Acknowledgements and further information:

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The opinions expressed are those of the authors only and should not be considered as representative of the European Commission’s official position.
Executive Summary

In terms of GDP, Greece is classified as a medium European Union country with 1.98% and 2.25% of the EU’s GDP and population respectively in 2009, while GDP per capita amounts to €20,700 representing 87% of average GDP per capita of EU-27. In terms of R&D expenditure, however, it falls with the classification of small countries representing only 0.57% of EU's GERD (2007). Since 2000, GERD remained stagnated around to 0.58% of GDP, while BERD, which is among the lowest in EU-27, slightly shrank from 0.19% of GDP in 2001 to 0.16% in 2007.

After almost a decade of high growth rates for Greece, the international economic crisis in 2008 slowed down the growth of the economy, although growth remained higher than the EU-27. Due to the very high debt and public deficit, the country entered a severe debt crisis in 2010 leading to a bailout agreement with IMF, ECB and European Commission, followed by a stringent austerity and consolidation programme that cuts public expenditures and investments. However, due to the fact that approximately 75% of the competitive research funding comes from the Structural Funds and that the government has committed the necessary national contribution, it is expected that the planned public funding of €1.3b for research and innovation until 2015 will be distributed without problems. On the contrary, institutional funding is expected to be reduced due to the cut of the salary of researchers and academics, the severe cut of recruitments, and the restructuring the public research sector through mergers. In the business sector crisis is expected to negatively affect the already very low R&D investments following the downturn of the fixed capital formation which has shrunk by 11.4% in 2009 and it expected to shrink by 15.3% in 2010. However, the behaviour of firms will differentiate depending on the size and the sector as there are signs of increasing investments among the research leading Greek companies (JRC, 2010).

Responding to the crisis and the Memorandum with IMF and EC Greek government is introducing significant reforms covering all domains of the knowledge triangle, as well as financial, economic, and regional policy. The reforms are expected to improve the enabling environment for all investments, including R&D and innovation and the modernisation of the business sector. However, the austerity programme and the rise of taxes (VAT, income and corporate taxes) decreased liquidity and internal demand deepening further the recession.

Mobilisation of resources by the business sector is hindered by the low demand for research based knowledge rooted in the existing structural characteristics of the economy, the significant institutional and bureaucratic obstacles and the volatile policy environment. In addition, the low absorptive capacity of the business sector and in particular the very low (by EU standards) demand for highly skilled human resources, is both a cause and effect of the low demand for knowledge. In addition restricted access to capital, especially for new firms, due to the reluctance of the financial system to finance innovation and risky investments is also among the factors hindering mobilisation of resources for R&D.

The existing research policy mix, although it is still under development as new measures are expected to be added in the near future, addresses the main barriers to R&D investment by focusing on strengthening R&D performing firms, shifting existing firms towards more knowledge intensive activities and setting up R&D intensive indigenous firms. This strategy is reinforced by strengthening collaboration...
between firms and the public research system. Although the overall policy mix is coherent and well balanced in terms of the barriers it addresses, most of the underlying causes of these problems, are related to other policy domains.

Knowledge Triangle

Coordination among the different aspects of knowledge triangle policy is still underdeveloped although certain steps towards this direction have been taken. The move of General Secretariat for Research and Technology (GSRT) to Ministry of Education is expected to strengthen co-ordination of research in terms of education policies. However, coordination of innovation policy is now split among GSRT and Ministry of Regional Development. Furthermore, according to the laws for research and for Higher Education Institutions (HEIs), which are under consultation, government intents to allocate institutional funding to research organisations and universities on the base of multi-annual programming agreements with the organisations. Also funding for research and innovation is going to be coordinated through a multi-annual framework programme (NFPRI), a role which today is played by the Structural Funds (SFs) Operational Programmes.

Effectiveness of knowledge triangle policies

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<th>Recent policy changes</th>
<th>Assessment of strengths and weaknesses</th>
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<td></td>
<td>A new target for GERD to go to 2% of GDP until 2020 has been set.</td>
<td>The policy mix implemented the last decade failed to mobilise private sector and increase knowledge demand and R&amp;D investments.</td>
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<td>After three years of funding stagnation, the first support measures have started.</td>
<td>The overall budget for research and innovation for the period 2010-2015 is significantly higher compared to the previous programming period.</td>
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<td>GSRT moved to Ministry of Education thus increasing coordination with education policies</td>
<td>Administrative shortcomings and lack of planning and implementation capacity jeopardise the effectiveness of the measures.</td>
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<td>A new law for the restructuring of the research and innovation governance is underway including the creation of a new funding instrument (NFPRI) which is going to consolidate research and innovation funding.</td>
<td>Recent fiscal crisis is expected not to affect competitive funding provided by the NSRF although investments on infrastructures and human resources will be significantly reduced.</td>
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<td>The share of competitive and performance related funding is going to be increased at the expense of the block funding.</td>
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<th>Recent policy changes</th>
<th>Assessment of strengths and weaknesses</th>
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<td></td>
<td>There is a gradual shift in the support of innovation from subsidies to intelligent financial mechanisms.</td>
<td>Innovation capacity of firms remains low despite the efforts of innovation policy</td>
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<td>The creation of new financial mechanisms focusing on early stage and micro financing has been announced.</td>
<td>Responsibility of innovation policy is now shared among GSRT and Ministry of Regional Development setting the issue of coordination.</td>
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<td></td>
<td>New measures are launched after almost three years of stagnation.</td>
<td>Administrative shortcomings and lack of planning and implementation capacity jeopardise the effectiveness of the measures.</td>
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Recent policy changes | Assessment of strengths and weaknesses
---|---
**Education policy**
- A new reform of the higher education sector has been initiated, focusing on improving the quality, efficiency and relevance of the provided education.
- Funding will be linked with performance and will be distributed on the base of multi-annual programming agreements.
- The focus on life long learning is strengthened.
- The academic community strongly opposes the announced reforms leading to an open confrontation with the government.
- There is a mismatch between supply and demand for life long learning.

**Other policies**
- New laws are under consultation for improving framework conditions including: reduction of red tape; simplification of the procedures for establishing firms; simplification of the tax system
- Bureaucracy is hindering efforts to improve framework conditions.
- Both economic crisis and the strict austerity programme and the rise of taxes (both VAT and corporate taxes) reduce liquidity from the market and worsen prospects for entrepreneurs.

**European Research Area**

In terms of national research policy, ERA provides the opportunity to tap into additional sources of funding, profit from international knowledge and increase local research capacity through collaborations and use of European resource infrastructures. Furthermore, ERA is seen by government as the mean of increasing the role of Greece in the Balkans and Southeast Europe. However, few steps towards the achievement of ERA objectives have been done the last three years due to lack of a coherent strategy and adequate budget. In 2010 the main efforts of the Ministry of Education, which is responsible for the research policy, have been on the one hand, the formulation of a new strategy for research, education and the internationalisation of the research system, and on the other hand the introduction of the necessary reforms for the implementation of the strategies. As it can be seen in the following table the reforms address several of the ERA objectives.
### Assessment of the national policies/ measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

