European Commission

Research and Innovation performance in Spain

Country Profile

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Spain

The challenge of effective R&I for a more knowledge-intensive economy

Summary: Performance in research and innovation

The indicators in the table below present a synthesis of research and innovation (R&I) performance in Spain. They relate knowledge investment and input to performance and economic output throughout the innovation cycle. They show thematic strengths in key technologies and also the high-tech and medium-tech contribution to the trade balance. The indicator on excellence in science and technology takes into consideration the quality of scientific production as well as technological development. The Innovation Output Indicator covers technological innovation, skills in knowledge-intensive activities, the competitiveness of knowledge-intensive goods and services, and the innovativeness of fast-growing enterprises, focusing on innovation output. The indicator on knowledge-intensity of the economy focuses on the economy's sectoral composition and specialisation and shows the evolution of the weight of knowledge-intensive sectors and products.

Key indicators of research and innovation performance	
R&D intensity 2012: **1.30 %** (EU: 2.07 %; US: 2.79 %) 2007-2012: **+0.5 %** (EU: 2.4 %; US: 1.2 %)	***Excellence in S&T***[1] 2012: **33.2** (EU: 47.8; US: 58.1) 2007-2012: **+0.4 %** (EU: +2.9 %; US: -0.2)
Innovation Output Indicator 2012: **80.8** (EU: 101.6)	***Knowledge-intensity of the economy***[2] 2012: **38.0** (EU: 51.2; US: 59.9) 2007-2012: **+2.1 %** (EU: +1.0 %; US: +0.5 %)
Areas of marked S&T specialisations: Food, agriculture and fisheries, transport technologies, construction technologies, environment and biotechnologies	***HT + MT contribution to the trade balance*** 2012: **3.3 %** (EU: 4.23 %; US: 1.02 %) 2007-2012: **+15.9 %** (EU: +4.8 %; US: -32.3 %)

Spain's investment in research and development (R&D) grew faster than the EU average over the period 2000-2008. Total expenditure in R&D reached its peak in 2008.The strongest increase was in the business sector, where total investment in R&D grew faster than in the public sector. Recent reforms have reduced the costs of creating a business. Public investment in R&D even increased beyond the economic crisis, in a counter-cyclic effort up to 2010. However, fiscal constraints forced Spain to cut public R&D expenditure from 2011 onwards, and with the effect of the economic recession, business R&D investment has also fallen.

Excellence in science and technology improved slightly over the 2007-2012 period; nevertheless, Spain is falling further behind the EU average in terms of excellence. However, structural change towards a more knowledge-intensive economy is under way with increase growth registered in the knowledge-intensive activities (KIAs) as a % of total employment. The change in Spain is slow compared to both the EU and the USA. One positive sign is the rising contribution of high-tech and medium-high-tech goods to the trade balance, indicating that the growing Spanish competitiveness is not only based on cost factors but also on a strong technology component.

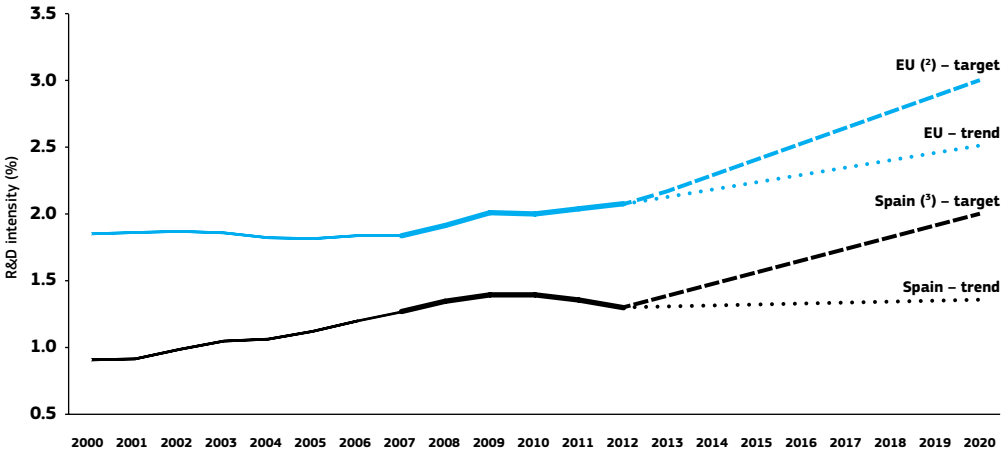
Thus, the main challenges remaining for Spain are to ensure smart fiscal consolidation by maintaining its investment in knowledge while ensuring a high quality of public spending. There is room to further improve the effectiveness of this investment with efforts towards a more performance-based funding allocation to R&I. Full implementation of the new Law for Science, Technology and Innovation, adopted in 2011, would also improve the quality of public spending, including accelerating the setting up of the national research agency and legal changes to stimulate researcher mobility between the public and private sectors.

