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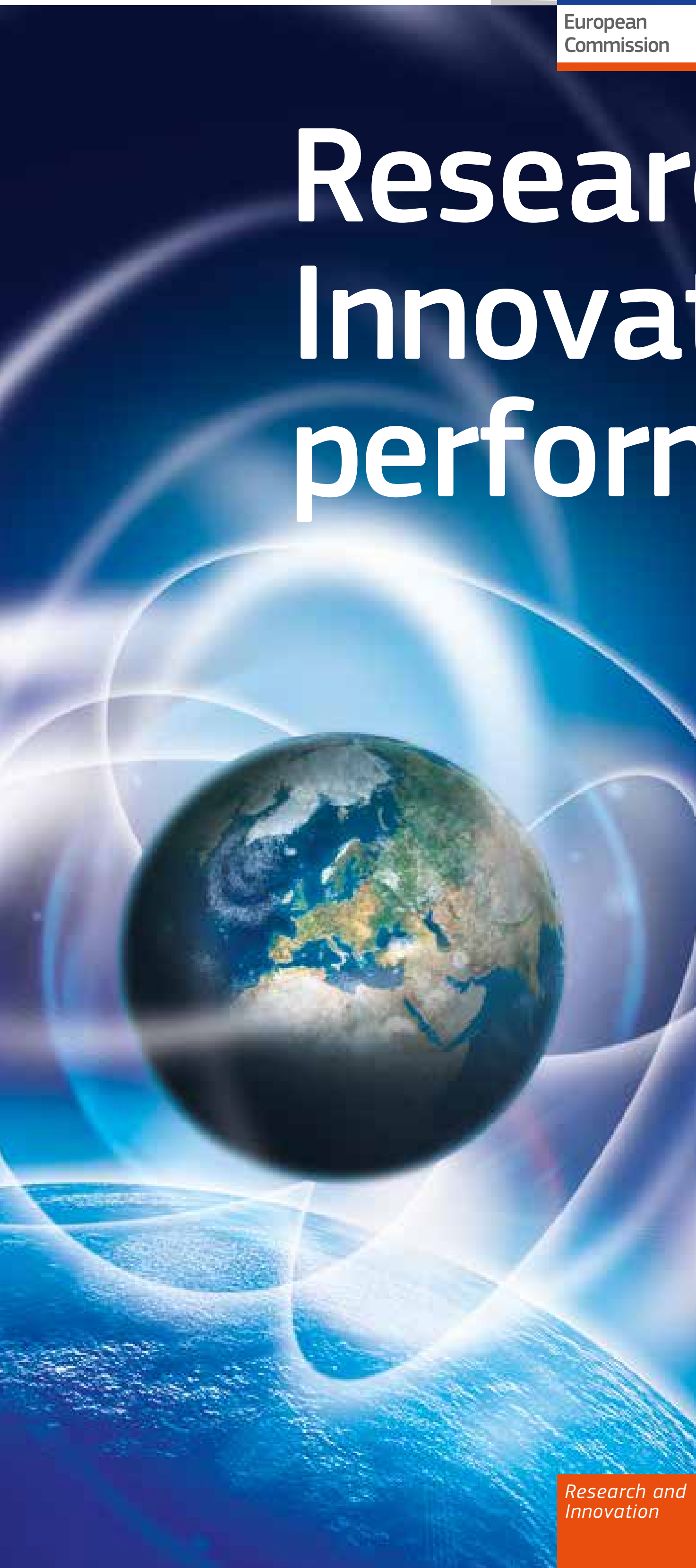

Research and Innovation performance in

Portugal

Country Profile

2014

Research and Innovation

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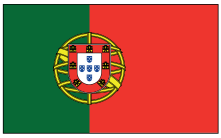


Portugal

The challenge of fostering 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 Portugal. 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: **1.50 %** (EU: 2.07 %; US: 2.79 %) 2007-2012: **-0.1 %** (EU: 2.4 %; US: 1.2 %)	***Excellence in S&T***[1] 2012: **27.3** (EU: 47.8; US: 58.1) 2007-2012: **+3.7 %** (EU: +2.9 %; US: -0.2)
Innovation Output Indicator 2012: **70.1** (EU: 101.6)	***Knowledge-intensity of the economy***[2] 2012: **42.6** (EU: 51.2; US: 59.9) 2007-2012: **+2.3 %** (EU: +1.0 %; US: +0.5 %)
Areas of marked S&T specialisations: Security, ICT, materials, new production technologies, and other transport technologies	***HT + MT contribution to the trade balance*** 2012: **-0.3 %** (EU: 4.23 %; US: 1.02 %) 2007-2012: **n.a.** (EU: +4.8 %; US: -32.3 %)

