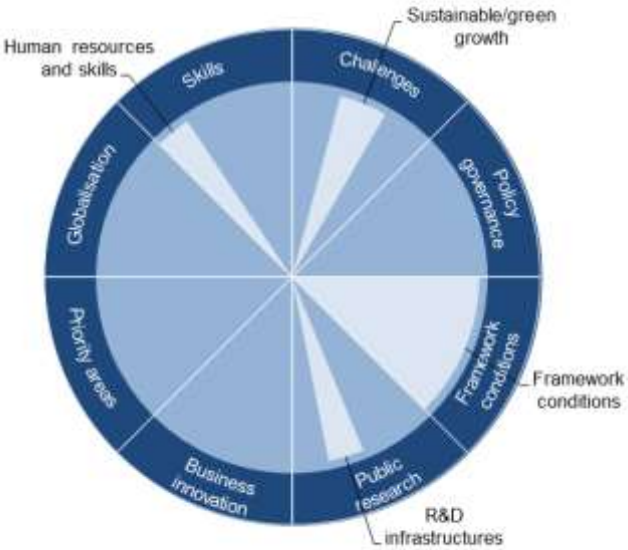
UNITED STATES

The United States has long been, and still is, at the forefront of cutting-edge science, technology and innovation. However, indicators such as business innovation surveys and data on the growth of multi-factor productivity suggest that the US lead is narrowing in spite of its world-class universities and global technology companies. R&D and patenting by businesses have also grown less rapidly than in the past. The 2009 Strategy for American Innovation: Driving towards Sustainable Growth and Quality Jobs, which was updated in February 2011 and again in October 2015, provides the strategic directions for government policies to further an innovation-based economy.

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

	USA	OECD
GERD		
USD million PPP, 2014	456 977	1 181 495
As a % of total OECD, 2014	40.4	100
GERD intensity and growth		
As a % of GDP, 2013	2.74	2.38
(annual growth rate, 2008-13)	(+3.1)	(+2.3)
GERD publicly financed		
As a % of GDP, 2014	0.85	0.61
(annual growth rate, 2009-14)	(-0.5)	(+2.5)

Figure 1. Major STI policy priorities, 2016



Hot issues

Strengthening public R&D capacity and infrastructures

Strengthening public R&D capacity and infrastructures remains the top STI priority for the United States. Overall, the US has the world's largest and strongest science base, although this may not be very apparent in the aggregate performance indicators, which are around or below the OECD median (figure 5[a,b,c]). For instance, the United States is home to 31 of the world's top 100 universities (8 of the top 10) and accounts for 22% of the world's articles on science and engineering. In addition to generating many publications, universities and PRIs are active in filing patents (figure 5[p]), especially in biotechnology (figure 7). Under the President's Plan for Science and Innovation, the federal government prioritises investing in basic research and in research infrastructure, including cyber infrastructure. Its support of basic and applied research increased from USD 60 billion in 2008 to a proposed USD 70.6 billion in 2016. In the 2016 Budget, research accounts for 48% of total government R&D funding, up from 41% in 2008, with a concomitant decline in the share of development funding. In addition to increased funding for basic research, the 2016 Budget targets public investment to support innovation in areas such as clean energy, advanced manufacturing and health research initiatives.

Fostering sustainable/green growth

The commitment of the United States to sustainable growth and clean technology has been on the rise over the last few years, and there is a plan to double US investment in clean energy innovation over five years. The 2016 Budget allocates funding for clean energy R&D with the aim to develop the technologies that will reduce US dependence on oil, build the domestic energy industries and jobs, as well as help reduce the emissions implicated in climate change. The 2016 Budget proposes USD 325 million to the Department of Energy to conduct transformational energy R&D; USD 2.7 billion to the Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE), with a focus on improving clean vehicle technologies and on developing advanced materials and processes to cut manufacturing costs by using less energy; and USD 2.7 billion for the US Global Change Research Program (USGCRP) to understand, predict, mitigate and adapt to global change.