[1] Composite indicator that includes PCT per population, ERC grants per public R&D, top universities and research institutes per GERD and highly cited publications per total publications.

[2] Composite indicator that includes R&D total expenditure, skills, sectorial specialisation, international specialisation and internationalisation sub-indicators.

Investing in knowledge

Spain – R&D intensity projections: 2000–2020 (1)



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: DG Research and Innovation, Eurostat, Member State
Notes: (1) The R&D intensity projections based on trends are derived from the average annual growth in R&D intensity for 2007–2012.
(2) EU: The projection is based on the R&D intensity target of 3.0 % for 2020.
(3) ES: The projection is based on a tentative R&D intensity target of 2.0 % for 2020.

Spain is not on track to reach its national R&D target for 2020, despite a lowering of this target from 3 % to 2 % in the national reform programme 2013. Reaching this national target of 2 % R&D intensity would require an average annual growth of 5.5 % over the period 2012-2020, implying substantial efforts by the public sector combined with strong framework conditions spurring a change in business models in the private sector towards growth built on R&D and knowledge investments.

The public sector represented about half of total R&D investment in Spain. Total expenditures in R&D amounted to EUR 13.392 million in 2012, down by 5.6 % compared to 2011. By sector of performance, the fall over the last year was higher in the public sector (-7.4 %) than in the private sector (-4.1 %). At the same time, expenditure in higher education fell by 7.2 % in 2012, although higher education expenditure on R&D did experience an average annual growth rate of 5.4 % over the period 2007-2010.

Business-sector R&D investment fell slightly every year over the 2008-2012 period (the average annual growth rate of total BERD was 13.7 % over the period 2002-2007, which changed to a negative average annual growth rate of -3.2 % over the 2008-2012 period). In the business sector, 78 % of R&D investment is made by a company's own resources, while most of the remaining costs are financed by public administration and foreign capital.

Out of almost EUR 34.7 billion of Structural Funds allocated to Spain over the 2007-2013 programming period, around EUR 5.5 billion (15.8 % of the total) related to RTDI[3]. Spain also performs well in terms of the ratio of EC funding from FP7 to its GERD, well above the EU average and with a positive growth rate.

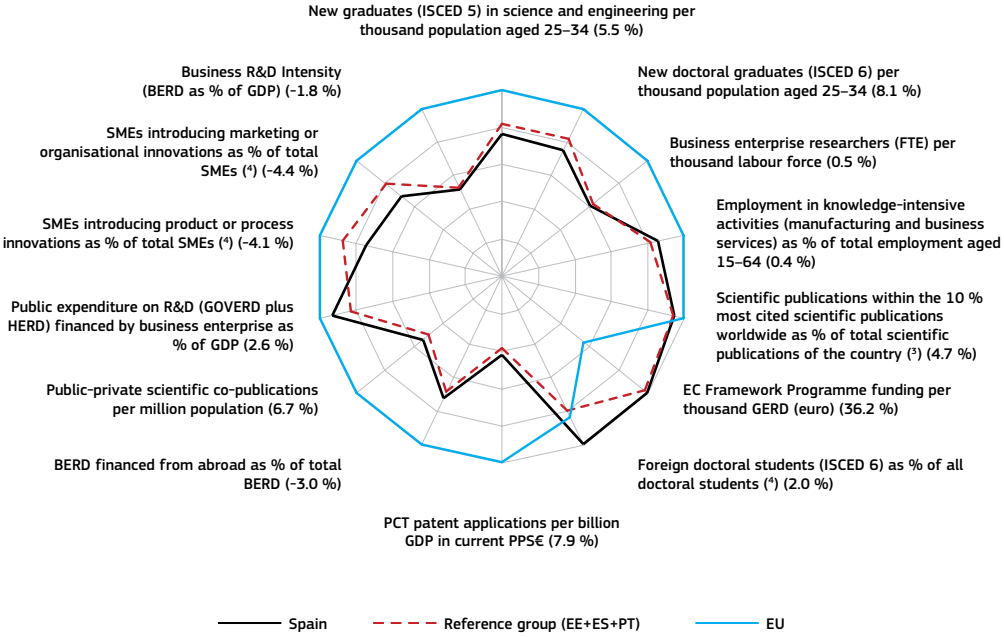
[3] RTDI includes the following sectors: (01) RTD activities in research centres, (02) RTD infrastructures and centres of competence, (03) Technology transfer and improvement of cooperation of networks, (04) Assistance to RTD, particularly in SMEs (and RTD services in research centres), (06) Assistance to SMEs for the promotion of environmentally friendly products and processes, (07) Investment in firms directly linked to research and innovation, (09) Other methods to stimulate research and innovation and entrepreneurship in SMEs, and (74) Developing human potential in the field of research and innovation.

An effective research and innovation system building on the European Research Area

The graph below illustrates the strengths and weaknesses of the Spanish R&I system. Reading clockwise, it provides information on human resources, scientific production, technology valorisation and innovation. Average annual growth rates from 2007 to the latest available year are given in brackets.

