIRO's new research unit Data61, Australia's largest data innovation group. It will use data analytics to connect disparate government datasets and publicly release them on open data platforms, and it will also play a key role in developing new cyber security architectures. More than 300 PhD students at Data61 partner universities will contribute to solve problems and develop new products, processes and services.

Technology transfer and commercialisation

Australia performs fairly well compared to the OECD median on technology transfer and industry-science co-operation (figure 5[o,p]). The government has recently allocated funding to two initiatives to encourage further international and intersectoral mobility. First, USD 12 million PPP (AUD 18 million) has been granted to a new Innovation Connections initiative as a component of the "Entrepreneurs' Programme". The initiative aims at providing matched grants to support the placement of graduate and postgraduate researchers in businesses and the placement of business researchers in publicly funded research organisations. Opportunities will be identified for SMEs to access R&D and testing facilities and to develop specialised training options by working more closely with the vocational education and training sector. Second, additional funding has been allocated to the former "Linkage Programme" that is administered by the Australian Research Council to promote national and international research partnerships between researchers and business, industry, community organisations and other publicly funded research agencies.

Globalisation

Australia is weakly integrated into international knowledge networks (figure 5[q,r]). While its participation in international scientific publications is on par with the OECD, relatively speaking many fewer Australian inventors are engaged in international co-patenting. The "Global Innovation Strategy", as part of the NISA, aims at addressing this issue by improving Australia's international innovation and science collaboration. The government has allocated USD 25 million PPP (AUD 36 million) over five years to i) establish five business development hubs ("Landing Pads") in global innovation hotspots to support entrepreneurial Australians abroad; ii) provide seed funding to assist Australian businesses and researchers to collaborate with international businesses and researchers through the Global Connections Fund; and iii) reduce barriers to regional collaboration and promote an open-market approach to industry-research collaboration, including Asia-Pacific workshops, multilateral projects and mobility support.

Structural aspects and specialisation

Figure 6. Structural composition of BERD, 2013 or latest year available

As a % of total BERD or sub-parts of BERD

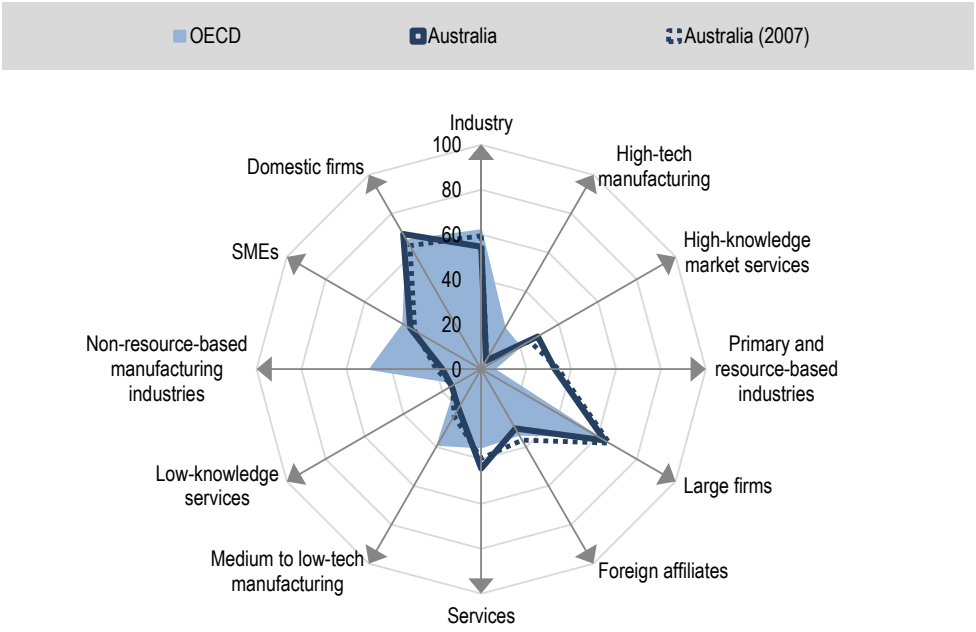
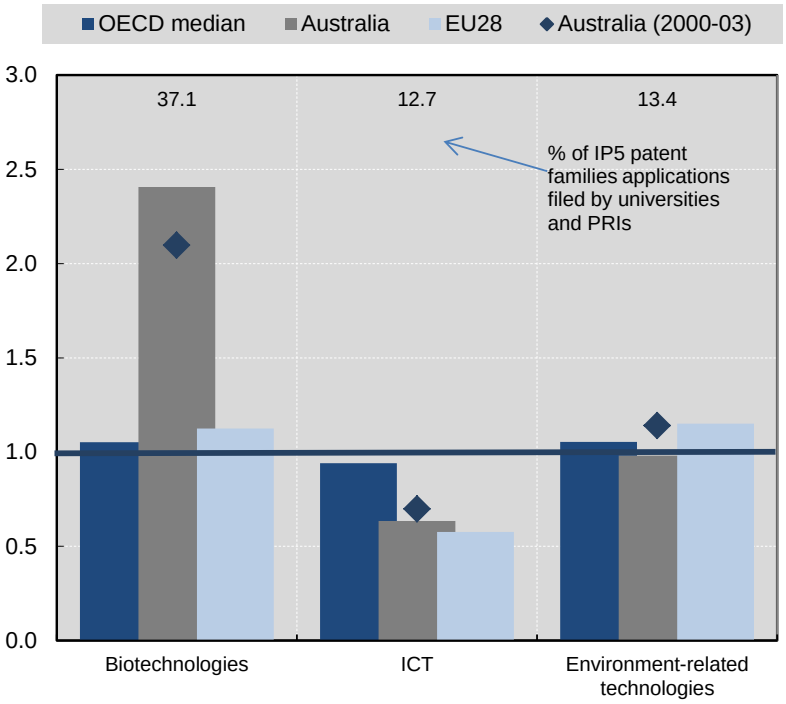


