Country Profile

OECD

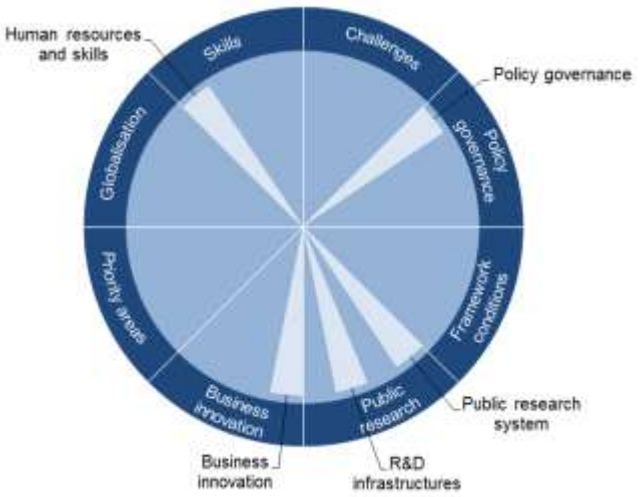
BRAZIL

While Brazil remains the world's seventh largest economy, growth has stagnated over the last two years as commodity prices, industrial activities and services have all declined. To boost the country's economic performance and increase productivity through innovation, the government has introduced new legislation as well as the National Strategy for Science, Technology and Innovation (ENCTI) 2016-19, which sets out the main challenges for STI policy (see below). The strategy aims for gross expenditure on research and development (GERD) to reach 2.0% of GDP in 2019.

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

	BRA	OECD
GERD		
USD million PPP, 2013	39 705	1 181 495
As a % of total OECD, 2013	3.5	100
GERD intensity and growth		
As a % of GDP, 2013	1.24	2.38
(annual growth rate, 2006-13)	(+3.3)	(+2.3)
GERD publicly financed		
As a % of GDP, 2013	0.71	0.61
(annual growth rate, 2006-13)	(+5.4)	(+2.5)

Figure 1. Major STI policy priorities, 2016



Hot issues

Improving the governance of the innovation system and policy

Brazil's government has recently introduced significant changes in STI governance. In May 2016, the administration merged the science and telecommunication ministries to become the Ministry of Science, Technology, Innovations and Communications (MCTIC). In the same month, it launched a new National Strategy for Science, Technology and Innovation (ENCTI) 2016-19, setting out the country's key challenges for STI policy: i) closing the technological gap with developed economies; ii) strengthening institutional capabilities to increase productivity through innovation; iii) reducing social and regional inequalities in access to the country's national innovation system; iv) developing innovative solutions for productive and social inclusion; and v) promoting sustainable development. ENCTI also assigned priorities to different economic and knowledge sectors, which the government believes will leverage national development, not only by proposing solutions to domestic issues, but also because they use the country's

technological potential, natural resources and industrial capacity. These sectors are: defence, water, food, biomes and bioeconomy, sciences and social technologies, climate change, ICTs, energy (including nuclear), health, and converging and enabling technologies. The country is continuing to develop its Technology System (SIBRATEC), aiming to support the technological development of Brazilian companies through the promotion of STI activities, including R&D investment and technology transfer. SibratecShop is an Open Laboratory Programme (OLP) that allows people of all skill levels to use industrial tools and equipment to build their own projects and turn their ideas into innovations. The OLP is an association of MCTIC, the National Service of Industrial Learning Institutes (SENAI) and the Brazilian Support Service for Small Enterprises (SEBRAE).

Improving overall human resources and skills

Human capital is a major bottleneck in the Brazilian innovation system. The share of the adult population with tertiary education is very small (figure 4[t]), and the performance of 15-year-olds in science is very poor (figure 4[v]), although there were marked improvements in the OECD PISA scores over 2003-12. Thus, the education system needs both expansion and improvement. Through the Brazil Scientific Mobility Programme (BSMP), formerly known as "Science without Borders", Brazil has since 2011 sponsored tertiary education studies in STEM disciplines in foreign countries, notably the US, Canada, the UK, France and Germany. This initiative aims to grant 100 000 scholarships to help distinguished Brazilian students enter the world's best universities. It is funded by the federal government organisation Higher Level Personnel Training Coordination (CAPES) and the National Council for Scientific and Technological Development (CNPq), part of MCTIC. In addition, the demography of PhD degree holders in Brazil has recently been evaluated to serve as a basis for evaluating post-graduate policies and to inform the system used by universities to allocate scholarships and grants.

