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Abstract

The Analytical Country Reports analyse and assess in a structured manner the evolution of the national policy research and innovation in the perspective of the wider EU strategy and goals, with a particular focus on the performance of the national research and innovation (R&I) system, their broader policy mix and governance. The 2013 edition of the Country Reports highlight national policy and system developments occurring since late 2012 and assess, through dedicated sections:

- national progress in addressing Research and Innovation system challenges;
- national progress in addressing the 5 ERA priorities;
- the progress at Member State level towards achieving the Innovation Union;
- the status and relevant features of Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3);
- as far relevant, country Specific Research and Innovation (R&I) Recommendations.

Detailed annexes in tabular form provide access to country information in a concise and synthetic manner.

The reports were originally produced in December 2013, focusing on policy developments occurring over the preceding twelve months.

ACKNOWLEDGMENTS AND FURTHER INFORMATION

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

The Country Report 2013 builds on and updates the 2012 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 2013 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 DG-RTD are also gratefully acknowledged. Further the information provided by Dr. Luísa Henriques and Mr. Tiago Saborida from Portugal's FCT is also 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.

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EXECUTIVE SUMMARY

Sustainability and adjustment are now the key issues faced by the Portuguese research and innovation system. Thanks to policies followed over several decades, Portugal was able to develop its Research and Innovation (R&I) infrastructure and high levels of capacity were acquired in certain domains. Incoming structural funding was instrumental in these developments since the late 1980s. However, the aim to upgrade R&I in Portugal has been made more difficult by the very challenging budgetary climate over recent years that is still ongoing. The effect of this climate is already visible in the most recent Research and Development (R&D) statistics, with the GERD/GDP ratio declining from 1,64% to 1,52% between 2009 and 2011. Universities in particular have reported difficulties in maintaining previous levels of research activity. Former levels of public investment, particularly in research, have not been sustainable in the current conditions.

The economic and financial crisis resulting in a focus on austerity has challenged Portugal to reconsider its approach to R&I policy. Notwithstanding the budgetary pressures that have been particularly strong because of Portugal's Economic Adjustment Programme agreed with the European Commission, European Central Bank and the International Monetary Fund, there is a need for the country to recognise that R&I is the path to sustainable long term economic growth, and therefore prioritize it in spending decisions. On an operational level, as the new EU funding cycle begins, national match funding will be necessary to fully exploit the opportunities offered by the European Structural and Investment Funds (ESIF) and their synergies with Horizon 2020.

Governance of the R&I system is still largely dominated by the public sector. A key feature of the public research system has been a high degree of centralisation, through fund allocation and policy making. The formal structures for consulting the main stakeholders, including companies, have only been used occasionally in the past. The low participation of the private sector in the governance of the research system is a result of policy choices, but also of the weak involvement of firms in R&D. The recent creation of three advisory councils (National Council for Science and Technology, National Council for Entrepreneurship and Innovation, and National Council for Reindustrialisation) may contribute to enhance the involvement by stakeholders in the definition of research and innovation policies, provided that their scopes are clearly defined and appropriate links are established among them.

The process of developing a Smart Specialisation Strategy has stimulated a more participatory approach to R&I policy, including at regional level through the involvement of the regional development coordination bodies (Comissões de Coordenação e Desenvolvimento Regional - CCDRs). The national funding agency for science, research and technology (Fundação para a Ciência e a Tecnologia - FCT) has been instrumental in driving forward this process, firstly by carrying out a comprehensive SWOT analysis (FCT 2013) and then through the organization of stakeholder meetings. Although the SWOT analysis is mostly focused on the research side, and less on innovation, the involvement of the CCDRs in the R&I policy process is a novel and interesting development.

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, for the reasons mentioned above;
- Improving strategic policy design, systemic density and coordination among the R&I system actors;
- Moving from a wide spectrum 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 SMEs in-house technological, organisational and marketing capabilities.

In the recent past the NSRF 2007-2013 concentrated R&I measures under a single programme (the Competitiveness Factors Operational Programme – ‘COMPETE’), thus in principle allowing for greater coordination between different sectoral policies. Further the NSRF 2007-2013 entailed a stronger focus on increasing extramural R&D carried out in cooperation between firms and the research sector. A similar approach will be followed in the Common Strategic Framework 2014-2020. There will be an Operational Programme on Competitiveness and Internationalisation which is intended to address the issues related to the development of the R&I system in connection to companies’ international competitiveness. This new Operational Programme includes five main priorities: 1) support to company investments in innovation, creativity, internationalisation and training; 2) strengthening R&I capabilities; 3) forging linkages and synergies among companies, R&D centres and higher education; 4) improving Portuguese economy’s international connectivity; and 5) modernisation of the public administration. In addition to this OP for Competitiveness and Internationalisation, the regional OPs will also provide funding for R&I activities.

Overall the available policy mix is reasonably comprehensive. The structural policies set up with the financial backing of EU funds over the previous two and half decades have allowed national research and innovation policies, in combination with other important areas of the policy mix, to adopt appropriate policy instruments and targets. In this sense the policy toolbox in Portugal is comparable to the more advanced economies. The set of measures provided in the NSRF 2007-2013 was generally appropriate, insofar they addressed the main challenges identified. A similar conclusion has been reached by a recent evaluation of the impact of the NSRF 2007-2013 on innovation and internationalization performance (Quaternaire and IESE 2013). The field in which the policy mix has had more shortcomings regards the provision of managerial support to SMEs. It might be expected that the smart specialisation policy process will bring some changes to the relative weight of the instruments used in the previous policy mix. However, the above observations in relation to the sustainability of the R&I system should not be overlooked.

The main bottlenecks to respond to the challenges identified are not so much related to the set of specific measures, but rather to other, deeper issues. Institutional aspects, namely cultural traits 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 has continued to be envisaged and supported mainly in a linear perspective. In the current climate, science and innovation have not been top priorities for public policy. And in spite of the increasing integration of thematic priorities in research policy, the coordination with the business sector remains very weak. Other policy instruments (Competitiveness and Technology Poles and Other Clusters and other joint-platforms) need to be revitalized and evaluated, to improve the allocation of public funds and to stimulate systemic cooperation between firms and scientific organisations. The interaction between research and innovation needs to be brought to the forefront of the economic strategy. More than a financial choice between ‘R’ and ‘I’, a key challenge remains the need to manage the R&I system as a whole by bringing together the different stakeholders to enhance its long-term social and economic impact.

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1 BASIC CHARACTERISATION OF THE RESEARCH AND INNOVATION SYSTEM

With a population of 10.5 million Portugal has a 2.1% share of the EU population. In terms of GDP its share is smaller, standing at 1.26% in 2013, down from 1.40% in 2011. These figures translate into a GDP per capita (in purchasing power parity) of €19,200, which is equivalent to 75% of the EU's 2012 average (in 2010 it was 80%). The GDP growth trend has been negative, with -2.9% in 2009, 1.9% in 2010, -1.3% in 2011, -3.2% in 2012 and -1.4% in 2013 ([Eurostat data](#)). The [European Economic Forecast Winter 2014](#) of February 2014 foresees a GDP growth rate of 0.8% in 2014.

Until the beginning of the recession, the overall trend in terms of R&D investment was 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. However, after 2009 R&D has followed the overall macroeconomic trend. By 2012 the Portuguese GERD (Gross Expenditure in Research and Development) was €2,469m, the equivalent to 1.5% of GDP, down from 2009, 2010 and 2011, when GERD was respectively €2,764m, €2,749m and €2,606m.

Notwithstanding a raising BERD/GERD share over the 2000s decade, R&D governance is still largely dominated by the public sector. The research system has been marked by a high degree of centralization, through fund allocation and political coordination. The regions have little role in the allocation of the research funds. National R&D budgets are not announced annually ex-ante together with the preparation of the national government budget; they are presented as an ex-post accounting exercise. At €1,579m in 2013 the government budget appropriations or outlays for R&D were 11% below 2010, when they reached a historical high at €1,768m. It has to be further pointed out that despite the ex-post nature of the R&D budget exercise there is a significant difference in relation to the actual amount of GERD finance by government funds. For 2011, the last year for which adequate data exists, the gap between the announced GBAORD (€1,754m) and GERD carried out with public funds (€1,089m) was 38%, which compares with a 2% gap for the EU overall in the same year.

National research policy has pursued two main inter-related goals, 'Excellence' and 'Internationalisation' of the research system. The setting of an international based evaluation system to masses research projects and academic research units has been instrumental in promoting those goals. Further, over the last decade Portugal has been increasingly active in ERA-oriented policies country established several partnerships with US universities and European institutes for developing the promotion of PhD programmes and joint research activities and knowledge sharing.

The development of the academic research system was possible through the combination of national funds with resources from the EU structural funds. The basic management of this system has matured, with a funding agency, similar to the research councils ([FCT - Foundation for Science & Technology](#)). Within the portfolio of its activities the FCT provides basic funding of academic R&D units for periods as long as five years and organizes their regular evaluation.

The scientific development roots go, however, further back in time. In terms of resource allocation a continuous effort has been made in Portugal since the 1960s to develop and strengthen the science base. This development has been achieved through the implementation of policies directed towards the training of younger scientists, the funding of basic science and the creation of universities. The threshold of 2,000 new PhDs per year was reached in 2012, bringing Portugal close to the EU's average when comparing PhD supply with the population. Output

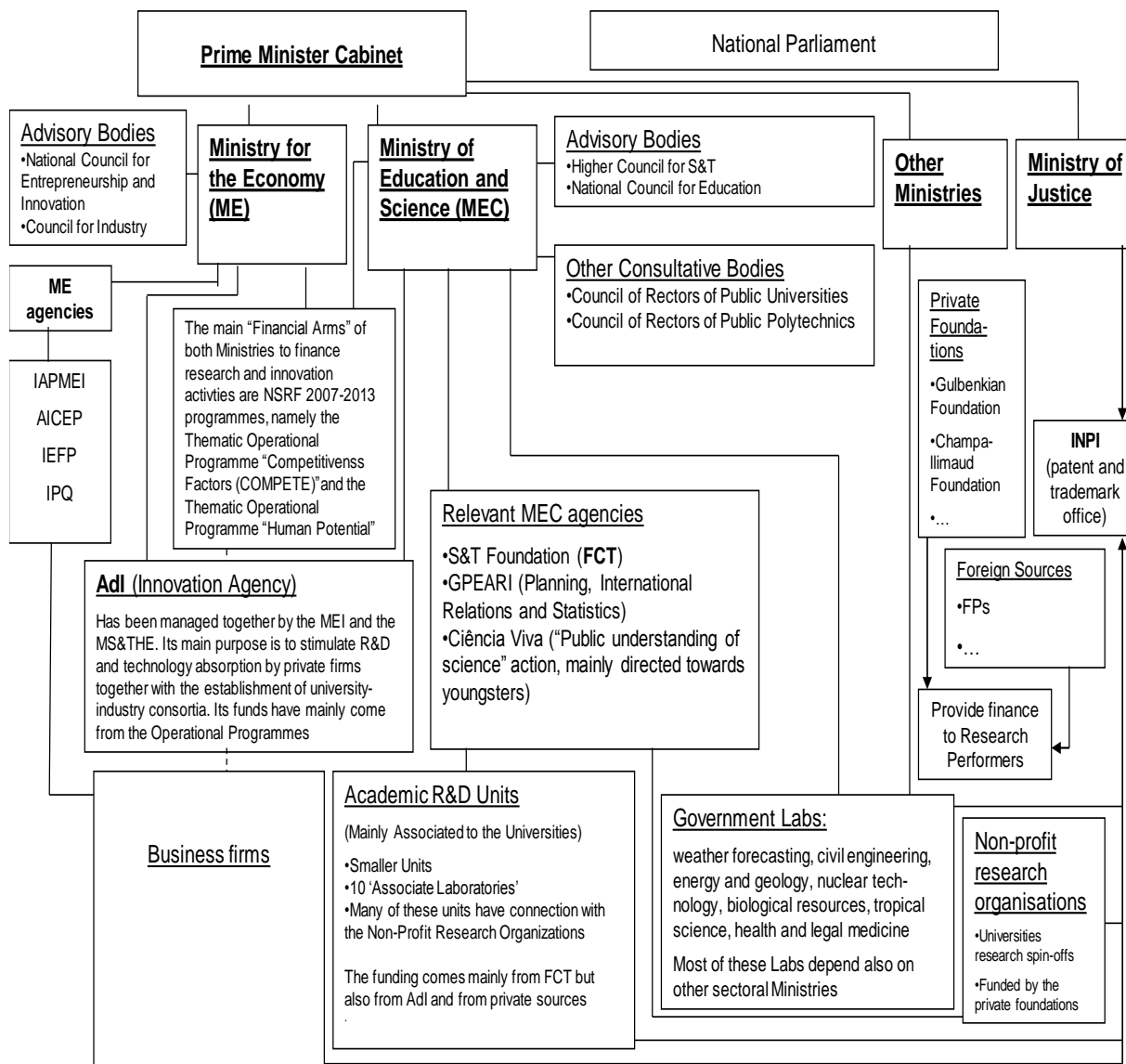
has also been expanding rapidly, with 1,081 ISI publications per million inhabitants in 2012, while in 2000 the performance was still at 321 publications per million inhabitants. The drop in investment in advanced training and scientific employment ([FCT data](#)), from €217.3m in 2010 and €219.0m in 2011 to €215.2m in 2012 and €192.9m in 2013 are likely to negatively affect these long term trends. However, the development of academic research has not been even. The public labs system that yet a few decades ago represented the most dynamic R&D agency in Portugal started to decline in terms of available resources and global activity before the 2000s.

On the business side the evolution of research output has been less impressive. Despite the significant rise in R&D investment that occurred in the second half of the 2000-2009 decade, 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) has remained until well below other countries with similar GDP per capita levels. As for 2012, the EPO granted 30 patents to applicants whose country of residence is Portugal, while the USPTO granted 47 utility patents in which the first inventor had a Portuguese address.

The weak involvement of business firms in R&D activities until recent years stemmed, above all, from the structural composition of the economy and little competition to the largest incumbents in the domestic market (Godinho, 2013). The fact that the country has lacked a technologically sophisticated industrial sector has also contributed to a historical record of an insufficient participation of business firms in setting national research priorities. Despite these problems the structural composition of the economy has changed to a certain extent, with some medium-tech activities emerging since the 1990s, and also a rising of knowledge-intensive business services (KIBS) (Godinho, 2013; Barreiros, 2006).

As visible in the organogram displayed in Figure 1, which refers to December 2013, the research system is organized in three 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. Other sectorial ministries, including the Agriculture, Environment and Defense ministries, also allocate funds for R&D, but their importance in R&D funding is not comparable. The second level (operational level) has the managing bodies of the main operational programmes that have provided funds for research together with the major executive agencies. Finally, the third level (research performers) displays the entities that actually perform R&D activities, namely academic R&D units and public laboratories. The organisations that provide advice to the Ministry for Education and Science are also displayed. The Parliament in the organogram is not formally connected with the remaining sectors, since this political body has had a limited role in discussing and defining policy objectives in the area of S&T; this issue has mainly been dealt with at government level.

Figure 1: Organisational Chart of the National R&I Governance System



2 RECENT DEVELOPMENTS OF THE RESEARCH AND INNOVATION POLICY AND SYSTEM

2.1 National economic and political context

Since 2011 Portugal's research and innovation policy has been affected largely by the austerity programme stemming from the agreement entered into with the so-called 'troika' (International Monetary Fund, European Investment Bank and European Commission). This has established a new framework for public policy in Portugal (and for the life of both citizens and companies). The country has seen a decline in economic activity, an upsurge in unemployment (which is close to 18%), and a wave of emigration of young, skilled individuals. While there is no recent data to confirm the net brain gain / brain drain, there are several indicators that foreign firms are actively recruiting young talent in Portugal. A [recent report of the Portuguese internal intelligence](#) entity (Sistema de Segurança Interna, 2014) states that the "economic crisis ambience has favoured the illegitimate access to the scientific knowledge embodied in products developed by national firms and other institutions [...]. It has to be pointed out that this transfer of knowledge [...] and the absorption of human resources by foreign firms, may well result in serious damage for the national economy" (authors' translation, pp. 28-29).

Significant cuts in the public budget have seriously challenged the orientations of research and innovation policy in Portugal and led to disagreements over current and future spending choices. Financing from the structural funds (namely through the Competitiveness Factors Operational Programme - CFOP) and about an overall consensus on the importance of research and innovation for the long term development of the country has to some extent protected this policy area from greater cuts seen elsewhere. However, the discontinuation of several demand-side measures is particularly notable, including those for electronic mobility (leading to Nissan cancelling planned investment) and renewable energy.

In science policy, budgetary cuts have led to an increase in applications for external financing, including from European research programmes. This outward looking strategy is illustrated by the renewal, in revised conditions, of the agreements established by the previous government with two US universities. However, the focus on budgetary cuts has led to incongruent policies and to conveying wrong messages to research players as was the case of the instruction issued the General Directorate for Budget (DGO, Ministry of Finance), in August 2013, according to which Universities own income for 2014 should not exceed 2012 levels. Though not being the central ones, financial constraints have also been among the reasons leading to the new regulation for the evaluation of R&D units.

Despite taking oath in mid-2011, the XIX Constitutional Government has already witnessed several ministerial reshuffles. While these changes have had no direct effect on science policy, since the Minister for Education and Science and the Secretary of State for Science have kept their positions, this has not been the case in the area of innovation policy. In spite of the counter-veiling influences mentioned above, government changes have been translated into shifts in innovation policy. Two are particularly notable: the declining focus on entrepreneurship; and the fate of AdI, the [Innovation Agency](#).

