

SPAIN

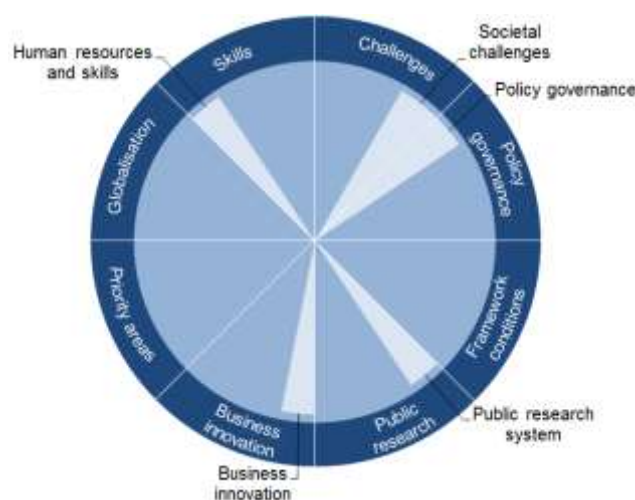
Spain's economy continues its recovery: in 2015, the GDP of Spain grew by 3.2%, significantly above the euro area average. Labour productivity has been catching-up (Figure 2) but potential for further improvement remains constrained. Growth prospects remain repressed due to lasting effects of the crisis and other structural factors of the Spanish economy (e.g. weak business dynamics). In terms of social inclusion, serious challenges remain. The unemployment rate of 22% of the labour force in 2015 is far larger than the OECD average. Unemployment among youth is among the highest in OECD countries (figure 4): 48% in 2015.

In terms of science, technology and innovation, Spain's significant progress in increasing R&D as a share of GDP in the 1990s and 2000s was curtailed and even reversed following the economic crisis. In particular, public R&D investment decreased steadily over the period 2009-14 at an annual growth rate of -3.4%. The trend has been reversed in 2015 with an increase of 2.1%. GERD intensity (relative to GDP) remains low: about half the OECD average. Major STI policy priorities are: reinforcing the public research system, addressing societal challenges, improving policy governance, business innovation, and human resources and skills (figure 1). The current strategy and policy frameworks for STI seek to address these concerns. The main actions are defined in the Spanish Strategy for Science, Technology and Innovation (SSSTI) (2013-20) and the Spanish National Plan for Scientific and Technical Research and Innovation (2013-16), both approved by the government in February 2013.

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

	ESP	OECD
GERD		
USD million PPP, 2014	19 246	1 181 495
As a % of total OECD, 2014	1.7	100
GERD intensity and growth		
As a % of GDP, 2014	1.23	2.38
(annual growth rate, 2009-10)	(-2.6)	(+2.3)
GERD publicly financed		
As a % of GDP, 2014	0.56	0.61
(annual growth rate, 2009-14)	(-3.4)	(+2.5)

Figure 1. Major STI policy priorities, 2016





Hot issues

Addressing societal challenges through STI

The new Spanish National Plan 2013-16 explicitly addresses the promotion of R&D and innovation projects oriented to societal challenges. These are: a) health, demographic change and wellbeing, b) food safety and quality; productive and sustainable farming activity; sustainability of natural resources, marine and maritime research, c) safe, efficient, clean energy, d) sustainable, smart, integrated transport, e) actions on climate change and efficient use of resources and raw materials, f) social change and innovation, g) digital economy and society safety, protection and defence. Addressing these challenges through collaborative and multi-disciplinary R&D and innovation is one of the four strategic goals of the Spanish Strategy for Science, Technology and Innovation 2013-20.

Encouraging business R&D and innovation

A critical challenge for improving competitiveness and economic growth in Spain is improving the innovation capacity of the business sector. The innovation performance of the Spanish business sector still lags behind the OECD median in several dimensions (figure 5^{a,d,e,f,g}). The gap is particularly important in terms of R&D activity and patenting. Few Spanish firms appear in the top 500 corporate R&D investors. The structural features of BERD remain pretty much the same as in 2007. As in most OECD countries, R&D is mostly concentrated in the manufacturing sector accounting for 60% of BERD, whereas services represent around 35%. Foreign affiliates account for 40%. The share of SMEs and large firms in BERD is almost even. Recent changes have been introduced to improve innovative entrepreneurship, as this is an important driver of employment, including a new Law (14/2013) in support of entrepreneurship and their internationalisation. Venture capital remains under-developed (figure 5^{h,i,j}) and the number of young patenting firms ranks at the bottom of OECD indicators. Business start-ups are smaller and with a lower survival rate than most of their Euro-area counterparts. The ease of entrepreneurship index ranks at the bottom-half group of OECD countries.

