European Commission

JRC SCIENTIFIC AND POLICY REPORTS

Erawatch Country Report 2012: Spain

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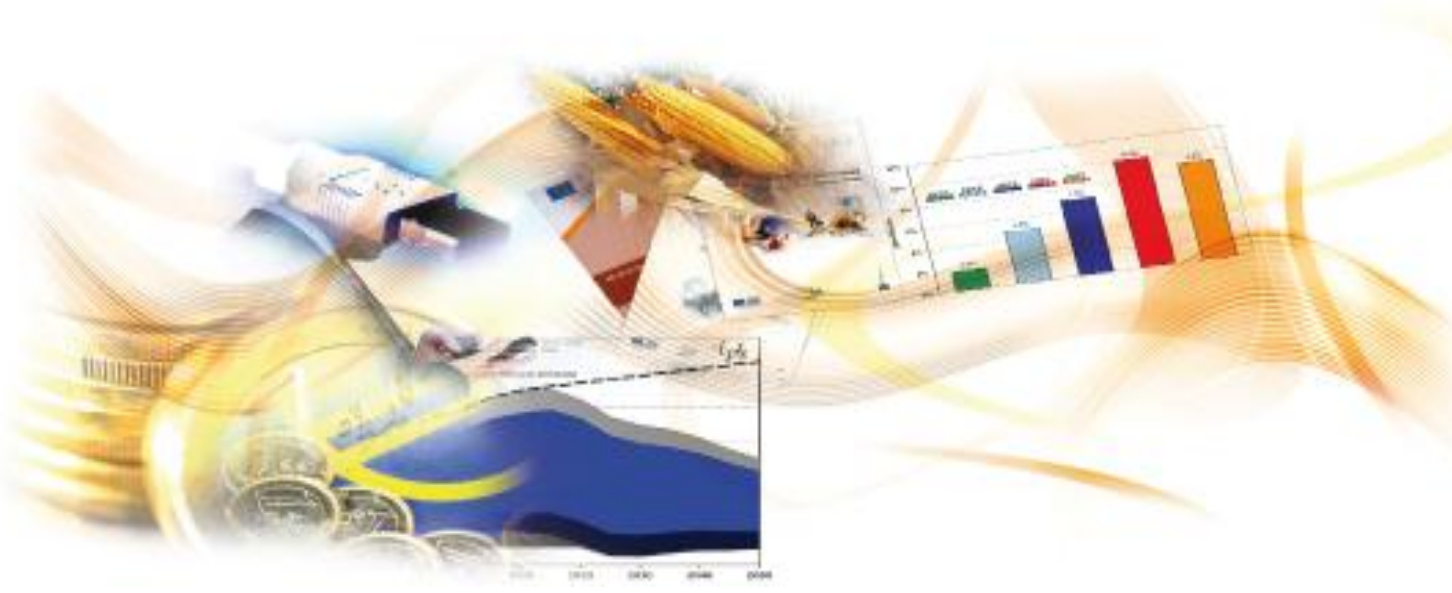
2014



Report EUR 26284 EN

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JRC90710

This document replaces ERAWATCH Country Reports 2012: Spain with ISBN number 978-92-79-34526-5 and PUBSY request number JRC83976.
The corrections made in the new document are to add the acknowledgements which were missing.

EUR 26284 EN

ISBN 978-92-79-38637-4 (pdf)

ISSN 1831-9424 (online)

doi:10.2791/86251

Luxembourg: Publications Office of the European Union, 2014

Printed in Spain

ACKNOWLEDGEMENTS AND FURTHER INFORMATION

This analytical country report is one of a series of annual ERAWATCH reports produced for EU Member States and Countries Associated to the Seventh Framework Programme for Research of the European Union (FP7). ERAWATCH is a joint initiative of the European Commission's Directorate General for Research and Innovation and Joint Research Centre.

The Country Report 2012 builds on and updates the 2011 edition. The report identifies the structural challenges of the national research and innovation system and assesses the match between the national priorities and the structural challenges, highlighting the latest developments, their dynamics and impact in the overall national context.

In particular, it has benefited from comments and suggestions of Fernando Hervás from JRC-IPTS who reviewed the draft report. The contributions and comments from DG-RTD and the ERAWATCH National Contact Point (Laura Hernández Garvayo and Carmen Martín Godín) and Joost Heijs, the author of the ERAWATCH Country Report 2011 are also gratefully acknowledged.

The report is currently only published in electronic format and available on the ERAWATCH website. Comments on this report are welcome and should be addressed to jrc-ipts-erawatch-helpdesk@ec.europa.eu.

EXECUTIVE SUMMARY

After a period of increasing economic growth and investments in Research and Development (R&D) and Innovation, Spain has severely reduced its R&D investments, threatening to set back the progress made in recent years. Spain made considerable efforts in the period 2002-2008 duplicating its Gross Expenditures on R&D (GERD) in absolute terms and increasing the GERD by Gross Domestic Product (GDP) in relative terms from 0.99% in 2002 to 1.35% in 2008. However, the financial crisis cut short the positive trend. In 2011, the R&D intensity (GERD as a percentage of GDP) decreased to 1.33%, reaching a figure lower than the one in 2008 (1.35%). The Government Budget Appropriations or Outlays on R&D (GBAORD) in Spain and its regions decreased by -12.2% (0.69% of GDP) in 2011, reaching a budget of €7,294m. Data on the general government budget for R&D and innovation (PGE) showed that public investments in R&D and innovation decreased for 2012 by -25.6% (Molero and de No, 2012b). This means that public R&D investments went back to the levels of 2006. In relative terms, the total funds per R&D personnel in Full Time Equivalent (FTE) have changed from €31.9k in 2002 to €41.1k per head in 2009. For 2013, this figure will represent €22.6k per head, which is much lower than the one in 2002 (Molero and de No, 2012c; Molero and de No, 2013). These severe cuts in R&D and innovation investments have raised important concerns among research-related organisations[1] about the financial sustainability of the Spanish R&D and innovation system. They also indicate that it will be very difficult for Spain to reach the targets of 3% GERD per GDP set by the Europe 2020 strategy, as the cuts are reducing the opportunities for Spain to change it economic structure and to overcome the current economic crisis. In fact, the new Spanish Strategy for Science, Technology and Innovation (EESTI) (2013-2020) has recently set a new lower target of 2% GERD per GDP for 2020.

Spain has a quasi-federal decentralised political system and so its R&D and innovation-related policies are on the same basis. In the past, allocation of competences in R&D and innovation were not clearly assigned to the different administrative levels, which led most regions to develop similar R&D plans and to launch similar and often overlapping instruments, programmes and agencies at both regional and national administrative levels (Erawatch Country Report 2010 and 2011). Some recent developments might improve the coordination of national and regional R&D and innovation policies. For example, the new Law of Science, Technology and Innovation (LCTI 2011) is aimed at improving national and regional coordination through the Council of Science, Technology and Innovation (CPCTI). Three regions accounted in 2011 for 58.3% of all R&D expenditures: Madrid (26.5%), Catalonia (21.9%) and the Basque Country (9.9%) are the leading regions, with a GERD by GDP of 2.0%, 1.5% and 2.1% respectively. All regional authorities ("Comunidades Autónomas") have registered for the Smart Specialisation Platform (S^3P), which "assists Member States and regions to develop, implement and review Research and Innovation Strategies for Smart Specialisation (RIS^3)" (RIS^3: on-line). In addition, the new EESTI strategy (2013-2020) includes the concept of "smart specialisation" in one of its 6 priority axe (Priority 5). This could help to overcome some fragmentation by prioritising research areas, based on the needs and resources of the regions.

The Spanish R&D and innovation system have challenges in their industrial structure, science and technology base and governance structure (OECD, 2006; EW, 2009 and 2011; EC, 2011a). The main industrial structural challenges are: the significant weight of Small and Medium-sized Enterprises (SMEs); a low-tech traditional sector; the lack of multinational enterprises; and a low

[1] These organisations include: the Spanish Confederation of Scientific Societies (COSCE), the Spanish Conference of University Rectors (CRUE), the Platform for Dignifying Research (PDI), the Spanish Federation of Young Researchers (FJI) and the National Association of Ramón y Cajal Researchers (ANIRC). These organisations have jointly signed different manifestos (see section 2.5). They are diverse and have different levels of relevance to the research system.

level of patenting activity. The main science and technology base challenges come from: its fragmentation; the lack of flexibility; and low levels of mobility between institutions, countries and sectors. Regarding the main governance challenges, these come from: the lack of institutional coordination (regional and ministerial); the lack of complementarities between research and innovation policies; and the lack of synergies between policy design and implementation. Important efforts have been made in improving the R&D and innovation policy mix over the past years. Successive strategies and plans have tried to address the challenges of the Spanish R&D system and to follow the suggestions of some comprehensive evaluations on this system (e.g. OECD, 2006). The new Spanish R&D and innovation strategy EESTI (2013-2020) and the new Plan of Scientific and Technical Research and Innovation (PECTI) (2013-2016) also follow this trend and try to respond to the challenges of the system and the shortcomings of previous plans. The new law (LCTI 2011) has also tried to address these challenges. However, as these very documents recognise, the structural and governance challenges of the Spanish research system remain.

The changes in the strategies and plans indicate an increasing emphasis on innovation, public-private R&D collaboration, research excellence and other emerging topics, such as the promotion of R&D and innovation on societal challenges or the role of public procurement to promote R&D and innovation.[2] The increasing importance of competitive funding, the implementation of a more diversified set of instruments (e.g. tax incentives, venture capital), and the increasing alignment with European objectives are also important changes in the Spanish policy mix.

Currently, the most important challenge of the Spanish R&D and innovation system is to reverse the decreasing trend of public R&D and innovation investments. In an environment of budgetary restrictions, it might be appropriate to focus on the strengths of the Spanish R&D system when setting the objectives and priorities and to remove the barriers that have prevented greater efficiency in these areas. According to the Innovation Union Scoreboard Report (EC, 2012), the strengths of the Spanish research system lie in its tertiary education, international scientific co-publications and medium and high tech exports. Focusing on these strengths, it might be appropriate to implement changes in the curricula of universities to foster innovation and entrepreneurship and to increase university-industry relationships. This might improve the match between education and training supply and employment needs, thereby decreasing the levels of unemployment among young people. In order to maintain the level of publications and to improve their quality, it might also be appropriate to promote "excellence" by granting more financial and managerial autonomy to the institutions and research groups with good levels of research performance. Changes in the research system could be implemented by improving the mechanisms to allocate funds by rewarding research groups and institutions that are better aligned with specific objectives. In addition to the funding mechanisms, it would seem necessary to introduce regulatory changes to increase the flexibility for research institutions to manage their own resources. Research institutions are clearly constrained by national regulations in managing their own human resources and require these changes. In addition, some special measures to address the situation of young researchers appear to be necessary. The changes brought by the new law LCTI 2011 appear to be limited in facilitating access by young researchers to permanent research positions. Currently, young researchers with temporary contracts are particularly suffering the consequences of a lack of resources. The lack of execution of public R&D budgets for R&D and innovation (Molero and de No, 2012a) indicates that it is necessary to analyse what instruments and measures are not being sufficiently demanded or used. This will help to reduce and prioritise objectives.

[2] Some of these have already been implemented through diverse mechanisms. For example, the Law on Sustainable Economy (2011) introduced public procurement of innovative goods and services as a policy instrument to promote innovation (see Footnote 32).

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1 INTRODUCTION

Spain has 46.2 million inhabitants (9.2% of the whole population of Europe) and produces around 8% of the GDP of the European Union (EU-27). The GDP per capita (€23,100) in 2011 was 8% below the EU-27 average of €25,100. The crisis in Spain particularly affected the unemployment rate, which rose to the highest in Europe (21.7% in 2011). Spanish GDP decreased by -0.3% in 2010 and increased slightly by 0.4% in 2011 while in the Eurozone these percentages were respectively 2.1% and 1.5%. With regard to the input side of the innovation and science system, Spain made strong efforts in the period 2002-2008, duplicating its Gross Expenditure on R&D (GERD) in absolute terms and increasing the GERD by GDP in relative terms from 0.99% in 2002 to 1.35% in 2008. However, the financial crisis cut short the positive trend. The R&D intensity (GERD as a percentage of GDP) decreased to 1.33% in 2011, which is lower than the one in 2008 (1.35%). Business R&D Expenditures (BERD) decreased respectively by -0.8% in 2010, by -1.5% in 2011. The Government Budget Appropriations or Outlays on R&D (GBAORD) in Spain and its regions decreased by -4.5% (0.79% of the GDP) in 2010 and by -12.2% (0.69% of GDP) in 2011, reaching a budget of €7,294m. For 2012 and 2013 only some data are available on the budget for public expenditure by the central government on R&D and innovation (PGE).[3] This state level budget increased from €4,000m in 2003 to €9,673m in 2009. After 2009, the budget started decreasing by -4.1% in 2010, -7.4% in 2011 and -25.6 in 2012, leading to a budget of €6,394m. For 2013 another 7.2% reduction has been applied. It must be pointed out that the state budgets include not only direct expenditures and subsidies for R&D but also loans. In fact, in the last few years the role of loans has increased while the budget for subsidies has decreased, which implies, de facto, a greater decrease. In addition, the non-execution of an important part of the budgets has worsened the situation. In the period 2009-2011, between 21% and 42% of the yearly public government budgets were not executed. Theses severe cuts in R&D and innovation investments have raised important concerns among research-related organisations (see section 2.5) about the financial sustainability of the Spanish R&D and innovation system. They have also reduced the opportunities for Spain to change its economic structure and to overcome the current economic crisis. In addition, they indicate that it will be very difficult for Spain to reach the target of 3% GERD per GDP set by the Europe 2020 strategy. Actually, the new Spanish Strategy for Science, Technology and Innovation (EESTI) (2013-2020) has recently set a new lower target of 2% GERD per GDP for 2020.

Spain is a "moderate innovator"[4] (EC, 2012 and EC, 2013) and its strengths lie in tertiary education, international scientific co-publications and medium and high tech exports, while its weaknesses are in private investments, public-private linkages, innovation outputs and knowledge-intensive activities. To illustrate its strengths: with increasing levels between 2008 and 2010 (data from the Innovation Union Scoreboard IUSB dashboard), and above the EU-27 average (shown in brackets), Spain is outstanding firstly in its percentage of population aged 30-34 who have completed tertiary education, which changed from 39.8% to 40.6% (34.6%); secondly, in the level of international co-publications per million, which changed from 454 to 599 (300); and thirdly in the contribution of medium and high-tech product exports of trade balance total, which changed from 101.97 to 103.05 (101.28). In contrast, the weak figures show that at levels below the EU-27 average, Spain underperformed in the percentage of GDP of private R&D expenditures, by 0.67% in 2011 against the UE-27 level (1.27%); in the number of public-private co-publications per million population, 22.5 against 52.8; in patent applications per billion GDP (in PPS€), 1.43 against 3.9; in patent applications in societal challenges per billion

[3] Data come from COSCE annual reports.