Portugal has expanded its R&I system over the last decade, increasing its investment in research at a remarkable average annual real-growth rate of 7 % between 2000 and 2007. However, after 2009, R&D followed the overall macroeconomic trend and R&D intensity decreased by an average of 0.1 % from 2007 to 2012. Public expenditure on R&D was maintained at 0.68 % of GDP in 2012, despite the economic crisis. Business enterprise expenditure on R&D (BERD) as a % of GDP increased from 0.6 % in 2007 to 0.7 % in 2012.

Portugal has also shown significant progress in the number of new doctoral graduates per thousand population aged 25-34 years, and in the share of researchers in the labour force. These evolutions have had a positive impact on scientific production and excellence. However, despite the progress observed in recent years in R&D expenditure in the business sector and the large increase in the total number of researchers, Portugal remains below the EU average in terms of public-private cooperation, knowledge transfer and employment in knowledge-intensive activities.

Ensuring the sustainability of the R&I system, focusing on a set of priority research fields, stimulating the emergence of new companies, particularly in knowledge-intensive activities, and strengthening the in-house technological, organisational and marketing capabilities of small and medium-sized enterprises (SMEs) are some of the main challenges facing the Portuguese R&D system.

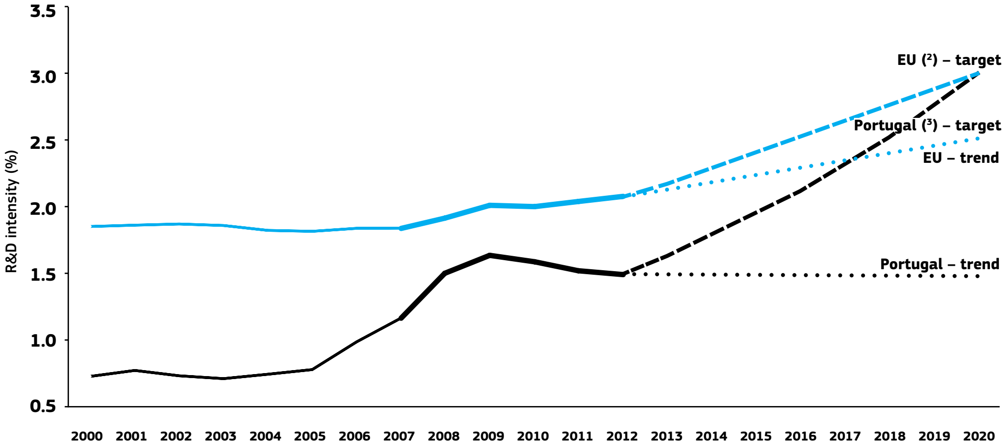
New initiatives, such as the System of Tax Incentives for Companies Investment in R&D (SIFIDE), the role of the Innovation Agency (AdI), the SWOT analysis of the country's R&D system, the Programme of Applied Research and Techno Transfer to Companies, or the reorientation of the cluster policy, aim to adequately support the structural change needed by the country to improve its productivity and competitiveness.

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, skills, sectoral specialization, international specialization and internationalization sub-indicators.

Investing in knowledge

Portugal – 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 in the case of the EU, and for 2008–2012 in the case of Portugal.
(2) EU: The projection is based on the R&D intensity target of 3.0 % for 2020.
(3) PT: The projection is based on a tentative R&D intensity target of 3.0 % for 2020.
(4) PT: There is a break in series between 2008 and the previous years.

Portugal has set a national R&D intensity target for 2020 of 3 %, where public-sector R&D intensity would reach 1 % and business R&D intensity 2 %. From 2005 up to the crisis years, Portugal made very significant progress towards the R&D intensity target. However, after 2009, R&D followed the overall macroeconomic trend, and by 2012, public-sector R&D intensity was 0.68 % and business R&D intensity 0.70 %.