Instruments to promote business innovation currently in use include: credit loans and other financial instruments (e.g. CDTI RDI projects, EMPLEA and public-private collaborative projects for societal challenges), and competitive grants (e.g. NEOTEC, technology platforms, collaborative R&D), equity financing and venture capital (Fondo INNVIERTE), as well as tax incentives on corporate income for business R&D and for IP revenues, and public procurement for R&D and innovation. Programmes for start-ups and SMEs include: The NEOTEC programme (competitive grants) for young innovative firms, and the Horizonte PYME -which supports the business growth of SMEs through proof of concepts and scientific, technical or commercial feasibility, and the Enterprise Growth Program. The latter provides business services to SMEs with potential to grow such as coaching and personalised consulting in digitalisation, innovation, finance, marketing and commercialisation, and other areas. At regional level, a network of technological and innovation centres, science parks and institutions such as TECNALIA –the biggest research and technology organization, provide technology transfer, and extension and consulting services to companies including those in traditional manufacturing sectors as well as in technological domains such as nanotechnologies, new materials, advance manufacturing, etc. which are important for the enabling the next production revolution.

Improving human resources and skills for innovation

Skills for innovation are an important area where Spain needs to improve. Although tertiary education attainment in adult population are near (slightly superior) the OECD median (figure 5^{b,v,w}), investments in tertiary education (per GDP) remain below the general trend in developed countries. As regards PISA results in science and Phds in science and engineering, Spain ranks in the bottom half OECD although the number of PhD graduates in general increased dramatically in the 2000s prior to the crisis. The government aims to further raise STI skills and training capacities to international standards. In the context of fiscal consolidation, between 2010 and 2014, and in line with the policy for all the public employment vacancies, the government temporarily limited the capacity of the public research institutions and universities to call





for new public employment permanent positions and to replace retirements. Since 2015 the situation has returned to normal and the universities and public research organisations could create new openings for hiring permanent researchers. Furthermore, last year the government approved fifty new positions (50) for permanent researchers in public research organisations (Investigador distinguido) with same rights than civil servants but under the regular labour law. Limited public competitive project funding for R&D also affected temporary positions. However the government has maintained the principal programmes for the training and employability of PhDs; Juan de la Cierva, Ramón y Cajal, Industrial Phds o Torres Quevedo provide opportunities for training and temporary postdocs positions in universities, PRIs and firms.

The Spanish National Plan established several measures to improve support to training, human capital formation, the mobility of human capital between research organisations and the private sector, and optimization of recruiting policies for researchers in the public sector. The plan for the “Promotion of Talents and their employability in R&D and innovation” contains specific measures to increase the uptake of doctoral programmes, training of technologists, and the hiring of young researchers in training. These are mainly competitive tenders and subsidies, and extension of existing contract programs for PhDs.

Improving the governance of innovation system and policy

The improvement of STI governance and administration of STI policies continues but the process of reforming has been slow. In November 2015, the National Research Agency was finally created. This organisation has been tasked with the efficient management of public R&D investment through the elaboration and implementation of Spanish research funding policy. The agency has incorporated the ANEP that has been in charge of the peer review and ex-ante evaluations of competitive R&D funding since 1986, and has included a strong mandate of ex-post scientific and technical monitoring and evaluation and impact assessment of the funding instruments in line with international standards.

Strengthening the public research system

The government aims to reinforce public research capabilities and to foster research excellence and infrastructures in order to increase the international impact of universities and research centres. Spain's performance in scientific publications is at the OECD median, although the ratio of public R&D expenditures to GDP and the density of global 500 universities are slightly below (figure 5^{a,b,c}). A major challenge for the public research system is to continue improving the quality of outputs, now in the OECD average, and to better contribute to industrial competitiveness and solving societal challenges commensurate with national strategic plans. Between 2010 and 2014, government appropriation for R&D decreased by 30% and this has limited has limited strengthening of the STI system and consequently, Spain's growth potential. The central government's budget for public expenditure on R&D in 2014, 2015 and 2016 indicates that the decreasing trend has been reversed; however, budget levels remain at the 2006 level (EC, 2015).