<table>
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<tr>
<th>ERA objectives</th>
<th>Main policy changes</th>
<th>Assessment of national strengths and weaknesses</th>
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</table>
| **1 Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers** | - The law for the higher education sector under consultation is expected to:  
  - improve alignment of curricula with economic and societal needs,  
  - strengthen the international orientation of the sector  
  - align postgraduate studies with European standards  
  - The new programme for postdoctoral research encourages inward and outward mobility. | - Low demand for researchers by the business sector  
- Misalignment between supply and demand of researchers and skills.  
- Low attractiveness of working conditions for researchers. The current cut of salaries and reduction of public investments due to the crisis is further reducing the attractiveness research jobs. |
| **2 Increase public support for research**                                      | - The budget for competitive funding for the current programming period has increased significantly compared to the previous period amounting to €1.3b.  
- The new multi-annual programming instrument NPFRI is expected to consolidate and better align funding with needs. | - Policy and administration inefficiencies delayed the planning and implementation of the OPs.  
- Public funding for competitive measures is not going to be reduced due to the crisis. However reduction of investment on human resources and infrastructure should be expected. |
| **3 Increase European coordination and integration of research funding**      | - A strategy for the internationalisation of the research system will be announced soon. | - No specific strategy for cross-border collaboration exists.  
- Overall low public funding of research, restrict resources for cross-border initiatives. |
| **4 Enhance research capacity across Europe**                                  | - The forthcoming law for the HEIs intents to introduce some flexibility for universities to set incentives for academics; link funding with performance; and adopt European standards in postgraduate studies.  
- The national road map for research infrastructures is under preparation. | - Strong opposition from the academic community hampers changes.  
- Overall low public funding of research, restrict resources for participating in European infrastructures. |
| **5 Develop world-class research infrastructures (including e-infrastructures) and ensure access to them** | - The national road map for research infrastructures is under preparation. | - Greece is interested in hosting a European Research Infrastructure  
- Overall low public funding of research, restrict resources for participating in European infrastructures. |
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<th>ERA objectives</th>
<th>Main policy changes</th>
<th>Assessment of national strengths and weaknesses</th>
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<td>6 Strengthen research institutions, including notably universities</td>
<td>The forthcoming law for the HEIs intends to:</td>
<td>• Quality of research has been improved in the higher education sector although it is still beyond the European average</td>
</tr>
<tr>
<td></td>
<td>• further enhance the quality assurance processes and links funding with performance;</td>
<td>• Quality of education is still hindered by several drawbacks.</td>
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<td>• Strengthened autonomy of HEIs increases accountability and opens management to stake holders.</td>
<td>• Strong opposition from the academic community hampers changes.</td>
</tr>
<tr>
<td>7 Improve framework conditions for private investment in R&amp;D</td>
<td>• The new fund NFEP intents to close the gap in the funding of innovative and new firms.</td>
<td>There are significant barriers for private R&amp;D investments including red tape, lack of competition in several segments of the economy, lack of funding due to the risk adverse culture of the financial system.</td>
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<td></td>
<td>• The new Investment Law provides tax incentives for innovative and research performing enterprises</td>
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<td></td>
<td>• Recent reforms reduced barriers in setting up enterprises</td>
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<td>8 Promote public-private cooperation and knowledge transfer</td>
<td>Most of the measures funded by GSRT are addressing science-industry cooperation and technology transfer either through collaborative research projects or research and innovation subcontracting.</td>
<td>• Low demand for research based knowledge by the private sector and low collaboration skills in universities and research centres hinders public private cooperation.</td>
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<td></td>
<td>• The recently launched programme for postdoctoral research facilitates inward and outward mobility of post doc researchers.</td>
<td>• The existing public technology transfer mechanisms are lacking the necessary competences and skills</td>
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<td>9 Enhance knowledge circulation across Europe and beyond</td>
<td></td>
<td>Greek research teams are very active in FP7 and COST programmes.</td>
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<td></td>
<td></td>
<td>• Participation in bilateral agreements and other co-operation instruments is limited due the low overall budget for research.</td>
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<tr>
<td>10 Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world</td>
<td>In the current programming period no policy measures or activities have been undertaken.</td>
<td>Particular interest for Balkan, Mediterranean and Black See countries. There are several links and co-operations.</td>
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<td>Era Objectives</td>
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| 11 | Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle | Efforts are made to improve coordination of knowledge triangle policies:  
- Move of GSRT to Ministry of education increase opportunities for better coordination with education policy;  
- The new multi-annual programme NFPRI coordinates funding for research and innovation. | Procedures for coordination of design and implementation across policy domains are underdeveloped. Recent efforts to develop some coordination mechanisms need time to break rigid boundaries. The effort is further hindered by the lack of competences and skills of the public administration, the frequent rotation of the hierarchy and the lack of organisational memory. |
| 12 | Develop and sustain excellence and overall quality of European research | Evaluation of HEIs continues in a faster pace.  
The new law under consultation for HEIs intents to: link funding with performance; consolidate HEIs; improve procedures for appointment and promotion of staff.  
The forthcoming law on research sets as a priority research excellence. | Quality is hinder by low institutional funding, limited autonomy, and inefficiencies in the peer review system and in the promotion and appointment of staff, geographical fragmentation of HEIs. |
| 13 | Promote structural change and specialisation towards a more knowledge-intensive economy | The new measure for the promotion of spin-offs and spin-outs contribute to the increase of the dynamic new knowledge intensive companies.  
The new measure supporting research in non-research performing firms facilitate firms to climb up the value chain. | Greek economy is specialised towards less knowledge intensive segments.  
Among the aims of the existing policy mix is to facilitate the restructuring of the economy towards knowledge intensive activities. |
| 14 | Mobilise research to address major societal challenges and contribute to sustainable development | GSRT organises further elaboration of the research priorities towards sustainable development and eco innovation. | Research priorities set in 2007 take into consideration societal challenges and are in line with the Grand Challenges. However no specific budget has been attached to the priorities. It is also expected that any future change in priorities will not be followed by specific budgets. |
| 15 | Build mutual trust between science and society and strengthen scientific evidence for policy making | GSRT is going to provide funds of approximately €5m during the period 2011-2015. | Activities developed during the previous programming period were not continued in the current period leaving a gap of almost three years. |
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1 Introduction

The main objective of the ERAWATCH Analytical Country Reports 2010 is to characterise and assess the evolution of the national policy mixes in the perspective of the Lisbon goals and of the 2020, post-Lisbon Strategy. The assessment will focus on the national R&D investments targets, the efficiency and effectiveness of national policies and investments into R&D, the articulation between research, education and innovation, and on the realisation and better governance of ERA. In doing this, the 15 objectives of the ERA 2020 are articulated.

The report builds on the 2009 report streamlining the structure and updating the 2009 policy assessment in the domains of human resource mobilisation, knowledge demand, knowledge production and science-industry knowledge circulation. The information related to the four ERA pillars covered in the 2009 report is also updated and it is extended in order to cover all six ERA pillars and address the corresponding objectives derived from ERA 2020 Vision.

Given the latest developments, the 2010 Country Report has a stronger focus on the link between research and innovation, reflecting the increased focus of innovation in the policy agenda. The report is not aimed to cover innovation per se, but rather the 'interlinkage' between research and innovation, in terms of their wider governance and policy mix.

2 Performance of the national research and innovation system and assessment of recent policy changes

The aim of this chapter is to assess the performance of the national research system, the 'interlinkages' between research and innovation systems, in terms of their wider governance and policy and the changes that have occurred in 2009 and 2010 in national policy mixes in the perspective of the Lisbon goals. The analysis builds upon elements in the ERAWATCH Country Report 2009, by updating and extending the 2009 policy assessment in the domains of resource mobilisation, knowledge demand, knowledge production and science-industry knowledge circulation. Each section identifies the main societal challenges addressed by the national research and innovation system and assesses the policy measures that address these challenges. The relevant objectives derived from ERA 2020 Vision are articulated in the assessment.

2.1 Structure of the national research and innovation system and its governance

This section gives the main characteristics of the structure of the national research and innovation systems, in terms of their wider governance.
In terms of GDP, Greece is classified as a medium European Union country with 1.98%¹ and 2.25% of the EU's GDP and population respectively in 2009, while GDP per capita amounts to €20,700 representing 87% of average GDP per capita of EU-27. In terms of R&D expenditure, however, it falls with the classification of small countries with only 0.57% of EU's GERD (2007). GERD in 2007 represented only 0.58% of GDP while, in the same year, the EU-27 average was 1.85%. Private R&D investments on R&D (BERD) as a percentage of GDP are among the lowest in EU amounting to only 0.16% of GDP compared to 1.19% for the EU-27 (2007). The trend is BERD to further diverge from EU-27 as between 2005 and 2007 it shrank by an average of 1.9% p.a. while in EU-27 it grew by 0.9% p.a.

During the period 2000-2007 Greece has experienced high growth rates of 4.1% on average well above the EU-27 which was of 2.2%. According to the OECD, the main growth drivers included: improvements in product market regulation; liberalisation of the financial market; membership in the European Monetary Union (EMU); the stimulus provided by the 2004 Olympic Games; a dynamic presence in the export markets of south-eastern Europe; and strong immigration of low cost unskilled human capital (OECD, 2007). The international economic crisis slowed down the growth of the economy by affecting tourism and shipping, although growth remained higher than the EU-27 (1.3 in 2008 compared to 0.5 of EU-27). Due to the very high debt (126.8% of GDP) and public deficit (15.4% of GDP in 2009²) the country entered a severe dept crisis leading to a bailout agreement with IMF, ECB and European Commission. The agreement foresees lending of €120b providing that Greece will follow a strict austerity programme which is going to cut down public deficit below 3% of GDP until 2014, as well as structural reforms. The severe cut of public expenditures and the rising of taxes foreseen in the agreement together with the persisting international crisis, led to a recession which is expected to reach -4% of GDP in 2010 and –2.5% in 2011 (Ministry of Finance, 2010).

Main actors and institutions in research governance

The government elected in October 2009 started a reform programme which is expected to affect all levels of the research system. The “Action plan for the strengthening of research, technological development and Innovation” (GSRT, 2010), which was under public consultation until October 2010, set as a priority the creation of an "Integrated Research Area" by coordinating the research activities of all public research organisations and developing public-private research collaboration. The main reforms described in the action plan are going to be enforced by a new law for the governance of R&D.

