ERAWATCH COUNTRY REPORTS 2012: Portugal

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Acknowledgments

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.

The first draft of this report was produced in December 2012 and was focused on developments taking place in the previous twelve months. In particular, it has benefitted from the comments and suggestions of John Edwards from JRC-IPTS. The contributions and comments from Tiago Saborida and Dr. Luísa Henriques (Foundation for Science and Technology) are also gratefully acknowledged.

The report is currently only published in electronic format and is 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

The Portuguese research and development (R&D) situation has been changing rapidly. By 2009 Portugal had advanced to a GERD/GDP ratio of 1.64%, with the business sector becoming since 2007 the most important R&D performer, boasting a 47.0% BERD/GERD share in 2009. Despite being relatively far below the EU average (2%), it should be recalled that until less than a decade ago the figure was still below the 1% mark. However, since 2009 investment in R&D has followed the overall macroeconomic trend: Portuguese GERD (Gross Expenditure in Research and Development) was €2,557m in 2011, the equivalent to 1.5% of GDP, a decline from 2009 and 2010, when GERD was respectively €2,764m and €2,749m.

The positive performance in terms of R&D until 2009 stems from a strong and sustained commitment to increase both the amount and quality of research in Portugal. Since the mid-1990s there has been a policy of providing support for research units based on the quality of research output, assessed by international standards. The policy of promoting post-graduate education has also played an important role in increasing the supply of human resources. This led to a significant growth of both the input and the scientific output of the research system. In recent years, Portugal has attracted a growing number of foreign researchers. By 2009 there were 1,523 PhD trained foreigner residents carrying out R&D activities in Portugal. Two important research infrastructures were recently launched: the Iberian International Nanotechnology Laboratory (INL), a Portuguese-Spanish joint-venture focused on nano-sciences and nanotechnologies research; and the Champallimaud Research Centre, inaugurated in 2010, dedicated to translational medical research on cancer and neurosciences.

Governance of the RSI system is still largely dominated by the public sector. The research system has been characterised by a high degree of centralisation, through fund allocation and policy making. The formal structures for consulting the main stakeholders have only been used occasionally in the past. The low participation of the private sector in the governance of the RSI system is a result of policy choices, but also of the weak involvement of firms in R&D until recently. The recent creation of two advisory councils (National Council for Science and Technology and National Council for Entrepreneurship and Innovation) may contribute to enhance the involvement by stakeholders in the definition of research and innovation policies.

The main challenges faced by the Portuguese R&D and innovation system, which are discussed in detail in the report, are the following:

● Ensuring the sustainability of the research and innovation system, after it has grown and matured in recent decades;

● Improving strategic policy design, systemic density and coordination among the RDI system actors;

● Moving from a wide ranging research policy to a more selective one, focusing on a set of priority research fields;

● Stimulating the emergence of new companies, both domestic and foreign-owned, particularly in knowledge intensive activities; and

● Strengthening the in-house technological, organisational and marketing capabilities of SMEs.

The NSRF 2007-2013 concentrated innovation and research measures under a single programme (the Competitiveness Factors Operational Programme – 'Compete'), thus in principle allowing for greater coordination between different sectoral policies. The NSRF entailed a stronger focus on increasing extramural R&D carried out in cooperation between firms and the research sector. The main measure has been the establishment of "collective efficiency strategies", aiming at stimulating different forms of cooperation and clustering among different actors, namely through the establishment of Competitiveness and Technology Poles (CTP). Further measures aimed at stimulating cooperative research projects were included in the NSRF, particularly in the 'Compete' OP. In addition to the NSRF measures, there have been other policy measures whose central objective has been to stimulate private R&D investment, the most important of which has been SIFIDE II, a system providing tax credits to investments in R&D.

The policy mix is now reasonably comprehensive. The structural policies set up with the help of the EU over the previous two decades have allowed national research and innovation policies, in combination with other important areas of the policy mix, to be fully equipped and with appropriate policy instruments and targets. In this sense the policy toolbox in Portugal does not compare poorly with the more advanced economies. The set of measures provided in the NSRF 2007-2013 is generally appropriate, insofar it addresses the main challenges identified. The field in which the mix has more shortcomings regards the provision of managerial support to SMEs.

The main bottlenecks to respond the challenges identified do not lay so much in the set of specific measures, but rather on other issues. The efficiency and effectiveness of the policy mix is seriously undermined by several structural problems. The cultural framework and the way formal and informal institutions interact generate an incentive profile that has not been in line with a systemic development of research and innovation. Research continues to be carried out and supported mainly in a linear perspective. The lack of coordination of both sectoral policies and between government and the business sector, which the NSRF 2007-2013 was supposed to overcome, has remained without significant changes. And despite the increasing integration of thematic priorities in research policy, these have not been pursued together with the business sector.

This report suggests possible directions towards which the current policy mix should evolve in the short and medium term.

The economic and financial crisis has concentrated the attention of government on macroeconomic stabilisation, which of course is the greatest challenge in the short term. Yet one of the negative consequences is that research and innovation policies have not been addressed at the highest political level. Other than the need to reform the labour market, few major structural policy announcements have been observed in recent months. The need to conceive a strategy regarding how to achieve "smart specialisation" as a post-crisis scenario, bringing in all the major stakeholders around a common platform, is a pre-condition for a successful policy mix.

The interaction between research and innovation needs to be brought to the forefront of the economic strategy. The virtues of the linear model approach are exhausted. The move towards the definition of thematic research priorities should stimulate the involvement of business interests. Policy instruments (CTP and Other Clusters and other joint-platforms) need to integrate much further the cooperation between academia and firms.

The preparation of the new programming period 2014-2020 offers the opportunity for selecting priorities in research and innovation, as part of the design and implementation of RIS3 strategies. The focus on priority areas makes sense in the context of the scarce resources

the country can call upon. However, there is the need for informed choices based on a high participation of diverse stakeholders to improve results as well as avoid the risk of rent seeking and capture by vested interests.

Government itself needs to keep up the momentum gathered over the previous decade with regard to administrative modernisation, while becoming a more intelligent actor in the innovation process; including through public procurement, definition of objectives and standards of practice and facilitating cooperation between the main stakeholders of the innovation system. Furthermore, the policy mix needs to integrate initiatives driven towards institutional reform in order to promote behavioural change regarding entrepreneurship, creativity and innovation.

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1. INTRODUCTION

With a population of 10.5 million people Portugal has a 2.1% share of the EU-27 population. In terms of GDP its EU-27 share is smaller, standing at 1.3% in 2012 (down from 1.4% in 2011). These figures translate into a GDP per capita at market prices of €16,178, which if measured in purchasing power parity is equivalent to 77% of the EU's 2011 average (down from 80% in 2010). GDP growth has been volatile and generally negative, with 0% in 2008, -2.9% in 2009, 1.4% in 2010 and -1.9% in 2011. The EUROSTAT forecasts for 2012 and 2013 are negative, with GDP expected to fall by 3.0% and a further 1% respectively.

Until the 2011 recession, the overall trend in terms of R&D data was in fact quite positive. By 2009 Portugal had advanced to a GERD/GDP ratio of 1.64%, with the private sector becoming since 2007 the most important R&D performer, boasting a 47.0% BERD/GERD share in 2009. Despite being relatively far below the EU average (2%), it should be recalled that until less than a decade ago the figure was still below the 1% mark. However, since 2009 investment in R&D has followed the overall macroeconomic trend: Portuguese GERD (Gross Expenditure in Research and Development) was €2,557m in 2011, the equivalent to 1.5% of GDP, a decline from 2009 and 2010, when GERD was respectively €2,764m and €2,749m.

The positive performance in terms of R&D investment until 2009 stems from a strong and sustained commitment to increase both the amount and quality of research in Portugal. Since the mid-1990s until today there has been a policy of providing support for research units based on the quality of research output, assessed by international standards. The policy of promoting post-graduate education has also played an important role in increasing the supply of human resources. This led to a significant growth of both the input and the scientific output of the research system. In recent years, Portugal has attracted a growing number of foreign researchers. By 2009 there were 1,523 PhD trained foreigner residents carrying out R&D activities in Portugal (GPEARI, 2011). Two important research infrastructures were launched in recent years: the Iberian International Nanotechnology Laboratory (INL), a Portuguese-Spanish joint-venture focused on nano-sciences and nanotechnologies research; and the Champallimaud Research Centre, inaugurated in 2010, dedicated to translational medical research on cancer and neurosciences.

A long and promising path has been followed to strengthen research activities in Portugal. Its main weakness however, has been knowledge exploitability. Science policy has been focused on increasing the human capital and improving research quality, but the exploitability of knowledge production has only been a secondary concern.

The sustained commitment to increasing the input into the research system until the economic crisis is illustrated by an official study on the professional situation of doctorates in Portugal (GPEARI, 2011): Full time equivalent (FTE) researchers more than doubled in six years, reaching 8.2 per thousand in 2009, with a very high share of women (44%); the number of S&T graduates as a share of the population in the 20-29 years age cohort increased from 1.2% to 2.1% from 2005 to 2008; and the annual number of new PhDs has steadily increased, from 1,027 for 2003 to 1,496 for 2008 with the share of new PhD holders in the sciences and engineering fields reaching 0.45 per 1,000 individuals in the 25-34 years age cohort**.**

The effort reported above has been translated into a significant improvement in research output. Scientific publications originating in Portugal have increased rapidly and are now close to the EU average, with 954 ISI publications per million inhabitants in 2011, up from just 321 publications per million inhabitants in 2000. With regard to patenting, the university sector became the main actor in Portugal towards the end of the last decade, filing for more

national patents than the private sector. From 2000-2008 the top four entities filing for national patents were the Universidade Técnica de Lisboa, Universidade do Minho, Universidade de Aveiro and Universidade do Porto. In the top 10 of patenting entities there were two research units associated with the university sector (INESC Inovação and INESC Porto) (Godinho 2009).