The *mot d'ordre* in innovation policy in the second half of 2011 and in 2012 has been entrepreneurship. This led to the launching of the [+E+I Programme](#), the National Programme for Entrepreneurship and Innovation, in December 2011, and has also been highlighted in the revision of the CFOP in 2012. However, it can be argued that the replacement of the Secretary

of State who was the main entrepreneurship ‘champion’ has resulted in a reduced commitment to entrepreneurship.

Another issue is the situation of [AdI](#). After a decision, reiterated by the former Secretary of State for Entrepreneurship and Innovation in May 2013, to integrate AdI into the Agency for Competitiveness and Innovation ([IAPMEI](#)), the new statutory Law of the Government, published on the 21st August 2013 (Decree-Law 119/2013, article 16 n°11) provides that AdI would remain as an autonomous organisation, reporting to the Minister for the Economy and Education and Science. Whereas the reversal of the original decision can be welcomed, the institutional instability does not help stakeholders in the innovation system.

The harsh economic and budgetary situation makes the preparation of the next round of European policies, namely the programming of the Community Support Framework for 2014-2020 as well as the preparation of the participation in Horizon 2020, extremely important to enable Portugal to strengthen and adapt its science and innovation policy.. Such policy is expected to play a key role in both changing the country’s specialisation profile and stimulating the upgrading and sophistication in traditional industries.

2.2 Funding trends

2.2.1. Funding flows

The [National Reform Programme Portugal 2020, which was approved by the Council of Ministers on the 20th 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. Portuguese GERD (Gross Expenditure in Research and Development) was €2,469m in 2012, the equivalent to 1.5% of GDP. This represents a decline in relation to 2009, 2010 and 2011, in which GERD was respectively €2,764m, €2,749m and €2,557m, even though it is still significantly above the years before 2009 (€1,973m in 2007 and €1,201m in 2005, with GERD/GDP ratios of 1.2% and 0.8% respectively).

As the data in the preceding paragraph hints, and before the recent decline, the Portuguese 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. Since then, however, this ratio has been declining, first to 1.59% in 2010, then to 1.52% in 2011 and finally to 1,50% in 2012.

From 2007 onwards the business sector became the most important actor in the R&D system, with a share of 47% in the national GERD in 2012. In 2001 when R&D expenditure was still at 0.77% of GDP the public sector’s share in R&D funding was 61% and the business sector’s share was only 32%.

At €1,579m in 2013 the government budget appropriations or outlays for R&D were 10.7% below 2010, when they reached a historical high at €1,768m.

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) have much smaller shares (with 3.2%, 3.2% and 4.6% of total funding respectively). The analysis of the funds provided by each sector compared to the remaining sectors shows a relatively low density in the research system; 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 of funds (98.2%) was for intramural research, revealing a weak link with the external research sector. In relation to the funds from abroad, all the four performing sectors are funded. The proportion of direct international funding has been low (between 3% and 4% in recent years).¹

Table 1. Basic indicators for R&D investments

	2009	2010	2011	2012	EU (2012)
GDP growth rate	-2,9	1,9	-1,3 p	-3,2 p	-0,4
GERD (% of GDP)	1,64	1,59	1,52	1,50 p	2,06
GERD (euro per capita)	261,7	260	246,5	234,2 p	525,8
GBAORD - Total R&D appropriations (€ million)	1 749,08	1 764,15	1 748,42	1 550,67P	86309,497 e
R&D funded by Business Enterprise Sector (% of GDP)	0,72	0,7	0,67	na	1,12*
R&D performed by HEIs (% of GERD)	36%	37%	38%	39%	24%
R&D performed by Government Sector (% of GERD)	7%	7%	7%	7%	12%
R&D performed by Business Enterprise Sector (% of GERD)	47%	46%	47%	47%	63%
Share of competitive vs. institutional public funding for R&D***, #1	57,1	46,4	47,6	48,8	na
Venture Capital as % of GDP (Eurostat table code tin00141)	0,25	0,38	0,08	0,14 #2	0,25 #2
Employment in high- and medium-high-technology manufacturing sectors as share of total employment (Eurostat table code tin00141)	3,0	2,9	2,9	na	5,6*
Employment in knowledge-intensive service sectors as share of total employment (Eurostat table code tsc00012)	29,3	30,0	31,6	na	38,9*
Turnover from Innovation as % of total turnover (Eurostat table code tsdec340)	15,6**	na	na	na	13,3**

Sources: EUROSTAT, except for #1, which stems from DGEEC/MEC; and #2, which stems from EVCA (2013).

¹ The resources under this classification “abroad” do not include EU structural funds for research that are channeled through the public budget.

Notes: * - 2011; ** - 2008; *** Weight of FCT, UMIC and the NSRF's OPs in the total public budget for R&D; p – provisional; e – estimate; na – not available.

2.2.2. Funding mechanisms

2.2.1.1 Competitive vs. institutional public funding

Historically the trend has been for a significant increase of competitive funding, as at least until the 1990s the R&I system was dominated by the public labs system. The development of a set of programmes and measures in connection with the structural programming led to the reinforcement of a trend started several years before, with the availability of further resources for competitive activities carried out by both academic entities and business companies. In 2009, when GBAORD was €1,752m, the amount of resources estimated as competitive funding was 57.1%. Since then that proportion fell down below 50%, with values for 2010, 2011 and 2012 of, respectively, 46.4%, 47.6% and 48.8%.²

2.2.1.2 Government direct vs indirect R&D funding³

The main policy instrument associated with indirect R&D funding has been SIFIDE, the System of Tax Incentives for Company Investments in R&D. [SIFIDE](#) has been the main policy tool that has been used. The Budget Law for 2011 extended the system until 2015 (SIFIDE II), and improved the conditions granted to R&D performing companies. The system was reviewed in 2013 in order to positively discriminate projects involving cooperation with other entities and international cooperation, and open access to the results. SIFIDE includes two kinds of incentives for companies performing R&D: a basic tax incentive, corresponding to 32.5% of eligible R&D expenditure undertaken in the relevant fiscal year and an incremental incentive, corresponding to 50% of the increase in R&D expenditure compared to the average of the two previous years. The amount of tax credits approved under SIFIDE has been close to €100m per year. A further system of tax incentives for R&D is the regime of scientific patronage. This regime which was enacted by the Law 26/2004 provides tax incentives to both individuals and organisations contributing to the financing of the activities foundations, institutes, associations, higher education institutions, and other units or centres carrying out R&D activities. In 2012 there were 1928 entities that participated in this system and had deductions on their taxable income of €21m. .

2.2.3 Thematic versus generic funding

Most funding is neither thematically nor sectorally focused. The dominant approach has been characterised by generic 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 expectation is that the OPs under the new NSRF 20014-2020 will bring a change of perspective on these matters, with the definition of some priorities in connection to the RIS3 perspective.

² It must be pointed out that the estimation of competitive funding is based on adding the R&D budgets of the FCT, UMIC and the OPs under the NSRF. However, at least in what concerns the FCT, not all its R&D budget concerns “competitive funding”, as it includes the payment of the membership fees of international research organisations to which Portugal belongs to or the contracts with US universities.

³ **Government direct R&D funding** includes grants, loans and procurement. **Government indirect R&D funding** includes tax incentives such as R&D tax credits, R&D allowances, reductions in R&D workers' wage taxes and social security contributions, and accelerated depreciation of R&D capital.

2.2.4 Innovation funding

More and more governments are allocating funding to innovation activities, moving from purely R&D to R&I funding. Portugal has not been an exception on this respect as it has been providing public funding to innovation both through direct and indirect policy instruments.

The direct incentives have been mainly managed by COMPETE, the Competitiveness Factors OP of the National Strategic Reference Framework 2007-2013. The two main incentive systems for innovation under COMPETE were the SII&DT and SIInovação (respectively Incentives System for R&D in Business Firms and Incentives System for Innovation). At the same time, COMPETE implemented the so-called Collective Efficiency Strategies, which are horizontal actions with an “innovation dimension”. The main action under the Collective Efficiency Strategies was the Competitiveness and Technology Poles (CTP), focussed on the promotion of clustering initiatives to strengthen the linkages among key players in the national or in regional innovation systems.

The indirect incentives have been promoted under SIFIDE. This is a tax credit system to stimulate R&D in business firms, allowing for a deduction on IRC (the business revenue tax). The equity of research and development entities, the costs of filing for and the maintenance fees of patents, the costs of R&D audits, the investment in the purchasing of R&D equipment, the salaries of researchers and auxiliary personnel related to research and development can all be deductible for IRC.

The main managing authority of the COFP programmes mentioned above has been IAPMEI (Agency for Competitiveness and Innovation), but AdI (Innovation Agency) has been in charge of ‘R&D in consortium’. Further AdI has also been in charge of SIFIDE.

2.3 Research and Innovation system changes

In 2012 and the first three quarters of 2013 there have been no major changes in the research and innovation system. The headlines have been maintained, although a few moves are worth highlighting.

As mentioned in section 2.2 above, the structure of R&D performers experienced some changes in parallel with the decline in overall R&D expenditures, particularly evident in the case of business enterprises.

With regard to advisory bodies, three developments are relevant. In December 2011, in the wake of the launching of the +E+I Programme, a National Council on Entrepreneurship and Innovation was established. Later, the Council of Ministers Resolution 14/2012, of 10th February, defined the competencies of the National Council on Science and Technology. Its members are internationally well-known scientists and researchers. The Council provides advice to the Government on science and technology policy affairs. The third development regards the creation of a National Board on Reindustrialisation. This follows the disclosure, in April 2013, by the former Minister for the Economy and Employment, Mr. Álvaro Santos Pereira, of a ‘Strategy for Growth, Employment and Encouragement of Industry’ (Governo de Portugal, 2013b). The mandate of the Council has been confirmed by the new Minister for the Economy, Mr. António Pires de Lima. According to the information available, the strategy seems to adopt a broad view of industry: this is meant to encompass “all the manufacturing industry value chain – from accessing raw materials to after-sales service”. However, no specific targets have been defined.

There were no major changes in funding agencies. The [Science and Technology Foundation \(FCT\)](#) is responsible for managing the lion’s share of research funding, with the exception of funding assigned to companies. In the innovation field, [IAPMEI](#) plays the key role in assigning financial support in the context of the National Strategic Reference Framework (NSRF) 2007-2013. This situation is most likely to remain unchanged in the years to come. The only relevant

change in this regard concerns [AdI](#), as mentioned above. AdI has played a role in providing finance to cooperative projects between research and industry as well as in managing SIFIDE, the tax system for supporting R&D. The decision, taken in 2012, to integrate AdI into IAPMEI has been reversed by the change of the Minister for the Economy. While there are arguments pro and against the integration, there are grounds to think that AdI might have important functions to carry out as an independent body focussed on stimulating innovation and cooperation as well as on launching non-conventional innovation initiatives. The issue remains, however, whether AdI will come back to its earlier 'bureaucratic', financing role or whether it might become a 'spearhead' for innovation policy experimentation.

2.4 Recent Policy developments

R&D and Innovation policy did not undergo major changes in 2013. In fact, the key policy measures that have been implemented were already foreseen in the NSRF 2007-2013. Similarly, policy guidelines stemming from the agreement with the 'troika' had been set up in 2011, the same happening with the main programme presented by the Government in this regard: the National Programme on Entrepreneurship and Innovation (+E+I Programme).

Against this background, a few relevant initiatives have taken place in 2013. Four of them, which contributed to national progress towards the IU commitments, deserve a reference here: (1) The development of a national and regional research and innovation strategies following the smart specialisation approach; (2) the process of designing a National Roadmap for Research Infrastructures; (3) the revision of the regulation on financial support for research centres in the Higher education system and for the private non-profit sector; and (4) the renewal of the agreements with US universities, namely the agreement with the Massachusetts Institute of Technology (MIT).

The [Foundation for Science and Technology](#) (FCT) launched an initiative aimed at designing a Research and Innovation (R&I) Strategy for Smart Specialisation, in the context of the preparation of the new round of European support. The first task was to conduct a SWOT analysis of the country's R&I system, which was presented at a public conference held in May 2013. This is considered as an important step in the policy making process, providing a basis for more informed and accurate strategic decisions in R&I policy. Although the SWOT analysis is more focused on R than on I, as pointed out in 2.7 below, it has been a very useful exercise. It enabled, for instance, to identify the level of R&D investments in 'Engineering sciences and technologies', particularly in ICT, as an important strength. A Working Group composed of the FCT, IAPMEI, AdI and 'COMPETE', was created in July 2013 by the Ministry of Education and Science and the Ministry of Economy to develop the national research and innovation strategy for smart specialisation. Since then, this Working Group has been actively designing the strategy. In the context of stakeholders participation the 15 priority themes selected were discussed in structured brainstorming sessions. The actors involved were drawn equally from academia and the business sector (http://www.fct.pt/esp_inteligente/jornadas.phtml.en) with a view to achieve an increased focus both at national and regional levels and to define smart specialisation priorities for Portugal.

The FCT has developed a National Roadmap for Research Infrastructures of Strategic Interest, including those aligned with the ESFRI Roadmap. This process involved the participation of the scientific community, through a set of more than 60 stakeholder meetings as well as a consultation directly launched by the European Commission to the entire EU research and innovation community, to gather topics for the first work programmes of the Horizon 2020 Research Infrastructures thematic priority. As a result of this, a national call was launched for research infrastructures to be included in the roadmap as strategic interest research infrastructures.

A new regulation for the evaluation of R&D units was published in July 2013, following a process of public consultation. The revision has been due to both budgetary restrictions and the need to respond to the challenges stemming from the Europe 2020 strategy and from Horizon 2020. The new regulation is aimed at encouraging research units to achieve critical masses, and multidisciplinary approaches to address complex problems and challenges.

Following the evaluation by the Academy of Finland ([Academy of Finland, 2012](#)), the agreements with the University of Texas at Austin and Carnegie Mellon University have been renewed, under revised conditions, in the second half of 2012. In the wake of this, the renewal for a further five years of the agreement with the Massachusetts Institute of Technology (MIT) was signed in July 2013. The focus will be put on innovation and entrepreneurship, through the launching of larger projects and the promotion of 'live laboratories', involving the cooperation between universities and industry in developing internationally tradable technologies.

On the negative side, four issues should be mentioned. The first is the discontinuation or curtailment of demand-side innovation initiatives such as for electric mobility or renewable energy. While such discontinuation was already perceived in late 2011 and 2012, no initiatives have been taken in that regard in 2013. The second, already pointed out above, has been the of AdI situation, an organisation that, if appropriately endowed with a clear mandate, resources and managerial capabilities might play an important role in innovation policy in Portugal. The time lost with the lack of clear and sound decisions in this regard has amounted to a waste of resources. The third is the delay in designing a national Smart Specialisation strategy, in spite of the initiatives mentioned abroad and a stronger drive afterwards. The fourth is the absence of a clear innovation strategy adopting a systemic, rather than a linear approach.

A thorough presentation and assessment of the measures taken by Portugal in 2012 and 2013 to respond specific IU commitments is presented in Annex 1.

2.5 National Reform Programme 2013 and R&I

Strengthening Research, Development and Innovation (R&D&I) is one of the objectives of Portugal's NRP. The document 'Estratégia Europa: Ponto de Situação das Metas de Portugal', dated April 2013, provides a brief assessment of the results achieved in this field ([NRP, 2013](#)) (Governo de Portugal, 2013a). It is recognised that there has been a decline in the R&D expenditures/GDP ratio, that has dropped from 1,64 to 1,52 between 2009 and 2011. A similar reference is made in the Commission's assessment of Portugal's NRP⁴, remarking that the ratio recorded for 2011 is very far from the 2,7% target established for 2020. This target, in fact, portrays an excessive optimism, assuming that the trend observed since 2005⁵ might be accelerated. As the authors of this report have underlined on several occasions (see for instance Godinho & Simões, 2011), without significant changes in the economic structure, such a growth could not be maintained. Therefore, there is a need for a realistic revision of the R&D expenditures/GDP goal, having in mind the present harsh economic conditions of the country and the likely opportunities for increasing business enterprises R&D expenditure. In general, the objectives defined in the field of Research, Development & Innovation (R&D&I) suggest that the approach is very much based on a linear model perspective. Initiatives to encourage innovation in companies are absent from the document, with the exception of the intention to change the orientation regarding Competitiveness and Technology Poles (CTP) and the Technology Transfer approach, which unveils a very biased view on how knowledge creation takes place in companies (see below).

A closer look at the initiatives mentioned in the document suggests the following comments:

⁴ SWD (2013) 372 final, dated 29 may 2013.

⁵ With hindsight, one may wonder whether R&D expenditures have been overestimated, namely as a result of an excessively 'benign' formulation and application of SIFIDE.

- **National Strategy for Smart Specialisation.** After the initiative taken by FCT to undertake a very useful and thorough SWOT exercise (FCT, 2013) of Portugal's research and innovation system (disclosed at a Conference in May 2013), the work on Smart Specialisation gained further momentum, and an inter-Ministerial group, involving namely bodies from the MEC (FCT) and the ME (IAPMEI, AdI and COMPETE), was set up. This has led to the definition, in January 2014, of a Research and innovation Strategy for Smart Specialisation, including national and regional approaches. A more fine-grained analysis of this theme will be provided in section 2.7 below.