At the political level, the Greek government and the Parliament with its Special Permanent Committee on Technology Assessment are the main actors. Under the current structure coordination at government level is weak so both policy design and implementation are mainly implemented at the operational level.

At the operational level a significant change has been implemented. The General Secretariat for Research and Technology (GSRT) of the Ministry of Development, which is the main research policy maker and funder of research since the early 1980s, moved to the Ministry of Education, Lifelong Learning and Religion. Thus all

¹ Unless stated otherwise, all quantitative indicators are based on Eurostat data sourced November 2010.
² Initially the public deficit was estimated at 13.7%. The figure was updated at 15.4% by Eurostat on 16 November 2010.
responsibilities for planning and funding research are concentrated in one ministry. Although this restructuring reinforces coordination among the two poles of the knowledge triangle - i.e. education and research- coordination with innovation is rather weakened as responsibility is now shared by the Ministry of Regional Development and Competitiveness and the Ministry of Education. Fears are expressed that the relocation denotes more emphasis to academic research and less so on business research and innovation.

The Ministry of Development took over some of the responsibilities of the former Ministry of Economy and Finance creating the Ministry of Regional Development and Competitiveness. The new ministry is now responsible for the management of the National Strategic Reference Framework which is the main funding source for research and innovation.

Most public research centres are supervised by GSRT. The main advisory body on research, the National Council for Research and Technology (NCRT), is attached to GSRT and contributes to priority setting for research funding. In an effort to strengthen coordination at this level, government reorganised the NCRT, increased its independence and its advisory role and broadened its scope by adding the responsibility of the evaluation of research policy and of all public bodies and organisations involved in the research system.

In addition to the funding distributed by GSRT, the Ministry of Education contributes to R&D funding through the general university funds (GUFs).

The Ministry of Rural Development and Food and the Ministry of Defence also provide some funding for research.

**Figure 1: Overview of the Greek research system governance structure**

Source: Revised from ERAWATCH Research Inventory
The institutional role of regions in research governance

At regional level the Regional General Secretariats, which until 2010 were part of the Ministry of Interior, played a limited role in R&D policy making due to lack of policy making and implementation capacity (GSRT, 2007). Despite the fact that their funding role has increased during the 2000’s, due to the increasing public funding (Structural Funds and national money) that is now distributed through the Regional Operational Programmes, they practically have no involvement in R&D and Innovation policy making. Their budgets and management authority have been relinquished to GSRT in order to finance its own national research measures with the obligation to allocate a specific amount per region following the breakdown agreed in the context of the respective regional Operational Programmes. Under the ongoing major reform of the governance of regions called “Kallikratis”, the regional secretariats are now in the process of being transformed into a kind of regional governments with significant power including the management of the Operational Programmes. However, the new responsibilities and budgets are expected to be clarified in 2011. Concerns are expressed on the ability of all regions to effectively design and implement policies due to their limited human resources.

Main research performer groups

The country’s 24 universities are the main research performers and account for approximately 50% of GERD (2007), while the 16 Technological Educational Institutions (TEI), which recently became part of the higher education system, make a limited contribution to research. In addition there are 27 public research centres with 12 of them been under the supervision of GSRT. Together, universities and public research centres are responsible for 71.7% of GERD, while private R&D performers have the lowest share (approximately 27% of GERD) among the EU member states after Cyprus and Lithuania (DG Research, 2008).

2.2 Resource mobilisation

Since 2000, Europe has made evident progress towards ERA but at the same time it is clear that Europe’s overall position in research has not improved, especially regarding R&D intensity, which remains too low. The lower R&D spending in the EU is mainly a result of lower levels of private investment. Europe needs to focus on the impact and composition of research spending and to improve the conditions for private sector R&D investments.

This section assesses the progress towards national R&D targets, with particular focus on private R&D and of recent policy measures and governance changes and the status of key existing measures, taking into account recent government budget data. The need for adequate human resources for R&D has been identified as a key challenge since the launch of the Lisbon Strategy in 2000. Hence, the assessment includes also the human resources for R&D. Main assessment criteria are the degree of compliance with national targets and the coherence of policy objectives and policy instruments.

2.2.1 Resource provision for research activities

Progress towards R&D investment targets

Investments on R&D in absolute terms have been increased the period 2000-2007 following the rate of growth of GDP and therefore the share in GDP has been stagnant (or fluctuated only slightly) at close to 0.6%. Due to the low level of private
investments (below 0.2% of GDP) the share of public funding of GERD in relative terms appeared to be higher than the EU-27 average. However it is far from optimum as the share of GBAORD in general government expenditures and the percentage of BERD financed by government are significantly below the European average.

Since 2000 total R&D investments as a percentage of GDP have been stagnated to an annual average of 0.58%, diverging from the national target of 1.5%. Despite the significant deviation from the target the new government elected in October 2009 raised the national target for R&D to 2% by 2020 (GSRT, 2010) relying on the potential leverage effect of a plant public funding of €1.3b\(^3\) for research and innovation for the period of 2010-2015\(^4\).

### Table 1: Basic indicators on R&D investments for Greece

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Greece</th>
<th>EU-27</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2005</td>
<td>2006</td>
</tr>
<tr>
<td>GERD (euro million)</td>
<td>1,154</td>
<td>1,223</td>
</tr>
<tr>
<td>R&amp;D intensity (GERD as % of GDP)</td>
<td>0.59</td>
<td>0.58</td>
</tr>
<tr>
<td>GERD financed by government as % of total GERD</td>
<td>46.8</td>
<td>na</td>
</tr>
<tr>
<td>GERD financed by business enterprise as % of total GERD</td>
<td>31.1</td>
<td>na</td>
</tr>
<tr>
<td>GERD financed by abroad as % of total GERD</td>
<td>19.0</td>
<td>na</td>
</tr>
<tr>
<td>GBAORD (euro million)</td>
<td>635</td>
<td>685</td>
</tr>
<tr>
<td>GBAORD as % of general government expenditure</td>
<td>0.74</td>
<td>0.76</td>
</tr>
<tr>
<td>BERD (euro million)</td>
<td>357</td>
<td>367</td>
</tr>
<tr>
<td>Business sector R&amp;D intensity (BERD as % of GDP)</td>
<td>0.18</td>
<td>0.17</td>
</tr>
<tr>
<td>BERD financed by government as % of total BERD</td>
<td>5.6</td>
<td>na</td>
</tr>
</tbody>
</table>

Source: Eurostat, November 2010

### Research funding mechanisms

Mechanisms for securing long-term investment in R&D, innovation and education have been in place since 1985. However, due to fiscal constraints they have become heavily dependent on Structural Funds, which represent approximately 10% of GERD. If general university funds (GUF) are excluded, funding from the Structural Funds amounts to 42% of the direct government funding of R&D (ERAWATCH Inventory, 2010). Dependence on Structural Funds together with planning inefficiencies of the administration resulted in the fragmentation of the planning and of funding budgets, which now are distributed across various sectoral or regional Operational Programmes (OPs). In addition, a complex and rigid management structure has been developed suitable for managing large infrastructure projects. This mechanism proved to be inadequate for dealing with the variety and some time complexity of research and innovation support measures. Plan and budget have to

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3 This is the amount of investment co-funded by Structural Funds and government. Logotech’s calculations based on Operational Programmes data.

4 Due to a 2 year delay in the implementation of the programmes the spending period will be extended from 2013 to 2015.
be negotiated with the European Commission through a complicated and lengthy process that enables little flexibility in terms of budget amendments.

Institutional funding increased from 46.3% of government budget appropriations in 2005, to 62.8% in 2007, due mainly to the gradual reduction in programme based funding following the end of the programming period 2000-2006. Although there is no updated data, it is estimated that institutional funding was prevailing also in 2008 and 2009 due to the delays in the development of the competitive funding programmes which started funding in 2010.

Competitive funding is allocated mainly through the Operational Programmes of “Competitiveness and Entrepreneurship”, “Education and Life Long Learning” and the Regional Operational Programmes of Attiki, Makedonia- Thraki, Ditiki Ellada- Pelloponisos - Ionia Nisia, and Thessalia – Sterea Ellada.

The OP “Competitiveness and Entrepreneurship” addresses public research organisations and industry and focuses mainly on innovation, collaborative and industrial research. The OP Education and Lifelong Learning support academic research and the development of researchers in the public research sector, while the two Regional operational Programmes support innovation, development of local research infrastructures and collaborative research.

According to the initial provisions in the OPs it is estimated that 43.8% will be directed to public R&D including the development of research infrastructures (11%), 30% will be directed to research and innovation in the business sector (around 9% will allocated to SMEs), and approximately 8% will go to research and innovation collaboration between business and research sectors including clusters and R&D and innovation poles (ERAWATCH Inventory, 2010). Tax incentives play only a marginal role as there is no differentiation between research and other types of investments.

