ERAWATCH Country Report 2009

Analysis of policy mixes to foster R&D investment and to contribute to the ERA

Portugal

Manuel Mira Godinho and Vítor Corado Simões
The mission of the JRC-IPTS is to provide customer-driven support to the EU policy-making process by developing science-based responses to policy challenges that have both a socio-economic as well as a scientific/technological dimension.
ERAWATCH COUNTRY REPORT 2009: Portugal

Analysis of policy mixes to foster R&D investment and to contribute to the ERA

ERAWATCH Network – Economics and Management Institute, Technical University of Lisbon (CISEP/ISEG)

Manuel Mira Godinho and Vítor Corado Simões
Acknowledgements and further information:

This analytical country report is one of 33 reports for EU Member and Associated States prepared as part of ERAWATCH. ERAWATCH is a joint initiative of the European Commission's Directorates General for Research and Joint Research Centre. For further information on ERAWATCH see http://cordis.europa.eu/erawatch. The analytical framework and the structure have been developed by the Institute for Prospective Technological Studies of the European Commission's Joint Research Centre (JRC-IPTS) in collaboration with DG-RTD and the ERAWATCH Network.

The report has been produced by the ERAWATCH Network (http://www.erawatch-network.eu/) in the framework of the specific contract on ERAWATCH Policy Mix Country Reports 2009 commissioned by JRC-IPTS. It makes use of information provided in the ERAWATCH Research Inventory with support of the ERAWATCH Network.

In particular, it has benefited from comments and suggestions of Paul Cunningham who reviewed the draft report. The contributions and comments of Luisa Henriques from JRC-IPTS are also gratefully acknowledged.

The report is only published in electronic format and available on the ERAWATCH website: http://cordis.europa.eu/erawatch. Comments on this report are welcome and should be addressed to Mariana Chioncel (Mariana.Chioncel@ec.europa.eu).

The information in this report is based upon primary and secondary sources. The contacts with the Department of European, Bilateral and Multilateral Relations of FCT (Portuguese Science and Technology Foundation), with GPPQ (Office for Promotion of the 7th EU RTD Framework Programme) and with the International Relations at UMIC (Portuguese Agency for the Knowledge Society) were critical to obtain the necessary information. In particular, we wish to acknowledge the extensive interviews with Ana Faisca, José Bonfim, Ana Margarida Santos (all from FCT) and Ana Cristina Neves (Head of International relations at UMIC). Further, ABIC (the association of scientific research grant holders) was contacted.

It was also essential the contribution of Rui Cartaxo, who helped the authors in gathering, processing and preparing the information that is part of the report.
Executive Summary

As highlighted by the Lisbon Strategy, knowledge accumulated through investment in R&D, innovation and education is a key driver of long-term growth. Research-related policies aimed at increasing investment in knowledge and strengthening the innovation capacity of the EU economy are thus at the heart of the Lisbon Strategy. This is reflected in guideline No. 7 of the Integrated Guidelines for Growth and Jobs. This advocates increasing and improving investment in research and development (R&D), with a particular focus on the private sector. This report aims at supporting the mutual learning process and the monitoring of Member States efforts. Its main objective is to characterise and assess the evolution of the national policy mixes in the perspective of the Lisbon goals, with a particular focus on the national R&D investments targets and on the realisation and better governance of the European Research Area. The report builds on the analytical country reports 2008 and on a synthesis of information from the ERAWATCH Research Inventory and other important available information sources.

Data released in December 2008 by GPEARI, the national statistical authority for R&D statistics, indicated a provisional 2007 GERD estimate of €1,921m, reflecting a steep nominal growth of 60% in relation to 2005 and bringing the GERD/GDP ratio for the first time ever above 1% to 1.18%. Of the four institutional sectors performing R&D activities, the Business sector is now significantly ahead, with a GERD share of 51%. The Higher Education sector, despite a rising nominal expenditure, experienced a drop to 30%. The Government and Private-Non profit sectors felt similar declines, respectively to 9% and 10%, being the most pronounced in the former sector which had its nominal GERD almost unchanged.

In terms of Portugal approaching the Barcelona targets, the most recent developments show that despite the very positive performance there is still a long way to reach the 1.8% target set by the government for 2010, particularly on the Business sector side.

The new NRP 2008-2010 underlines the key role played by science and technology in improving the country’s competitiveness in a globalised world. The revision of the NRP explicitly acknowledges that it follows the four areas defined as key in the context of the Lisbon Strategy, and namely the one dealing with “intensifying research, development and innovation”.

However, the type of measures favoured by the NRP 2008-2010 risk to go against the recent evolution towards a more balanced research system. As outlined in this report there are different routes to stimulate R&D growth, but the NRP 2008-2010 perspective appears to be too focused in just one of them (increasing R&D in the public sector). This is confirmed by the contents of Area 3 of the NRP 2008-2010, which is about “more R&D and a better innovation system”. The five guidelines presented in that section of the NRP 2008-2010 are mainly concerned with the increase of the research base, namely growth of investment and of researchers, rather than with R&D carried out by business enterprises.

The policy mix has played a role in the developments mentioned above. Besides the bulk of the measures addressed to improve research in the academic sector, two sorts of incentives might have played an important role in explaining the increase in business enterprise R&D expenditures. The first is SIFIDE, which granted generous tax incentives to companies. The second is the creation of small R&D units in companies (NITECs) that helped some former non-R&D performers to get on to the
The NSRF 2007-2013 has introduced an important measure regarding the stimulation of Competitiveness and Technology Poles that might facilitate the communication between research demand and supply. The Consortia that are expected to arise from the reorganised Government labs system might act in a similar direction. Another lever of change is the new law of the universities sector (RJIES), which might provide opportunities for research units to have a stronger say on universities management and activities.

This report points to five main barriers to private R&D investments: (1) the structure of the Portuguese economic fabric itself, where supplier-dominated industries still have an important role; (2) low firm size, including the near absence of large national R&D performing companies; (3) the weak absorptive capabilities of most SMEs, hindering the design of competitive strategies in the context of which R&D activities might be pursued; (4) the distance from large and demanding markets in which sophisticated customers play a key role, together with the weak domestic linkages among business and research centres; and (5) the lack of a dynamic private venture and risk capital industry in Portugal.

<table>
<thead>
<tr>
<th>Barriers to R&amp;D investment</th>
<th>Opportunities and Risks generated by the policy mix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics of the economic fabric</td>
<td>The response to this barrier requires a consistent effort in three fields: entrepreneurship, FDI attraction, and company in-house capabilities. The main risks are related to contextual factors (the crisis, and the slowing-down of Europe), but also with the inability to mobilise human potential and attract investment.</td>
</tr>
<tr>
<td>Absence of large R&amp;D performers</td>
<td>The opportunity is to use the new policy mix and other initiatives to foster a stronger R&amp;D commitment by players with a ‘pulling’ effect.</td>
</tr>
<tr>
<td>Insufficiently demanding customers</td>
<td>The opportunities are related to the openness of the economy, the use of ICT and the new approaches to clustering. The risks stem from the recession curtailing the possibility of innovative firms having access to a stimulating international demand.</td>
</tr>
<tr>
<td>Weak absorptive capacity of many SMEs</td>
<td>The pursuit of clustering policies may open opportunities, but there is a risk that unsuccessful implementation may jeopardise the efforts.</td>
</tr>
<tr>
<td>Weakness of venture capital institutions</td>
<td>This is a structural problem that may only be responded to, in part, by foreign investment in this field. The consolidation of FINICIA may be envisaged as an opportunity.</td>
</tr>
<tr>
<td>Public research policy with insufficient application concerns</td>
<td>The main risks related to this are the development of a good but self-centred research system without strong links with economic and social needs, although the launch of poles might contribute to generate collaborative opportunities.</td>
</tr>
</tbody>
</table>

The weakest features of the policy mix seem to be the promotion of high-tech entrepreneurship and the attraction of FDI, although the latter depends more on other factors, including strategic intelligence and professionalism, than just on incentives. Furthermore, there is a question mark about the way in which the policy measures in this area will be implemented in a crisis context, which may lead to some relaxation of the criteria and requirements for support being granted. The way the “collective efficiency strategies” (the “clustering approach”) will be implemented will be critical and there are justified fears that there is not enough know-how to combine wisely the necessary bottom-up and top-down approaches. A final shortcoming concerns the absence of proper instruments for generating a consensus among the main stakeholders in relation to long term priorities and sustained resource mobilisation.

To foster private investment in research there are important opportunities related to the possibility of attracting sophisticated FDI, stimulating knowledge-intensive start ups and developing company in-house capabilities. There are, however, important risks related to contextual factors (the economic and financial crisis and the slowing-
down of Europe). The recession may also hinder the possibility of Portuguese companies reaching sophisticated customers in the relevant international markets. The pursuit of clustering policies may open opportunities for linking research demand and supply, but there is a concern that unsuccessful implementation may jeopardise the efforts, given the lack of know-how in conducting this sort of policies. The opportunities that exist in furthering the linkages between the main stakeholders of the research system may be overlooked in the context of the economic crisis and foreseen strategic investments, which show low potential for stimulating R&D-performing firms and wide collaborations between them and the research units in the university and government labs sectors.

The information that has been presented and analysed in this report makes clear that Portugal is strongly committed to, and involved in, the building of the European Research Area.

ERA and ERA-related policies, though not all of them, are important for overall national research policies and strategies. ERA objectives are very much in line with the purpose of “internationalisation of research policy” defined by the Portuguese government, although this goes further than ERA, being extended to the “partnerships for the future” with US Universities. The objective of attracting high-quality researchers from abroad figures high in Government priorities. The same happens with the involvement in European research infrastructures, heralded in the decision to create the International Iberian Nanotechnologies Laboratory in Braga.

The main components of the contribution of national policies to the ERA may be presented along three axes. The first concerns the development of the labour market for researchers. This has been expressed namely by the decision to create 1000 new jobs for PhD holders in research units and Associate labs, increased by a further 500 until 2010, according to the 2008-2010 NRP. The creation of the ‘Invited Chairs’ for senior academics and researchers comes in the same vein.

The second axis concerns international partnerships. There has been an active participation in multilateral programmes and scientific networks including several European joint research infrastructures. Within the constraints of the country’s limited resources, Portuguese partners have been active in the context of those international research networks and infrastructures. There has also been an open policy with regard to the possibility of participation of individuals and research units from third countries. The above-mentioned contracts established with several US universities (MIT, Austin-Texas, Carnegie-Mellon and Harvard) and with the Fraunhofer Society are also examples of internationalization concerns.

Finally, Portugal has been committed to increase the participation in other activities related to the building up of ERA, namely FP7 and the ERA-NET initiative. An office aimed at promoting the involvement of Portuguese organizations, both public and private, in FP7 was established in 2007, by the MCTES (GPPQ). In what ERA-NETs are concerned, Portugal has so far participated in 25 ERA-NETs in different fields. A major restriction to an even stronger commitment to ERA-NETs stems from the country’s limited financial and human resources. Further, in what regards the opening up national programmes, the perception that Portuguese scientists would be in disfavour in relation to researchers from the scientifically more advanced member states has been an important barrier to further advancements.
<table>
<thead>
<tr>
<th>Short assessment of its importance in the ERA policy mix</th>
<th>Key characteristics of policies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Labour market for researchers</strong></td>
<td>• Focus on the supply of new scientists, with generous grants provided to PhD candidates and Post-Doc researchers.</td>
</tr>
<tr>
<td></td>
<td>• As supply has tended to exceed demand in recent years, the government has set a target of 1000 new research posts plus 500 new posts indicated in the NRP 2008-2010.</td>
</tr>
<tr>
<td></td>
<td>• Researchers’ salaries are attractive both on national and international terms.</td>
</tr>
<tr>
<td></td>
<td>• Promotion of women is leading to equal opportunities and access, but mobility to the top still limited.</td>
</tr>
<tr>
<td></td>
<td>• International collaboration programmes with MIT, Austin-Texas, Carnegie-Mellon, and Fraunhofer plus the Invited Chairs programme.</td>
</tr>
<tr>
<td></td>
<td>• Scientific visa created in 2007.</td>
</tr>
<tr>
<td><strong>Governance of research infrastructures</strong></td>
<td>• There has been a clear orientation towards participation in inter-governmental organisations and international research infrastructures.</td>
</tr>
<tr>
<td></td>
<td>• Strong and committed participation in multilateral and bilateral organisations and in international research infrastructures.</td>
</tr>
<tr>
<td><strong>Autonomy of research institutions</strong></td>
<td>• University reform has been a critical policy area, providing more autonomy for universities managing and raising their resources.</td>
</tr>
<tr>
<td></td>
<td>• Universities’ management reform foresees growing participation of society.</td>
</tr>
<tr>
<td></td>
<td>• Competitive funding in what regarding teaching has just been put in place, but still corresponds to a very minor share of total.</td>
</tr>
<tr>
<td><strong>Opening up of national research programmes</strong></td>
<td>• European-wide coordination and joint-programming have been promoted but opening up of national programmes has been limited.</td>
</tr>
<tr>
<td></td>
<td>• Important participation in ERA-NETs and JTIs.</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive Summary</td>
<td>3</td>
</tr>
<tr>
<td>1  Introduction</td>
<td>8</td>
</tr>
<tr>
<td>2  Characteristics of the national research system and assessment of</td>
<td>9</td>
</tr>
<tr>
<td>recent policy changes</td>
<td></td>
</tr>
<tr>
<td>2.1 Structure of the national research system and its governance</td>
<td>9</td>
</tr>
<tr>
<td>2.2 Summary of strengths and weaknesses of the research system</td>
<td>11</td>
</tr>
<tr>
<td>2.3 Analysis of recent policy changes since 2008</td>
<td>13</td>
</tr>
<tr>
<td>2.3.1 Resource mobilisation</td>
<td>14</td>
</tr>
<tr>
<td>2.3.2 Knowledge demand</td>
<td>16</td>
</tr>
<tr>
<td>2.3.3 Knowledge production</td>
<td>17</td>
</tr>
<tr>
<td>2.3.4 Knowledge circulation</td>
<td>18</td>
</tr>
<tr>
<td>2.4 Policy opportunities and risks related to knowledge demand and</td>
<td>20</td>
</tr>
<tr>
<td>knowledge production: an assessment</td>
<td></td>
</tr>
<tr>
<td>3  National policy mixes towards R&amp;D investment goals</td>
<td>21</td>
</tr>
<tr>
<td>3.1 Barriers in the research system for the achievement of R&amp;D</td>
<td>22</td>
</tr>
<tr>
<td>investment objectives</td>
<td></td>
</tr>
<tr>
<td>3.2 Policy objectives addressing R&amp;D investment and barriers</td>
<td>23</td>
</tr>
<tr>
<td>3.3 Characteristics of the policy mix to foster R&amp;D investment</td>
<td>24</td>
</tr>
<tr>
<td>3.3.1 Overall funding mechanisms</td>
<td>24</td>
</tr>
<tr>
<td>3.3.2 Policy Mix Routes</td>
<td>25</td>
</tr>
<tr>
<td>3.4 Progress towards national R&amp;D investment targets</td>
<td>31</td>
</tr>
<tr>
<td>4  Contributions of national policies to the European Research Area</td>
<td>33</td>
</tr>
<tr>
<td>4.1 Towards a European labour market for researchers</td>
<td>34</td>
</tr>
<tr>
<td>4.1.1 Policies for opening up the national labour market for</td>
<td>36</td>
</tr>
<tr>
<td>researchers....</td>
<td></td>
</tr>
<tr>
<td>4.1.2 Policies enhancing the attractiveness of research careers in</td>
<td>38</td>
</tr>
<tr>
<td>Europe</td>
<td></td>
</tr>
<tr>
<td>4.2 Governing research infrastructures</td>
<td>39</td>
</tr>
<tr>
<td>4.3 Research organisations</td>
<td>41</td>
</tr>
<tr>
<td>4.4 Opening up national research programmes</td>
<td>42</td>
</tr>
<tr>
<td>4.5 National ERA-related policies - a summary</td>
<td>43</td>
</tr>
<tr>
<td>5  Conclusions and open questions</td>
<td>45</td>
</tr>
<tr>
<td>5.1 Policy mix towards national R&amp;D investment goals</td>
<td>45</td>
</tr>
<tr>
<td>5.2 ERA-related policies</td>
<td>46</td>
</tr>
<tr>
<td>References</td>
<td>48</td>
</tr>
<tr>
<td>List of Abbreviations</td>
<td>48</td>
</tr>
</tbody>
</table>
1 Introduction