The situation is different with regard to EPO patent applications, with most applications originating in the business sector, though the volume of applications is much smaller than for national patents. So far the rise in R&D investment that happened in the second half of the last decade has not yet been reflected in the demand for patent protection by business firms. Until recently, the number of patents filed by Portuguese firms both at the European Patent Office (EPO) and at the United States Patent and Trademark Office (USPTO) remained considerably less than other countries with similar GDP per capita levels. In 2011, the EPO granted 26 patents to applicants whose country of residence was Portugal, while the USPTO granted 30 utility patents in which the first inventor had a Portuguese address.

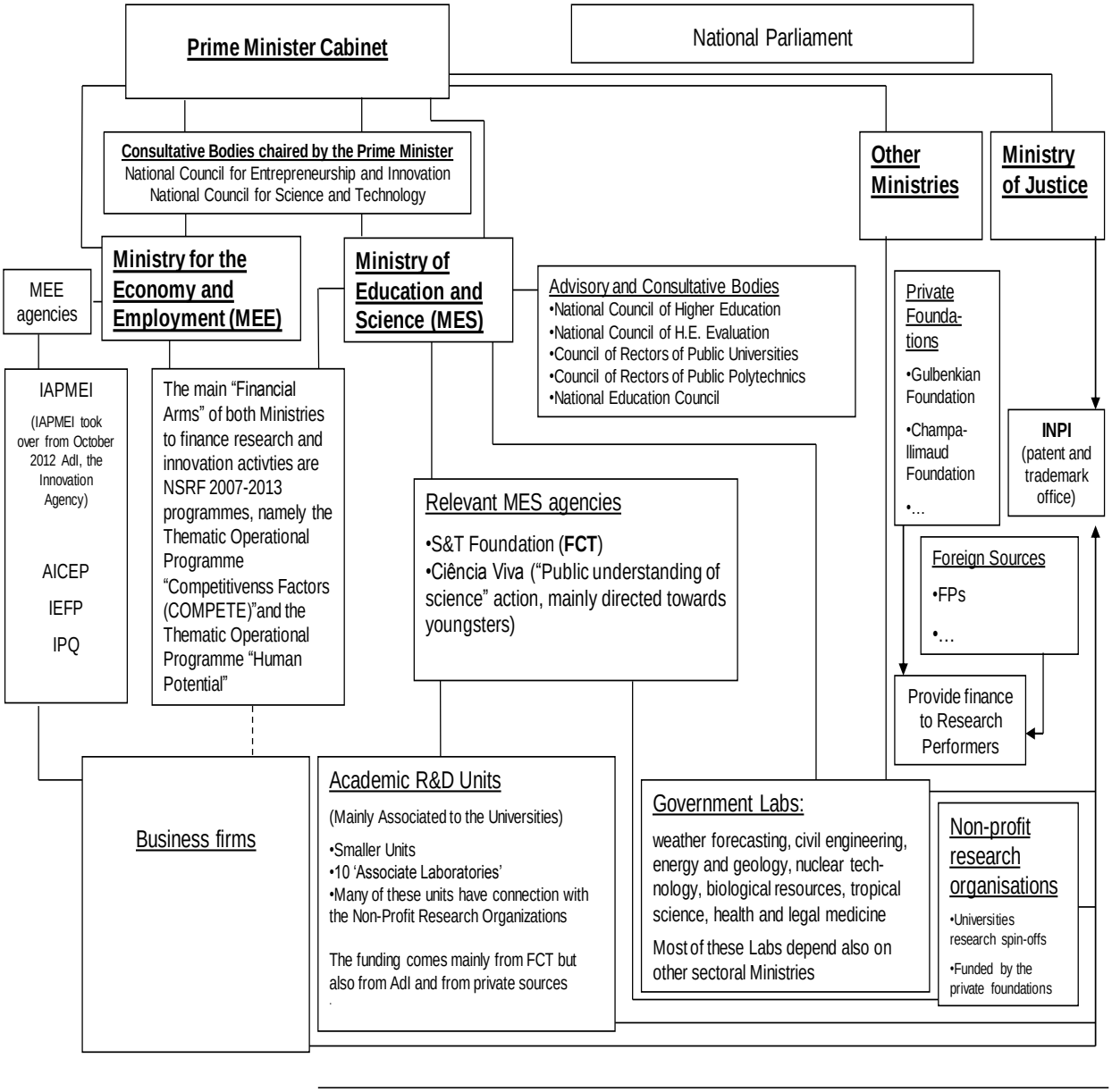
Despite increased awareness and targets in policy documents, patenting continues to be a weak link in Portugal's research output. This situation reflects the insufficient concern with exploitability. As pointed out in a previous EW Country Report for Portugal (Godinho and Simões, 2009), there has been an implicit assumption that the effort in the provision of highly skilled human resources and in encouraging research quality and internationalisation would, sooner or later, lead to a change in the economic fabric. However, this idea has yet not materialised. Exploitability of research output remains limited. It may even be argued that the focus on international research standards led to an increased gap between the scientific and the business worlds. The weak patenting performance is also related to the prevailing economic structure.

The structural composition of the economy has undergone a certain degree of change over recent decades. A joint VW-Ford investment (the Auto-Europa plant, now fully owned by VW) to build a large car manufacturing plant in 1991 induced a progression from low- to medium-tech industries. Further, increasing urbanisation and general economic development has led to a growth in the services sector that is now in line with most developed economies, with a consolidation of a KIBS (Knowledge Intensive Business Services) segment supplying advanced services, albeit mostly concentrated in the domestic market (Barreiros 2006). Yet the changes that began in the 1990s have not continued in recent years, as incoming FDI slowed and the larger domestic firms have not sought to position themselves in higher tech- and knowledge-intensive activities. This structural stickiness has been aggravated by the recession, as gross fixed capital formation has declined further continuing a pre-existing trend. This situation is reflected by a climate of weak knowledge demand for universities' research. The lack of capability within the private sector to define a clear agenda for publicly funded research is therefore set to remain, at least in the short term.

Despite the positive performance of business in recent years, R&D governance is still largely dominated by the public sector. The research system has been characterised by a high degree of centralisation. All major decisions have been taken by the government, namely by the responsible ministries which, since June 2011 have been the Ministry for Education and Science and the Ministry for the Economy and Employment. The national parliament has had a weak involvement in issues concerning research and innovation policies. The formal structures for consulting the main stakeholders have only occasionally been used. In December 2011 a decision was taken to create a National Council on Entrepreneurship and Innovation (CNEI) to be chaired by the Prime Minister. In February 2012, a National Council for Science and Technology was established; an advisory body whose membership is drawn from the academic world, also to be chaired by the Prime Minister.

As visible in the organigram below, the research system is organized in three successive levels. The first level (political level) contains the Prime Minister's Office and the main ministries in charge of supporting R&D: the Ministry for Education and Science and the Ministry for the Economy and Employment. Other sectoral ministries also allocate funds for R&D, but with much lower importance. The second level (operational level) includes the main operational programmes that finance the research system together with the major executive agencies. Finally, the third level (research institutions) displays the agencies that actually undertake R&D activities, namely academic R&D units and publicly funded laboratories. The organisations that provide advice to the Ministry for Education and Science are also displayed. The Parliament in the organigram is not connected with the remaining actors, since this political body has had a limited role in discussing and defining policy objectives in the area of S&T, with the issue mainly being dealt with at government level.

Figure 1: Organisational Chart of the National Innovation Governance System



2. Recent developments of the research and innovation policy and system

2.1 National economic and political context

The key issue faced by Portuguese research policy remains the same as the one highlighted in the 2011 ERAWATCH Country Report for Portugal (Godinho and Simões, 2012): how to match financial restrictions with the sustainability of the effort undertaken to improve research performance?

Austerity has been the chief concern of economic policy. However, together with a focus on reducing labour costs, this will likely lead to short term strategies that are focused more on cost-cutting and exploiting short-term opportunities than on long term objectives. There has been a recent growth in exports including the development of new market opportunities but there are doubts whether this trend can be sustainable. As pointed out in the last issue of the Erawatch Highlights for Portugal, it is essential to look at the medium-term, and to avoid a disproportional focus on cost cutting. In his 2013 New Year's address the President of the Republic expressed concern about the impact of the government's austerity policies on competitiveness and growth. He called for a new commitment to fostering growth that involves all of society. In summary, the key political challenge for 2013 will be how to preserve social cohesion in a time of increasing taxes, declining welfare support and no economic growth.

It is clear that to be competitive in a global world, exploitation of comparative advantage and existing capabilities is not enough. Sustained competitiveness requires experimentation, exploring new markets and developing innovative products. To achieve this, a sustained commitment to research and innovation is essential.

While this is recognised by the Ministry for Education and Science, the budgetary context leaves little possibility for maintaining levels of investment in science and innovation. Most demand-led innovation initiatives have been discontinued and new investment in science is also declining. Budgetary constraints have led to a drop in the budget of the Foundation for Science and Technology (FCT). While international awards to scientists working in Portugal are still being granted, there is a need to ensure the conditions required to attract high level researchers, while avoiding the departure of key scientists and the breakup of research teams. Given the context of decreasing national resources, it is now recognised that sources of international financing for research have to be more widely explored, which is now a central policy concern for the future. There is a need to find the means to consolidate the improvements in research witnessed over the last decade.

Given the difficult economic and fiscal environment faced by companies and the Higher Education sector, a further decline in both GERD and BERD may be expected in 2013. Research organizations are concerned about losing high-skilled researchers which have been attracted by job offers from abroad. The recent assignment of 'FCT Researchers grants' is a very positive development. However, it is not likely to fully address the risk of brain drain. As it was pointed out in an earlier issue of the Erawatch Highlights for Portugal, the declining trend in BERD is likely to continue in the coming years. There is therefore a risk to the development of a significant level of in-house research capabilities in companies and opportunities for university-industry cooperation.

In this context, the preparation of the next round of financial support from the European Union will become particularly important. This might be an opportunity to design a more

balanced economic policy able to reconcile the demands for financial stability with a new push for growth. Without this, it will not be possible to sustain the commitment to improve research and innovation performance.