Red tape, rigid management structures and low capacity of the public administrators led to significant delays in design and launching research programmes for the programming period 2007-2013. During the period 2007-2009 funding from Structural Funds to R&D and innovation was almost zero. Thus, the only sources for funding of research for the whole of 2007 and 2009 were institutional funding, FP7 and a diminishing number of projects from the previous programming period. Funding started only in 2010 with a delay of three years (see section 2.2.2 for launched programmes).

Recent policy changes

The new government started the restructuring of research funding in an effort on the one hand to accelerate the investment of the unspent budget of NSRF for research and innovation; and on the other hand to create a new multi-annual programming instrument the National Programming Framework for Research and Innovation (NPFRI) which integrates all research and innovation objectives and activities of the ministries in a single action plan aiming at a small number of national priorities. According to the consultation paper (GSRT, 2010) the main funding directions of the NPFRI are: research projects in specific research priorities, support of innovation, development of an integrated research area, development of research infrastructures and development of human resources in research.
Also, the undergoing tax reform aims at making the tax incentives more attractive for investors and especially for R&D and innovation investments.

**Main societal challenges and building mutual trust between science and society**

In 2007 GSRT set a wide range of research priorities for the period 2007-13 on the base of an assessment of the economic and societal challenges the country was facing at that time (GSRT, 2007). The priorities relevant to societal challenges are:

- Promotion of cultural heritage; improve understanding of cultural heritage and develop methods for protection, restoration, preservation and promotion of cultural goods;
- Promotion of sustainable mobility i.e. efficient, safe and environment-friendly transportation of people and goods, while also ensuring continuous improvement of the services provided to citizens.
- Addressing climatic change; lessen the dependence on imported energy resources in an environment-friendly manner; enhance energy safety.
- Understand the environmental processes, problems and risks; promote the sustainable management of the environment: seek out “cleaner” technologies and production processes.
- Improve the health system by addressing the deficiencies; develop prevention and early and reliable diagnosis; develop personalised treatments, new therapeutic methods, and innovative pharmaceuticals.
- Improve safety, monitoring and management of the environment and the natural resources;
- Improve safety of citizens and critical infrastructures from threats such as terrorism, organised crime and natural disasters.

However, no specific budget has been allocated to the research priorities and their funding follows a bottom-up approach based on the demand for competitive project funding.

The new Government is intending to further focus policy on green, sustainable development based on knowledge, innovation and human capital (GSRT, 2010). Further elaboration of these aspects will be presented in forthcoming calls of competitive research programmes.

Development of a mutual trust between science and technology is among the objectives of research policy since the previous programming period. However, initiatives started during 2000-2006 included support of museums and exhibitions, visits and demonstrations, or science ambassador programmes were not continued in the current programming period due to the significant delays in the overall planning. GSRT is designing interventions of approximately €5m for period 2011-2015 for supporting activities regarding the role of science in society and education. The strategy focuses on six axes: familiarisation with the production of scientific knowledge; facilitate access to scientific knowledge; improve the reputation of science and the attractiveness of research career; involvement of the civil society in science; understanding the relation between art and science; and promotion of specific applications.

**The impact of crisis on public R&D investments**
The final impact of the deficit and debt crisis in Greece on R&D will be the result of trends moving to different directions. The bailout agreement (Memorandum of Economic and Financial Policies) between Greece, IMF and EU foresees a significant reduction of public expenditures until 2013. According to the current update of the memorandum with IMF and EC, public expenditures should be cut by €5.58b (2.5% of GDP) in 2010, by €9.65b in 2011 (4.3% of GDP) and by €4.78b (2% of GDP) in 2013. The cut for the Public Investment Programme (which is the funding source for all public investments) amounts to €1.1b for 2010 while in 2011 it will be lower by 3.3% compared to 2011. However, due to the fact that approximately 75% of the competitive research funding comes from the Structural Funds and that the government has ensured the national co-funding, mainly through loans from the European Investment Bank, it is expected that the planned public funding of €1.3b for research and innovation until 2015 will be distributed without problems. On the contrary, institutional funding is expected to be reduced due to the cut of the salary of researchers and academics (in the context of the overall public spending reductions) of approximately 17% and by restructuring the public research sector through mergers.

2.2.2 Evolution of national policy mix geared towards the national R&D investment targets

Business sector’s investment on R&D follows the overall trend of R&D expenditures (GERD) and remains stagnant below 0.2% of GDP for the whole period 2000-2007. During the period 2005-2007 private investments decrease both in absolute and relative terms (see Table 1). The average BERD accounts for 0.16% of GDP while for the same period the EU-27 average was 1.17%. Thus the gap between Greece and the EU-27 is persisting and even increasing.

The crisis started in Greece in 2008 is expected to negatively effect the already very low R&D investments following the main trend of the private fixed capital formation which has shrunk by 11.4% in 2009 and it expected to shrink by 15.3% in 2010. However, it is expected that the behaviour of firms will differentiate depending on the size and the sector. According to the data presented in “The 2010 EU Industrial R&D Investment Scoreboard” (JRC, 2010) the five research leading Greek companies in 2009 increased their investments in R&D compared to 2008 by 61%.

The low private investments have been recognised by the government as a major problem which is related with the structure of the economy, the framework conditions and the business culture (GSRT, 2010). On that ground, the government is revising the current policy by creating a policy mix which goes beyond the research policy domain. The main priorities presented in the current consultation are:

- improvement of the economic environment and of the framework conditions;
- development of cooperation between the scientific and business community;
- participation in real terms of the business sector in cutting edge research;
- support of entrepreneurship with innovative orientation; and

5 The figures could be changed in the near future depending on the progress of the implementation of the austerity programme.

6 According to Ministry of Finance 17% is the average cut of salaries in the public sector. However, cut in researchers’ salaries could be different.

7 The growth rate is calculated by using the sum of the investments in 2008 and 2009.
diffusion and commercialisation of research results;

Following the ‘routes’ identified by the “Policy Mix Project” as the major ways for stimulating private R&D investments the new policy mix is defined as follows:

**Route 1: Stimulating greater R&D investment in R&D performing firms**

Stimulation of R&D investments in R&D performing firms is the most important among the six routes in terms of number of measures and overall budget. The approach is to facilitate companies’ access to high quality research facilities and groups through collaborative research and development of intramural research (programme “Collaboration”). International cooperation through EUREKA is also a dimension that is growing in importance.

The R&D measures are accompanied by measures supporting long term collaboration between the business and the science sector such as the existing regional innovation poles which are going to be expanded by adding new ones; and knowledge intensive clusters.

Support for research in R&D performing SMEs is provided by the new measure “Support for new firms and SMEs” aiming at developing intramural R&D in SMEs by providing funding to networks of SMEs.

**Route 2: Promoting the establishment of new indigenous R&D performing firms**

The route increases its important with some of the existing mechanisms such as fund of funds TANEO, while new measures are set in place. The new initiatives include tax incentives in the new “investment law”\(^8\), measures improving access of firms, including new ones, to finance and subsidies for creation of new firms. The former set of measures includes the creation of the “National Fund for Entrepreneurship and Development” (ETEAN) which is an umbrella mechanism providing a wide portfolio of financing products to innovative enterprises (see section “other policies affecting R&D investments”). The latter include the “Creation – support to new innovative enterprises, notably highly knowledge intensive” measure supporting spin-offs from public research organisations and new firms spinning-out from established or new innovative companies, started in the end of 2009.

Support for industrial research for new companies has been redesigned and now the new measure “Support for new firms and SMEs” aims only at national priority areas. Some of the above measures are expected to be part of integrated initiatives such as innovation and R&D poles. Also measures aiming at supporting youth and female entrepreneurship will be refocused towards innovative ventures.

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

Currently two measures target implicitly or explicitly this route. The new measure “Support for new firms and SMEs” is addressing this goal by supporting firms, of any size, which have not been supported by any national or European research programmes in the past. In addition Innovation Voucher for SMEs supports subcontracting of small R&D and innovation tasks to research and innovation organisations.

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

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\(^8\) The new Investment Law is expected to be launched in early 2011.
For several years the focus has been on attracting FDI through tax incentives and other forms of funding. The Hellenic Centre for Investments made some unsuccessful and uncoordinated efforts to attract R&D investments from abroad by promoting the research capabilities and achievements of the country.

The first effort dedicated to attracting research intensive FDIs by developing the necessary enabling conditions, is a mini policy mix initiative the “Alexandria Innovation Zone” in Thessaloniki. The business plan was completed in December 2008 however no important progress has been made so far.