[4] Together with the Czech Republic, Greece, Hungary, Italy, Lithuania, Malta, Portugal and Slovakia (EC, 2013).

GDP (in PPS€), 0.39 against 0.96; in the percentage of GDP coming from licence and patent revenues from abroad, 0.06% against 0.51%; and in the percentage of knowledge-intensive services exports of total service exports, 21.6% against 45.1%.

The number of people employed in R&D activities in 2011 was 215,079 (FTE). After increasing more than 65% from 2002 to 2010 (0.6% from 2009 to 2010), this number decreased in 2011 by -3.1, coming back to total figures lower than the ones of 2008. Based on the FTE data, 41.8% are working in the private sector, 37.6% in Higher Education Institutions (HEIs) and 20.4% in Public Research Organisations (PROs). Taking into account the research performance, universities showed the highest research performance level in the total number of international articles published in 2006-2010 (SCImago). Universities published 68% of total publications, followed by the health sector (26.8%), Public Research Bodies (OPIs) (22.3%), firms (2.2%) and others (2.3%). However, taking into account the quality of publications ("normalised impact") OPIs showed the highest impact with 1.42, followed by firms (1.2), Universities (1.15) and the health sector (1.13) (COTEC, 2012: 35).

The main responsibilities for research and innovation policy design and operational management are concentrated in the Ministry of Economics and Competitiveness (MINECO) – before December 2011 the Ministry of Science and Innovation (MICINN) – which distributed (in 2011) 67.8% of the Spanish State Budget[5] on R&D and innovation (FECYT, 2012: 19). The Ministry of Industry, Tourism and Commerce (MITYC) – now MINETUR – accounted for 26.8% of the budget. Other R&D players are the Ministry of Defence (2.4%) and the Ministry of Education (MEC) – now MEDU – with 1.8% of the total R&D-related funds of the Spanish State Budget (FECYT, 2012).[6]

The MINECO, assisted by the State Secretary for Research, Development and Innovation (SSRDI), is responsible for drafting and managing the main R&D and innovation instruments: the multiannual "strategies" and "plans". The Spanish Strategy for Science, Technology and Innovation (EESTI) (2013-2020) is the strategy that sets the rationale, objectives and indicators of the Spanish R&D and innovation policy. The Spanish State Plan for Scientific and Technical Research and Innovation (PECTI) (2013-2016) is a multiannual plan that implements the EESTI by setting its priorities, programmes, coordination mechanisms, costs and sources of funding. The new EESTI and PECTI were approved on 1st February 2013. The proposals have merged the two strategies and plans originally envisaged by the new Law of Science, Technology and Innovation (LCTI 2011). The PECTI will replace the National Plan for R&D and Innovation (2008-2011), extended to the end of 2012. The MINECO is supported by the Executive Committee for Science, Technology and Innovation policy (CDCTI) (an interministerial coordination body) and two main advisory bodies, which are the Council of Science, Technology and Innovation (CPCTI) (in charge of the coordination with regional governments and other actors of the R&D system) and the Advisory Council of Science, technology and Innovation (CACTI) (which gathers representatives of the research community, enterprises and trade-unions). The main funding bodies involved in the implementation of R&D and innovation policies are: The Spanish Research Agency (to be created), which aims to be an autonomous entity that will assign R&D funds on scientific merit grounds and the Centre for Industrial Technological Development (CDTI), which is a public corporate entity engaged mainly in the promotion of innovation and technological development for companies. Other institutions, such as the Carlos III Health Institute (ISCIII) also fund research. The Information System of

[5] In contrast to the case of the GBAORD data this budget includes not only subsidies and direct or indirect R&D and innovation expenditures but also loans and credits.

[6] A similar distribution was applied in 2012: MINECO distributed 68.9% of the Spanish State Budget, MINETUR 25.7%, MDE 2.7% and MEDU 1.83%. In order to be consistent with the data sources used in the assessment, data for 2011 is provided in the text.

Science, Technology and Innovation (SICTI) is responsible for the data collection and analysis for the monitoring of all policy programmes and instruments of the R&D and innovation policy (see Figure 1).

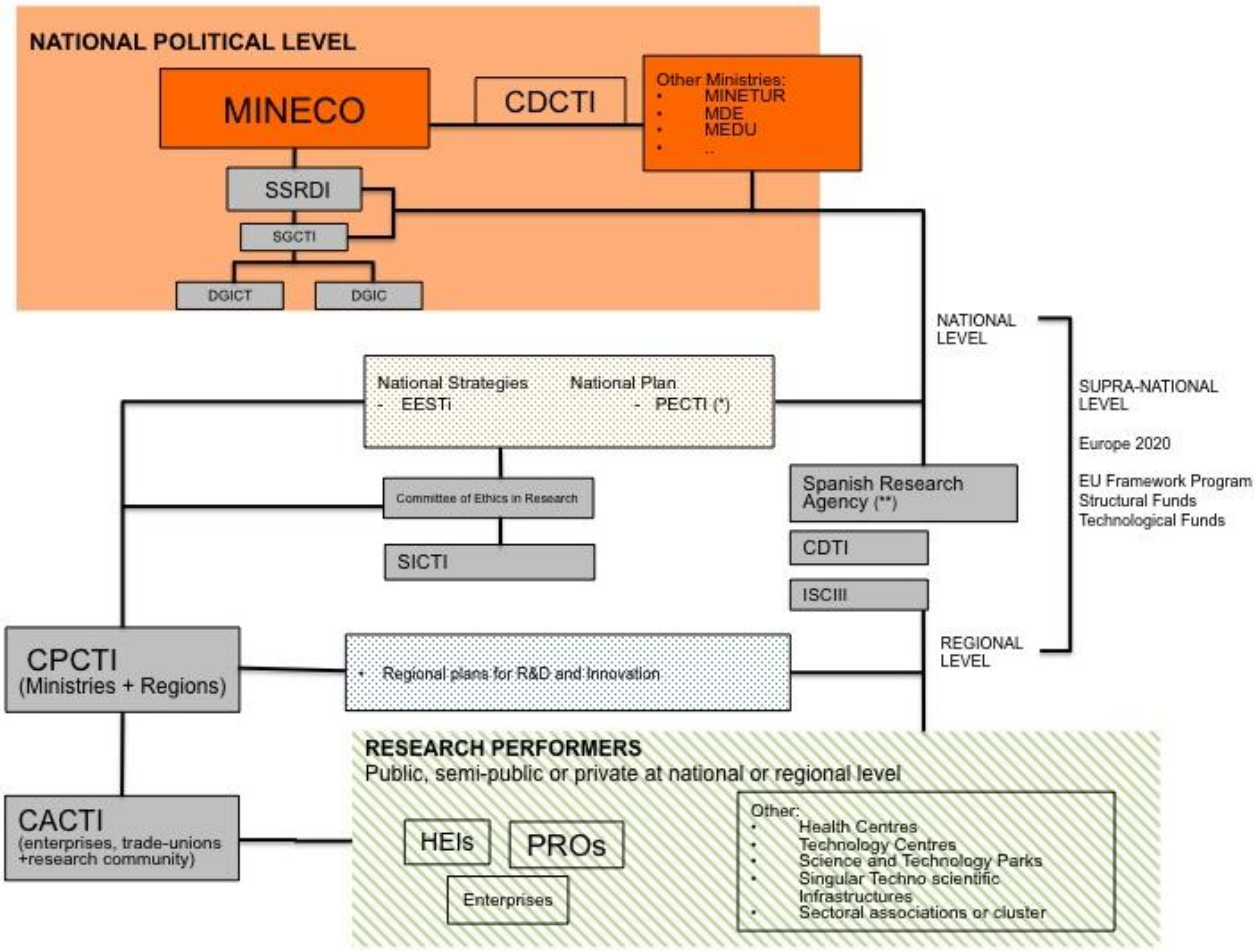
Spain has a quasi-federal decentralised political system and so its R&D and innovation-related policies are on the same basis. In the past, allocation of competences in R&D and innovation were not clearly assigned to the different administrative levels which led most regions to develop similar R&D plans and to launch similar and often overlapping instruments, programmes and agencies at both regional ad national administrative levels[7] (Erawatch Country Report 2010 and 2011). Some recent developments might improve the coordination of national and regional R&D and innovation policies. For example, the new Law of Science, Technology and Innovation (LCTI 2011) is aimed at improving national and regional coordination through the Council of Science, Technology and Innovation (CPCTI). Some specific policies are more often carried out on a regional level, such as cluster policies and SME-oriented measures. Moreover the regional governments are also in charge of the universities. Three regions accounted in 2011 for 58.3% of all R&D expenditures: Madrid (26.5%), Catalonia (21.9%) and the Basque Country (9.9%) are the leading regions, with a GERD by GDP of 2.0%; 1.5% and 2.1% respectively.[8] All Regional authorities "Comunidades Autónomas" have registered to the Smart Specialisation Platform (S^3P), which "assists Member States and regions to develop, implement and review Research and Innovation Strategies for Smart Specialisation (RIS^3)" (RIS^3: on-line). In addition, the new Spanish Strategy for Science, Technology and Innovation (EESTI) (2013-2020) includes the concept of "smart specialisation" in one of its 6 priority axe (Priority 5). This could help to overcome some fragmentation by prioritising research areas, based on the needs and resources of the regions.

The Spanish Research System and R&D policy framework have suffered important changes during this year, due to the approval of the new Law of Science, Technology and Innovation (LCTI) on 1st June 2011 and the arrival of a new government (21st December 2011). Although these changes occurred in 2011, some of the main institutional changes took place in 2012 and some envisaged changes have not yet been implemented (e.g. the new Research Agency). The most relevant novelties included in the new LCTI are its emphasis on innovation (which was missing in the so-called Science Law of 1986) and the design of the Spanish Research Agency, which together with the CDTI will become the most important funding agencies for research and innovation respectively. Other important changes will affect researchers' careers, especially in the case of university-based researchers and those in Public Research Organisations (PROs). The close-down of the Ministry of Science and Innovation (MICINN) is the most relevant change brought by the new government.

[7] Such as the case of scholarships for PhD students; R&D project support for firms, PRO or HEI; National and regional agencies that have to vouch for the researchers and give them a declaration that their experience is suitable for fulfilling certain levels of jobs as researchers. Moreover, several regional R&D policy plans are similar to the national "plan".

[8] Two other remarkable regions are Andalusia with 11.6% of the GERD. However this is a very large region of Spain and in fact its GERD by GDP is 1.1%. The other region is Navarre, a small region, though its GERD by GDP is very high 2% in 2011 (2.7% of Spanish GERD).

Figure 1: The structure of the Spanish research and innovation system



SOURCE: Own elaboration. Key: in orange: State oriented institutions and instruments. In blue: regional oriented institutions and mechanisms. In green: research performers

CACTI	Advisory Council of Science, technology and Innovation
CDTI	Centre for Industrial Technological Development
CDCTI	Executive Committee for Science, Technology and Innovation policy
CPCTI	Council of Science, Technology and Innovation
DGICT	Directorate-General of Scientific and Technological Research
DGIC	Directorate-General of Innovation and Competitiveness
EESTI	Spanish Strategy for Science and Technology and Innovation.
ISCIII	Carlos III Health Institute
MINECO	Ministry of Economy and Competitiveness (before December 2011 Ministry of Science and Innovation (MICINN)
MINETUR	Ministry of Industry, Energy and Tourism
MEDU	Ministry of Education, Culture and Sports
MDE	Ministry of Defence
SGCTI	General Secretariat of Science, Technology and Innovation
SICTI	Information System of Science, Technology and Innovation
SSRDI	State Secretary of Research Development and Innovation
PECTI	Spanish State Plan of Scientific and Technical Research and Innovation (2013-2016) (*) The PECTI merges the envisaged Spanish National Plan for Scientific and Technical Research (PECT) and the Spanish National Plan for Innovation (PEI) Currently the National Plan for R8D and Innovation 2008-2011 has been extended to the end of 2012. The EESTI merges the planned Spanish Strategy for Science and Technology (EEST) and the Spanish Strategy for Innovation (EEI) (**) Not yet implemented.

2 RECENT DEVELOPMENTS OF THE RESEARCH AND INNOVATION POLICY AND SYSTEM

2.1 National economic and political

The crisis in Spain has particularly affected the unemployment rate, which rose to the highest in Europe (21.7%) in 2011.[9] Spanish GDP decreased by -0.3% in 2010 and increased slightly by 0.4% in 2011 while in the Eurozone these percentages were respectively 2.1 and 1.5%. The debt crisis obliged Spain to apply severe cuts to its public budget, which have specially affected the budgets for R&D and Innovation. GBAORD decreased by -12.2% in 2011. The budget for public expenditures by the central government on R&D and innovation (PGE) decreased in 2012 by -25.6%, thus increasing the trend of previous years' cuts (see section 2.2 and 3). These severe public budget cuts for R&D and innovation have triggered important institutional and grassroots actions in support of science. Several research-related organisations have raised important concerns about the sustainability of the Spanish R&D system (see section 2.5).

Regulatory changes to comply with public deficit targets also affected R&D and innovation system. For example, in order to be able to create the new Spanish Research Agency envisaged by the new Law LCTI it was necessary to include an amendment to the draft of the General State Budget of 2012 as this forbade the creation of any public agency. In the same way, some regulatory measures to correct the public deficit (e.g. Royal Decree-Law 20/2011) have limited staff recruitment and the filling of positions left vacant by retirees.

The basic principles of the Spanish Research System and R&D policy framework have suffered important changes due to the approval of new Law LCTI (1st June 2011) and the arrival of a new government (21st December 2011). The new strategy and plan – the Spanish Strategy for Science, Technology and Innovation (EESTI) (2013-2020) and the Spanish State Plan for Scientific and Technical Research and Innovation (PECTI) (2013-2016) – also introduce important changes (see section 2.4).