One of the main objectives of the Spanish Strategy is to promote institutional strengthening through rewarding and funding Spanish international centres of excellence, the already recognized “Severo Ochoa and María de Maeztu” Programme for research centres and units. Performance evaluation of individual researchers employed in universities and PRIs was established in 1989. An individual-level permanent increase of salary, provided on the basis of a favourable assessment of the research outputs of 6 years, could be granted after a review. Having a minimum number of positive 6 year evaluations is also used as requirement for participation in some hiring and selection committees, or a reduction in teaching activities, etc.



Some key STI performance indicators

Figure 2. Economic performance

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

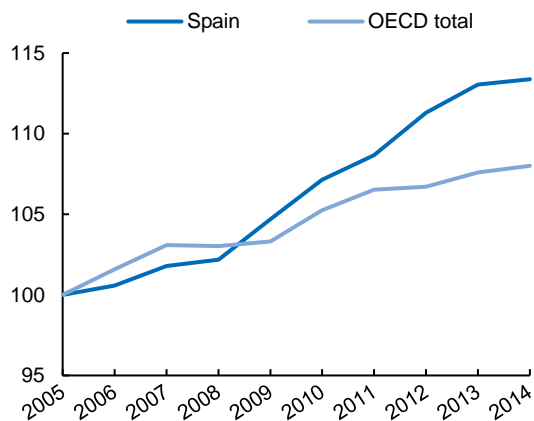


Figure 3. Environmental performance

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

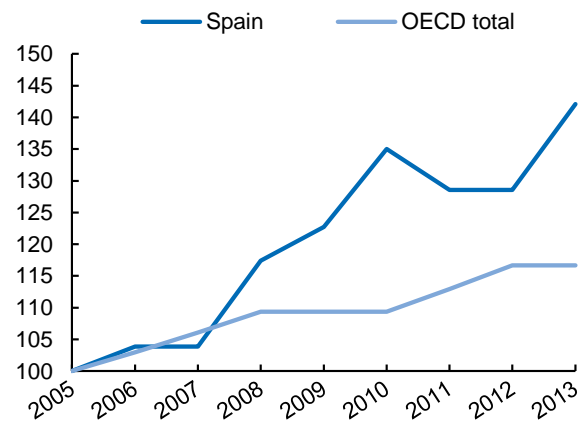
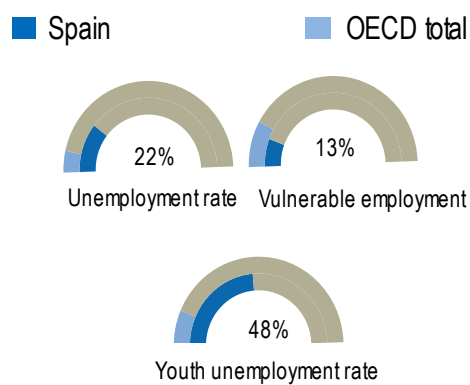