As highlighted by the Lisbon Strategy, knowledge accumulated through investment in R&D, innovation and education is a key driver of long-term growth. Research-related policies aimed at increasing investment in knowledge and strengthening the innovation capacity of the EU economy are thus at the heart of the Lisbon Strategy. This is reflected in guideline No. 7 of the Integrated Guidelines for Growth and Jobs.1 This advocates increasing and improving investment in research and development (R&D), with a particular focus on the private sector. For the period 2008 to 2010, this focus is confirmed as main policy challenge and the need for more rapid progress towards establishing the European Research Area, including meeting the collective EU target of raising research investment to 3% of GDP, is emphasised.

A central task of ERAWATCH is the production of analytical country reports to support the mutual learning process and the monitoring of Member States’ efforts in the context of the Lisbon Strategy and the ambition to develop the European Research Area (ERA). The first series of these reports was produced in 2008 and focused on characterising and assessing the performance of national research systems and related policies in a comparable manner. In order to do so, the system analysis focused on key processes relevant for system performance. Four policy-relevant domains of the research system have been distinguished, namely resource mobilisation, knowledge demand, knowledge production and knowledge circulation. The analysis within each domain has been guided by a set of generic "challenges", common to all research systems, which reflect possible bottlenecks, system failures and market failures which a research system has to cope with. The analysis of the ERA dimension still remained exploratory.

The country reports 2009 build and extend on this analysis by focusing on policy mixes. Research policies can be a lever for economic growth, if they are tailored to the needs of a knowledge-based economy suited to the country and appropriately coordinated with other knowledge triangle policies. The policy focus is threefold:

- An updated analysis and assessment of recent research policies
- An analysis and assessment of the evolution of national policy mixes towards Lisbon R&D investment goals. Particular attention is paid to policies fostering private R&D and addressing its barriers.
- An analysis and assessment of the contribution of national policies to the realisation of the ERA. Beyond contributing to national policy goals, which remains an important policy context, ERA-related policies can contribute to a better European level performance by fostering, in various ways, efficient resource allocation in Europe.

---

2 Characteristics of the national research system and assessment of recent policy changes

2.1 Structure of the national research system and its governance

With a population of 10.6 million people, Portugal has a 2.1% share of the overall EU population. In terms of GDP, the share is smaller, standing at 1.6% of the overall EU GDP. These figures translate into a GDP per capita (in ppp), 73% of the EU average.

Data released in December 2008 by GPEARI, the national statistical authority for R&D statistics, indicated a provisional 2007 GERD estimate of €1,921m, reflecting a steep nominal growth of 60% in relation to 2005 and bringing the GERD/GDP ratio for the first time ever above 1% to 1.18%. However, as this figure is below the average value of 1.83% for the EU in 2007, one infers easily that the Portuguese share in the overall EU GERD (slightly above 1.0%) is still below both its population and GDP shares.

Main actors and institutions in research governance

The leading institution in the governance of the research system is the Ministry of Science, Technology and Higher Education (MCTES). MCTES commands by far the most significant stake in the national S&T budget and it has implemented in recent years two important policies which will impact significantly in the research sector, namely the reform of the government labs and the establishment of a new universities’ governing law. The Ministry for the Economy and Innovation, which initially oversaw the Plano Tecnológico, has meanwhile lost ground in research activities.

The Parliament in Portugal has not had an active role in research policies. MPs see research problems as a topic far from mundane political issues, and normally discuss research policies only when called to pass a law which needs parliamentary backing.

Despite a growing importance by both their contribution to national development and involvement with the local communities, universities often act together in relation to major issues. They are now adapting to the new university law passed in 2008. This potentially provides them with higher levels of autonomy, both in spending and raising funds. Most of the research carried out in Portugal is performed by the universities or in the private non-profit entities which operate in their orbit. The expectation is that the universities will keep the leadership in the performance of research activities (on the assumption that most R&D carried out by firms is related to “development” activities). However, the university governing bodies have had a marginal influence on the orientation of the research conducted within them, since their research centres and institutes are in general autonomous and receive funding directly from the MCTES programmes. The criteria defined by MCTES for the evaluation of those units and the projects they submit to open calls have played a critical role in defining the trajectory of university research.

The Government Labs sector has suffered a significant downsizing in the last two decades, mainly due to the lack of a clear policy. This has been partially compensated by the development of the Associate Labs, which have emerged mainly from the merger of university research centres. The reform of the government labs sector which is now under way points to a greater coordination of activities
between these two types of labs. Such coordination will materialise in the context of disciplinary consortia to be established by both parts.

Overall the research governance model can be characterised as following a top down approach, with few mechanisms for participation by interest groups and society in general. The advisory body of S&T policy, which is foreseen in the MCTES statute, to gather different societal sectors has not yet appointed its members.

The institutional role of the regions in research governance

The national S&T budget is centrally coordinated by both MCTES and the operational programmes under the National Strategic Reference Framework 2007-2013 (NSRF 2007-2013). The governing bodies of the regions in mainland Portugal are appointed centrally and have little role in research orientation. The same however does not apply to the Atlantic regions of Azores and Madeira, which have governments elected by the regional vote and have their own departments overseeing S&T activities. However, the relative size of these activities is quite small, and the certificated research units operating in those regions also benefit from MCTES programme support.

Main research performer groups

The structure of research as regards the sectoral breakdown of GERD remained stable until a few years ago. The funding structure for 2005 reflected the traditional status-quo. In 2005, the Government sector was still in the lead position, with a 56% of the total funding of R&D, while the Business sector was second with 36%. The remaining sectors (“Abroad”, “Private non-profit” organizations, and “Higher Education”) were at a significant distance (respectively with 5%, 2% and 1% of total funding). If one takes the GERD performers perspective, the Business enterprises sector led with a 38% share, slightly ahead the Higher Education sector share of 35%. The Government and the Private non-profit sectors were both quite below the former two sectors, with shares of 15% and 12%, respectively.

The recently released provisional figures for 2007 show a decline of the Government sector share, at least in as concerns the performance perspective, as information on funding has not yet been released. The Business sector is now significantly ahead, with a GERD share of 51% and the Higher Education sector, despite a rising nominal expenditure, experienced a drop to 30%. The Government and Private-Non profit sectors felt similar declines, to 9% and 10%, respectively, being most pronounced in the former sector which had its nominal GERD almost unchanged.

The figure below portrays the national research system and its governance. Four levels are identified in the chart: “policy level”; “finance”; “implementation of the policies”; and “research activities”.

...
2.2 Summary of strengths and weaknesses of the research system

The analysis of section 2.2 is based on the ERAWATCH Analytical Country Reports 2008 which characterised and assessed the performance of the national research systems. In order to do so, the Country Reports focused on key processes relevant for system performance. Four policy-relevant domains of the research system were looked at, namely resource mobilisation, knowledge demand, knowledge production and knowledge circulation. The analysis within each domain was guided by a set of generic "challenges", common to all research systems, which reflect possible bottlenecks, system failures and market failures that a research system has to cope
with. The Analytical Country Report for the specific country can be found in the ERAWATCH web site.

**Table 1: Summary assessment of strengths and weaknesses of the national research system**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Challenge</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Justifying resource provision for</td>
<td>Despite several public statements at the government level in favour of increasing research funding, there is no ample consensus on research policies – the Parliament, business associations and civil society in general are not committed to this issue.</td>
</tr>
<tr>
<td>Resource mobilisation</td>
<td>research activities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Securing long term investment in</td>
<td>Over recent decades, public funding of science has been growing, including block-grant funding allowing for overall research system growth. A possible problem is the eventual decline of EU structural funds.</td>
</tr>
<tr>
<td></td>
<td>research</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dealing with barriers to</td>
<td>Business sector has had a weaker involvement in research financing than government. The growth of high tech and knowledge intensive sectors has been limited. However, the new structural programmes strengthened the incentives for business firms to set up R&amp;D units and foster R&amp;D activities together with other entities.</td>
</tr>
<tr>
<td></td>
<td>private R&amp;D investment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Providing qualified human resources</td>
<td>The number of PhDs and Post-Docs has been growing fast, and recently unemployment among young researchers began to rise. The newly created research positions are of a short-medium term nature and there is apparently a shortage of permanent researcher positions compared to the numbers of PhDs and Post-Docs in the country.</td>
</tr>
<tr>
<td>Knowledge demand</td>
<td>Identifying the drivers of knowledge</td>
<td>Business firms, public procurement and other stakeholders have not been active in setting the agenda for research demand in the Portuguese research system, despite of a few positive moves in recent years. However, the growth of the scientific community and the quality of the research performed in many labs offers opportunities for fruitful university-industry collaboration and the development of a spin-off research-based company sector.</td>
</tr>
<tr>
<td></td>
<td>demand</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Co-ordination and channelling knowledge</td>
<td>Coordination mechanisms have been largely absent or non-operational. However, recent initiatives, namely in the health business sector and led by the COTEC association, together with the “Competitiveness and Technology Poles” measure, may have a positive impact.</td>
</tr>
<tr>
<td></td>
<td>demands</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitoring of demand fulfilment</td>
<td>No mechanisms of this type exist</td>
</tr>
<tr>
<td>Knowledge production</td>
<td>Ensuring quality and excellence of</td>
<td>There has been a sustained effort towards increasing the quality of academic research. As part of this strategy the creation of Associate Labs has stimulated that quality further while Government Labs have lost relevance and financial resources. The system of international evaluation of the research units funded by FCT has also promoted research quality.</td>
</tr>
<tr>
<td></td>
<td>knowledge production</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ensuring exploitability of knowledge</td>
<td>The concern with exploitability of research-based knowledge production has been very limited. Existing incentive systems (financing criteria, academic and scientific careers statutes) do not provide stimulus for exploitability, exacerbating the consequences of low demand for R&amp;D by the Portuguese business sector. Some measures included in the new SAESCTN, such as the RTD Voucher, seem to be headed to counter this problem. The policy guidelines depicted in the NRP 2008-2010 continue to put the emphasis on research, with low exploitability concerns.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Knowledge circulation**

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitating circulation between university, PRO and business sectors</td>
<td>There is a weak tradition of university-industry collaboration. There have however been some positive signs recently, including the development of cluster policies and initiatives (Competitiveness and Technology Poles and other clusters).</td>
</tr>
<tr>
<td>Profiting from international knowledge</td>
<td>There has been an active policy of pushing Portuguese researchers towards &quot;internationalisation&quot;, including the recent agreements with foreign universities and R&amp;D organisations. The involvement with top international universities and research organisations can be seen as part of this effort. Though involving several firms, such agreements concentrate mostly on purely academic activities. The capacity to attract FDI in R&amp;D areas has been limited, despite some advances in 2008.</td>
</tr>
<tr>
<td>Enhancing absorptive capacity of knowledge users</td>
<td>The poor absorptive capacity of the majority of Portuguese enterprises has not been fully addressed by corresponding policies strengthening the diffusion of knowledge. The existing diversity of intermediary entities has not been matched by proper action. A positive feature is the intention to strengthen the support to firms so that they set up R&amp;D facilities</td>
</tr>
</tbody>
</table>

Academic research has advanced in scale and scope in recent decades in Portugal. Scientific output has been rising continuously since the mid 1970s and scientific publications in international journals (ISI) have been growing at a rate above 10% per year (GPEARI, 2008a)). However, significant shortcomings exist in adapting the supply of knowledge to societal demands and ensuring exploitability. The problem is, however, not just on the supply side. Society in general has not been able to clearly articulate its demands from research. Business firms in particular have not been able to influence significantly the country’s research agenda. This reflects the economic structure (fragility of high tech and knowledge intensive sectors, small average size of firms) and the inability of firms to put forward their demands. Further public procurement has not been used as an instrument to link research to practical needs, although the new **Public Contracts Code** may drive a change in this regard. This dualistic development reflects a lack of systemic integration between the main stakeholders. Such a lack of integration has jeopardised the intended dissemination of knowledge.

The governance model that has developed is characterised by a top-down approach with few mechanisms for stakeholders’ involvement and participation. Despite growing public investment in research and a significant stimulus to scientific quality improvement, the centralisation of policy- and decision-making has not allowed the maturing of a balanced research and innovation system. Recently, however, there have been some positive moves from the private business sector to promote greater coordination between research supply and application. Also, the policy measure of the NSRF 2007-2013 for promoting Competitiveness and Technology Poles might contribute in a similar direction.

### 2.3 Analysis of recent policy changes since 2008

The contribution of research and research policies to Lisbon goals (as well as to other societal objectives) goes beyond the fostering of R&D investment. It is therefore important to also analyse how other remaining shortcomings or weaknesses of the research system are addressed by the research policy mix. The focus of the section is on the analysis of main recent policy changes which may have a relevant impact on the four policy-related domains.
Recent policy changes in Portugal have broadly followed the basic orientations defined earlier, namely in the Technological Plan, the science policy document Commitment to Science for the Future of Portugal (Commitment to Science), disclosed in 2006, and the National Strategic Reference Programme 2007-2013 (NSRF 2007-2013). Therefore, new policy developments have been relatively limited, being broadly consistent with the policy documents mentioned above.