2.2 Funding trends

After a period of increasing economic growth, which ended in 2008, Spanish GDP decreased by -0.3% in 2010 and increased slightly by 0.4% in 2011 while in the Eurozone these percentages were respectively 2.1 and 1.5% (see Table 1). The forecast Spanish GDP for 2012 is -1.4%, which is much lower than the EU-27 forecast of -0.3%. With regard to the input side of the innovation and science system, Spain made great efforts in the period 2002-2008 when its Gross Expenditure on R&D (GERD) in absolute terms doubled, while in relative terms the GERD by GDP increased from 0.99% in 2002 to 1.35% in 2008, reaching its highest level in 2009 (1.39%). However, the financial crisis cut short this positive trend. In 2010 the R&D intensity (GERD as a percentage of GDP) practically stagnated (1.39%) and decreased to 1.33% in 2011, reaching a figure lower than the one in 2008 (1.35%). The Government Budget Appropriations or Outlays on R&D (GBAORD) in Spain and its regions decreased by -4.5% (0.79% of the GDP) in 2010 and by -12.2% (0.69% of GDP) in 2011, reaching a budget of €7,294m. In relative terms, GBAORD as a percentage of GDP declined from 0.83% in 2009 to 0.69% in 2011 but is still higher than the EU average of 0.73%. Business R&D expenditures (BERD) decreased respectively by -0.8% in 2010 and -1.5% in 2011 leaving the total private expenditures at

[9] Data from INE

€7,369m. BERD as a percentage of GDP was 0.7% in 2011 slightly lower than the one in 2009 0.72% but far from the EU average of 1.26%. By sectors of performance, the distribution of GERD did not change much. The business enterprise sector and Higher Education Institutions (HEIs) slightly increased their shares from 51.9% and 27.8% respectively in 2009 to 52.1% and 28.2% in 2011. These increases went against the decline in shares of PROs. Not-for-Profit Organisations (NPOs) played a minor role, in consisting of the remaining 0.2%. These figures on R&D expenditures indicate that it will be very difficult for Spain to reach the targets of 3% GERD per GDP set by the Europe 2020 strategy.

Table 1: Basic Spanish R&D indicators (2009-2012)

	2009	2010	2011	2012 (estimate, if such data are available)	2020 national target	EU27
GDP growth rate	-3.7	-0.3	0.4	-1.4(f)	:	- 0.3 (2012)
GERD as % of GDP	1.39	1.39	1.33	:	3	2.03s (2011)
GBAORD (€ million)	8,700	8,308	7,294	:	:	91,277.1 (EU27 total 2011)
GBAORD as % of GDP	0.83	0.79	0.69	:	:	0.73s (2011)
BERD (€ million)	7,568	7,506	7,396	:	:	:
BERD as % of GDP	0.72	0.72	0.7	:	:	1.26 (2011)
R&D performed by HEIs (% of GERD)	27.8	28.3	28.2	:	:	24% (2011)
R&D performed by PROs (% of GERD)	20.1	20.1	19.5	:	:	12.7% (2011)
R&D performed by Business Enterprise sector	51.9	51.5	52.1	:		62.4% (2011)

s - EUROSTAT estimate
f- Forecast
(:) Non-available
Data Source: EUROSTAT, March 2013
Targets from:
http://epp.eurostat.ec.europa.eu/portal/page/portal/europe_2020_indicators/headline_indicators)

For 2012 and 2013 only some provisional data are available on the central government's budget for public expenditures (PGE).[10] This state level budget increased from €4,000m in 2003 to €9,673m in 2009. After 2009, the budget began decreasing, by -4.1% in 2010, -7.4% in 2011 and by -25.6 in 2012, leading to a budget of €6,394m. For 2013 another -7.2% reduction was applied. The state budgets include not only direct expenditures and subsidies on R&D but also loans. In fact, in the last few years the share of loans has been increasing, in contrast to that of subsidies, which implies, de facto, an even greater decrease. Considering the growth of the Spanish R&D system, the total funds per R&D personnel (FTE) have changed from €31.9k in 2002 to €41.1k per head in 2009. For 2013, this figure will represent €22.6k per head (€16.2k non-financial) (Molero and de No, 2012c, Molero and de No, 2013). This is a clear step backwards for the Spanish R&D system. The PGE for 2012 returned the public R&D investments to the levels of 2006 (Molero and de No, 2012b). In addition, the non-execution of an important part of the budgets has worsened the situation, and COSCE has denounced this. In the period 2009-2011, between 21% and 42% of the yearly budgets were not executed. Since 2008, the total budget not executed is equivalent to €8,661m, which is higher than the total budget for 2011 (Molero and de No, 2012a). COSCE, in its analysis of the PGE on R&D for 2013 (Molero and de No, 2012c), warns that the envisaged 80% of the total reduction lies in non-financial funds, and this will have a devastating impact on public research and, especially, in

[10] Data from COSCE reports.

basic research (see section 2.5 for the reaction of some research organisations on R&D funding cuts).

Competitive project-based funding has gained importance within the Spanish R&D and innovation system.[11] The budget for R&D and innovation distributed by the National State Administration (AGE) for 2011 was €3,323.7m, of which 63.4% was distributed through low interest credits and 36.6% was subsidies (FECYT, 2012). The new plan PECTI (2013-2016) clearly states that most of the funds will be distributed through competitive funding mechanisms.

Spain boasts a broad set of policy instruments, mostly based on low interest credits, to stimulate greater R&D investment in R&D performing firms. The Spanish system of tax incentives for R&D and innovation has been one of the most generous among OECD countries for the past few years. However, despite the fact that tax incentives are very generous, the bureaucratic procedure for benefitting from these deductions was until recently complex and uncertain. This diminished the incentive effects of the support programme. The Ministry of Treasury has indicated that the average annual cost of tax income forgone by the state was €200-300m in 2002-03 and over €300-400m in 2004-08, decreasing to around €200m in the last few years. This represents around 3-5% of private R&D expenditure in this period, while support in the form of subventions since 2007 has been around 16-18 % (see section 4.2).

Spain has recently designed a large number of support schemes to foster public-private cooperation in R&D and innovation. These programmes aim to improve a level of public-private collaboration that has been considered low (OECD, 2006; COTEC, 2012). Industry finances 8% of the R&D expenditures of universities. A specific National Programme (Np) on public-private cooperation has been designed to increase this cooperation. This programme is included in the Instrumental Working Line (IWL) "Articulation and internalisation of the system" of the Spanish National Plan for R&D and innovation (NP). In 2011, the Np on "Public-private Cooperation" distributed €654m 91% of the IWL and had two instruments: INNPACTO and INNPRONTA (FECYT, 2012).

Probably the most comprehensive approach to analysing the thematic priority setting of the Spanish policies for R&D and innovation is the distribution of the Spanish GBOARD.[12] This indicates that in 2011, over 44.6% of the funds could be considered generic while 53.7% could be directly assigned to specific technological or scientific areas. Generic funds have increased their weight in the last few years from 35.8 in 2006 to 44.6 in 2011. Regarding thematic R&D priorities, the most important one is health, with a participation of 14.2%, followed by industrial production and technology (IPT) at 8.7%, agriculture (7.6%) and transport telecommunications and other infrastructures (TTI) at 5.4%. Comparing the distribution of the last two years, it should be mentioned that Spain has increased its participation in exploration and exploitation of outer space, but decreased its participation in TTI. Compared to the EU average, Spain has a higher participation in health, agriculture, TTI and environment while lower mainly in political and social systems, structures and processes, and IPT. Moreover, on a European level the defence-related GBOARD is more important. The percentage of funds assigned to defence has been decreasing since 2008, representing only 1.7% of the GBOARD in 2011.

2.3 New policy measures

Without considering the new policy measures envisaged in the new strategy EESTI (2013-2020) and plan PECTI (2013-2016) (see next section), the main policy measures on research and

[11] In 1983 this form of support accounted for 23% of the R&D-related state budget, while at the beginning of this century this percentage was around 30% of all funds (Sanz. 2005).

[12] See EW (2011) for different alternatives to analyse the thematic focus and its advantages and disadvantages.

innovation policy included in the National Plan and in the Spanish Strategy for innovation (e2i) in 2011 were:

- The Severo Ochoa, which recognizes research centres of excellence
- The subprogram AVANZA TIC Verdes on innovation projects to foster energy efficiency
- The INNPRONTA sub-programme, which aims to encourage public-private collaboration on strategic industrial research
- FEDER-INTERCONNECTA (Andalucía and Galicia), which funds big projects on experimental and strategic development
- INNTERNACIONALIZA, which funds projects of SMEs to exploit innovative technologies abroad
- INNVIERTE. A venture capital fund with about €300m for 2011-2013
- INNODEMANDA, which funds technologies for public procurement innovation

Last year, some programmes suffered delays (e.g. call for proposals of the R&D plan on fundamental research projects and Research Training (FPI)) or significant reductions (e.g. Research Training – FPI and FPU – with a reduction of 200 grants), or were cancelled entirely (e.g. the Jae programme). Also, many regions reduced their budgets for R&D and innovation and cancelled research training grants (e.g. Madrid, Castile and Leon and the Canary Islands)

2.4 Recent policy documents

The main new policy documents are: The new Law of Science, Technology and Innovation (LCTI), the new Spanish Strategy for Science and Technology and Innovation (EESTI) (2013-2020) and the Spanish State Plan of Scientific and Technical Research and Innovation (PECTI) (2013-2016).

NEW LAW OF SCIENCE, TECHNOLOGY AND INNOVATION (LCTI)

The new **Law of Science, Technology and Innovation (LCTI)** (1st June 2011) replaced the so-called Law of Science of 1986. The new law aims to improve coordination with regional and European authorities, to take into account the growth of the Spanish R&D and innovation system, to improve research careers and to help the transition to an economy based on knowledge and innovation. It also mentions gender issues and ethics. The emphasis on innovation, which was missing in the Law of 1986, the design of several mechanisms aimed at improving national and regional coordination, and the project of the Spanish Research Agency are the main relevant aspects of the new Law. It modifies the governance and human resources for R&D and improves the mechanisms for the transference of knowledge.

Governance of the R&D and innovation system

The LCTI organises the governance of the R&D and innovation system as follows. The Ministry of Science and Innovation (MICINN) now – the Ministry of Economy and Competitiveness (MINECO) – is responsible for drafting and managing the R&D and innovation strategies and plans proposals. The LCTI envisaged two strategies and two plans that have recently merged into single documents.

- The **Spanish Strategy for Science and Technology and Innovation (EESTI) (2013-2020)** is a multiannual plan that sets the rationale, objectives and indicators of the Spanish R&D and innovation policy (see below a specific section for this document).
- The **Spanish State Plan of Scientific and Technical Research and Innovation (PECTI) (2013-2016)** is a multiannual plan that implements the EESTI by setting its

priorities, programmes, coordination mechanisms, costs and sources of funding.
Both documents were approved on 1st February 2013 (see below a specific section for this document).

The **Executive Committee for Science, Technology and Innovation policy (CDCTI)** is an inter-ministerial body responsible for the planning, evaluation and coordination of the main Spanish instruments for R&D and innovation.

Two main consultative bodies support the design and implementation of the R&D innovation strategies and plans:

- **Council of Science, Technology and Innovation (CPCTI)** – in charge of coordination with regional governments and other actors in the R&D system. It also supports the drafting of the national strategies. Its members are the Secretaries of State of the Ministries with R&D and innovation responsibilities and representatives of each of the regional governments "Comunidades Autónomas". It replaces the General Council of Science & Technology (GSCT).
- **Advisory Council of Science, Technology and Innovation (CACTI)** in which the research community, enterprises and trade unions are represented. It reports on the strategies and plans and offers information, suggestions and opinions. It replaces the Advisory Council for Science and Technology Policy (ACSI).

The Ministry, in collaboration with other ministries, drafts the R&D and innovation plans. The CDCT and CACTI report on the drafts before these are subjected to the approval of the Government.

The LCTI 2011 envisages the creation of the Spanish Research Agency (to be created). This Agency aims to be an autonomous entity that will assign R&D funds on grounds of scientific merit. The draft of the General State Budget (PGE) of 2012 forbade the creation of any public agency, making it necessary to include an amendment to allow the creation of the Research Agency. The LCTI does not include specific details about the structure and responsibilities of this agency, which will be, together with the **Centre for Industrial Development (CDTI)**, the main funding bodies of the R&D and innovation system. It is assumed that the Agency will be responsible for the research-oriented projects whereas the CDTI will manage policy instruments oriented towards the enterprises. Other organisations, such as the Carlos III Health Institute, also fund research.

The **Information System of Science, Technology and Innovation (SICTI)** is responsible for the data collection and analysis for the monitoring of all policy programmes and instruments of the R&D and innovation policy. The system aims to gather information coming from national and regional actors (the National State Administration – AGE – and the Regional Administrations – "Comunidades Autónomas"). The system is under the umbrella of the MINECO and the Council of Science, Technology and Innovation (CPCTI). The LCTI emphasises the coordination between national and regional information systems through the SICTI and the CPCTI.

The **Committee of Ethics in Research** is an advisory body on the ethics of research and technology.

The design of several mechanisms aimed at improving national and regional coordination, such as the Council of Science, Technology and Innovation (CPCTI) and the new information system (SICTI), as well as the project of the Spanish Research Agency are the main changes in the governance of the R&D and innovation system brought by the new law. Figure 1 shows the structure of the Spanish research and innovation system and Table 2 in section 2.5 summarises some of the main organizational changes and equivalences between the new and previous

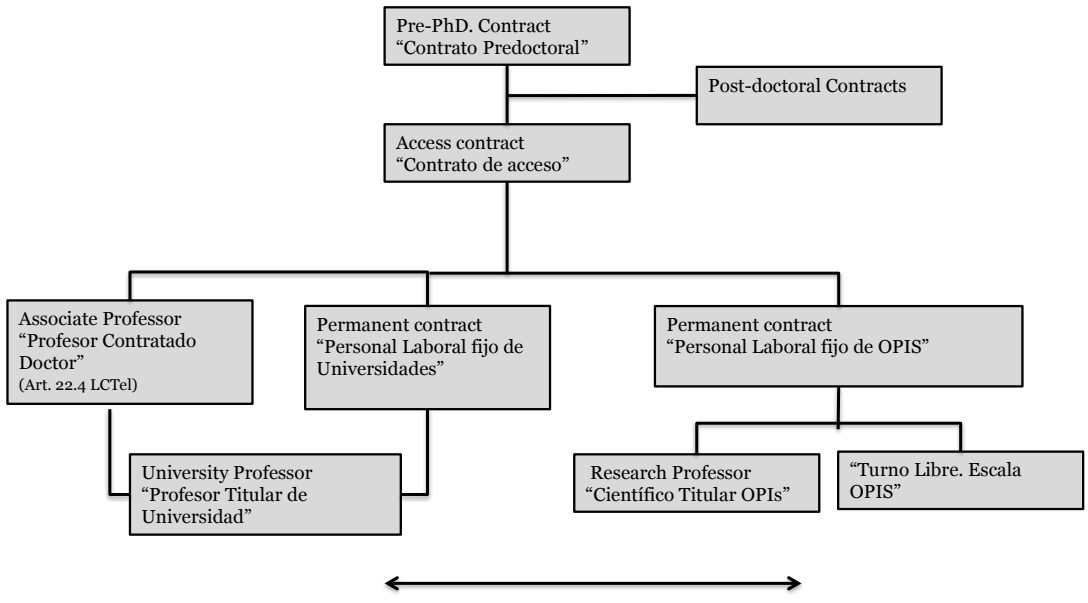
Spanish R&D and innovation system.