Therefore, the main challenge for Portuguese R&D is to ensure the sustainability of the R&I system, to increase the share of business R&D investment in total national R&D investment, and to attract foreign business R&D investment. Business R&D investment reached its highest level in 2009 in both absolute and relative terms after some years of significant growth. The difficult national business environment and the contraction of domestic demand have put enterprises in the position of having to find external markets while facing challenges in terms of efficiency and financing. Public funding of R&D has been sustained, despite the pressures created by reducing public expenditure. However, the conversion of investments in R&I into company competitiveness in international markets remains weak.

Private and public R&D investment also receives support via co-funding from the European budget, in particular through the Structural Funds and from successful applications to the Seventh Framework Programme (FP7). Of the EUR 21.5 billion of Structural Funds allocated to Portugal over the 2007-2013 programming period, around EUR 4.5 billion (21 % of the total) related to RTDI[3]. The success rate of Portuguese applicants in FP7 is 18.4 %, lower than the EU average success rate of 28 %. By 2013, there were over 2157 Portuguese applicants in retained proposals, with a total EC financial contribution of EUR 450 million.

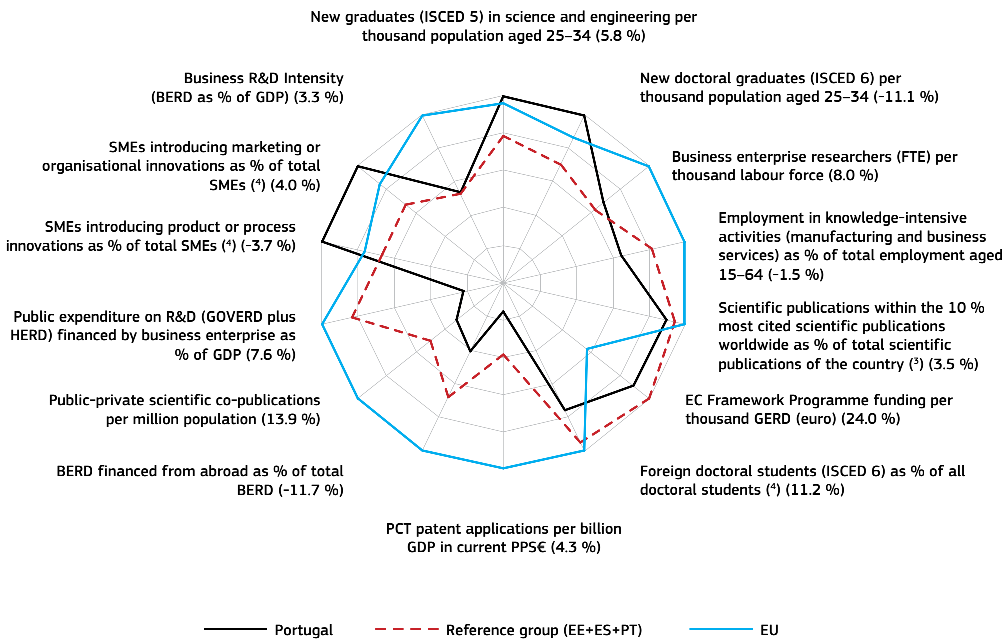
3 RTDI includes the following sectors: (01) RTD activities in research centres, (02) RTD infrastructures and centres of competence, (03) Technology transfer and improvement of cooperation of networks, (04) Assistance to RTD, particularly in SMEs (and RTD services in research centres), (06) Assistance 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 Portugal's R&I system. Reading clockwise, it provides information on human resources, scientific production, technology valorisation and innovation. The average annual growth rates from 2000 to the latest available year are given in brackets under each indicator.

Portugal, 2012 (1)

In brackets: average annual growth for Portugal, 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.

In broad terms, the graph shows that the large increase in R&D investment over the period 2000-2011 has triggered a stronger human resources component, higher scientific quality and some innovation, but with less progress in technology valorisation. All in all, while there was a good effort in training young researchers, Portugal remains below the EU average on technology development, business R&D, and the knowledge-intensity of the economy.

