

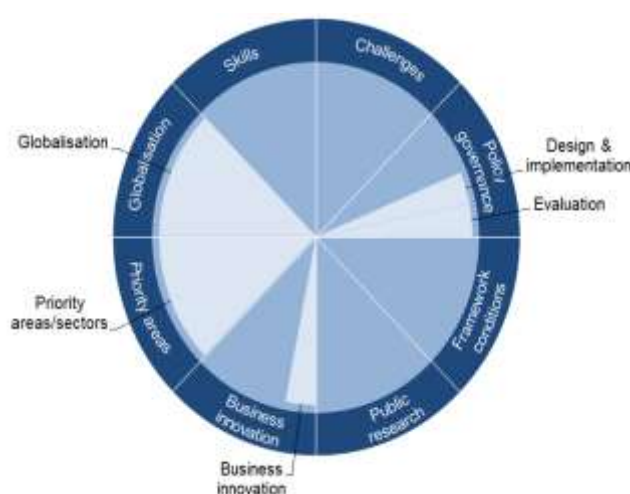
TURKEY

Turkey is a large, fast-growing, middle-income OECD economy. It has industrialised rapidly in recent years. Although growth has slowed in the last few years, it is projected to remain close to 4% in 2016, while the national objective is to reach average growth of 5% per annum in 2017 and 2018. The trade deficit has declined since 2013, as policy focused on industry and exports. Turkey has made significant strides in building up its STI capacities, with international STI cooperation playing a pivotal role, and GERD grew by 9.7% annually over 2009-14. Turkey is committed to sustaining its investment in STI. Currently, the National Science, Technology and Innovation Strategy (UBTYS) 2011-16 and the Tenth Development Plan 2014-18 provide the guidelines for Turkey's national STI policy. Ongoing impact assessment exercises will serve as a basis for the new National STI strategy 2017-23. Targets for GERD and BERD were set by the Supreme Council for Science and Technology (SCST) to reach 3% and 2% of GDP, respectively, by 2023.

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

	TUR	OECD
GERD		
USD million PPP, 2014	15 132	1 181 495
As a % of total OECD, 2014	1.3	100
GERD intensity and growth		
As a % of GDP, 2014	1.01	2.38
(annual growth rate, 2009-10)	(+9.7)	(+2.3)
GERD publicly financed		
As a % of GDP, 2014	0.45	0.61
(annual growth rate, 2009-14)	(-0.1)	(+2.5)

Figure 1. Major STI policy priorities, 2016



Hot issues

Encouraging business innovation and innovative entrepreneurship

According to the World Bank's Ease of Doing Business Index, entrepreneurship conditions in Turkey could be significantly improved (5). The government considers an ecosystem approach centred on the business sector and entrepreneurs crucial for a well-functioning innovation system. Support for entrepreneurship and SMEs is therefore one of the priorities of the SCST. Several decrees and policy initiatives have recently



been put in place, such as the International Incubation Centre in 2015 as well as the Acquisition of Foreign High-Tech Companies and the R&D Centres of International Enterprises, both in 2014. The scope of the business sector R&D Centres Programme was expanded to R&D design issues and accordingly renamed the R&D and Design Centres Programme in 2016. Furthermore, the Ministry of Science, Industry and Technology (MoSIT) started the Technological Products Promotion and Marketing Programme in 2013 and the Technological Products Investment Support Programme in 2014. Both target firms have previously received public/international R&D and innovation support.

Targeting priority areas/sectors

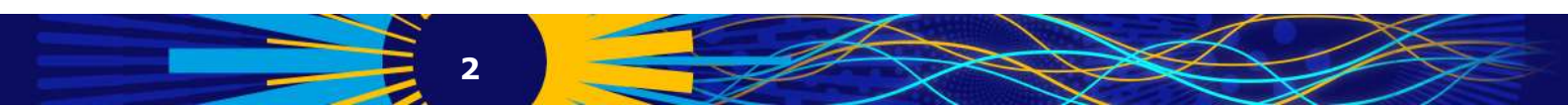
Turkey's RTA performance in biotechnology, ICT and environment-related technologies is low compared to the OECD median and has markedly deteriorated in the past decade (8). For this reason, Turkey has recently expanded its focus on the nano and biotechnology industries. The Turkish Industry Strategy 2015-18, which has replaced the former 2011-14 strategy of the same name, builds on the country's relative technological advantage in medium-high tech manufacturing (7) and sets out the long-term vision for Turkey to become one of the leading production bases in Eurasia and Africa in medium- and high-tech products. The Strategy aims at increasing the competitiveness and efficiency of industry and at expediting its transformation by giving it a more qualified labour force and a greater world market share. TÜBİTAK's Major Industry-Oriented Support Programme was revised in 2014 to foster knowledge transfer mechanisms and trigger interdisciplinary R&D. Furthermore, clusters and regional policies have recently attracted policy attention. The Tenth Development Plan 2014-18 intends to transform the innovation system into a cluster-oriented and entrepreneurship-focused structure. To this end, the MoSIT launched a Cluster Support Programme in 2014. The objectives are aligned to the Industry Strategy 2015-18, so as to spur the production of high-technology goods and increase their global market share.