Improving overall human resources and skills

With the highest share of GDP spent on higher education in the OECD area, the United States has a good skills foundation and a high share of a tertiary-qualified workforce (figure 5[s,t]). However, there has been a relative decline in doctoral graduates in science and engineering, and American 15-year-olds perform below the OECD median in science (figure 5[w,v]). The federal government is committed to improving STEM education at all levels to nurture a highly skilled, competitive US workforce for the future. In June 2013, President Obama released a Five-Year Strategic Plan for Federal STEM Education (2013-17) to increase efficiency and coordination in STEM programmes across the federal government. The 2016 Budget includes a major new investment of USD 3.1 billion in federal programmes on STEM education, seeking to advance a government-wide goal of increasing by one-third (by one million) the number of well-prepared college graduates with STEM degrees over the next decade. The 2016 Budget also proposes USD 50 million to create the Advanced Research Projects Agency for Education (ARPA-ED) to produce breakthroughs in learning technology.

Improving the framework conditions for innovation

Overall, US STI policy is oriented to creating jobs, laying the foundations for future industries and improving economic competitiveness. Several reforms to the patent system aim to bolster innovation. The America Invents Act of 2011 switched the US patent regime from the previous “first to invent” to a “first to file” system for patent applications filed on or after 16 March 2013. The Act also aims to improve patent quality and increase inventors’ ability to protect intellectual property abroad. The US Patent and Trademark Office (USPTO) now offers a fast-track option for processing a patent within 12 months, reducing patent backlogs and limiting litigation. In the course of 2014, the USPTO hosted several roadshows across the country to increase understanding of the First Inventor to File (FITF) provisions and assist inventors in the filing and prosecuting of patent applications.

Some key STI performance indicators

Figure 2. Economic performance

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

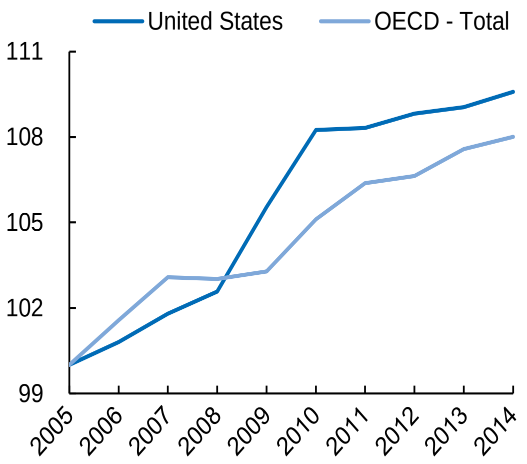


Figure 3. Environmental performance

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

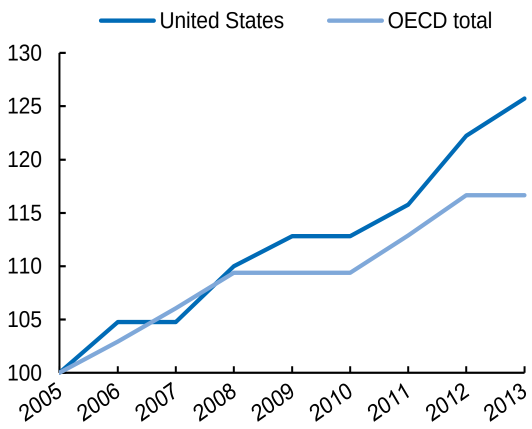
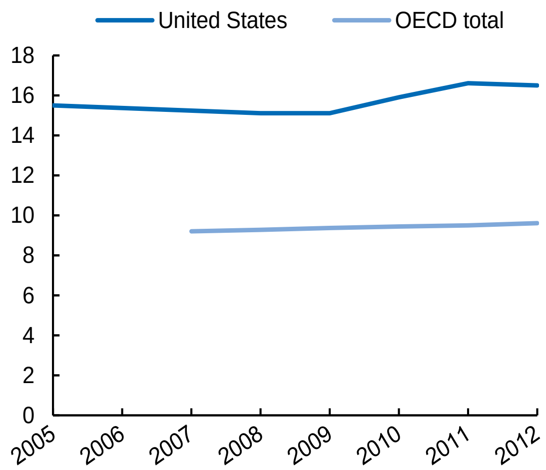