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

The priority of the route is high although its goal to some extent is also addressed by mechanisms focusing on more than one route. The policies include mechanisms for developing both supply and demand for R&D and innovation services and the creation of and improvement to mechanisms for bridging between supply and demand. In the new industrial research programme “Support for new firms and SMEs” subcontracting to public research and technological development organisations is compulsory, while the new measure “Innovation Vouchers for SMEs” explicitly supports subcontracting of research and innovation activities.

Regional Innovation Poles contribute to this route’s goal by developing user oriented research infrastructures and providing support for research and innovation subcontracting.

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

Increasing R&D in the public sector is supported through four sub-routes, namely development of research infrastructures; direct competitive research funding; multi-annual research agreements and support of collaboration with the business sector.

Support for research infrastructures is related directly to excellence in two dimensions. The existing public research infrastructure supervised by GSRT is going to be restructured and funding will be directly related with performance and quality criteria. Competitive funding for academic research is increased to approximately €380m for the period 2010-2015 (from €115m in the previous period). In addition Partnerships of Institutes in the form of thematic networks will be supported through competitive funding. Institutional funding will take the form of multi-annual programming agreements between public research organisations and GSRT.

The six routes are not equally important within the policy mix. Attracting R&D performing firms from abroad is given low importance with the main emphasis on increasing R&D in firms that already have research activities, setting up new research intensive firms and increasing competitive R&D in the public sector. Encouraging more firms to undertake R&D has increased in importance through the new measure targeting SMEs. Increasing R&D in the public sector is linked to excellence with an emphasis on creating critical mass in priority areas refocusing funding and consolidating the research base. In this respect coordination with European research policies has become more important due to expected synergies.

Although, research policy mix is addressing most of the major deficiencies in the research system which is relevant to research policy domain, it fails to meet the main policy targets as it has been characterised by low funding and lack of focus and priorities. Equally important are the significant deficiencies experienced in the implementation of the policies due to staffing shortcomings in terms of both quality
and quantity, complex implementation procedures, red tape and lack of learning and knowledge accumulation mechanisms (e.g. through evaluations or training) in the implementing authorities (see also INNO-Policy TrendChart, 2008).

The undergoing changes intent to refocus funding on a smaller number of areas and improve the performance of the funding by emphasising on the quality and the relevance of the outcome. In addition there are ongoing efforts on the one hand to simplify the procedures and the paperwork for participating in competitive programmes, and on the other hand to increase transparency in the appraisal and selection procedures. However, the efficiency of these efforts remains to be seen.

In addition to the policy mix, public procurements could be an important mechanism for stimulating innovation and R&D in companies. However, lack of transparency and the existing corruption in the public sector undermines the potential of public procurements to support R&D and innovation policy. The government is now reorganising the procurement system by increasing central control and improving procedures in specific areas such as the health system.

**Other policies affecting R&D investments**

In response to the economic crisis and under the pressure of the “Memorandum of Economic and Financial Policies” the government started an ambitious programme of reforms covering financial, economic, innovation, human resources, education, and regional policy, which is expected to improve the enabling environment for all investments, including R&D and innovation and the modernisation of the business sector in general.

In the domain of economic and innovation policy the main objective is to increase competition, facilitate the creation of new firms and encourage innovation oriented entrepreneurship by improving framework conditions and access to financing. In that direction the main reforms are: the simplification of the procedures in order new firms to be established in one day, the new framework is expected to start in early 2011; improvement of the regulatory framework for developing industrial areas and business parks; and creation of a road map for removing the 30 most important obstacles for entrepreneurship and innovation. In addition the “National Fund for Entrepreneurship and Development” (NFED) is under public consultation. NFED includes two funding pillars. The first pillar includes Jeremie, and mechanisms providing seed and start up capital, venture and equity capital and credit guarantees to innovative enterprises of all sectors. The second pillar will support eco-innovation and green investments.

In the education policy domain a new reform at all levels of the education system is under way. The reform in the higher education sector, which was under public consultation from October to December 2010, replaces the previous reform started in 2005. The new reforms introduce radical changes towards the modernisation of higher education in the management, academic units, organisation of studies, and funding of HEIs in an effort to increase accountability, improve management,

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9 Examples are the SIEMENS scandal regarding the procurements in OTE when the company was under public control and the overpricing and overspending in pharmaceuticals and medical equipment and consumables in hospitals. For the latter European Commission has set a fine of €4.3m to the Greek government on March 2009 for not taking the necessary actions, article in the newspaper EXPRESS, 25 November 2010.

10 Joint European Resources for Micro to Medium Enterprises
increase autonomy of HEIs, improve quality of knowledge provision, and improve the provided services to the students (Ministry of Education, 2010).

Lifelong learning will receive a considerable share of the public funding under the new OP for education, amounting to 15% (approximately €331m) (Ministry of Education, 2007). Funding will support the creation of Institutes for Lifelong Learning within universities and the development of appropriate curricula. Despite efforts on the supply side, development of demand has been overlooked by policy so far, resulting on oversupply of any kind of training programmes (INNO-Policy TrendChart, 2008).

Coordination between research and education policy is still weak. The transfer of the GSRT to the Ministry of Education, puts policy making of research, innovation and education under the same ministry and thus it is expected to improve coordination between research and education. However, several responsibilities on innovation remain in the Ministry of Regional Development and Competitiveness and thus coordination of innovation policy and research policy is weakening.

Main barriers and risk for attaining the national targets for BERD

The research policy adopted so far failed to meet targets for private investments (BERD 40% of GERD) mainly due to the fact that there are significant barriers which are related to domains that are beyond the scope and influence of the research policy or even of the knowledge triangle policies (Maroulis, 2009). The low investment in research by the private sector is a result of the very poor demand for research based knowledge, reflecting the structural characteristics of the Greek economy, which is oriented towards less knowledge intensive and low added value segments of the economy. Despite high growth rates over the last 15 years, expansion of the economy is not innovation driven and the contribution of technology intensive sectors to value added is marginal. A combination of structural characteristics and significant institutional and bureaucratic obstacles together with a volatile policy environment, lead business to invest in activities with either high rates of return in the short-term, or very low risk (Bartzokas, 2007).

In addition, low absorptive capacity in the business sector and the misalignment between supply and demand for university graduates and skills (Maroulis, 2009) are two of the factors hindering the increase of demand for knowledge. Also the country’s performance in lifelong learning, which is a mechanism for improving absorptive capacity and also inducing structural change, is very weak and is worsening (INNO-Policy TrendChart, 2008). Policy efforts to encourage demand for research based knowledge are being hindered by the limited ability and willingness of the public research system to respond to economic needs, and the failure of intermediary organisations to efficiently facilitate knowledge circulation (Maroulis, 2009).

Finally, private R&D investment is also hindered by reluctance on the part of the financial system to finance innovation; traditionally, the focus of the financial system has been on low risk investment. Since 2009 the lack of liquidity in the financial market, due to the economic crisis, increased conservatism and reduced even more financing.

The government’s programme of reforms (see discussion above), at least at the level of rhetoric, addresses the most important barriers which are mainly outside the research policy domain. The changes in the regulatory environment, which is expected to reduce red tape and increase competition, and the shift from subsidies toward more intelligent financing instruments for supporting entrepreneurship and
innovation, are all in the right direction. However, it remains to be seen how fast and efficiently they will be implemented in order to address the deteriorating economic environment due to the crisis, given the low efficiency and capacity of the public administration. On the other hand increases of taxes (VAT, corporate and income taxes) reduce liquidity and discourage investments.

In addition to the efforts to improve framework conditions, the emphasis on establishing new R&D performing firms is expected to contribute to shifting the economy towards more knowledge intensive segments. However, the prosperity and sustainability of the firms depends among other factors on the success of the reforms addressing framework conditions. Also increasing emphasis on non R&D-performing and on supporting extramural R&D and technological services to SMEs addresses a significant drawback.

Finally, supporting of both research and non research human resources, reforming the higher education sector, increasing funding for life long learning and developing relevant infrastructures is expected to contribute in the long run to the improvement of absorptive capacity of the business sector.

2.2.3 Providing qualified human resources

The production of high quality researchers and postgraduates cannot be seen in isolation from the overall quality of the Greek higher education system which is one of the most centralised and least flexible systems in the OECD (OECD, 2007).

Doctoral level education is offered by universities and the research centres supervised by GSRT. On average in the period 2005-2008 7,607 new PhD students were enrolled and 1,662 graduated annually. Equally important for the Greek research system is the inflow of Greek PhD graduates from abroad amounting to 600-700 per year\(^{11}\). A recent study on researchers mobility found that more than 35% of the researchers working in the Greek HEIs obtained their degree abroad (MORE, 2010b). Demand for doctoral studies, as it is expressed by the enrolments, decreased after a peak of 7,869 in 2006 to 7,164 in 2008. The share of PhD students in the total student population in higher education (ISCED levels 5-6) is higher (3.4% in 2008) than in EU-27 (2.6%) indicating a higher demand for PhD studies in Greece.