Human Resources

The LCTI includes four types of private (non-civil servant) labour contracts: (1) to carry out a PhD degree (four years maximum with minimum wages) (Art. 21); (2) of access (five years and maximum of 80 hours of teaching) (Art. 22); (3) for researchers working on research projects (D.a 23a); and (4) for distinguished researchers or scientists, "of great prestige" who will be able to occupy key positions in management or in "important" programmes (which can be permanent) (Art.23). The pre-PhD contract will be delayed till 2014 and the access ones could be conditioned by the State budget and public employment supply. Moreover, it has created a unified professional career. The different official professional scales for scientists with a civil servant status in public research organisations (PROs) will be unified in three, comparable to those of the Spanish National Scientific Research Council (CSIC): (1) research professor, (2) scientific researcher and (3) permanent scientist. This unification facilitates staff mobility between the PROs (see Figure 2 below).

The LCTI also improves several aspects in the career of the researchers. The future replacement of the 2+2 system (two years scholarship and then a two year contract) by a four-year employment contract implies the full recognition of certain rights such as unemployment benefits and maternity leave. In addition, the LCTI improves mobility between private and public organisations by allowing an extended leave for a maximum of 5 years and reducing partially the incompatibility for working in private firms (see section below).

Figure 2. Scheme of a research career



Source: MINECO

Mechanisms for knowledge transfer

The LCTI emphasises the role of innovation, technology and knowledge transfer by improving the mechanisms of knowledge transfer, granting property rights to researchers and reducing the incompatibily for researchers employed at public institutions to work in private firms. It aims at improving mechanisms of knowledge transfer by: (1) increasing the value of transfer activities (e.g. by detecting research groups whose knowledge could be applied or by increasing the role of OTRIs) (2) promoting the "units of excellence" (art. 33.1) or (3) developing an open-access

archive with research results. It encourages the creation of Technology Based Enterprises (EBTs) by allowing researchers to work part-time in private firms created by the organisations in which they are working and by eliminating restrictions on the maximum share ownership of a private company (10%) and the restrictions on being a board member in private companies. It modifies the previous Law of Sustainable Economy (Law 2/2011) to allow researchers to profit from their patent earnings.

THE SPANISH STRATEGY FOR SCIENCE AND TECHNOLGY AND INNOVATION (EESTI)

The **Spanish Strategy for Science and Technology and Innovation (EESTI) (2013-2020)** establishes the rationale, objectives and indicators of the Spanish R&D and innovation policy. The EESTI merges the two strategies envisaged by the LCTI –the Spanish Strategy for Science and Technology (EEST) and Spanish Strategy for Innovation (EEI) – and replaces to the previous National Science and Technology Strategy (ENCYT) and Spanish Strategy for Innovation (e2i).

The new strategy, EESTI, is based on: 5 basic principles; 4 general objectives disaggregated into 18 specific objectives; 6 Priority Axes; and 6 articulation mechanisms. It also sets out indicators to measure the impact of the R&D and innovation policy.

Its 5 principles are: (1) Coordination of R&D and innovation policies; (2) Stable framework; (3) Quality and social impact; (4) Efficiency and accountability; (5) Gender issues (See section 4.1 for the general and specific objectives).

The EESTI is in line with the Europe 2020 strategy. It is also based on an analysis that identifies 14 challenges[13] that are quite similar to the ones identified by the OECD report (2006).

THE SPANISH STATE PLAN FOR SCIENTIFIC AND TECHNICAL RESEARCH AND INNOVATION (PECTI) (2013-2016)

The **Spanish State Plan for Scientific and Technical Research and Innovation (PECTI) (2013-2016)** implements the EESTI by establishin its priorities, programmes, coordination mechanisms, costs and sources of funding. The PECTI merges the two strategies envisaged by the LCTI – the Spanish National Plan for Scientific and Technical Research (PECT) and the Spanish National Plan for Innovation (PEI) – and replaces the National Plan for R&D and Innovation 2008-2011, extended to the end of 2012, as well as Ingenio 2010.[14]

The new PECTI gives special emphasis on its integration into the European Research Area and to the promotion of: "(a) excellent basic research; (b) technological, industrial and firm leadership; and (c) scientific and technical research and innovation capabilities on grand challenges" (PECTI: 5).

Following the EESTI format, it is structured into 4 programmes and 18 sub-programmes (see

[13] (1) Low intensity of R&D effort; (2) Low private R&D investments; (3) Lack of instruments for financing private R&D; (4) Lack of venture capital; (5) Regional disparity in R&D; (6) Fragmentation of R&D groups; (7) Lack of public-private collaboration; (8) Inefficient mechanisms for Knowledge transfer; (9) Low R&D activity in traditional sectors and SMEs; (10) Small size and number of enterprises doing R&D activities; (11) Inter-sectorial mobility barriers for scientists; (12) Small survival business rates; (13) Low internationalisation of R&D actors (specially firms); (14) Low rate of firms in medium high sectors.

[14] Ingenio 2010 established the specific goals to commit with the Lisbon Strategy. These were to increase the ratio of R&D investment by GDP to 2%, to increase the R&D contribution of the private sector up to 55% and to reach the EU-15 average in the percentage of GDP allocated to ICT.

Box 2 in section 4.1).[15] In addition, it includes 2 strategic actions – first Health and secondly Digital economy and society. It establishes 6 modes of participation[16] and 4 funding instruments – subsidies, loans, venture capital and tax incentives. As in previous plans, it is operationalised through annual programmes. It envisages indicators to evaluate the management and the result of the programmes.

The PECTI is based on an analysis of the previous plan that identified 8 main problems.[17]

The new strategy and plan were approved on 1st February 2013, to follow on the current National Plan on R&D that finished in 2011 and was extended to the end of 2012. Two public consultation processes on the strategy and plan were carried out in October 2012 and December 2012 (see 2.7).

2.5 Research and innovation system changes

The main research and innovation system changes were brought by the LCTI and the change of the government. In addition, it is worth mentioning the social mobilisation in support of science that was triggered by the severe public budget cuts on R&D and innovation.

As the previous section specifies, the LCTI brought about some important changes in the Spanish research and innovation system. The emphasis in improving national and regional coordination through the CPCTI and SICTI and the creation of the new Spanish Research Agency are probably the most important changes in the governance structure introduced by this law. Some bodies were re-organised (e.g. the CPCTI) or re-named. (See the previous section for details, Figure 1 for the structure of the system and Table 2 for a summary of some of the main organisational changes and equivalences between the new and previous Spanish R&D and innovation system).

The new government (December 2011) closed down the Ministry of Science and Innovation (MICINN) and reallocated the main R&D and innovation responsibilities to the Ministry of Economy and Competitiveness (MINECO). Other Ministries with R&D responsibilities were reorganised or renamed (see Table 2 below).

Table 2: Main organisational changes and equivalences between the new and previous Spanish R&D and innovation systems

NEW R&D and innovation System	PREVIOUS R&D and innovation SYSTEM
MINECO	MICINN
Spanish Research Agency	
Spanish Strategy for Science, Technology and Innovation (2013-2020) merges: - Spanish Strategy for Science and Technology (EEST) - Spanish Strategy for Innovation (EEI)	National Strategy for Science and Technology (ENCYT)
	National Strategy for Innovation (since 2010)

[15] The programmes and sub-programmes are similar to the general and specific objectives of the EESTI.
[16] (1) R&D and innovation programmes; (2) Human Resources actions; (3) Research infrastructures and equipment; (4) complementary actions; (5) dynamic actions; and (6) collaborative actions.
[17] (1) Administrative burden; (2) lack of coordination (inter-institutional; inter-departmental and inter-regional); (3) excessive number of instrument; (4) fragmentation of funding; (5) unrealistic time framework; (6) lack of adequate indicator to follow evaluate the development and impact; (7) lack of dissemination of the results of funded projects; and (8) ministerial organisational changes that created problems in the development of programmes.

The Spanish State Plan of Scientific and Technical Research and Innovation (PECTI) merges: - Spanish National Plan for Scientific and Technical Research (PECT) - Spanish National Plan for Innovation (PEI)	National Plan for R&D and Innovation Spanish National Plan for Innovation
Council of Science, Technology and Innovation (CPCTI)	General Council of Science & Technology (GSCT)
Advisory Council of Science, technology and Innovation (CACTI)	Advisory Council for Science and Technology Policy (ACSI)
Information System of Science, Technology and Innovation (SICTI)	

In 2012, there were important institutional and grassroots public demostrations in support of science. The campaign for "A tick box in the tax declaration" ("Casilla en apoyo de la ciencia en la declaración de la Renta"), the "Open letter for Science in Spain", followed by the communication "No future without R&D and Innovation" and the simultaneous support actions of 19th December 2012 were probably the most significant ones. These actions denounced the severe public budget cuts on R&D and innovation as making R&D and innovation unsustainable and reducing the opportunities to improve the Spanish economy.

"A tick box on the tax declaration" ("Casilla en apoyo de la ciencia en la declaración de la Renta"). On 3rd January 2012 a web campaign started from a science blog that collected signatures demanding a specific tick box in the tax declaration to allow taxpayers to devote 0.7% of their taxes to research.[18] Within about a month, the campaign had gathered nearly 300,000 signatures, which were handed to the relevant institution.

"Open Letter for Science in Spain". This letter was the result of a consensus between different research-related organisations – COSCE, CRUE, the Federation of Young Researchers, the grassroots movement "Investigación digna", and the trade-unions CC.OO. and UGT. The letter demanded that "a new reduction of the investments in R&D and innovation" should be avoided and that R&D and innovation should be included among the "priority sectors".[19] This letter gathered about 40,000 signatures in a week.

"No future without R&D and Innovation" is a communication launched during the "Week of Science" (8th-18th November 2012) by the above-mentioned institutions jointly with the "Foro de Empresas Innovadoras", which denounced the severe public budget cuts on R&D. On those days the Spanish Congress was debating the Public General Budgets for 2013.

On 19th December 2012 the organisations that had launched the "Open letter for Science in Spain" called for a series of **simultaneous public demonstrations** in support of research and Innovation with the slogan "There is a future with R&D and Innovation". These were followed in several Spanish cities and included a special programme on SER radio, one of the most important radio stations in the country.

[18] Currently, the Spanish tax declaration form includes a tick box that allows tax payers to devote 0.7% of their taxes either to development or religious actions.

[19] The Royal Decree-Law 20/2011, an urgent measure to correct public deficit (BOE-A-2011-20638, 31 Dec., 2011, Art. 3) establishes that *"the hiring of personnel (…) will be restricted to sectors considered to be a priority"*. These sectors will also be allowed to fill the vacancies left by retirees.

2.6 Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3)

The concept of "smart specialisation" is gaining importance in the Spanish R&D and innovation system. Smart specialization entails the necessity to prioritise specific areas of research and innovation based on the needs and resources of regions. It is worth mentioning that the new Spanish Strategy for Science, Technology and Innovation (EESTI) (2013-2020) includes the concept in one of its 6 priority axe (Priority 5) as the tool for increasing the competitiveness of the regional systems of Innovation. The Spanish State Plan for Scientific and Technical Research and Innovation (PECTI) (2013-2016) also mentions this concept. However, it is not very clear if it will be a national, regional or a shared competence.

Many other regional authorities are using the concept of "smart specialisation" to design or develop their regional strategies. One piece of evidence of the success of the concept is that all Regional authorities or "Comunidades Autónomas" (CAs) have registered for the Smart Specialisation Platform (S³P), which "assists Member States and regions to develop, implement and review Research and Innovation Strategies for Smart Specialisation (RIS³)" (RIS³: on-line). In addition, Navarre and the Balearic Islands have been the subject of case studies on smart specialisation (Ortega-Argilés, 2012).

In any case, it is also worth mentioning the case of the Basque Country as a region in which this rational was applied a long time ago. In the early 198os, this region started a series of policies that were designed and implemented in collaboration with the main political, economic and social stakeholders, and it has managed to transform its economic structure and become one of the main R&D regional actors with the highest R&D investment per GDP in Spain (2.1% in 2011), as well as being the region with the lowest level of unemployment (12.1% in 2011. Source).[20]

2.7 Evaluations, consultations

Under the mandate of the MINECO, the Spanish Foundation for Science and Technology (FECYT) carried out yearly evaluations of the R&D public calls for proposals from 2006-2010. Currently, the Ministry has decided to carry out evaluations with a longer time frame. The CDTI evaluates most of the business-oriented instruments, but there were not publically available reports on 2012 at the time of writing this report (see section 4.3). Therefore, it could be said that the most important public consultations of the year were carried out in relation to the Draft of the Spanish Strategy for Science and Technology and Innovation (2013-2020) (EESTI) and the Draft of the Spanish State Plan for Scientific and Technical Research and Innovation (2013-2016) (PECTI), in October and December 2012. As mentioned, the final versions of the EESTI (2013-2020) and PECTI (2013-2016) were approved on 1st February 2013.

The consultation on the draft of the **Spanish Strategy for Science, Technology and Innovation (EESTI) (2013-2020)** was carried out between 9th and 25th October 2012. The document received more than 1,400 comments and suggestions (EESTI: 3). For example, the COSCE (Modrego et al., 2012a) recognised the efforts of the EESTI to improve coordination but identified several main weaknesses in the document: it did not take real actions to address the

[20] Source INE. In addition, the RedIRIS, an academic and research network, aimed at improving communication could also help to apply strategies of smart specialization.

current situation of the Spanish R&D and innovation system (e.g. it uses data of 2010); it did not include a realistic time framework; it did not have a clear assignation of responsibilities for genuinely changing the governance system and for improving the efficiency of the system. Some of these comments were partially addressed in the final version of the document. For example, the principles have been reduced from 7 to 5 and the articulation principles from 10 to 6.