Figure 4. Unemployment

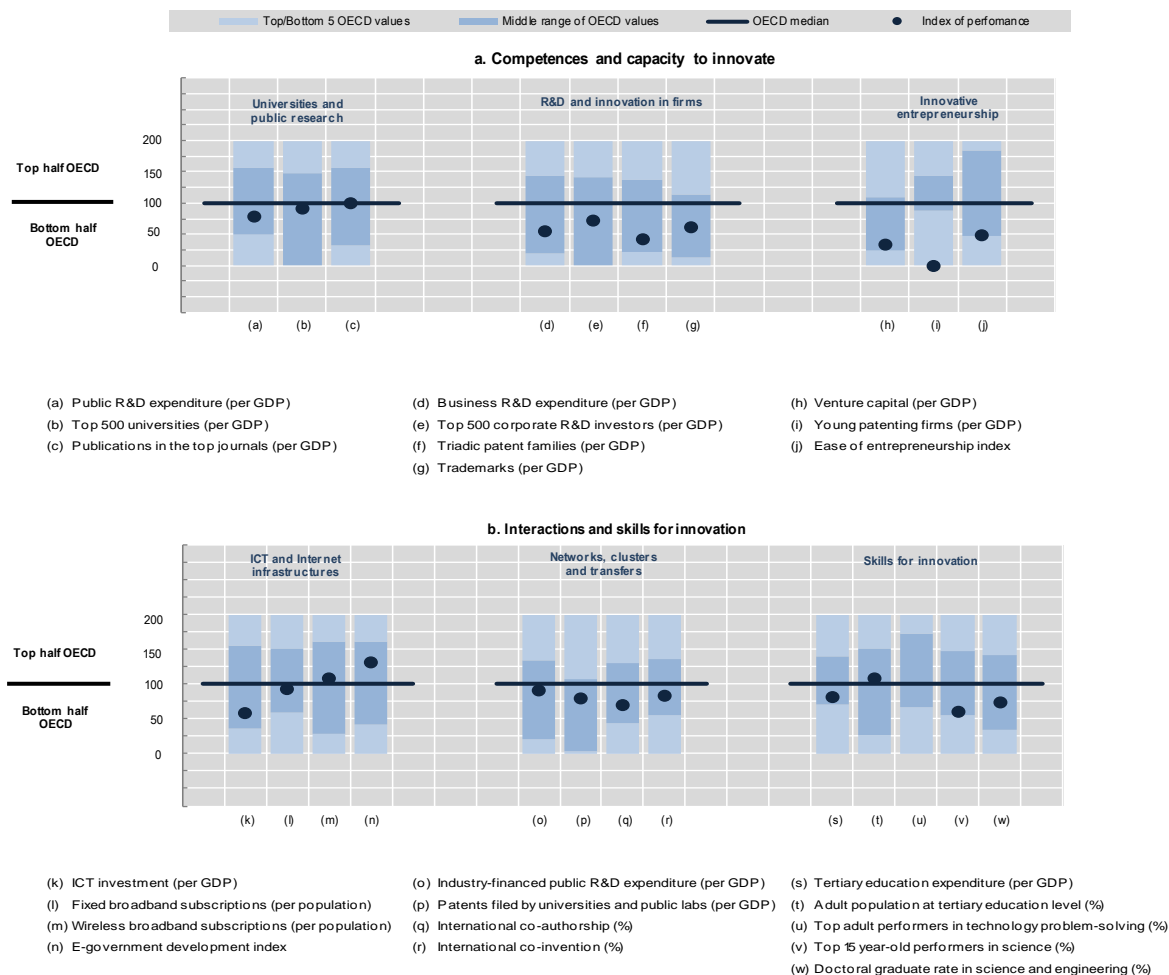
2015 or latest year available, percentages



Benchmarking national STI systems

Figure 5. Science and Innovation in Spain

Comparative performance of national science and innovation systems, 2016



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



Highlights of the Spanish STI system

ICT and Internet infrastructures

The ICT capabilities of Spain have been improving but not evolving equally across the different types of ICT investment (figure 5^{b,k,l,m,n}). Spain ranks low in terms of ICT investment (per GDP) and scores at the median of OECD in fixed broadband subscriptions (per population) and wireless broadband subscriptions. In contrast, it scores relatively well in terms of ICT development for public administration and services, according to the e-government development index.

The Spanish government also attaches importance to ICT infrastructure (the Digital Agenda for Spain 2013-20 replaces the Strategy for Avanza2). Support for ICT firms to innovate and conduct R&D (Strategic Action on Digital Society and Economy) amounted to USD 808 million (EUR 550 million). The “Strategic Action for the Economy and the Digital Society” (2013-16), included in the Spanish National Plan for Scientific and Technical Research and Innovation (2013-16), brings together a set of measures designed to promote the adoption of digital technologies and the development of the Information Society. The target population are SMEs. The main funding instruments of the Agenda are competitive grants and loans. In 2014, the budget allocated was 550 million euros. The Strategic Action integrates the measures set out in the “Digital Agenda for Spain”, designed to provide a boost for the Spanish System for Research, Development and Innovation in the field of information technologies, communications and the information society. The Digital Agenda for Spain also includes ecommerce, e-administration, health care, and telecommunication networks, with a budget of USD 1.5 billion (EUR 1 billion).