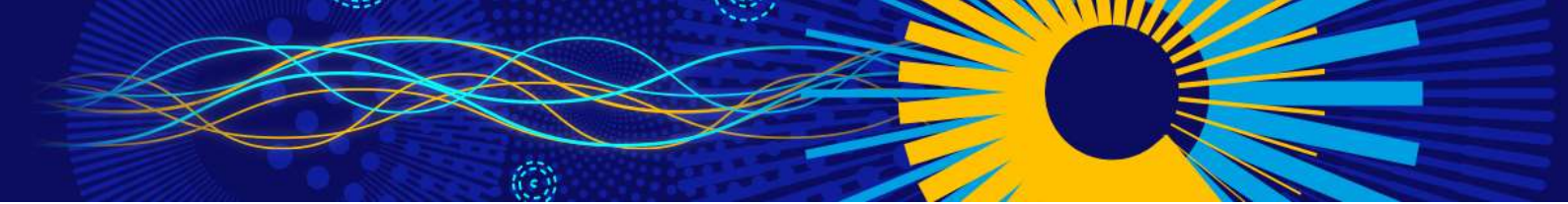
Improving the design and implementation of STI policy

Turkey has recently placed greater emphasis on encouraging broader participation in STI policy design. The high-level prioritisation groups, the Delphi surveys of experts in the sector concerned and the focus groups combine strategic and bottom-up initiatives as well as both qualitative and quantitative measures in order to set future sectoral priorities. This approach facilitates the broad, active participation of non-state actors. The Inter-Governmental Coordination Council for R&D, Innovation and Entrepreneurship, chaired by the president of TÜBİTAK, was established to harmonise all R&D support schemes nationwide and to better co-ordinate the R&D financing institutions so as to ensure the integrity and coherence of public actors and a target-oriented approach to public support.

Improving STI policy evaluation and impact assessment

The Coordination Council for R&D is also responsible for evaluating all national R&D support schemes. In total, the Council has assessed 62 R&D support mechanisms since its foundation in 2011. An additional decree is to be presented to the upcoming SCST meeting to diversify the support mechanisms that are related to research commercialisation. A special department has been set up in the MoSIT to assess the impact of Turkey's support programme for R&D and innovation. TÜBİTAK has conducted an overall evaluation of the priority programmes from the supply-side perspective, using indicators of strengths and weaknesses. The MoSIT has also published Performance Indices for Technoparks since 2011 and for Business Sector R&D Centres since 2012; the latter account for more than 60% of business R&D expenditure and employment. Similarly, performance assessment has been reinforced in universities and PRIs, based on a cooperation protocol between the Ministry of Development and TÜBİTAK on performance indicators, classification, and the monitoring of current and future research centres.





Addressing the challenges of STI globalisation and increasing international cooperation

Turkey's international co authorship and co invention performance, as measured by the share of scientific publications and patents produced domestically with at least one co-author or co-inventor located abroad, is weak compared to other OECD countries (figure 5^q). To address this issue, the Incubation Centre and Accelerator Support Programme intends to support Turkish companies on international markets, e.g. by facilitating the global market penetration of products, by providing special support to start-ups, and by utilising the knowledge of Turkish researchers living abroad. In 2016, the SME Development Organisation (KOSGEB) granted USD 4 million PPP (5.2 million Turkish lira, TRY) for the establishment of incubation centres in the United States alone. Moreover, the Investment Support and Promotion Agency (ISPAT) is in the process of developing a new investment support and promotion scheme to attract foreign R&D investment. Researchers are also encouraged to conduct research abroad via several fellowship or grant programmes. In 2015, the Academy of Sciences (TÜBA) implemented a new award programme to foster the international mobility of researchers. In addition, in order to facilitate technology transfer from abroad, the Directive on Support for Market Research and Penetration was amended in that same year.

Some key STI performance indicators

Figure 2. Economic performance

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

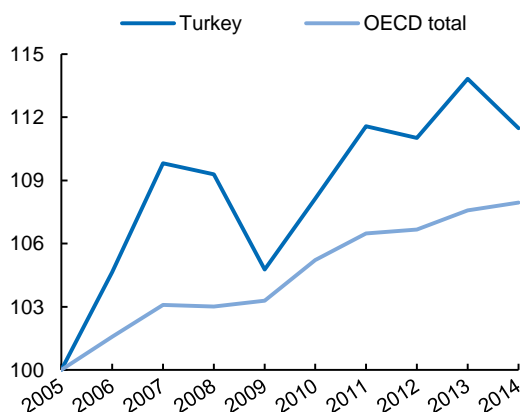


Figure 3. Environmental performance

Green productivity, GDP per unit of CO₂ emitted, index 2005=100

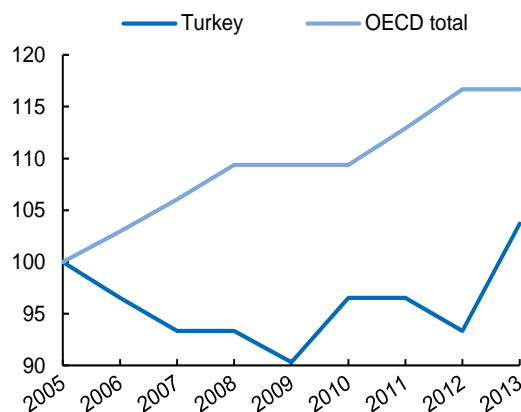
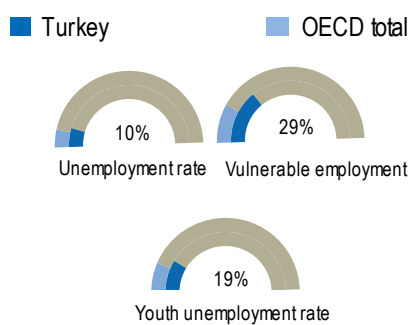