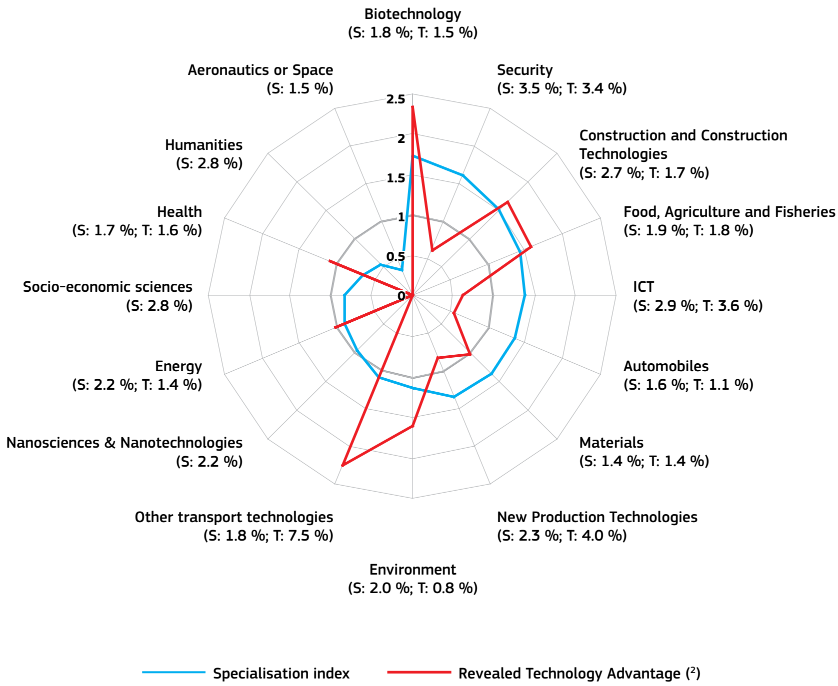
In the field of human resources for R&I, Portugal is achieving significant progress in the number of new doctoral graduates, which is the consequence of strong public incentives. However, the share of employment in knowledge-intensive activities has not followed the same trend, reflecting a weakness as regards its capacity to move towards more knowledge-intensive sectors. The quality of scientific production improved significantly, achieving 10 % of national scientific publications in the 10 % most-cited scientific publications worldwide, which is close to the EU average.

As seen in the graph above, the evolution of research output has been weaker on the business side. The overall technology development is well below the EU and reference group average. The same is true for public-private scientific co-publication, highlighting the need to emphasise the links between science and innovation.

Portugal's scientific and technological strengths

The graph below illustrates the areas, based on the Framework Programme thematic priorities, where Portugal 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.

Portugal – 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 and technological specialisation in selected thematic priorities shows a mixed situation with some co-specialisations as well as some mismatches. In most of the sectors, scientific quality is not combined with technological and industrial specialisation, while scientific production and quality is much more limited in other sectors relevant to its industry.

The country displays relevant scientific strength in several sectors, such as security, ICT, automobile, materials, and new production technologies, construction and construction technologies, food, agriculture and fisheries, and biotechnology. However, no corresponding technological specialisation can be found for those fields, with the exception of construction and construction technologies, food, agriculture and fisheries, and biotechnology, where the scientific profile is coupled with the country's technological profile.

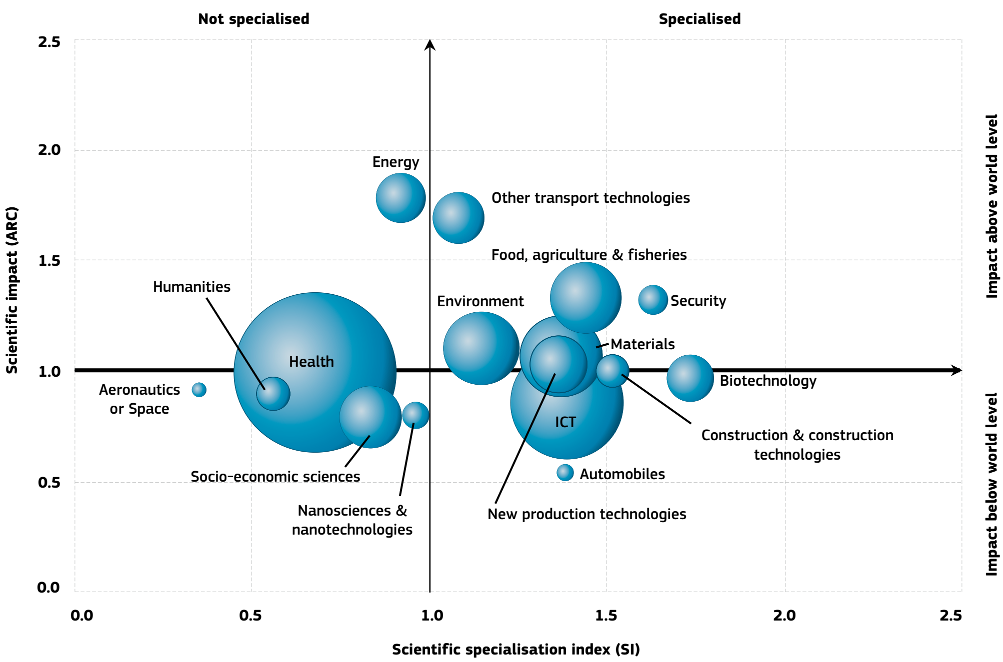
On the other hand, technological specialisation in other transport technologies is not backed up by a strong domestic scientific specialisation, despite the good quality of its publications. Taking into account the technological specialisation of Portugal in this field, it would probably benefit from fostering a scientific specialisation in this sector.