Figure 4. Income inequality

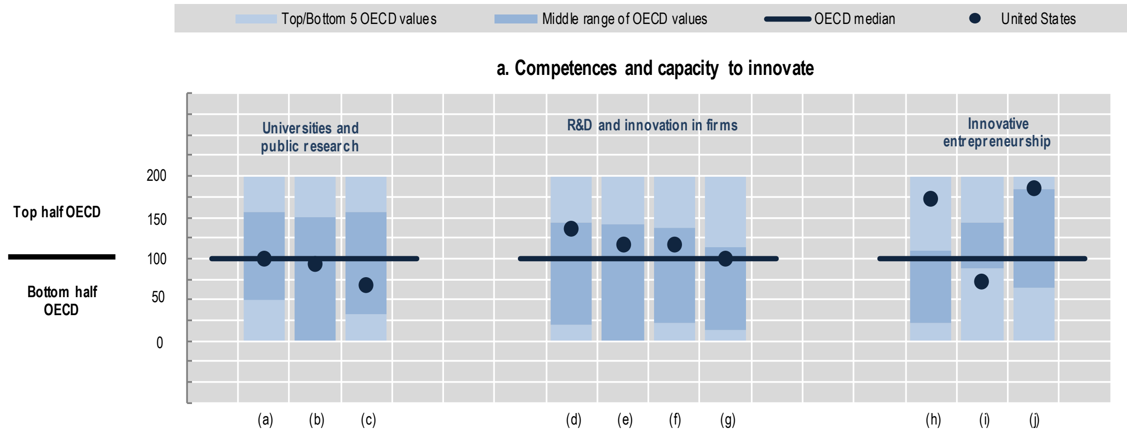
Ratio top decile/first decile of real household net disposable income



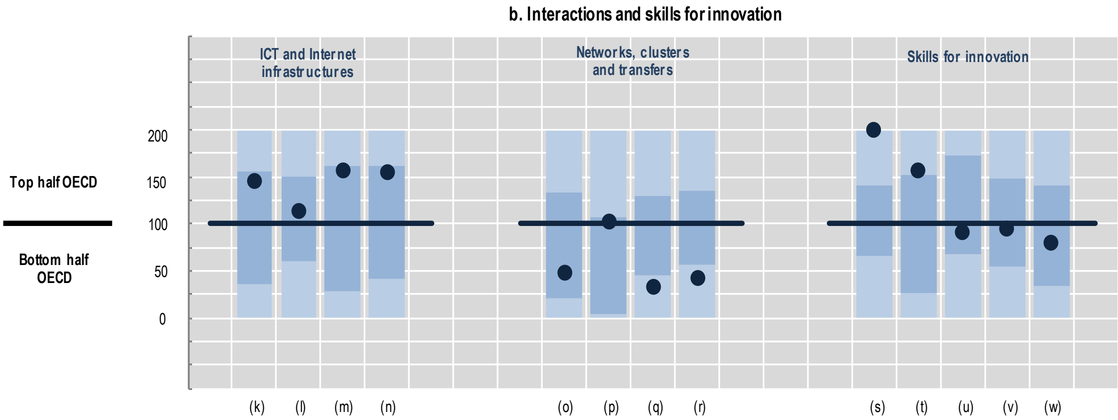
Benchmarking national STI systems

Figure 5. Science and Innovation in the United States

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 US STI system

New sources of growth

In support of a national effort to bring together industry, universities and the federal government to invest in emerging technologies that will create high-quality manufacturing jobs, the 2016 Budget provides USD 2.9 billion for federal advanced manufacturing R&D. Within this envelope, the nine National Network of Manufacturing Innovation institutes are supported by over USD 600 million in federal investment and matched by more than USD 1.2 billion in non-federal investment. Six additional institutes are to be created by January 2017 to scale up advanced manufacturing technologies and processes. These investments will expand R&D on innovative manufacturing processes, advanced industrial materials and robotics. And they will complement ongoing efforts to encourage entrepreneurship and to improve the transitions from discovery to the marketplace.

New challenges

The United States continues to make large budgetary commitments to meet emerging health challenges. In 2015, the Obama Administration focused on sustaining support for basic biomedical research and supporting opportunities for breakthroughs in innovative neurotechnologies (the BRAIN Initiative), personalised medicine (the Precision Medicine Initiative) and combating antimicrobial resistance. Launched with USD 100 million in 2014, the BRAIN initiative searches for new ways to treat, cure and prevent brain disorders, such as Alzheimer's disease, epilepsy and traumatic brain injury. In 2016, the Interagency Working Group on Neuroscience was established to coordinate activities in neuroscience research across the federal government. The 2016 Budget proposes USD 215 million to launch the US government Precision Medicine Initiative, a multi-agency research effort to accelerate biomedical discoveries and to better predict which treatments will be more effective.