The consultation on thedrat of the **Spanish State Plan for Scientific and Technical Research and Innovation (PECTI) (2013-2016)** was carried out between 22nd and 8th December 2012. The document received more than 800 comments and recommendations (PECTI: 5). For example, the COSCE (Modrego et al., 2012b) recognised the efforts of the plan to establish its main aim as improving coordination between design and implementation. However, it clearly stated that the plan "has high expectations that are impossible to reach. This generates a feeling of frustration" (p. 2). The report was quite negative, as it considered, among other issues[21], that the design of the plan did not take into account the current situation of the Spanish R&D and innovation system. The main criticisms were the lack of priority-setting in an environment of decreasing public budgets; the lack of precision in establishing the funding methods; the fact that it does not take into account previous failures (e.g. by using instruments for promoting innovation that have not been used or evaluated); the low importance of the ex-post evaluation mechanisms and vague distribution of responsibilities between funding bodies (the Spanish Research Agency and the CDTI). Some of these comments were partially addressed in the final version of the document. For example, it includes references to the ex-post evaluation, it is more detailed when describing the competences of the funding bodies and includes more detailed, but still general, indicators.

2.8 Policy developments related to Council Country Specific Recommendations

The Council Country-Specific Recommendations (July 2012) recommended that Spain should "review spending priorities and reallocate funds to support access to finance for SMEs, research, innovation and young people" (Recommendation 6: p. 13). The **National Reform Programme 2012** and the **Stability Programme 2012-15** could be considered in order to assess the measures adopted to tackle these recommendations. These policy documents mainly reinforce the objectives for the Spanish R&D and innovation system of increasing excellence, internationalisation, and regional and public-private collaboration, and they place a higher emphasis on innovation activities.

The **National Reform Programme 2012** includes in the R&D measures in action number 92. These include the creation of the Spanish Research Agency and the new "strategies" and "plans". These are recognised as improving the private participation in the Spanish R&D system and improving the indicators on innovation. Actions 24 (health) and 75 (digital agenda) also mention the importance of R&D.

The **Stability Programme 2012-15** states the importance of improving the levels of innovation and internationalisation in the Spanish Research and Innovation system. It also mentions the LCTI, the Spanish Research Agency and the strategies and plans as specific measures.

[21] More specifically, it considers that the PECTI lacks realistic analysis; clarity and coherence between objectives; design of effective instruments; priority setting; stability; budget allocation and real change in the governance system towards efficiency, evaluation and cooperation among all the stakeholders.

In summary, it is difficult to disentangle the possible specific measures adopted to tackle the Council Country Specific Recommendations (July 2012) from the general measures to design and implement the R&D policy framework (e.g. LCTI or PECTI). It could be said that there is a higher emphasis on innovation in the R&D policy framework. However, public budget cuts to R&D and innovation indicate that the specific recommendations of reallocating funds to support R&D and innovation are clearly not being followed.

3 STRUCTURAL CHALLENGES FACING THE NATIONAL SYSTEM

Spain is a "moderate innovator"[22] (EC, 2012 and EC, 2013) and its strengths lie in tertiary education, international scientific co-publications and medium and high tech exports, while its weaknesses are in private investments, public-private linkages, innovation outputs and knowledge intensive activities. To illustrate its strengths: with increasing levels between 2008 and 2010 (data from the IUS dashboard) and above the EU-27 average (shown in brackets), Spain is outstanding firstly in its percentage of population aged 30-34 who have completed tertiary education, which changed from 39.8% to 40.6% (34.6%); secondly in the level of international co-publications per million, which changed from 454 to 599 (300); and thirdly in the contribution of medium and high-tech product exports to trade balance, which changed from 101.97 to 103.05 (101.28). In contrast, the weak area figures show that at levels below the EU-27 average, Spain underperformed in the percentage of GDP of private R&D expenditures, by 0.67% in 2011 against the EU-27 level (1.27%); in the number of public-private co-publications per million population, 22.5 against 52.8; in patents application per billion GDP (in PPS€), 1.43 against 3.9; in patents applications in societal challenges per billion GDP (in PPS€), 0.39 against 0.96; in the percentage of GDP coming form license and paten revenues from abroad, 0.07% against 0.58%; and in the percentage of knowledge-intensive services exports of total service exports 21.6% against 45.1%.

The Spanish research and innovation system relies heavily on public funds, and recent severe public budget cuts are threatening to create new structural challenges and to intensify the existing ones. Spain had a GBAORD as a percentage of GDP of 0.69% in 2011 that was above the EU-27 average of 0.73. GBAORD decreased by -4.5% (0.79% of the GDP) in 2010 and by -12.2% (0.69% of GDP) in 2011, leading to a budget of €7,294. As mentioned, data on the central government's budget for public expenditures on R&D and innovation (PGE) showed that public investments on R&D and innovation decreased in 2012 by -25.6%, thereby increasing the negative trend of previous years (-4,1% in 2010 and -7.4% in 2011). This means that public R&D investments reverted to the levels of 2006 (Molero and de No, 2012b). In relative terms, the total funds per R&D personnel (FTE) have changed from €31.9k in 2002 to €41.1k per head in 2009. For 2013, this figure will represent €22.6k per head (Molero and de No, 2012c; Molero and de No, 2013), which is much lower than the one in 2002. The increasing share of loans against that of subsidies implies, de facto, an even greater decrease. In addition, the non-execution of an important part of the budgets, as this has worsened the situation (between 21% and 42% in the period 2009-2011) (Molero and de No, 2012a). The concentration of the reductions in non-financial funds (Molero and de No, 2012c and 2013) could have a very negative impact on public basic research. Important research organisation condemned these severe cuts, as they could destroy the achievements of several years of R&D investments (see section 2.2 and 2.5).

Spain, like all developed countries, needs to invest heavily in R&D and innovation if it is to gain and maintain its economic competitive advantage. It has to compete nowadays with industrialised low wage countries and global players such as China or India or the Eastern European EU countries (such as Poland or Romania). The Spanish public authorities and firms have appeared to understand that to build a stronger R&D and innovation system was the only way to become competitive and meet the challenges of a globalised world. In fact, Spain made strong efforts in the period 2002-2008 when its GERD in absolute terms doubled while in

[22] Together with the Czech Republic, Greece, Hungary, Italy, Lithuania, Malta, Portugal and Slovakia (EC, 2013)

relative terms the GERD by GDP increased from 0.99% in 2002 to 1.35% in 2008. There was also a restructuring of the country's policy mix on R&D and innovation, including new instruments aimed at tackling the main challenges and overcoming bottlenecks in the Spanish R&D and innovation system (EW, 2011). However, the severe public budget cuts to R&D in recent years appear to contradict the rational of increasing R&D investments, the formal political discourse in support of R&D and innovation expenses, and the Council's Country-Specific suggestions (see section 2.8).

Table 3: Innovation Union Scoreboard Indicators for Spain (2008-2011)

	2008	2009	2010	2011	EU-27
ENABLERS					
Human Resources					
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	0.9	1	1.2		1.5(10)
Percentage population aged 30-34 having completed tertiary education	39.8	39.4	40.6	40.6	34.6
Open, excellent and attractive research systems					
International scientific co-publications per million population	454	493	546	599	300
Scientific publications among the top 10% most cited publications worldwide as a % of total scientific publications of the country	10.2				10.9 (08)
Finance and support					
R&D expenditure in the public sector as % of GDP	o.61	0.7	0.67	0.64	0.75
FIRM ACTIVITIES					
R&D expenditure in the business sector as % of GDP	0.74	0.72	0.72	0.67	1.27
Linkages & entrepreneurship					
Public-private co-publications per million population	22.5	23.9	26.5	28.7	52.8
Intellectual assets					
PCT patents applications per billion of GDP (in PPS€)	1.38	1.43			3.9 (09)
PCT patents applications in societal challenges per billion of GDP (in PPS€) (climate change mitigation; health)	0.34	0.39			0.96(09)
OUTPUTS					
Economic effects					
Contribution of Medium and high-tech product exports to trade balance	101.97	101.92	102.56	103.05	101.28
Knowledge-intensive services exports as % of total service exports	22.7	22.5	21.6		45.1 (10)
License and patent revenues from abroad as % of GDP	0.05	0.05	0.06	0.07	0.58

Data sources: Eurostat and Innovation Union Scoreboard (2013)

The Spanish R&D and innovation system faces challenges in its industrial structure, science and technology base, and governance structure. These main challenges were identified several years ago (OECD, 2006; EW 2009; EC, 2011a) and, despite the efforts, they still remain. For example, the new strategy EESTI (2013-2020) identifies 14[23] challenges that are quite similar to the ones

[23] See Footnote 13.

signalled by the OECD report (2006). Recent studies (Heijs, 2012 and Buesa, 2012) also indicate the persistence of these challenges.

Industrial structure challenges. The Spanish industrial structure is characterised by its significant weight of small and medium-sized firms in low-tech traditional sectors (OECD, 2006; EW, 2010, 2009; EC, 2011a) and the lack of sufficient Spanish multinational enterprises with a leading role in creating R&D-related networks (EW, 2012; Scoreboard 2012). Thus, it is not surprising to find low levels of Spanish patenting activity (EC 2012 and 2010b) and a low innovative culture (COTEC, 2011a).

Science and technology base challenges. The Spanish public R&D system has increased its performance considerably in the recent years and positively enabled its human resources capacity (see the above-mentioned levels of international publications and tertiary education). However, the system is challenged by its fragmentation and lack of flexibility, with low levels of mobility between institutions, countries and sectors (OECD, 2006; EW, 2012), which act as barriers to improving its efficiency. This fragmentation, and lack flexibility and mobility, create inefficiencies[24] and negatively affect the creation of the necessary "critical mass" to keep on improving the level of quality of research outputs[25] and reducing the distance between research and social and economic needs.

The fragmentation of the system was mainly caused by the rapid creation and growth of universities without considering the demand (Hernández & Pérez, 2011) and by the dispersion of funding (OECD, 2006). The lack of mobility makes it necessary to improve inter-institutional mobility and reduce the high levels of "endogamy" (Cruz-Castro and Sanz-Menendez, 2011; Cruz-Castro et al., 2006); to facilitate access by foreign researchers and the return of nationals with foreign experience; and to improve public-private collaborations. Research institutions lack the necessary levels of mobility to facilitate knowledge creation and circulation; to become more efficient and competitive; and to reduce the distance between research and social and economic needs.

Governance challenges. The main policy challenges have been identified as the lack of coordination (regional and ministerial) between research and innovation policies and insufficient synergies between policy design and implementation (OECD, 2006). The new plan, PECTI (2013-2016), recognises the persistence of these challenges.[26]

As mentioned, despite the efforts, the main challenges of the Spanish R&D and innovation system remain. This is due to three main reasons (1) systemic or structural challenges are

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[24] "The empirical analysis of Hernandez and Perez (2011) indicates three main reasons for this inefficiency. First of all, the growing number of new universities or local campuses that were created by the regional governments, despite the lack of demand from potential students. Secondly, the fact that the future stable employment of young researchers or university professors in the public sector depends almost exclusively on the possibilities in their own organisation to generate a strategy of internal growth. To justify this growth new studies and degrees (including expert or master courses) were created, again without the necessary demand from students. Both tendencies increased the costs per student exponentially. A third form of inefficiency is based on the low productivity and insufficient excellence level of the research activities. Almost 25% of the Spanish public scientific researchers – despite the current very low minimum requirements - do not have any formal recognition of their research activities (EW, 2010; Hernandez and Perez, 2011). One of the causes is the very low – or almost non-existent- payments for productivity or excellence for their research and educational activities. In addition, the few existing mechanisms have a very low discriminating level due to the low minimum requirements." (EW 2011: 16)

[25] Although the levels of research performance (international scientific co-publications per million population) are above the EU-27 average, the impact of research is below this average (for the latest data available of 2008 the scientific publication among the top 10% most cited publications worldwide as a percentage of total scientific publications was 10.2 against 10.9.

[26] See Footnote 17.

basically long-term challenges (e.g. it is impossible and probably mistaken to change the economic structure or research base of a country in a short-term period); (2) the Spanish R&D and innovation system is a "developing" system (the R&D efforts of Spain are recent and it is unrealistic and probably mistaken to expect some results (e.g. high level of patenting activity) and features (e.g. high public-private collaboration) that correspond more to a "developed" R&D system); (3) some of the challenges have not been properly addressed.

4 ASSESSMENT OF THE NATIONAL INNOVATION STRATEGY

4.1 National research and innovation priorities

The national research and innovation priorities and goals are set by the national and regional "strategies" and "plans". The LCTI 2011 foresaw two strategies and plans that aimed to set out the general common objectives and priorities on R&D and innovation policies. These should be shared by all the national and regional administrations, thereby enssuring an efficient implementation of policies at different political levels (regional, national and European). The strategies and plans aim to transform the Spanish economy into a sustainable and knowledge-based economy and policy goals are in line with Europe 2020 strategy which is aimed at reaching the 3% investment of GDP in R&D. These envisaged two strategies and two plans have recently been merged into two single documents:

The **Spanish Strategy for Science and Technology and Innovation (EESTI) (2013-2020)** set the rationale, objectives and indicators of the Spanish R&D and innovation policy. The EESTI merges two envisaged strategies – the Spanish Strategy for Science and Technology (EEST) and the Spanish Strategy for Innovation (EEI) – which replaces the previous National Science and Technology Strategy (ENCYT) and Spanish Strategy for Innovation (e2i).

The **strategy implemented by the Spanish State Plan for Scientific and Technical Research and Innovation (PECTI) (2013-2016)** implements the EESTI by setting its priorities, programmes, coordination mechanisms, costs and sources of funding. The PECTI merges two envisaged strategies – Spanish National Plan for Scientific and Technical Research (PECT) and the Spanish National Plan for Innovation (PEI) – and which replaces the National Plan for R&D and Innovation 2008-2011, extended to the end of 2012, and Ingenio 2010.[27]

The new strategy and plan were approved on 1st February 2013. The current National Plan on R&D that finished in 2011 was extended to the end of 2012. The public consultation processes on the strategy and plan were carried out in October 2012 and December 2012 (see 2.7).

The National Plan for R&D and innovation (2008-2011) (NP) (extended to the end of 1012) was the main Spanish research policy programme. It had six main objectives – IWL Instrumental Working Lines (see box 1 below for description of these general and specific objectives). The national plan also included quantitative objectives based on the pursued improvement of 16 statistical R&D indicators.