- **Programme of Applied Research and Technology Transfer to Companies:** this is intended to encompass 'hybrid' doctoral training, the launch of calls for doctoral and postdoctoral grants for enterprises, and an increased focus of the programmes with US universities on entrepreneurship and innovation. These initiatives have merits in enticing the cooperation between universities and research centres, on the one hand, and business companies, on the other. However, in our opinion, they are not likely to entail a significant change in companies' innovation capabilities. They suffer from a 'linear model' bias (Cooke & Simões, 2013). They assume that the issue is just to 'transfer' knowledge from the universities (often called 'knowledge centres') to companies. These are envisaged as recipients of knowledge developed by the former. The reality tells a different story. For knowledge to be shared, and not 'transferred', the different players have to be active and appropriate linkages and trust has to be built among them. Companies should not be envisaged as passive 'adopters' of knowledge developed in laboratories elsewhere. Companies themselves have valuable knowledge which should interact with knowledge creation activities in Universities, contributing to shape R&D questions.

- **Reorientation of SIFIDE, the system of tax incentives to R&D activities:** This is a welcome move, particularly in the context of budgetary difficulties. An excessively open interpretation of SIFIDE has most probably led to the emergence of a couple of banks among the top ten R&D players in the country. It is also positive the fact that SIFIDE has been retained despite budgetary pressures, since it may play a role (together with instruments such as the measure on R&D teams in companies) in contributing towards sustaining companies' commitment to R&D activities.

- **Reorientation of Competitiveness and Internationalisation Poles⁶:** The NRP document is not very explicit regarding the policy guidelines for the revision of the CTP. Most probably it has been written without taking into account the conclusions of the evaluation on clustering policy⁷ carried out this year (SPI and Inno-TSD, 2013). Such conclusions should, in our view, be taken into account in the reorientation of the cluster policy in Portugal. CTPs have shown that they may play an important role in stimulating cooperation, combining different knowledge streams and improving competitiveness. There is, however, evidence that performance has been highly variable, with cases of clear success and outright failures. Clustering policy should be pursued, as the NRP document underlines. The revision of the policy needs to be firmly anchored in the assessment of past experience, learning from lessons of almost four years of experience as well as from the evaluation undertaken.

⁶ This label is awkward, since the legal name is Competitiveness and Technology Poles. The label used in the NRP has been suggested in an informal expert group report on Poles and Clusters, convened by the Ministry for the Economy and Employment, but to our best knowledge has never been formally adopted.

⁷ For a brief presentation of the findings of the evaluation, see the next session.

- **Strategy for Research Infrastructures (RIs):** This is an area in which very positive steps have been taken. The present government defined a new policy approach, aimed at the design of a national RI roadmap in line with ESFRI guidelines. The main objectives of such policy are well translated into the NRP document. The process has now finished and the results have already been published.
- **National call for evaluation and financing of research units:** Though not in the first semester, as stated in the NRP document, the new regulation for the evaluation of R&D units has been published in July 2013, following a process of public consultation. The definition of new rules for research units has resulted from two main considerations: (1) [the context of budgetary restrictions](#) (CLA, 2013, p.15) and (2) the setting up of the Horizon 2020 programme and the need to respond to societal challenges included in the Europe 2020 strategy. The main objectives of the regulation are two-fold: (1) to encourage research units to have critical mass in order to achieve effectiveness, in line with earlier assessments (for instance, Ribeiro, Peleteiro & Silva, 2007) of the Portuguese research system; and (2) to stimulate the emergence of creative environments, namely through multidisciplinary approaches to address complex problems and challenges.
- **Research plan for the Sea and the Atmosphere:** This initiative will be in line with the *National Strategy for the Sea 2013-2020*. This has been subject to public discussion until the end of May 2013. It will be operationalized through the action Plan Sea-Portugal, “intended to promote the economic, social and environmental valorisation of the sea, through the launching of sectorial and inter-sectorial projects” (Governo de Portugal, 2013c:3). Its implications for research are obvious, particularly taking into account the findings of the SWOT analysis undertaken by the FCT, according to which Portugal has strengths in ocean research, and should further explore the opportunities stemming from the ‘blue economy’.
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2.6 Recent evaluations, consultations, foresight exercises

Research Infrastructures

The national RI road-mapping exercise, led by the FCT, is now underway. Through a public consultation of the Portuguese scientific and innovation community, information on existing interest and potential of participation in ESFRI Roadmap Research Infrastructures was identified and updated. In a second stage, motivated by the MERIL project (Mapping European Research Infrastructures Landscape – project coordinated by the European Science Foundation), research infrastructures that corresponded to the concept put forward by the ESF were identified in Portugal. At this point, the FCT was still lacking a database of information on RIs, and the concept of RIs which could distinguish research equipments from research infrastructures was yet to be settled. Building the database is one of the aims to be kick-started through the Roadmap procedure. This second stage corresponded in time to the second semester of 2012 and included the participation of the scientific community in a consultation directly launched by the European Commission to the entire EU research and innovation community, to gather topics for the first work programmes of the Horizon 2020 Research Infrastructures thematic priority, concerning the so-called I3 activities (integrating activities for existing research infrastructures, which in the FP7 accounted for 60% of the Research Infrastructures thematic priority budget, within the Capacities Specific Programme).

Meetings were held with the scientific community across the country, including autonomous regions of Madeira and Azores, with the aim to present the intentions of the FCT for a public call leading to the development of the first National Roadmap for Research Infrastructures. This allowed the gathering of direct feedback to prepare the rules for participation and evaluation,

taking into account the concrete reality in each institution and networks of institutions. Another key element is the interaction with regional authorities, namely the Regional Coordination and Development Commissions (CCDRs), in order to design co-funding instruments with the FCT, in the context of present and future National Strategic Reference Framework (NSRF) Operational Programmes.

A call was issued for RI to apply for the National Roadmap on Strategic Interest Research Infrastructures, being open until 30th September 2013. Applications have been subject to a scientific merit evaluation, by independent panels, whose members are experts in each scientific field, as well as a strategic relevance evaluation, with the direct participation of the CCDRs and where articulation with sectoral policy priorities, ESFRI and other world class research infrastructure initiatives is verified. The results were notified by the FCT in February 2014.

SWOT Analysis

An important SWOT analysis of Portugal's research and innovation (R&I) system, with a view to prepare a Smart Specialisation Strategy, was carried out by the FCT. The final report (FCT, 2013) was presented at an International Conference held in May 2013. This exercise is expected to lead to the definition of R&I priorities, on the basis of a series of structured brainstorming sessions with stakeholders from academia and industry. The report concludes with a thorough SWOT table, identifying the key strengths, weaknesses, opportunities and threats faced by Portugal's R&I system.

The final report includes seven main chapters, followed by the main conclusions. The structure is based on a knowledge processing approach, similar to the one followed in some ERAWATCH reports: from Resource mobilization and Knowledge production to Knowledge exploitation and Markets for Knowledge. A very positive feature of the document is the systematic use of similar country benchmarks. The benchmarks selected are the following: Austria, Belgium, Spain, Finland, Netherlands, Hungary, Ireland, Italy, Norway and the Czech Republic.

The chapter on public policies on R&I provides a very interesting and well-grounded analysis of the evolution of structure and governance of the R&I innovation system. It is pointed out that the concern with an innovation system started in 2001 with the PROINOV experience. It is found that, in global terms, the R&D&I system has achieved its objectives, particularly on what concerns tertiary education, the growth in human resources and publications.

According to this exercise, one of Portugal's strengths concerns the level of R&D investments in 'Engineering sciences and technologies', particularly in ICT. When compared to the EU 27, Portugal is mainly specialized in scientific domains such as fisheries, marine and fresh water biology, materials science (composite materials, ceramics and biomaterials), engineering (ocean and agricultural). The report points out the 'blue economy' and the "exploitation of ICT advantages in the context of societal challenges for Europe 2020" as opportunities for Portugal (FCT, 2013).

In spite of its merits, the FCT SWOT report can be criticized in several respects. A key weakness that we identify is a bias towards the research system compared to the attention given to the innovation system at large. Another problem is, in our view, the strict approach to knowledge processing, disregarding the facts that there are often joint processes of knowledge production cum exploitation and that companies are not passive 'exploiters' of knowledge created by others. Finally, the identification of the SWOT items may be criticized on the ground that several strengths and opportunities identified do not seem to be well founded by the evidence and analysis provided in the text.

Strategy for Growth, Employment and Encouragement of Industry

In April 2013 the former Minister for the Economy and Employment launched a 'Strategy for Growth, Employment and Encouragement of Industry' (Governo de Portugal, 2013a). As

mentioned in 2.3 above, this strategy seems to adopt a broad range perspective, without a definition of specific sectoral targets. The strategy establishes a number of quantitative targets to be achieved by 2020 in different fields, from manufacturing industries value added and exports to investment in R&D&I; this was intended to be between 2.7 and 3.3% of GDP by 2020. Eight action lines were established to bring about the objectives defined. One of them addresses ‘Innovation and entrepreneurship’, encompassing *inter alia* the following actions: ‘Start up Portugal’, a programme to attract high potential entrepreneurs to the country; encouragement of company innovation through the strengthening of cooperation with S&T organisations; promotion of the participation of Portuguese organisations in EU research programmes; improvement of the incentives towards innovation-orientated R&D activities, public investment in R&D with an aim to contribute towards economic growth as well as towards the sustainability of the scientific system; creation of an entrepreneurship-driving environment; and using public procurement to foster company innovation. It is yet to be seen whether these action lines will still be pursued after the nomination of a new Minister for the Economy. In a recent press interview, he identified three main objectives for his mandate. To contribute to exiting the financial support programmes of the ‘troika’ in 2014; to pursue the economic recovery process, and to ensure investment growth (Exame, October 2013).

NSRF evaluations

It should also be noted that evaluations of programmes and policies under the National Strategic Reference Framework (NSRF) 2007-2013 has been launched by Observatório do QREN⁸ (NSRF Observatory). Three of them are especially relevant from the R&I perspective: clustering strategy; strategic perspective on innovation and internationalization; and the mid-term evaluation of the CFOP (‘Compete’), which is being completed at the time of writing. Therefore, we refer only to the first two evaluations.

The evaluation on clustering strategy recognizes the merits of launching a cluster policy, but points out that there is a significant gap between the expectations and achievements. Among the key problems identified are the weaknesses of the governance model, the insufficient capabilities of many organisations in charge of managing Poles (CTPs) and clusters, and the excessive inward looking approach followed by most of them, with very weak, if any, linkages with ‘peer’ organisations abroad. Problems related to the interaction with, and use of, the broader system of investment incentives were also mentioned: “though significant amounts have been made available for projects (...), coordination and management of the partnership, there were difficulties in operationalizing most of the preferential condition for access to the incentives envisaged in the initial framework” for supporting clustering initiatives (SPI & Inno TSD, 2013: xiii). The conclusion, however, points firmly towards the continuation of the clustering policy, provided a set of adjustments aimed at correcting the weaknesses identified and a new process of Poles and clusters evaluation were launched.

The strategic evaluation of the effects of the NSRF 2007-2013 on innovation and internationalization broadly confirms the appropriateness of the policy followed in that regard (Quaternaire Portugal & IESE, 2013). An interesting finding, confirming earlier research, was the existence of a positive loop between innovation and internationalization. It was also found that the incentive system has a wide scope and has reached a high level of maturity, positively assessed by stakeholders. It is recommended, therefore, that the next 2014-2020 Competitiveness and Internationalisation OP should focus more on incremental improvements of the existing set of instruments than on a thorough, ‘revolutionary’ redesign of innovation policy instruments. Efforts should be addressed towards the following: Avoiding the ‘atomisation’ of technology-based incubators; adjusting the financing of pre-incubation and incubation of technology-based projects to the needs felt by the promoters; encouraging project demonstration initiatives;

⁸ QREN stands for Quadro de Referência Estratégico nacional, that is, National Strategic Reference Framework.

improving and streamlining evaluation processes; enhancing inter-regional consistency; and launching experimentation initiatives in specific fields, including the exploration of the links between innovation and internationalisation policies.

2.7 National and Regional Research and Innovation Strategies on Smart Specialisation (S3)

The level of development of S3 initiatives in Portugal is relatively uneven. The definition of S3 strategies is more advanced at regional than at the national level. But at regional level the situations are different, Region Centro standing as the first of the five mainland Portuguese regions in designing a RIS3 strategy.

At national level, the process of designing a Smart Specialisation strategy is less advanced. As mentioned under 2.6 above, the FCT took the lead through the launching of a SWOT analysis, which provides a thorough assessment of the research system). In the wake of this exercise, a working group on Smart Specialisation including the main national organisations with a bearing on R&I policies (FCT, IAPMEI and AdI and COMPETE) was established. This is a very positive move in a country where science and enterprise policies have often been *de espaldas*, with little cooperation among them (Godinho & Simões, 2005 and 2009; Henriques, 2006). This working group has launched a process of stakeholder consultation involving academia and companies at equal level, including namely the management of Competitiveness and Technology Poles and Regional Coordination Commissions. However, the process was still underway by at the time of writing and will extend well into 2014.

It is interesting to remark that the Council of Ministers Resolution 33/2013, of May 20 2013, regarding the Partnership Agreement, makes a reference to smart growth, but none to smart specialisation.

At regional level, the priorities for future areas of specialisation have already been disclosed, though with different degrees of ‘maturation’. In most cases these have been based on a consultation with a host of regional stakeholders, and have drawn from a SWOT analysis.

Priorities are obviously diverse, and they translate to a large extent the different characteristics of regional innovation systems as well as the ambitions and the challenges faced in the 2014-2020 programming period. An important point usually underlined by regional authorities, irrespectively of the regions, is that the focus should not be on ‘specialisation’ as such, but rather on exploring opportunities for cross-fertilisation and related variety. As a recent report on Smart Specialisation strategy in Portugal put it: there is “a wide consensus [...] about the relevance of ‘transversality’, exploring the opportunities for related variety as well as for entrepreneurial discovery” (Cooke & Simões, 2013: 3). In Algarve the issue has been how to avoid excessive specialisation in the tourism industry, defining other possible areas of development.

The main priorities for the various regions of mainland Portugal, as made explicit in the information available at the time of writing, are the following:

- Norte: health & life sciences; culture, creativity & fashion; generic, wide spectrum technologies; agro-environment & food systems; symbolic capital & tourism services and technologies; mobility and environment industries, human capital and specialised services; and economy of oceanic resources (Almeida, 2013).
- Centro⁹: agro-forestry, materials, ICT, sea and marine activities, tourism, biotechnology, healthcare and well-being plus rural based innovation (Saraiva, 2012);

⁹ A general objective set up by the Centro Region Coordination Commission is to put the region in the ‘first league’ of the IUS regional scoreboard by 2020.

- Lisboa¹⁰: smart growth, encompassing production systems, education, employment & entrepreneurship, and creative & cultural environments; sustainable growth, focussing on environmental resources, services & risks, low carbon economy, and urban regeneration; inclusive growth, by encouraging proximity services and social innovation and inclusion; and development of regional capabilities (Henriques, 2012);
- Alentejo: there is a ‘transversal’ priority anchored in the economy of natural resources; more specifically, the priorities draw from the recently launched Regional Technology Transfer System programme; it is important to underline that the Regional Innovation System of Alentejo is very weak, in spite of the existence in the region of some large investments;
- Algarve: the strategy revolves around the intention to foster the inter-actions between “structuring” and “emergent” activities; the first include tourism, agrifood and fishing & aquaculture, while the second are ICT, renewable energy, and life sciences & health services (Guerreiro, 2013).

It is generally recognised that governance structures are a critical element for the success of RIS3 strategies. Interestingly, this has been clearly underlined in a presentation by the President of Algarve Regional Coordination Commission. However, with the exception of Centro region, where governance will rely to some extent on the Regional Council (a large structure for stakeholder consultation), little is said about RIS3 governance in the documents available at the time of writing (December 2013). Similarly, it is not clear which instruments will be established to assess the appropriateness of strategy implementation as well as to change route, when and if needed.

In what concerns the links and co-ordination mechanisms between the national and the regional levels the situation is not yet clear. In fact, regional players were pioneers in the process: while most regional strategies are already designed, the same does not happen, as mentioned above, at the national level. While a dialogue has been established between both levels, as pointed out above, it is not likely that the national level might be anchored on regional ones. This is due to several reasons, including the fact that Portugal is not a regionalised country, the uneven level of development of the regional innovation systems and the legitimacy gap of the regional coordination commissions (these do not depend from regionally elected bodies, their Presidents being nominated by the central government).

The design of the Partnership Agreement was based on the findings of evaluations carried out for several programmes under the NSRF 2007-2013; this is particularly the case with regard to innovation issues. No nation-wide Smart Specialisation initiative had been completed beforehand. With a high degree of probability, the situation will be different with regard to the design of OPs, especially the regional OPs. In fact, though the degree of advancement of RIS3 is uneven, RIS3 priorities will for sure be translated into Regional OPs, with these reflecting regional RIS3 approaches. At national level the process is still going on: as far as one can anticipate, one cannot take for granted that it will be completed in time to be fully translated into the OPs, namely into the Competitiveness and Internationalisation OP (CIOP).

With regard to financing, though recognising that the scope of the Smart Specialisation strategy exceeds the scope of the Partnership Agreement, the EU funding envelope for 2014-2020 provides the basic reference. This has been the traditional approach and is even more so having in mind the harsh financial conditions faced by the country. Therefore, the overall structure of the OPs for the 2014-2020 EU funding cycle is not dissociated from such envelope. The key logic for the 2014-2020 programming period is to increase support to companies in order to enhance their competitiveness, and to reduce investment in infrastructures, since it is felt that this is no longer a relevant constraint (Cooke & Simões, 2013). There will be, of course,

¹⁰ It is important to bear in mind that the Lisbon Region is not eligible for cohesion funding.

measures to encourage private investment in research and innovation activities, having in mind the conditions to get international financing. It is expected that foreign direct investment might play an important role. The evidence so far is, however, far from convincing: besides the recently disclosed strengthening of *Volkswagen* investments in Portugal, the only significant foreign investment project in recent years with a likely significant impact on structural change has been carried out by *Embraer*, the Brazilian aircraft company. The government has strongly underlined the cutback in the business firms' income tax, which will be reduced from 25 to 23% in fiscal year 2014, as an enticement for private investment, namely foreign investment. While it may play a role, the literature on foreign investment clearly indicates that tax considerations play a relatively limited role in the decision where to locate an investment abroad.