2.3.1 Resource mobilisation

The Portuguese government has consistently considered investment in science, technology and innovation to play a key role in contributing to enhance long-term economic development. This perspective has been behind the major science policy documents and also the Lisbon National Reform Plan (NRP), both in the initial version for 2005-2008 and in the recent extension for 2008-2010 (for details see the box on the NRP below).

In line with this, budgetary allocations for science and technology, and particularly for R&D, have considerably increased in recent years. GBAORD reached €1,852m in 2009, corresponding to about 1.07% of the GDP forecast for this year. A comparison with similar data for 2007 reveals a GBAORD increase of almost 50%, from €1,272m in 2005 (GPEARI, 2008b). As a result, the share of the R&D budget in the overall Government Budget went up, from 2.6% in 2007 to 3.4% in 2009. In the same period, the share of Science and Technology allocations increased from 2.9% to 3.6%. As the Government has strongly underlined, in 2008 the ratio of GBAORD to GDP exceeded 1% for the first time and data for 2009 indicate another increase to the above mentioned 1.07% (GPEARI, 2008b). This shows that at least in terms of Government financial allocations, Portugal is complying with the Barcelona objectives; however, the effectiveness of such an increased expenditure has also to be taken into consideration. A recent Parliamentary report has underlined this issue.

The cooperation with US Universities, namely with the MIT, Carnegie-Mellon and the University of Texas at Austin, mentioned above, has been pursued. The agreement with MIT is focused on bio-engineering systems, engineering design and advanced manufacturing, sustainable energy systems, transportation systems and management sciences. The cooperation with Carnegie-Mellon is in four main fields: information processing and networking; critical infrastructures and risk assessment; technology, innovation and policy; and applied mathematics. Digital media, advanced computing and mathematics are the key domains of the cooperation with the University of Texas at Austin; this also includes the University Industry Enterprise network (UTEN), aimed at technology transfer, whose activities will be mentioned in the knowledge circulation section (2.3.4 below).

The Commitment to Science expressed the intention to create one thousand new research jobs by 2009, through post-doc positions in research institutions. This process is under way and calls for the recruitment of new doctors have been launched by many R&D organizations, namely Associate Laboratories and larger research units. The NRP 2008-2010 mentions the intention to create at least 500 new research jobs for PhD holders. Also in the field of mobilising human resources for science, a programme for the creation of Invited Chairs, supported by companies, has been launched. Several Portuguese companies have already expressed the

---

2 This positive development has, however, been accompanied by a decline in budgetary allocations for Higher Education.
intention to participate to support such Chairs. Foreign investors also seem to appreciate this programme: for example, Toshiba has supported the Atsutoshi Nishida Chair for research on digital contents and education technologies. Another example of resource mobilization through cooperation with multinational firms is the agreement entered into with Sun Microsystems. This involves the development of open education systems and research cooperation between the company and Portuguese research organisations on emerging digital systems and open code applications.

Another relevant initiative to mobilise resources for scientific and technological activities is the revision of SIFIDE, the tax incentive system to promote company R&D activities. The Portuguese Initiative for Investment and Employment (Law 10/2009, of March 10, 2009) provides a significant increase in SIFIDE support rates. The basic rate for exempting R&D expenditures from income tax has been increased to 32.5% from 20%. The maximum allowed for use of the incremental rate has doubled to €1.5m.

In the programme of reform of Government Laboratories, a call has been issued for the creation of R&D Consortia in the following fields: (1) biosciences and biotechnology, particularly on applications to agriculture, forests and fishing (Biopolis); (2) Physics and advanced computing (Física-N); (3) public risks (Riscos); (4) Oceanography and marine sciences and technologies (Oceanos); (5) Space sciences and technologies (Espaço); and promotion of Portuguese participation in European security-focused R&D (Segurança).

### Changes in National Reform Programme regarding the role of research in the broader economic growth strategy

The new NRP 2008-2010 strongly acknowledges the key role played by science and technology in improving the country’s competitiveness in a globalised world. The revision of the NRP explicitly acknowledges that it follows the four areas defined as key in the context of the Lisbon Strategy, namely that dealing with “intensifying research, development and innovation”.

The document starts with a review of the recommendations and the challenges identified by the Commission with regard to the implementation of the NRP 2005-2008. One of them concerns R&D policy. It states that the country should “pursue the application of the technological plan, consolidating the links between research, higher education and industry, and encouraging greater participation by the private sector”.

Area 3 of the NRP 2008-2010 is specifically focussed on “more R&D and a better innovation system”. The relevance of strengthening R&D and innovation is mentioned once more. The key thrust of this part of the NRP is continuity: it is argued that the policy followed has so far led to good results, and should therefore be pursued. A list of some 20 measures is presented, most of them corresponding to the continuation of the policies. There are however a few new features, including: creation of new thematic S&T networks; revision of the scientific patronage law; and promotion of research in the area of social gender relations.

The recently disclosed assessment of Portugal’s NRP 2008-2010 is not very critical about the policy intentions expressed in the R&D field. It recognises the effort undertaken to strengthen R&D activities and the achievements so far. It warns, however, that “the targeted tripling of business R&D by 2010 may be difficult to reach despite a recent recovery in business R&D expenditure”. It also underlines...
that in spite of positive developments “the innovation system still presents systemic deficiencies, in particular a weak inter-linkage among its various actors”. The way in which the measures on the development of collective efficiency strategies (namely clusters and technology and competitiveness poles) will be implemented is envisaged as a critical issue to respond the identified linkage weaknesses.3

There were also policy developments with regard to the “Code of Public Contracts” (Código dos Contratos Públicos, 2008). As mentioned in the 2008 EW Analytical Country Report on Portugal, this law makes compulsory that all public contracts over €25m shall reserve between 0.5 and 1% of their contracted value to finance R&D activities on matters related to the subject of the contract concerned. The procedures for following up the implementation of the Code on such R&D assignments were laid down by the Ministerial Decree 701-J/2008 of 29 July. According to this, the implementation of R&D projects under the purview of the Code shall be coordinated, followed, audited and controlled by a commission created for such purpose and whose members are nominated by the Ministers for Science, Technology and Higher Education and for Public Works, Transports and Communications.

Table 2: Main policy changes in the resource mobilisation domain

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Main Policy Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Justifying resource provision for research activities</td>
<td>• Sustained commitment to strengthen research capabilities and activities in Portugal; this has been expressed in several documents since 2005 and public funding of research has been rising, and more recently in the new NRP 2008-2010; another expression of such a commitment has been the increase in GBAORD, expected to exceed 1% of GDP for 2009.</td>
</tr>
</tbody>
</table>
| Securing long term investments in research       | • Definition of control procedures regarding the implementation of the R&D assignments laid down in the Code of Public Contracts.  
|                                                | • Launch of call for new R&D Consortia.                                               |
| Dealing with uncertain returns and other barriers | • Strengthening of the tax incentive system to foster R&D activities.  
|                                                | • Review of industrial property law.                                                   |
| Providing qualified human resources              | • Continued support to higher education in S&T.  
|                                                | • Intention to create 500 new jobs for researchers until 2010.  
|                                                | • Development of the Invited Chairs programme                                         |

2.3.2 Knowledge demand

The main developments with regard to knowledge demand stem from earlier policy documents and initiatives mentioned above, namely the Commitment to Science and the contracts with US universities. Also worth mention is the new law of Higher Education institutions passed in September 2007.

This law is under implementation and the statutes of the individual universities are already defined. Only a few have chosen to become foundations, an option provided

by the Law. The process of drafting and agreeing on the statutes of the faculties under the different universities is under way, and the electoral processes to the various governing bodies will follow. The law will strengthen a process started a dozen years ago of increasing the relevance of research units and associated laboratories as research performers, as these units are required by the new law to perform certain roles in the scientific management of universities. However, despite a decline in their own research funds, universities still play a key role in fostering knowledge demand.

Some initiatives launched in the context of the NSRF 2007-2013 have also contributed to influence knowledge demand. For instance, the launch of the RTD and Innovation Vouchers enable companies to better express their demands to RTD organizations. Additionally, other research promotion initiatives under the NSRF 2007-2013 contribute to shape and make explicit research demand. Examples include the Competitiveness and Technology Poles (CTPs), which will be established in several economic fields and regional clusters as well as the launch of a call on co-promotion of R&D projects under the Support System for Scientific and Technological Organisations (SAESCTN). The measure on CTPs will be addressed in more detail below under the 'knowledge circulation' topic.

As pointed out in Table 3, the main features of knowledge demand have remained almost unchanged with regard to the 2008 EW Analytical Country Report on Portugal.

Table 3: Main policy changes in the knowledge demand domain

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Main Policy Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifying the drivers of knowledge demand</td>
<td>• New programmes under NSRF 2007-2013.</td>
</tr>
<tr>
<td>Co-ordinating and channelling knowledge demands</td>
<td>• New law for Higher Education institutions.</td>
</tr>
<tr>
<td></td>
<td>• Partnerships with US Universities.</td>
</tr>
<tr>
<td></td>
<td>• New programmes under NSRF 2007-2013.</td>
</tr>
<tr>
<td>Monitoring demand fulfilment</td>
<td>• Evaluation exercises have been carried out, the last</td>
</tr>
<tr>
<td></td>
<td>one dating from 2005. Such exercises were usually</td>
</tr>
<tr>
<td></td>
<td>related to the process of evaluating programmes</td>
</tr>
<tr>
<td></td>
<td>supported under the CSF.</td>
</tr>
</tbody>
</table>

2.3.3 Knowledge production

The two key tenets of knowledge production have also remained mostly unchanged. They may be summarised as follows: (1) a strong and sustained commitment to increase the size and the quality of research and, therefore, of knowledge production; and (2) a weak concern with the exploitability of knowledge production.

One should acknowledge, however, the existence of signs of a move towards an increase in exploitability concerns, although mostly within a linear, technology transfer perspective. These include the launch of the Technology Supply and Demand Marketplace, by the Innovation Agency (AdI), and the UTEN initiative under the partnership with the University of Texas at Austin. More detail about these initiatives is provided in section 2.3.4. Further NSRF measures on CTPs and clusters are expected to improve the bridging between knowledge production and economic exploitation.

In the period under analysis, the international evaluation of FCT's research units was completed and its results publicly disclosed. The report confirms a sustained increase in the numbers of researchers holding a doctoral degree (an increase of
about 42% with regard to 2003). In line with the goal of enhancing the quality of the research performed, the number of units benefiting from the FCT (Foundation for Science and Technology, which acts as research council) support has experienced a significant reduction, though this has been more than compensated from rises in the funds allocated to the supported units; these quality requirements have also resulted in an increasing scale of the research units achieved through the merger of existing units. Meanwhile, a similar evaluation process for the associate laboratories is under way at the time of writing.

As presented in detail under Section 2.3.1, a call for R&D Consortia in six scientific fields has been launched in the context of the reform of government laboratories. Such consortia are expected to play an important role in contributing towards achieving the critical mass required to carry out internationally relevant research in the fields concerned.

A number of firms have benefited from support for R&D in the context of the ‘Compete’ programme 4, particularly in respect to the creation of R&D teams and centres and the launch of individual or cooperative R&D programmes. The above mentioned agreement with Sun Microsystems may also lead to enhancing Portuguese research in the scientific domains concerned (open education systems, emerging digital systems and open code applications) as well as ensuring exploitability of the knowledge developed between the company and Portuguese research organizations.

Table 4: Main policy changes in the knowledge production domain

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Main Policy Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improving quality and excellence of knowledge</td>
<td>• Evaluation of research units (already completed)</td>
</tr>
<tr>
<td>production</td>
<td>• Evaluation of associate laboratories (in progress at</td>
</tr>
<tr>
<td></td>
<td>the time of writing)</td>
</tr>
<tr>
<td>Ensuring exploitability of knowledge production</td>
<td>• Technology transfer initiatives.</td>
</tr>
<tr>
<td></td>
<td>• Increasing support to the creation of in-house R&amp;D</td>
</tr>
<tr>
<td></td>
<td>capabilities by companies.</td>
</tr>
<tr>
<td></td>
<td>• (Note: exploitability has not been a major concern of</td>
</tr>
<tr>
<td></td>
<td>research policy).</td>
</tr>
</tbody>
</table>

2.3.4 Knowledge circulation

The key headlines of policy regarding knowledge circulation were also defined in the documents and programmes mentioned earlier. Therefore, there are no major developments or policy initiatives in the period under review. Again, these come in the wake of orientations already defined.

The above considerations apply to several issues already referred to in the 2008 EW Analytical Country Report. These include namely two initiatives addressed to promote international knowledge circulation. These are the following:

- the continuation of the “programme of international partnerships in science, technology and higher education” with US Universities and with Fraunhofer Gesellschaft; and

- the creation of the office for promoting the Portuguese participation in the 7th Framework Programme (GPPQ).

---

4 ‘Compete’ is the new label for the Competitiveness Factors Operational Programme under the NSRF2007-2013.
Partnerships were established with the following US Universities: MIT, Carnegie Mellon, and University of Texas at Austin. These are focussed on different subjects. The agreement with Fraunhofer addresses five main fields: information and communication technologies, biotechnology, nanotechnologies, advanced production engineering, and logistics. It provides also for the establishment of a Fraunhofer research institute in Portugal.

The GPPQ is aimed at encouraging the participation of Portuguese organisations in FP 7. Created by the MCTES, it is intended to bridge researchers and companies involved in FP7, through the coordination of the delegates to EC Committees, the representatives in Technological Platforms and Joint Technology Initiatives, and the National Contact Points network.

With regard to knowledge circulation between research organizations and the domestic industrial fabric, several measures were already included in the NSRF 2007-2013, and more specifically in the ‘Compete’ programme. These include mobilising projects, demonstration projects, co-promotion of R&D projects, collective R&D projects and the RTD Voucher. Although not specifically aimed at knowledge circulation, the measures on the creation of R&D teams and centres in companies are also relevant due to their objective of increasing the absorptive capacity of firms. Other initiatives, taken in earlier rounds of the Community Support Framework (CSFs), were the OTICs - Knowledge and Technology transfer Offices created in the main Universities and GAPIs, the Industrial Property Support Offices.