Figure 4. Unemployment

2015 or latest year available, percentages

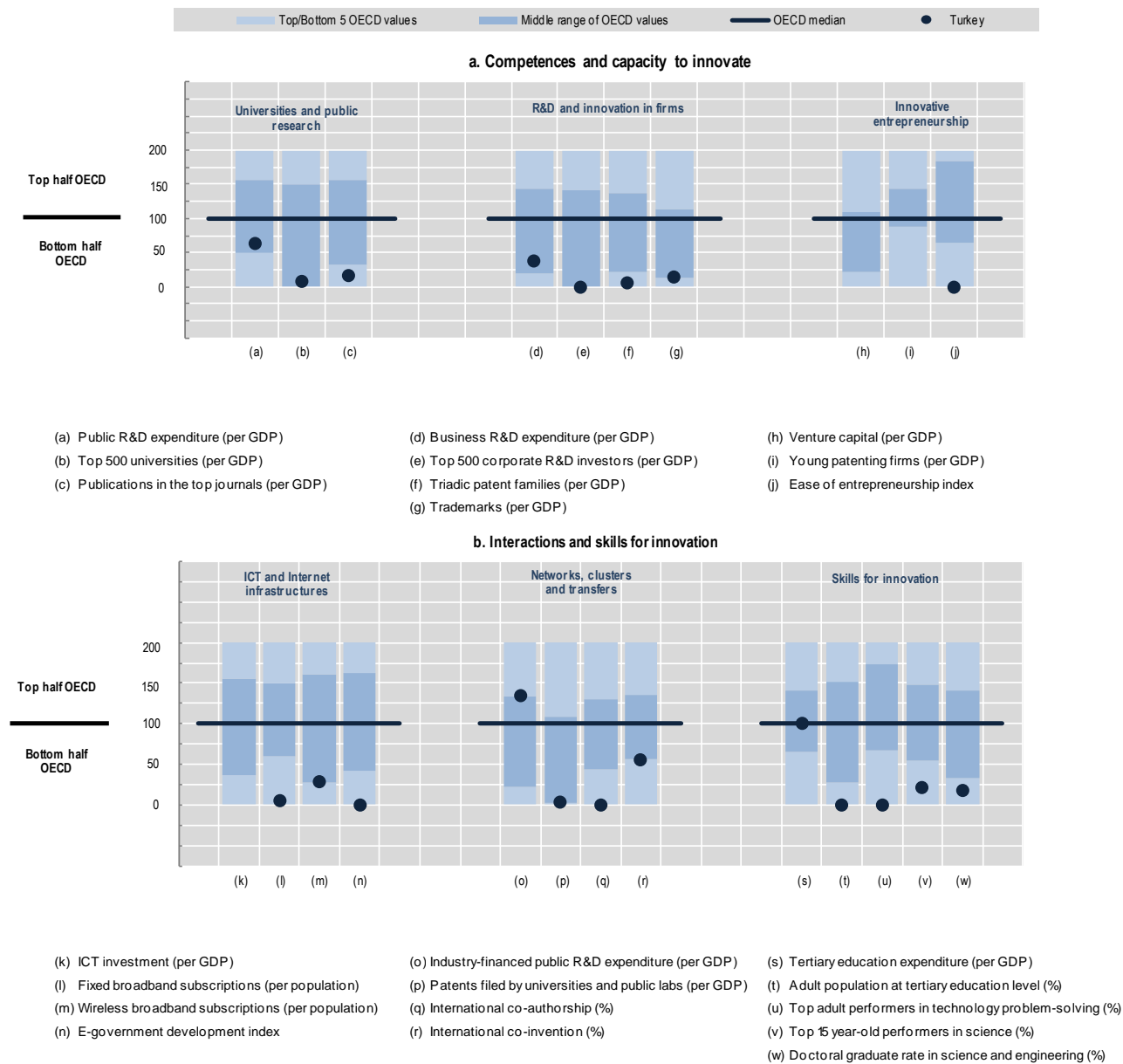
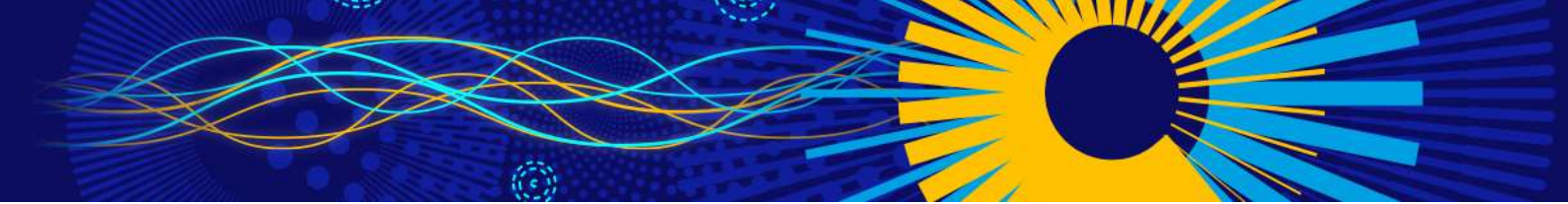




Benchmarking national STI systems

Figure 5. Science and Innovation in Turkey

Comparative performance of national science and innovation systems, 2016





Highlights of the Turkish STI system

New challenges

The new STI strategy 2017-23 will likely set societal challenges and in particular a higher standard of living as pivotal themes for the next decade. The National Climate Change Action Plan (NCCAP) 2011-23 is Turkey's first green growth strategy. The goal of the Ministry of Energy is to reduce energy consumption by 20% per unit of GDP by 2023 (base 2011). In 2014, The Technology Development Foundation introduced a Green Future Accelerator Fund with USD 8.6 million PPP (TRY 10 million) to step up the transfer of R&D results into green technology.