STI policy governance

The Office of Management and Budget (OMB) published new guidance that significantly reforms and strengthens federal grant-making, including grants to extramural research performers (universities, etc.). Furthermore, in 2016, the US will launch a new Evaluation and Assessment Capability (EAC) programme spearheaded by the National Science Foundation (NSF). The objective of this initiative is to provide the NSF with the capacity to operate from a basis of evidence in policy decisions and to improve evaluation of NSF-funded programmes and research. Evaluation results have already informed the October 2015 revision of A Strategy for American Innovation, programme design, research topics, coordination of agency research agendas and research collaborations.

Innovation in firms

While public funding of business R&D has declined since 2008, primarily because of declines in defence budgets, more emphasis has recently been placed on direct support for business R&D and innovation. In December 2015, the Research and Experimentation Tax Credit was retroactively extended and made permanent. Over the next several years, a greater share of US R&D investments made through competitive grants will go to small businesses and small business-led consortia. Technology consulting services/extension programmes were introduced in 2013 with a focus on manufacturing and on new firms arising from advances in basic research. The US government continues to propose expansions of loan guarantees and risk-sharing mechanisms, particularly in the clean-energy sector.

Innovative entrepreneurship

The US regulatory environment and funding conditions for entrepreneurship are good (figure 5[h,i]). In 2015, as part of its efforts to build an entrepreneurial culture, the US government organised a White House Demo

Day to showcase stories of entrepreneurial success from across the country and to demonstrate the importance of inclusion in a national start-up economy. At the event, new federal government steps were outlined to support entrepreneurial efforts in diverse communities.

ICT and internet infrastructures

The United States has a good ICT infrastructure (figure 5[l,m,n]). The wireless subscription rate and ICT investment as a percentage of GDP are well above the OECD median (figure 5[m,k]), although the latter decreased from 3.4% in 2003 to 3.1% in 2013. The Networking and Information Technology R&D (NITRD) initiative coordinates the investments and efforts of more than 20 US government agencies in supporting R&D in the field, and the 2016 Budget allocated USD 4.1 billion PPP for that purpose.

Technology transfer and commercialisation

US federal agencies continue to make progress in reshaping their priorities and programmes to meet the goals laid out in the President's October 2011 Memorandum on Accelerating Technology Transfer and Commercialization of Federal Research in Support of High Growth Businesses. The Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programmes remain active. A government-wide policy mandating increased public access to scientific publications and digital data resulting from federally-funded research was issued in 2013 and will be implemented by the end of 2016. Although there are agency differences, the standard is for all research publications resulting from federally-funded research to be publicly accessible within one year of publication, and for data resulting from federally-funded research to be publicly accessible as soon as and as openly as possible. Some agencies are supporting dedicated infrastructures for open access, including data repositories, publication repositories and public-private collaborations to create repositories. A US Executive Order in 2013 established open and machine-readable data as the default for government information. This Executive Order is being implemented by US government agencies through Open Data Initiatives in various fields. Recently, the US government launched Open Data Initiatives in health, energy, climate, education, finance, public safety and global development. The White House has also launched Project Open Data to share best practices and code so as to assist US federal agencies in making their data more open. The aim is to make these data available in open, machine-readable formats, and many of these data sets are accessible through the central portal of data.gov.

Clusters and regional policies

The federal government works with agencies such as the Small Business Administration and the Commerce Department's Economic Development Administration (EDA) to develop regional clusters on advanced technologies (e.g. robotics, energy and cybersecurity), food systems, broadband and recreation. The EDA's efforts to develop and grow Regional Innovation Clusters (RICs) provide: i) data, tools and best practices; ii) infrastructure; iii) institutional support; and iv) significant financial support (at the regional level). The EDA also seeks to streamline federal support for RICs across agencies, working with partners through the Taskforce for the Advancement of Regional Innovation Clusters (TARIC) on policy recommendations, coordinated grants and other initiatives. The Office of Innovation and Entrepreneurship also promotes entrepreneurship at the regional level through the i6 Challenge, a multiagency competitive grant programme.