2.8 Policy developments related to Council Country Specific Recommendations

The memorandum of understanding established in May 2011 between the EC, the ECB and the IMF, on one hand, and the Portuguese government, on the other, did not foresee any specific commitment in relation to the R&I activities. The only reference to R&D in the memorandum has to do with a regulation in the code of public contracts, that imposes that 1% of public contracts above €25m has to be spent in R&D. Specifically, the memorandum imposes that such amount does not need to be invested in R&D carried out domestically.

3 PERFORMANCE OF THE NATIONAL RESEARCH AND INNOVATION SYSTEM

3.1 National Research and Innovation policy

Table 2- Performance of the R&I System: Portugal and the EU

	Portugal	EU 27
HUMAN RESOURCES		
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	1.9	1.5
Percentage population aged 25-64 having completed tertiary education	26.1	34.6
Open, excellent and attractive research systems		
International scientific co-publications per million population	678	300
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	10.04	10.90
Finance and support		
R&D expenditure in the public sector as % of GDP	0.69	0.75
Public Funding for innovation (innovation vouchers, venture/seed capital, access to finance granted by the public sector to innovative companies)		N/A
FIRM ACTIVITIES		
R&D expenditure in the business sector as % of GDP	0.73	1.27
Venture capital and seed capital as % of GDP	0.032	0.094
Linkages & entrepreneurship		
Public-private co-publications per million population	17.0	52.8
Intellectual assets		
PCT patents applications per billion GDP (in PPSE)	0.65	3.90
PCT patents applications in societal challenges per billion GDP (in PPSE) (climate change mitigation; health)	0.15	0.96
OUTPUTS		
Economic effects		
Contribution of MHT product exports to trade balance	-1.20	1.28
Knowledge-intensive services exports as % total service exports	28.99	45.15
License and patent revenues from abroad as % of GDP	0.03	0.58

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

According to the 2013 Innovation Union Scoreboard, Portugal continued to be part of the “Moderate innovators” cluster. Portugal is ranked immediately after Italy and Spain, and before the Czech Republic, Greece, Slovakia, Hungary, Malta and Lithuania (European Commission, 2013a). Portugal ranks first or second among ‘Moderate innovators’ peers in two out of eight dimensions: ‘Open, excellent and attractive research systems’ and ‘Innovators’. In contrast, the dimensions in which the country’s performance is relatively lower (ranked in the bottom three among the ‘Moderate Innovators’ group), are ‘Human resources’ and ‘Economic effects’. These dimensions were already the relatively worst performing in the 2011 Innovation Union Scoreboard. In spite of very significant advances in doctoral education, secondary and tertiary education levels are still well below the EU average. (European Commission, 2013).

The conversion of investments in research (and innovation) into company competitiveness in international markets remains a very weak link. A look at both the Innovation Union Scoreboard

2013 and the [COTEC Innovation Barometer](#) (COTEC 2013, p. 6) show that Portugal fares better in creating conditions for R&D and innovation than in translating such conditions into competitive performance. In spite of the investments undertaken in enhancing R&D capabilities and the support provided to innovation in companies (Quatenaire Portugal & IESE, 2013), the capacity of Portuguese firms to successfully compete worldwide in knowledge-intensive product and service markets is still limited (Godinho & Simões, 2012a; Mamede, Godinho & Simões, 2014). The share of employment in knowledge intensive activities corresponds to 67% of the EU's average only (European Commission, 2013). An indicator-wise comparison between Portugal's and the EU 27 average performances provides a deeper view about Portugal's strengths and weaknesses. The first concern 'International scientific co-publications' (226%, probably due to the small size of the country, but also showing a very internationalised research system), 'and 'New doctorate graduates' (127%). The items in which Portugal records a worst performance (below 20% of EU 27 average) revolve around patenting and licensing ('License and patent revenue from abroad as % of GDP' (0,03%), 'PCT' patents applications per billion GDP (0.65 in PPS€)', and 'PCT' patents applications in societal challenges per billion GDP (0.15 in PPS€)'. Other fields recording weak performances are 'Public-private co-publications per million population' (17.0) and 'Venture capital and seed capital as % of GDP' (0.032%).

A longitudinal view of the medium-term performance indicates that 'Non-EU doctorate students', 'International scientific co-publications' and 'R&D expenditures in the public sector' are the indicators in which improvements have been stronger; above 10% per year. It should be mentioned, however, that the last figure is based on 2011 R&D statistics, and does not still capture the decline in public R&D investment (GBAORD dropped by 10.7% between 2010 and 2013, has pointed out in section 2.2 above) stemming from the implementation of the Memorandum of Understanding with the EC, ECB and IMF.

3.2 Structural challenges of the national R&I system

Drawing from the analysis of the 2013 Innovation Union Scoreboard and similar initiatives, such as the [COTEC Innovation Barometer](#), from the SWOT exercise carried out by the FCT (FCT, 2013), and from the authors' reflection on the development of Portugal's R&I system, several structural challenges were identified. Given that both no significant macroeconomic improvements occurred and the harsh budgetary constraints have not been reversed, it is not surprising that such challenges remain basically the same as those identified in the previous 2012 Erawatch Country Report (Godinho & Simões, 2013). A brief account of such challenges is provided below:

Ensuring the sustainability of the research and innovation system: Since the 1960s, efforts were undertaken to promote the training of young scientists abroad. Such efforts have been strengthened after the late 1980s, following Portugal's entry in the European Economic Community, profiting namely from structural funds allocations. Meanwhile, research policy management capabilities have developed incrementally, with block and extra competitive funding instruments made available to support advanced academic research. Several programmes were launched to stimulate the establishment of research consortia between academic research centers and industrial companies. Though this cooperation has faced different problems, which have limited its breadth and depth (see the challenges referred to below), research activities on the business side, as measured by BERD, grew swiftly until 2009. Such growth, in part fuelled by very generous tax incentives to R&D, has not been sustained, as shown by the recent figures on R&D expenditures (DGEEC, 2013): provisional data on BERD for 2012 fell to €1,16 Million, from €1,31 Million for 2009. In the context of the present economic climate, a recovery is not foreseeable in the near future. Prospects are not better for the Higher Education sector. In fact, the recent decline in research funding (as indicated by the fall in GBAORD between 2010 and 2013 outlined above), 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 all creating a very negative outlook. Since the 2012 Country Report (Godinho & Simões, 2013) the conditions have aggravated with regard to the activity of the R&I system, increasing the potential for an irreversible loss of critical mass. The fact that Portugal will be entering a new programming period in 2014 will not immediately contribute to improve the conditions, as most programmes and measures will take some time to be launched. Further, the fact that science has not been treated as a significant or even moderate priority means that the shortage of the national matching funds may compromise any potential benefits stemming from the inflow of structural funding. Therefore our earlier warning on the issue (Godinho & Simões, 2013) has gained increased relevance: “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 between the R&I

system actors: Several authors have noted (for instance, Caraça, 1999; Godinho & Simões, 2005; Simões, 2003) that the divide between research and innovation policies has historically been a major hindrance to the quality and consistency of the research and innovation system. This has also been recognised by the recent SWOT analysis undertaken by the FCT (FCT, 2013). In spite of some attempts to bridge it, namely with a new policy architecture under the National Strategic Reference Framework 2007-2013, and more recently with what may be perceived as a new culture of collaboration in the relationships between the ministries of research and the economy, a coherent strategy has not yet been achieved. The Strategic Programme for Entrepreneurship and Innovation, launched in December 2011, and the Industrial Promotion Strategy for Growth and Employment, launched in April 2013 and revised in November 2013, do not ensure effective governance and coordination between the fields. This problem is compounded by the limited involvement of the various stakeholders, notably companies in the process of designing R&I policy (Cooke & Simões, 2013; Godinho & Simões, 2013; Godinho, 2013). The very low level of ‘Public-private co-publications per million population in Portugal’ (see table above) clearly translates this situation. Strengthening the systemic density requires the strengthening of interactions among the players in the system. The launching of cluster policies, namely the CTP - Competitiveness and Technology Poles, was meant to foster the cooperation among various stakeholders. However, in spite of several achievements, it has fell short of expectations, particularly in some fields. An additional 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 requires initiatives to encourage the circulation of people and ideas between companies and research centers. This would be critical to enhance the capability to combine the body of understanding (characteristic of university activities) with the body of practice (characteristic of company activities) and to stimulate unexpected creative encounters (Cooke & Simões, 2013). 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 spectrum research policy to a more selective one, focusing on a set of priority research fields: Since the late 1980s, Portugal’s research policy has followed a horizontal approach, without discriminating between research fields. The rationale for such a policy was the fact that Portugal’s scientific underdevelopment had to be addressed through a broad, generic perspective. This has led to significant achievements. However, in our opinion, the situation has changed for two main reasons. First, 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). Second, budgetary constraints demand a more focussed approach to escape from a dispersion of public funds and to promote economies of scale in research. This is also in line with a sound smart specialisation perspective.

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 “excellence” and to open calls for “all scientific fields”, but at the same time set life sciences and health as key research areas (Programa do XIX Governo Constitucional, 2011). The Deputy Minister for Science also stated the need for focus and priority setting in science policy (Parreira, 2012). Although its ‘direct’ findings should be taken with some caution, the SWOT analysis undertaken by the FCT in its deep-spectrum diagnosis of the R&I system (FCT, 2013) also points in this direction. The ongoing dialogue stemming from the public disclosure of the results of that report is expected to contribute towards the identification of specific priority areas. However, one word of caution is needed: while prioritisation may bring important potential gains, there is a risk of sub-optimal choices due to lobbying or lack of strategic intelligence. Hence, the need for good governance processes.

Stimulating the emergence of new companies, both domestic and foreign-owned, particularly in knowledge intensive activities: A negative feature emerging from the 2013 Innovation Union Competitiveness Report is the low share of employment in knowledge intensive activities in Portugal (about 67% of the EU average). While there has been some recovery between 2008 and 2012, the pace is too slow (0.8% *per annum*) to ensure structural change (European Commission, 2013b). A committed effort is needed in this regard if Portugal wants to become competitive in more knowledge intensive areas. 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 (Mamede, Godinho & Simões, 2014). 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 make a stronger effort in this regard. The government is focusing its efforts on a more competitive tax system, including a gradual decline in company income tax and the creation of a tax office to provide advice to international investors (Governo de Portugal, 2013b). However, one should bear in mind that investment decisions are not taken on the basis of tax considerations only (Tavares-Lehmann, Coelho & Lehmann, 2012). Other aspects, such as the quality and availability of skilled manpower, the quality of local suppliers and the institutional framework (bureaucracy, efficiency of the legal system) are often more relevant than the tax level *per se*. Success in attracting foreign investment 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. This is essential to build a reputation in the field. The policy orientations suggested above are also highly congruent with the smart specialisation strategy that will be established for 2014-2020.

Strengthening 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 75% of the EU average, while the share of the population in the 20-24 cohort with upper secondary level education is 81% of the EU average (European Commission, 2013b). This is reflected *inter alia* in companies’ capabilities. Managerial capabilities are limited, especially in traditional industries. Most new firms are set up by former employees who display entrepreneurial drive but who often lack a sound knowledge base (Vicente, 2006). The need to leave the domestic market and engage into international activities, particularly through exports, makes the strengthening of in-house capabilities increasingly 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. Interestingly, there is a positive interaction between innovation and internationalisation capabilities at company level (Quaternaire Portugal & IESE, 2013). There is an agreement that the focus on technological capabilities, though relevant, is not sufficient. It should be combined with initiatives to promote organisational and marketing capabilities. These are keys to develop innovative approaches enabling 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.

3.3 Meeting structural challenges

As pointed out in earlier reports, the policy mix is now reasonably comprehensive (Godinho & Simões, 2009, 2010 and 2013). A similar view has been expressed in a recent independent evaluation of the impact of the 2007-2013 NSRF in the fields of innovation and internationalisation (Quaternaire Portugal & IESE, 2013). The set of measures provided by the NSRF 2007-2013 was generally appropriate, insofar they addressed the main challenges identified. The field in which the mix has more shortcomings is still, in our opinion, the provision of managerial support to SMEs.

Therefore, the main bottlenecks to respond to the challenges identified are not so much associated to 'holes' in the set of specific measures but on other, more systemic issues. The efficiency and effectiveness of the policy mix has been seriously undermined by three main types of problems.

The first is the still insufficient coordination among the different sectoral policy perspectives. Though some improvements have taken place in the recent past, a systemic approach to tackle the challenges is still lacking. In spite of encompassing initiatives such as the Industrial Promotion Strategy for Growth and Employment (Governo de Portugal, 2013b), which covers different policy issues, including research and innovation, in order to foster manufacturing activities, a systemic approach to research and innovation is still lacking. In fact, the design and implementation of research and innovation policies has not been steered at the highest political level.

The second difficulty is related with 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), the idea that investment in science and in the 'transfer' of scientific knowledge to companies is the key to ensure an innovation based competitive approach is still dominant, especially among research policy makers. 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 (Cooke & Simões, 2013; Mamede, Godinho & Simões, 2014 forthcoming). These issues are further exacerbated by financial restrictions leading to resignations of experienced civil servants.

Institutional issues correspond to the third group of problems (Godinho, 2013). Institutional weaknesses seriously hinder the working of the R&I system. Research and innovation activities are collaborative processes demanding appropriate links and collaborative networks among the players. The low level of interpersonal trust limits the depth and breadth of collaborative endeavours. This becomes a widespread barrier for both the implementation of systemic, integrated and participated policy approaches and for appropriate and consistent implementation. It must be pointed out that the available policies and measures have been directed towards the 'accumulation' dimension (tangible and intangible capital) and not so much

towards these institutional aspects. The fragilities in the existing social capital, however, may critically undermine the efforts in the other dimensions.

Policy implementation has been another weak link. Though several improvements have been introduced, companies continue to complain that the process is still too bureaucratic (Quatenaire Portugal & IESE, 2013: Annex 6). 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 (Cooke & Simões, 2013). The intermediate evaluation of the NSRF 2007-2013 (Augusto 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. In summary, much can still be done to make implementation more efficient.

Several independent evaluations of various aspects of the NSRF 2007-2013 have already been carried out (Augusto Mateus & Associados, 2010; IESE & Quatenaire Portugal, 2011; Quatenaire Portugal & IESE, 2013; SPI & Inno TSD, 2013). The first two are mainly concerned with implementation and less with effectiveness. Although both evaluation exercises provide a positive assessment, they agree in stressing the advantage of adopting a more well-defined strategic perspective towards the policy mix. 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. This has also been pointed out in the report on the impact of the NSRF 2007-2013 on innovation and internationalisation performance (Quatenaire Portugal & IESE, 2013).

The latter report takes a positive stance with regard to the role played by the NSRF 2007-2013. Four conclusions are particularly noteworthy. First, it is considered that the incentive system has reached a high level of maturity, drawing upon a systemic concept of competitiveness, and has been focussed on promoting company capabilities as well as on collective initiatives. Second, there has been a positive interaction between the developments in innovation and internationalisation: there is a process of coevolution of both capabilities at firm level. Third, the approach has been much more appropriate for the more advanced cohesion regions of Norte and Centro, and less for Alentejo and Algarve. Fourth, the incentive system is broadly appropriate, and should not be significantly changed in the next programming phase. However, some areas for improvement are pointed out, including *inter alia*: improvement in financing of start-ups; public policy intermediation through the involvement of industry associations; dissemination of results throughout the economic fabric; and clustering initiatives.

These clustering initiatives, labelled as Collective Efficiency Strategies, have been subject to a specific evaluation (PI & Inno TSD, 2013). This evaluation has taken a critical tone, stressing that there has been “a significant gap between initial intentions and the reality” (SPI & Inno TSD, 2013: ix). To bridge the gap, the launching of a national medium term clustering policy was suggested, adopting a more selective stance. The establishment of appropriate links between clustering, R&I and territorial policies in connection with Smart Specialisation strategies was pinpointed.

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.