Portugal has established scientific strength in the field of food, agriculture and fisheries where scientific production and quality can be correlated with a certain technological specialisation. However, there is room for improvement in the scientific impact of some sectors which rank high on science specialisation indicator, i.e. ICT, automobile, materials, or new production technologies. Finally, scientific and technological specialisation in biotechnology is not coupled with the quality of domestic science. Conversely, scientific and technological specialisation in energy is not leveraged by the high scientific impact of domestic science in Portugal.

The definition of Research and Innovation Strategies for Smart Specialisation (RIS3) is more advanced at regional than national level, although at regional level the situations are different. Region Centro is the first of the five mainland Portuguese regions to design an RIS3 strategy which includes relevant sectors such as agriculture, materials or biotechnology[4].

The graph below illustrates the positional analysis of Portuguese 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.

Portugal – 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.

4 In January 2014, a multi-level strategy for Portugal was submitted, including one national and seven regional strategies; the level of development varies among the regions.

Policies and reforms for research and innovation

R&I policy is characterised by a large political consensus and continuity over time that has enabled significant progress from a relatively low base. Long-term consistency has proved to be a positive determinant in ensuring the consolidation of the R&I system. However, a few relevant initiatives took place in 2013: (1) the National Strategy for Smart Specialisation (also included in the 2014-2020 Partnership Agreement), the operational competitiveness programme COMPETE and incentive schemes in dialogue with stakeholders (universities and technological centres); (2) revision of the regulation on financing R&D organisations; (3) reorientation of the SIFIDE; (3) AdI; (4) evaluation of the clustering strategy; (5) the creation of three advisory bodies; and (6) the Programme of Applied Research and Technology Transfer to Companies.

In recent decades, Portuguese research policy has been horizontal in nature and has covered a broad spectrum. However, the Foundation for Science and Technology (FCT) launched an initiative aimed at designing a Research and Innovation (R&I) Strategy for Smart Specialisation, in the context of the preparation of the new round of European support. The first task, already performed, was a SWOT analysis of the country's R&I system – up to December 2013, there was a series of stakeholder sessions to discuss the selected national priorities and to propose vision and policy recommendations. This is seen as an important step in the policy-making process, providing a basis for more informed and accurate strategic decisions in R&I policy.

The new regulation for the evaluation of R&D aims to encourage the needs of research units to achieve a critical mass in order to be effective and to stimulate the emergence of creative environments, namely through multidisciplinary approaches to addressing complex problems and challenges.

The main policy instrument associated with indirect R&D funding has been SIFIDE. The Budget Law for 2011 extended the system until 2015, and improved the conditions granted to R&D-performing companies. The instrument was reviewed in 2013 in order to positively discriminate towards projects involving cooperation with other entities and international cooperation, and to provide access to the results. SIFIDE includes two kinds of incentives for companies performing R&D: a basic tax incentive, corresponding to 32.5 % of eligible R&D expenditure undertaken in the relevant fiscal year, and an incremental incentive, corresponding to 50 % of the increase in R&D expenditure compared to an average of the two previous years. The amount of tax credits approved under SIFIDE has been close to EUR 100 million each year.