In spite of this negative outlook, there are some positive developments. First, the Ministry for Education and Science seems to be aware of the problems and is planning to explore and promote international funding sources to support the research system. The intention to make strategic choices while keeping a culture of excellence and international evaluation should be encouraged. The recent decisions to renew (though at a lower budgetary level) agreements with the University of Texas at Austin and Carnegie-Mellon University (and the intention to proceed in the same way regarding the agreement with MIT) are positive, especially because they were taken on the basis of results from an independent evaluation of the programmes.

Second, the setting up and activation of institutional mechanisms to consult stakeholders may be an important contribution to increase the breadth and depth of the interactions among the main players of the research system in Portugal. It signifies a departure from the 'less participatory' approach that was dominant in the past and which lacked an understanding of the relevant stakeholders in the process, which go beyond the research community to include R&D performing companies.

The third positive development concerns the commitment to develop a strategic approach to the research and innovation system in line with a smart specialization approach. While the results would not be available before April 2013, the activities undertaken to establish the new strategy together with a consultation of stakeholders, may lead to an integrated understanding of the research and innovation system and consequently to a more coherent policy approach. The main issue seems to be the stickiness of the linear perspective: Without a systemic response that recognises the importance of the knowledge bases of both science and industry, the outcome is not likely to significantly improve Portugal's competitiveness.

2.2 Funding trends

Portuguese GERD (Gross Expenditure in Research and Development) was €2,557m in 2011, the equivalent to 1.5% of GDP. This represents a decline in relation to 2009 and 2010, in which GERD was respectively €2,764m and €2,749m, but is still significantly above previous years (€1,973m in 2007 and €1,201m in 2005, with GERD/GDP ratios of 1.2% and 0.8% respectively).

The Portuguese research and development (R&D) situation changed rapidly in the second half of the 2000-2009 decade, with the GERD/GDP ratio peaking at a historic high of 1.64% in 2009. It was a co-evolution of private and public funding that contributed to rising R&D expenditure until 2009, bringing the country closer to the EU's average of 2.0%. Portugal reached for the first time ever a R&D /GDP ratio above 1% in 2007 , increasing to 1.64% in 2009 but declining slightly in the last two years, first to 1.59% in 2010 and then to 1.50% in 2011.

Since 2007 the business sector has become the most important actor in the R&D system, with a share of 46% in the national GERD in 2011. In 2001 when R&D expenditure was still at 0.85% of GDP the public sector's share in R&D funding was 61% and the business sector's share was only 32%.

At €1,751m in 2011 government budget expenditure on R&D was kept relatively unchanged compared to the previous year, when it reached a historic high at €1,765.4m. For 2012, however, the announced figure of €1499.7m represents a significant contraction when

compares to the rising trend of the last decade.

The Portugal 2020 document, published in March 2011, set a R&D/GDP ratio target of between 2.7%-3.3% for 2020, with the public sector contributing 1.0%-1.2% and the private sector 1.7%-2.1%. In the current climate these figures seem too ambitious.

	2009	2010	2011	2012 (estimate, if such data are available)	2020 national target	EU average 2011
GDP growth rate	-2.9	1.9	1.6 (p)	-3.0 (f)		1.5
GERD as % of GDP	1.64	1.59	1.50 (p)		2.7%-3.3%	2.03 (s)
GBAORD (€ million)	1522	1765	1751	1500 (p)		92398 (s) (t)
GBAORD as % of GDP	0.92	1.02	1.02	0.90 (f)		0.73 (s)
BERD (€ million)	1311	1266	1174 (p)			159976 (s) (t)
BERD as % of GDP	0.78	0.73	0.69 (p)		1.7%-2.1%	1.26 (s)
R&D performed by HEIs (% of GERD)	36.4	36.7	38.3 (p)			24.0
R&D performed by PROs (% of GERD)	7.3	7.1	7.5 (p)			12.7
R&D performed by Business Enterprise sector	1311	1266	1174 (p)			159976 (s) (t)

Source of the data: EUROSTAT.

Notes: (b) – Break in series; (f) – Estimate; (p) – Provisional; (s) – Eurostat estimate; (t) – total value (not average value).

The breakdown of the 2011 R&D investment by sources of funds indicates that the business sector is at about the same level as the government, with shares of 44.1% and 44.9% respectively. The remaining sectors (”Higher Education”, “Abroad” and the “Private non-profit” sectors) are significantly less (with 3.2%, 3.2% and 4.6% of total funding respectively). The analysis of the funds provided by each sector to the remaining sectors shows a relatively low density in the research system, as with the exception of government funding the relative amounts involved in funding third-parts are always small. Government, which is the primary funding source, provided a significant amount of resources to all types of research institutions in 2011; the main beneficiary being the higher education sector (71.8% of the government funds) followed by public research organisations (13.2%) and the private non-profit sector (10.6%). Regarding funding from the business sector, the vast majority (98.2%) was for in house research, revealing a weak link with other research

institutions. In relation to the funds from abroad, they are funding all the four performing sectors. The resources under this classification "abroad" do not include EU structural funds for research that are channeled through the public budget.

Looking back on government funding of academic R&D over recent years, the proportion of institutional funding has been rising, even though two contradictory trends have co-existed; the share of the government labs has been declining and the share of university R&D units and institutes (namely the so-called "associate labs") rose further over the last decade.

As regards government funding of business R&D, the main trend has been the relative growth of tax incentives *vis-à-vis* competitive funding through R&D grants to firms. Tax incentives have been provided through SIFIDE, which corresponds to a tax credit assigned to R&D performing companies.

In relation to the competitive funding for firms, funds have been channelled through the programmes co-funded by the ERDF and ESF. The economic and financial crisis that started in 2009 led to increasing difficulty for firms to generate complementary financing to benefit from these programmes.

Most funding is neither thematically nor sectorally focused. The dominant approach has been characterised by general incentive systems which do not address specific industries, technologies or scientific fields. A notable exception is the collective efficiency strategies (particularly CTPs and Other Clusters), where the clustering theme is key.

The proportion of direct international funding has been low (between 3% and 4% in recent years), but this does not include the EU structural funds which are delivered through national programmes.

2.3 New policy measures

There have been no major policy measures in research and innovation in 2012, since the headlines of research and innovation policy were broadly defined in the context of the 2007-2013 National Strategic Reference Framework (NSRF). As mentioned in the TrendChart Report (Simões & Godinho, 2012), there has been in 2012 a slight re-programming of the 2007-2013 NSRF which involved increased direct allocation of funds to firms, a stronger focus on financial engineering, namely venture capital, and the opening of new credit lines for firms with investment projects already approved. The following initiatives taken in 2012, either in the context of research policy or under the Strategic Programme for Entrepreneurship and Innovation (+E+I), are noteworthy:

• The creation of Portugal Ventures, as a result of the merger of the three state-owned venture capital organisations: AICEP Capital Global, InovCapital, and Turismo Capital. Portugal Ventures claims to focus "its investments in innovative, scientific and technology based companies as well as in companies from the more traditional tourism and industrial Portuguese sectors, with significant competitive advantages and export oriented to global markets" (http://www.portugalventures.pt/en/about-us.html?hrq=2);

• Launching of 'Entrepreneurship Passport' (Passaporte Empreendedorismo); a grant given to young graduates committed to develop entrepreneurial projects. According to the information available, the purpose is to support "projects with high potential that are still in the idea phase" (http://www.ei.gov.pt/+empresas/passaporte-empreendedorismo/);

• The creation of the National Council for Science and Technology by Council of Ministers Resolutions 47/2011 and 14/2012. This Council, chaired by the Prime Minister, is expected to play an important role in research policy advice.

• Setting up of the Intellectual Property Court; a special court in charge of deciding on intellectual property issues, including the assignment of internet domain names.

• Renewal for a further five years of the cooperation agreements with the University of Texas at Austin and Carnegie-Mellon University. This decision was based on the results of the evaluation carried out by the Academy of Finland.

2.4 Recent policy documents

No documents defining general orientations for research and innovation policies were published in 2012. There were however two informal documents deserve a mention: 'Ciência 2012', written by the Secretary of State for Science, Leonor Parreira, and the report of the working group on clusters, convened by the Ministry for the Economy and Employment.

'Ciência 2012' helps to understand the research policy issues and orientations in Portugal. It is argued that budgetary constraints will lead Portugal to look for financing abroad so as to enable the sustainability of the research system. Two main priorities were defined for research policy: (1) to support People (namely through the FCT researcher programme) and Institutions (through programmes of "grant administrators", doctorate-holders and equipment as well as through an increased consideration of the institutions' research achievements in granting financial support); and (2) to promote "the transfer of S&T to the productive fabric", including the support to doctoral programmes in companies, to 'hybrid' doctoral education, doctoral grants in priority areas (though these are not provided) and the strengthening of UTEN, the technology transfer network developed with the University of Texas at Austin.

The Report on Competitiveness Poles (Lahman et ali., 2012) was based on an analysis of and interviews with actors from the various poles and clusters. It provides an assessment of strengths and weaknesses. It is argued that export orientation should become a more important consideration. The document suggests a new model for the governance of poles and clusters, encouraging the establishment of networking instruments as well as a monitoring and evaluation unit. However, the report so far has had no practical consequences. Most probably, the government is waiting for the results of the on-going evaluation to take decisions in this regard.

Turning now to the legal documents dealing with research and innovation policy issued in 2012, the creation of the National Council for Science and Technology should be noted. This new body is expected to herald a new phase in the process of policy design and implementation, enabling an increased involvement from stakeholders. The question remains however whether a Council with 20 high-level researchers is enough to capture the views from the different stakeholders beyond such a community. This has been mentioned in connection with what has been classified as an "academic bias" in research policy (see on this Avaliação Intercalar do POCTI, CESO and CISEP 2004). If mechanisms for involving other stakeholders (industry, civil society, regional bodies) are not put in place and/or appropriate links with the Council for Entrepreneurship and Innovation established, there may be a risk of cutting society's links with science development (Godinho and Simões, 2009).

The setting up of the Intellectual Property Court, already foreseen by the Law 46/2011, of June 24th, is also a positive step, insofar as it creates a court specialised in intellectual

property matters. This was long-awaited by the main players in the field as for the first time there will be a group of specialised judges on industrial property issues, which will hopefully raise the quality and speed of decisions. However, there is no evidence so far that the court is carrying out its mission effectively.