Spain, 2012 (1)

In brackets: average annual growth for Spain, 2007–2012 (2)



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: DG Research and Innovation, Eurostat, OECD, Science-Metrix/Scopus (Elsevier), Innovation Union Scoreboard.
Notes: (1) The values refer to 2012 or to the latest available year.
(2) Growth rates which do not refer to 2007–2012 refer to growth between the earliest available year and the latest available year for which comparable data are available over the period 2007–2012.
(3) Fractional counting method.
(4) EU does not include EL.

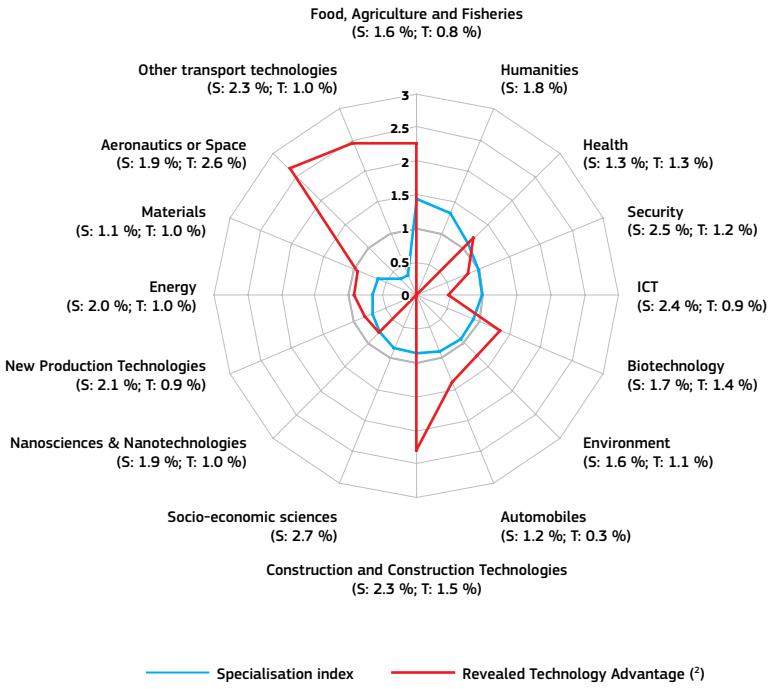
Spain's R&I system is building up obvious strengths in its internationalisation, in particular in terms of integration in the EU's Seventh Framework Programme (FP7) and in attracting foreign doctoral students. Positive trends are also visible in human resource training, public-private cooperation and the knowledge-intensity of the economy, although continued efforts are still needed to fully catch-up. The worrying trend over the period 2007-2012 was the shrinking R&I activity in the private sector, in particular among small and medium-sized enterprises (SMEs).

In terms of integration in the European Research Area (ERA) and beyond, Spain increased its international scientific co-publications (total number of international co-publications involving a Spanish author and at least one author from another country) by 16 % over the period 2000-2011. The level of Spain's international co-publication (29.1 %) is still below that of comparable European countries (France 35.2 % or Portugal 41 %), but is comparable to that of Italy (30.8 %). Overall, Spain is well connected to the major European research hubs, in particular in France, the United Kingdom and Germany, but also to Italy and Portugal. However, a closer look reveals that this is mainly in three autonomous communities – Cataluña, Valencia and Madrid – where close integration has developed with the European networks, while the other Spanish regions are mainly connected inside Spain.

Spain's scientific and technological strengths

The graph below illustrates the areas, based on the FP7 thematic priorities, where Spain shows scientific and technological specialisations. Both the specialisation index (SI, based on the number of publications) and the revealed technological advantage (RTA, based on the number of patents) measure the country's scientific (SI) and technological (RTA) capacity compared to that at the world level. For each specialisation field it provides information on the growth rate in the number of publications and patents.

Spain – S&T National Specialisation ([1]) in thematic priorities, 2000–2010
in brackets: growth rate in number of publications ([3]) (S) and in number of patents ([4]) (T)



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: Science-Metrix Canada; Bocconi University, Italy
Notes: ([1]) Values over 1 show specialisation; values under 1 show a lack of specialisation.
([2]) The Revealed Technology Advantage (RTA) is calculated based on the data corresponding to the WIPO-PCT number of patent applications by country of inventors. For the thematic priorities with fewer than 5 patent applications over 2000–2010, the RTA is not taken into account. Patent applications in 'Aeronautics or Space' refer only to 'Aeronautics' data.
([3]) The growth rate index of the publications (S) refers to the periods 2000–2004 and 2005–2009.
([4]) The growth rate in number of patents (T) refers to the periods 2000–2002 and 2003–2006.