Overall demand for researchers is lower than the EU-27 average. The share of researchers (in full time equivalents) as a percentage of the total employment in Greece was in 2007\(^{12}\) 0.46%, which is much lower than the EU-27 average of 0.66%. Comparing with EU-27, the demand from the business sector is very low (Maroulis, 2009) and therefore most PhD graduates are pursuing academic careers where a PhD degree is a prerequisite. Approximately 85% of the PhD holders are employed in the university sector and only 7% in the business sector\(^{13}\) although the share of the latter has been almost doubled since 2001 (3.6%). The surplus of doctoral graduates is directed to non-research jobs or it expatriates. However, no specific estimation can be made about brain drain as data on international mobility of researchers are not available.

The high supply of PhD holders compared to the demand, the rigidities in the recruitment systems of universities and the low institutional funding, has worked to

\(^{11}\) Hellenic NARIC
\(^{12}\) Latest available data on researchers provided by Eurostat for Greece is in FTE for 2007. Latest data in head counts is for 2005.
\(^{13}\) Latest available data by Eurostat are for 2005.
increase the academic staff working on short term contracts\textsuperscript{14} from 16.6\% of the total academic staff in 2001 to 20.0\% in 2008\textsuperscript{15}.

Human Resources in Science and Technology (HRST) as a share of the economic active population in Greece have been increased faster than EU-27 in the last five years. However, the share remains lower. In 2009 the share of HRST in the economically active population of the age group 25-64 was 31.8\% while in EU-27 it was 40.1\%. The share of HRST in the public administration (51.5\% of the employed in 2009) is higher than in the total economy (32.8\%) reflecting the fact that holding a degree is increasingly becoming a prerequisite for most of the job positions in the public administration.

Supply of science, maths and engineering graduates fluctuates from year to year however the general trend is slightly positive. The average annual share of the graduates in the population aged 20-29 was 0.98\% for the years 2005-2008 which is much lower than the 1.38\% of the EU-27. In 2008, the shares of the graduates in the population aged 20-29 of Greece and EU-27 where 1.1\% and 1.4\%, respectively.

In recent years some efforts for the introduction of entrepreneurship spirit in the studies has been made by the introduction of the subject in the curriculum especially of the engineering departments.

Comparing supply with demand for human resources by the business sector two observations could be made. On the one hand, according to 6\textsuperscript{th} Community Innovation Survey (CIS6) with data for 2006, the share of innovative firms that see lack of qualified personnel as a significant obstacle to innovation is the highest in the EU-27 and is comparable only to Estonia, Latvia and Lithuania. This reveals a lack of skills and capabilities regarded as important for innovation. On the other hand studies (Lianos, 2007) have provided evidences for the existence of over-education indicating an abundance of highly educated individuals relative to overall demand. Comparing the two observations, a misalignment between supply and demand for university graduates is evident in terms of fields of study and skills.

Lower production of HRST compared to EU-27 and misalignment with demand is combined with very low participation in professional training activities keeping low the absorptive capacity of the business sector. Organisation of vocational training in firms is very low compared to EU-27. In 2005\textsuperscript{16} only 21\% of enterprises organised continuing vocational training compared to the 60\% in EU-27, and only 14\% of employees participated in such training compared to 33\% of EU-27. Participation in life long learning is also very low compared to EU-27, although it grows faster than in EU-27. In 2009 participation of the age group 25-64 in life long learning was only 3.3\% while the participation in EU-27 was 9.3\%.

Responding to the problem of misalignment between demand and supply of graduates and postgraduates, the government is planning specific actions within the overall reform of the higher education sector (Ministry of Education, 2010). The relevant reforms include change of the admission mechanism and the selection of field of study, different organisation of studies allowing for more flexibility in the development of curriculum and organisation of interdisciplinary studies, assessment of the quality of teaching and changes and opening of the management to the

\textsuperscript{14} Teaching staff are hired under law 407/08 for only one or two semesters with mainly teaching responsibilities only.
\textsuperscript{15} Hellenic Statistical Authority
\textsuperscript{16} This is the latest year of reference for all countries.
society. Also the budget for the support of lifelong learning activities is increasing and HEI are encouraged to develop their own programmes.

### 2.3 Knowledge demand

This section focuses on structure of knowledge demand drivers and analysis of recent policy changes.

The demand for research based knowledge is shaped by the structural characteristics of the Greek economy, which is oriented towards low- and low-to-medium technology sectors and less knowledge intensive services. Allocation of research funding among the funding sources, provides an indication of the main drivers of demand for research. Research funded by the private sector represents only 31.1% of the total funding (EU-27 average amounts to 54.6%)\(^{17}\) while government funding represents 46.8% of the total.

The low knowledge demand is reflected also in the R&D intensity in the business sector which is only 0.16%\(^{18}\) and in the share of BERD in total gross R&D expenditures amounting to 30%; both being among the lowest in the EU-27.

Business activity has been concentrated in the less knowledge intensive and low value added segments resulting in low demand for research based knowledge. Driven by the internal consumption, which was the main driving force of the growth during the late 1990s and 2000s, trade remained the most important sector in terms of value added at factor prices (VA) despite its relative decline from 34.5% of total VA in 2003 to 29.1% in 2007. During the same period, manufacturing slightly improved its position from 17.7% of VA in 2003 to 19.6% in 2007. The financial services sector was the most dynamic one, experiencing a significant expansion from 7.3% of VA in 2003 to 11.4% in 2007. The transport sector retained its position around to 11% while the construction sector experienced a decline after the Olympic Games from 10.1% in 2003 to 7.2% in 2007.

Among manufacturing sectors, food products and textiles-apparel are the most prominent. Food product experienced a slight increase of its share in VA from 3.8% in 2003 to 4% in 2007, while textile and apparel declined from 1.7% in 2003 to 1.3% in 2007. Apart from the food, chemical and petroleum products experienced also a growth in their share from 1.8% in 2.5%. Also share of publishing and printing increased from 1.6% to 2.2% and metal products increased from 1.3% to 2.1%.

R&D demand from the private sector is driven mainly by most of the prominent sectors (chemicals, trade, food, fabricated metal products) as well as by IT services and electrical equipment where Greece shows a strong specialisation in R&D expenditures compared to the EU (ERAWATCH Network, 2006).

Universities are the most significant performers of R&D, with HERD representing 47.8% of GERD in 2006, while GOVERD corresponds to 20.8% of GERD. The share of research expenditures in universities and public research centres financed by the business sector, and therefore it is directly related to business sector’s demand for knowledge, is approximately 6.63%.

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\(^{17}\) Latest available data for 2005

\(^{18}\) BERD as a percentage of GDP for 2007
2.4 Knowledge production

The production of scientific and technological knowledge is the core function that a research system must fulfil. While different aspects may be included in the analysis of this function, the assessment provided in this section focuses on the following dimensions: quality of the knowledge production, the exploitability of the knowledge creation and policy measures aiming to improve the knowledge creation.

2.4.1 Quality and excellence of knowledge production

Scientific knowledge in Greece is mainly produced in an extended university system and in research centres and independent institutes most of them under the supervision of Ministry of Education. TEI were included in the higher education system only recently and they are still at an early phase of catching up with universities.

Despite the relatively low position of the HEIs in international rankings (see section 3.3.1), the productivity of the research system in terms of production of publications is high compared to other European countries. The average annual growth rate of the number of publications the period 1981-2007 was three times higher than that of EU-27 (9.2% and 3.7% respectively\(^{19}\)) (Logotech, 2009). The last three years of available data (2005-2007) the growth was even faster (11.8% and 5.2) respectively. Due to the higher growth rates Greece caught up with the rest of Europe in 2006 in terms of publications per capita, and in 2007 publications per capita amounted to 856 compared to 785 in EU-27.

Productivity of R&D expenditures (GERD) that is measured as publications per million Euros of GERD is very high in Greece compared with EU-27. In 2007 7.3 publications was produced per million euros while the average in EU-27 was only 1.7. Productivity of research personnel is also higher in Greece compared to EU-27. In 2007 publications per researcher in full time equivalents (FTE) was 0.46 for Greece compared to 0.29 for EU-27. However, the impact of its publications is relatively low as indicated by the citations to publication. Citation rates to EU-25 publications are 1.5 times higher than of those for Greek publications (24.1 and 15.8 respectively\(^{20}\)) (Logotech, 2009).