Universities and public research

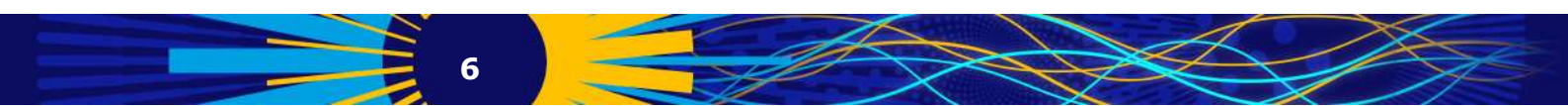
Turkey's public research system, as measured by public R&D expenditure per GDP, is rather small (0.5 % in 2014) (figure 5^a). Turkey produces few international publications in top scholarly journals as per OECD standards (figure 5^c) and has only one world-class university (figure 5^b). Public research is currently undergoing major reforms to improve its quality and relevance, to increase collaboration with the private sector, and to leverage private funding. As a general trend, performance based funding models have become more effective at promoting R&D activities. The 2014 Law on the Funding of Research Infrastructure constitutes a legal basis for a performance-based funding system in HEIs and regulates the utilisation and sustainability of research infrastructures. In 2015, the SCST adopted two new initiatives to improve the efficiency and quality of public research in universities. These include two decrees: one to Support the Development of Universities' R&D Strategy in line with regional competences, research capacities, and needs, and a second one to Increase the Quality and Quantity of doctoral graduates in science and engineering, which is still at a low level (figure 5^w). In 2014, the SCST passed a new decree for a support programme to develop excellent research centres. The Research Infrastructures Law that was enacted in 2015 makes plans for financial and managerial reform in the universities, with a special focus on research centres. In addition, the Project Performance Award and the Incentive Programme for International Scientific Publications (UBYT) aim to reward successful projects and high-quality publications, respectively. The latter provides up to USD 6 000 PPP (TRY 7 500) per published article. The Turkish Academic Network and Information Centre (ULAKBIM) also recognises open science as a priority area and is currently developing an overarching strategy for open science policy based on the working results of the annual National Open Access Workshop and the Open Science Committee.

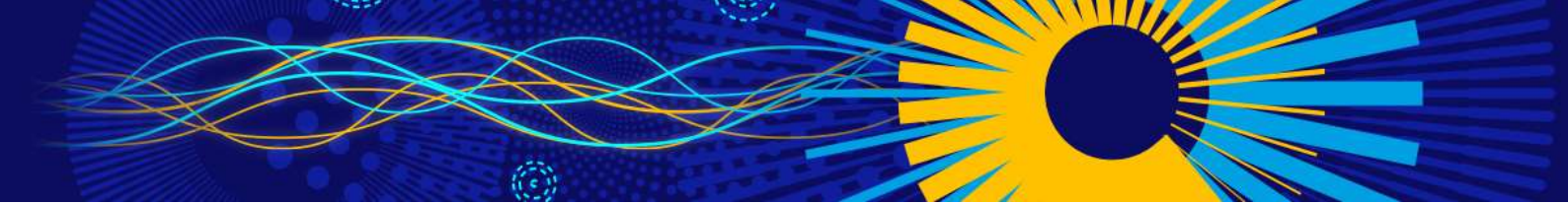
ICT and Internet infrastructures

Turkey lags behind other OECD countries on ICT and Internet performance indicators. The number of fixed and wireless broadband subscriptions per population and the e government index are well below the OECD median (figure 5^{l,m,n}). The 2015-18 Information Society Strategy and Action Plan has been put into force as a major policy document that would enable Turkey to achieve its information society goals, i.e. expanding its broadband infrastructure, delivering more effective public services, improving the diffusion of ICT and supporting e commerce.

Technology transfer and commercialisation

By OECD standards Turkish universities and PRIs collaborate well with industry but file relatively few patents (figure 5^{op}). The Research Institutes of TÜBİTAK encourage closer industry-science collaboration through large-scale R&D projects. Since 2012, TÜBİTAK has also implemented a series of new programmes to trigger collaborative R&D and foster a technology-based entrepreneurship culture and academic entrepreneurship. The Government-University Industry Cooperation Strategy Plan enables academic staff to be employed in the R&D and Design Centres for a temporary period of up to one year. In parallel, the Technology Development Foundation of Turkey (TTGV) provides financial assistance to firms that are willing to develop prototypes and awards for the successful implementation of master's and doctoral studies in

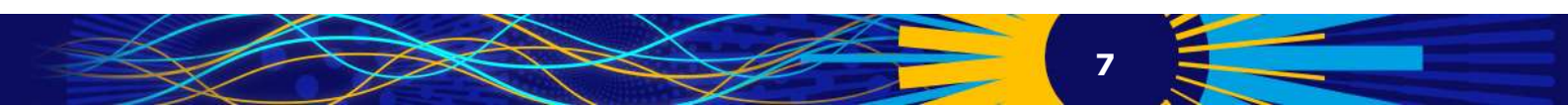




firms. The TTGV also offers a training programme on technology assessment, the management of intellectual property and licenses, business development and alternative funding models for start-ups. In 2015, Turkey launched the Public-University-Industry Partnership Strategy and Action Plan (2015-18) as a new national strategy for knowledge transfer between academia and industry, with the aim of strengthening **Turkey's high-tech** base. In addition, Turkey implemented three initiatives related to IPR, knowledge transfer and public procurement: first, the national IP Strategy and Action Plan (2015-18), administered by the Turkish Patent Institute, supports legislation and the protection and auditing of IPR through improving institutional capacity. Second, an EU-financed project on Strengthening the Turkish Copyright System with a Focus on Fostering Creative and Copyright-Based Industries was implemented in 2016, with the objective of ensuring a more effective copyright system for creative industries. Third, the Public Procurement Law was amended in 2015 to facilitate innovation, technology transfer and the exploitation of domestic products.