Table 3

Challenges	Policy measures/actions addressing the challenge	Assessment in terms of appropriateness, efficiency and effectiveness
1. Ensuring the sustainability of the research and innovation system.	<ul style="list-style-type: none"> - Increased commitment to European research projects. - Increased selectivity in the assignment of funds. - New regulation on R&D units block funding. - Definition of priority areas. <p>(More than specific actions, these are intentions expressed by the Government. The R&I system SWOT exercise carried out by the FCT is expected to contribute towards the identification of priority areas).</p> <ul style="list-style-type: none"> - Launching of the Investigador FCT (FCT Researcher) grants - Renewal of the agreements with US Universities. - Launching of the National Roadmap for Research Infrastructures. - Continuation of SIFIDE II. 	<p>The intentions expressed by the Government make sense in face of the budgetary difficulties. However, a clear definition of priorities is still to take place. The renewal of the agreements with US Universities is a positive development. The revision of the R&D organisations financing is simultaneously intended to encourage R&D organisations to increase scale and to reduce budgetary support. The Roadmap for Research Infrastructures is a positive development, enabling an increased cooperation at European level. However, research policy is attracting increased controversy. There have been several negative reactions from the research community to the revision of R&D funding policy as well as to the transparency of the criteria and procedure for assigning FCT Researcher grants (CLA, 2012 and 2013; CNCT, 2014). This indicates that the revision of the research policy, largely due to budgetary constraints, has not been able to fully mobilise the research community. This is likely to increase the brain drain movement. However, 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. <u>It is important that budgetary cuts will not put into jeopardy the long term sustainability of the research and innovation system</u></p>

<p>2. Improving strategic policy design, systemic density and coordination among the RDI system actors.</p>	<p><u>Programmes:</u></p> <ul style="list-style-type: none"> - Technological Plan (basically until 2009). - Strategic Programme on Entrepreneurship and Innovation (launched in December 2011). - Launching and revision of the Industrial Promotion Strategy for Growth and Employment (2012) <p><u>Advisory Bodies</u></p> <ul style="list-style-type: none"> - Advisory Bodies: Creation of the National Councils for (1) Entrepreneurship and Innovation, (2) Reindustrialisation, and for (3) Science and Technology. <p><u>NSRF Measures (2007-20013):</u></p> <ul style="list-style-type: none"> - Competitiveness and Technology Poles (CTP). - OTICs (Technology Transfer Offices). - Co-promotion projects. - R&D Consortia. - Collective R&D projects. - Innovation Voucher. - CITECs and NITECs. <p><u>Recent measures:</u></p> <ul style="list-style-type: none"> -Several measures on the promotion of entrepreneurship (inc. Entrepreneurship Voucher); -Launching of a FCT Technology Transfer Office (in connection with GAIN, the programme with the University of Texas at Austin). <p><u>Announced Measures:</u></p> <p>The Industrial Promotion Strategy for Growth and Employment points out a set of new measures (most of them are scheduled for 2014).</p>	<p>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.</p> <p>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.</p> <p>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.</p> <p>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 patenting and 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 (Quatenaire Portugal & IESE, 2013). 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.</p>
<p>3. Changing from a wide spectrum research policy to a more selective one, based on a set of priority research fields.</p>	<ul style="list-style-type: none"> - Revision of the State Laboratories System. - Creation of the Iberian International Nanotechnology Laboratory (INL) (2005). - S&T Thematic Networks ?. - Government Intention to define priority areas in research policy - Initiatives of stakeholder dialogue following the SWOT exercise carried out by FCT (first initiatives in the fields of ICT, energy, and materials). 	<p>Science policy has been characterized over recent decades 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 lab corresponded to the identification of nano-sciences and nanotechnologies as an important research priority, which may be considered as a positive development. Although the Government programme announced the intention to identify priority areas, the process of dialogue with stakeholders has been launched very recently, following the SWOT exercise undertaken by the FCT. A process of definition of priority fields in research policy, involving the participation of the various stakeholders was launched in the last quarter of 2013. This issue is even more important in the present context of budgetary restrictions.</p>

<p>4. Stimulating the emergence of new companies, both domestic and foreign-owned, particularly in knowledge intensive activities.</p>	<ul style="list-style-type: none"> - Strategic Programme on Entrepreneurship and Innovation (+E+I). - Creation of Portugal Ventures. - Industrial Promotion Strategy for Growth and Employment (launched April 2013, revised November 2013). - Many dispersed initiatives (namely at regional level). 	<p>In spite of the dispersion of initiatives to stimulate entrepreneurship, they have not been 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 Strategic Programme on Entrepreneurship and Innovation (+E+I) is intended to address these problems.. Overlapping with +E+I, the Industrial Promotion Strategy for Growth and Employment also include a host of measures intended to stimulate entrepreneurship. Another field where policy has lacked much to be desired regards the attraction of new knowledge-based companies from abroad. Although there have been a couple of success stories, foreign investment policy has not been able to appropriately this important target.</p>
<p>5. Strengthening SMEs in-house technological, organisational and marketing capabilities.</p>	<ul style="list-style-type: none"> - NITECs. - Innovation Voucher. - SME Skills Support System (other measures besides the Innovation Voucher). - Collective Actions Support System. 	<p>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 under the NSRF 2007-2013. Available information suggests that the Innovation Voucher measure has generated a reasonable demand, although no specific evaluation has been carried out so far. In general, the policy mix is appropriate to respond the challenges. However, 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; and the encouragement to SMEs cooperation for innovation and internationalisation.</p>

4 NATIONAL PROGRESS IN INNOVATION UNION KEY POLICY ACTIONS

The aim of this section is to analyse whether the national policy mix is aligned with the IU and ERA Communication objectives.

4.1 Strengthening the knowledge base and reducing fragmentation

Promoting excellence in education and skills development

The research labour market in Portugal grew steadily between 2000 and 2009. At an average growth rate of 9.1% per year, the number of FTE researchers raised from 16.738 to 40.084 over the decade. In the beginning of the 2010s growth in total FTE researchers slowed down in comparison to the previous decade, with an average growth rate of 4.7% up to 2012, bringing the total FTE researchers to 50694 in 2012 ([Eurostat data](#)). Given this growth, the number of FTE researchers per 1000 inhabitants in Portugal grew from below the EU27 average (1,6 vs. 2,3 in 2000) to above the EU27 average (4,5 vs. 3,2 in 2011).

The research employment in the business firms sector was influential in this change. As the number of business FTE researchers increased faster than in other sectors, its share moved up from 5,1% in 2000 to 22,4% in 2011. Nevertheless this share remained well below the EU27 average, which was 45,1% in 2011.

However, the largest research employer in Portugal is still the Higher Education sector (61.4% in 2011), followed by the Business sector (22,4%, as mentioned above), the Private Non-Profit sector (11,5%) and the Government sector (4.7%, losing share year after year).

The overall positive evolution of the Portuguese research labour market was driven by several factors, but the most important of them has been the sustained supply of new PhDs. Within the OECD countries, only Switzerland and Sweden scored higher than Portugal in terms of new PhD graduates in 2009, with the proportion of individuals in the relevant age group who took their PhD degrees being respectively 3,4% and 3,0% in those two countries and 2,7% in Portugal, followed by Finland and Germany, both with 2.5%.¹¹

However, the rising supply of new PhD holders over the last decade is an asset that is not being exploited as the research labour market is increasingly having problems in absorbing them. Beyond the difficulties of the research institutions funded by government grants, the current economic and financial crisis implies that business firms are not willing to take on further highly qualified personnel. A possible consequence is that a significant “brain drain” among the younger generation of researchers will occur, in the sequence of a flow of qualified emigration that has been seen as threatening to the national economy (Sistema de Segurança Interna, 2014). This may happen against the trend of the last decade, which according to the 2011 Population census was one of “brain-gain”. As a matter of fact, the information on the research grants awarded by the FCT for Post-Doc positions indicates that in the decade between 2000 and 2009, 34% of Post-Doc grants were awarded to foreigners, with that proportion being particularly higher in the latter years (2008, 2009) when 42% of those grants were awarded to foreigners.

Apart the financial restrictions, it can be stated that the conditions in the research labour market in Portugal have been changing quickly in recent years. Many institutions have adapted harder

¹¹ OECD (2011), Education at a Glance 2011: OECD Indicators and (2009) Education at a Glance 2009: OECD Indicators, OECD, Paris.

tenure granting procedures and the recruitment of new researchers, even for replacement purposes, has become much more difficult.

The evolution outlined in the paragraphs above has happened in a context of increasing internationalization of the research careers. The Statute of the University Teaching Career states (in its reviewed version of 2009) that "The competitions for the recruitment of full professors, associate professors and assistant professors are international and open to an area or areas to be specified in the vacancy announcement". The "Regulation for Grants awarded by FCT", which regulates the selection, hiring and legal regime applicable to all research fellows, states that "the candidates applying for the grants awarded by the FCT are: Nationals or citizens of other Member States of the European Union; Citizens of third states, holders of permanent residence or beneficiaries of the status of long-term resident; Other citizens of third states, whenever the tender opening the competition foresees the possibility of an individual interview." No cross-border portability of the grants is however foreseen by this regulation.

The Portuguese legislation lays down specific rules for nationals of third countries who intend to come to Portugal to carry out research or a teaching activity (in accordance to special legislation concerning highly qualified foreigners). Residence permits can be provided when a third country national has been selected to work in a higher education institution, a research centre or a company duly recognized by MEC.

By the end of 2012 the "FCT PhD Programme" was established. The key objectives of this measure were to support the development of internationally competitive, research-based PhD Programmes and equip students with the necessary transferable skills. In the sequence of the 2012 call, 51 PhD programmes were recommended for funding and a total of 1,502 grants were awarded. Further 3.78 M€ of complementary budget was recommended (for courses, laboratory rotations or fieldwork) for a period of 4 years.

The reforms in secondary education curricula and the promotion of secondary level technical schools that have been implemented are positive but their effects are felt very much in the long term. The law on university governance (RJIES) that was passed in 2007 and which has been under review needs to be fully implemented in what regards the interaction between universities and the communities they are based in.

While it is clear that a national policy for the research labour market began to emerge over the previous decade through a series of actions implemented by the FCT, the European Charter of Researchers has not been at the centre of Portuguese policy as regards researchers' work and careers. It is thus unsurprising that [only eight Portuguese organizations have signed the Charter](#).

Research Infrastructures

Available information suggests that the national Research Infrastructures (RI) landscape is not homogeneous. Some sectors have high quality RIs which can be considered of international interest, such as in the fields of sea and maritime research, nanotechnologies and materials science or some new bio-tech related infrastructures. A strong effort was made through the re-equipment programme launched by the FCT a decade ago plus the funding of associated laboratories and research units supported by the FCT.

There has been however a change in the most recent years, evidenced by a new approach *vis-à-vis* the ESFRI roadmap. The new policy is in favor of a commitment towards the roadmapping exercise as well as an increased participation in enabling reciprocal access to RIs.

There is a list of Portuguese RIs developed by ESFRI. Meanwhile, a survey of Portuguese RIs has been carried out by the FCT with the aim of identifying Regional Partner Facilities (RPF). This exercise is expected to provide an accurate perspective of the national RI landscape in terms of quality of large national infrastructures and scientific-technological platforms. It includes questions regarding participation in European projects and condition for use by external

researchers. The analysis of the data collected will give a clearer view of the conditions for external use of Portuguese RIs. The exercise will also enable the identification of the funding requirements for operation, facility upgrading and new equipment of the RIs surveyed.

In line with this, the FCT launched a public consultation of the scientific and innovation community, collecting information on existing interest and potential participation in ESFRI Roadmap Research Infrastructures. Further, motivated by the MERIL project (Mapping European Research Infrastructures Landscape) coordinated by the European Science Foundation, research infrastructures that corresponded to the concept put forward by the ESF were identified in Portugal. It is important to note that the FCT had neither a structured database of information on RIs nor a stabilized concept of RIs allowing it to distinguish research equipment from research infrastructure. The concept was meanwhile fine-tuned and building the database is one of the aims to be pursued through the Roadmap Procedure. In a further step, in the sequence of meetings that were held with the scientific community across the country over the second semester of 2012, the FCT launched in 2013 a public call for the development of the first National Roadmap for Research Infrastructures. This call was open until the 30th of September 2013. The aim was to have the Roadmap ready on the second semester of 2013. The financial commitments to national, European and international RIs will be determined through the results of this Roadmap. They will have to be coordinated with the next programming period, which is to start formally in January 2014.

The development of a national roadmap is a signal of a new willingness regarding the selection of areas for participation in ESFRI/intergovernmental research infrastructures (RI). ESFRI RIs are seen as excellent door openers for the national scientific community in different R&I fields. The willingness of the Portuguese research community to take part in international RIs is illustrated by the participation in the ESFRI Roadmap RI “Instruct” (in which five universities have supported the fee for participation in this structural biology RI through their own budgets), in the Social Sciences European Social Survey (supported by ICS, an associated laboratory), in CLARIN (Common Language Resources and Technology Infrastructure), or in digital infrastructures such as PRACE, among others in the Energy, Environment, Engineering and Physics areas.

Portugal has also participated in FP7’s thematic priority I3 – Integrating Activities of the Research Infrastructures, with national entities receiving funds under that thematic priority from 2007 up to 2012 amounting to 10,94M€, equivalent to 0,67% of its budget. This is a medium-low percentage if compared to the 1,2% that makes up the national contribution to the overall FP7 budget.

The definition of measures supporting the transnational access to Portuguese RIs on a reciprocal basis is expected to be one of the outcomes of the development of the National Roadmap for RIs. This is also expected to set up a number of actions aimed at removing barriers to access for researchers.

Initiatives to remove barriers to access of researchers have been carried out in the context of bilateral collaboration or as result of participation in international projects. No specific collective actions have been taken so far promoted by the FCT or other national agency in what concerns RIs. The establishment of the National Roadmap for RIs is likely to build a path towards further removal of barriers, thereby facilitating transnational access to RIs.

4.2 Getting good ideas to market

Improving access to finance

The budgetary and financial constraints have significantly curtailed the take-up of the policy measures under the NSRF 2007-2013 operational programmes by companies, namely in the

innovation field (Godinho and Simões 2012a). In fact, the credit crunch has severely limited SMEs' access to bank loans, 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 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 tax incentive system (SIFIDE), which has provided a favourable treatment to investments in R&D, has been reinstated for 2013 but, given the prevailing budgetary constraints, more stringent eligibility conditions and a reduction in the benefits provided were put forward. It should be noted that despite a widespread acknowledgement that SIFIDE was instrumental in contributing to the raising of business R&D in Portugal over the previous decade, there are no assessments of its specific contributions or benchmark studies comparing with similar systems in other countries.

Portugal Ventures, a venture capital operator, was established in June 2012 as a result of the merger of the three state-owned venture capital organisations (AICEP Capital Global, InovCapital and Turismo Capital), with the aim of directing "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>). This organizational centralization is likely to increase the effectiveness of the venture capital mechanisms operating with government backing.

One area where a significant U-turn occurred was the demand-side policies to spur innovation and bringing the country to the forefront of new technological areas. Two relevant initiatives that were established over the last decade: the promotion of an industrial sector around the use of renewable energy sources and the establishment of an electric mobility market, experienced a withdrawal of political support over the last three years. The previous government attempted to establish an [industrial cluster to supply wind farms](#). Enercon, the German producer that has provided innovative solutions in this area, set up a plant in Portugal with the assumption that support, namely through financial mechanisms, would maintain the demand for wind turbines. For several reasons such support has been partially discontinued. A relatively similar situation has happened in relation to [Mobi.e](#), an initiative launched to stimulate the acquisition of capabilities around electric mobility and to develop a lead market in this area. The incentives that were to be provided to new car buyers to purchase electric cars and the support for the establishment of a supply network to charge the batteries have not materialized as expected.

Protect and enhance the value of intellectual property and boosting creativity

Portugal is bounded by the international regulations and commitments signed over recent decades in what concerns intellectual property regulation. As a member of the WTO, Portugal is a member of the TRIPS agreement since 1994. Before that, in 1992, Portugal joined the European Patent Convention, thus belonging to the EPO (European Patent Office) system for more than two decades. The country is also a member of the Patent Cooperation Treaty and the Madrid Protocol, both governed by the World Intellectual Property Organisation, which provide access to the international PCT patents and the international trademarks entrance systems. Additionally, as a EU member, Portugal is part of the Community Trademark system, and more recently, in 2010, the country signed the London Agreement for an EU Patent. In sum, the regulatory framework is similar to what prevails in most EU Member States. The scope for variation in this context is very limited, and inter-country differences are only found in the public policies *vis-à-vis* the use of IP.

In this regard the operational programmes that have been implemented over the most recent programming periods have put forward measures to stimulate the use of IP, although in recent

years the intensity of those measures has declined. The most important measures that were launched were the introduction of the offices for the promotion of industrial property (GAPI), established within business associations and higher education institutions, and the incentive system for the use of industrial property (SIUPI).

The use of IP has been extremely dualistic, as the number of new trademark registrations has by far exceeded the number of patent filings. Even controlling for industrial specialisation, the country has underperformed significantly in terms of patent use ([Godinho & Rebelo 2007](#)). The measures that were put forward since the beginning of the 2000s to stimulate the understanding of IP and the use of patents by business firms and academic entities were effective, bringing a lethargic demand for patents to a much more active stance. However, in the most recent years (2009 to 2012) the growth of the demand for the domestic protection of new inventions drew almost to a standstill, being stuck well below 1.000 per year. There is an awareness that much could be done to stimulate creativity and the propensity to invent, but the prevailing economic and financial climate tends to favour other priorities.

A related area, where some change has happened recently, is the ensuring of open access to scientific knowledge. Two measures have to be mentioned on this respect: the Scientific Open Access Repository of Portugal (RCAAP); and b-on – The Online Knowledge Library. The RCAAP portal allows the searching, discovery and recall of thousands of scientific and scholarly publications, namely journal articles, conference papers, thesis and dissertations, which are distributed by several Portuguese repositories. Currently there are almost 500,000 documents indexed from more than 50 Resources. The other measure mentioned above is b-on. This online library allows for unlimited access of researchers in universities and research organisations to over 16,750 scientific international publications through subscriptions initially negotiated by the Portuguese government with the 16 main publishers of international peer-reviewed academic journals. Recently the Portuguese government established the financial framework for the continuation of b-on. €40.6m will be paid to the publishers that supply the contents of the b-on over the 2013-2015 period (Council of Ministers Resolution 16/2013, published 21 March 2013).

Public procurement

The Portuguese public administration invested massively in its ICT infrastructure in the 2000s decade. This led to changes in the organization of processes and to perceived improvements in the services offered to citizens (Godinho and Simões 2012b). However, the recent economic and financial difficulties have led to a more careful approach in terms of government ICT investment. A Strategic Plan for Rationalisation and Reduction of Costs with ICT in Public Administration was launched in December 2011 to reduce costs with ITC by €558 million annually over 2012-2016. In parallel to this Plan an entity (ESPAP) has also been created, stemming from the merger of three pre-existing entities: the National Agency of Public Procurement; the Institute of Informatics, and GERAP, the organisation in charge of managing the shared resources of the Public Administration. ESPAP pursues the same objective of the Plan, which is to promote the rationalisation of the Public Administration's ICT resources together with making public procurement in general more efficient.