Recent public debate has uncovered several drawbacks in the HE system that reduce quality, including: low institutional funding which is not related with performance and quality; limited academic autonomy and strong involvement of the Ministry of Education in academic, administrative and planning issues; poor functioning of the peer review system and the system for the promotion and appointment of staff, fragmentation of HEIs into several geographically scattered units, (National Council for Education 2006, Ministry of Education 2010, HQAA 2010).

2.4.2 Policy aiming at improving the quality and excellence of knowledge production

The research centres supervised by the General Secretariat for Research and Technology (GSRT) have been systematically evaluated at institutional level since 1995. The evaluations, which are organised by the GSRT, are performed every 4 or 5 years. The main focus of the assessment is on research excellence. The relevance

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19 Estimations are based on Eurostat and Thomson ISI data on publications and citations
20 It is used 5 years window for the estimation of citations per publication.
of the research to the knowledge needs of the country is not systematically addressed. The evaluations at the institutional level are done by thematic international expert panels. The results of the evaluations have been used to justify additional funding to the institutions. The forthcoming law on research (see section 2.1 and GSRT, 2010) set excellence and relevance of research as main priority.

Quality control for both research and educational activities was introduced in 2008 for all universities. Every faculty undergoes its own internal quality assessment which is followed by an external evaluation with the participation of academics from foreign universities. So far only 10% of the external evaluations have been completed as a result of administrative problems and the reluctance of some academics and departments to except assessment. For more details on the university quality assurance mechanisms and the progress made in the assessment see section 3.3.1

The planned reforms in the research system and the HE sector set research and education excellence at the centre of the designed changes (Ministry of Education, 2010). The proposed methods to increase quality is the long term planning as well as systematic evaluation and allocation of funding based on the performance and the achievements of HEIs. The introduced reforms found strong opposition among academics who argue that the assessment will lead to a cut in public funding for many departments and universities. So the challenge for government is to turn the assessment exercise into an incentive and not a punishment mechanism, given the fact that many of the problems identified by the evaluations are influenced by public policy, such as the low quality of infrastructures, inadequate funding, obsolete legislative framework, red tape, number of students exceeding the capacity of the universities (HQAA, 2010).

### 2.5 Knowledge circulation

Tackling the challenges that European society faces in the 21st century will require a multi-disciplinary approach and coordinated efforts. Many debates and conferences, e.g. the Lund Declaration recognise that such complex issues cannot be solved by single institutions, technology sectors or MS acting alone. Hence strong interactions within the "knowledge triangle" (education, research and innovation) should be promoted at all levels. Moreover, in the context of increasing globalisation, cross-border flows of knowledge are becoming increasingly important. This section provides an assessment of the actions at national level aiming to allow an efficient flow of knowledge between different R&D actors and across borders.

#### 2.5.1 Knowledge circulation between the universities, PROs and business sectors

Knowledge circulation within the Greek research system is hindered by the weak links and interactions among the main actors, especially between the research community and the business sector (Maroulis, 2009 and GSRT, 2010).

Among PROs, research centres are the most inward oriented with very weak links with business. Research funded by the business sector amounted to only 1.3% of GOVERD in 2005, which is quite low compared to the EU-27 average of 8.6% (DG Research, 2008). Universities are more outward-oriented with statistics showing collaboration with business to be higher than the EU average. The share of HERD funded by business amounted to 8.9% in 2005, while the corresponding figure for the EU-27 was 6.3%. However, collaborations in Greece are rather opportunistic, pushed more by the supply side (universities and research centres) and less by demand.
(business) and are generally based on the requirement for business participation in research programmes (GSRT, 2007 and INNO-Policy TrendChart, 2006). Circulation of knowledge between university and non-university research organisations has been identified by the government as insufficient (Ministry of Development, 2007).

Improvement of collaboration between the research and business sector was always the main priority of the public research policy, and efforts have been made by government to develop the necessary infrastructures and to provide funding at a competitive base for collaborative research and innovation projects. However, the impact of the policies so far was poor due to the structural character of the problem which goes beyond the research policy domain.

At the level of infrastructures GSRT supported the creation of Technology Transfer Offices (TTOs) in universities and research centres. However TTOs failed to deliver the expected results and today only few of them are active in technology transfer.

In addition to the institutional setting, GSRT has developed research and innovation programmes focusing on the promotion of collaboration and circulation of knowledge. All routes 1 to 5 for stimulating private investment in R&D presented in section 2.2.2 include measures promoting collaboration and technology transfer. Among the most important programmes in terms of budget is “Collaboration” which supports joint research of firms and public research organisations in thematic areas of national priority. The programme will provide funding of €76m during the period 2010-2015. The programme “Support for new firms and SMEs” with a budget of €11m for the same period is promoting subcontracting to public research and technological development organisations by firms, while the measure Innovation vouchers for SMEs, with a budget of €8.4m is explicitly supporting subcontracting of small scale research and innovation activities. Circulation of knowledge from public research organisations to the private sector is also facilitated by the creation of spin-offs, which is supported with €25m by the programme Creation – support to new innovative enterprises, notably highly knowledge intensive (spin off and spin out).

Finally two more complex approaches the “innovation poles” already existing in five regions and the microelectronic cluster (€33m for 2009-2013) are also promoting collaboration on specific technology areas and sectors.

For the near future, GSRT is planning the development of thematic research networks and collaboration between research institutes on the base of multiannual research agreements (GSRT, 2010).

2.5.2 Cross-border knowledge circulation

Due to the small size of the Greek research system access to international knowledge has been regarded as very important by public research organisations and companies with an international orientation. Similarly, public policy saw international collaboration as an opportunity for tapping into additional sources of funding and to increase the local research capacity.

The main mechanism promoted by public policy for cross border cooperation is the EU Framework Programmes. In order to support public research organisations to participate in the FPs Government provides the necessary matching funds from a separate budget line. In FP721 827 Greek teams are participating in 564 FP7 contracts establishing more that 6,700 project links with EU and non EU participants.

21 Data have been updated on June 2009.
In addition to FP, participation in EUREKA and EUROSTARS is encouraged by the government although public funding remains low. Since 2006 Greek organisations have participated in 83 EUREKA projects of a total budget of €114m.\(^{22}\) The public budget 2007-2015 for EUROSTARS is only €1.78m.

Cross-border research collaboration is also promoted through bilateral research agreements which mainly support networking and visits. Participation of the private sector is rare (see also section 3.5.2).

Participation in international scientific and research infrastructures is another way of promoting access to international knowledge which is attracting the attention of policy makers. Greece is one of the 12 founding members of CERN and contributes €13m per year. Approximately 100 Greek PhD students have worked in CERN in the last ten years and several senior researchers have participated in its experiments. However, this type of access to international knowledge is almost exclusively benefitting PROs, while the benefits to the business sector have not been encouraging. In 2005 Greece joined the ESA contributing €11m per year.

Support of individual mobility of researchers received limited attention and usually only the inward mobility receives support, with the exception of PhD scholarships provided by the State Scholarships Foundation. The only measure which is running since 2007 is the Support of Postdoctoral Researchers who launched its first call in October 2010. The budget of the programme is €30m and it addresses both Greeks and non Greeks PhD holders who want to perform research in a Greek public research organisation without any restriction regarding the subject.

Despite the recognised importance of cross-boarder collaborations the response of public policy was mainly reactive instead of proactive. GSRT is preparing a policy shift which is expected to be manifested in a new policy document focusing on the international research collaboration and the positioning of Greece within this context.

### 2.5.3 Main societal challenges

As it is evident from the involvement of Greece in cross-border collaborations described in the previous section, usually participation is not driven by a national agenda and on the basis of predefined priorities, but it is mainly a supply driven response to existing initiatives. The interest of research teams is also important as it was the case of participation in the European research infrastructures where the participation followed the requests of research teams with strong influence. Thus no specific priorities can be identified ex-ante.

### 2.6 Overall assessment

The policy mix planned for the programming period 2007-2013 is now slowly unfolding after a significant delay of almost three years. Change in management rules in 2007 and creation of bureaucratic structures, lack of flexibility due to Structural Funds rules and negotiation procedures, together with the low capacity and skills of the public administration, are the main reasons for the delay. The efforts of the new government to simplify management structures and procedures in order to increase flexibility and efficiency, and the revision of the strategy caused further delays in 2010.