The new strategy, EESTI, is based on 5 basic principles, 4 general objectives and 18 specific ones, 6 Priority Axe, and 6 articulation mechanisms. It also has sets of indicators to measure the impact of R&D and innovation policy (See box 2 below for a description of the new general and specific objectives).

In addition, it should be mentioned that the **National Reform Programme 2012** and the **Stability Programme 2012-15** translate the Europe 2020 strategy into national targets. These

[27] See Footnote 14.

policy documents reinforce the objectives for the Spanish R&D and innovation system of increasing excellence, internationalisation, and regional and public-private collaboration, and place greater emphasis on innovation activities.

Box 1: General and specific objectives of the Spanish R&D and innovation policies (based on previous policy framework –end 2012)[28]

I. **Putting Spain in the vanguard of knowledge (3):** (1) raising the profile of knowledge generation; (2) finance based on criteria of excellence and demand; (3) increasing the number of researchers and their qualification.

II. **Promoting a highly competitive structure of firms (5):** (1) Increasing the capacity of the Science and Technology (S&T) infrastructure organisations and (2) its interdisciplinary use by all agents, especially small- and medium-sized enterprises (SMEs), fostering (3) cooperation and (4) technology transfer; (5) matching R&D to demand in the markets.

III. **Integrating the regional level into the national S&T system: (3)** (1) Encouraging coordination between national and regional policies (2) including joint tenders and (3) the evaluation of the policies.

IV. **Strengthening the international dimension of the S&T system (5):** Promoting (1) the international cooperation of Spanish R&D agents; (2) participation in and use of large European research facilities and (3) in the VII Framework Programme (FP); (4) providing access for foreign R&D agents to national public tenders; (5) coordination of R&D executing agents of different countries by ERA-NET.

V. **Making available a favourable atmosphere for R&D investments (4):** Improving (1) cooperation; (2) transparency; (3) policy-management; and (4) organisation (evaluation criteria, access, etc.) to ensure the goal achievement is related to R&D and innovation investment.

VI. **Making available favourable conditions to promote scientific culture and the diffusion of S&T advances in society (3)** (1) Using new means of communication to show the scientific and technological innovations to society; (2) designing stable structures to promote scientific culture; (3) creating networks for social communication in science and technology.

Box 2: General and specific objectives of the Spanish R&D and innovation policies New EESTI 2013-2020

I. **Recognition and promotion of talent and employability (3):**
(1) Education and training in R&D and Innovation; (2) Mobility and development of research career; (3) Human resources employability.

II. **Promotion of excellence (4):**
(1) Institutional empowerment; (2) Sustainability and use of scientific and technological infrastructures; (3) Promotion of frontier knowledge; (4) Promotion and development of emergent technologies.

III. **Business leadership (3):**
(1) Encouragement of business R&D and Innovation; (2) Market oriented R&D and innovation activities; (3) Promotion of enabling technologies.

IV. **Promotion of R&D and innovation towards societal challenges (8):**
(1) Health, demographic change and welfare; (2) Bio economy; security and food quality, sustainable agriculture production and natural resources sustainability; (3) Energy, security and green energy efficiency; (4) Smart, sustainable and integrated transport; (5) Climate change, efficiency in the use of resources and raw materials; (6) Innovation and social change; (7) Digital economy and society; (8) Security, liberty and rights protection.

The new EESTI strategy (2013-2020) appears to be based on an analysis that identifies 14 challenges.[29] These challenges are quite similar to the ones signalled by the OECD report (2006) that were in the basis of the previous plan (2008-2011). It has to be mentioned that efforts were

[28] This scheme of goals is almost the same as that presented in the **National Strategy for Science and Technology (ENCYT)** – a common declaration of intentions approved by the 3rd Conference of the Regional Presidents (chaired by the President of the Spanish government) (EW, 2012).

[29] See Footnote 13.

made in following the suggestions of these evaluations.[30] However, the new PECTI plan (2013-2016) recognises the persistence of these governance challenges[31] and has tried, among other issues, to reduce the number of objectives, improve regional and national collaboration, and the information system for the monitoring of policy programmes and instruments.

The changes in the strategies and plans indicates an increasing emphasis on innovation, public-private R&D collaboration, research excellence and other emerging topics, such as the promotion of R&D and innovation on societal challenges or the role of public procurement[32] to promote R&D and innovation.

Regarding the priorities or the structural impact of public support for research in the private sector, the data of the INE can be used. In 2011 the Spanish state (and/or regions) financed 14.4% of the total private R&D (support intensity), 60.7% distributed for SMEs and 39.3% for big firms. In the service sector this percentage (17.9%) is clearly higher than in agriculture (15.1%) and the industrial sector (11.5%). Within the service sector "other business services" (38.4%), the "R&D services" (25.6% NACE 72, including the technology centres). In addition, some industrial sectors are supported more intensively, such as aerospace (38.7%). Public funds for private R&D have decrease by 14.6% between 2010 and 2011.

The solution to the major societal challenges and the contribution to sustainable development are receiving growing attention in Spanish R&D and innovation policies. The EESTI 2012-2020 and PECTI (2013-16) follow the efforts of previous measures[33] and increase their focus on the promotion of R&D and innovation on societal challenges (see Box 2 general objective focus on societal challenges).

The evaluation of the impact and the efficiency of the policy measures on R&D is not an extended practice in the Spanish R&D and innovation system (Heijs and Martinez, 2011; Eparvier, 2009). The research policy evaluation culture could be considered as moderately developed. Strategies and plans are increasingly based on some sort of evaluation analysis. There is nonetheless a range of evaluation studies – especially for national policies – carried out by different researchers and financed by different policy-makers or agencies. In particular, the CDTI, the FECYT and the Institute for Fiscal Studies or COSCE frequently finance or carry out such studies. Most of them analyse specific instruments or programmes. Most studies offer a positive view on the impact and indicate the existence of financial additionalities (see section 4.3). More recently, these reports emphasise the possible negative effects of decreasing trends on public budgets for R&D and innovation (e.g. COSCE reports)

[30] The structure of the plan (2008-2011) aimed to overcome the limitations identified in earlier plans (OECD, 2006) by changing the structure of distribution of funds – from thematic areas to instrumental priorities, aiming to involve stakeholders in achieving collective goals through strategic and operational objectives- reducing its structure reduced; simplifying and standardising tools, programs and actions, as well as increasing its visibility to the executors of the activities and decreasing the number of calls. This structure aimed to create enough critical mass to achieve an innovative environment.

[31] See Footnote 17.

[32] The Law on Sustainable Economy (2011) introduced public procurement of innovative goods and services as a policy instrument, especially in some specific fields such as environmental protection and digitalisation of public services, in collaboration with regional and local authorities (For details, see the Mini Country Report of Spain 2011). The new Law of Science, Technology and Innovation (2011) reinforced the objectives of these policy initiatives and instruments. INNODMANDA and INNOCOMPRA are instruments designed to implement these policy goals.

[33] The previous strategy E2i-Strategy (2009) - and the new Law on Sustainable Economy (March 2011) included a focus on sustainable development and societal challenges such as clean energy and biotechnology. Both objectives – sustainable growth and structural change - were regarded as complementary because technological progress towards solving societal problems could generate new high tech enterprises and promote the required structural change, which are considered to be one of the mayor challenges of the Spanish economic recovery and long term growth (Heijs, 2011).

4.2 Evolution and analysis of the policy mixes

The most important tendencies in the policy mix in the last few years have been: the clear shift towards innovation policies; the increasing importance of knowledge transfer from the research sector to the productive one; the increasing importance of competitive funding and the implementation of a more diversified set of instruments. This trend can be seen through the objectives of the strategies and plans, new initiatives, instruments and budget allocation. Some changes in the management of human resources for R&D and innovation deserve attention. Additional new trends in the policy mix are research that is oriented towards the solution of societal challenges and the use of public procurement to encourage innovation.

As mentioned in previous sections, we can see this evolution through the changes in the objectives set by different R&D and innovation strategies and plans. The merger between the R&D strategies and plans with the innovation strategies and plans could be also interpreted as a way to reinforce innovation policies and the knowledge transfer from research to innovation (see section 4.1).

Almost all new R&D policy initiatives are aimed at increasing the cooperation between the research system and the private sector. With the exception of the Severo Ochoa programme that focused on "excellence", all new programs launched in 2011 focused on innovation and/or knowledge transfer – AVANZA TIC Verdes, INNPRONTA, FEDER-INTERCONNECTA; INNTERNACIONALIZA; INNVIERTE and INNODEMANDA (see section 2.3). It is worth mentioning the relevance of the instruments created to generate large long-term strategic projects based on public-private cooperation (PPC) in order to create a critical mass and the large number of Science and Technology Parks that have been created in cooperation with universities and/or public research organisations.[34] This change towards innovation and knowledge transfer is a more continuous change that is often difficult to track with exact data or to pinpoint at a specific moment.

The greater weight in the policy mix in 2011[35] was the support for competitive projects for public research organisations and universities (around 23-28% of the budgets in the period 2009-2011). Moreover, these institutions received block funding. The total direct support for business R&D was around 38% of the total budget of the policy mix in 2011 (subventions 18%; support for PPC 17%; and tax advantages 3%). The support for R&D and innovation infrastructures absorbed over 11% of the funds, a level much lower than in 2009 when it still absorbed 18% of the funds. In fact the total support for the science sector and the creation of facilities for technology transfer absorbed around 50% of the total support budget in 2009-2010 while in 2011 their participation dropped to 37% (excluding the block funding). In the meantime, the support for R&D in firms for individual and cooperative (science-enterprises) projects (including tax incentives) rose from 26% to 38% of the total budget. However, the decreasing public support for R&D, including private R&D, demands a clear prioritisation of R&D and innovation policy objectives to handle this diverse set of instruments.

The Spanish system of **tax incentives** for R&D and innovation has been one of the most generous among OECD countries for the past few years. The current Spanish regulation

[34]For example, the INNPRONTA programme requires PPC, a minimum budget of €15m, a minimum duration of 4 years and financing of up to 47% of the budget.

[35] This data is a summary of section 2.2 of the ERAWATCH Mini Country Report for Spain (EW, 2011b). This report uses the ERAWATCH classification and summarises the data of the Working Plans of 2009 to 2011, which offer detailed information on the budgets for all the instruments of the Spanish R&D and innovation policies of the central government.

includes three types of R&D tax incentives for firms (Ministry of Science and Innovation, 2011: 12): (1) Tax deduction for R&D and innovation activities (ex-ante and ex-post); (2) Income reduction for transferring intangible assets ("Patent Box") and (3) Social security benefits for full-time R&D personnel.[36] Despite the fact that tax incentives are very generous, however, the bureaucratic procedure for benefitting from these deductions was until recently complex and uncertain. This diminished the incentive effects of the support programme. To simplify the deduction and limit the uncertainty about the approval of the R&D and innovation tax deduction, in 2004 the Spanish government introduced the so-called "Motivated Reports".[37] The Ministry of Treasury indicates that the average annual cost of tax income forgone by the state was €200-300m in 2002-03 and over €300-400m in 2004-08 decreasing to around €200m in the last few years. This represents around 3-5% of private R&D expenditure in this period, while support in the form of subventions has been around 16-18 % since 2007 (see Country Fiche section 4).

Spain has a large number of instruments to foster Human Resources in science and innovation and the mobility of such resources. In 2011, the Instrumental Working Line (IWL) for Human Resources of the R&D Spanish National Plan received €271.4m, 8.2% of the total R&D activities fund by the AGE (FECYT, 2012). Three overall programmes are included in this IWL: (1) the programme for the training of researchers (with a funding of €94m – 34.7% of total funds for Human Resources in R&D) offers support for PhD students (a two year scholarship and a two-year contract); (2) the programme for the mobility of Human Resources for lecturers and doctorate students (€15,4m - 5,67%) and; (3) the programme to increase the demand for researchers in the Spanish R&D system (€161.9m – 59.7%), which supports post-doctoral contracts and facilitates access by PhDs to a permanent position and into firms (FECYT, 2012). Moreover, the regional governments also offer a large number of schemes geared to R&D human resources. However, budget cuts have led several regional and national governments to cancel or suspend some of these programmes (see section 2.3).

The **LCTI** (1st June 2011) has introduced some important changes in the human resources for R&D, to improve mobility between sectors and to improve access to a research career (see 2.4). However, some criticism exists regarding the scope of these measures. The research community was expecting the law to implement a "tenure-track" contract to facilitate access by young researchers to a permanent research position. However, it appears that the "access contract" does not meet this requirement, being another type of contract that does not improve the precarious situation of young researchers in Spain.[38] A flexible and competitive system for the management of human resources is a constant demand of the research community (see section 2.5).

The education policy to create human capital is in the hands of the universities and their management is isolated and not always oriented to the needs of the future labour market (EW, 2012), although in the case of Catalonia a first step has been towards a new model of governance that integrates the production sector into the decision-making process of universities. On that

[36] The deductions are based on the Royal Decree - Law 4/2004 and are further developed in Law 35/2006; Law 4/2008; the Royal Decree - Law 3/2009 and the Law 2/2011). The tax reform approved in November 2006 brought important changes. First, it enabled up to a 40% reduction in social security taxes of R&D staff working for firms. Second, following a trend of reducing corporate taxes, R&D and innovation corporate tax credits were also reduced. In 2009, the deduction procedure was simplified: cancelling the time limit of 2 years to deduce taxes for R&D investments. Moreover in 2011 the deduction for innovation was increased from 8% to 12%.

[37] These reports certify R&D and innovation activities and expenditures of firms and are binding on the Tax Authorities. They are filled in and approved by official organisations registered by the Spanish government. Such reports are not compulsory in order to benefit from tax deductions for R&D and innovation expenditures, but offer a guarantee that they will be admitted as such.

[38] See Footnote 26.

region a Commission was created to study and propose a new Governance system of the university with a specific role of the stakeholders.[39] The OECD published two studies on Higher Education Strategies in Catalonia and Andalusia pointing out the problems already mentioned (OECD, 2011b and 2011c).

As mentioned in the previous section, the promotion of R&D and innovation on societal challenges or the role of public procurement to promote R&D and innovation are included as priorities in the new strategy EESTI (2013-2020) and new plan PECTI (2013-2016) and follow previous policy efforts in this line. However, the definition of these societal challenges has received some criticism for not considering the country specific needs and R&D strengths (Modrego, A. et al., 2012b). Measures to encourage innovation through public procurement are still only in an incipient stage.