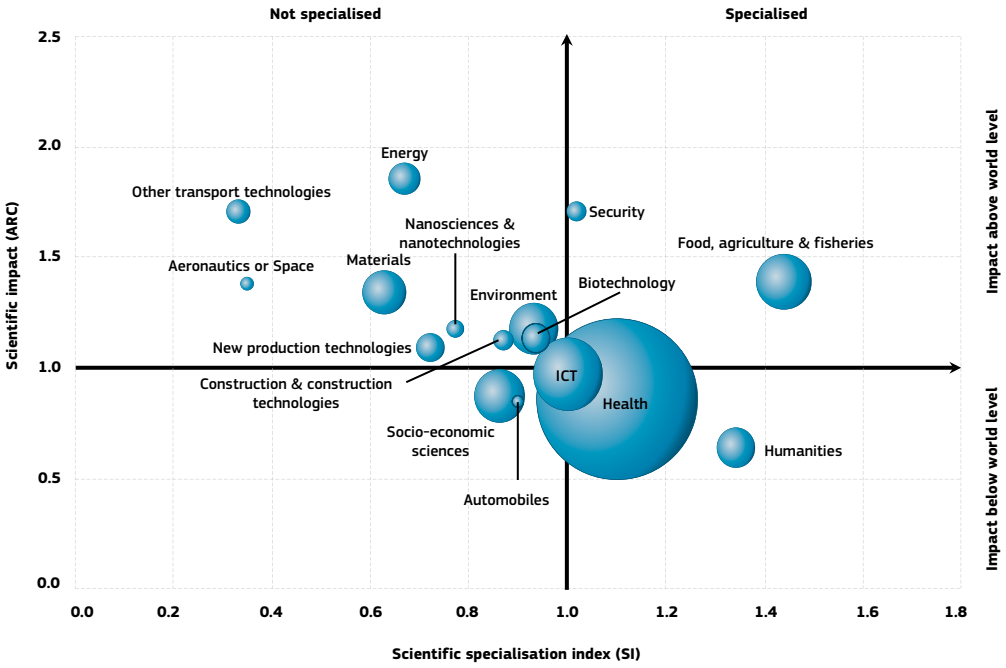
Comparison of the scientific profile with the technology profile shows a good match only in the field of food, agriculture and fisheries. Spain's technology production is also specialised in transport technologies, construction technologies and, to a certain extent, in the environment, and biotechnologies. In the fields where Spain is specialised in both science and technology (food and agriculture), the ERA offers good opportunities for cooperation, in particular scientific cooperation with researchers from several Northern and Eastern European countries, and technological cooperation with Norway, Iceland, Denmark, Lithuania, the Netherlands, Switzerland, Slovakia and Portugal[4].

[4] Innovation Union Competitiveness Report 2013, SWD(2013) 505

The relative strengths in patenting are visible in Cataluña, Madrid and the Basque country, although Aragon and Cantabria are also present in energy patenting. The main technology sectors are food and agriculture, biotechnology, ICT, aeronautics or space, other transport technologies and energy, although the core technology development in these sectors in Europe is taking place in regions outside Spain. The data on patenting in industrial sectors show that Cataluña has particular strengths in organic fine chemistry, pharmaceuticals, and food chemistry, while the Basque country has similar technology strengths in engines, pumps and turbines, thermal process and apparatus, furniture, games, other consumer goods, machine tools, electrical motors, and green energy.

The graph below illustrates the positional analysis of Spanish publications showing the country's situation in terms of scientific specialisation and scientific impact over the period 2000-2010. The scientific production of the country is reflected by the size of bubbles, which corresponds to the share of scientific publications from a science field in the country's total publications.

Spain – Positional analysis of publications in Scopus (specialisation versus impact), 2000–2010



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: Science-Metrix Canada, based on Scopus
Note: Scientific specialisation includes 2000–2010 data; the impact is calculated for publications of 2000–2006, citation window 2007–2009.

As shown in the graph above, scientific quality, as measured by the 10 % most-cited publications, has grown by 3.6 % over the period 2007-2012. The largest numbers of scientific articles are produced in the field of health, followed by ICT, environment, food, agriculture and fisheries. Scientific production in Spain is also important in the fields of energy, materials, and in socio-economic sciences. Scientific excellence can be found in particular in the field of energy, other transport technologies, security, materials science and in food, agriculture and fisheries. However, those areas with the highest impact are still underdeveloped in terms of the number of publications, with the exception of research in food, agriculture and fisheries. Likewise, scientific impact is only average in the fields where most scientific articles are produced, such as health, ICT, and socio-economic sciences.

Policies and reforms for research and innovation

The Spanish authorities are addressing these challenges in the Law for Science, Technology and Innovation, which was adopted with broad political support in 2011, as well as in the Spanish Strategy for Science, Technology and Innovation and the State Plan for Scientific and Technical Research and Innovation, adopted in February 2013. Reform proposals cover the governance system, the quality of human resources, the funding allocation system, and knowledge transfer between actors. Objectives and priorities are well aligned with the objectives of Europe 2020, the Innovation Union and Horizon 2020. The 2011 law simplifies the allocation of competitive funding for R&I by giving responsibility for the allocation of funds to two main bodies: the new national research agency (AEI) and the existing agency for innovation (CDTI). Public-private cooperation will be reinforced by the introduction of legal changes to researchers' contracts, thereby stimulating mobility between the public and the private sector. Legal reforms related to the recruitment and careers of researchers will encourage international outward mobility as well as inward mobility of foreign researchers with high levels of excellence. In addition to these legal reforms, agreed by all parties, a strong policy focus is being placed on technology transfer to the market and on instruments to stimulate private R&D.