In this regard, the only relevant change in the innovation field concerns AdI, the innovation agency. AdI has played a role in providing finance to cooperative projects between research and industry as well as in managing SIFIDE. Following a decision to integrate the agency into the Institute for Support to Small and Medium-sized Enterprises and Innovation (IAPMEI), the new law ensures that AdI will remain an autonomous organisation, reporting to the Minister for the Economy.

Portugal has carried out an evaluation of the clustering strategy which recognises the merits of launching a cluster policy but points out that there is still a significant gap between expectation and achievement and has identified weaknesses in the governance model, insufficient capabilities among many organisations to manage poles (CTPs) and clusters, and the excessive inward-looking approach with very weak linkages with 'peer' organisations abroad, among the main problems.

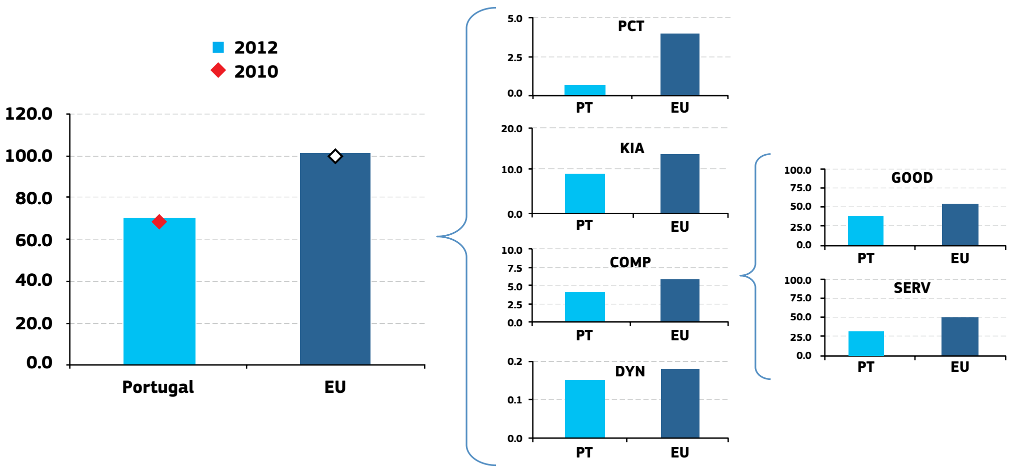
To enhance stakeholder involvement in defining R&I policies, three advisory councils have been created: the National Council for Science and Technology, the National Council for Entrepreneurship and Innovation, and the National Council for Reindustrialisation.

The Programme of Applied Research and Technology Transfer to Companies aims to promote 'hybrid' doctoral training, the revision of doctoral grants, and a greater focus of the programmes on entrepreneurship and innovation among US universities.

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 Portugal's position regarding the indicator's different components:

Portugal – 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 %).

Portugal is a low performer in the European innovation indicator. This is the result of low performance in all components of the innovation indicator, although its performance has been improving since 2010.