The 'Entrepreneurship Passport' initiative does not appear to have a significant and lasting impact in encouraging entrepreneurship. It is likely to be more a tool to fight young unemployment than an effective tool to lead young graduates to become entrepreneurs. The level of the monthly grant assigned does not appear to be enough to attract potential high flying entrepreneurs.

2.5 Research and innovation system changes

The main changes introduced in the research and innovation system are related to the creation of the new bodies mentioned above (National Council for Entrepreneurship and Innovation, National Council for Science and Technology, Portugal Ventures, and the Industrial Property Court), and the discontinuation of the Innovation Agency (AdI), which has been integrated into IAPMEI, the former Institute for Small and Medium-sized Enterprises and Innovation.

Although formally created in December 2011 in the context of the Strategic Programme for Entrepreneurship and Innovation (+E+I), the National Council for Entrepreneurship and Innovation started its activities in 2012. It is a consultative body, formally chaired by the Prime Minister, and includes government members as well as academics and businessmen.

The National Council for Science and Technology was created by the Council of Ministers Resolution 47/2011, of November 9, 2011, but its membership and working procedures were only laid down by the Council of Ministers Resolution 14/2012, of February 2, 2012. This Council, also formally chaired by the Prime Minister, was designed as a key consulting body for "cross-cutting science and technology matters". More specifically, the Council will provide "advice in the definition of priority areas and sectors, the promotion of excellence in S&T (…), the internationalisation of Portuguese science, the excellence of S&T education (…) as well as the cross-cutting and inter-ministerial coordination of science, technology and innovation policies" (Council of Ministers Resolution 47/2011)

Portugal Ventures resulted from the merger of the various public venture capital bodies. It is aimed at promoting entrepreneurship as well as providing funding for investments in innovative, S&T-based companies with products and services geared towards international markets. The Intellectual Property Court was assigned the mission to resolve the disputes dealing with intellectual property and internet domain names. Further information on this is given in sections 2.3 and 2.4 above.

Another development, regarding the organisational structure to support research and innovation initiatives, has been the decision, taken by the Council of Ministers on October 31st 2012, to integrate the Agência de Inovação (Innovation Agency, AdI) into IAPMEI, which has been renamed IAPMEI - *Agência para a Competitividade e Inovação, I.P.*, (Agency for Competitiveness and Innovation). Two main reasons seem to be behind such a move. The first is the need to cut public expenditure. The second is the setting up of a single agency to handle company oriented research and innovation support systems. The merger makes sense, since the Innovation Agency had lost relevance and strength. The issue remains however to what extent IAPMEI will be able to forge ahead in promoting company research and innovation, escape bureaucratic inertia, and endowed with skilled human resources to carry out its new extended mandate.

As a result of the discontinuation of AdI, FCT is now the only key S&T agency under the Ministry for Education and Science (MES). Created as a joint venture between MES and the Ministry for the Economy and Employment, AdI's main mission was "to promote innovation and scientific development by facilitating the relationships between research and the Portuguese business companies fabric". According to the above-mentioned decision by the Council of Ministers, the activities formerly carried out by AdI regarding the promotion of research consortia between universities and companies were assigned to IAPMEI, which is part of the Ministry for the Economy and Employment.

Despite the creation of the National Councils for Entrepreneurship and Innovation and for Science and Technology, available evidence suggests that there is not a fully-fledged research and innovation policy at national level. In spite of the positive initiatives taken at junior governmental level (by the Secretary of State for Competitiveness, Entrepreneurship and Innovation and by the Secretary of State for Science), the Ministers for the Economy and for Education and Science appear to be overwhelmed by daily challenges, and lack the time and probably the will to launch a combined effort to promote a coordinated strategic approach to research and innovation.

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

Portugal is divided into seven NUTS 2 regions. Five of these are in the European mainland while the other two (Azores and Madeira) are in the North Atlantic. The latter have relatively small populations, each having less than 250,000 inhabitants, and in both of them the personnel involved in R&D activities are below 500 FTE. They elect regional parliaments and enjoy political autonomy that allow them to define research and innovation policies. Despite this they rely on national programmes in this area as much as the continental regions. The five mainland regions each have a Regional Coordination Commission responsible for implementing some policies related to the environment, land use and regional development, namely local urbanization plans, environmental management and implementation of structural policies, as they each have (like Azores and Madeira) a regional operational programme under the NSRF 2007-2013.

The regional breakdown of the national GERD shows a high concentration in Lisbon, which accounts for well over half of both GERD (53.2%) and BERD (59.4%) and almost half of the national R&D personnel. The other two Portuguese regions with a significant weight in terms of R&D are Norte and Centro, which account for respectively 26.4% and 14.8% of the national 2010 GERD. In that same year Lisbon had a GERD/GDP ratio of 2.32%, while the equivalent figures for the two closest regions, Centro and Norte, were 1.50% and 1.28% respectively. The four remaining regions were well below the 1% mark for that ratio.

By the end of 2012 the preparation of the new programming period 2014-2020 was still at an early stage. An exception to this was the co-organisation of a seminar by the European Commission and the Portuguese NSRF Observatory on Regional Research and Innovation Strategies for Smart Specialisation (RIS3) on the 9th of April 2012, to make the national and regional actors aware of the new RIS3 perspective. More recently on the 11th and 12th of December 2012 the FCT organised a workshop devoted to "The National Research and Innovation System: Challenges, Strengths and Weaknesses, towards 2020". In this workshop the five NUTS 2 continental regions' Regional Coordination Commissions plus the regional governments of Madeira and Azores were invited to put forward their views on research and innovation policies in relation to the setting up of Regional Smart Specialisation Strategies

(RIS3). These public presentations were preceded in the weeks before by several initiatives at the regional level. More recently all the Portuguese regions have been actively preparing strategies to feed into the national RIS3. FCT has also been active on this regard. In addition to the seminar referred to above, FCT has been involved in carrying out a SWOT analysis of the Research and Innovation System. A roadmap towards the full contribution of research and innovation policies to the national smart specialization strategy is being developed. This will lead to a thorough assessment of the national research and innovation system with a view to the challenges foreseen until 2020, and including benchmarking with 10 other European countries. The final outcome should be a national report with the definition of priorities and performance indicators to be endorsed by the different national and regional actors.

2.7 Evaluations, consultations

The main independent evaluation specifically dealing with research and/or innovation issues completed in 2011-2012 was an analysis of the partnerships with American universities, undertaken by the Academy of Finland (Academy of Finland, 2012). There was also an independent evaluation of a more general nature, completed in 2011, addressing the implementation of the NSRF 2007-2013 as a whole (IESE & Quaternaire Portugal, 2011).

The programme of the partnerships with US Universities was established by the Portuguese government in 2007, aiming at encouraging joint programmes in specific fields to boost the country's STI development. The main purposes of the evaluation, carried out by the Academy of Finland, were the following: (1) to establish the real outputs from the programmes as well as their relevance in international terms; (2) to assess whether the scientific, technological and academic returns correspond to "good value" for the investments made; and (3) to provide advice about the future development of this initiative. The evaluation considers that the programme has a significant potential for promoting research and innovation. It states that "overall, the present instrument of Research and Education Collaboration is seen as unique" and "it has great potential in promoting R&D&I, and cultural change, and contains an ambitious agenda for taking Portugal to the next level in innovation activity". On the positive side, it is considered that "Portuguese collaboration with US universities (Massachusetts Institute for Technology, Carnegie-Mellon University and the University of Texas at Austin) in research and education is a bold example of an international university-government programme with high-profile science and innovation policy objectives".

However, it was found that the strategy of focusing Portuguese public funding so strongly on US universities was not supported by all of the stakeholders. The total amount allocated to the cooperation with US Universities for the 2007-2011 period was €166.5 million (on average €33.3 million per year; this compares with a national R&D budget (GBAORD) which over this period was c. €1.5 billion per year). The report considers that the model used was not a real partnership, being more similar to a purchaser-provider model. Being still too early to evaluate the full impact of the partnerships, it was also pointed out that some key stakeholders in this process have indicated that more could have been expected out of the total investment by the Portuguese side.

The report recommends that the cooperation should be pursued, although its size and scope should be adjusted to take into consideration the findings of the evaluation and the difficult financial conditions faced by the country. As a consequence of this evaluation, the government decided to renew the cooperation agreements with the University of Texas at Austin and with Carnegie-Mellon University for an additional five year term, but with a

reduced budget. The agreement with the Massachussets Institute of Technology (MIT) is also being renewed under similar conditions.

A working group convened by the Secretary of State for Competitiveness, Entrepreneurship and Innovation undertook an evaluation of the Poles and Clusters Programme. This evaluation suggests that the cluster policy has clear merits, but a reorientation is needed in order to fulfil the high expectations. It suggests that a new framework for the definition of poles and clusters is needed while governance has to be improved. Besides innovation, these initiatives should also aim at internationalisation. Hence, instead of Competitiveness and Technology Poles, it is argued that these should be labelled 'Competitiveness Poles'. The existing clusters should be envisaged as elements of those 'Competitiveness Poles'. Meanwhile, in mid-2012 an overall evaluation of the Collective Efficiency Strategies measure (which includes the Poles and Clusters Programme) was assigned to an international consortium led by a Portuguese consultancy firm. The first results of this evaluation are expected to be available soon.

A call for proposals has been launched to carry out an evaluation of the innovation policy measures under 'Compete'. This is expected to provide a more comprehensive evaluation of the effective contribution of the host of measures included in the 'Compete' Programme to foster innovation.

3. Structural challenges faced by the national research and innovation system

In spite of the improvement of the country's position in international rankings, Portugal suffers from a set of interrelated structural challenges that seriously hinder the transformation of the resources allocated to R&D over recent decades into increased competitiveness. Such challenges have only become more acute under the difficult financial economic and budgetary conditions the country has been facing recently.