The most relevant measures for knowledge circulation under the ‘Compete’ Operational Programme are the CTPs and clusters. In particular, CTPs are expected to provide a shared context enabling cooperation between R&D organizations, companies and other players in order to develop, share and apply knowledge to enhance the country’s international competitiveness in the fields concerned. In November 2009, the applications for CTPs and clusters were disclosed and the final evaluation procedure started. An evaluation panel analysed the proposals paying particular attention to the following aspects: strategic vision, headlines of the programme of activities, structural relevance of the projects, characteristics and involvement of the promoters, and the governance model. As of March 2009, the evaluation panel had taken their recommendations, including suggestions for changes to correct weaknesses in the proposals concerned, but the final disclosure of the CTPs to be supported was expected to take place by April 2009.

Two other initiatives led by AdI have also addressed knowledge circulation. One was the Innovation Days, held in November 2008. These were an exhibition of the achievements of Portuguese R&D organizations, open to the general public. More specifically, the initiative had three main objectives: to diffuse R&D results; to support economic exploitation of R&D results; and to foster the development of partnerships between “entrepreneurs, researchers and investors”. The other one is the launching of the Technology Supply and Demand Marketplace. This is intended to be a brokerage instrument managed by AdI to enable the match of knowledge supply and demand. This instrument is supplemented by brokerage events to foster a more appropriate matching of supply and demand, often in connection with European brokerage initiatives.

Another tool to promote knowledge circulation is the above mentioned UTEN. This corresponds to the replication of a technology transfer methodology developed at the University of Texas at Austin. A consortium of Portuguese universities and research centres with the IC² Institute of the University of Texas at Austin was set up with a
view to accelerate processes of science and technology innovation and commercialisation focusing on US market access.

**Portugal was in charge of Eureka’s presidency between July 2008 and June 2009.**

The Portuguese presidency aimed at strengthening the partnerships and the collaboration between research, business and financing players from different countries to develop new projects in common. The closing conference, ‘Innovation Days’, was held in Lisbon between 18 and 20 June 2009. Associated with the European Year for Creativity and Innovation, this conference was envisaged as a forum to promote knowledge circulation.

### Table 5: Main policy changes in the knowledge circulation domain

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Main Policy Changes</th>
</tr>
</thead>
</table>
| Facilitating knowledge circulation between university, PRO and business sectors | • Competitiveness and Technology Poles (CTPs)  
• Technology Supply and Demand Marketplace.  
• UTEN – University Technology Enterprise Network.  
• Innovation Days. |
| Profiting from access to international knowledge | • Partnerships with US Universities and with Fraunhofer Gesellschaft.  
• Creation of the office for promoting the participation in the FP (GPPQ) |
| Absorptive capacity of knowledge users | • Creation of R&D teams (NITECs) and centres (CITECs) in companies. |

### 2.4 Policy opportunities and risks related to knowledge demand and knowledge production: an assessment

Following the analysis in the previous section, this section assesses whether the recent policy changes respond to identified system weaknesses and take into account identified strengths.

The most significant policy opportunities arise from the NSRF programmes whose implementation is now reaching cruising speed. These programmes contribute to funding of new R&D activities of considerable size and they may help to keep Portuguese GERD/GDP ratio above 1 per cent over the near future. The NSRF funds represent an opportunity for new approaches regarding stakeholders’ coordination, clustering and promotion of the systemic relationships which have been so far by and large neglected. The Competitiveness and Technology Poles measure of NSRF will facilitate communication between knowledge demand and supply and facilitate coordination. The research consortia that are now being set up between the government labs and other actors may act in a similar direction. The new university governance law is also offering the possibility that research units have a more active say in managing universities’ activities.

The main policy risks stem from two different aspects. The first one is of a short term nature and is not directly related with the recent policy developments reviewed above. It has to do with the current economic and financial climate. The deepening and lengthening of the recession might jeopardise the GERD growth that Portugal has experienced in recent years. In particular business firms might feel tempted to cut back their R&D investments if they do not perceive an economic upturn in the short term. The simple decline in profits will make firms less prone to use the SIFIDE (the R&D incentives system, see Section 3.4 below on this), affecting their willingness to report R&D expenditure. The second risk has to do with a structural aspect, which is the lack of systemic integration between the research and innovation
stakeholders. With regard to this there is the possibility that the private business sector, public procurement and civil society organizations will not mature rapidly enough in terms of the capability to influence the country’s research agendas. This situation may lead to a widening gap between knowledge production and application.

Table 6: Summary of main policy related opportunities and risks

<table>
<thead>
<tr>
<th>Domain</th>
<th>Main policy opportunities</th>
<th>Main policy-related risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource mobilisation</td>
<td>Government commitment and the resources of the NSRF 2007-2013, might help to keep public financing of research at historically high levels.</td>
<td>If recession deepens and lengthens BERD might incur a severe drop. The lack of generalised consensus about research investment might also jeopardise current priorities. Further competitive funding increase and the incapacity to provide stable jobs may negatively impact on the sustainability of the research system.</td>
</tr>
<tr>
<td>Knowledge demand</td>
<td>The NSRF 2007-2013 seems to be leading to a wider coordination between knowledge supply and demand through the establishment of cluster-based policies. Further, as advisory bodies have been inactive, there is scope for improving coordination.</td>
<td>The focus on academic excellence per se might further widen the gap between research activities and societal needs. Despite the code of public contracts passed in 2008 requiring that large investments shall contribute to R&amp;D activities, the persistence of public investment in large conventional infrastructure projects is not in line with the idea of using public procurement as a technology development lever.</td>
</tr>
<tr>
<td>Knowledge production</td>
<td>Government efforts to keep research funding higher than in the past will facilitate further growth in scientific publication. The university law reform might also bring opportunities for an improved climate for academic research activities. In relation to applied knowledge and exploitability there is large scope for improvement. In particular the development of cluster policies and the establishment of research consortia led by government labs may stimulate such development.</td>
<td>The persistence on a linear model approach will not help an integrated, systemic development. The absence of clear S&amp;T and research policy priorities and the passivity in making consultative councils work may limit the convergence of perspectives needed to improve exploitability.</td>
</tr>
<tr>
<td>Knowledge circulation</td>
<td>Besides the points mentioned above, the sustained commitment to promote company R&amp;D units is expected to provide opportunities for knowledge sharing. The launch of innovation and R&amp;D vouchers may entice a demand for research services.</td>
<td>Absence of stimulation of long term cooperation between different stakeholders, together with the inactivity of policy advisory mechanisms, may not facilitate the development of consensus and the dissemination of knowledge.</td>
</tr>
</tbody>
</table>

3 National policy mixes towards R&D investment goals

The aim of this chapter is to deepen the analysis of national policy mixes with a focus on public and in particular private R&D investment. The Lisbon strategy emphasises an EU overall resource mobilisation objective for 2010 of 3% of GDP of which two thirds should come from private investment. R&D investment is seen as important yardstick for the capacity of an economy to turn the results of science and research into the commercially viable production of goods and services and hence
knowledge into growth. Corresponding investment policies are mainly pursued at national level and determined with a national focus.

The chapter is structured around five questions:

1. What are the specific barriers in the country that prevent reaching the Lisbon goal? What barriers exist in the country to prevent reaching the specific targets, particularly related to the private sector R&D investments?

2. Given the above, what are the policy objectives and goals of the government that aim to tackle these barriers?

3. What Policy Mix routes are chosen to address the barriers and which specific instruments and programmes are in operation to implement these policies?

4. What have been the achievements in reaching the above mentioned R&D investment objectives and goals?

5. What are the reasons for not reaching the objectives, adaptation of the goals?

The chapter aims to capture the main dimensions of the national policies with an emphasis on private R&D investment. The chosen perspective of looking at investments in R&D is the concept of Policy Mixes. The analysis and assessment follows a stepwise approach following the five questions mentioned above.

### 3.1 Barriers in the research system for the achievement of R&D investment objectives

The various policy documents on science, technology and innovation policy (including the Technological Plan, the Commitment to Science, the NSRF 2007-2013 and the NRPs 2005-2008 and 2008-2010) have all converged in stressing the need to foster R&D activities, both in the public and in the business enterprise sector. However, as mentioned in page 3 above, the NRP 2008-2010 appears to be mainly focussed on the promotion of public R&D expenditures.

As explained in the EW Country Profile, GBAORD has experienced a consistent increase in the 2007-2009 period, almost reaching a 50% growth. The public (or “institutional sector”, as it is called in the R&D statistics for 2007) (see Godinho & Simões 2009) is closer to the Barcelona objectives than the business enterprise sector. In spite of the recent growth of R&D expenditures in this sector, which have for the first time ever exceeded those of the “institutional sector”, the main barriers for the achievement of the Barcelona 3% objective still concern the mobilisation of company resources for R&D.

This mobilisation is hampered by five main factors, as explained in detail in the ERAWATCH Country Report 2008. The first concerns the structure of the Portuguese economic fabric. The share of technology and knowledge intensive sectors is limited. The structural changes that occurred in the 1990s led mainly to the growth of specialised suppliers, rather than to science-based businesses. The second relates to firm size. This problem is compounded by the weak absorptive capabilities of most companies. They suffer from managerial and marketing weaknesses that hinder the development of competitive strategies in the context of which R&D activities might be pursued. The distance from large and demanding markets, in which sophisticated customers play a key role, is another reason to

---

explain the low commitment by business firms to R&D. The fifth factor concerns the lack of a dynamic private venture and risk capital industry in Portugal. Commercial banks have traditionally been reluctant to lend money to start-ups in science-based areas. The problem is strengthened by the underdevelopment and ‘shallowness’ of capital markets in the country.

To these barriers, a policy bias might be added. Despite the success of public research policy, it has been based on the assumption that the development of academic research would necessarily lead to a more dynamic and technologically sophisticated industrial fabric. This reasoning seems to be behind the rationale for the measures suggested for R&D and Innovation in the NRP 2008-2010. There are of course several examples of successful research spin-offs and technology-based new firms. However, as pointed out in the EW 2008 Analytical Country Report on Portugal, the effect of positive spillovers from research in bringing about a structural change in the industrial fabric cannot be taken for granted.

However, recent developments in company attitudes indicate signs of change in a positive direction. The COTEC Portugal initiative on the sustained development of innovation in companies has brought the need to spur company investment in R&D and innovation to the foreground. The above initiative has included the launch of a process of certification of company research, development and innovation activities as well as an ‘Innovation Scoring’ tool for companies. The new ‘Compete’ programme also puts a focus on research and innovation. The uptake of the RTD Incentive System by firms has been below expectations. This fact cannot be dissociated from the present international crisis, but it shows nonetheless the difficulties in achieving a sustained growth in business sector R&D activities.

3.2 Policy objectives addressing R&D investment and barriers

The Government has defined clear goals with regard to R&D investments. These were laid down in the Technological Plan, and reaffirmed in the Commitment to Science as well as in the NRPs 2005-2008 and 2008-2010. The goals were (Plano Tecnológico, 2005: 26 and 54): (1) Achieving a three-fold increase in business enterprise R&D, to reach 0.8% by 2010; and (2) Doubling the level of public investment in R&D to meet the 1% Barcelona target by 2010.

Area 3 of the NRP 2008-2010, which deals with “more R&D and a better innovation system”, recalls the above objectives and puts forward five guidelines to drive national policy in that regard (NRP 2008-2010, 2008:Part II, 34):

- Investing in Knowledge and in scientific and technical competence measured at the highest international level;
- Investing in human resources and in the Scientific and Technological Culture;
- Investing in public and private R&D institutions, in their reinforcement, responsibility, organisation and network infrastructure;
- Investing in Internationalisation, High Standards and in Evaluation;
- Investing in economic Valorisation of Research.”

---

6 See the development of this argument in 3.2 below.
7 COTEC Portugal is a business association, created under the aegis of Mr. Jorge Sampaio, the former President of the Republic, whose membership includes the biggest Portuguese firms as well as a network of innovative SMEs.
These guidelines are, however, mainly concerned with public R&D, carried out in the context of route 6, than with business enterprise R&D. There is also a reference to the objective of promoting the cooperation between companies and R&D organizations, but there are no specific guidelines regarding the encouragement of company R&D investments. The key driver for change appears to be public R&D, which may not be the most appropriate lever to stimulate private business R&D. In fact, should the focus be put on public R&D, the weaknesses identified earlier concerning the barriers to a stronger business enterprise investment in R&D (and innovation) will not get a consistent response.

There are several developments, however, that might lead to actual business R&D growth. The RTD Incentive System, supported in the context of the NSRF 2008-2010, already includes several measures aimed at encouraging companies to carry out R&D activities, while high tech entrepreneurship is supported under the Innovation Incentive System. Several measures under both Incentive Systems, such as NITEC and CITEC (in RTD IS) and Innovation projects (under Innovation IS), are aimed at strengthening companies’ absorptive capabilities, a key consideration to induce companies to follow the ‘capability ladder’ that may lead them to invest in research at a later stage. Another relevant aspect in improving absorptive capacity concerns the employment of more skilled labour, addressed by the Human Potential Operational Programme under the NSRF 2007-2013.

3.3 Characteristics of the policy mix to foster R&D investment

This section is about the characterisation and governance of the national policy and instrument mix chosen to foster public and private R&D investment. While policy goals are often stated at a general level, the policy mix has a focus on how these policy goals are implemented in practice. The question is what tools and instruments have been set up and are in operation to achieve the policy goals? The following sections will each try to tackle a number of these dimensions.

3.3.1 Overall funding mechanisms

The purpose of this section is to provide a perspective of the pattern of public funding for R&D. To draw such a pattern one should take into account that ‘public’ funding for R&D in Portugal comes from two main sources: the national budget and European funds, namely from FEDER. The first source is the most important. It encompasses direct allocations (corresponding to GBAORD) and indirect ones, relating to tax incentives to R&D; unfortunately there is no available information on the amount assigned to tax incentives. The relevance of European funding should not be overlooked. In fact, considering the ‘Compete’ programme only, the amount assigned to Axis 1, focused on ‘Knowledge and Technological Development’, corresponds to €500m; to this amount one should add the FEDER funds assigned to R&D activities in the context of the Regional Plans.

Drawing from the information presented in the EW Baseload Inventory, it is possible to get a general perspective of GBAORD evolution and structure. GBAORD experienced a significant increase between 2007 and 2009, from €1,272m to €1,852m. In this period, the share of R&D in the total Government budget has grown

---

9 See also GPEARI (2009).
from 2.6% to 3.4%, while the ratio between GBAORD and GDP improved from 0.78% to 1.07%.

A caveat is needed with regard to GBAORD structure. In the absence of detailed statistics, an estimation exercise has been carried out, based on actual data available as well as on historical trends10. An analysis by type of financing shows that the pattern is dominated by ‘Institutional support’, which accounts for almost one half of GBAORD for 2009 (for 2007 its weight was even higher, reaching around 58%). The share of ‘Project-based funding’ corresponded to about one quarter of the total for 2009.