As part of these rationalisation efforts there is also the intention of promoting a wider use of open source software and open standards, even though it is acknowledged that this being important it is not easy to achieve in practice (Godinho and Simões 2012b). The new approach will have to rely further on managerial innovation and on the development of skills of those in charge of the ITC infrastructure, both at the central levels and at the delivery level, closer to the users of the services. The borders between different public entities will need to be revised. And the cooperation between them, both in terms of ICT use and the deployment of qualified human resources will certainly be relevant in the near future.

4.3 Working in partnership to address societal challenges

The Commission invited in 2011 all key stakeholders to support the “European Innovation Partnerships” (EIPs) concept and to commit to make the concept work. EIPs “are challenge-driven, focusing on societal benefits and a rapid modernisation of the associated sectors and markets”. The information available for Portugal is that the MEC, through the FCT, has promoted an integrated approach to the EIPs in close collaboration with other Ministries, including the Ministry of Foreign Affairs, to increase the Portuguese participation in the governing bodies of all EIPs and to promote activities within this context. Further linkages with FP7 and future Horizon 2020 have been sought. The situation concerning each one of the five EIPs is as follows:

- In EIP AHA (Active & Healthy Ageing) Portugal has participated in the six Action Groups, through at least 4 "national clusters" (around Minho, Oporto, Coimbra and Lisbon) involving more than 100 entities. Ageing@coimbra, a consortium led by the University of Coimbra, is one of the 32 European Reference sites selected by EIP-AHA.
- In EIP-AGRI (Agricultural Sustainability and Productivity) Portugal has participated in one of the Focus Groups. The Portuguese Ministry for Agriculture and Sea is preparing the creation of groups operating under the Rural Development Programme 2014-2020 that will interact with European groups active in similar areas, under the coordination of the Network & Service Point created by EIP-AGRI.
- In EIP Raw Materials Portugal is represented in the Sherpa group and in three Operational Groups. The Portuguese Directorate General of Energy and Mines, which belongs to the Ministry of the Environment, Planning and Energy, has been active within this EIP. A call for Action Groups will be launched in 2014 and Portugal is preparing to participate.
- In EIP Water Portugal is represented in the High Level Group and in the Task Force. Portugal has also been involved in several Action Groups through universities, enterprises and associations; further participating in 4 of 11 FP7 financed projects related to this EIP.
- In EIP Smart Cities and Communities Portugal is represented in the High Level Group and in the Sherpas Group, namely through the Madeira Technopole. This EIP was launched in March 2013 and no Action Plan had been defined by mid October 2013. Portugal is thus closely following the process.

4.4 Maximising social and territorial cohesion

As pointed out in section 2.7 of this report, the level of development of the national Smart Specialisation Strategy (S3) in Portugal is relatively uneven. The definition of RIS3 strategies is more advanced at the regional than at the national level, with some regions leading the way and preparing their regional strategies for the next programming period without any relevant strategic input from the national level.

The main activity which was implemented at the national level with regard to the definition of a Portuguese S3 strategy was the implementation by the FCT of a full SWOT analysis of the R&I system (though focusing more on the “R” than on the “I” dimension), beginning in the last quarter of 2012 and with a final [report](#) being published in May 2013. This was a valuable exercise from a technical and political perspective, as it awakened the Portuguese public administration for the need to define priorities in accordance to the smart specialisation approach.

In parallel to the drafting of this report, the FCT together with IAPMEI (the institute that supports SMEs and business investment), AdI (the Innovation Agency) and ‘COMPETE’ bureau, organised a series of symposia over the last quarter of 2013. These symposia “aim to identify the potential of each area in becoming a priority in the national research and innovation

strategy and the vision for, as well as the challenges faced in that area” over the next programming period. The selection of the areas of these symposia was done in concordance with the results of the SWOT analysis, thus being related areas in which Portugal presents strategic advantages. These symposia allowed several key players in research and innovation to debate the instruments and public policy measures needed to face the challenges and address the institutional and market gaps identified. Each symposia led to a report on the theme and topics under discussion. The areas which have been object of these symposia include: Cross-cutting Technologies and its applications; Energy; Materials and Raw Materials; ICT; Industry and Production Technologies; Space and Logistics; Health, Well-being & Territory; Natural Resources & Environment, and Innovation: Knowledge Protection and Commercialisation.

These symposia allowed key agencies from both the Ministry of Education and Science and the Ministry of the Economy to align their policies, which have had no previous tradition of coordination in relation to R&I issues. These advancements are naturally welcome in an environment where integrated governance of R&I issues has lagged behind for several decades. This process generated in January 2014 a synthesis document whose title is a “R&I Strategy for a Smart Specialisation”. This document sets out five “structuring objectives” and elected 15 “thematic priorities” under 5 axes (see below). These priorities were finally integrated in the Partnership Agreement for 2014-2020 (see pages 29-30).

To a certain extent, and through participation in the process of the SWOT analysis, the Regional Coordination Commissions (five in the mainland plus two in the Atlantic regions), the regions have also been involved in this process and thus acquiring a shared view on what might be a national S3 strategy for the 2014-2020 period. This is relevant as the process of preparation of regional S3 strategies has been quite uneven, with some regions moving forward in that direction faster and better than others. The priorities that have been defined at the regional level are naturally diverse, in agreement with the different structural conditions, opportunities and challenges of each region. As mentioned above in 2.7 the focus of the regional strategies has not been on ‘specialisation’ as such, but rather on exploring opportunities for cross-fertilisation and related variety.

The “R&I Strategy for a Smart Specialisation” document mentioned above put forward five “structuring objectives”, as follows: Promote the S&T knowledge base; Stimulate cooperation between R&I system actors, for knowledge transfer and circulation; Stimulate the tradable sector with diversification of markets and upgrading of products; Stimulate entrepreneurship to create employment and upgrading skills; and Promote the transition to a low-carbon economy. Further that document on a “R&I Strategy for a Smart Specialisation” elected 15 “thematic priorities” under five axes, as follows: Axis 1 -Horizontal technologies (Energy, ITC, Materials); Axis 2 - Production industries and technologies (Product industries and technologies, Process industries and technologies); Axis 3 - Mobility, Space and Logistics (Automobile, aeronautics and space, Transportation, mobility and logistics); Axis 4 - Natural resources and environment (Agro-food, Forest, Ocean economy, Water and environment); Axis 5 - Health, well being and territory (Health, Tourism, Cultural and creative industries, Habitat).

4.5 International Scientific Cooperation

International scientific cooperation has long been envisaged as a strategic priority for Portugal (Godinho and Simões 2012c). Despite the focus of this cooperation in the most recent decades being on European-wide activities, there has also been a strong connection with the US in these domains. The links across the North Atlantic have been promoted within the frame of INVOTAN projects and also through FLAD, the Luso-American Foundation for Development. Despite the activities of FLAD going much beyond scientific cooperation, this Foundation has had a programme of mobility grants and promotes and supports research projects between

Portuguese universities and US counterparts; in particular, it has financed cooperation programmes with the National Institutes of Health.

In 2007 the Portuguese government launched an ambitious programme of cooperation with US Universities, labelled '*Partnerships for the Future*', aimed at encouraging the carrying out of joint programmes in specific fields to provide an increased strength to the country's STI development. An evaluation of this initiative carried out in 2011-2012 (Academy of Finland, 2012) found that the programme had had a significant potential for promoting research and innovation: "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". Further the report stated that the "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 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 emphasized that the model used was not a real partnership, being more similar to a purchaser-provider model. In the sequence of this report's recommendations, and also in tune with the prevailing financial constraints, the size and scope of this cooperation has been adjusted.

The relevance assigned to transnational cooperation has also led to the creation of the INL, the Iberian International Nanotechnology Laboratory, in the sequence of a joint decision of the Portuguese and Spanish governments taken in 2005. INL was established in Braga (Northern Portugal) to foster interdisciplinary research addressing major challenges in nanomedicine, nanotechnology applied to environmental & food control nanoelectronics, and nanomachines and molecular manipulation at nanoscale. Difficulty in finding the programmed funding for INL has led to an attempt to bring in researchers from both China and Brazil, and agreements have been closed with Brazil in this respect.

5 NATIONAL PROGRESS TOWARDS REALISATION OF ERA

Portugal has launched initiatives across all ERA dimensions. In particular, Portugal has moved forward to adopt measures and practices that allow for greater cooperation in the setting of research agendas, such as the setting up of the International Iberian Nanotechnology Laboratory (INL) and the launching of the National Roadmap on Research Infrastructures, and in guaranteeing the opening of the research labour market and favouring mobility. However, some important challenges and shortcomings still persist. A brief summary of the main initiatives on the five ERA priorities is provided below.

5.1 More effective national research systems

The Portuguese research and development (R&D) situation changed rapidly in the 2000s decade. By 2009 Portugal had advanced to a GERD/GDP ratio of 1.64%, with the business sector becoming the most important R&D performer since 2007, 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.

It must be said that the national target in terms of R&D investment stems from the Portuguese commitments towards the 2020 EU-wide objectives of raising the GERD/GDP ratio across the Union. However, in the current climate of severe recession, there is little prospect of the country keeping in the same the trajectory of increasing its GERD/GDP ratio that it pursued until 2009. There is at the moment no policy document outlining a strategy in relation to investments in research and innovation. The policy orientation in this area stems from the government programme which has been carried out since mid-2011.

In relation to a RDI multi-annual programming, the policy orientation was provided until 2006 by the Community Support Framework programmes and, since 2007 by the National Strategic Reference Framework 2007-2013. As we are now in a period of transition to the next NSRF, there are yet no clear guidelines in relation to future mid-term policies. In principle, with the implementation of the ‘smart specialisation’ concept, it is expected that the national investments in R&I may increase in the medium-term. However, given the current economic situation and the harsh financial climate there is a serious concern in relation to the capacity of the Portuguese government to match the EU structural funds committed to the new programmes, at least over the next few years.

In relation to the evolution of institutional and project based competitive funding, the long term trend has been for a rise in the second component, and in both components there has been an increase of funding provided through the application of international peer-review review mechanisms. The funding of academic research has been increasingly professional, based on peer review and international standard and adopting multi-annual planning and budgeting, even though instability on the conditions and amount of funding has been on the rise over the most recent years.

The culture of international peer review is now firmly established in the university system in Portugal. The funding brought to academic research by the FCT follows such principles. The main exception to this rule is the funding brought to support the network of public laboratories, which is not mainly linked to peer review mechanisms. However, it must be pointed out that the

research teams that work in these labs also submit proposals for funding of their research projects to the regular calls, and thus in that component they are under the “principles of international peer review”.

In relation to the introduction or enhancement of “competitive funding through calls for proposals and institutional assessments as the main modes of allocating public funds to research and innovation”, two measures should be referred to: “R&D projects - Projects of Scientific and Technological Development Research”; and the “R&D Units” support measure. The first of these two measures is managed by the FCT. It has been active for many years now (since before 2000). It is a central measure in funding research in Portugal. It consists in launching calls, normally every year, open to all disciplinary areas. More focused calls have also been launched, but they depend on momentary priorities and they are not permanent. This measure is now permanent, though some problems and changes have emerged in recent years in terms of the funding through this channel as the austerity policies are having an impact on the timing of the most recent calls and having an effect of delaying funding to projects that compete in the open calls. The second measure mentioned above provides incentives for the creation of R&D units in business firms. It supports projects aimed at enhancing the productivity, competitiveness and integration into the global market through the creation of R&D units in firms (NITEC and CITEC). The understanding is that the R&D team shall have a permanent existence and its members shall be dedicated solely to activities of endogeneisation and development of technological skills within the company. This measure is part of the Compete Operational Programme, one of the NSRF 2007-2013 programmes.

5.2 Optimal transnational co-operation and competition

Internationalisation has been one of the key objectives of Portugal’s scientific and technological (S&T) policy over the last four decades. This has been translated namely into several actions aimed at strengthening Portugal’s involvement in the successive Framework Programmes (FPs) as well as in the building of the European Research Area. To enhance Portuguese involvement in the FP7, a National Office for Promoting Portuguese Participation in the Framework Programme (GPPQ) was established in 2007, currently part of the FCT. However, Portugal still needs to improve the capability to collect the spillovers from an increased participation in international research efforts, to integrate them into the strengthening of national research institutions and into strategic projects. In spite of a significant participation of Portuguese teams in FP7, the return to national investment has still been below, though close to 100%. This success rate is however much higher than the return that Portuguese participants obtained from FP6. Specifically, national policies need to learn to manage the trade-off between increasing European collaboration and capturing benefits for Portugal, as spatial economies of scale are set within ERA. Such a need is particularly sharp nowadays, since increased involvement in Horizon 2020 is envisaged as critical to compensate for the declining domestic budgetary allocations to research. There have been quite intensive initiatives on the preparation and diffusion of Horizon 2020.

Portugal’s involvement in ERA-NETs provides a very interesting example of Portugal’s transnational cooperation. The FCT has participated in 53 ERA-NETs (23 ongoing), promoting cooperation among other scientific research funding agencies, ministries and/or research institutes (as program managers) of EU Member States, as well as associated and third countries. This area was considered by GPPQ, which is part of the FCT, as one of those in which Portuguese participation has been more successful (GPPQ, Newletters May and November 2010). Criteria for deciding to participate in ERA-NETs have been related to both research excellence of the Portuguese ERA-NET ‘champions’ and the existence of a critical research mass in Portugal (Godinho & Simões, 2011).

The main initiatives taken in the recent past with regard to this priority concern the setting up of the INL and the development of the National Roadmap for Research Infrastructures, aligned with the ESFRI Roadmap.

The first initiative dates back from 2005 and it has been referenced to in earlier EW country reports. For this reason only a brief summary of some of its features is given here. Created as a joint-venture between the Portuguese and the Spanish governments, the INL is the first fully international research organisation in Europe in the field of nanoscience and nanotechnology. It is aimed at becoming a world reference in these fields. Unfortunately, however, the INL has not been immune to the effects of the budgetary cuts on both the Portuguese and the Spanish sides. This has to some extent undermined the Institute's development and international affirmation.

Secondly, the design of the National Roadmap for Research Infrastructures has taken place over 2012 and 2013. The change in government in mid-2011 led to a change in Portugal's position *vis-à-vis* the ESFRI roadmap. The new policy stance favours commitment towards the roadmapping exercise with a view to an increased participation in reciprocal access to Research infrastructures (RIs). In line with this, the FCT has started to develop a National Roadmap for Research Infrastructures. There has been a procedure of public consultation of the Portuguese scientific community, enabling the collection of updated information on existing interest and potential of participation in ESFRI Roadmap Research Infrastructures. In a second stage, in the second semester of 2012, motivated by the MERIL project (Mapping European Research Infrastructures Landscape – a project coordinated by the European Science Foundation), Portuguese research infrastructures that matched the concept put forward by the ESF were identified. This second stage also included the participation of the scientific community in a consultation directly launched by the European Commission of all the EU research and innovation community, to gather topics for the first work programmes of the Horizon 2020 Research Infrastructures thematic priority, concerning the so-called I3 activities (integrating activities for existing research infrastructures, which in the FP7 accounted for 60% of the Research Infrastructures thematic priority budget, within the Capacities Specific Programme).

A process of dialogue with stakeholders was launched with the scientific community across the country. This resulted in direct feedback to prepare the rules for participation and evaluation, taking into account the concrete reality in each institution and networks of institutions. Another key element is the interaction with regional authorities, namely the Regional Coordination Commissions (CCDRs), in order to design co-funding instruments with the FCT, in the context of present and future National Strategic Reference Framework (NSRF) operational programmes. Other ministries besides Education and Science (Economy, Agriculture, Transports and Health) have also been involved, in order to ensure alignment of policy priorities.

In the third phase, a call for proposals was launched, which was open until September 30th. According to information provided by the FCT, a total of 124 applications were submitted. At the time of writing (end of December 2013), the evaluation procedure is still running, a decision being expected shortly. The financial commitments to national, European and international RIs will be determined through the results of the RI national roadmap.

5.3 An open labour market for researchers

The conditions in the research labour market changed significantly over the most recent decades. In 1982 there were 3,963 FTE R&D personnel and by 2003, the equivalent figure was 25,529 FTE. The latest figures indicate that the research system kept expanding until the early 2010s, as a total of 56,192 FTE research personnel were accounted for in 2012.

Over the most recent years, many institutions have adapted harder tenure granting procedures and the recruitment of new researchers is much more difficult due to budgetary pressures or legal restrictions. In this context, institutions have been able to absorb some “fresh blood”

essentially by contracting younger researchers for non-permanent positions, by using Post-Doc grants, which provide support from three up to six years. It must be pointed out that in the decade between 2000 and 2009, 34% of Post-Doc grants were awarded to foreigners. Such orientation in terms of contracting younger foreign researchers may have long term benefits by increasing the internationalisation of the domestic research labour market.

At the same time the number of PhD graduates has not stopped growing. By 2012 the country reached the mark of more than 2.000 new PhD graduates. However, this increasing supply of new PhD holders is an asset that is not being fully exploited, as the research labour market has shown growing difficulties to absorb them. In addition to the difficulties in the research institutions funded by government grants, the current crisis implies that business firms are not (and will not be) absorbing highly qualified personnel.