Technology transfer and commercialisation

As in other OECD countries, enhancing the contribution of public research to the economy and society is a great challenge. In terms of industry-science linkages and the commercialisation of public research, Spain has made significant progress in developing an eco-system to foster interactions between public research and business but low demand for research and low absorptive capacity in the business sector remains an obstacle, particularly for SMEs. As a consequence, Spain scores below OECD in several indicators (figure 5^{b,o,p}) such as the share of industry-financed public R&D (as a share of GDP). In spite of an increased in university patenting in recent years, its intensity (relative to the size of the economy) scores at the bottom half of OECD.

Although most KT actions and related costs are eligible as part of R&D projects’ grants. Measures to foster KT and commercialization within Universities and PRIs include the adoption of a new action plan (2015-2020) targeting: training and skills on KT, incentives to researchers, internationalisation of results, public-private partnerships, new models of Technology Transfer Offices (TTOs), definition of KT indicators among others. Coordination among national and regional KT agents has been improved by the appointment of a national focal point for knowledge transfer activities within the State Secretariat for Research, Development and Innovation, as well as by the appointment of 17 regional focal points, (one per Autonomous Community). Finally, the Royal Decree 415/2015 introduced a significant reform: it recognises the participation of researchers in knowledge transfer activities in academic careers. Notable initiatives to support industry-science research collaboration include the Retos Colaboracion programme in the Spanish National Plan and the CIEN Strategic Business Research Consortia.

Clusters and regional policies

The integration of the Smart Specialisation Strategies launched by the European Union in the framework of the Spanish Strategy on STI led to an integrated agenda with the Autonomous Regions to promote structural change based on: (1) support for R&D&I activities directed at the demands of stakeholders; (2) the intensive use of information and communication technologies, and (3) boosting business development and the competitiveness of small- and medium-sized businesses. The Innovating Corporate Associations





programme (Programa de Agrupaciones Empresariales Innovadoras (AEI)), launched in 2007, provides support for the creation and development of innovating clusters. Since 2010, MINETUR introduced the program of “Support to Business Angel Networks” to promote the strengthening and professionalisation of business angels. Closely linked to the “Challenges of Society and the Digital Economy” are the development and promotion measures for the development of «Smart Cities», urban environments that are moving towards the economic and social transformation of their territories through co-ordinated initiatives and investment in ICT/e-infrastructure and networks.

Globalisation

Spain's public research base is well connected internationally judging by co-authorship data but more is needed to deepen the integration of the overall innovation system into international networks, especially by business firms (figure 5⁹). The government's “Strategy for the Internationalisation of Spanish Universities 2015-2020” therefore seeks to expand Spain's participation in international programmes and international networks of research and innovation. The Europa Managers (Europa Gestores) and Europa Research (Europa Investigación) provide funds for the recruitment of experts at universities, public research institutions and other public and private R&D non-profit entities with the objective to increase the participation of Spanish stakeholders in international projects and programmes, in particular Horizon 2020. Spain has improved its participation in Horizon 2020. Spain obtained 553,3 million in the first 73 recorded calls of the European research and innovation program, which placed it as the fifth recipient of funding. According to interim results, for the period 2014-15, Spain improved its position and now ranks 4th, behind Germany, United Kingdom and France.

In regards to the business sector, the internationalisation of firms remains an area of concern. Through the competitive programme, Empresa Nacional de Innovacion (ENISA) finances SMEs in their internationalization process. There will be projects based on innovative, viable, profitable and proven business models facing global and competitive markets. The program CDTI-Interacionaliza (managed by CDTI) funds projects that aim to promote international use of the results from R&D carried out by Spanish companies and these activities may include transfer technology transfer, adaptation and promotion in international markets. According to aggregated results of H2020 competitive funding calls, Spanish SME enterprises are performing quite well.