Globalisation

The US integration into international knowledge networks, as measured by international co-authorship and co-patenting, remains weak compared to the OECD median (figure 5[q,r]). This reflects a size effect and the variety of opportunities offered by domestic linkages. On the other hand, the well-documented importance of foreign-born scientists in academia and of foreign-born entrepreneurs in industry testify to US openness in STI activities. A few policy initiatives have been implemented in recent years aimed at encouraging further internationalisation of the US STI system. In 2013, the Graduate Research Opportunities Worldwide

(GROW) programme expanded opportunities for graduate students to engage in international research collaboration with various global partners, including emerging economies (Brazil, India or Singapore). GROW is open to awardees of the NSF Graduate Research Fellowship Programme.

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

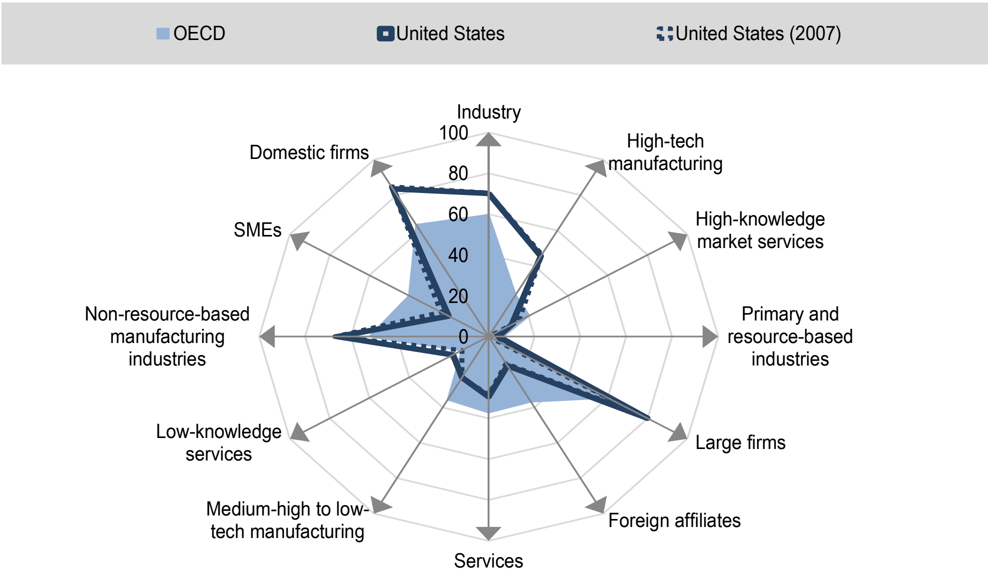
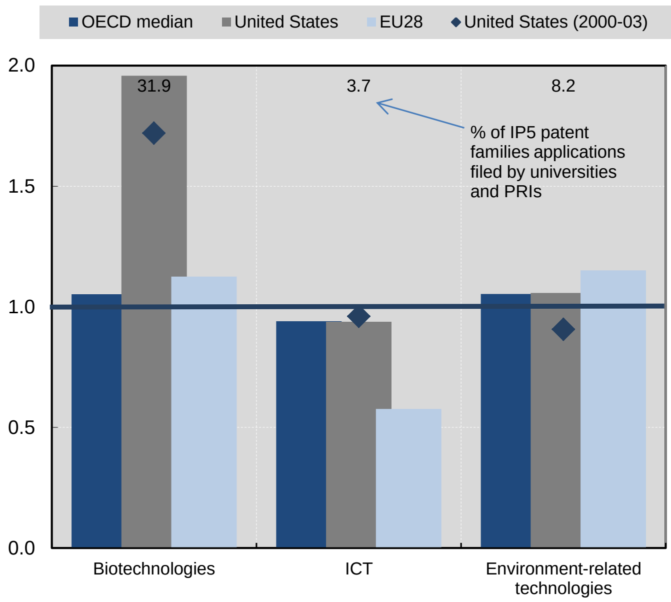