The lack of execution of public R&D budget for R&D and innovation (Molero and de No, 2012a) indicates that there is a need to analyse what instruments and measures are not being sufficiently demanded or used.

4.3 Assessment of the policy mix

The Spanish policy mix in the last decade has experienced important changes. Most of them were based on several analyses of the obstacles and problems of the Spanish innovation system (OECD, 2006; COSCE, 2005; COTEC, 2005). Although these studies are not so recent their impact has been very important and in some way, still notable. In addition, new studies appear to have influenced the structure of the new strategy EESTI (2013-2020) and plan PECTI (2013-2016), both of which follow the efforts of previous plans that had a qualitative influence on the balance between different policy instruments. In particular, following the INGENIO 2010 initiative –approved at the end of 2005 – and then integrated in the National Plan for R&D (2008-2011) and the e2i the creation of NTBFs and university spin-offs, the promotion of R&D projects in general and more specifically public-private cooperation in long term strategic projects have all been reinforced[40]; and policies to foster human capital, such as the incorporation of PhD holders into the private sector and the creation of the S&T infrastructure, have been heavily reinforced. In addition, the e2i strategy has reinforced several of those instruments offering extra financial support for R&D and innovation in general and specifically for risk capital, paying attention to societal challenges and, for the first time, has included public procurement as an instrument associated with the acquisition of innovative goods and services. As mentioned, all these instruments for the promotion of innovation and knowledge and technology transfer have been included and reinforced in the new strategy EESTI (2013-2020) and plan PECTI (2013-2016).

The overall impact of these new instruments is not clear. As mentioned, the R&D policy evaluations are still not a systematic activity (CIA4OPM, 2011; Heijs and Martinez, 2011; Eparvier, 2009). The research policy evaluation culture could be considered as moderately developed. As mentioned, strategies and plans are increasingly based on some sort of evaluation analysis. There is nonetheless a range of evaluation studies – especially for national policies – carried out by different researchers and financed by different policy-makers or agencies. In particular, the CDTI, the FECYT and the Institute for Fiscal Studies or COSCE frequently finance or carry out such studies. Most of them analyse specific instruments or programmes. Moreover, PhD students or researcher conduct other studies using the publicly available databases (see Valadéz et al, 2011; Herrera, 2008; Herrera and Heijs 2007). Most studies offer a positive view on the impact and indicate the existence of financial additionalities (Heijs, 2001;

[39] See newsletter of www.corresponsables.com (24th December)
[40] The CENIT programme now called INNPRONTA

Heijs and Buesa, 2007; Barajas et al, 2009; Huergo et all, 2009; Magro, 2011; Saiz-Briones 2009).[41] The CDTI, which is in charge of most of the business-oriented instruments, seems to function well and several internal and external evaluations of their activities have been carried out that prove this (Heijs, 2001, Heijs and Buesa, 2007; Barajas et al, 2009; Huergo et all, 2009). The impact assessment of the European Framework Programme "Evaluation of the impact of the FP6 in the RTD Public System in Spain" (MICINN, 2010) shows a positive, important impact on the participants in terms of an increase in R&D funds, cooperation and internationalisation. Only a few studies offer a more critical view. For example, the study by Vega-Jurado et al (2009) underpins the idea that firms frequently use the support for public-private cooperation in Spain to obtain additional financial support, the incoming technology transfer of new knowledge being less important. Moreover the study by Heijs and Buesa (2007) showed that the regional public support does promote public-private cooperation and the national and European support schemes promote horizontal cooperation. However, in the case of vertical cooperation, the support schemes do not affect the intensity in cooperation in R&D. The problem is that most studies analyse specific isolated aspects and evaluate whether the instruments were effective and can therefore be justified. There is a lack of studies that carry out a broad overall assessment, that offer a cost benefit analysis or evaluate whether the implementation was efficiently carried out. The existing studies evaluate some specific impacts on the supported firms but do not analyse the structural changes of the production sector. However, such an effect as the result of the public support is very difficult to isolate from other possible explanatory aspects, such as the changing national and international environment. More recently, some of these reports (e.g. COSCE) emphasise the possible negative effects of decreasing trends on public R&D and innovation investments.

It could be stated that Spain has a broad policy mix with a huge set of differentiated instruments that try to tackle almost all the barriers and weaknesses of the Spanish innovation system. Although some instruments are still lacking[42], the policy mix can be considered satisfactory and the existing schemes meet most of the needs of the enterprises. However, in addition to reversing the current trend of decreasing R&D and innovation investments, it is also necessary to handle the systemic failures of the R&D system that have not really been addressed. The measures taken by the Spanish government are quite limited with regard to allowing the institutional modernisation of the public research system towards excellence and specialisation (ERAWATCH report 2010; EW, 2011; EW, 2012). In an environment of budgetary restrictions, it might be more appropriate, therefore, to focus on the strengths of the Spanish R&D systems and to remove the barriers that have prevented efficiency being improved in these areas. At the same time, in this environment, it appears necessary to focus on a small set of objectives agreed with stakeholders and to establish a clear prioritisation (see section 3). Research institutions clearly demand changes to improve the management of resources, especially human resources (see section 2.5). This would imply granting more flexibility and autonomy to institutions or research groups that comply better with certain objectives.

Currently, the main problem of the Spanish R&D and innovation system relies on the decreasing trend in public budget for R&D and Innovation. If this trend is not stopped, it will set back the progress achieved in previous years of R&D and innovation efforts. In a system that relies heavily on public funds (see section 3), this political decision to reduce public funds for R&D and innovation also sends a wrong message to other stakeholders and to future generations. It appears contradictory to reduce public R&D funds when R&D and innovation investments are,

[41] The study by Saiz-Briones (2009) showed a non-linear relationship between the support intensity (amount of support by sales) and the effect on the R&D expenditures in Spanish firms. Here the effect decreases in the case of very high support intensities.

[42] For example, support schemes to stimulate firms that do not perform R&D and to create new innovative firms in traditional sectors could be improved (Heijs, 2011 and ERAWATCH, 2011b). In addition, instruments to attract R&D firms from abroad could be further developed (COTEC, 2011a).

at the same time, presented as the mechanism that will help Spain to change its economic system and overcome the economic crisis. Instead, this decision appears to supports the idea that R&D and innovation expenditure are for environments of economic growth. The increasing precarious situation of young researchers does not encourage future generations to enter into a research career and requires urgent measures to be taken (See Table 4).

Table 4: Assessment of the effectiveness of the specific policies to address the structural challenges

Challenges	Policy measures/actions addressing the challenge [43]	Assessment in terms of appropriateness, efficiency and effectiveness
Public Budget cuts in R&D and innovation (no execution, loans, no implementing og alternative methods to seek efficiency)	Challenge created by political decisions	Public Budget cuts in R&D and innovation threaten to aggravate existing structural challenges and to set back the progresses achieved in previous years.
Lack of technology transfer between research system and productive system	There is growing orientation to Public Private Cooperation. Increase in budgets for several programmes like the CDTI support for cooperative projects (e.g. INNPRONTA) and knowledge transfer. They promote both critical mass and cooperation The new law LCTI (2011), the new EESTI (2013-2020), and PECTI (2013-2016) also address these challenges.	The results appear to be positive although more studies on the efficiency of these programmes appear necessary. There is some criticisms of how these new law, strategy and plan will address these challenges (see section 2.7 and 2.5).
Fragementation/ Lack of critical mass		
Lack for demand innovation and new technology	Creation of a specific programme for Innovation- based public procurement.	This instrument is not still evaluated.
Lack of entrepreneurial and innovative culture	Support schemes of the CDTI and the national Plan address these challenges (IWL "Program of Science and Innovation Culture")	COTEC reports appear to indicate an increase in the innovative culture of universities and research centres. However, improvement in the curricula of universities and evaluation of innovative activities of researchers appear to be necessary.
Lack of inter-institutional, international and sectoral mobility	In addition to the specific policy measures (section 4.2), the new law LCTI (2011), the new EESTI (2013-2020), and PECTI (2013-2016) also address these challenges.	The levels of internationalisation appear to be increasing (More reports). However, more efforts could be made - To simplify the accreditation process to help foreign academics - To change the reward system encouraging excellence and innovation

[43] Changes in the legislation and other initiatives not necessarily related with funding are also included.

		- To reduce endogamy The new law appears to be limited to address the increasing precarious situation of young researchers
Societal challenges	The new law LCTI (2011), the new EESTI (2013-2020), and PECTI (2013-2016) address these challenges and follow previous efforts.	Both are part of the EU strategy "ERA 2020" vision of economic growth towards a smart, sustainable and inclusive economy. There is some criticism regarding the definition and envisaged implementation of research on societal challenges (section 4.1).
Coordination policy	The new law LCTI (2011), the new EESTI (2013-2020), and PECTI (2013-2016) address these challenges and follow previous efforts.	There is some persistence on this governance challenges. These measures include some changes but some of them are still not clearly defined (see section 2.7)

5 NATIONAL POLICY AND THE EUROPEAN PERSPECTIVE

The Spanish government and political parties considered R&D and innovation as a main driver of Spanish competitiveness and as the solution to overcome the current crisis. However, in 2011, the R&D intensity (GERD as a percentage of GDP) decreased to 1.33%, reaching a figure lower than that of 2008 (1.35%). The Spanish GBOARD also decreased by -12.2% in 2011. The central government's budget of public expenditures for R&D and innovation (PGE) decreased in 2012 by -25.6%, returning the public R&D investments to the levels of 2006 (Molero and de No, 2012b) (see section 2.2 and 3). These reductions in R&D investments have clearly changed the positive trend of the previous years. In the period of 2002-2008, GERD doubled in absolute terms and R&D intensity increased from 0.99% to 1.35%. In addition to these past R&D investments efforts, in recent decades Spain has developed an integrated and coherent framework of R&D and innovation policies. However, recent figures on R&D investment indicate that it will be very difficult for Spain to reach the target of 3% GERD per GDP set by the Europe 2020 strategy.

These reductions on public R&D investments have raised important concerns among research-related organisations (see section 2.5) about the financial sustainability of the Spanish research system. The size of the Spanish R&D system has risen considerably in the last years. In relative terms, the total funds per R&D personnel (FTE) have changed from €31.9k in 2002 to €41.1k per head in 2009. For 2013, this figure will represent €22.6k per head, which is much lower than the one in 2002 (Molero and de No, 2012c; Molero and de No, 2013). Nowadays, Spain has also a broad policy framework with different objectives and instruments that could be affected by these budget cuts if a clear prioritisation of objectives is not implemented. It has to be recognised that considerable effort has been made in recent years in improving the R&D and innovation policy mix over. Successive strategies and plans have tried to address the challenges of the Spanish R&D system and to follow the suggestions of some comprehensive evaluations on the system (e.g. OECD 2006). The new Spanish R&D and innovation strategy EESTI (2013-2020) and the new plan PECTI (2013-2016) also follow this trend and try to improve the challenges of the system and shortcomings of previous plans. The new law LCTI has also tried to address these challenges. However, as the documents themselves recognise, the structural and governance challenges of the Spanish research system still remain.

As mentioned, in the current environment of budgetary restrictions, it may be important to focus on the strengths of the Spanish R&D system when setting the objectives and priorities and to remove the barriers that have prevented efficiency from improving in these areas. According to the Innovation Union Scoreboard Report (2012 and 2013), the strengths of the Spanish research system rest on: its tertiary education; its international scientific co-publications; and its medium and high-tech exports. As the percentage of the population that has completed tertiary education is increasing, it might be appropriate to implement changes in the curricula of universities to foster innovation and entrepreneurship and to increase university-industry relationships. This might improve the match between education and training supply and employment needs, thereby decreasing the levels of unemployment among young people. Spain also has a good level of international co-publications per million inhabitants. In order to maintain and increase the level of publication and its quality (citations), it might be appropriate to promote "excellence" by granting more financial and managerial autonomy to the institutions and research groups that have good levels of research performance. Changes in the research system could be implemented by improving the mechanisms to allocate funds to reward research groups and institutions that are better aligned with specific objectives (e.g. through ex-post evaluations based not on

individuals but on research groups). For example, the mechanism to allocate block funds for universities, based exclusively on the number of students, could be changed by including other additional criteria, such as research performance, employability of students, degree of internationalisation, co-operation with other sectors, etc. In addition to the funding mechanisms, it would seem necessary to introduce regulatory changes in order to increase the flexibility of research institutions to manage their own resources. Research institutions require changes so as to improve the management of resources (see section 2.5). They are clearly constrained by national regulations to manage their own human resources, which makes it difficult for them to offer competitive salaries and working conditions and to attract and retain talent. Flexibility and autonomy could be offered to those institutions that comply better with certain objectives. In addition, some special measures to address the situation of young researchers would seem to be necessary. The changes brought by the LCTI appear to be limited, with regard to facilitating the access by young researchers to a permanent research positions.[44] Currently, those with temporary contracts are particularly suffering the consequences of the lack of resources. Spain also has a good proportion of medium and high-tech export products among its total exports. In the innovation area it may also be necessary to build upon current strengths. The lack of execution of public R&D budget for R&D and innovation (Molero and de No, 2012a) indicates that it is necessary to analyse what instruments and measures are not being sufficiently requested or used. This will help to reduce objectives and prioritise them.

Regarding the ERA communication objectives, Spanish policy mix was generally moving towards a better alignment with these objectives. However, the severe public budget cuts for R&D and innovation could negatively affect Spanish convergence rates and time.

- **More effective national research system**. Spain has increased research competition (e.g. funds are increasingly allocated through competitive mechanisms), but at the same time has significantly decreased its investment in research. Allocation of funds through open calls for proposals is increasing, however, evaluation are usually done by domestic experts.
  The assessment of the quality of research-performing organisations and teams and their outputs is not the basis for institutional funding decisions. Research institutions have a low level of autonomy to allocate funds, which discourages organisational change. In addition, budget cuts appear to be applied without considering the efficiency of policy initiatives and research institutions.
- **Optimal transnational co-operation and competition – grand challenges and infrastructures**. The solution to major societal challenges is receiving growing attention in the Spanish R&D and innovation policies. The EESTI 2012-2020 and PECTI (2013-16) follow the efforts of previous measures (see section 4). Considerable efforts are being place to facilitate the convergence of national and regional research agendas (e.g. smart specialisation and EESTI). These could facilitate future synergies between national and international programmes. However, ex-post evaluation is not a common practice and the portability of grants is limited – either institutionally or internationally.
  Spain considers the European Strategic Forum for Research Infrastructures (ESFRI) to be an important initiative. It contributes significantly to a broad range of pan-European research infrastructures. However, budget cuts for R&D are causing a delay in the payment of the country's financial contribution to some international research infrastructures (e.g. CERN).
- **An open labour market for researchers**. Policy measures to address the lack of transparent, open and merit-based recruitment are much needed (see section 3). Budget cuts result especially harmful for young mobile researchers. In a research market with

[44] The following article summarises this position: http://sociedad.elpais.com/sociedad/2011/05/10/actualidad/1304978411_850215.html.

high levels of endogamy prominent young researchers with international experience find it difficult to access to research positions. Although some policy measures have been implemented to encourage intersectoral mobility, mobility between industry and academia appears to be very low. Previous job experience in industry or abroad is generally not recognised when accessing to a research position.