Skills for innovation

As part of the measures to improve skill match and integration of university graduates to the productive sector, the Ministry of Education, Culture and Sports (MECD) in collaboration with the Social Security has launched a Map (the “Employability and Employment of Spanish graduates Map”) crossing data registration with Social Security. The Employability Map is a tool to match supply and demand. A recent reform has revisited regulations for the recognition of foreign qualifications in higher education. Additionally, the Royal Decree (967/2014) sets the conditions and the procedure for the approval and declaration of equivalence for official university diplomas and academic level, and validation of foreign higher education studies. The reform also updated the procedure for correspondence to determine the levels of Spanish qualifications for higher education in the official titles of architect, engineer, graduate, technical architect, technical engineer and diplomatic. Spain ranks below the OECD median in terms of performance in science among in the group of top 15 year-old students and in doctoral graduate rates in science and engineering. In contrast, the share of tertiary education expenditure and share of tertiary education attainment of the adult population with tertiary education level (percentages) are both close to the OECD average.





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

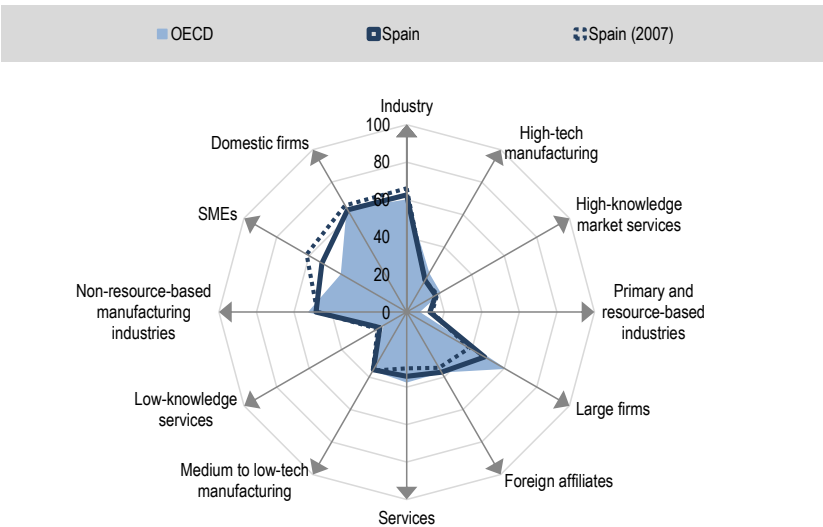
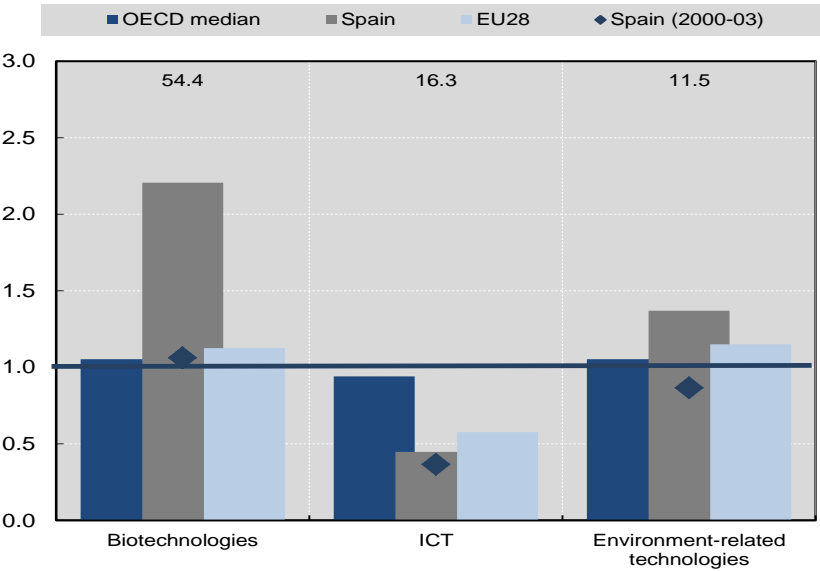
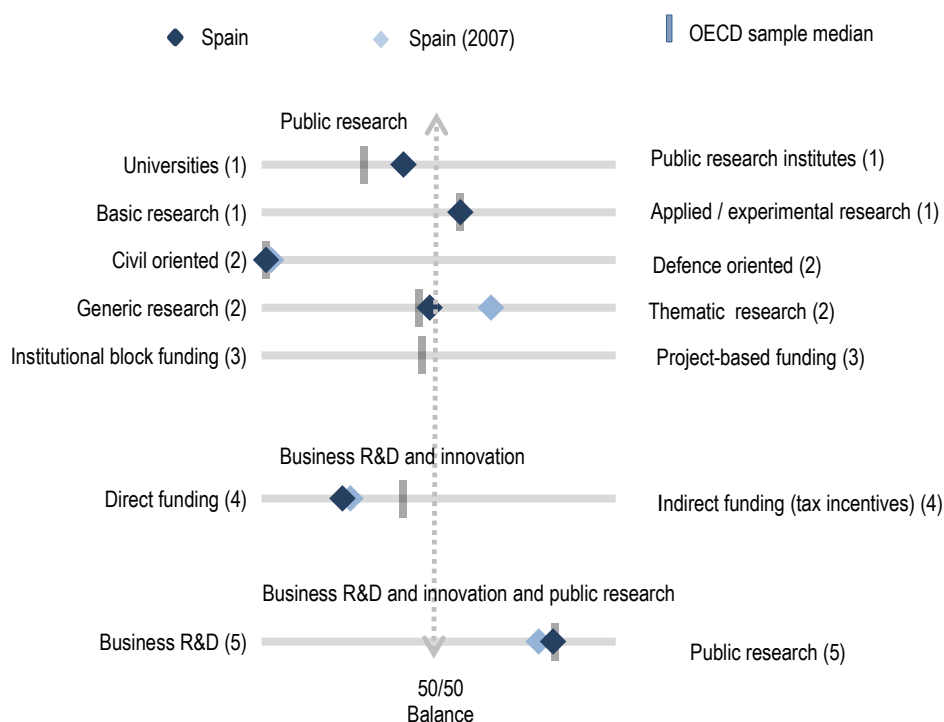