Skills for innovation

Turkey has almost quadrupled the number of full-time equivalent researchers since 2002 from a very low human resource base (figure 5^{s,t,u,v,w}). The authorities adopted the Turkish Qualifications Framework in 2015, which seeks to improve the quality of education and training and to develop the qualifications required by the labour market. To this end, the government is currently reviewing the National Curriculum at both primary and secondary levels to set out the essential knowledge that all pupils should acquire in reading, writing, science and mathematics. Accordingly, Turkey participates in the Scientix 2 Project, which aims to promote and support a Europe-wide collaboration among STEM teachers, education researchers and policy makers. Moreover, under the Making Use of Information Technologies initiative, the Ministry of National Education funds a number of training programmes for every level of education so as to develop and extend ICT competences and skills. The Vocational and Technical Education (VET) Strategy Document and Action Plan (2014-18) has been implemented to strengthen investment in technological infrastructure. A cooperation agreement on Promoting Entrepreneurship was signed between the relevant ministries and TUBITAK to improve the quality and innovative aspect of VET. More than 15 000 teachers and administrators already received training on leadership and entrepreneurship between 2012 and 2015.



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

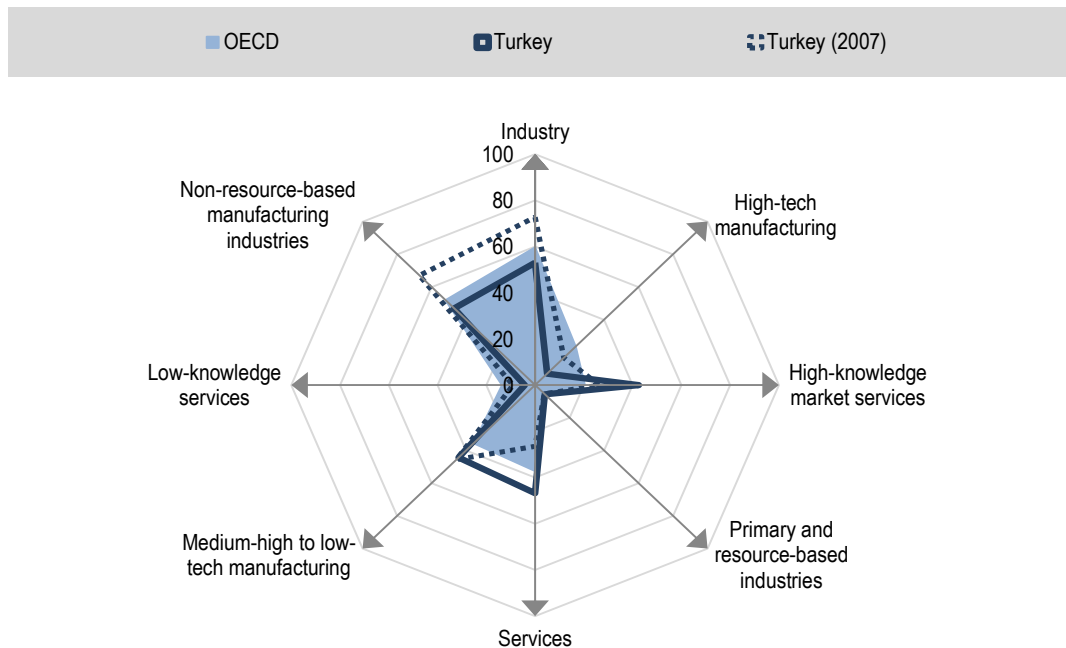
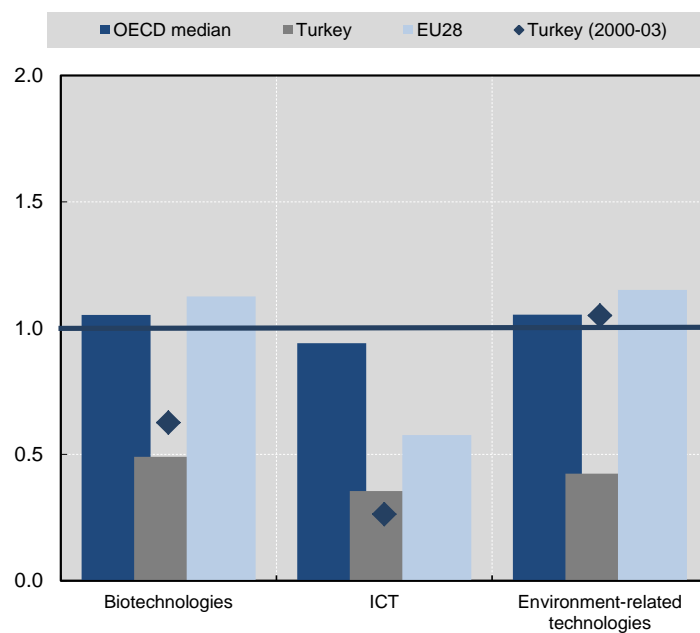