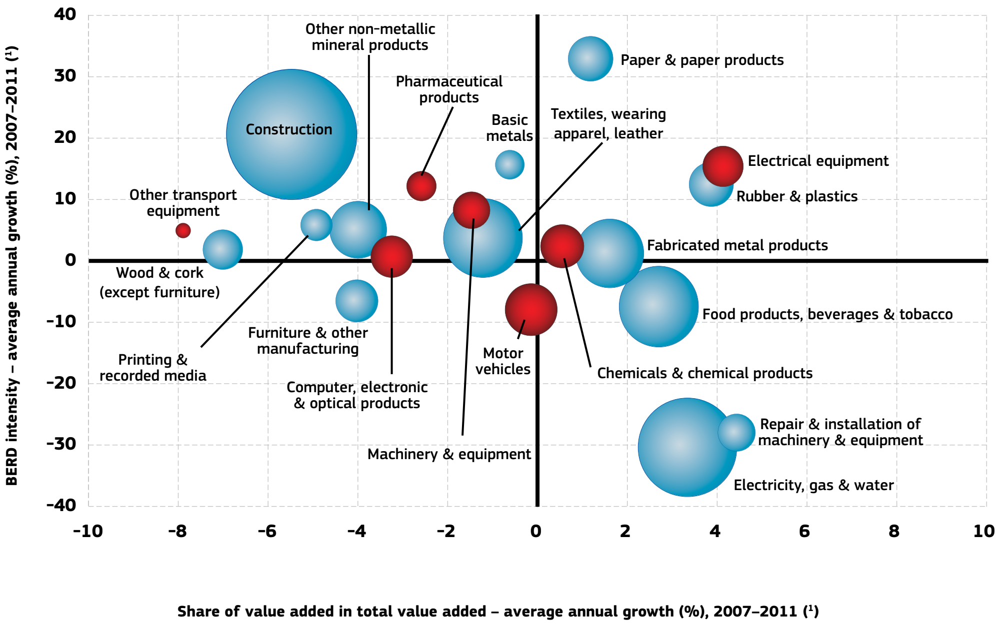
Portugal performs at a very low level in patents partly as a result of its economic structure, with no Portugal-based international players in patent-intensive manufacturing sectors. The structure of the economy, with a high share of low-tech production, such as food, textiles and shoes, also results in a low export share of medium-high/high-tech goods and a low share of employment in knowledge-intensive activities (KIA). In addition, significant employment in agriculture and tourism-related accommodation and food services contributes to the low employment share of KIA employment. The relatively low performance in the export share of knowledge-intensive services is explained by the importance of tourism, which is classified as non-KIS. Road freight transport services (also non-KIS) have a relatively high importance in services exports, too, while this pattern is not compensated for by any strongholds in KIS exports.

Portugal performs at a low level in the innovativeness of fast-growing firms. This is explained by a high share of employment in fast-growing enterprises in less-innovative sectors, such as construction, accommodation and food-service activities, and in administrative and support-service activities.

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 of moving 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 in the graph). The red sectors are high-tech or medium-high-tech sectors.

Portugal – Share of value added versus BERD intensity: average annual growth, 2007–2011 (1)



Source: DG Research and Innovation – Unit for the Analysis and Monitoring of National Research Policies
Data: Eurostat
Notes: (1) 'Printing and reproduction of recorded media': 2008–2011; 'Furniture and other manufacturing': 2010–2011.
(2) High-tech and medium-high-tech sectors (NACE Rev. 2 – two-digit level) are shown in red.

For a small country like Portugal, the road to growth leads to an extended market beyond the national boundaries, where competition must be confronted with high-quality actors in sectors providing more value added. This requires reinforcing the capacity of enterprises to move into more high-tech and medium-high-tech sectors. The graph above gives a general picture of manufacturing sectors over the period 2007-2011, showing reduced shares of value added but increased BERD intensities for most of the sectors. In particular, other transport equipment, wood and cork, printing and recorded media lost important positions in terms of valued added. Construction also lost an important share of value added despite growth in R&D intensity over the period.

Paper and paper products, rubber and plastics, and electrical equipment (considered as high-tech or medium-high-tech sectors) play an important role in manufacturing value added with a high growth rate in R&D intensity. Growth in the share of value added for chemicals and chemicals products is encouraging.

The 2013, the EU's industrial R&D scoreboard, ranking the top 1000 companies investing in R&D, shows six top Portuguese companies in the following sectors: banking (two), electricity, fixed-line telecommunication, pharmaceuticals and biotechnology, and software and computer services.