Improving direct and indirect knowledge transfers

In January 2016, Brazil passed a new Innovation Law (13.243/2016). This legislation introduced a comprehensive reform of the regulatory framework for the interaction between the public and private research sectors, which make up the country's national innovation system. In particular, it authorises higher education institutions (HEIs) and public research institutions (PRIs) to collaborate more freely with companies, introduces tax incentives to encourage SMEs to purchase research equipment and facilitates the issuance of visas for foreign R&D personnel and their hiring by private companies. The Brazilian Support Service for Small Enterprises programme (SEBRAE) encourages cross-sector mobility of researchers so as to facilitate knowledge flows between universities and PRIs and SMEs.

Strengthening public R&D capacity and infrastructures

Brazil has relatively few universities among the world's top 500 (figure 4[b]). Research output, measured by scientific publications in top-quartile journals (figure 4[c]), is weak by OECD standards, although the publication of Brazilian science and engineering articles increased on average by 11.8% a year between 2003 and 2013, according to the US National Science Foundation. The increase was, however, less than that of other major emerging economies: China (18.9%) but also India (13.6%). Brazil's government is continuing to support various initiatives aiming to develop its PRI network. Key PRIs such as the Synchrotron Light Laboratory (LNLS) and the National Centre for Monitoring and Warnings of Natural Disasters (CEMADEN) continue to expand with government support. The CT-Infra sectoral fund supports the maintenance, upgrading and modernisation of STI research infrastructures in HEIs and PRIs and the development of their partnerships with the business sector.

Supporting R&D and innovation in firms

Relative to the OECD countries, Brazil is home to only a few of the largest R&D-investing firms (figure 4[e]). While it is at the forefront of high-technology fields such as deep-water oil extraction, this leadership in innovation has not spilled over to the rest of the Brazilian economy. Furthermore, the country's performance on non-technological innovation, as measured by trademark registration, is very weak (figure 4[g]). The

Funding Authority for Studies and Projects (FINEP) aims to raise the level of R&D in companies through the Company Innovate Plan (*Plano Inova Empresa*). The plan encourages projects that run greater technological risks through combining credit finance with non-refundable grants and equity financing, among other support measures. While the plan allocated USD 10.7 billion PPP (18.5 billion Brazilian reals – BRL) in 2014 for companies' investment in product and processes innovation, the budget increased to USD 13.4 billion PPP (BRL 22.7 billion) in 2015. The Brazilian Agency for Industrial Research and Innovation (EMBRAPII) fosters swiftness, flexibility and risk reduction in R&D and in innovation projects conducted by companies. The non-refundable grants managed by EMBRAPII are invested in projects carried out by companies and research institutions that are acknowledged for their excellence, their technological focus and their ability to meet companies´ R&D and innovation requirements. The agency relies on the cooperation of public and private research institutions that are accredited as EMBRAPII Research Units. These units focus on private sector demands and seek to spread the risks of innovation projects that are in pre-competitive stages.

Some key STI performance indicators

Figure 2. Environmental performance

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

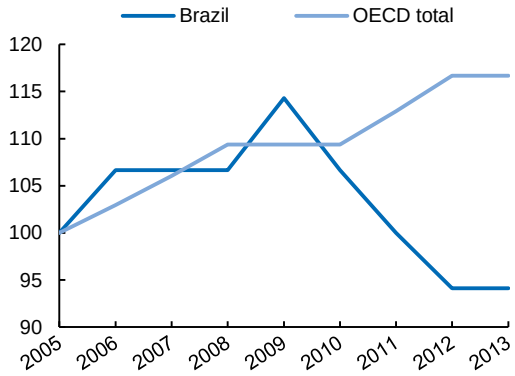
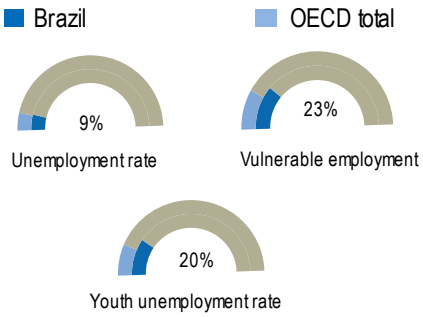