As the Innovation Union Competitiveness Report argues, "in order to increase its economic competitiveness by raising its productivity and changing the structure of exporting enterprises, Portugal will have to maintain its efforts in increasing its investments in Research and Innovation" (European Commission, 2011). However, the most relevant indicators regarding R&D effort (GERD, BERD, GBAORD) show that national R&D investment has been declining since 2009. The issue is, thus, how to mobilise resources for a policy that will equip the country to face its structural challenges in a period of austerity.

	Portugal	EU 27
Human resources		
New doctorate graduates (ISCED 6) per 1000 population aged 25-34 (2009)	2.7	1.5
Percentage population aged 25-64 having completed tertiary education (2010)	23.5	33.6
Open, excellent and attractive research systems		
International scientific co-publications per million population (2010)	581.5	301.1
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country (2007)	9.26	10.73
Finance and support		
R&D expenditure in the public sector as % of GDP (2011)	0.11	0.26
FIRM ACTIVITIES		
R&D expenditure in the business sector as % of GDP (2011)	0.69	1.26
Linkages & entrepreneurship		
Public-private co-publications per million population (2008)	8.7	236.2
Intellectual assets		
PCT patents applications per billion GDP (in PPS€) (2008)	0.59	3.78
PCT patents applications in societal challenges per billion GDP (in PPS€) (climate change mitigation; health) (2008)	0.12	0.64
OUTPUTS		
Economic effects		
Medium and high-tech product exports as % total product exports (2009)	35.4	48.2
Knowledge-intensive services exports as % total service exports (2009)	29.9	48.1
License and patent revenues from abroad as % of GDP	0.02	0.51

Source: Eurostat and Innovation Union indicators as found in the Innovation Union (IU) Scoreboard.

According to the 2011 Innovation Union Scoreboard, Portugal is part of the "Moderate innovators" cluster, together with Spain, Italy, Greece, the Czech Republic and Poland (European Commission, 2012a). Portugal ranks better than her 'Moderate innovators' peers in 3 out of 8 dimensions, as follows: 'Finance and support'; 'Linkages and entrepreneurship'; and 'Innovators'. Portugal ranks second on 'Open, excellent and attractive research systems'

and ‘Linkages and entrepreneurship’. The dimensions in which the country’s performance is lower are ‘Human resources’, ‘Firm investments’, ‘Intellectual assets’ and ‘Economic effects’. In spite of the very significant effort in doctoral education, secondary and tertiary education levels are still well below the EU average. (European Commission, 2012a). Further, the capacity to transform the investments in research into competitive capacity remains a very weak link.

In fact, both the Innovation Union Scoreboard and the COTEC Innovation Barometer show that Portugal fares better in creating conditions for R&D and innovation than in translating such conditions into competitive performance. As stated in the 2011 Erawatch Country Report for Portugal (Godinho and Simões 2012), the investments undertaken in enhancing R&D capabilities have not led so far to a significant change in how companies compete in international markets. The Portuguese levels of employment in knowledge intensive activities, of medium and high tech manufacturing exports and of knowledge-intensive services exports correspond to 67.75% and 62% of EU average values respectively (European Commission, 2011).

This analysis leads to the identification of the following structural challenges:

Ensuring the sustainability of the research and innovation system: Efforts to develop a modern S&T system date back to the 1960s, when a policy of training young scientists abroad started. Since then the investment in advanced human resources has continued. At the same time the machinery of research policy developed incrementally, with block and competitive funding instruments made available to support advanced academic research. Several programmes have been trying to capitalize on these efforts, to allow for a greater communication between the academic centers of knowledge and industry. Though this communication has been hindered by several reasons (see the challenges referred to below), research activity on the business side grew rapidly until 2009. The recent decline in research funding, the difficulties in recruiting young researchers or in keeping those already employed in proper jobs, and the increasing difficulties to find adequate support for research projects and activities are together creating a very negative outlook. If the spending cuts are not overturned in the short to medium term, the country risks facing a severe brain drain, with loss of human capital and an irreversible weakening of its centres of excellence.

Improving strategic policy design, systemic density and coordination among the RDI system actors: The divide between research and innovation policies has historically been a major hindrance to the quality and consistency of the research and innovation system (Caraça, 1999; Godinho and Simões, 2005). In spite of some attempts to bridge it, namely with a new policy architecture under the National Strategic Reference Framework 2007-2013, a coherent strategy has not yet been achieved. The Strategic Programme for Entrepreneurship and Innovation established in late 2011 aimed to address this problem. It seems, however, that the volume and diversity of portfolios assigned to the Ministry for the Economy and Employment, including public works and transportation as well as employment, has made innovation a low priority. A related issue concerns the weak involvement of the various stakeholders, notably companies in the process of designing RDI policy. It is advisable that existing *fora* for stakeholder consultation that have been established are effectively implemented.. This is essential to stimulate a closer dialogue and interaction between research, entrepreneurship and business activities. The very low level of ‘Public-private co-publications per million population in Portugal’ (see table above) is an indicator of this situation. Strengthening the systemic density requires the promotion of interactions among the players in the system. The launching of cluster policies, namely the CTP - Competitiveness and Technology Poles under the NSRF 2007-2013, was meant to foster the cooperation among various stakeholders. An increasing concern, which to a certain extent is

related to the sustainability challenge highlighted above, is how to deal with the difficulties in financing public and university research as an opportunity to strengthen the linkages with company capabilities and needs. This demands initiatives that make the circulation of people and ideas between companies and research centers easier. This might be a way to combine the body of understanding (characteristic of university activities) with the body of practice (characteristic of company activities). Such an interaction is much more promising than the misleading, linear model-based concept of technology transfer, so widespread in national (and European) policy approaches.

Moving from a wide scope research policy to a more selective one, focusing on a set of priority research fields: The significant achievements of Portuguese research policy since the late 1980s took place in the context of a horizontal policy that did not positively discriminate among the different research fields. The rationale for such a policy was the fact that Portugal still had a long way to go: scientific backwardness had to be addressed in a broad, generic perspective. The situation has now changed. Portugal has reached a status that in many regards is close to or even above the EU average, as is the case of "New doctorate graduates" or "International scientific co-publications" (see the table above). The maturation in Portuguese science demands a different approach, particularly in the context of budgetary constraints. The government that stepped down in July 2011 had already provided signs of an increased prioritisation of specific fields, as with the creation of the Iberian International Nanotechnology Laboratory (INL). The current government expressed the intention to pursue the bet on "excellence" and to open calls for "all scientific fields", but at the same time set life sciences and health as a key research area (Programa do XIX Governo Constitucional, 2011). In a recent statement the Deputy Minister for Science stated the need for focus and priority setting in science policy (Parreira, 2012). The discussions that started over 2012 to establish national and regional policies congruent with the RIS3 perspective for 2014-2020 may be an important factor in this respect. One may however be aware that while focusing on priority areas may bring important potential gains, there is the enormous risk of sub-optimal choices due to lobbying or lack of strategic intelligence.

Stimulating the emergence of new companies, both domestic and foreign-owned, particularly in knowledge intensive activities: One issue that clearly emerges from the Innovation Union Competitiveness Report is the low share of employment in knowledge intensive activities in Portugal (about 67% of the EU average). While it is true that this share is growing (European Commission, 2011), the pace has not been high enough to ensure structural change and further effort is needed. This would require not only the domestic promotion of skilled entrepreneurship and the development of already established knowledge-based firms but also the attraction of knowledge-intensive inward investment. In this field, a committed, long-term strategy is required. At the beginning of the decade Portugal was successful in attracting several foreign R&D investments. The Government programme stated the intention to devote a stronger effort in this regard. However, success is not easy: it demands a very professional and consistent implementation, the development of bridging capabilities (for instance, research organisations, suppliers...) and focus on the priority areas defined. These policy orientations are also highly congruent with the smart specialisation strategy that will be established for 2014-2020. But again, it will be essential to escape vested interests while identifying and helping the most promising areas.

Strengthening the SMEs in-house technological, organisational and marketing capabilities: The education levels of the Portuguese population are lower than the EU average: the share of population in the 30-34 cohort, which completed tertiary education is 65% of the EU average, while the share of the population in the 20-24 cohort with upper secondary level education is 70% of the EU average (European Commission, 2011). This is

reflected in companies' capabilities. Managerial capabilities are limited, especially in traditional industries. New firms are set up by former employees who display entrepreneurial drive but often lack a sound knowledge base (Vicente, 2006). The need to leave the domestic market "comfort zone" and engage into international activities, particularly through exports, makes the strengthening of in-house capabilities badly needed. This issue has been recognised in innovation policy statements and was translated into a few initiatives aimed at contributing to enhance SMEs' innovation capabilities. An interesting example was the NITEC programme, aimed at supporting the setting up of dedicated R&D teams in companies. There is, however, a need to pursue and improve such programmes, since they are essential to enhance SMEs competences to innovate and compete in international markets. In this vein, the focus on technological capabilities is not sufficient. It should be combined with initiatives to promote organisational and marketing capabilities. These are key to develop innovative approaches enabling the companies to improve their performance in international markets. In particular, specific initiatives should be launched with a view to enable the most innovative companies to successfully introduce their new products and technologies in the most affluent and sophisticated markets.

4. Assessment of the national innovation strategy

4.1 National research and innovation priorities

Two distinct levels need to be taken in consideration to analyse the national research and innovation strategy. The first one has to do with the structural policies, which are related to the multi-annual NSRF 2007-2013, and the second one has to do with the policies under the government programme, which are limited by an electoral cycle that is shorter than the one of the structural policies. The national government determines the structural policies in the moment of its inception or through possible adjustments over its implementation, as it happened with the re-programming undertaken in 2012. The NSRF is thus at the programming level of the policymaking cycle. In practice, the NRSF acts as the funding source of the policies set by the successive governments. The election that took place in June 2011 led to a replacement of the former Socialist majority by a centre-right majority. This change has had some implications for the research and innovation priorities, which are identified below.