- **Gender equality and gender mainstreaming in research**. Gender considerations are being recently incorporated into policy making. The LCTI mentions gender issues and the EESTI includes them as one of its 5 principles. However, legal and other barriers to the recruitment, retention and career progression of female researchers appear to exist, especially at high level. Gender imbalance in decision making process is being increasingly considered, but gender dimension in research programmes appear to be less frequent. Research institutions rarely conduct impact assessments of practices to identify gender biases. Therefore, strategies to correct them are therefore rare or have an informal character.
- **Optimal circulation, access to and transfer of scientific knowledge including via digital ERA**. Policies to define and coordinate access to and preservation of scientific information are recent. The FECYT facilitates access to researchers working at national research organisations to bibliographic research information (Web of Knowledge). Open access measures for publication sand data resulting from publicly funded research are rare.

REFERENCES

Barajas, A., Huergo, E. y Moreno, L. (2009) Impacto económico de la participación en el Programa Marco de I+D. CDTI.

Buesa, M (2012) El sistema nacional de innovación en España: un panorama. *Innovación y Competitividad*, 869, pp. 7-41.

CIA4OPM (2011): Optimizing the research and innovation policy mix: The practice and challenges of impact assessment in Europe. Findings from FP7 OMC-net project (www.CIA4OPM.com).

Cruz-Castro, L. and Sanz-Menendez, L. (2011) Mobility versus job stability: Assessing tenure and productivity outcomes, *Research Policy*, Vol. 39, pp. 27-38.

Cruz-Castro, L., Sanz-Menéndez, L. y Aja Valle and J. Junio (2006) Las trayectorias profesionales y académicas de los profesores de universidad y los investigadores del CSIC. http://www.iesam.csic.es/doctrab2/dt-0608.pdf

COTEC (2005) El sistema español de innovación. Situación en 2004.Madrid, COTEC.

COTEC (2011a) Tecnología e Innovación en España Informe Cotec 2011.

COTEC (2011b) La compra pública de tecnología innovadora en Biotecnología.

COTEC (2012) Informe Cotec 2012: Tecnología e Innovación en España.

Eparvier, P. (2009) ERAWATCH Research Inventory Report: overview across EU countries.

ERAWATCH network (2009) ERAWATCH POLICY MIX REPORT 2009: SPAIN. Analysis of policy mixes to foster R&D investment and to contribute to the ERA. Editor ERAWATCH Network.

ERAWATCH network (2011) ERAWATCH Analytical country report 2010, Spain.

ERAWATCH network (2012) ERAWATCH Analytical country report 2011, Spain.

European Commission (2011a) European competitiveness reports 2011.

European Commission (2011b) Innovation Union Competitveness Report. Brussels.

European Commission (2012) Innovation Union Scoreboard (IUSB), 2011. PRO-INNO Europa Paper.

European Commission (2013) Innovation Union Scoreboard (IUSB), 2013. Belgium.

European Commission (2012) The 2012 EU R&D ScoreboardIndustrial Investment Scoreboard. Seville IPTS

FECYT (2012) Memoria de actividades I+D+I 2011. Fecyt.

Heijs, J. (2001). Evaluación de la política tecnológica: teoría y práctica. Editado por el Consejo Económico y Social de España, 280 páginas, ISBN 84-8188-154-6.

Heijs, J. y Buesa, M. (2007) Cooperación en innovación en España y el papel de las ayudas públicas. Editorial: Instituto de Estudios Fiscales. (ISBN 978 84 8008 238 0)

Heijs, J. and Martinez I. (2011) Luces y sombras de los sistemas de innovación. In the book: *Europa. Balance y perspectivas de futuro*. Editor Sergio A. Berumen and ESIC.

Heijs, J. (2012) Fallos sistémicos y de mercado en el sistema español de innovación. *Innovación y Competitividad*, 869, pp. 43-63

Hernández Armenteros, J. Pérez García, J.A. (2010) Problemas de eficiencia del Sistema Universitario Público Español CyD Informe CyD 2010. http://www.fundacioncyd.org/wps/wcm/connect/ab42110048e9c823afe0afa57f8ee75f/DOC+CYD+16-2011+Resumen+Ejecutivo+ICYD2010.pdf?MOD=AJPERES

Herrera, L. (2008) La política de innovación y la empresa: Efecto y distribución de las políticas de innovación, *Colección de Estudios, Consejo Económico y Social*, Madrid. ISBN: 978-84-8188-291-9 (The Innovation Policy and the Firm: Effect and Distribution of Innovation Policies was published by the Spanish Economic and Social Council).

Herrera, L.; Heijs, J. (2007): Difusión y adicionalidad de las ayudas públicas a la innovación: una estimación basada en "propensity score matching". *Revista de Economía Aplicada*. Número 41 (vol. XV), 2007. (Pp. 177 a 197: ISSN 1133-455-x)

Huergo, E., Trenado, M. y Ubierna, A. (2009): Impacto de los créditos blandos en el gasto en I+D empresarial. CDTI, Madrid.

Magro, E. (2011) Evaluation in a Systemic World: The Role of Regional Science and Technology Policy. PhD Thesis of the Deusto University.

Modrego, A. et al. (2012a) Comentarios al documento Estrategia Española de Ciencia, Tecnology e Innovación (EECTI). COSCE.

Modrego, A. et al. (2012b) Comentarios al documento "Plan Estatal de Investigación Científica y Técnica y de Innovación 2013-2016". COSCE.

Molero, J., de No, J. (2013) Análisis de los recursos destinados a I+D+i (Política de Gasto 46) contenidos en los Presupuestos Generales del Estado para el año 2013. COSCE.

Molero, J., de No, J. (2012a) Análisis de los recursos destinados a I+D+I (Política de Gasto 46) contenidos en el Proyecto de Presupuestos Generales del Estado para el año 2012. COSCE.

Molero, J., de No, J. (2012b) La inversion de I+D+I en los Presupuestos Generales del Estado 2012. COSCE.

Molero, J., de No, J. (2012c) Análisis de los recursos destinados a I+D+I (Política de Gasto 46) contenidos en el Proyecto de Presupuestos Generales del Estado para el año 2013. COSCE.

Molero, J., de No, J., Toro, M. & Trivez, J. (2011) Análisis de los recursos destinados a I+D+I (Política de Gasto 46) contenidos en los presupuestos generals de Estado para el año 2011. COSCE.

MORE (2010a) Study on mobility patterns and career paths of EU researchers. FINAL REPORT (deliverable 7), Brussels, June 2010.

MORE (2010b) Study on mobility patterns and career paths of EU researchers. TECHNICAL REPORT 2 – Part I – Mobility Survey of the Higher Education Sector. Brussels, June 2010.

MORE (2010c) Study on mobility patterns and career paths of EU researchers. TECHNICAL REPORT 2 – Part II – Mobility Survey of the Industrial researcher mobility study. Brussels, June 2010.

MORE (2010d) Study on mobility patterns and career paths of EU researchers. TECHNICAL REPORT 2 – Part III – Mobility Survey of the non-university research institutes sector. Brussels, June 2010.

OECD (2006) R&D and innovation in Spain: Improving the Policy Mix. Paris.

OECD (2011a) Demand side innovation policies. Paris.

OECD (2011b) Higher Education in Regional and City Development. The Autonomous Region of Andalusia, Spain.

Ortega-Argilés, R. (2012) Economic transformation strategies smart specialisation case studies.

Saiz Briones, Javier (2010) Factores determinantes de la inversión financiera en innovación (PhD Thesis Compluense University Madrid.

Sanz (2005) Políticas de I+D y presupuestos públicos en un entorno cambiante. Presupuesto y Gasto Público 39/2005: 217-242. Instituto de Estudios Fiscales.

Valadez, P.; Heijs, J. and Buesa, M. (2011) El impacto de las ventajas fiscales para la I+D e innovación. Papeles de Economía Española. Fundación de las Cajas de Ahorro.

Vega-Jurado, J., Gutiérrez-Gracia, A. and Fernández-de-Lucio, I. (2009) La Relación entre las Estrategias de Innovación: Coexistencia o Complementariedad. *Journal of Technology management and innovation*, 4, 3.

LIST OF ABBREVIATIONS

ACSI	Advisory Council for Science and Technology Policy
ANIRC	National Association of Ramón y Cajal Researchers Asociación Nacional de Investigadores Ramón y Cajal
AGE	National State Administration /Administración General del Estado
BERD	Business R&D Expenditures
CACTI	Advisory Council of Science, technology and Innovation Consejo Asesor de Ciencia, Tecnología e innovación
CDCTI	Executive Committee for Science, Technology and Innovation policy Comisión Delegada del Gobierno para Política Científica, Tecnológica y de Innovación
CDTI	Centre for Industrial Development (Centro para el desarrollo tecnológico Industrial)
CPCTI	Council of Science, Technology and Innovation (Consejo de Polítia Científica, Tecnológica y de Innovación)
COSCE	Spanish Confederation of Scientific Societies (Confederación de Sociedades Científicas de España)
CRUE	Spanish Conference of University Rectors (Conferencia de Rectores de las Universidades Españolas
EBTs	Research based enterprises (Empresas de base tecnológica)
ENCYT	National Strategy for Science and Technology (Estrategia Nacional de Ciencia y Tecnología)
EECT	Spanish Strategy for Science and Technology (Estrategia Española de Ciencia y Tecnología (before ENCYT))
EEI -e2i	Spanish Strategy for Innovation (Estrategia Española de Innovación)
EESTI	Spanish Strategy for Science, Technology and Innovation (Estrategia Española de Ciencia y Tecnología y de Innovación)
EU	European Union
EW	Erawatch
FECYT	Spanish Foundation for Science and Technology (Fundación Española para la Ciencia y la Tecnología)
FEDIT	Spanish Federation of Technology Centres (Federación Española de Centros Tecnológicos)
FJI	Spanish Federation of Young Researchers (Federación de Jóvenes Investigadores)
FTE	Full-Time Equivalent
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Expenditure on Research and Development
GSTC	General Council of Science & Technology
HEIs	Higher Education Institutions
INE	Spanish Institute of Statistics (Instituto Nacional de Estadística)
ISCIII	Carlos III Health Institute (Instituto de Salud Carlos III)
IWL	Instumental Working lines (Líneas instrumentales de Actuación)
LCTI	Law of Science, Technology and Innovation (Ley de Ciencia, Tecnología e Innovación)
MEC	Ministry of Education (Ministerio de Educación)
MEDU	Ministry of Education, Culture and Sports (Ministerio de Educación Cultura y Deporte)
MICINN	Ministry of Science and Innovation (Ministerio de Ciencia e Innovación)

MINECO	Ministry of Economy and Competitiveness (before MICINN) Ministerio de Economía y Competitividad
MINETUR	Ministry of Industry, Energy and Tourism (Ministerio de Industria Energía y Turismo)
MITYC	Ministry of Industry, Tourism and Commerce (Ministerio de Industria, Turismo y Comercio)
NP	Spanish National Plan for R&D and Innovation (Plan Nacional de Investigación Científica, Desarrollo e Innovación Tecnológica)
Np	National programmes (Pogramas nacionales)
OPIs	Public Research Bodies (Organismos Públicos de Investigación)
PROs	Public Research Organisations
PECT	Spanish National Plan for Scientific and Technical Research Plan Estatal de Investigación cientifífica y técnica (before NP)
PECTI	Spanish State Plan of Scientific and Technical Research and Innovation (2013-2016) (It merges the envisaged PECT and PEI) (Plan Estatal de Investigación Científica y Técnica
PDI	Platform for Dignifying Research (Plataforma por una Investigación Digna)
PEI	Spanish National Plan for Innovation (Plan Estatal de Innovación)
PGE	General Government Budget (Presupuestos Generales del Estado)
RIS³	Research and Innovation Strategies for Smart Specialisation
R&D	Research and Development
SICTI	Information System of Science, Technology and Innovation Sistema de información sobre ciencia, Tecnología e innovación
SGCTI	General Secretariat of Science, Technology and Innovation (Secretaría General de Ciencia, Tecnología e Innovación)
SMEs	Small and Medium Enterprises
SSRDI	State Secretary of Research, Development and Innovation (Secretaría de Estado de Investigación, Desarrollo e Innovación)

European Commission
EUR 26284 – Joint Research Centre – Institute for Prospective Technological Studies

Title: ERAWATCH Country Reports 2012: Spain

Authors: Ana Fernández Zubieta

Luxembourg: Publications Office of the European Union

2014- 40 pp. – 21.0 x 29.7 cm

EUR – Scientific and Technical Research series – ISSN 1831-9424 (online)

ISBN 978-92-79-38637-4 (pdf)

doi:10.2791/86251

Abstract
This analytical country report is one of a series of annual ERAWATCH reports produced for EU Member States and Countries Associated to the Seventh Framework Programme for Research of the European Union (FP7). The main objective of the ERAWATCH Annual Country Reports is to characterise and assess the performance of national research systems and related policies in a structured manner that is comparable across countries.
The Country Report 2012 builds on and updates the 2011 edition. The report identifies the structural challenges of the national research and innovation system and assesses the match between the national priorities and the structural challenges, highlighting the latest developments, their dynamics and impact in the overall national context. They further analyse and assess the ability of the policy mix in place to consistently and efficiently tackle these challenges. These reports were originally produced in December 2012, focusing on policy developments over the previous twelve months.
The reports were produced by independent experts under direct contract with IPTS. The analytical framework and the structure of the reports have been developed by the Institute for Prospective Technological Studies of the Joint Research Centre (JRC-IPTS) and Directorate General for Research and Innovation with contributions from external experts.

LF-1A-26-284-EN-N

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Publications Office

doi:10.2791/86251
ISBN: 978-92-79-38637-4