Figure 3. Unemployment

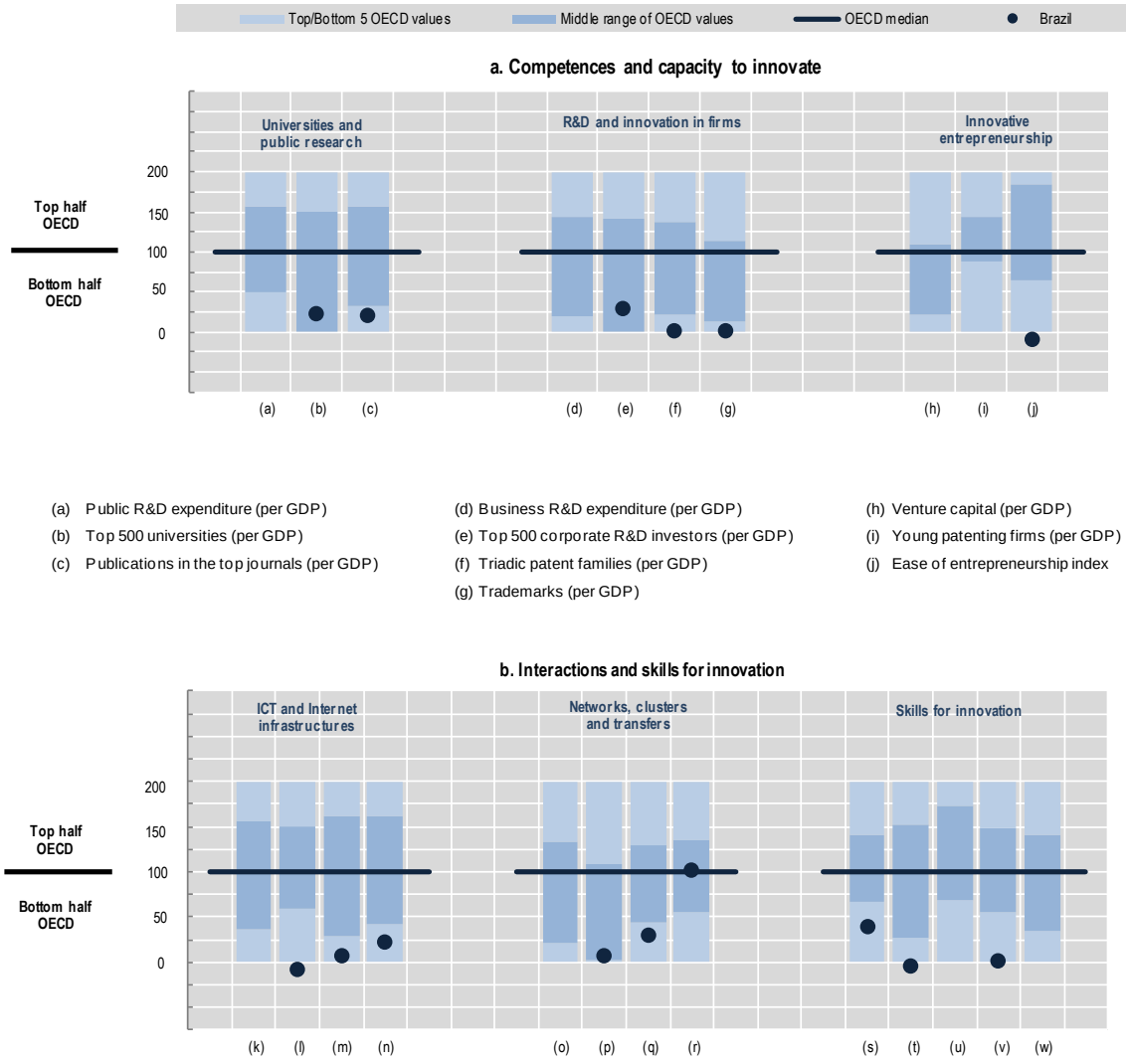
2015 or latest year available



Benchmarking national STI systems

Figure 4. Science and Innovation in Brazil

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 Brazilian STI system

New sources of growth

Brazil's ENCTI strategy seeks to strengthen its comparative advantage in several technology sectors, including the "green" economy. In environmental technologies, Brazil has a revealed technology advantage (RTA) above the BRIICS average, but below the OECD median. In biotechnology, Brazil displays an advantage with respect to both the OECD and the BRIICS (figure 5). In 2013, the government launched the Brazilian Nanotechnology Initiative (IBN), which has reinforced the 2004 Nanotechnology National Programme. With an estimated yearly budget of USD 60 million PPP (BRL 100 million), the initiative aims mainly to support R&D activities in the nanotechnology laboratories that make up Brazil's National System of Nanotechnology (SisNANO), making these facilities accessible to HEIs and businesses.