Since 2007 Portugal has been following the NSRF 2007-2013. As with the three Community Support Frameworks (CSFs) that preceded it, the NSRF 2007-2013 combines EU and national funds to address structural weaknesses. The NSRF aggregates a set of operational programmes and measures, including in the fields of research and innovation. The NSRF is the main source of resources for funding research activities. In contrast to the previous CSFs, the NSRF 2007-2013 was marked by a concentration of policies regarding innovation and research under the same programme (the Competitiveness Factors Operational Programme, in short known as COMPETE). The challenge was to provide a more systemic approach in these policy areas, in order to strengthen the national innovation system. The 2010 intermediate overall evaluation of the COMPETE Programme (A. Mateus & Associados, 2010) has highlighted that notwithstanding progress in policy design, the degree of practical integration of different areas has remained low.

With the overall objective of promoting systemic integration, the NSRF entailed a much stronger focus on increasing extramural R&D carried out in cooperation between business firms and the research sector. The main measure concerning this objective has been the establishment of 'collective efficiency strategies', aiming at stimulating different forms of cooperation and clustering among different actors, namely through the establishment of Competitiveness and Technology Poles (CTP). The remaining NSRF measures stimulating research cooperation include: 'Collective RTD projects' (led by business associations to respond to the technology development needs of their members); the 'Mobilising projects' (involving companies and R&D organisations); the 'Co-promotion projects', (again through partnerships between companies and RTD organisations); the 'R&D Consortia' (usually led by R&D organisations, to develop specific research projects involving research organisations and business firms); and the 'RTD Voucher' (now included in the 'Innovation Voucher'), granted to a company to benefit from R&D services.

The demand for these measures has been generally quite high, but at the same there has been a significant gap between the rate of project approval (higher) and the actual implementation of the projects (lower). Further, key measures such as the CTP poles have been taken up to varying degrees, where some poles (like Produtech, on manufacturing technologies, or the food industry cluster) have been quite dynamic while others have shown limited activity. The intermediate overall evaluation of the NSRF 2007-2013 indicates that the low degree of

strategic integration between the three main thematic areas (competitiveness, human resources, regional development) has remained the most significant problem.

In addition to the NSRF measures, there have been other policies whose central objective has been to stimulate private R&D investment, the most important of which has been SIFIDE, a system providing tax credits for R&D investments. This measure, which has now existed for a decade with a brief interruption in 2005, was restated by the budget law of 2011 that established SIFIDE II. In spite of the government change and increasing budgetary constraints, SIFIDE has been kept active, though with reduced incentives.

The former government issued two important policy documents, which were meant to provide a revamped framework for innovation policy. Those two documents were the Agenda Digital of November 2010 and Portugal 2020, published in March 2011. These two initiatives were short-lived, due to the government change that took place in mid-2011. A revised Digital Agenda was issued in December 2012. It has the following objectives: (1) to promote the development of broadband infrastructure; (2) to create the conditions for increasing in 30% the number of companies involved in e-commerce in 2016 compared to 2011; (3) to promote the use of on-line public services to reach 50% of the population by 2016; (4) to create the conditions to ensure a 20% increase in ICT exports in 2016 compared to 2011; and (5) to encourage the use of new technologies with a view to ensure a decline of 30% in the number of individuals that has never used the internet.

The present government announced in December 2011 the Programa Estratégico para o Empreendorismo e a Inovação +E +I (Strategic Programme for Entrepreneurship and Innovation). +E +I aims at promoting entrepreneurship and innovation. Its main strategic objectives are the following: creation of a more entrepreneurial society; expanding the basis of innovative and export-orientated companies; promoting a networked country integrated in international knowledge, entrepreneurship and innovation networks; and to ensure better investments and better outcomes. In the field of entrepreneurship, there is a concern to create an environment favourable to the emergence of excellence initiatives and projects. The measures contained in this new programme coincide essentially with several measures which were already under implementation with funding of the NSRF 2007-2013 programmes.

The re-programming of the NSRF, undertaken in 2012, has entailed a redistribution of budgetary allocations, involving namely increased allowances for promoting entrepreneurship and the creation of a credit line to enable companies with approved investment projects to carry them out, to compensate for the drying up of bank credit.

The main changes in research and innovation policy since mid-2011 have to do with the budgetary difficulties and changes in policy priorities. They may be characterised as follows: (1) significant drop in demand-side innovation investment, particularly in the intelligent mobility (Mobi.E) programme; (2) increased assignment of funds for encouraging entrepreneurship, namely venture capital, in line with the guidelines defined in the +E+I Programme; (3) increased focus on the availability of credit lines opened to companies, in order to counter the drying up of bank credit; and (4) the drop in funds assigned to post-graduate education and training of skilled human resources abroad.

Concerning research policy driven towards scientific development, a stable set of horizontal priorities has been pursued since before 2000. The most important of these have been: bringing Portuguese science to the levels of excellence of the leading countries in different disciplinary areas; promoting the internationalisation of the Portuguese academic community; and setting up a machinery of support for the research system.

There have however been changes in recent years, a set of horizontal priorities being enlarged towards integrating thematic priorities. The partnerships with US Universities (some of which have been renewed with additional five year terms) and with the Fraunhofer Gesellschaft addressed well-defined thematic areas, namely energy, advanced computation, security and health. In the same vein, the creation of the Iberian Nanotechnologies Laboratory (INL) came from a specific concern with this techno-scientific field. The present government has highlighted the need for increased focus as well as for the definition of priorities, having in mind budgetary constraints. Life sciences were mentioned in the Government Programme as a priority area

From the perspective of the overall policy mix impacting research and innovation, several other aspects should be highlighted. As a follow up to former national policies, the NSRF 2007-2013, under the Human Potential thematic programme, established several measures addressed to promote post-graduate education. However, in face of budgetary restrictions, a decline in those investments is now clear. The promotion of a scientific and technological culture has also been envisaged as essential for the modernisation of the country. The Ciência Viva Agency has played a very important role in this regard. In contrast, the Government has remained committed to support research grants for PhD holders: 155 researchers were assigned the five years 'Investigador FCT' ('FCT Researcher') grants.

Two evaluation exercises were undertaken recently in connection with the NSRF. One of them, mentioned above, was the mid-term evaluation of the NSRF 2007-2013 and the other analysed one of its operational programmes (COMPETE). The first (A. Mateus & Associados, 2010) was broadly positive, although it calls for the strengthening of the strategic dimension of the NSRF, particularly on the consistency of the three thematic operational agendas (Competitiveness, Human Potential and Territorial Valorisation). Regarding innovation, the evaluation is positive. It underlines that company investments are following a trend which is more geared towards higher technology intensity, increased knowledge integration, value chain improvements in traditional industries and the emergence of value added export industries. The second evaluation was specific to the COMPETE Programme (IESE & Quaternaire Portugal, 2011). It dealt with organisational and management issues, namely the adaptation of the policy instruments to a new economic reality, and not so much with the economic impacts of innovation policy. According to the information collected, the overall assessment is positive in terms of selectivity, take-up of innovation and competitiveness measures and governance model. The evaluation points out, however, that there is a need for a better project follow-up. It also remarked that, though tangible investments keep the majority share in the investments supported, there has been an increased opportunity for intangible investments.

Apart from the generally positive results of these two evaluation exercises, which focus on the period before 2011, the main problem now seems to lay more in the current economic climate, which is seriously inhibiting firms from strategically investing in innovation. The need to renovate and upgrade the business sector through both the improvement in capabilities of existing firms and the creation of a larger sector of new knowledge-intensive firms is severely limited by the dire conditions of the economy. However such trajectory needs to be pursued by all means, as a way of not losing for good the scientific capacity that the country was able to build over recent decades.

4.2 Evolution and analysis of the policy mixes

The national innovation policy mix has been very much influenced by the launching of the successive Community Support Framework programmes (CSFs). These have defined the

main features and measures under the policy mix. We concur with the view that "one cannot state that a true integrated science, technology and innovation policy existed in Portugal" (Laranja, 2007: 185) and that EU funds "have been the main instrument" for action in that regard (Laranja, 2007:186). The policy mix has also been influenced by government changes, often leading to significant policy reorientations.

During the last three years, the policy mix has remained quite stable. In fact, the main policy measures under the NSRF 2007-2013 were launched in 2007/2008, and no major changes were made so far. The re-programming undertaken in 2012 introduced some minor changes in the policy mix. As mentioned in 4.1 above, these were mainly related to the increase in funds for promoting entrepreneurship and venture capital as well as to the launching of a credit line aimed at helping companies with approved investment projects to carry them out in spite of the drying up of financing from banks.

The budgetary and financial constraints have significantly curtailed the take-up of the policy measures by companies, namely in the innovation field. In fact, the credit crunch has severely limited SMEs' access to bank loans (Simões, 2009), thereby reducing their possibilities to carry out investments, even with public support. Export intensity, measured by the ratio of exports to turnover, has been introduced as an eligibility condition for firms applying for support under the NSRF 2007-2013 company support systems. The concern with international competitiveness, namely with export promotion, became a key cross-cutting priority for economic policy, including innovation policy.

The government that took office in late June 2011 did not make any major changes in the R&D and innovation policy mix, with the exception of an increased focus on financial engineering and the promotion of venture capital instruments (including the creation of Portugal Ventures, mentioned in 2.3 above. It is important to remark that the tax incentive system (SIFIDE II), which provided a favourable treatment to investments in R&D, has been reinstated for 2012 and 2013. The budgetary constraints have led to more stringent eligibility conditions as well as to a reduction in the benefits provided under SIFIDE. The Budget for 2013 assigned the responsibility for SIFIDE incentives to the Tax and Customs Authority. The commitment to keep the system even in the current financial conditions is noteworthy.

A Strategic Programme for Entrepreneurship and Innovation +E+I (Council of Ministers Resolution 35/2011) was approved in December 2011 with a view to promote innovation and entrepreneurship. This Programme is based on four main pillars: (1) enhancing citizens' competencies; (2) encouraging innovation; (3) stimulating entrepreneurship; and (4) launching more appropriate financing instruments. However, +E+I has not entailed the launching of new support measures, but rather some changes in existing incentive systems to adapt them to the +E+I objectives and guidelines.