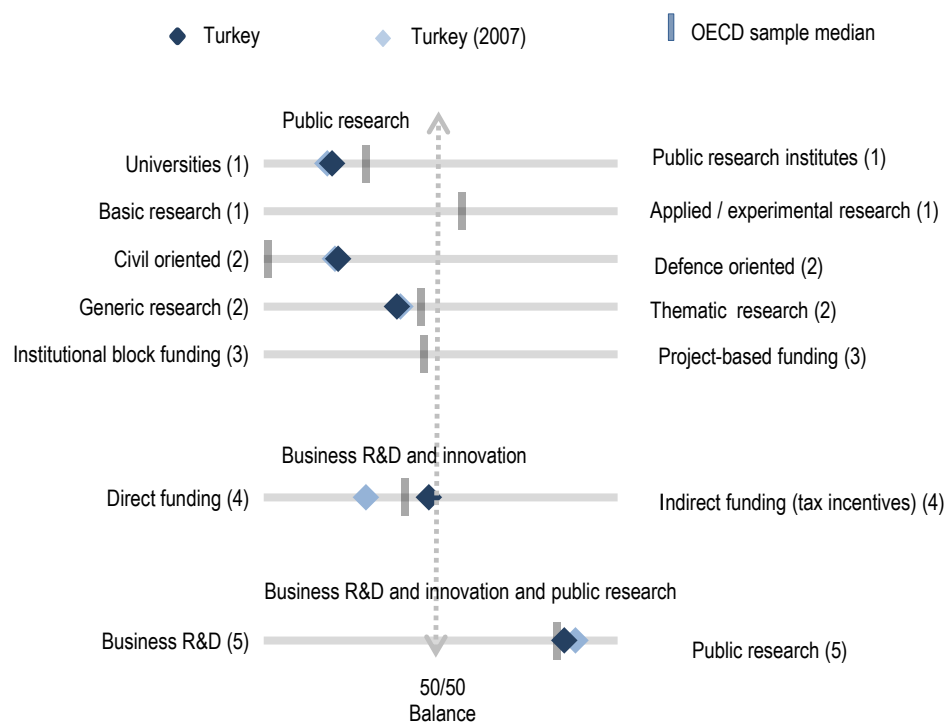
Figure 7. Revealed technology advantage in selected fields, 2011-13

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.

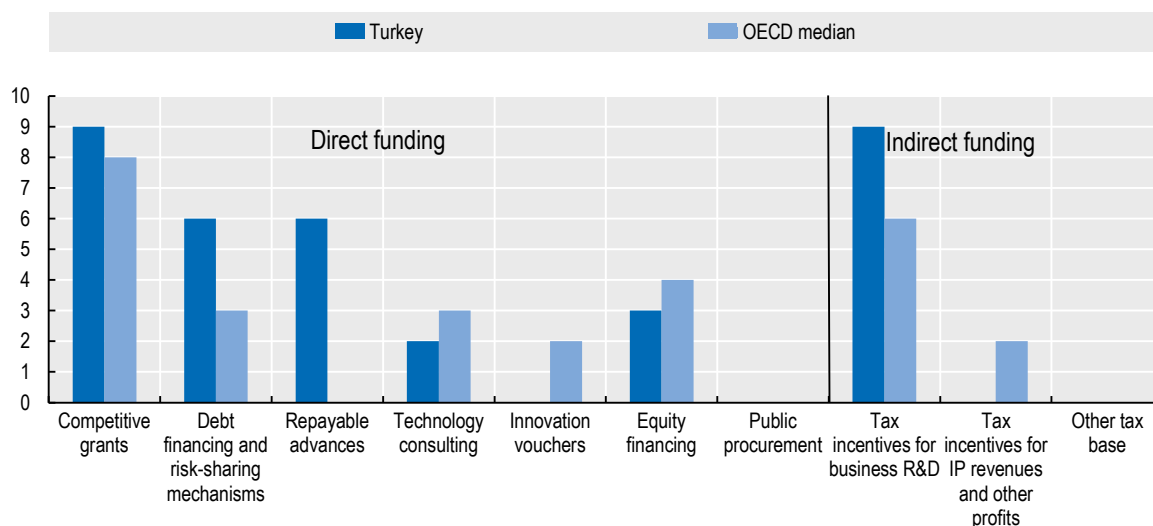
(2). Balance as a share of total government budget appropriations and outlays for R&D (GBAORD).

(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. Turkey's responses are available in the EC/OECD STI Policy Database, edition 2016 at http://qdd.oecd.org/DATA/STIPSurvey/TUR...STIO_2016

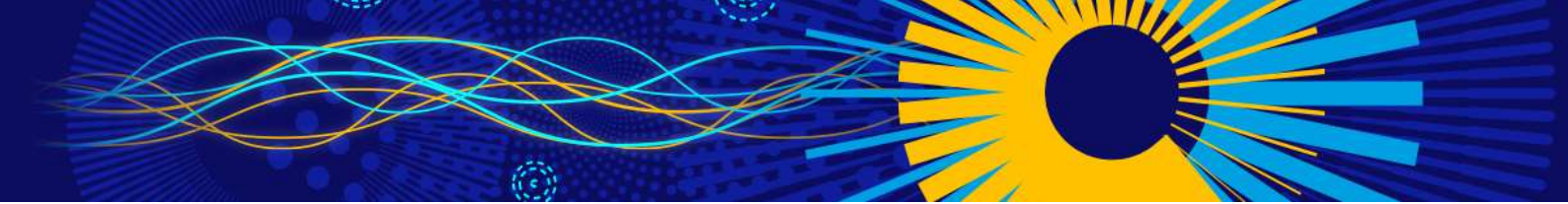
Source: See the reader's guide and methodological annex.