The Europe 2020 country specific recommendation on R&I to Spain in 2014 (adopted by the Council on 8 July) indicates the need to identify sources of financing for the new national strategy for science, technology and innovation and to make operational the new State Research Agency.

The implementation of the law and the strategy for the Spanish R&I system is ongoing. With the development of smart specialisation strategies in the 17 Spanish regions predicted to be finalised early in 2014, it is essential to ensure inter-regional links and coordination between national and regional R&I policies. Most Spanish regions have finalised their smart specialisation strategies (RIS3). Considering the drafts and final strategies, most regions have chosen to focus on sustainable agriculture and natural resources (14 regions) and on intelligent and sustainable transport (13 regions). A considerable number of regions have also proposed specialisation in sustainable energy (9) and the digital society (9). In terms of economic sectors, the smart specialisation strategies are focus mainly on the agri-food sector, industrial sector, tourism, health, energy, communication, and water. In many regions, the smart specialisation strategies are cross-sectorial, proposing innovation in new combinations of industries and sectors, such as products and services combining biofood-health and tourism, or energy-ICT-renewables. The industrial profile of the region and its connectedness to global or European value chains are taken into consideration, as are a more forward-looking vision for society and the economy of the region in 2020 in some of the regions.

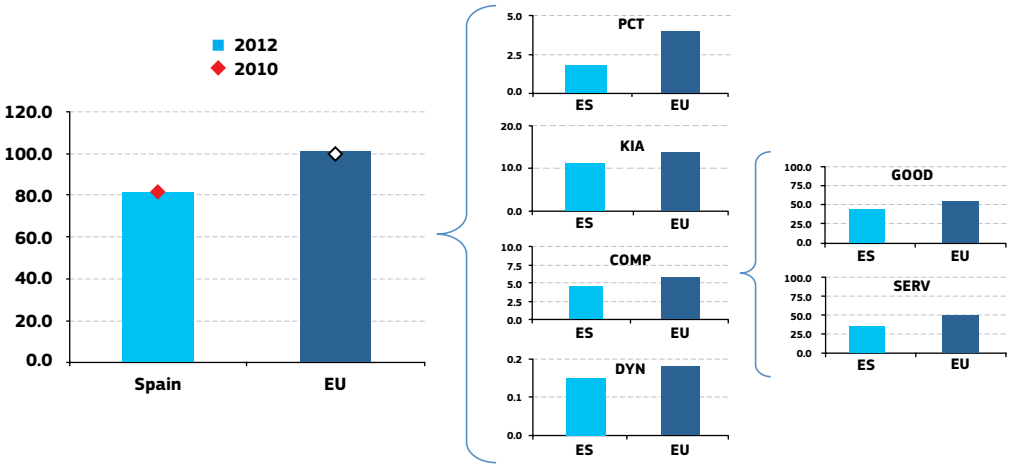
In 2013, the Spanish government also launched new programmes supporting risk and equity funding for innovation-based firms, such as the 'Isabel la Catolica' programme. Legal framework conditions for business angels have been reinforced, and measures have been taken to enhance the business environment, notably the market unity law and the law for the promotion of entrepreneurship and its internationalisation. The objective is to support the internationalisation of businesses, simplify the business environment of SMEs, and to promote a second chance for entrepreneurs. There is room for further reforms enhancing the quality of public spending on R&D in line with the structural reforms pushed forward by the ERA agenda. The allocation of institutional funding to public research organisations in Spain is currently, and for the most part, not based on performance criteria. In fact, a competitive allocation of institutional funding based on performance criteria would contribute to a higher quality of scientific outputs. Moreover, the system's science base is not reliant on international peer review. In 2013, a focused international peer review of the Spanish R&I system was launched in the context of ERAC.

Innovation Output Indicator

The Innovation Output Indicator, launched by the European Commission in 2013, was developed at the request of the European Council to benchmark national innovation policies and to monitor the EU's performance against its main trading partners. It measures the extent to which ideas stemming from innovative sectors are capable of reaching the market, providing better jobs and making Europe more competitive. The indicator focuses on four policy axes: growth via technology – (patents); jobs (knowledge-intensive employment); long-term global competitiveness (trade in mid/high-tech commodities); and future business opportunities (jobs in innovative fast-growing firms).