Generic instruments dominate the scene. This is confirmed by the low share of targeted and thematic funding in GBAORD (below 10%). This feature has to do with the research policy approach followed since the 1980s and more specifically since 1995. The argument for the low significance assigned to thematic issues is that the country needs first to overcome scientific and technological backwardness as a whole, without being ‘biased’ by very specific thematic or sectoral considerations. Improving the quality of the R&D system, as measured by academic patterns, has been the chief objective. Therefore, most calls for R&D projects are addressed to all scientific fields.

There are, however, signs that in the future ‘targeted and thematic funding’ will increase in the future. This idea is based on four arguments. First, the reform of the government laboratories identified several scientific and technological fields requiring a stronger focus. In this vein, as mentioned in section 2.3.1 above, a call has recently been launched for the creation of R&D consortia in six specific fields. Second, the agreements with the US Universities and the Fraunhofer Gesellschaft address well defined thematic areas. Third, the creation of the Iberian Nanotechnologies Laboratory clearly portrays an increased concern with and investment in this scientific field. Fourth, the MCTES has underlined that the Portuguese scientific system is already consolidated; this may be interpreted as indicating that the system is mature enough for thematic choices to take place in the near future.

3.3.2 Policy Mix Routes

The “Policy Mix Project” identified the following six ‘routes’ to stimulate R&D investment:

1. promoting the establishment of new indigenous R&D performing firms;
2. stimulating greater R&D investment in R&D performing firms;
3. stimulating firms that do not perform R&D yet;
4. attracting R&D-performing firms from abroad;
5. increasing extramural R&D carried out in cooperation with the public sector or other firms;
6. increasing R&D in the public sector (see Nauwelaers 2008).

The routes cover the major ways of increasing public and private R&D expenditures in a country. Each route is associated with a different target group, though there are overlaps across routes. The routes are not mutually exclusive as, for example, competitiveness poles or cluster strategies aim to act on several routes at a time.

---

10 For more specific information on this exercise, see the EW Baseload Inventory.
Within one ‘route’, the policy portfolio varies from country to country and region to region depending on policy traditions, specific needs of the system etc.

In Portugal, the launch of the new NSRF 2007-2013 entailed several changes to the portfolio of measures to support R&D, which was analysed in the country review undertaken in the context of the ‘Policy Mixes’ project (see Simões et al. 2007). Although there has been a line of continuity with the past in most routes, the NSRF 2007-2013 brought about two major changes: first, a revision of the support measures; and second, and most importantly, a significant increase in the weight assigned to Route 5.

At present, it is impossible to undertake an exercise similar to the one reported in the above mentioned document, since financial information on the ‘Compete’ programme, where most measures are included, corresponds to 7-year budgets only and does not distinguish specific measures. Therefore, the comments below on the relative weight of the various ‘routes’ should be interpreted with care.

**Route 1: Promoting the establishment of new indigenous R&D performing firms**

In the last five years, several initiatives have been taken to promote the establishment of new technology-based firms. These are presented in detail in the joint TC/EW database and include:

a. NEST-New Technology Based Companies, which has been in force since December 2002, in the context of PRIME, the Specific Programme for the Modernisation of the Portuguese Economy;

b. SIPIE for technology based firms, dealing with both the creation and further development of technology-based firms, replacing NEST;

c. NEOTEC to support early-stage phases of technology focussed entrepreneurial projects;

d. FINICIA, launched in 2006, is aimed at providing financial support to the creation of new companies, with a specific vector to support “high innovation content projects”; and

e. Entrepreneurship Projects, under the Innovation Support System of ‘Compete’ (NSRF 2007-2013), created in 2007. This measure is not exclusively addressed to new R&D performing firms. So far, the take up of this measure appears to have been limited.

f. At sectoral level, there are also measures intended to promote the development of Science and Technology Parks as well as of incubator facilities.

Several Portuguese innovation policy analysts (see Godinho and Simões 2005 and Augusto Mateus e Associados 2006) have converged in pointing out the incentive systems to promote entrepreneurship have failed, and a thorough redesign and ambition in public policy in this field is needed.

**Route 2: Stimulating greater R&D investment in R&D performing firms**

This has been, since the mid-1990s, addressed by various incentive systems, of a financial and tax nature. In the fiscal field, there is one system providing tax credits to investments in R&D (SIFIDE). Discontinued in early 2005, the system was relaunched by the present Government shortly after taking office. For the fiscal year
2009, the incentives granted under SIFIDE have been significantly increased, as mentioned in 2.3.1 above.

Financial incentives to R&D activities have been granted under several programmes under PRIME (2000-2006). In the present ‘Compete’ programme, launched in 2007, there is a significant number of projects addressed to enhancing R&D investments by R&D performers. These include the following:

1. Individual Company Research and Technological Development (RTD) projects;
2. Demonstrating projects, to be carried out by R&D performing firms to diffuse and demonstrate the business applications of specific technologies; and
3. CITEC, concerning the creation of R&D Centres with a view to consolidate and strengthen the development of R&D activities.

Besides these programmes, three additional initiatives deserve reference, although they are not mainly focussed on the stimulus to R&D performers. These are: Collective RTD projects, led by business associations to respond the technology development needs of their members; Mobilising projects, involving companies and R&D organisations, particularly in the context of CTPs and clusters; and Co-promotion projects, also carried out through partnerships between companies and RTD organisations. These projects combine routes 2 and 5 (and to some extent also 3), and will be mentioned again under route 5.

**Route 3: Stimulating firms that do not perform R&D yet**

The main instrument here is the NITEC programme. Launched in 2003, NITEC has been the most successful Portuguese R&D oriented financial measure. NITEC supports the creation of small, dedicated R&D teams in companies. The success of NITEC and the need to build upon its success led to a revision of the system in the context of the ‘Compete’ programme. The old NITEC programme gave rise, in 2007, to two measures: CITEC, mentioned above, addressed to already R&D performing firms; and NITEC-Mark II, focused on helping non- and occasional-R&D performers to engage into R&D activities, by creating an organisational structure for that purpose.

The COTEC ‘Innovation Scoring’ tool referred to earlier is also expected to have a very positive impact on the development of non-R&D performers attitudes and absorptive capabilities, contributing therefore for them to carry out sustained R&D activities.

**Route 4: Attracting R&D-performing firms from abroad**

Since the early 1960s, foreign direct investment (FDI) has played a key role in the modernisation of the Portuguese economy. Some subsidiaries, originally set up in Portugal to market (and/or manufacture) the MNE products in Portugal have evolved to create R&D capabilities in the country. There are some examples, the most evident being Siemens communication systems, now integrated into NSN-Nokia Siemens Networks.

The attraction of technologically sophisticated FDI has long since figured high in Portuguese economic policy, especially since the late 1970s, although success has been relatively limited, especially in the last 18 years. It is important to note that courting technologically sophisticated FDI did not necessarily mean, especially at the beginning, FDI firms carrying out R&D activities in Portugal.
Having in mind EU rules of establishment, there are no incentive systems exclusively addressed to route 4. The attraction of R&D performing FDI is undertaken through the general incentive systems addressed to R&D and innovation. It is important to note, however, that the recent introduction of a 'Special Projects' (above €15m) regime under the RTD Incentive System (see Ministerial Decree 711/2008, of July 31st) seems to be oriented towards gaining additional leverage to court and attract R&D performing FDI (and also to negotiate the assignment of further projects, involving relevant R&D activities, to existing Portuguese subsidiaries).

**Route 5: Increasing extramural R&D carried out in cooperation with the public sector**

In the earlier CSFs, this route had limited importance in terms of the financial resources assigned. In the context of the PRIME operational programme, which ran between 2000 and 2006, there were only four types of measures within the scope of this route: R&D activities by consortia involving companies and R&D organisations; Mobilising projects for technological development; IDEIA, also on R&D consortia; and DEMTEC, on pilot projects for developing technologically innovative products and/ or processes.

The new NSRF 2007-2013 entailed a much stronger focus on “collective efficiency strategies”. These involve different forms of cooperation and clustering among different sort of players (companies, business associations, universities, R&D organisations, technology transfer organisations, regional associations, etc.). As a result, route 5 became much more relevant, being envisaged not just as a means to "increase extramural R&D carried out in cooperation with the public sector", but as a key tool to foster linkages and cooperation to promote innovation (not just R&D) and competitiveness. The “collective efficiency strategies” correspond to the first wide scale attempt to induce systemic change by promoting collaborative initiatives encompassing different players (companies, R&D organisations, Universities, science parks…). Time will tell whether such a policy is consistent, coherent and sustained enough to lead to significant results.

The main “collective efficiency” initiative is the above mentioned CTPs measure. This appears to be a major instrument for pursuing route 5. However, CTPs (as other clustering initiatives) are not granting financial incentives as such. They are a ‘label’ that place the players involved in a better position for getting support under the various measures available to support R&D and innovation.

Therefore, the main financial measures under route 5 are:

1. Collective RTD projects, led by business associations to respond the technology development needs of their members, especially in the context of a CTP, a cluster, an industry or a region; the R&D activities to be carried out should be contracted with S&T organisations;

2. Mobilising projects, aimed at the strengthening of scientific and technological competencies, and expected to have relevant impacts on CTPs, on clusters and on the consolidation of value chains; these projects should involve companies and R&D organisations,

---

The RTD Incentive System encompasses the various measures focussed on promoting R&D, namely the individual company RTD projects, the Mobilising projects, the Co-promotion RTD, the Collective RTD projects, the Demonstration projects, the NITECs and the CITECs.
(3) Co-promotion projects, also carried out through partnerships between companies and RTD organisations, in order to exploit synergies. The calls for these projects are usually focused on a specific industry or technology;

(4) RTD Voucher, granted to a company to benefit from R&D services to be rendered by a S&T organisation; and

(5) R&D Consortia, usually led by R&D organisations, to develop specific research projects involving also business firms.

**Route 6: Increasing R&D in the public sector**

This is the traditional route to develop R&D activities carried out by the public sector. Historically, this has been the most important route in terms of the assignment of public funding. Available evidence clearly indicates that it continues to be the dominant one, even in the context of the NSRF 2007-2013 (see the NSRF as well as GPEARI 2008b).

As discussed above, both institutional and competitive funding are used in Portugal. A generalist approach, rather than a thematic one, has been followed. The estimation presented in the Country Profile available at the EW database indicates that ‘Institutional’ support has accounted for more than 47% of GBAORD for 2009.

In addition to the funds coming from the Government budget, EU funds also play an important role. Funds addressed to R&D projects are mostly concentrated on the Support System for Scientific and Technological Organisations (SAESCTN) and include:

- Research projects;
- R&D projects oriented towards the implementation of public policies or the valorisation of research results;
- S&T thematic networks
- Participation in international R&D programmes.

**The importance of education and innovation policies**

For decades there has been a ‘divide’ between research and enterprise policies in Portugal, well documented in TrendChart reports (Simões 2005) and in other works on research and innovation policy in Portugal (Godinho & Simões 2005).

In recent years, the situation has improved although an integrated, systemic approach is still to be developed. Nevertheless, there is a growing recognition of the relevance of the Knowledge triangle (Research, Innovation and Education). To some extent the Technological Plan may be perceived as an instrument to coordinate and foster the inter-action between the three sides of the Triangle (Caraça & Simões 2008). In the same vein, the NSRF 2007-2013 has been able to put under the same Operational Programme the incentive systems addressed to science and enterprise policies, although the integration still needs to be improved.

The commitment to the development of post-graduate education has been evident throughout the last three decades. The creation of the MCTES is also a recognition of the need to appropriately combine Higher Education and Science policies. The achievement of a large pool of PhDs was envisaged as a pre-condition for the development of the R&D system. The achievements in postgraduate education are undisputed, in spite of the emergence of postgraduate unemployment; the policy
aimed at recruiting individuals holding doctoral degrees for research units and associate laboratories, mentioned under 2.3 above, may be seen as a response to such unemployment. The increase in S&T investment has in part been achieved through a decline of funding and investment in the higher education sector, partly in connection with the Bologna Reform. While there were good reasons to foster efficiency and to curb bureaucracy and entrenched positions in the university system, thus opening it to the outside world, the pruning that has happened might show negative effects in the near future.

Among the specific policy instruments to bridge the three policy domains of education, research and innovation, the “collective efficiency strategies” is the most important. They have the potential to create dynamic linkages among the three areas, fostering cooperation and synergies among the different players. The transformation of such a potential into actual change cannot however be taken for granted.

With regard to the interactions with other policies, the role assigned to the tax policy incentives under SIFIDE has already been pointed out. The ‘information society’ policy has also been strongly related to science policy, the more so as UMIC, the Agency for the Knowledge Society, is under the purview of MCTES. The present government has boosted environmental policies, namely in the development of renewable energies. This has been related to science and research policies and several relevant R&D programmes, some in association with US Universities, have been launched in this field. To succeed a sustained commitment is needed, going further than the launch of projects to also encompass its ongoing implementation.

**Assessment of the importance of policy mix routes and their balance**

The above comments on the six policy routes indicate that route 6 is the most important overall, followed by route 2. The main development in the recent past has been the increasing role assigned to route 5. The development of linkages between different players in the context of PCTs and clusters is expected to lead to an increase in extramural R&D carried out in cooperation with R&D organisations. There appears to be awareness however that the routes are not exclusive, and one of the key issues in policy terms is the development of synergies among them.

A summary of the main findings regarding the use of the various routes and recent related policy changes is presented on Table 7 below.