StatLink <http://dx.doi.org/10.1787/888933434110>

References

General references

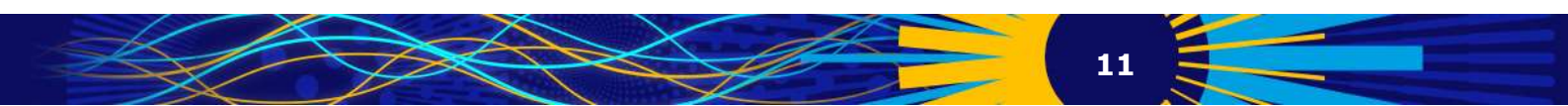
- Dernis H., Dosso M., Hervás F., Millot V., Squicciarini M. and Vezzani A. (2015), *World Corporate Top R&D Investors: Innovation and IP bundles*, A JRC and OECD common report, Luxembourg, Publications Office of the European Union.
- EC (European Commission) (2015), *EU R&D Scoreboard: The 2015 EU Industrial R&D Investment Scoreboard*, European Commission, Luxembourg, <http://iri.jrc.ec.europa.eu/scoreboard.html>, accessed 4 October 2016.
- Flanagan, K., E. Uyarra and M. Laranja (2010), "The policy mix for innovation: rethinking innovation policy in a multilevel, multi-actor context", *Munich Personal RePEc Archive (MPRA)* No. 23567, July.
- IEA (2015), *CO2 Emissions from Fuel Combustion 2015*, OECD Publishing, Paris, DOI: http://dx.doi.org/10.1787/co2_fuel-2015-en
- Kergroach, S. (2010), "Monitoring innovation and policies: developing indicators for analysing the innovation policy mix", internal working document of the Directorate for Science, Technology and Industry (DSTI), OECD, Paris.
- Kergroach, S., J. Chicot, C. Petroli, J. Pruess, C. van Ooijen, N. Ono, I. Perianez-Forte, T. Watanabe, S. Fraccola and B. Serve, (forthcoming-a), "Mapping the policy mix for innovation: the OECD STI Outlook and the EC/OECD International STIP Database", *OECD Science, Technology and Industry Working Papers*.



- Kergroach, S., J. Pruess, S. Fraccola and B. Serve, (forthcoming-b), “Measuring some aspects of the policy mix: exploring the EC/OECD International STI Policy Database for policy indicators”, *OECD Science, Technology and Industry Working Papers*.
- OECD (Organisation for Economic Co-operation and Development) (2016), *Education at a Glance 2016: OECD Indicators*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/eag-2016-en>.
- OECD (2016), *OECD Economic Outlook, Volume 2016 Issue 1*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_outlook-v2016-1-en.
- OECD (2016), *OECD Country Reviews of Innovation Policy*, www.oecd.org/sti/inno/oecdreviewsofinnovationpolicy.htm.
- OECD (2015), *Pensions at a Glance 2015: OECD and G20 indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/pension_glance-2015-en.
- OECD (2015), *OECD Skills Outlook 2015: Youth, Skills and Employability*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789264234178-en>.
- OECD (2015), *OECD Science, Technology and Industry Scoreboard 2015: Innovation for growth and society*, OECD Publishing, Paris, http://dx.doi.org/10.1787/sti_scoreboard-2015-en.
- OECD (2015), *OECD Digital Economy Outlook 2015*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789264232440-en>.
- OECD (2015), *Entrepreneurship at a Glance 2015*, OECD Publishing, Paris, http://dx.doi.org/10.1787/entrepreneur_aag-2015-en.
- OECD (2015), *National Accounts at a Glance 2015*, OECD Publishing, Paris, http://dx.doi.org/10.1787/na_glance-2015-en.
- OECD (2015), *The Innovation Imperative: Contributing to Productivity, Growth and Well-Being*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789264239814-en>.
- OECD (2014), *Measuring the Digital Economy: A New Perspective*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789264221796-en>.
- OECD (2014), *OECD Science, Technology and Industry Outlook 2014*, OECD Publishing, Paris, http://dx.doi.org/10.1787/sti_outlook-2014-en.
- OECD (2011), *Towards Green Growth: Monitoring Progress: OECD Indicators*, OECD Green Growth Studies, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789264111356-en>.
- OECD (2010), “The Innovation Policy Mix”, in *OECD Science, Technology and Industry Outlook 2010*, OECD Publishing, Paris, http://dx.doi.org/10.1787/sti_outlook-2010-48-en.
- OECD (2010), *Measuring Innovation: A New Perspective*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789264059474-en>.
- OECD and SCImago Research Group (CSIC), (2014), *Compendium of Bibliometric Science Indicators 2014*, <http://oe.cd/scientometrics>.
- Van Steen, J. (2012), “Modes of public funding of R&D: Towards internationally comparable indicators”, OECD Science, Technology and Industry Working Papers, No. 2012/4, OECD Publishing, Paris, <http://dx.doi.org/10.1787/5k98ssns1qzs-en>.

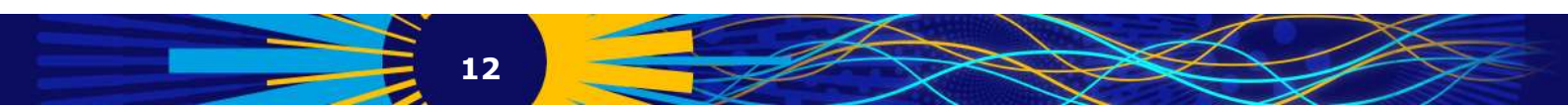
Databases and data sources

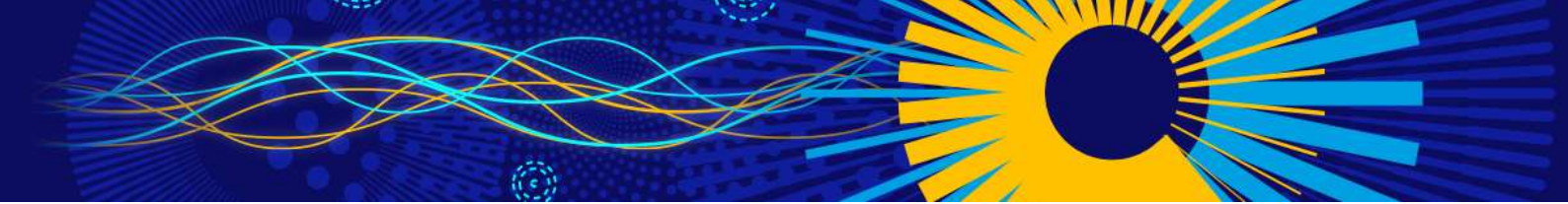
- Academic Ranking of World Universities (2016), “Shanghai ranking academic ranking of World universities”, www.shanghairanking.com, accessed 4 October 2016.
- Bureau Van Dijk (2011), *ORBIS Database*, Bureau Van Dijk Electronic Publishing.