The graph below enables a comprehensive comparison of Spain's position on the indicator's different components:

Spain – Innovation Output Indicator



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: Eurostat, OECD, Innovation Union Scoreboard 2014, DG JRC
Notes: All data refer to 2012 except PCT data, which refer to 2010.
PCT = Number of PCT patent applications per billion GDP, PPS.
KIA = Employment in knowledge-intensive activities in business industries as % of total employment.
DYN = Innovativeness of high-growth enterprises (employment-weighted average).
COMP = Combination of sub-components GOOD and SERV, using equal weights.
GOOD = High-tech and medium-high-tech products exports as % total exports. EU value refers to EU-28 average (extra-EU = 59.7 %).
SERV = Knowledge-intensive services exports as % of total service exports. EU value refers to EU-28 average (extra-EU = 56 %).

Spain is a medium-low performer in the European innovation indicator. It performs below the EU average in all components of the innovation indicator. Furthermore, its performance is stagnating, and is particularly low in PCT patents and in the share of knowledge-intensive service exports. The latter is explained by the importance of service exports not classified as knowledge-intensive services, such as tourism and related services, in the Spanish economy.

There are around 18 000 firms in Spain actively involved in innovation in their business models. During its economic crisis, the number of companies carrying out innovation has been reduced by half (from an estimated 36 000 in 2008). The sectors with the largest share of innovative firms were R&D services, transport equipment, pharmaceuticals, electronics, chemistry, telecommunications, ICT services, banking and assurance, and machinery. The innovation intensity (firm's investment in innovation as a share of overall revenue) fell from 2.2 % in 2009 to 1.75 % in 2012. In 2011, the innovative firms cooperated with both private and public actors in their innovation process: 47 % cooperated with suppliers for innovation, 37.7 % with universities, 34.7 % with technology centres, 30.2 % with private consultants, 29 % with clients and only 21.9 % with public research organisations. Compared to 2010, the innovative firms had slightly increased their cooperation with all these actors, except for a slight fall in the cooperation with suppliers. According to Spanish companies, the largest obstacles for innovation are costs (highlighted by 44 % of the firms), lack of interest in innovation (30 %), lack of markets for innovative products (27 %) and lack of knowledge (22 %)[5].

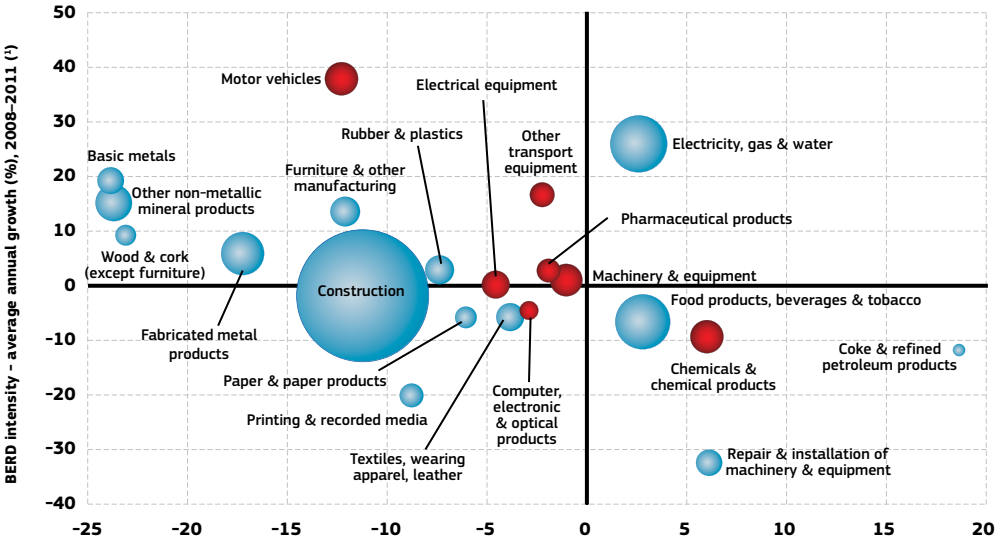
Access to finance is still among the top concerns of Spanish SMEs. In 2011, risk capital and private equity funding in Spain came mostly from foreign investors (82 %). Total risk capital reached a peak in 2007. A large number of the risk capital investments were concentrated in five large operations in 2011. However, investments (26.3 %) were also made in high-growth firms in their expansion phase. In the period 2001-2011, risk capital has invested in a total of 2930 firms in Spain. In addition, venture-capital investment fell in 2011, from EUR 242 million in 2010 to EUR 208 million in 2011. Venture capital was mainly invested in professional services, the health sector, industrial services and in the energy, and natural resources sectors.

5 INE 2012; COTEC 2013 report

Upgrading the manufacturing sector through research and technologies

The graph below illustrates the upgrading of knowledge in different manufacturing industries. The position on the horizontal axis illustrates the changing weight of each industry sector in value added over the period. The general trend to the left-hand side reflects the decline in manufacturing in the overall economy. The sectors above the x-axis are those where research intensity has increased over time. The size of the bubble represents the sector share (in value added) in manufacturing (for all sectors presented on the graph). The red sectors are high-tech or medium-high-tech sectors.