**Table 7: Importance of routes in the national policy and recent changes**

<table>
<thead>
<tr>
<th>Route</th>
<th>Short assessment of the importance of the route in the national policy</th>
<th>Main policy changes since 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Recognised as important but so far insufficiently or inappropriately addressed by policy</td>
<td>No major changes, since a new measure was launched in 2007.</td>
</tr>
<tr>
<td>2</td>
<td>Mix of tax and financial incentives. New measures on individual and collective R&amp;D and on R&amp;D centres in companies aimed at encouraging R&amp;D investment in companies.</td>
<td>No major changes, since a new set of measures was launched in 2007; launch of the process of RDI certification and the ‘Innovation Scoring’ tool.</td>
</tr>
<tr>
<td>3</td>
<td>After a long period of inappropriate measures to address this route, the launch of NITECs, together with some measures aimed at strengthening absorptive capacity, are starting to make a difference, with new firms engaging in R&amp;D activities.</td>
<td>No major changes, since a new set of measures was launched in 2007; launch of the ‘Innovation Scoring’ tool.</td>
</tr>
</tbody>
</table>
### Route Short assessment of the importance of the route in the national policy | Main policy changes since 2008
---|---
4 | Important concern, though not addressed by specific measures. Performance was poor in the last decade, though several agreements with multinational firms to set up R&D facilities have been reached in 2008. | No major changes, since a new set of measures was launched in 2007. |
5 | This route is becoming more important; there is a clear focus on poles and other clusters; since the results of the first call on this regard were not disclosed, it is still too early to assess policy results. | “Collective efficiency strategies” herald a new policy approach with regard to this route. |
6 | This is still the dominant route in terms of both political concern and financial allocations; the reform of government laboratories is starting to take shape. To boost business enterprise R&D, the dominance of this route has to be overcome. | No major changes |

### 3.4 Progress towards national R&D investment targets

Available statistical evidence for 2007 suggests that a significant increase in R&D investment has taken place, particularly in business enterprise R&D (GPEAR, 2009). Gross R&D expenditure (GERD) reached 1.18% of GDP as against 0.81% for 2005. The business enterprise component (BERD) corresponded to 0.61% of GDP, almost doubling with regard to 2005. The “institutional sector” R&D expenditures amounted to 0.57% of GDP, therefore exhibiting a more modest growth (0.50 for 2005) (GPEAR, 2009). An additional sign of improvement of business sector research capabilities is the evolution of the technological balance of payments: data recently disclosed by the Bank of Portugal (Banco de Portugal) indicates a positive balance in 2008; this outcome has taken place for the second consecutive year.

Coming back to GERD figures, these might be compared with both the Barcelona targets and the more modest targets defined by the Government and pointed out in 3.2. supra. A comparison with the 3% goal is not meaningful, since this is not a realistic objective for Portugal. The goal set down by the Government was to achieve a GERD to GDP ratio of 1.8% in 2010.

If one takes the year 2003 as a reference, as suggested by the Government, progress has been consistent with the objectives defined on the GERD to GDP ratio. We have undertaken this assessment, assuming a constant growth rate of the ratio through the 2003-2010 period. This would lead to a GERD/GDP ratio for 2007 of 1.22%; slightly above the real figure of 1.18%. If data on Government and business enterprise sectors were considered, the results are consistent: the ratio of Government R&D expenditures to GDP has been 0.50% for 2007, a little below the ‘expected’ 0.6%; for the BERD/GDP ratio, the ‘expected’ figure for 2007 was 0.62%, when the actual percentage reached was 0.61%.

A slightly different picture emerges, however, if absolute R&D expenditures, at current prices, are considered. The growth objectives for Government and business enterprise R&D defined in the Technological Plan and in the ‘Commitment to Science’ were, respectively, two- and three-fold increases on a 7-year period. Again assuming a constant annual growth rate, the ‘expected’ amount for Government R&D
would be €1,035m, that is, almost 10% below the target; in contrast, real BERD has been €988m, 56% above expectations.

Information disclosed so far does not enable a sound and thorough analysis of the reasons behind the dramatic increase in business enterprise R&D investment. Five tentative explanations may be considered. The first is a significant enlargement of the survey basis, leading to an increase in the number of companies reporting R&D investments. The second is to some extent an alternative to the previous one: the rise in the number of R&D performers, from 930 to more than 1500, is mainly due to the transformation of earlier non-R&D performers into performers as well as to the creation of new technology-based firms. Available evidence suggests that a wider survey coverage is more likely an explanation than the emergence of new R&D performing firms, since the number of firms supported under NITEC only explains 26 per cent of the increase in the number of R&D performers. The third explanation has to do with the growing role in BERD of software development activities by the financial sector. This seems very likely, but needs more detailed information to be confirmed. Fourth, firms that were already R&D performers may have considerably increased their expenditures. Finally, it is likely that 2007 figures are strongly boosted by SIFIDE, the R&D tax system. These figures may distort the reality, since some companies might have used SIFIDE as a tool for lawful tax evasion, somewhat overestimating R&D expenditures. Nevertheless, the dramatic increase in BERD is certainly due to the mix of these five factors. Another question, particularly relevant for policy purposes is the sustainability of the recorded BERD growth. If the fifth explanation proves to be relevant, R&D expenditures for 2009 might experience a decline, due to the effect of the economic and financial crises.

The policy mix has played a role in the above developments. Besides the measures addressed to improve the public research sector, two sorts of incentives may have played a role. The first is SIFIDE, while the second is the creation of NITECs. Beyond this, there is a growing awareness in the business sector about the positive role that R&D activities may play to foster competitiveness.

In spite of the positive developments that have occurred, the business enterprise sector does not perform a central role in the definition of Portugal’s research agenda. If implementation is properly carried out, the policy mix seems to be appropriate to current needs and challenges. The ‘Compete’ programme laid down a diversified set of incentives for company R&D, mainly addressing routes 2 and 5. The traditionally weak concern with enhancing absorptive capacity has been addressed in a more consistent way, although much remains to be done on the provision of expert assistance to small firms. The new focus on poles and clusters is welcomed, insofar as it may respond to the problem of weak cooperation among the players in the national system of innovation. The weakest links seem to be the promotion of high-tech entrepreneurship and the attraction of FDI, although this depends more on vision, strategic intelligence capabilities and professionalism than on new incentives.

The effectiveness of policy mix in the future is conditional on three main features: (1) implementation capability, judiciously combining bottom-up and top down approaches; (2) capacity to establish a consistent and sustained dialogue between policy makers and businessmen; and (3) achieving a reasonable level of cooperation among the various types of actors in the R&D system corresponds to the third.

A brief summary of the opportunities and risks related to the barriers to R&D investments identified in 3.1 is presented in Table 8 below.
### Table 8: Main barriers to R&D investments and respective policy opportunities and risks

<table>
<thead>
<tr>
<th>Barriers to R&amp;D investment</th>
<th>Opportunities and Risks generated by the policy mix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics of the economic fabric</td>
<td>The response to this barrier requires a consistent effort in three fields: entrepreneurship, FDI attraction, and in-house company capabilities. The main risks are related to contextual factors (the crisis, and the slowing-down of Europe’s economies), but also with the inability to mobilise human potential and attract investment.</td>
</tr>
<tr>
<td>Absence of large R&amp;D performers</td>
<td>The opportunity is to use the new policy mix and other initiatives to foster a stronger R&amp;D commitment by players with an 'innovation demand' effect.</td>
</tr>
<tr>
<td>Insufficiently demanding customers</td>
<td>The opportunities are related to the openness of the economy, the use of ICT and the new approaches to clustering. The risks stem from the recession curtailing the possibility of innovative firms having access to a stimulating international demand.</td>
</tr>
<tr>
<td>Weak absorptive capacity of many SMEs</td>
<td>The pursuit of clustering policies may open opportunities, but there is a risk that unsuccessful implementation may jeopardise the efforts.</td>
</tr>
<tr>
<td>Weakness of venture capital institutions</td>
<td>This is a structural problem that may only be responded, in part, by foreign investment in this field. The consolidation of FINICIA may be envisaged as an opportunity.</td>
</tr>
<tr>
<td>Public research policy with insufficient application concerns</td>
<td>The main risks related to this are the development of a good but self-centred research system without strong links with economic and social needs, although the launch of poles might contribute to generate collaborative opportunities.</td>
</tr>
</tbody>
</table>

### 4 Contributions of national policies to the European Research Area

ERAWATCH country reports 2008 provide a succinct and concise analysis of the ERA dimension in the national R&D system of the country. This Chapter further develops this analysis and provides a more thorough discussion of the national contributions to the realisation of the European Research Area (ERA). An important background policy document for the definition of ERA policies is the Green paper on ERA (Commission of the European Communities 2007) which comprises six policy dimensions, the so-called six pillars of ERA. Based on the Green Paper and complementing other ongoing studies and activities, this chapter investigates the main national policy activities contributing to the following four dimensions/pillars of ERA:

- Developing a European labour market of researchers facilitating mobility and promoting researcher careers
- Building world-class infrastructures accessible to research teams from across Europe and the world
• Modernising research organisations, in particular universities, with the aim to promote scientific excellence and effective knowledge sharing

• Opening up and co-ordination of national research programmes

In the ERA dimension, the wider context of internationalization of R&D policies is also an issue related to all ERA policy pillars and is normally present in the dynamics of national ERA-relevant policies in many countries.

4.1 Towards a European labour market for researchers

Characteristics of the National Market for researchers in terms of demand-supply balance

The XVIIth Constitutional Government programme clearly stated the creation of 1000 new jobs for researchers as an objective for its mandate (2005-2009). Despite being set in a context of a shrinking number of public servants, this target of 1000 new research posts might not be enough to match the growing supply of new researchers coming to the market. This, to some extent, has been recognised in the NRP 2008-2010 which expresses the Government’s intention to create 500 additional jobs by 2010.

While the average annual number of new PhDs awarded or recognised by Portuguese Universities was below 80 in the 1970s, it rose to more than 200 in the 1980s and to over 500 in 1995, eventually reaching 1000 by 2003. The current Government set a target of new 1500 PhDs to be reached in 2009, but the most recent figures, for 2007, when 1459 new PhDs were awarded or recognised, hint that the 2009 target might have already been reached by 2008. Further to this growing supply of doctorate holders, the number of new holders of higher education degrees has been growing steadily. In 2007 9.6% of Portuguese residents (7.8% of men and 11.3% of women) held a higher education degree. If only the population at active age (15-64 years old) is taken, this rate rises to 13.1% in 2007, while it was only 11.2% in 2004.

This growth in the supply of individuals holding higher education degrees has however been reflected in a rising unemployment rate among educated people. About 38,000 holders of HE degrees were registered in the Employment Centres in December 2008, equivalent to a 4.1% unemployment rate for this segment of the labour market. For holders of Masters or PhD degrees, according to official statistics the total unemployment figures in December 2008 were, respectively, 809 and 62. These figures do not fully convey the difficulty in finding a job in Portugal for that group of people, since a number have decided to go abroad to follow their careers. This is a new phenomenon in Portugal. The traditional situation was that any new PhD degree holder would automatically find a position.

There is increasing tension in the labour market for holders of advanced degrees despite a steady growth in the number of employed researchers. In 1982 there were 5,736 researchers (3963 FTE), equivalent to 0.9‰ of the active population, but by 2007 the figure rose to 50,361 (27,987 FTE) or 5.0‰ of the active population.

Traditionally, new researchers arriving in the labour market have been employed by public universities or the government laboratories. However, in recent years, due to budgetary constraints younger researchers have typically been hired by different types of research units as post doc fellows with the support of FCT grants.
Research careers and academic careers have a certain parallel, since after being granted a PhD a young researcher might be promoted to three successive positions: Assistant Researcher, Principal Researcher and Research Coordinator (in the universities the equivalent positions are Assistant Professor, Associate Professor and Full Professor). The salaries for both careers are similar and go from a gross monthly salary\textsuperscript{12} of €3,101 (for an Assistant in the earlier stage of the career) to €5,249 (for the most senior position). These figures compare favourably with salaries of holders of a university degree in the Public Service, whose gross salaries range from €1,334-3,002 per month.

A study on the remuneration of researchers in the public and private sector conducted for the Research Directorate-General of the European Commission\textsuperscript{13} places Portuguese researchers in the medium-low range in terms of remuneration level in the EU25. Referring to year 2006 the average yearly remuneration paid in Portugal was 33,334€ (in PPP), below the EU25 average of 40,126€.

The Portuguese position in the overall ranking seems to be negatively affected by the substantial number of fellowships currently awarded in the country. According to the same study, when level of experience is considered Portugal is among the group of countries with lowest salaries paid in the EU25 to non-experienced researchers (0-4 years). Researchers in this group have a yearly remuneration of 9,644€, which is less than half of the EU average. This gap narrows dramatically as level of experience increases, with most experienced researchers (more than 15 years of experience) earning 54,496€, fairly close to the EU25 average of 55,213€.

Promotion from one position to the next in both research and academic careers is mainly based on scientific merit criteria. Due to the structure of the careers pyramid,, access to the top positions depends on a limited number of permanent places within each institution. To recruit for those senior positions, open competitions are organised in which both researchers from within and outside the institution may participate.

Researchers working in the public sector (government labs plus public universities), which employs most of the researchers in the country, have traditionally had relatively stable career prospects, at least after being granted tenure. This situation has, however, changed recently. Many institutions now have harder tenure granting procedures and the recruitment of new researchers, even for replacement purposes, has been made much more difficult due to budgetary pressures or legal restrictions. A review of the university career statute is about to be published and is expected to increase further the threshold for tenure granting. In this context, institutions have been able to absorb some “fresh blood” by contracting younger researchers for non-permanent positions, by providing Post-Doc grants which are limited to between three to six years. The 1,000 new research positions that have been targeted involve this sort of procedure.

The evolution of the national market for researchers described above needs to be related to existing performance indicators. It should be stressed that research output in Portugal has closely followed the dramatic increase in both the number of PhD holders and researchers. In the early 1980s, the average number of publications (GPEARI 2008) in all scientific domains was lower than 350 per year. This figure rose

\textsuperscript{12} These figures are for 2008. For 2009 they have been raised on average by 2.9%.

\textsuperscript{13} 2007 EC report "Remuneration of Researchers in the Public and Private sectors", available online, http://www.cipur.it/Varie/Forum%20DDL112/Study%20remuneration%20researchers.pdf
to around 1,400 per year in the 1990s and to more than 4,700 in the early 2000s. The most recent figures (2003-2007) point to a further increase to a 5,750 annual average. In Natural Sciences and Engineering, the annual average number of publications per million inhabitants in Portugal rose from 107 in the 1990s to 211 in the early 2000s, growing at an annual rate of 11% between 1991 and 2003. These figures compare to the EU15, respectively 495 and 556, with an annual growth rate of 2%, and to the US, respectively 747 and 702, with an annual growth rate of -1%. If these growth rates remain unchanged, Portugal is expected to catch up in terms of indexed publications with the EU15 and the US by 2012-2013. This quantitative performance of academic science shall be regarded as a strength of the Portuguese research system, even though several important weaknesses remain, as pointed out in this chapters above.

4.1.1 Policies for opening up the national labour market for researchers

Portugal has been investing considerably in building a solid human resources base in the field of science and technology. The number of grants available for PhD training has been rising since the early 1970s. As the supply of new researchers holding a PhD degree has grown significantly, there has been, since the middle of the 1990s a complementary incentive to more senior researchers, with the awarding of post-doc grants and other scholarships for senior positions.