Figure 7. Revealed technology advantage in selected fields, 2011-13

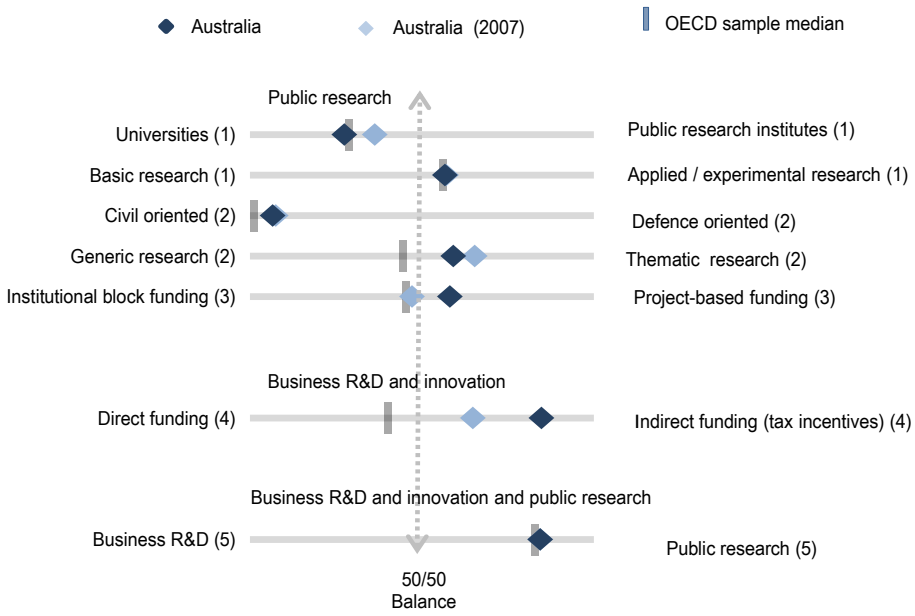
Index based on IP5 patent families applications



National STI policy mix

Figure 8. Allocation of public funds to R&D, 2014 or latest year available

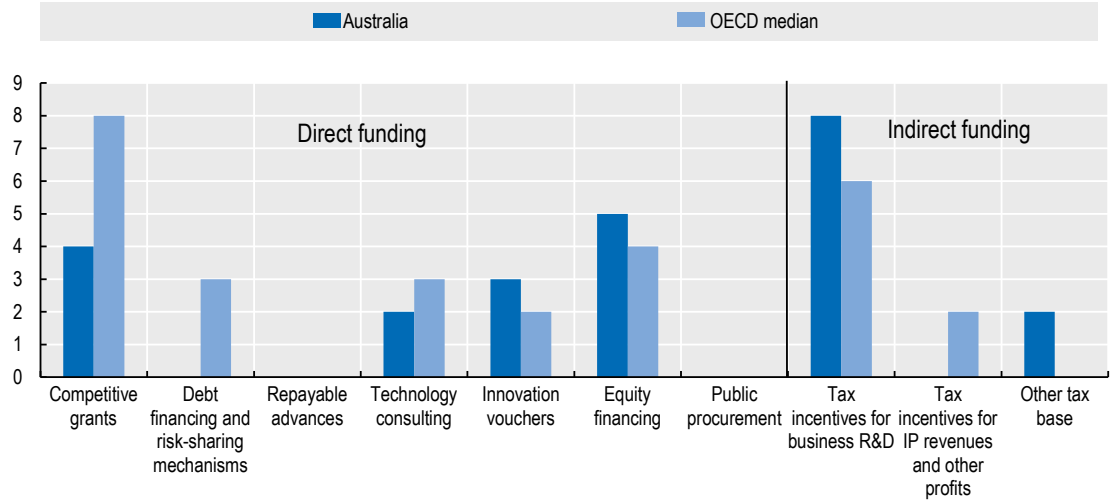
By sector, type of R&D and mode of funding



(1). Balance as a share of both higher education (HERD) and government (GOVERD) R&D expenditure.
(2) Balance as a share of total government budget appropriations and outlays for R&D (GBAORD).
(3) Balance as a share of total funding to national performers.
(4) Balance as a share of both indirect funding (through R&D tax incentives) and direct funding (through grants, procurement, loans, etc.).
(5) Balance as a share of publicly-funded HERD and GOVERD and components of (4).

Figure 9. Most relevant policy instruments of funding for business R&D, 2016

Country self-assessment, index (9 = high and increasing relevance to 0 = not used)



Note: Policy information comes from country responses to the OECD STI Outlook policy questionnaires 2016 and 2014. Australia's responses are available in the EC/OECD International Database of STI Policy, edition 2016 at http://qdd.oecd.org/DATA/STIPSurvey/AUS...STIO_2016.

Source: See the reader's guide and methodological annex.

StatLink http://dx.doi.org/10.1787/888933433676

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