Key indicators for Portugal

PORTUGAL	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	1.62	2.57	3.31	3.78	3.09	2.84	1.95	1.60	2.10	-11.1	*1.81*	9
Performance in mathematics of 15-year-old students: mean score (PISA study)	:	:	466	:	:	487	:	:	487	20.9 (3)	495 (4)	16 (4)
Business enterprise expenditure on R&D (BERD) as % of GDP	*0.20*	0.30	*0.46*	0.60	0.75	0.78	0.73	0.71	*0.70*	*3.3*	1.31	16
Public expenditure on R&D (GOVERD + HERD) as % of GDP	*0.45*	0.39	*0.43*	0.46	0.63 (5)	0.72	0.70	0.69	*0.68*	*1.8*	*0.74*	11
Venture capital as % of GDP	0.14	0.16	0.11	0.12	0.23	0.14	0.12	0.21	0.14	2.6	0.29 (6)	12 (6)
S&T excellence and cooperation												
Composite indicator on research excellence	:	:	:	22.8	:	:	:	:	27.3	3.7	47.8	17
Scientific publications within the 10% most cited scientific publications worldwide as % of total scientific publications of the country	:	9.0	8.8	9.2	9.9	9.9	:	:	:	3.5	11.0	14
International scientific co-publications per million population	:	338	410	434	512	546	614	698	761	11.9	343	13
Public–private scientific co-publications per million population	:	:	:	10	11	12	14	17	:	13.9	53	20
FIRM ACTIVITIES AND IMPACT												
Innovation contributing to international competitiveness												
PCT patent applications per billion GDP in current PPS (EUR)	0.2	0.5	0.5	0.5	0.6	0.7	0.6	:	:	4.3	3.9	20
License and patent revenues from abroad as % of GDP	0.02	0.02	0.04	0.04	0.03	0.06	0.02	0.03	0.02	-9.7	0.59	25
Community trademark (CTM) applications per million population	34	56	97	119	108	91	84	95	94	-4.6	152	18
Community design (CD) applications per million population	:	12	13	15	14	18	16	18	16	1.8	29	19
Sales of new-to-market and new-to-firm innovations as % of turnover	:	:	13.3	:	15.6	:	14.3	:	:	-4.2	14.4	11
Knowledge-intensive services exports as % total service exports	:	22.8	26.5	28.5	28.7	28.9	29.0	30.1	:	1.4	45.3	15
Contribution of high-tech and medium-tech products to the trade balance as % of total exports plus imports of products	-3.61	-2.36	-1.47	-1.66	-1.30	-2.98	-3.50	-1.20	-0.28	-	4.23 (7)	21
Growth of total factor productivity (total economy): 2007 = 100	100	98	98	100	99	97	100	100	100	0 (8)	97	5
Factors for structural change and addressing societal challenges												
Composite indicator on structural change	:	:	:	38.1	:	:	:	:	42.6	2.3	51.2	16
Employment in knowledge-intensive activities (manufacturing and business services) as % of total employment aged 15–64	:	:	:	:	8.8	8.8	8.6	9.1 (9)	9.0	-1.5	13.9	26
SMEs introducing product or process innovations as % of SMEs	:	:	38.7	:	47.7	:	44.2	:	:	-3.7	33.8	5
Environment-related technologies: patent applications to the EPO per billion GDP in current PPS (EUR)	0.02	0.06	0.05	0.05	0.05	0.03	:	:	:	-27.2	0.44	26
Health-related technologies: patent applications to the EPO per billion GDP in current PPS (EUR)	0.05	0.09	0.09	0.10	0.10	0.06	:	:	:	-19.3	0.53	23
EUROPE 2020 OBJECTIVES FOR GROWTH, JOBS AND SOCIETAL CHALLENGES												
Employment rate of the population aged 20–64 (%)	73.5	72.3	72.7	72.6	73.1	71.2	70.5	69.1 (10)	66.5	-1.0	68.4	17
R&D intensity (GERD as % of GDP)	*0.73*	0.78	*0.99*	1.17	1.50 (5)	1.64	1.59	1.52	*1.50*	*-0.1*	*2.07*	14
Greenhouse gas emissions: 1990 = 100	138	145	137	133	130	124	119	116	:	-17 (11)	83	25 (12)
Share of renewable energy in gross final energy consumption (%)	:	19.8	20.9	22.0	23.0	24.6	24.4	24.9	:	3.1	13.0	6
Share of population aged 30–34 who have successfully completed tertiary education (%)	11.3	17.7	18.4	19.8	21.6	21.1	23.5	26.1	27.2	6.6	35.7	20
Share of population aged 18–24 with at most lower secondary education and not in further education or training (%)	43.6	38.8	39.1	36.9	35.4	31.2	28.7	23.2	20.8	-10.8	12.7	26 (12)
Share of population at risk of poverty or social exclusion (%)	:	26.1	25.0	25.0	26.0	24.9	25.3	24.4	25.3	0.2	24.8	16 (12)

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 2011 and the previous years. Average annual growth refers to 2008–2010.
(10) Break in series between 2011 and the previous years. Average annual growth refers to 2007–2010.
(11) The value is the difference between 2011 and 2007. A negative value means lower emissions.
(12) The values for this indicator were ranked from lowest to highest.
(13) Values in italics are estimated or provisional.

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