The institution that has administered the bulk of these different sorts of grants has been FCT (the Portuguese research council). PhD grants awarded by FCT are intended primarily, for Portuguese nationals as well as EU citizens living in Portugal, and can be used either in Portugal or abroad. These scholarships can also be awarded to foreign researchers wishing to perform their research in Portuguese Universities. Post-Doctoral grants are also awarded to any researcher wishing to perform post-doctoral activities in a Portuguese university, irrespectively of nationality. Mobility is explicitly valued, namely in the case of the researchers with foreign doctoral degrees who wish to return to Portugal, but post-doc grants are also provided to candidates willing to do their work in a foreign lab or university. The larger national universities host Mobility Centres intended to assist incoming researchers to move in. These Mobility Centres are members of the European Network of Mobility Centres ERA-MORE.

As the research community has grown significantly in recent decades, new instruments have been developed for its management. The DeGóis Curricula Platform is a tool developed by FCT for gathering, supplying and analysing the intellectual and scientific production of Portuguese researchers who have been invited to upload their CVs in the Platform. The DeGóis Platform was developed with the objective of identifying the scientific domains in which researchers work, relating those domains to the “Fields of Science” proposed by the OECD. This makes the curricula inserted in the Platform comparable to other models coming from other scientific communities, therefore facilitating the potential international mobility of researchers.

Another recently launched instrument related to mobility is the Invited Chairs programme, which aims to attract international high level researchers to stimulate the internationalisation of Portuguese universities. The programme had offered up to 50 Full Professorship posts in 2008 and 2009. FCT provides up to 25% to 50% of the salary to facilitate the attraction of international leading researchers for between three to five years (renewable once). Both universities and scientific research units (which
include the government labs and the associate laboratories) can benefit from this measure.

An area that has been significantly stimulated by the Portuguese government in recent years, and which is directly related to mobility prospects and activities, is the direct relationship with top foreign universities and research organisations, labelled by the Government as ‘Partnerships for the future’. The contracts with MIT, Carnegie-Mellon and University of Texas (which led to the MIT Portugal, CMU-Portugal and UT Austin Portugal programmes) are part of this initiative.

The Advanced and PhD courses in the framework of these three programmes are taught in English. In the beginning they were offered to the same target population as the one addressed by the FCT grants, but they have recently been opened to students from all over the world. These programmes typically involve a component, which is taught in Portugal, eventually using ICT to communicate with lecturers abroad, although PhD students are also expected to conduct part of their research in the American universities.

Also in the context of the ‘Partnerships for the Future’ initiative, the Fraunhofer Portugal programme was established as a joint initiative of FCT, UMIC and Fraunhofer-Gesellschaft. In contrast with the former contracts, this one was established with an organization from another European Research Area country and focuses exclusively on research activities.

Another initiative which necessarily involves transnational mobility is the INL – International Iberian Nanotechnology Laboratory to be located in Braga. INL “is the first, fully international research organization in Europe in the field of nanoscience and nanotechnology. It has an international legal framework similar to intergovernmental laboratories in other areas located in Europe like CERN, ESO, EMBL, and ESRF. The new laboratory is being established by Portugal and Spain, but in the future it will be open to the membership of other countries of Europe and other regions of the world”. 14

An additional aspect to be mentioned in this section is the status of the Bologna process. Portugal has adhered to this process with the aim of contributing to the creation of an European Higher Education Area, namely by reinforcing the three cycle system (bachelor/master/doctorate). By 2007, about 70% of all university courses in Portugal were already following the ECTS scheme, and 88% of the 1st and 2nd cycle courses were expected to work according to Bologna rules in academic year 2007/8. As recently as April 2008, the overall rate of accomplishment of the adjustments recommended by the Bologna process was estimated by the Portuguese Government to be 90%. 15 As this process progresses, with Portugal adopting an educational structure comparable to those existing in most of Europe, the transnational mobility of scientific personnel will naturally be furthered.

**Researcher-friendly social security and supplementary pension systems, health-insurance, scientific visa for third countries**

Issues such as social security access, health insurance or compatibility of pension schemes should be seen in the wider context of harmonization between the various Member States.

---

14 Quotated from [http://www.iinl.org/nano-history.php](http://www.iinl.org/nano-history.php)
Specific provisions have been made in the 2007 Immigration Law in order to facilitate the entry of foreign researchers to Portugal, regarding both temporary and residence visas. This law was designed taking into consideration the attraction of foreign researchers to Portugal, by facilitating temporary and residence scientific visas. Research centres, universities or firms seeking to employ scientists send visa requests directly to the Ministry of Science and visas have now to be conceded within 30 days.

4.1.2 Policies enhancing the attractiveness of research careers in Europe

Remuneration policies

As stated above, salaries of academic staff compare favourably with salaries paid by the Public Service sector to holders of a university degree. Researchers' salaries in Portugal are comparable to those paid in the UK and higher than those paid in some other EU countries with higher incomes per capita.

With scholarships that are directly funded by FCT, as is overwhelmingly the case in Portugal, their values are fixed. For 2009 the monthly stipend of a PhD grant awarded is €980 in Portugal and €1,710 abroad, while post-doc grants are, respectively, €1,495 and €2,245.\(^{16}\)

If the scholarships are granted by institutions or projects not directly funded by FCT, the nominal value of the grants might be different, although this is not recommended by FCT.

As mentioned above, specific grants and funds are available to allow universities and research labs to attract foreign scientists. Also some private sector firms are following active policies to attract foreign talented researchers. While this trend is not general, some firms like Bial, a pharmaceutical company with headquarters in the periphery of Oporto, are contracting foreign researchers for their R&D labs.

However, the attraction of researchers to the private business sector is still limited in overall terms. This means that competition based on higher salaries offered by companies to researchers has not yet affected the most qualified staff of universities and research labs.

Promotion of women

The latest data suggest that the gender gap in the research sector is narrowing. Women made up 41% of all HE lecturers and professors in 2001 and 43% in 2007.\(^{17}\) In the research sector the equivalent proportion was 44% in 2006,\(^{18}\) which compares very favourably with the EU27 average of female researchers of 28%. Nonetheless, in the associate laboratories, only 4 out of a total of 25 currently have women as directors. Further, the number of women promoted to full professorships in the universities is well below their share in the total staff of the institutions.

Portuguese law guarantees a four month maternity leave for women with full pay. Scholarships follow the same rule, as they are paid over the leave and extended for

---


the same duration. Women cannot be fired during pregnancy and their return to the same type of work is guaranteed by law.

The prospects for the future evolution of the gender gap can be viewed from the current situation of the higher education sector. In 2006, women formed the majority of the students enrolled in Higher Education: 56% of students registered for the first time in HE and 54% of all HE students. In terms of degrees obtained, women represented 61% and 63% of ISCED 5A and 5B (Portuguese *bacharelato* and *licenciatura*) and 61% of ISCED 6 (Master degree) in 2006. In contrast, women accounted for only 44.5% of PhDs awarded in 2001 but this figure rose to 52% in 2006.

**Uptake of the Charter of researchers**

The various elements of the policies discussed above indicate that a national policy for the research labour market has started to be defined in recent years. Nonetheless, the Charter of Researchers has not been at the centre of Portuguese policy as regards researchers’ work and careers. It is thus unsurprising that, according to the EURAXESS site, only one Portuguese research organization (Numena, a small Social Science research center) has signed the European Charter for Researchers.

### 4.2 Governing research infrastructures

This topic of “governing research infrastructures” will be dealt with next along two perspectives: first the analysis will focus on what has been done on exclusively national infrastructures; and second it will turn to the international collaborations and partnerships that Portugal has been involved.

There has been some financial investment in national research infrastructures, namely through a public Program for the Renewal of Scientific Equipment (PNRC). PNRC was launched in 2001. It comprised 214 individual projects of equipment, funded with €71.8m, and six National networks (Nuclear Magnetic Resonance, Mass Spectrometry, Electron Microscopy, Advanced Computing, Functional Cerebral Imagiology and Geophysics) funded with €19.8m.

Three interesting research infrastructures created in recent years are Biblioteca do Conhecimento Online (On-line Knowledge Library, *b-on*), Rede de Ciência, Tecnologia e Ensino Superior - *RCTS* (S&T and HE Education Network) and the Portuguese National GRID Initiative.

*b-on* allows online access to more than 16,750 electronic publications from 16 international publishers in all areas of academic and scientific research. It was designed in 1999 and launched in April 2004 with 3,500 titles from six publishers. It allows the full text of papers published in the major scientific journals to be accessed online by individuals in all research and higher education institutions in Portugal. This is possible as the government established a contract with the top international scientific journal publishers providing nationwide access to their contents. More than 40,000 professors and researchers and 340,000 students from 66 research and higher education institutions now have unlimited access to the b-on contents and search engine, which also provides access to the Web of Knowledge bibliographic reference and citation tools. The contents will be substantially enlarged as the b-on portal will also provide full text search of Master and PhD thesis presented in Portuguese institutions as well as other national academic and scientific content.
RCTS is a computing network, run by FCCN, which makes use of Internet protocols to provide a collaboration and communication platform among educational, scientific, technological and cultural institutions.

The GRID Initiative, launched in April 2006, aims to promote the development of GRID Computing and the sharing of distributed computing resources. The strengthening of multidisciplinarity and collaboration between researchers and users of high performance computing and pursuing Portuguese integration in the GRID Computing international network are among its main objectives.

The degree of internationalisation (or ‘Europeanisation’) of these infrastructures is limited, since they are oriented primarily to serve the domestic scientific community.

Turning now to the international collaborations and partnerships in which Portugal has been participating, it must be pointed out that FCT is now the department of the Ministry of Science, Technology and Higher Education that concentrates most responsibilities in the support of the internationalisation of the National Scientific and Technological System.

The XVIIth Constitutional Government Programme stated an intention of Portugal participating fully in international research organizations. The announced commitment towards such participation contrasts with a more inconsequent attitude on these matters in the previous years. It is in this context that FCT has been financing the national participation in several international research organizations, as well as in joint projects or undertakings which are part of scientific and technological cooperation agreements or bilateral agreements between Portugal and other countries and institutions.

Through FCT, Portugal is a member of several international research infrastructures, namely those belonging to the EIROforum: CERN, EFDA (European Fusion Development Agreement), EMBL, ESA, ESO, and ESRF. Portugal also participates in the following research infrastructures: EMBC, EMBO, GBIF (Global Biodiversity Information Facility), and EurOcean (European Centre for Information on Marine Science and Technology). Further information on these participations is provided on the FCT website. It must be pointed out, however, that no documents are available (at least in the public domain) identifying the strategy behind these participations or providing an evaluation of the Portuguese involvement.

Another EU initiative in which there has been Portuguese involvement is ESFRI – the European Strategy Forum on Research Infrastructures. ESFRI has been instrumental in establishing a “Roadmap” aimed at identifying new Research Infrastructures of pan-European interest. Portugal has not been very enthusiastic about this line of work. The argument is that it mainly corresponds to a list of projects that has not been validated by the EU Council of Ministers. It is argued that the definition of the infrastructures for the future of Europe is needed, but the Roadmap has not been able to provide the necessary means for such endeavour. There is also a perception that there has not been a proper coordination with those infrastructures which are already operational.

In spite of that general attitude FCT has been supporting the national research teams willing to participate in preparatory stages for the establishment of new European infrastructures. In particular, different types of support have been provided to enable such teams to apply for financing in the scope of the FP.

It might be mentioned that in this context the Portuguese government has not voted favourably in the Council the proposal of regulation for ERICs – European Research
Infrastructures Consortia. The point was that the proposal required the involvement of at least 3 countries in new ERIC projects. This stance stemmed mainly from the fact that Portugal has been heavily investing recently in a new infrastructure, the INL – International Iberian Nanotechnology Laboratory, which is an initiative of the two EU Iberian members.

INL is the result of a joint decision of the Governments of Portugal and Spain. It has an international legal framework similar to the few international laboratories in other areas located in Europe. In the future it will be open to the membership of other countries from the EU and from other regions of the world. Although INL is an Iberian institution by name, it is registered as an international Research Centre and will thus be open to agreements with other countries. INL is an example of a bilateral or multilateral voluntary agreement and co-operation. A fundamental restriction to an unlimited growth of participation in these variable geometry ventures is the fact that Portugal is a small country, with limited resources.

### 4.3 Research organisations

Most of the research activities carried out in Portugal are clustered around the universities. Apart from the government labs, which have been declining since the 1980s, universities were the natural working place for someone wishing to follow a research career. One significant development since the late 1970s/early 1980s was the growth of an important sector of non-profit research organisations, whose names vary from “research centre” to “research institute”, operating within the universities themselves or established in the vicinity of the most important public universities.

The new Law on Higher Education, RJIES, approved in September 2007, is a step forward to a renewal of university governance. The Governing body of each university will be the Conselho Geral (General Council), composed of a majority of professors and researchers complemented with student representatives (15%). The main novelty, however, is that the Conselho Geral also provides for a significant involvement of representatives from the civil and businesses communities, as at least 30% of its members must be chosen from outside the institution. The Chairman of the General Council should come from these external representatives. Early in 2009 the Universities have begun to choose these external representatives, which include distinguished entrepreneurs, managers, professors and other public personalities.

Rectors and deans will now be chosen by open tender. The only restriction is that the rector should be a professor or a researcher from any national or foreign university or research institution.

Under the new law (RJIES), public universities were offered the option to become a public foundation. Two universities (U. Aveiro and U. Porto) and a university school (ISCTE) have recently chosen to do so. Several other universities, that were expected to make a similar move, have not done so due to fears of financial instability and of employment insecurity for their staffs.

The funding of the universities has depended primarily on their areas of specialization. Medical schools, for instance, get in relative terms more funding than social sciences faculties. Apart from the disciplinary areas of specialization, funding depends also significantly on the balance between the number of graduates and the proportion of dropouts. The number of Master and PhD programmes in the university has a similar positive effect on funding, as well as the ratio of academic staff holding PhD degrees.
Competitive funding for universities’ teaching is being introduced for the first time in 2009. It is still a small amount of money compared with the overall university budget, since the funds allocated to this mode of financing represent around 2% of the funding of running costs. The criteria linked to this competitive funding are qualitative and in line with those noted in the paragraph above.

Given this recent development, it is clear that Portuguese universities have evolved to a dual university funding system, with a split between block grant and competitive funding in place since 2009. The expectation is, according to announced Government intentions, that dual funding will be intensified in the coming years.

Portuguese universities have a tradition of considerable management autonomy, and this is expected to be continued under the new law RJIES. However, most of the funds universities receive from the public budget cover running costs, namely the staff salaries and other intermediate consumption. These funds have been complemented by other sources, i.e. students’ fees and services offered to the communities in which the universities operate. Universities have also sought other sources in addition to the national budget allocations. Typically the research funding is not administered by the universities themselves, but by the research centres and research institutes that were established in recent decades in connection to them.