Looking at the policy mix from the perspective of the Innovation Union self-assessment tool, it is possible to identify the main strengths and weaknesses of Portugal's R&D and innovation policy mix. The main strengths are pointed out below. Unfortunately, most of these strengths are subject to qualifications, to a large extent as a result of policy changes stemming from the need to curb public expenditure and the credit crunch:

● A broad perspective of innovation policy, going beyond technological research and its applications, and the emergence of a commitment to systemic policies, epitomised in the measures regarding poles and clusters;

● Before the intensification of the sovereign debt crisis there was an "adequate and predictable public investment in research and innovation". This is now at stake due to the stringent financial conditions faced by the country, although the Ministry for Education and

Science is aware of the problem and is looking for additional financing sources in order not to compromise past achievements.

● Excellence has been a key criterion for allocating resources to research, though the same could not be said about education policy;

● Partnerships between higher education institutes, research centres and businesses have been promoted, with positive results, especially in co-promotion projects (Mamede, 2012);

● Launching of cluster policies (Competitiveness and Technology Poles [CTP] and Other Clusters), aimed at generating stronger interaction among the players in the national system for research and innovation; however, there are doubts about the effectiveness of such endeavours, particularly on what concerns the capabilities and dynamics of some CTPs and clusters (an evaluation exercise is now being carried out); and

● There is in place a wide array of policy instruments that cover most of the relevant fields in R&D and innovation policy (although their implementation sometimes leaves much to be desired).

In contrast, there are major weaknesses which significantly hinder the effectiveness of the policy in bringing about fast change in terms of innovation behaviour and economic competitiveness. These are related namely to the dominance of the 'linear model' in policy design (Godinho, 2012, Laranja, 2007 and 2012; Simões, 2012)[1], the weaknesses of the education system (Crato, 2006; Teixeira, 2012) and insufficient capabilities in the public sector (Godinho & Simões, 2005; A. Mateus & Associados, 2010).

4.3 ASSESSMENT OF THE POLICY MIX

The policy mix is now reasonably comprehensive, as pointed out in earlier reports (Godinho & Simões, 2009 and 2010). The set of measures provided in the NSRF 2007-2013 is generally appropriate, insofar it addresses the main challenges identified. The field in which, at the time of writing (January 2012), the mix has more shortcomings is in the provision of managerial support to SMEs.

The main bottlenecks to respond to the challenges identified do not lay therefore in the set of specific measures, but rather on other issues. As explained more in detail in the table below, the efficiency and effectiveness of the policy mix is seriously undermined by two problems. The first is the still insufficient coordination among the different sectoral policy perspectives which precludes the development of a systemic approach to tackle the challenges. The design and implementation of research and innovation policies has not been steered at the highest political level. The second is the dominance of a 'linear model' perspective (Godinho, 2012; Laranja, 2012; Simões, 2012). In fact, in spite of some improvements stemming from the policy mix of the NSRF 2007-2013 (Mamede, 2012), there is still the idea that investment in science and in the 'transfer' of scientific knowledge to companies would be the key to ensure an innovation based competitive approach. Politicians seem to lack a clear view about the systemic nature of the innovation process and still do not realise the importance of the non-technological dimensions. Furthermore, the insufficient in-house capabilities and the passive and bureaucratic stance adopted by some organisations in the public sector are not conducive to foster innovation. These issues are further exacerbated by financial restrictions as well as by the institutional failures mentioned in the next section of the report.

[1] See, for a different view, Mamede (2012).

Policy implementation has been one of the weak links. Though several improvements have been introduced, companies continue to complain that the process is still too bureaucratic. This reduces the take up by the target actors. The transfer of competences to regional authorities in several measures introduced an additional administrative burden with implications in terms of implementation. However, the experience has proved to be generally positive, since it enabled the development of a better dialogue between applicants and the administration, thereby easing the process. The intermediate evaluation of the NSRF 2007-2013(A. Mateus & Associados, 2010) suggests that the implementation machinery improved with regard to earlier CSF rounds; it notes, however, the need to improve some aspects, namely a better project follow-up. On the other hand, the financial crisis raised further problems for implementation, since matching funding traditionally provided by banks has been significantly curtailed. To sum up, much can still be done to make implementation easier and more efficient.

Two evaluation exercises have been carried out regarding the NSRF 2007-2013 (Augusto Mateus & Associados,2010; IESE & Quaternaire Portugal, 2011). They are both of a general nature and do not address specific policy measures in detail[2]. They are also mainly concerned with implementation, and less with effectiveness aspects. An interesting, and positive, finding regards the fact that while tangible investments keep the majority share in the investments supported, there has been increased room for intangible investments. Although both evaluation exercises provide a positive assessment, they agree in stressing the advantage of adopting a more clear strategic perspective towards the policy mix.

A brief summary of the assessment of the effectiveness of the policy mix to address the challenges identified in Section 2 is provided in the table below.

[2] As mentioned above, an evaluation of the cluster policy is being carried out at the time of writing.

Challenges	Policy measures/actions	Assessment in terms of appropriateness, efficiency and effectiveness
Ensuring the sustainability of the research and innovation system, as it grew and started to mature over the most recent decades	- Increased commitment to European research projects. - Increased selectivity in the assignment of funds. Definition of priority areas. (More than specific actions, these are intentions expressed by the Government). - Continuation of SIFIDE II.	The intentions expressed by the Government make sense in face of the budgetary difficulties. However, so far no clear definition of priorities has taken place. It is important that budgetary cuts will not put into jeopardy the long term sustainability of the research and innovation system. The capability to fight brain drain is also dependent on policies aimed at promoting economic growth, particularly on what concerns the recruitment of highly-skilled people by companies.
Improving strategic policy design, systemic density and coordination among the RD system actors	<u>Programmes</u>: - Technological Plan (basically until 2009). - Strategic Programme on Entrepreneurship and Innovation (launched in Dec.2011). - Advisory Bodies: Creation of the National Councils for (1) Entrepreneurship and Innovation and for (2) Science and Technology, <u>Measures</u>: - Competitiveness and Technology Poles (CTP) - OTICs (Technology Transfer Offices) - Co-promotion projects - R&D Consortia. - Collective R&D projects - Innovation Voucher - CITECs and NITECs	The effects of the policy instruments (including programmes, advisory bodies and specific measures) have been mixed, but in general their effectiveness to respond the challenge has been limited. The Strategic Programme on Entrepreneurship and Innovation launched late in 2011 might play a role in this field. However, so far it has just concerned with promoting entrepreneurship and has not been able to reach a trans-Ministerial stature. It is too early to assess the work carried out by the Councils. It would be very much desirable to establish an appropriate coordination between them. The results achieved by the cluster initiatives (CTP and other clusters) are mixed. In spite of a few very positive examples, the effectiveness of the cluster policy in bringing about an increased systemic interaction remains limited. The OTICs have helped universities to become more involved in technology commercialisation. However, the linear approach model implicit in this initiative significantly reduced its effectiveness. The role played by Co-promotion projects under the Incentive System for Research and Technological Development (SII&DT) is clearly positive: they have stimulated cooperative University-Industry projects. In contrast, participation of companies in Co-promotion projects under the Incentive System for S&T Organizations (SAESCTN) fall short of expectations. They were not able to generate an acceptable take-up by companies. Though making a positive contribution, the measures. Vouchers, CITECs and NITECs have obviously a very limited role in influencing the density of the system. In global terms, in spite of the strengthening of potentially relevant policy instruments, the implementation has still been insufficient to effectively respond the identified challenges.
Changing from a broad range research policy to a more selective one, based on a set of priority research fields	- Revision of the State Laboratories System - Creation of the Iberian International Nanotechnology Laboratory (INL) - S&T Thematic Networks - Intention to define priority areas in research policy	Science policy has been characterized by the absence of prioritisation of specific fields. The cooperation with US universities has introduced some priority orientations. Some of these were changed in the recent renewal of the agreements with the University of Texas at Austin and Carnegie-Mellon University. The creation of the INL corresponded to the identification of nano-sciences and nanotechnologies as an important research priority, which may be considered as a positive development. However, in general terms, no initiative has been taken so far to develop a process of definition of priority fields in research policy, involving the participation of the various stakeholders. This issue is even more important in the present context of budgetary restrictions.

Stimulating the emergence of new companies, both domestic and foreign-owned, particularly in knowledge intensive activities	- Strategic Programme on Entrepreneurship and Innovation (+E+I). - Creation of Portugal Ventures - New initiatives to promote entrepreneurship under +E+I. - Many dispersed initiatives (namely at regional level)	In spite of the dispersion of initiatives to stimulate entrepreneurship, they were not satisfactory in terms of appropriateness, efficiency and effectiveness, as the Strategic programme for Entrepreneurship and innovation implicitly recognised. They have not led to a clear upsurge in the creation of new firms with potential for succeeding in the international arena. The shallowness of capital markets has also hindered the development of skilled venture capital firms and business angels. The new Strategic Programme on Entrepreneurship and Innovation is intended to address these problems. Another field where policy has been unsuccessful regards the attraction of new knowledge-based companies from abroad. Although there have been a couple of success stories, foreign investment policy has largely disregarded this important target.
Strengthening SMEs in-house technological, organisational and marketing capabilities	- NITECs - Innovation Voucher - SME Skills Support System (other measures besides the Innovation Voucher) - Collective Actions Support System	Traditionally, support provided to SMEs was chiefly of a financial nature and did not address the provision of services. The NITEC measure, introduced in the third CSF, and the Innovation Voucher contributed to balance the kind of support provided. The NITEC initiative was very successful in the first years, but the take up has declined in the recent past. Available information suggests that the Innovation Voucher has generated a reasonable demand, although no specific evaluation has been carried out. Therefore, the policy mix is now more appropriate to respond the challenges. Three important aspects are still insufficiently addressed: the provision of management support to traditional SMEs (in spite of the introduction of some improvements); management support to new high-tech companies; encouragement to SMEs cooperation for innovation and internationalisation.