Figure 7. Revealed technology advantage in selected fields, 2011-13

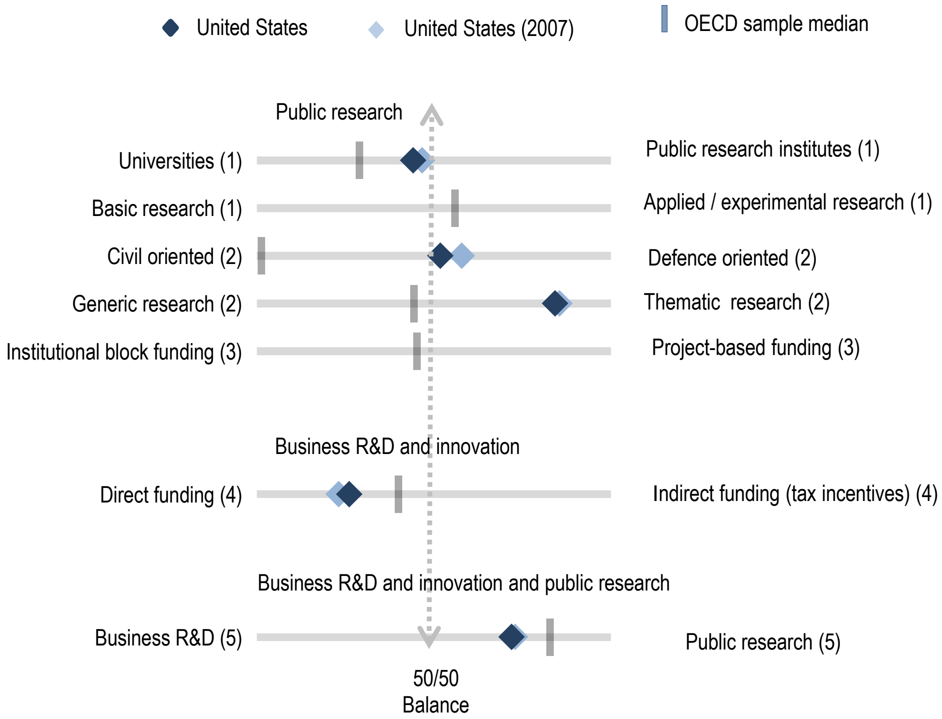
Index based on IP5 patent families applications



National STI policy mix

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

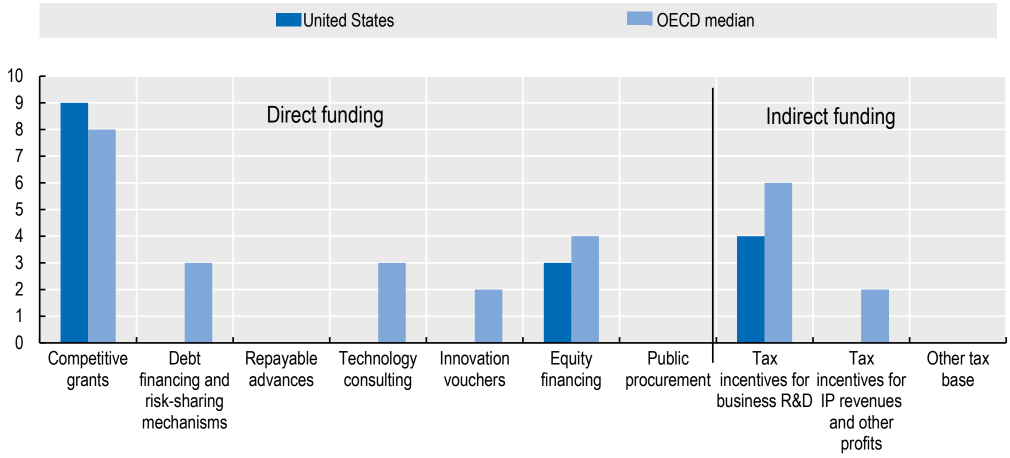
By sector, type of R&D and mode of funding



(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: Note: Policy information comes from country responses to the OECD STI Outlook policy questionnaires 2016 and 2014. United States responses are available in the EC/OECD STI Policy Database, edition 2016 at http://qdd.oecd.org/DATA/STIPSurvey/USA...STIO_2016.

Source: See reader's guide and methodological annex.

StatLink http://dx.doi.org/10.1787/888933434132

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