The level of support to these research units depends on the quality of the research performed. Their activities are systematically and periodically subject to review and appraisal by scientific peers, including foreign researchers and national researchers working in foreign universities or research institutes. The last evaluation exercise focused on the activities performed in 2003-2006. The research units are entitled to funding for a period of time usually up to 4-5 years, with the level of funding dependant on being evaluated as just “good”, “very good” or “excellent”.

### 4.4 Opening up national research programmes

Portugal has followed a policy of research programmes open to all disciplinary areas. Thematic programmes have not been frequent, apart some initiatives in the ICT area. The policy model that has been adopted provides wide support to all academic areas and is based on competitive funding, both to projects and to the certificated research units. The research council (FCT) allocates funds to calls published every one or two years. In the context of these calls teams, irrespective of the area or sector, submit their projects to FCT. The projects are ranked and selected on the basis of the quality of the research proposed, given a certain breakdown of the funds among broad disciplinary areas. Further, FCT funds the research units, including the associated laboratories, based on periodic evaluations of the quality of their work. The rationale behind the funding decisions on both projects and research units is that no excellent scientific research should be left without support.

As a general rule, foreign citizens living in Portugal for at least one year have the same access rights as Portuguese researchers and an equal opportunity to get scholarships for research. Two caveats should be made, however, on these matters. First, until recently any foreign citizen willing to come to Portugal (and not only those who have been living for at least one year) could apply for PhD and Post-Doc grants. Second, with regard to participation in calls for research projects, foreign scientists (irrespective of being European or form other countries) can only participate in projects in the condition of “consultants”. The possibility that foreign teams participate
(even as a secondary partner) together with national teams in submitting projects to those calls, is not foreseen.

In what regards the certificated research unit's activities, they welcome researchers from other countries, both from Europe and elsewhere. Further, Portuguese researchers living abroad have the same rights of access to programmes as if they were living in Portugal. Grants must be used in the institutions to which the grant is allocated but it is possible to get research scholarships to study and carry out research in research centres abroad.

An indication that Portugal is open and willing to welcome senior researchers is the Invited Chairs programme which was mentioned above and the stimulus to International partnerships. Foreign researchers or research teams wishing to join Portuguese research centres are welcome and can have access to funding.

Portugal has also been quite active in participating in the ERA-NETs and has participated in 25 of them (a full list can be found in the FCT site) since the inception of the 6th Framework Programme. Portugal has participated in the joint calls issued by the various ERA-NETs and to date FCT has invested about €10m in over 20 of these calls. Portuguese participation ranges from broad ERA-NETs, such as Social Sciences (Norface) or Nanoscience (NanoSci-ERA) to more focused ERA-NETs, such as those on Hydrogen and Fuel Cell research (HY-CO) or Complexity research (Complexity-Net). The main restriction to an increased participation is the limitation of available resources, in terms of technical expertise and the funding capacity of FCT.

In parallel with the ERA-NETs, Portugal has also been active in the Joint Technological Initiatives, with involvement since their beginning in ARTEMIS and ENIAC, having assigned respectively, €10.8m and €0.5m for Portuguese participation.

The information provided above indicates that Portugal has been positive about greater coordination and joint-programming with other national agencies and EU bodies. However, with regard to the opening up national programmes, there is no evidence of recent steps into that direction. This lack of advances probably stems from a perception that the opening up of national programmes by countries like Portugal may bring more threats than opportunities, as researchers from the scientifically more advanced countries might be better prepared to reap off the opportunities arising from such opening up.

4.5 National ERA-related policies - a summary

The above sections indicate that Portugal is actively committed to the building up of the European Research Area.

The labour market for researchers has been characterized by a growing supply of new researchers, given the long-term national policy of providing relatively generous grants to PhD students. The most recent data indicate that about 1,500 new PhD enter the research labour market every year. Traditionally the new doctorates have been absorbed by the university sector, but more recently most of the new researchers have been offered work by the associate labs or the research units that operate within the academic organizations. Most of these new jobs have been supported by post-grants whose length may vary between 3-6 years. It has been

---

19 http://alfa.fct.mctes.pt/apoios/cooptrans/eranets/
through this type of instrument that the Portuguese government has been pursuing its target of creating 1,000 new research posts until the end of 2009.

Researchers' salaries are attractive if compared to those of senior public servants holding university degrees. Available data also suggest that Portuguese researchers' salaries compare favourably to salaries paid to researchers abroad, including several EU countries of higher incomes per capita. Women comprise 50% of PhDs awarded and more than 40% of both total researchers and university staff, but these shares decline steeply as one gets closer to the top positions in the academic careers.

Portugal has been opening up by means of bilateral International partnerships. This has been the case of the contracts established at about the same time with several US universities and with a European research institution (the Fraunhofer Society). The programme of “Invited Chairs” has also provided incentives to senior researchers coming to Portuguese academic institutions. Further, the scientific visa was created in 2007 to facilitate incoming scientists to establish in the country.

As a result of scientific and technological cooperation agreements with other countries and international institutions, there has been an active participation in multilateral programmes and scientific networks, including several European joint research infrastructures, Portugal is keen on working in the framework of these international research activities and infrastructures and has favoured their opening up to other countries and research units. A fundamental restriction to a more intense participation in these variable geometry ventures is the fact that Portugal is a small country with limited resources.

The autonomy of research institutions is clearly seen on the increasing accrued openness of Portuguese universities to society, including participation of outsiders to the universities in their management and advice. The recent change in the legal framework of the universities, with the possibility of them choosing to become public foundations, is an important step in the same direction. The changes brought about by the new law suggest that a growing autonomy in the allocation of resources will be possible, though the universities will also bear further responsibility in raising those resources. University competitive funding has just been put in place but is very minor compared with block grants.

The opening up of national research programmes is particularly relevant as regards ERA-NETs participation. Portugal has so far been involved in 25 ERA-NETs and several joint calls, the only restriction being Portugal a relatively small country it clearly has limited endowment of both financial and human resources. Portugal has also been involved in the Joint Technological Initiatives, particularly in ENIAC and ARTEMIS. An important barrier towards further involvement in opening up national programmes is the perception that Portuguese scientists would be in disfavour in relation to researchers from the scientifically more advanced member states.
Table 9: Importance of the ERA pillars in the ERA policy mix and key characteristics

<table>
<thead>
<tr>
<th>Labour market for researchers</th>
<th>Short assessment of its importance in the ERA policy mix</th>
<th>Key characteristics of policies</th>
</tr>
</thead>
</table>
|                               | • This has been the main pillar of the development of ERA in Portugal, as the initial human resources base was poor and has been significantly improved. | • Focus on the supply of new scientists, with generous grants provided to PhD candidates and Post-Doc researchers.  
• As supply has tended to exceed demand in recent years, government set target of 1000 new research posts plus 500 new posts indicated in the NRP 2008-2010  
• Researchers’ salaries are attractive both on national and international terms.  
• Promotion of women is leading to equal opportunities and access, but access to the top still limited  
• International collaboration programmes with US universities and Fraunhofer plus Invited Chairs programme.  
• Scientific visa created in 2007 |
| Governance of research infrastructures | • There has been a clear orientation towards participation in inter-governmental organisations and international research infrastructures | • Strong and committed participation in multilateral and bilateral organisations and in international research infrastructures |
| Autonomy of research institutions | • University reform has been a critical policy area, providing more autonomy for universities managing and raising their resources | • Universities’ management reform foresees growing participation of society  
• Competitive Funding has just been put in place, but still corresponds to a very minor share of total. |
| Opening up of national research programmes | • Portuguese policies have favoured opening up but have been hindered by a shortage of resources | • Important participation in ERA-NETs and JTIs |

5 Conclusions and open questions

5.1 Policy mix towards national R&D investment goals

The Portuguese research system has significantly improved during the last three decades, particularly since the mid-1990s. The establishment of multi-annual block funding for research units on the basis of international evaluation processes and the continued investment in post-graduate education together with the competitive funding for research projects have contributed to significantly improve the system, in spite of the difficulties of Government labs reform. R&D statistics for 2007 confirm the growth path of public R&D investments and show a dramatic increase in BERD, to 0.61% of GDP as against 0.31% and 0.24%, respectively, for 2005 and 2003.

This positive development notwithstanding, business enterprise investment continues to be the weak link in the process of approaching the Barcelona targets of 3% R&D to GDP, with 2% private and 1% public. In fact, the distance from the Barcelona goal is much higher for the business sector than for the public sector. There has been a sustained investment in science and research by the Government, as expressed by
the GBAORD figures for 2009. On the contrary, there are serious concerns regarding the sustainability of the growth in R&D figures from the private sector, as a consequence of the present crisis.

There are five main barriers to private R&D investments: (1) the structure of the Portuguese economic fabric itself, where supplier-dominated industries still have an important role; (2) low firm size, including the near absence of large national R&D performing companies; (3) the weak absorptive capabilities of most SMEs, hindering the design of competitive strategies in the context of which R&D activities might be pursued; (4) the distance from large and demanding markets in which sophisticated customers play a key role, together with the weakness of domestic linkages among business and research centres; and (5) the lack of a dynamic private venture and risk capital industry in Portugal.

The policy mix has played a role in the positive developments mentioned above. Besides the measures addressed to improve the public research sector, two sorts of incentives might have played an important role in explaining the increase in business enterprise R&D expenditures. The first is SIFIDE, which granted generous tax incentives to companies. The second is the creation of small R&D firms in companies (NITECs) that helped some formerly non-R&D performers to enter the R&D 'ladder'. Beyond this, there is a growing awareness in some segments of the business sector about the relevance of R&D activities to foster competitiveness.

With regard to a more focused response to the five barriers identified above, the NSRF 2007-2013, and particularly the ‘Compete’ programme introduced some positive changes. The ‘Compete’ programme laid down a diversified set of incentives for company R&D, addressing R&D-performing firms and the research system. The absorptive capacity issue has been addressed in a more consistent way, although much remains to be done, especially on the provision of expert assistance to small firms. The new focus on poles and clusters is intended to respond to barrier (4), while contributing for change on the first two barriers mentioned.

The weakest features of the policy mix seem to be the lack of promotion of high-tech entrepreneurship and the attraction of FDI, although this depends more on other factors, including strategic intelligence and professionalism, than just on incentives. Furthermore, there is a question mark about the way how the policy measures will be implemented in a crisis context, which may lead to some relaxing in the criteria and requirements for support being granted. The implementation issue is particularly relevant for the “collective efficiency strategies” (CTPs and other clusters), which demand a wise combination of bottom-up and top-down approaches to make a difference in promoting more cooperative approaches in pursuing R&D and innovation strategies. A final shortcoming relates to policy governance and concerns the absence of proper instruments for generating a consensus among the main stakeholders in relation to long term priorities and sustained resource mobilisation.

5.2 ERA-related policies

The information presented and analysed in chapter 4 makes clear that Portugal is strongly committed to, and involved in, the building of the European Research Area.

Many ERA and ERA-related policies are important for overall national research policies and strategies. ERA objectives are very much in line with the purpose of “internationalisation of research policy” defined by the Portuguese government, although this goes further than ERA, being extended to the “partnerships for the
future” with US Universities. Attracting high-quality researchers from abroad is an objective highly positioned in Government priorities. The same is true for the involvement in European research infrastructures, exemplified by the decision to create the International Iberian Nanotechnologies Laboratory in Braga.

The main components of the contribution of national policies to the ERA may be presented along three axes. The first concerns the development of the labour market for researchers. This has been expressed by the decision to create 1000 new jobs for PhD holders in research units and Associate labs, increased by a further 500 by 2010, according to the 2008-2010 NRP. The creation of the ‘Invited Chairs’ for senior academics and researchers comes in the same vein.

The second axis concerns international partnerships. There has been an active participation in multilateral programmes and scientific networks including several European joint research infrastructures. Within the constraints of the country’s limited resources, Portuguese partners have been active in the context of those international research networks and infrastructures. There has also been an open policy with regard to the possibility of participation of individuals and research units from third countries in research projects. The above-mentioned contracts established with several US universities (MIT, Austin-Texas, Carnegie-Mellon and Harvard) and with the Fraunhofer Society are also examples of internationalization concerns.

Finally, Portugal has been committed to increase participation in other activities related to the building up of ERA, namely FP7 and the ERA-NET initiative. An office aimed at promoting the involvement of Portuguese organizations, both public and private, in FP7 was established (GPPQ). Portugal has so far participated in 25 ERA-NETs in different fields. A major restriction to an even stronger commitment to ERA-NETs stems from the country’s limited financial and human resources. Further, in what regards the opening up national programmes, the perception that Portuguese scientists would be in disfavour in relation to researchers from the scientifically more advanced member states has been an important barrier to further advancements.
References


GPEARI (2008b): Dotações Orçamentais para C&T e I&D 2009, GPEARI.


List of Abbreviations

ACRI Austrian Cooperative Research Institutes (Vereinigung der kooperativen Forschungsinstitute)
ARC Austrian Research Centers
CTP Competitiveness and Technology Poles
ERP Fund European Recovery Programme Fund
EW ERAWATCH
FCT Portuguese Science and Technology Foundation
FP European Framework Programme for Research and Technology Development
HEI Higher education institutions
HES Higher education sector
MCTES Portuguese Ministry for Science, Technology and Higher
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSRF</td>
<td>National Strategic Reference Framework</td>
</tr>
<tr>
<td>PRO</td>
<td>Public Research Organisations</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>Research and development</td>
</tr>
<tr>
<td>SF</td>
<td>Structural Funds</td>
</tr>
<tr>
<td>S&amp;T</td>
<td>Science and technology</td>
</tr>
</tbody>
</table>
Abstract

The main objective of the ERAWATCH Policy Mix Country reports 2009 is to characterise and assess in a structured manner the evolution of the national policy mixes in the perspective of the Lisbon goals, with a particular focus on the national R&D investments targets and on the realisation and better governance of the European Research Area. The reports were produced for all EU Member State and six Associated States to support the mutual learning process and the monitoring of Member and Associated States’ efforts by DG-RTD in the context of the Lisbon Strategy and the European Research Area. The country reports 2009 build and extend on the analysis provided by analytical country reports 2008 and on a synthesis of information from the ERAWATCH Research Inventory and other important available information sources.

This report encompasses an analysis of the research system and policies in Portugal.
The Publications Office has a worldwide network of sales agents. You can obtain their contact details by sending a fax to (352) 29 29-42758.
The mission of the Joint Research Centre is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of European Union policies. As a service of the European Commission, the Joint Research Centre functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.