Spain – Share of value added versus BERD intensity: average annual growth, 2008–2011 (1)



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: Eurostat
Notes: (1) 'Basic metals', 'Electricity, gas and water', 'Fabricated metal products', 'Furniture and other manufacturing', 'Motor vehicles', 'Other non-metallic mineral products', 'Other transport equipment', 'Paper and paper products', 'Printing and reproduction of recorded media'', 'Repair and installation of machinery and equipment', 'Rubber and plastic products','Wood and cork (except furniture)': 2008–2009.
(2) High-tech and medium-high-tech sectors (NACE Rev. 2 – two-digit level) are shown in red.

In the business sector, R&D expenditures can be found mainly in the R&D services sector, representing 51.9 % of total BERD (not included on the graph), ICT, pharmaceutical, aeronautic construction, motor vehicles, and the chemical sectors. Motor vehicles, other transport equipment, electricity, gas and water, and basic metals and non-metallic mineral products were the business sectors that increased their R&D intensity most over the period 2008-2011. However, with the exception of the electricity, gas and water sector, their weight in the overall Spanish economy diminished. The chemical sector, and the computer and electronic sector, where international competitiveness is largely based on R&D, decreased their R&D intensity between 2008 and 2011. Broadly speaking, electrical equipment, pharmaceutical products, machinery equipment, and the construction sector maintained their R&D intensity.

Larger firms invested more in R&D (with over 80 % of total business R&D investment in aeronautics, motor vehicles, and the pharmaceutical sector). Among these larger firms, the mid-caps dominated. In particular, the sectors with large R&D investments by SMEs were ICT services, professional activities, programming consulting, commerce, chemicals, and machinery equipment. In total, SMEs represented 47.6 % of total business R&D investment in 2011, down from 50.2 % in 2010 (and the SMEs perform 57 % of the business R&D). Compared to other similar countries, one characteristic in Spain is SMEs' high contribution to the total business R&D investment, in particular in service sectors (COTEC report 2013).

Among the world's top 2000 R&D investing firms, Spain numbers 13. These companies are mainly active in the ICT services sector (Telefónica, Amadeus, Indra Systems), in the construction and materials sector (Acciona, ACS, Obrascon-Huarte-Lain), in the pharma and biotech sector (Almirall, Grifols, Zeltia) and in the energy or industrial engineering sectors (Gamesa, Abengoa, Repsol). There is also one bank (Banco Santander) in this list. In 2012, the R&D investments by these firms ranged from EUR 1000 million from Telefónica to around EUR 100 million in the energy sector. All but one of these companies increased their R&D investments from 3-12 % over the three-year period 2009-2012. The largest increases were made by firms in the construction and material sector, registering an R&D investment growth of 20-40 %. Other Spanish firms with considerable R&D investments (among the top 1000 R&D investors in Europe) are Iberdrola (electricity sector), Fagor Electrodomésticos, Amper (telecommunications), CAF (automobiles parts), Azkoyen (industrial machinery), Rovi pharmaceutical lab (pharmaceuticals), and Pescanova (agro-industry) (EU Industrial Scoreboard, 2013).