New challenges

Brazil enjoys extensive natural resources and a rich biodiversity, which mean that it is also vulnerable to extreme climate variability. In 2011, Brazil released its Biodiversity and Natural Resources Programme, which aims to develop products, processes and services and add value to this biodiversity. The programme also intends to support the development of effective management practices. In parallel, the country invested in a System for Monitoring and Observation of the Impacts of Climate Change (SISMOI), which acts as a platform for policy makers and civil society to access data and analysis and to support informed governance. Brazil also faces major societal challenges related to income inequality and poverty. The country's rates of youth unemployment and vulnerable employment are high by OECD standards. The Digital Inclusion Programme aims to guarantee access to ICTs for poor people by providing training and professional qualifications. It plans the creation of Access Centres for Social Technology Development (CATI), where people can improve their professional skills, appropriate knowledge and access scientific information. The CATI also help build collaborative work environments on the Internet. The Digital Inclusion Programme aligns ICT infrastructures so as to optimise their use and funding. Finally, the Connection of Infrastructure for Digital Social Convergence programme works to strengthen social inclusion projects, especially in education, safety and health.

Innovative entrepreneurship

The government has strongly emphasised supporting the commercialisation of technological innovation. The FINEP funding authority allocates funds to support incubators and technological parks as well as their resident companies. To encourage innovative entrepreneurship, several FINEP initiatives provide funding for SMEs, mainly in the form of grants. For example, the First Innovative Firm Programme (PRIME) supports start-ups less than 2-years-old with up to USD 71 000 PPP (BRL 120 000). Inovar seeks to promote venture capital for technology-based companies, to develop training programmes from venture capital agents and to fund incubators. Inovacred in turn aims to provide up to USD 47.5 million PPP (BRL 80 million) in funding for innovation activities for companies with yearly revenues of under USD 53.4 million PPP (BRL 90 million).

ICT and Internet infrastructures

While the country lags in Internet access (figure 4[i]), it experienced a rapid rise in fixed and wireless broadband subscriptions, i.e. 79% and 825%, respectively, from 2010 to 2014. In 2014, the law governing ICT was revised to extend several tax incentives for the promotion of R&D in the ICT sector up till 2029. Under the revised law, the Brazilian government expects to allocate about USD 4.25 billion PPP (BRL 7 billion) in fiscal incentives and other forms of support for private investment in ICT. Moreover, with a budget of

USD 35.6 million PPP (BRL 60 million) in 2013, FINEP introduced a programme to provide non-reimbursable funds for firms' R&D investment in ICT (*TI Maior*).

Clusters and regional policies

Sixteen FINEP sectoral funds provide competitive grants for promoting R&D and strengthening co-operation between HEIs, PRIs and business in key sectors, including aeronautics, agribusiness, biotechnology, ICT and health. Each of the funds is managed by a governing body, which is composed of sector representatives from business, academia and government and is responsible for establishing a long-term strategy, defining priorities and monitoring actions. Local Productive Arrangements (PPI-APLs) provide funding for S&T activities and technological assistance and services to enterprises. The National Programme of Incubators and Technological Parks (PNI) aims to create new ventures and provide support to the state and regional networks of incubators.