5. National policy and the European perspective

Portugal together with the whole EU has been living in a difficult environment, marked by the economic downturn. The problems which several EU governments, including the Portuguese government have felt in borrowing from the financial markets, turned into a much wider crisis of the Euro system. In the 2011 ERAWATCH Country Report for Portugal (Godinho and Simões 2012) it was pointed out that "there are no convincing signs that the present difficulties will be easily overcome". One year on and that statement has been fully confirmed. According to the EUROSTAT forecast, GDP may have declined 3% in 2012 and it will fall yet another 1% in 2013.

The urgency of a solution for the economic and financial problems has made governments in the more affected countries focus on macroeconomic stabilisation while attention has moved away from the more microeconomic and longer-term research and innovation policies. This shift in focus does not mean that these policies have become less important but only that the urgency of the crisis has left governments with little capacity to deal with the structural issues. The current situation may however offer important opportunities for bringing into the national and EU agendas several key structural constraints. This means that a clear policy agenda together with the strategic willingness of both governments and the main stakeholders of research and innovation may be very helpful in bringing the member states to move forward to a more considered development trajectory. In the case of Portugal the intense public discussion that has occurred following the assistance programme drawn up by the EU, the ECB and the IMF, has led to a better identification of some key barriers to further economic advancement. By now there is a consolidated perception that the present crisis stems from both demand and supply factors.

On the demand side an over-evaluated currency has facilitated imports, while the membership of the Eurozone has allowed for excessive low-cost borrowing in the financial markets. On the supply side the widening productivity gap with the leading economies has set the country in a low productivity, low growth trajectory. The combination of these forces has helped the economic and business structure to freeze in benefit of the intermediary agents located between import and final consumption, instead of stimulating the development of knowledge-intensive firms with high value-added products. The move to a more medium-tech economic structure that happened between the late 1980s and 2000 has to a great extent been consolidated, but the (expected, and to a certain extent desirable) shrinking of the traditional sectors that has meanwhile occurred has not been offset by the creation of employment and export potential in other sectors. Most of the employment created over the last two decades has been concentrated in non-tradable activities. The very low pace of knowledge-based entrepreneurship has meant that the dualistic nature of scientific and technological development has been aggravated.

The existing policy mix has been characterised as being quite comprehensive (Godinho and Simões, 2010). The structural policies set up with the help of the EU over the previous two decades have allowed national research and innovation policies, in combination with other important areas of the policy mix, to be fully equipped including appropriate policy instruments and targets. In this sense the policy toolbox in Portugal does not compare poorly with the more advanced economies. The more immediate reason why they have not been very effective lies in the macroeconomic aspects indicated above. But their limited effectiveness lies also in several other relevant, deep-rooted shortcomings. First of all structural policies

have barely dealt with the institutional aspects which affect entrepreneurship, risk-taking, collaboration, creativity and innovativeness. The cultural framework and the way formal and informal institutions interact generate an incentive profile that has not been in line with a systemic development of research and innovation. Research continues to be carried out and supported mainly in a linear perspective. Despite the increasing integration of thematic priorities in research policy, these have not been pursued together with the business sector.

As stated above the policy mix and the diversity of instruments that have been implemented are quite comprehensive. Furthermore their analysis indicates a broad alignment with the European Research Area (ERA) objectives. ERA policies have been set out with the strategic objective of creating a more unified space for researchers and knowledge circulation in Europe. There is an intention of rationalizing research efforts while at the same benefiting from economies of scale in new S&T knowledge creation. Therefore all R&D activities, initiatives and policies that involve a transnational perspective in Europe are part of this effort. The policy Communication on the European Research Area (European Commission, 2012) aims at a significant improvement in Europe's research performance, with the ultimate aim of promoting growth and job creation. The Communication put forward a set of measures to be implemented together by the EU Member States, the Commission and Research Organisations to ensure the completion of ERA by 2014. With the objective of opening up and connecting EU research systems, the ERA agenda focuses on five priorities.[3]

As last year's ERAWATCH Country Report for Portugal (Godinho and Simões, 2012) indicated, initiatives have been implemented in Portugal across all ERA dimensions, although some important challenges and shortcomings still persist. Portugal has moved forward by adopting measures and practices that allow for greater cooperation in the setting of research agendas and in guaranteeing the opening of the research labour market and favouring mobility.

Despite its efforts in improving international research cooperation, the country still needs to learn how to collect the spillovers from an increasing participation in international research efforts, to integrate them into national research institutions and strategic projects. One example of the problems that may occur in the future is the participation in the FP7, in which despite a significant participation of Portuguese teams the return to national investment has been below 100%, in particular in what refers to the participation in ITER, ESA or JRC. In what regards FP7 projects themselves, the estimated return is 93%, which is above the equivalent figure for FP6. Yet the country needs to keep improving; more specifically, national policies need to learn to manage the trade-offs between increasing European collaboration and capturing benefits for Portugal, as spatial economies of scale are set within the ERA. In relation to the labour market for researchers there are also signs that the implementation of the ERA directives may not be easing the domestic situation. The increasing supply of new PhD holders over the last decade is an asset that is not finding proper exploration, as the research labour market has shown growing difficulties to absorb them. In addition to the difficulties on the research institutions funded by government grants, the current crisis implies that business firms will not start absorbing highly qualified personnel in the shorter timeframe. The consequence is that the brain drain of world level scientists that the country started to face in previous decades may now become more intense.

[3] More effective national research systems; Optimal transnational co-operation and competition on common research agendas, grand challenges and infrastructures; An open labour market for researchers facilitating mobility, supporting training and ensuring attractive careers; Gender equality and gender mainstreaming in research encouraging gender diversity to foster science excellence and relevance; Optimal circulation and transfer of scientific knowledge to guarantee access to and uptake of knowledge by all.

Drawing on the analysis above and on the remaining sections of this report, some possible directions towards which the current policy mix should evolve in the short and medium term can be identified.

The economic and financial crisis has absorbed the attention of government towards macroeconomic stabilisation, which of course is the greatest challenge in the short term. The negative consequence of this is that even more than before research and innovation policies have not been dealt with at the highest political level. Apart from the need to reform the labour market, no other major structural perspectives have been present in policy statements in recent months. The need to conceive a strategy regarding how to achieve "smart specialisation" as a post-crisis scenario, bringing in all the major stakeholders around a common platform, is a pre-condition for a successful policy mix.

The interaction between research and innovation needs to be brought to the forefront of the strategy, as the country has developed a pronounced dualism in terms of science (stronger) and technology (weaker) capabilities. The virtues of the linear approach are virtually exhausted. The move towards starting to define thematic research priorities over recent years has not happen with the involvement of business interests. Policy instruments which have been implemented (CTP and Other Clusters and other joint-platforms) need to integrate much further the cooperation between academia and business firms. Furthermore, the development of companies in-house capabilities is essential to provide an appropriate demand for scientific knowledge as well the desirable increase in the involvement of the business community in the definition of research policy priorities.

The preparation of the new programming period 2014-2020 offers the opportunity for choosing priorities in research and innovation, in congruence with the implementation of RIS3 strategies. The focusing on priority areas makes sense in the context of scarce resources the country is facing. However, there is the need for informed and widely participated choices, so that the double risk of capture by vested interests and wrong choices is avoided.

The reforms in secondary education curricula and the promotion of secondary level technical schools that have been implemented are positive but their effects are very much in the long term. As the education and training systems are not providing the right mix of skills, curricula need to be reviewed in congruence with future scenarios. The law on university governance (RJIES) that was passed in 2007 needs to be fully implemented, to allow universities to interact further with the communities they are based on, while at the same time providing the seeds to move ahead in terms of advanced basic and applied knowledge.

Government itself needs to keep the momentum experienced over the previous decade with regard to administrative modernisation, while becoming a more intelligent stakeholder in the innovation game, through public procurement, the promotion of demand-side innovation approaches, the definition of objectives and standards of practice and steering the cooperation between the main stakeholders of the innovation system. Finally, the policy mix needs to integrate initiatives driven towards institutional reform in order to promote behavioural change regarding entrepreneurship, creativity and innovation.

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List of Abbreviations

A3HE	Agency for Assessment and Accreditation of Portuguese Higher Education
AdI	Innovation Agency
BERD	Business Expenditures for Research and Development
CERN	European Organisation for Nuclear Research
CNEI	National Council on Entrepreneurship and Innovation
CTP	Competitiveness and Technology Poles
ECB	European Central Bank
EPO	European Patent Office
ERA	European Research Area
ERA-NET	European Research Area Network
ESA	European Space Agency
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EU-27	European Union including 27 Member States
FCCN	Foundation for National Scientific Computing
FCT	Science and technology Foundation
FDI	Foreign Direct Investment
FP	European Framework Programme for Research and Technology Development
FP7	7th Framework Programme
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GOVERD	Government Intramural Expenditure on R&D
GPEARI	Planning, Statistics and International Relations Office of the Ministry for Education and Science
GPPQ	Office for promoting national participation in the Framework Programme
HEI	Higher education institutions
HERD	Higher Education Expenditure on R&D
HES	Higher education sector
IMF	International Monetary Fund
INL	Iberian International Nanotechnology Laboratory
IP	Intellectual Property
IPTS	Institute for Prospective Technological Studies
JRC	Commission's Joint Research Centre
KBBE	knowledge-based bio-economy
KIBS	Knowledge-Intensive Business Services
MCTES	Ministry for Science, Technology and Higher Education (ceased to exist in June 2011)
MEC	Ministry for Education and Science
MEE	Ministry for the Economy and Employment
MEID	Ministry for the Economy, Innovation and Development (ceased to exist in June 2011)
NEM	Networked and Electronic Media

NRP	National Reform Plan
NSRF	National Strategic Reference Framework
OECD	Organisation for Economic Co-operation and Development
OTICs	knowledge and technology transfer offices
PNRC	Programme for the Renewal of Scientific Equipment
R&D	Research and development
RCTS	Science, Technology and Society Network
RI	Research Infrastructures
RTDI	Research Technological Development and Innovation
S&T	Science and technology
SF	Structural Funds
SME	Small and Medium Sized Enterprise
TTOs	Technology Transfer Offices
USPTO	United States Patent and Trademark Office
UTEN	University Technology Enterprise Network
VC	Venture Capital