Key indicators for Spain

SPAIN	2000	2005	2006	2007	2008	2009	2010	2011	2012	Average annual growth 2007–2012 (1) (%)	EU average (2)	Rank within EU
ENABLERS												
Investment in knowledge												
New doctoral graduates (ISCED 6) per thousand population aged 25–34	0.91	0.92	0.94	0.93	0.94	1.03	1.16	1.21	1.37	**8.1**	***1.81***	**18**
Performance in mathematics of 15-year-old students: mean score (PISA study)	:	:	480	:	:	483	:	:	484	**4.4 (3)**	**495 (4)**	**18 (4)**
Business enterprise expenditure on R&D (BERD) as % of GDP	0.49	0.60	0.67	0.71	0.74 (5)	0.72	0.72	0.71	0.69	***-1.8***	**1.31**	**18**
Public expenditure on R&D (GOVERD + HERD) as % of GDP	0.41	0.52	0.53	0.56	0.61	0.67	0.67	0.65	*0.61*	***1.8***	***0.74***	**14**
Venture capital as % of GDP	0.18	0.29	0.29	0.28	0.15	0.09	0.24	0.19	0.14	**-12.5**	**0.29 (6)**	**10 (6)**
S&T excellence and cooperation												
Composite indicator on research excellence	:	:	:	33	:	:	:	:	33	**0.4**	**47.8**	**12**
Scientific publications within the 10% most cited scientific publications worldwide as % of total scientific publications of the country	:	9.2	9.5	9.5	10.1	10.4	:	:	:	**4.7**	**11.0**	**11**
International scientific co-publications per million population	:	350	391	424	459	499	546	603	631	**8.3**	**343**	**16**
Public–private scientific co-publications per million population	:	:	:	22	22	24	26	29	:	**6.7**	**53**	**16**
FIRM ACTIVITIES AND IMPACT												
Innovation contributing to international competitiveness												
PCT patent applications per billion GDP in current PPS (EUR)	0.9	1.3	1.3	1.3	1.4	1.6	1.6	:	:	**7.9**	**3.9**	**14**
License and patent revenues from abroad as % of GDP	0.07	:	0.08	0.04	0.05	0.05	0.06	0.07	:	**21.0**	**0.59**	**17**
Community trademark (CTM) applications per million population	86	136	145	165	153	152	169	173	174	**1.1**	**152**	**12**
Community design (CD) applications per million population	:	23	22	24	22	20	23	21	19	**-4.3**	**29**	**17**
Sales of new-to-market and new-to-firm innovations as % of turnover	:	:	15.9	:	15.9	:	19.0	:	:	**9.2**	**14.4**	**2**
Knowledge-intensive services exports as % total service exports	:	:	:	24.0	22.7	22.5	21.5	21.6	:	**-2.5**	**45.3**	**24**
Contribution of high-tech and medium-tech products to the trade balance as % of total exports plus imports of products	0.29	1.35	1.75	1.58	1.97	1.92	2.56	3.05	3.31	-	**4.23 (7)**	**11**
Growth of total factor productivity (total economy): 2007 = 100	102	100	100	100	99	99	99	100	101	**1 (8)**	**97**	**2**
Factors for structural change and addressing societal challenges												
Composite indicator on structural change	:	:	:	34.2	:	:	:	:	38.0	**2.1**	**51.2**	**20**
Employment in knowledge-intensive activities (manufacturing and business services) as % of total employment aged 15–64	:	:	:	:	11.8	11.8	11.5	11.8	11.9	**0.4**	**13.9**	**19**
SMEs introducing product or process innovations as % of SMEs	:	:	29.5	:	27.5	:	25.3	:	:	**-4.1**	**33.8**	**21**
Environment-related technologies: patent applications to the EPO per billion GDP in current PPS (EUR)	0.05	0.09	0.10	0.10	0.09	0.14	:	:	:	**19.9**	**0.44**	**15**
Health-related technologies: patent applications to the EPO per billion GDP in current PPS (EUR)	0.16	0.28	0.23	0.22	0.22	0.23	:	:	:	**2.8**	**0.53**	**15**
EUROPE 2020 OBJECTIVES FOR GROWTH. JOBS AND SOCIETAL CHALLENGES												
Employment rate of the population aged 20–64 (%)	60.7	67.2 (9)	68.7	69.5	68.3	63.7	62.5	61.6	59.3	**-3.1**	**68.4**	**26**
R&D intensity (GERD as % of GDP)	0.91	1.12	1.20	1.27	1.35	1.39	1.40	1.36	1.30	**0.5**	***2.07***	**16**
Greenhouse gas emissions: 1990 = 100	135	154	151	154	143	130	125	126	:	**-28 (10)**	**83**	**25 (11)**
Share of renewable energy in gross final energy consumption (%)	:	8.4	9.1	9.7	10.8	13.0	13.8	15.1	:	**11.7**	**13.0**	**12**
Share of population aged 30–34 who have successfully completed tertiary education (%)	29.2	38.6	38.1	39.5	39.8	39.4	40.6	40.6	40.1	**0.3**	**35.7**	**12**
Share of population aged 18–24 with at most lower secondary education and not in further education or training (%)	29.1	30.8 (9)	30.5	31.0	31.9	31.2	28.4	26.5	24.9	**-4.3**	**12.7**	**28 (11)**
Share of population at risk of poverty or social exclusion (%)	:	24.3	24.0	23.3	24.5	24.5	26.7	27.7	28.2	**3.9**	**24.8**	**19 (11)**

Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: Eurostat, DG JRC – Ispra, DG ECFIN, OECD, Science Metrix / Scopus (Elsevier), Innovation Union Scoreboard
Notes: (1) Average annual growth refers to growth between the earliest available year and the latest available year for which compatible data are available over the period 2007–2012.
(2) EU average for the latest available year.
(3) The value is the difference between 2012 and 2006.
(4) PISA (Programme for Internatonal Student Assessment) score for EU does not include CY and MT. These Member States were not included in the EU ranking.
(5) Break in series between 2008 and the previous years. Average annual growth refers to 2008–2012.
(6) Venture capital: EU does not include EE, HR, CY, LV, LT, MT, SI and SK. These Member States were not included in the EU ranking.
(7) EU is the weighted average of the values for the Member States.
(8) The value is the difference between 2012 and 2007.
(9) Break in series between 2005 and the previous years.
(10) The value is the difference between 2011 and 2007. A negative value means lower emissions.
(11) The values for this indicator were ranked from lowest to highest.
(12) Values in italics are estimated or provisional.

2014 Country-specific recommendation on R&I adopted by the Council in July 2014

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