In 2013 the FCT launched a “FCT Researcher” call, to which 1379 post-doc researchers competed. A position under this programme is attractive, as it provides professional stability and funding over a 5-year period. A total of 210 of such positions were funded.

Recruitment in Portuguese research institutions has basically been based on “open, transparent and merit based” criteria. The “Statute of University Teaching Career”, which was originally published in 1979, after its 2009 review has allowed more flexibility in terms of contracting researchers working abroad. The “Statute of the Research Career”, that regulates the access to research position within the public labs, has not yet been adapted in the same direction.

In relation to the “setting up and running of structured innovative doctoral training programmes applying the Principles for Innovative Doctoral Training”, the “FCT PhD Programmes” were established in 2012, as part of defining a new typology and diversity of doctoral programmes. The key objectives of this measure are as follows: to support the development of internationally competitive, research-based PhD Programmes; Foster collaborations and sharing of resources between Portuguese institutions, to bolster the international status of these institutions; and Equip students with the necessary transferable skills. Funding for “FCT PhD Programmes” covers the costs of: PhD grants (national or mixed), for three or four years maximum, and/or Bolsas de Investigação Científica (BIC grants), for a maximum duration of one year; and training courses, laboratory rotations or other types of field work that may be necessary to achieve the scientific aims of the PhD programme. The funding of the selected PhD programmes is limited to four years. The 2012 call recommended 51 PhD programmes for funding. A total of 1,502 grants were recommended in this call. Further 3.78 M€ complementary budget was recommended (for courses, laboratory rotations or fieldwork) for a period of 4 years.

5.4 Gender equality and gender mainstreaming in research

Gender equality in research has not been perceived as a severe problem, though in reality the country exhibits a somewhat dual picture. On the one hand, Portugal is one of the eight Member States in which women’s share in the research population exceeds 40%; reaching 46% in 2009. In the Higher Education sector, women’s share in research personnel is even higher, exceeding 50%. On the other hand, the situation is different in top posts: the glass ceiling index for 2010 was 1.83, slightly above the EU 27 average. The country has one of the lowest proportions of female heads of institutions in the HES in 2010 (7.3%), well below the EU 27 average (15.5%). However, female participation in scientific and management boards in Portugal is 38%, slightly above EU 27 average (36%)(European Commission, 2013c).

The positive overall picture on this regard does not conceal, however, the fact that the proportion of women in top positions is relatively low. This is illustrated by the fact that, for example in 2010, only 3% of women were in Grade A in HEI sector, while the corresponding share for men was 9% (European Commission, 2013c). There is clearly room for improvement

in this regard. That would involve more soft power and the building up of an increased awareness of the problem with the possible definition of target shares for women participation.

There is no legislation establishing a mandatory share of women in research. In fact, no need has been felt for that, having in mind that such a share is relatively high and has increased during the last decade. There have been, however, successive National Plans for Equality, Gender, Citizenship and Non-discrimination. The present Fourth Plan 2011-2013, which is arriving to an end, includes a strategic area concerning Research and Knowledge Society (Strategic Area N° 6). The main purpose is to set up specific measures to promote the introduction of the gender perspective in research and the knowledge society. The Fifth Plan, running between 2014 and 2017, has been approved by the Council of Ministers, and is now available for public consultation. It includes a strategic area dealing with “promotion of even treatment among men and women in public policy” in several fields, including “education, science and culture”. It provides *inter alia* for: introducing the category of gender studies among the areas for research funding by the FCT, and for the carrying out of a research project about female participation in ICT in Portugal.

Outside the scope of public policy, the L’Oréal Medals of Honor for Women in Science should also be mentioned. The awards are granted annually and intended for advanced scientific research at post-doctoral level, in Portuguese universities or other institutions of recognised merit in the fields of Health Sciences and Environmental Sciences.

5.5 Optimal circulation, access to and transfer of scientific knowledge including via digital ERA

A wide number of initiatives have been taken to improve the circulation, access and sharing of knowledge, in line with ERA priority #5, targeting the academic community and the access to and dissemination of scientific knowledge, and addressing the sharing between the academic world and the business sector. However, this issue has not been dealt with as an integrated policy topic, and a traditional technology ‘transfer’ view has dominated.

The main initiatives include the following:

- The Scientific Open Access Repository of Portugal (RCAAP): The main result of this initiative is an online portal that gives access to thousands of scientific and scholarly publications, namely journal articles, conference papers, thesis and dissertations, which are provided by several Portuguese repositories. The key objectives of RCAAP are as follows: to increase the visibility, accessibility and dissemination of Portuguese scientific research; and to facilitate management and access to information on the national scientific production through registration of scientific literature in specific information systems and their aggregation in the RCAAP portal. The RCAAP portal is the main result of the RCAAP project.
- b-on – The Online Knowledge Library: Allows for unlimited access of researchers in universities and research organisations to over 16,750 scientific international publications through subscriptions initially negotiated by the Portuguese government with 16 publishers (all the major main publishers of international peer-reviewed academic journals were included). The institutions that participate in the b-on have full access to the contents of the publications. These institutions include: Higher Education Institutions, Associated Laboratories, Publics Labs, Public Administration, Non Profit Research Organizations and Hospitals. In 2013 (Council of Ministers Resolution 16/2013, published 21.3.2013) the Portuguese government established the financial framework for the continuation of b-on. €40.6m will be paid to the publishers that supply the contents of the b-on over the forthcoming 3 years period (2013, 2014 and 2015).

- DeGóis Curricula Platform: this corresponds to a portal where researchers can upload information on their profile, academic activities, prizes and awards, scientific productions and projects. It provides a tool for gathering, supplying and analyzing the intellectual and scientific production of Portuguese researchers. It consists of a portal having as main features the individual management of the curricular information, the visualization of national science and technology indicators and the search for curricula according to content related queries. This curricula management system allows the researcher to upload her or his personal data, private and professional addresses, academic activities, spoken languages, prizes and awards and research fields, as well as all kinds of scientific productions and the detailed information on the research projects in which s/he is/was engaged. It also allows the uploading of information related to supervisions and presence in boards of examiners. With the objective of identifying the scientific domains of the researchers' works, DeGóis allows the establishment of relations between the scientific productions and the OECD's Fields of Science table. By applying this international standard it becomes possible to compare the Curriculum DeGóis with other models coming from other scientific communities.

- GAIN - Global Acceleration Innovation Network was launched in the end of 2012 for the setting up of a national structure for innovation acceleration and technology transfer. It results from a partnership between the Ministry of the Economy and the Ministry of Education and Science. The programme envisaged to extend the work and scope of the existing UTEN (University Technology Enterprise Network, a network of professional Technology Transfer Offices focused on the commercialization and internationalization of Portuguese S&T). In practical terms GAIN will entail the collaboration between the FCT (Science and Technology Foundation), AdI (Innovation Agency), IAPMEI (Institute for Business Investment) and the partnerships between Portugal and several US universities. The network is expected to work closely with the stakeholders in the innovation and S&T system, namely with HEI, business sector and the venture capital industry. It will encompass, a network of professional Technology Transfer Offices (TTOs) focused on the commercialisation and internationalisation of S&T (see: <http://utenportugal.org/>). The basic units of GAIN will be the existing OTICs (Offices for Knowledge and Information Transfer) and GAPIs (Support Offices for Industrial Property Use) that have operated in the HEI sector and in other institutions. However, it must be pointed out that at least until the end of 2013 there were no visible signs of implementation of this measure.

- Intellectual Property policy for R&D projects: A partnership between the FCT and INPI (the National Institute for Intellectual Property) has been launched with a view to design an intellectual property policy for R&D projects financed through the FCT. A meeting with stakeholders is scheduled for early January 2014.

Annex 1. PERFORMANCE OF THE NATIONAL AND REGIONAL RESEARCH AND INNOVATION SYSTEM

Feature	Assessment	Latest developments
1. Importance of the research and innovation policy	(-) Research and innovation were not defined as national policy priorities; this shows a limited commitment to R&I at the higher Government level; (-) There has been a lack of capacity to mobilise the scientific community to overcome budgetary restrictions.	(+)SWOT exercise carried out by FCT, including the dialogue launched with stakeholders; (+) Inclusion of an axis on 'Innovation, Entrepreneurship and R&D' in the Industrial Promotion Strategy for Growth and Employment (-) Decline in R&D funding
2. Design and implementation of research and innovation policies	(-) Incapacity to counter the brain drain as well as to mobilise the research community; (-) The focus on financing R&D projects with "commercial applicability" risks to undermine the development of basic sciences; (+) The increased dialogue between the ministries for education and the economy means that the traditional divide among research and innovation is being bridged (however, this happens in a context of reduced priority assigned to research and innovation at top government level) (+)The Initiatives aimed at defining a set of priority areas are welcome in the present budgetary conditions.	(+)Increased dialogue between the ministries in charge of research and innovation affairs; (+)SWOT exercise carried out by FCT, including the dialogue launched with stakeholders; (+) Work aimed at defining specific priorities (-)though two and a half years were elapsed without decisions on this regard (+) Development of headlines following a smart specialisation logic; (-)however, the initiative was launched too late and the involvement of stakeholders was very limited; (+) Inclusion of an axis on 'Innovation, Entrepreneurship and R&D' in the Industrial Promotion Strategy for Growth and Employment (however, this strategy has been defined prior to the identification of research priorities) (-) Decline in R&D funding (+) New regulation on financing R&D organisations aimed at promoting economies of scale and cooperation;
3. Innovation policy	(-) Innovation is not promoted as a key political flag (entrepreneurship and exports emerge as key priorities) (-) Innovation supply- and demand-side policies are not being developed in a consistent way, since most demand-side policies have been discontinued; (+) Interesting initiatives at regional level, especiall in the Centro region	(+) Launching of the Industrial Promotion Strategy for Growth and Employment which includes several measures aimed at fostering innovation: (-) Innovation issues have been insufficiently addressed in the FCT SWOT exercise; (-) Demand-side innovation policies, which were earlier pursued, have been largely discontinued; (+)Though positive, the decision to keep AdI, the Innovation Agency was taken (-) too late, jeopardizing the resources and capabilities of the Agency.
4. Intensity and predictability of the public investment in research and	(-) Portugal's research system is facing a serious sustainability challenge (this requires a different policy approach and the mobilisation of the academic and scientific communities; (-) There has been an incapacity to develop	(-) Decline in public investments in research; (+) New regulation on financing R&D organisations aimed at promoting economies of scale and cooperation,

innovation	<p>strategies in order to reconcile budgetary restrictions with the need to ensure the sustainability of the research system;</p> <p>(-) There is evidence on the inability of policy makers to mobilise the academic and research communities, leading to a feeling that financial and budgetary conditions are 'blind' to the sustainability needs of the research system.</p>	<p>but also (-) envisaged as an instrument to reduce the level of research financing;</p> <p>(-) Decline in Budgetary allocations to universities ;</p> <p>(-) Migration of young researchers is becoming endemic, due to a combined perception of declining opportunities in Portugal and improved conditions abroad.</p>
5. Excellence as a key criterion for research and education policy	<p>(+) The commitment to consider excellence as a central criterion for assigning funding to R&D projects seems to be strong;</p> <p>(-) There are however signs of increased weight assigned to "commercial applicability", which risks to raise increased problems for the development of basic sciences.</p>	<p>(+) There have been statements of government officials regarding the role of excellence as a basic criterion for project selection and the assignment of funding;</p> <p>(-) Negative reactions from the scientific community regarding the selection criteria followed in the last 'FCT Researcher' call;</p> <p>(-) Increased weight assigned to commercial applicability in the last call for exploratory projects.</p>
6. Education and training systems	<p>(+) The developments in the field of training are positive insofar they are geared to enhance the employability of students by better taking into account employers' needs;</p> <p>(-) it has been commented, however, that an excessive focus on a dual education approach might limit the development of transversal competencies;</p> <p>(+) The improvements in PISA ranking are positive, though it is still early to assess their sustainability;</p> <p>(-) These rankings raise some doubts about the appropriateness of the changes recently introduced at the secondary level of the education system;</p> <p>(+) The envisaged introduction of Entrepreneurship matters in education curricula is positive, although there are doubts regarding the alignment of different Ministries on this issue;</p> <p>(-) The declining budget assigned to Universities may put at stake the key role played by public Universities in education and research;</p> <p>(-) The education system is still too centralised, and some decisions taken recently have strengthened the perception of centralisation.</p>	<p>(+) Development of dual system of training, following the German approach;</p> <p>(+) Increased rigor in the selection of teaching staff;</p> <p>(+) There is an increasing concern with entrepreneurship education (this has been pointed out as an important measure in the Promotion Strategy for Growth and Employment);</p> <p>(-) Significant divergences between the Minister of Education and the Council of rectors about the proper financing of Universities.</p> <p>(-) Budget policy decisions taken without understanding the needs of Universities and R&D organisations in the context of Horizon 2020 (though revised, this has been a sign of a harsh relationship.</p> <p>(+) Increased ranking of Portuguese students in the OECD PISA in Mathematics and Native Language.</p>
7. Partnerships between higher education institutes, research centres and businesses, at regional, national and international level	<p>(+) Increased awareness of Universities about the need to cooperate in order to respond the challenges of education internationalisation;</p> <p>(+) The decision to assign the evaluation of the partnerships with US Universities to the Academy of Finland enabled an independent assessment of the results achieved;</p> <p>(+) The decision, drawing on the evidence provided by the evaluation, to renew such partnerships, under revised conditions, is very positive;</p> <p>(+) There is a recognition of the need to further stimulate the cooperation between different players of the R&I system (specific measures, still undisclosed, are expected for the first quarter of 2014);</p> <p>(-) However, in some public instances, cooperation is envisaged mostly as a 'technology transfer' issue;</p>	<p>(+) Portuguese Universities have been gaining ground in international rankings (though budgetary cuts may hinder its sustainability);</p> <p>(+) Creation of the University of Lisboa, the first voluntary merger of Universities in Portugal (one of the reasons behind the merger was the strengthening of capabilities for increased international cooperation);</p> <p>(+) Renewal, under revised conditions, of the agreements with US Universities;</p> <p>(+) Early preparation for Horizon 2020, involving different groups of actors;</p> <p>(+) Cooperation between FCT and</p>

	<p>(-) The zigzags regarding the continuation of the Innovation Agency (AdI) had a negative role in the promotion of University-Industry cooperation;</p> <p>(+) There is a firm commitment to profit from the international cooperation opportunities opened by Horizon 2020;</p> <p>(-) There is, however, a contradiction between such commitment and the budgetary allocations to Universities and research centres, which seriously undermine the capacity to provide matching funding;</p> <p>(-) No decisions were taken so far as a result of the PCT evaluation;</p> <p>(-) The discontinuation of demand-side innovation initiatives has severely curtailed several interesting innovation cooperation initiatives among different types of actors.</p>	<p>INPI- National Institute for Industrial Property with a view to design an intellectual property policy for R&D projects financed by FCT</p> <p>(+) Positive experiences of several Competitiveness and Technology Poles (CTP) as instruments for increased cooperation between Universities, research centres and business companies: (-) in contrast, there are other cases in which such Poles have not been able to develop synergies among those types of actors;</p> <p>(-) the evaluation of CTP was very critical about the management and governance of most poles and clusters.</p> <p>(+) Creation of a Technology Office in FCT, integrating all FCT-related innovation activities, and ensuring the liaison between the main funding agency for academic R&D and the business sector;</p>
8. Framework conditions promote business investment in R&D, entrepreneurship and innovation	<p>(+) This has been a priority field for government action, in part due to the commitments taken in the Memorandum of Understanding, partly as a result of the Government's conviction that framework conditions should be revised to enable more pro-business conditions;</p> <p>(+) The commitment to promote entrepreneurship:</p> <p>(-) However, there has not been consistency in action, the headlines being dependent on the ministries in charge;</p> <p>(-) The focus on entrepreneurship has been somewhat <i>naïf</i>, implicitly assuming that entrepreneurship would be the key element in changing the economic system, and underrating the role to be played by innovative projects carried out by existing forms;</p> <p>(-) There has been, as a result of the Memorandum of Understanding, a few initiatives aimed at curbing the power of incumbents in utilities; however these fell short of the needs, having in mind the level of 'rents' identified;</p> <p>(-) In most cases the initiatives have been taken without bearing in mind Portugal's institutional framework, particularly on concerns trust and cooperation among economic agents.</p>	<p>(+) Revision of the public venture capital system, and creation of Portugal ventures;</p> <p>(-) Launching of +E+I, the Strategic Plan for Entrepreneurship and Innovation;</p> <p>(+) Initiatives to promote entrepreneurship, including the Entrepreneurship Voucher;</p> <p>(+) Revitalisation Programme, to enable faster recovery processes of companies experiencing financial difficulties or bankruptcy; (-) however, the take up of this measure has been very low;</p> <p>(+) The axis on 'Innovation, Entrepreneurship and R&D' in the Industrial Promotion Strategy for Growth and Employment 2014-2020 includes a set of measures aimed at "creating a favourable environment for entrepreneurship".</p> <p>(+) Launching of a new Competition Law.</p>
9. Public support to research and innovation in businesses is simple, easy to access, and high quality	<p>(+) The existing set of instruments to promote innovation is generally appropriate and addresses the main policy issues (except regarding demand-side innovation); stakeholders have expressed a broad agreement with that set of instruments; it would be important to keep and improve them for the next round of cohesion funding;</p> <p>(+) The evaluation machinery has reached a good level of maturity and efficiency, (-) though there is still red tape to be eliminated;</p> <p>(-) Increased challenges regarding the sustainability of the research system;</p> <p>(-) There has been a lack of capacity to mobilise the scientific community to overcome budgetary restrictions;</p>	<p>(+) Revision of the public venture capital system, and creation of Portugal Ventures;</p> <p>(+) Though positive, the decision to keep AdI, the Innovation Agency, alive, it was taken (-) too late, jeopardizing the resources and capabilities of the Agency;</p> <p>(+) More careful assignment of tax R&D incentives to firms;</p> <p>(+) New regulation on financing R&D organisations aimed at promoting economies of scale and cooperation;</p> <p>(-) Decline in R&D funding;</p>