Figure 7. Revealed technology advantage in selected fields, 2011-13
Index based on IP5 patent families applications



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.

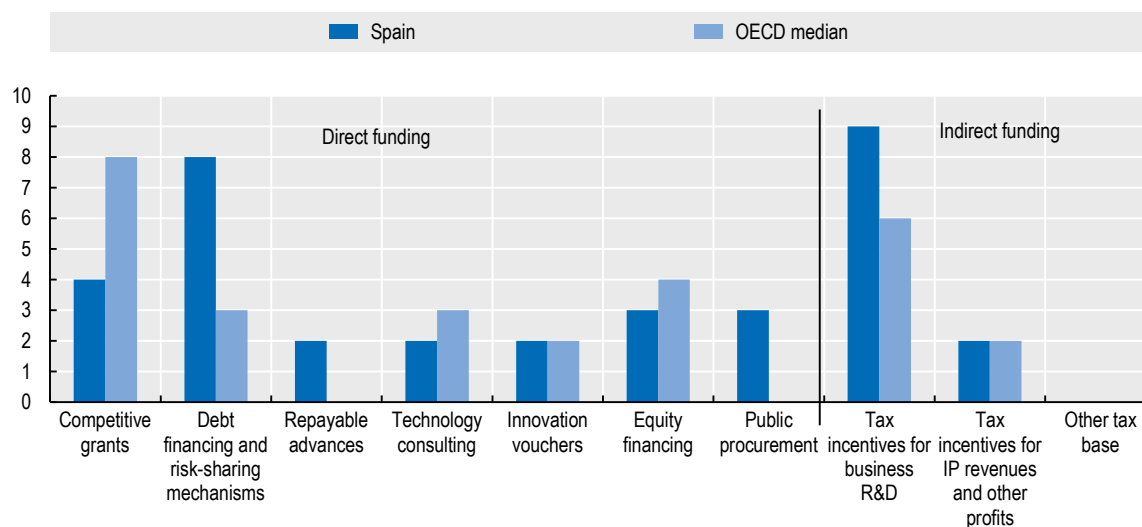
(2). Balance as a share of total government budget appropriations and outlays for R&D (GBAORD).

(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 EC/OECD STI Policy Survey 2016 and 2014. Spain's responses are available in the EC/OECD STI Policy Database, edition 2016 at http://qdd.oecd.org/DATA/STIPSurvey/ESP...STIO_2016.

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

StatLink  <http://dx.doi.org/10.1787/888933434078>

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