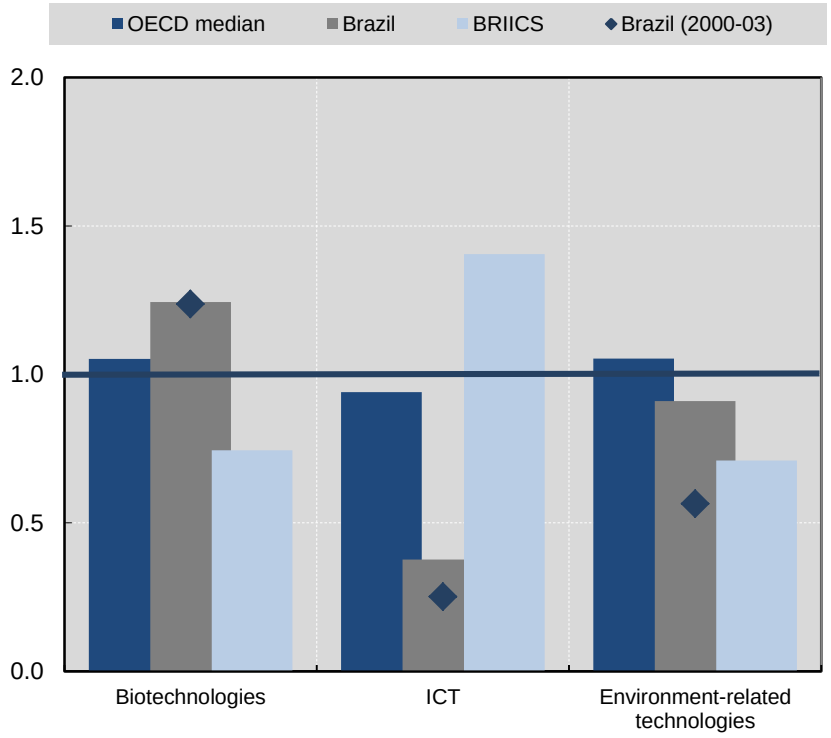
Globalisation

Brazil has a weak level of international scientific cooperation, as reflected by its low share of international co-authored scientific articles and international co-patenting (figure 4[q,r]). In the academic field, MCTIC, FINEP, CNPq, CAPES and PRIs have been dedicating effort to further internationalise their activities. In the business area, SEBRAE's Planning Internationalisation Initiative (*Planejando para Internacionalizar*) remains the main programme providing support for the business expansion of small enterprises and for their access to international markets. In addition, the Inter-Ministerial Pro-Innovation Committee acts as a one-stop shop for enterprises to get information on the different supporting instruments that are available across ministries and agencies. Apart from these, no major initiative has been implemented recently.

Structural aspects and specialisation

Figure 5. Revealed technology advantage in selected fields, 2011-13

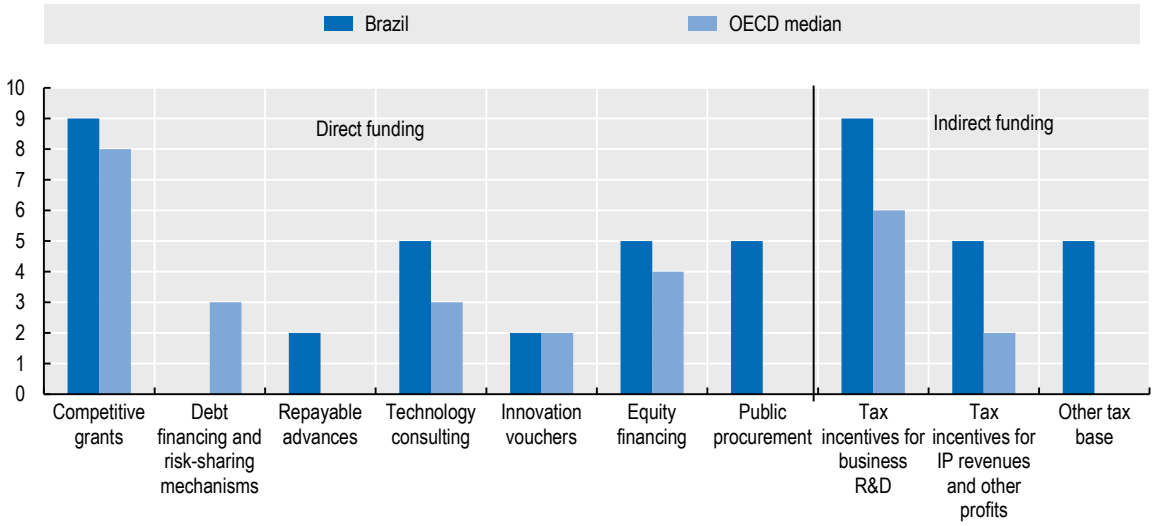
Index based on IP5 patent families applications



National STI policy mix

Figure 6. 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 *EC/OECD International Survey on STI Policies (STIP)* 2016 and 2014. Brazil's responses are available in the EC/OECD International Database on STI Policies, edition 2016 at http://qdd.oecd.org/DATA/STIPSurvey/BRA...STIO_2016.

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

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