	<p>(-) Some Public organisations are too bureaucratic with insufficient knowledge about the key issues faced by business firms; additionally, they are increasingly understaffed and under-skilled, as a result of the decline of public servants wages.</p> <p>(-) There is a lack of appropriate support to help young innovative companies in commercialising their products/services and in internationalising their activities.</p>	
10. The public sector itself is a driver of innovation	<p>(-) Research and innovation were not defined as national policy priorities; this shows a limited commitment to R&I at the higher Government level;</p> <p>(-) Public procurement decisions are taken on the basis of costs and savings, innovation considerations being usually absent;</p> <p>(+) There are organisational innovation prizes in the public sector (however, the thrust towards organisational innovation which was evident in the late years of last decade, has vanished);</p> <p>(-) Government attitude towards public service and public organisation does not encourage innovation commitment.</p>	(-) Discontinuation of most demand-side innovation initiatives

Annex 2. NATIONAL PROGRESS ON INNOVATION UNION COMMITMENTS

TABLE OF MEASURES RELATED TO IU COMMITMENTS 2012-2013

	IU Commitment	Main changes in 2012-13	Brief assessment of progress / achievements
1	Member State Strategies for Researchers' Training and Employment Conditions	No main changes. Although there is no specific mechanism to implement the C&C, the national context is very much aligned.	Neutral
4	ERA Framework	Portugal keeps her commitments to ERA. The main change has been the carrying out of a national Roadmap for Research Infrastructures (RIs) (see 5 below).	(+)
5	Priority European Research Infrastructures	<ul style="list-style-type: none"> First National Roadmap for Research Infrastructures is underway, its completion being scheduled for December 2013. The process includes an evaluation of the strategic relevance and scientific merit of the RIs. Portugal is closely following the development of the European Charter on Transnational Access for RIs, within both ESFRI and Science Europe forums; 	(+)
7	SME Involvement		(-)
11	Venture Capital Funds	<ul style="list-style-type: none"> Continued commitment to the development of venture capital and business angels Initiatives launched on that regard in the context of Structural Funds 	(+)
13	Review of the State Aid Framework	<ul style="list-style-type: none"> The revision of the Regulation on Exemptions by Category together with the identification of new categories of exemptions in underway. 'Aid to innovation clusters' and 'Aid to process and organizational innovation' are among the new exemptions. 	Neutral
14	EU Patent	<ul style="list-style-type: none"> No changes 	Neutral
15	Screening of Regulatory Framework	<ul style="list-style-type: none"> No screening on that regard. 	(-) [In fact, several of the policies following from the Memorandum with the 'troika' had a negative effect on innovation]
17	Public Procurement	<ul style="list-style-type: none"> Innovation is not a relevant concern in public procurement. 	(-) In part as a result of the austerity policy, there has been, since 2011, a discontinuation of the demand-led innovation policies launched earlier.
20	Open Access	<ul style="list-style-type: none"> FCT has launched a public consultation for its policy on open access to results, and will soon prepare the norms to be implemented on open access. In its proposed policy FCT promotes the use of e-infrastructures, through the national 	(+)

		repository.	
21	Knowledge Transfer	<ul style="list-style-type: none"> Change in the Innovation Vouchers system, now called 'Vale Inovação – Regime Simplificado'. Extension of the Voucher System to Entrepreneurship Revision of the Partnerships with US Universities with a view to strengthen technology transfer Work is being carried out with a view to launch GAIN, a technology transfer office 	<p>(-) Simplification led drop the accreditation procedure, with negative effects on the quality of the services provided</p> <p>(+) High take up</p>
22	European Knowledge Market for Patents and Licensing	<ul style="list-style-type: none"> No significant changes. [The intention to promote the markets for technology was expressed in the +E+I Programme. However, so far it has not been translated into action. 	(-)
23	Safeguarding Intellectual Property Rights	<ul style="list-style-type: none"> No changes. [in 2010, Portugal signed the London Treaty for an EU Patent] 	Neutral
24	Structural Funds and Smart Specialisation	<ul style="list-style-type: none"> Regarding R&I, FCT set up in 2012 a taskforce to foster activities aiming to contribute to the development of a coordinated, regionally based, Smart Specialization strategy (RIS3). FCT also created an interdepartmental Working Group that carried out a diagnosis of the national R&I system, including a SWOT analysis, published in May 2013. This report is considered a baseline for foresight analyses and the organisation of thematic symposia. These aim to identify the potential of each scientific area in becoming a priority in the national R&I strategy for 2014-2020. The selection of each area was based on scientific, technological and economic specialization. Each symposium will lead to a report on the theme and topics under discussion. The symposia are organised by FCT, IAPMEI, AdI and COMPETE. 	<p>(+) Regarding the initiatives taken by FCT and the cooperation among public organisations belonging to different Ministries</p> <p>(-) The late launching of the process entails the risk that a sound nation-wide RIS3 strategy will not be available before the end of the year.</p>
25	Post 2013 Structural Fund Programmes	<ul style="list-style-type: none"> The scope of the key Operational Programmes (OPs) for 2014-2020 has already been defined Their headlines have not been disclosed so far 	<p>(-) The process is delayed, namely due to Government changes.</p>
26	European Social Innovation pilot	<ul style="list-style-type: none"> Approval of the social economy law (Lei nº30/2013), in May 2013, which promotes social research and innovation, including technology process and organizational management innovation. The guidelines approved, in August 2013, for the Common Strategic Framework (CSF) 2014-2020 include a reference to supporting social innovation and innovative measures of social intervention. The 'Map of Innovation and Social Entrepreneurship in Portugal' of innovative initiatives aimed at knowledge creation and diffusion. Approval of Strategic Initiatives for Promoting Youth Employability and Support to SME ('Impulso Jovem'): professional training, support to the entrepreneurship and investment (Council of Ministers Resolution No. 51-A/2012 June 14, and 	<p>(-) (in spite of some initiatives on this regard, the results are meagre as Social Innovation issues do not figure high in Government priorities)</p>

		RCM n ° 36/2013 of 4 June).	
27	Public Sector Innovation	<ul style="list-style-type: none"> ▪ Setting up of CRESAP, an independent organisation in charge of evaluating the capabilities of candidates for managerial position in Public Organisations ▪ The 'Portugal Did IT' / 'The National Public Procurement System: Developing and Implementing an eProcurement Solution' has been nominated for the 2013 edition of the European Public Sector Awards. 	(-) [In spite of the positive step in creating CRESAP, the successive cuts in civil servants wages are seriously undermining Public Administration strategic and operational capabilities. The announced Public Sector Reform has been constantly delayed. This is a clear hindrance to Public Sector Innovation]
29	European Innovation Partnerships	<ul style="list-style-type: none"> ▪ EIP AHA: Portugal participates in the 6 Action Groups, through at least 4 "national clusters" (around Minho, Porto, Coimbra, Lisboa; Ageing@coimbra (consortium lead by Univ. Coimbra) is one of the 32 European Reference sites selected by EIP-AHA. ▪ EIP-AGRI: Portugal participates in one of the Focus Groups; the Ministry for Agriculture and Sea is preparing the creation of groups operating under the Rural Development Programme 2014-2020, that will interact with European groups active in similar areas (coordination by the Network & Service Point created by EIP-AGRI); ▪ EIP Raw Materials: Portugal is represented in the Sherpa group and in 3 Operational Groups; ▪ EIP Water: Portugal is represented in the High Level Group and in the Task Force and is involved in several Action Groups through universities, enterprises and associations; Portugal also participates in 4 of 11 FP7 financed projects related to EIP water (WATER INNO&DEMO call 2013); ▪ EIP Smart Cities and Communities: Portugal is represented in the High Level Group and in the Sherpas Group; this EIP was launched recently (March 2013) and no Implementation/Action Plan has been taken. 	(+)
30	Integrated Policies to Attract the Best Researchers	<ul style="list-style-type: none"> ▪ The 'FCT Researcher Programme' was launched in 2012, aiming to create a talent base of scientific leaders, by providing 5-year funding for the most talented and promising researchers, across all scientific areas, irrespectively of nationality; the Programme is intended to support both outstanding post-doctoral researchers who wish to make the transition to independent researcher, and already independent researchers, with a proven track record. <ul style="list-style-type: none"> ● FCT provides complementary support to some of the Marie Curie granted researchers (e.g. COFUND scheme). 	(+) However, this has been insufficient to reverse the wave of researchers leaving Portugal to find better conditions abroad, given the context of budgetary cuts.
31	Scientific Cooperation with Third Countries	<ul style="list-style-type: none"> ▪ General perspective: (1)PT has put more efforts on the following up of the EU-third countries strategies (e.g. engagement on SFIC pilot initiatives with Brasil, China, India, USA, the 8th Africa-EU Partnership on Science, Information Society and Space), programmes (e.g. EDCTP2 preparation) and high 	(+)

		<p>level forums (Latin America, India, Africa); and (2) in the scope of the S3 process, a workshop on scientific cooperation with third countries, will be organized in Autumn 2013.</p> <ul style="list-style-type: none"> ▪ The main country-specific developments were the following: ▪ USA: Renewal of the US – Portugal Partnerships in 2012 – , though with less financial resources; In this new phase partnerships are expected to shift their focus towards entrepreneurship and innovation. ▪ China: Portugal-China Joint Innovation Centre for Advanced Materials (call launch in 2013, following the MoU signed in 2012 between the Portuguese and Chinese governments; ▪ Brasil: new S&T&I MoU between FCT and FAPESP in 2013; new MoU signed between FCT, HidroEX (UNESCO Centre- Minas Gerais) and SECTES (Minas Gerais) in 2013 on ICT and distance learning, Hydrology, and Technology Transfer. ▪ Africa (Portuguese-speaking countries): ongoing negotiations for the establishment of the UNESCO Centre on Basic sciences for the Community of Portuguese-speaking Countries CPLP; a new S&T protocol was signed with Cabo Verde on PhD grants for Portuguese-speaking countries’ students. 	
32	Global Research Infrastructures	<ul style="list-style-type: none"> ▪ Portugal joined in 2013 the world's most powerful optical telescope design, the E-ELT ESO project, which will cost more than a billion Euros and will be opened in 2023 in the Atacama Desert, Chile. 	(+)
33	National Reform Programmes	<ul style="list-style-type: none"> ▪ Regarding the objective of ‘Strengthening research, Development and innovation’ the main developments have been , the focus on technology transfer, the revision of the R&D units financing conditions, and the launching of the ESFRI roadmapping were the main developments in 2012 and 2013 	<p>(-)</p> <p>The logic behind most initiatives pointed out on the NRP suffers from a linear model bias.</p>

Annex 3. NATIONAL PROGRESS TOWARDS REALISATION OF ERA

ERA Priority	ERA Action	Recent changes
1. More effective national research systems	Action 1: Introduce or enhance competitive funding through calls for proposals and institutional assessments	A call for funding the R&D Units funded by FCT has been launched in 2013 , in the sequence of a reviewing of the statute regulating the R&D Units. The new regulations stimulate the concentration of R&D units. SIFIDE was reviewed in 2013 to positively discriminate projects involving cooperation with research entities and international cooperation.
	Action 2: Ensure that all public bodies responsible for allocating research funds apply the core principles of international peer review	
2. transnational operation competition Optimal co-and	Action 1: Step up efforts to implement joint research agendas addressing grand challenges, sharing information about activities in agreed priority areas, ensuring that adequate national funding is committed and strategically aligned at European level in these areas	The Smart Specialization exercise has taken the societal challenges in the priority areas and those are aligned with Horizon 2020.
	Action 2: Ensure mutual recognition of evaluations that conform to international peer-review standards as a basis for national funding decisions	
	Action 3: Remove legal and other barriers to the cross-border interoperability of national programmes to permit joint financing of actions including cooperation with non-EU countries where relevant	The setting up of INL in 2005 provides a reference in relation to actions 3 and 5. In 2012 a call was launched for RTD projects in the sequence of a collaboration protocol between FCT and the French Agence Nationale de la Recherche (ANR).
	Action 4: Confirm financial commitments for the construction and operation of ESFRI, global, national and regional RIs of pan-European interest, particularly when developing national roadmaps and the next SF programmes	Portugal has been analysing the possible alignment of national RI with ESFRI's Roadmap, and a national consultation was launched in 2013. RIs of strategic interest were identified in the first semester of 2013 through a public competition.
	Action 5: Remove legal and other barriers to cross-border access to RIs	
ERA priority 3: An open labour market for researchers	Action 1: Remove legal and other barriers to the application of open, transparent and merit based recruitment of researchers	The 2009 review of the Statute of University Teaching Career allows for more flexible (open) recruiting. The 'FCT Researcher' contracts are opened to the foreigners in equal foot to the nationals.
	Action 2: Remove legal and other barriers which hamper cross-border access to and portability of national grants	
	Action 3: Support implementation of the Declaration of Commitment to provide coordinated personalised information and services to researchers through the pan-European EURAXESS3 network	

	Action 4: Support the setting up and running of structured innovative doctoral training programmes applying the Principles for Innovative Doctoral Training.	The “FCT PhD Programmes” were established in 2012, as part of defining a new typology and diversity of doctoral programmes. 51 PhD programmes and a total of 1,502 grants were recommended for funding. The Programme of Applied Research and Technology Transfer to the Industry was set up in 2012 to provide support to doctoral training and for post-docs in the industry.
	Action 5: Create an enabling framework for the implementation of the HR Strategy for Researchers incorporating the Charter & Code	
ERA priority 4: Gender equality and gender mainstreaming in research	Action 1: Create a legal and policy environment and provide incentives	The Fourth National Plan for Equality, Gender, Citizenship and Non-discrimination (2011-2013) launched in 2011 aims at promoting equality as a trigger for competitiveness and development.
	Action 2: Engage in partnerships with funding agencies, research organisations and universities to foster cultural and institutional change on gender	
	Action 3: Ensure that at least 40% of the under-represented sex participate in committees involved in recruitment/career progression and in establishing and evaluating	
ERA priority 5: Optimal circulation, access to and transfer of scientific knowledge including via digital ERA	Action 1: Define and coordinate their policies on access to and preservation of scientific information	A partnership between FCT and INPI (the National Institute for Intellectual Property) has been launched with a view to design an intellectual property policy for R&D projects financed through FCT.
	Action 2: Ensure that public research contributes to Open Innovation and foster knowledge transfer between public and private sectors through national knowledge transfer strategies	GAIN (Global Innovation Acceleration Network) was announced late in 2012 as a mechanism for innovation acceleration and technology transfer. The programme will extend the work and scope of the existing UTEN
	Action 3: Harmonise access and usage policies for research and education-related public e-infrastructures and for associated digital research services enabling consortia of different types of public and private partners	
	Action 4: Adopt and implement national strategies for electronic identity for researchers giving them transnational access to digital research services	As part of the 2013 call for funding of R&D Units FCT has requested all the members of the competing units to have a ORCID identification number.

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LIST OF ABBREVIATIONS

AdI	Innovation Agency
BERD	Business Expenditures for Research and Development
CTP	Competitiveness and Technology Poles
DGEEC	Direcção-Geral de Estatísticas do Educação e Ciência
EC	European Commission
ECB	European Central Bank
EIPs	European Innovation Partnerships
ERA	European Research Area
ERA-NET	European Research Area Network
ESF	European Social Fund
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EU 27	27 EU Member States (before Croatia joined the EU)
FCT	Science and technology Foundation
FP	European Framework Programme for Research and Technology Development
FP7	7th Framework Programme
FTE	Full Time Equivalent
GAIN	Global Acceleration Innovation Network
GAPIs	Support Offices for Industrial Property Use
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GPPQ	Office for promoting national participation in the Framework Programme
HEI	Higher education institutions
HES	Higher education sector
IAPMEI	Institute for Business Investment
ICT	Information and Communication Technologies
IMF	International Monetary Fund
INL	Iberian International Nanotechnology Laboratory
INVOTAN	Comissão Coordenadora de Investigação para a OTAN (Portuguese commission for research within NATO)
IP	Intellectual Property
IPTS	Institute for Prospective Technological Studies
JRC	Commission's Joint Research Centre
MEC	Ministry for Education and Science
NRP	National Reform Plan
NSRF	National Strategic Reference Framework
OECD	Organisation for Economic Co-operation and Development
OPs	NSRF Operational Programmes
OTICs	Knowledge and technology transfer offices
PPP	Purchasing power parity

PROINOV	Programa Integrado de Apoio à Inovação
QREN	Quadro de Referência Estratégico Nacional (National Strategic Reference Framework)
R&D	Research and development
R&I	Research and Innovation
RI	Research Infrastructures
RIS3	Research and innovation strategies for smart specialisation
SIFIDE	Sistema de Incentivos Fiscais à I&D Empresarial (Business R&D fiscal credits programme)
SME	Small and Medium Sized Enterprise
SWOT	Strengths, Weaknesses, Opportunities and Threats analysis
S&T	Science and technology
TRIPS	Agreement on Trade Related Aspects of Intellectual Property Rights (this is an annex to the founding treaty of WTO)
TTOs	Technology Transfer Offices
UMIC	Agência para a Sociedade do Conhecimento
UNESCO	United Nations Educational, Scientific and Cultural Organization
UTEN	University Technology Enterprise Network
WTO	World Trade Organization

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