- EC/OECD (forthcoming), International Database on Science, Technology and Innovation Policies (STIP), edition 2016, www.innovationpolicyplatform.org/ecocd-stip-database.
- Elsevier B.V. (2014), Elsevier Research Intelligence, www.elsevier.com/online-tools/research-intelligence/products-and-services/scival, accessed 4 October 2016.
- Eurostat (2016), Education and Training Databases, June, <http://ec.europa.eu/eurostat/web/education-and-training/data/database>, accessed 4 October 2016.
- Eurostat (2016), Total intramural R&D expenditure (GERD) by sectors of performance and source of funds, April, http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=rd_e_gerdfund&lang=en, accessed 4 October 2016.
- Graham, S., G. Hancock, A. Marco and A. Myers (2013), "The USPTO Trademark Case Files Dataset: Descriptions, Lessons, and Insights", SSRN Working Paper, <http://ssrn.com/abstract=2188621>.
- IEA (International Energy Agency) (2015), CO2 Emissions from Fuel Combustion Database, www.iea.org/publications/freepublications/publication/name,43840,en.html.
- ILO (International Labour Organization) (2016), Key Indicators of the Labour Market database, www.ilo.org/global/statistics-and-databases/research-and-databases/ki/m/lang--en/index.htm, accessed 4 October 2016.
- IMF (International Monetary Fund) (2016), World Economic Outlook (WEO) Databases, July, www.imf.org/external/pubs/ft/weo/2016/01/weodata/index.aspx, accessed 4 October 2016.
- ITU (International Telecommunication Union) (2016), World Telecommunication/ICT Indicators 2016, www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx, accessed 4 October 2016.
- OECD (2016), Activity of Multinational Enterprises (AMNE) Database, August, www.oecd.org/industry/ind/amne.htm.
- OECD (2016), ANBERD Database, July, www.oecd.org/sti/anberd.
- OECD (2016), OECD Annual Labour Force Statistics Database, July, www.oecd.org/employment/labour-stats/.
- OECD (2016), Broadband Portal, August, www.oecd.org/sti/broadband/oecdbroadbandportal.htm.
- OECD (2016), OECD Education Databases, September, <http://gpseducation.oecd.org/>.
- OECD (2016), Entrepreneurship Financing Database.
- OECD (2016), Educational Attainment and Labour Force Status Database, <https://data.oecd.org/education.htm>.
- OECD (2016), OECD Income Distribution Database, www.oecd.org/social/income-distribution-database.htm.
- OECD (2016), Main Science and Technology Indicators (MSTI) Database, June, www.oecd.org/sti/msti.
- OECD (2016), OECD National Accounts Databases, September, www.oecd.org/std/na/.
- OECD (2016), OECD/NESTI data collection on R&D tax incentives, July, www.oecd.org/sti/rd-tax-stats.htm.
- OECD (2016), Patent Database, June, www.oecd.org/sti/inno/oecdpatentdatabases.htm.
- OECD (2016), Productivity Database, September, www.oecd.org/std/productivity-stats.
- OECD (2016), Programme of International Students Assessment (PISA) Database, OECD Education Statistics, June, www.pisa.oecd.org.
- OECD (2016) Programme for the International Assessment of Adult Competencies (PIAAC) Database, OECD Education Statistics, June www.oecd.org/skills/piaac/surveyofadultskills.htm.
- OECD (2016), Research and Development Statistics (RDS) Database, April, www.oecd.org/sti/rds.
- OECD (2016), STI Micro-data Lab: Intellectual Property Database, June, <http://oe.cd/ipstats>.





OECD (2014), Product Market Regulation (PMR) Database, March, www.oecd.org/economy/pmr.

OECD (2013), “Modes of public funding of R&D: Interim results from the second round of data collection on GBAORD”, internal working document of the Working Party of National Experts on Science and Technology Indicators (NESTI), OECD, Paris.

UIS (UNESCO Institute for Statistics) (2016), Education Database, June, http://data.uis.unesco.org/Index.aspx?DataSetCode=EDULIT_DS, accessed 4 October 2016.

UIS (2016), Science, Technology and Innovation Database, July, http://data.uis.unesco.org/Index.aspx?DataSetCode=SCN_DS, accessed 4 October 2016.

UN (United Nations) (2016), UN e-Government Survey, United Nations, NY. <https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2016> (accessed 4 October 2016).

World Bank (2016), World Development Indicators (WDI) Databank, <http://wdi.worldbank.org>

© OECD, 2016. This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

<http://oe.cd/STIOutlook> – STIPolicy.data@oecd.org –  @OECDInnovation – <http://oe.cd/stinews>





From:

OECD Science, Technology and Innovation Outlook 2016

Access the complete publication at:

https://doi.org/10.1787/sti_in_outlook-2016-en

Please cite this chapter as:

OECD (2016), "Turkey", in *OECD Science, Technology and Innovation Outlook 2016*, OECD Publishing, Paris.

DOI: https://doi.org/10.1787/sti_in_outlook-2016-91-en

This work is published under the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of OECD member countries.

This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

You can copy, download or print OECD content for your own use, and you can include excerpts from OECD publications, databases and multimedia products in your own documents, presentations, blogs, websites and teaching materials, provided that suitable acknowledgment of OECD as source and copyright owner is given. All requests for public or commercial use and translation rights should be submitted to rights@oecd.org. Requests for permission to photocopy portions of this material for public or commercial use shall be addressed directly to the Copyright Clearance Center (CCC) at info@copyright.com or the Centre français d'exploitation du droit de copie (CFC) at contact@cfcopies.com.