\(^{22}\) This is the total budget of the projects, not only the Greek participation. For more information see: http://www.eureka.be/contacts/member.do?memId=GR
Table 2: 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>
</table>
| Resource mobilisation   | • The new national framework for research funding will consolidate funding across ministries and direct it towards national priorities.  
• New measures will increase the number of firms performing R&D, and stimulate greater R&D investments in R&D performing firms. | • Further delays in the implementation of the measures will stagnate private and public investments.  
• If knowledge demand from the private sector remains low the excess supply of researchers will continue. |
| Knowledge demand        | • Promotion of entrepreneurship, and efforts to eliminate red tape and increase competition could increase the needs of firms for new knowledge | • Reforms need time to bear fruits and therefore it is questionable whether increasing the R&D intensity from 0.58% of GDP to 2% in 10 years is feasible.  
• Increase of VAT and high corporate taxes drain the market and create disincentive for investments including R&D  
• Public procurements, within the specific environment, cannot increase demand for innovative products and thus to stimulate demand for knowledge |
| Knowledge production    | • Introduction of reforms in universities and especially the establishment of an evaluation system are expected to improve the effectiveness and quality of the knowledge production system.  
• Consolidation and coordination of the research infrastructure and will increase productivity and create the necessary critical mass. | • Despite improvements in the quality of the knowledge produced, its exploitation is being hindered by low demand for knowledge from the business sector.  
• The effectiveness of HEI evaluation is undermined by lack of a specific approach and consensus between the stakeholders on linking evaluation results with decision making in HEIs development. |
| Knowledge circulation   | • The existing policy mix provides opportunities for science-business collaboration  
• Support of participation in European research programmes and intergovernmental infrastructures allow access to additional pool of resources and of knowledge | • Delays in launching the whole portfolio of measures are hampering the efficiency of piecemeal efforts.  
• Efforts to improve knowledge circulation are being hampered by low absorptive capacity in the business sector and the pursuit of low tech business strategies.  
• Low budget and lack of an internationalisation strategy hinder exploitation of international collaborations. |

The effectiveness of the past and current policies aiming at improving the main domains of the research system (see Table 2) is hampered by significant barriers (Table 3) which are related to domains that are beyond the scope of the research policy. Furthermore the current crisis is magnifying the existing inefficiencies and the structural problems of the research system. Therefore, articulation of a wider in scope policy mix is necessary, that includes knowledge triangle policies and elements of other policies affecting competition, entrepreneurship and financing.

Table 3: 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>
</table>
### Barriers to R&D investment

<table>
<thead>
<tr>
<th>Country Report</th>
<th>Opportunities and Risks generated by the policy mix</th>
</tr>
</thead>
<tbody>
<tr>
<td>The severe depth crisis reduces flexibility of government to mobilise sufficient resources.</td>
<td>- The existence of Structural Funds ensures that the public funding of R&amp;D will not be reduced. However, the elimination of any other public source of funding increases dependence on Structural Funds and thus management rigidity and complexity will remain.</td>
</tr>
<tr>
<td>Demand for research based knowledge from the private sector is low due to its orientation towards less knowledge intensive and lower value added segments of the economy.</td>
<td>- Emphasis on establishing new R&amp;D performing firms contributes to shifting the economy towards more knowledge intensive segments, although the unfavourable business environment is hampering the prosperity and sustainability of new firms. - Increased emphasis on non R&amp;D-performing firms and on supporting extramural R&amp;D and technological services to SMEs addresses a significant drawback.</td>
</tr>
<tr>
<td>The characteristics of the business environment encourage short-sighted and risk-averse behaviour of the business sector discouraging investment in research.</td>
<td>- Economic reforms and innovation related policies aimed at improving innovation dynamics and entrepreneurship contribute to a changing business culture and business environment. - However, the pace in the implementation of reforms is too slow for sufficiently coping with the acceleration of the economic crisis in 2010.</td>
</tr>
<tr>
<td>Low absorptive capacity, which is both a supply and demand problem, is further hindering demand for knowledge.</td>
<td>- Measures for the support of both research and non-research human resources will improve absorptive capacity. - Reforms to the HE sector would contribute to improving quality in graduate and postgraduate studies. However, the reforms could bear fruits regarding the alignment of supply with demand only in the long run. - Increased funding for life long learning and development of relevant infrastructures is expected to improve supply. However, overlooking the demand side will reduce performance, focus and quality.</td>
</tr>
<tr>
<td>Limited interaction between public research institutions and firms.</td>
<td>- Measures supporting subcontracting and research collaboration between business and public research organisation (including HEIs) could contribute to increased interaction. However, the low demand for knowledge and the significant inefficiencies of intermediary organisations could reduce the effectiveness of these efforts.</td>
</tr>
<tr>
<td>Limited access to capital due to the risk averseness of the financial system and the high cost of capital compared to other European countries</td>
<td>- Public co-funding of investments in both R&amp;D and non-R&amp;D performing firms counter-balances to some extent the restricted access to capital. Furthermore, the establishment of NFED could close a gap in the funding of innovative firms.</td>
</tr>
</tbody>
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### 3 Interactions between national policies and the European Research Area

#### 3.1 Towards a European labour market for researchers

The [Communication Better careers and more mobility: A European Partnership for Researchers](http://example.com) proposed by EC in May 2008 aims to accelerate progress in four key areas:

- Open recruitment and portability of grants;
Meeting the social security and supplementary pension needs of mobile researchers;

Providing attractive employment and working conditions;

Enhancing the training, skills and experience of researchers

The Commission has also launched concrete initiatives, such as dedicated information services for researchers, in particular through the activities grouped under the name of EURAXESS – Researchers in Motion. Based on the assessment of the national situation in the four key dimensions detailed above, this section will conclude if national policy efforts are supporting a balanced ‘brain circulation’, with outward mobility levels matching inward mobility levels. High levels of outward mobility coupled with low levels of inward mobility often signal an unattractive national labour market for researchers and unsuitable research infrastructures. This may trigger, despite the policy efforts supporting the mobility the ‘brain drain’ rather than brain circulation.

3.1.1 Stocks and mobility flows of researchers

Research personnel in full time equivalent accounted for approximately 0.42% of active population in 2007. The figure is much lower than the EU-27 average which amounts to 0.61%. As it has been argued in section 2.2.3 the low share reflects the low demand for researchers by the productive sector. The main demand is coming from the university sector which absorbs 60% of the researchers. In total, the public research sector absorbs 69% of the researchers while the business sector accounts for only 29%. In EU-27 the share of the private sector is much higher and amounts to 46%. Limited demand for researchers by the private sector in Greece can be attributed mainly to the low knowledge demand due to the orientation of the Greek economy towards low- and low-to-medium technology sectors and less knowledge intensive services.

The current crisis is expected to negatively affect employment of researchers as companies combine cutting of research budgets, with efforts to increase productivity in their research teams. Furthermore, hiring in the public research sector has recently stopped until at least 2013, due to the strict austerity programme, which has blocked hiring of new personnel in the public sector. Until the relaxing of the measure, personnel will be hired only on a project base.

The low demand from the private sector results in the majority of PhD graduates pursuing academic careers. The working conditions for academics and researchers in the public sector, such as civil servant status, work flexibility and relatively higher average salaries (despite the recent reductions) compared to the private sector which are around 74% on average of the salaries in universities (CARSA 2007, p166), are also a factor in the increased demand for positions in the public research system.

The surplus of doctoral graduates tends to take up non-research jobs, leave the country or remain in the countries they obtained their research degree. Data on international mobility of researchers are scarce, making it difficult to estimate brain drain effects. However, some figures provide indications of the size of brain drain. According to Moguérou and Di Pietrogiacomo (2008) 605 scholars in US were of
Greek origin in 2005/2006, thus, bringing Greece 10th among the EU member states. In relative terms, Greece is ranked 10th among the EU Member States, as the US scholars with Greek origin represented approximately 2.5% of the researchers in the HE and government sector.

Short-term outward mobility is high, especially for study purposes. Despite the problems related to degrees obtained in foreign countries, the number of Greeks that go in another Member State for their PhD study compared to the PhD candidates in the country, is the second highest in EU after Ireland25 (Moguérou and Di Pietrogiacomo, 2008). According to the same study in 2005, the share of Greeks pursuing a PhD in US represented 8% of the PhD students in Greece. However, three years later the share was decreased by half reaching 4% (MORE, 2010a). MORE also found that in 2010, 73% (the third highest share among EU-27 countries) of the researchers in Greek universities have worked in a country other than the country where they attained their highest educational degree (PhD or post doctorate). Probably this is the case because most of the researchers in this category have attained their PhD abroad due to the lack of well organised doctorate studies in Greece until recently.

Inward mobility of researchers is hindered by the need for foreign degrees to be formally recognised by the National Academic Recognition and Information Centre (NARIC) in order to be regarded as equivalent to degrees obtained from Greek universities. This certification is obligatory in order to sign up for a postgraduate course or be employed in a permanent position as a researcher in the Greek higher education and research system. However, individuals that have already held similar professional positions in another country are excluded from this requirement.

3.1.2 Providing attractive employment and working conditions

Attractiveness of the research sector, in terms of remuneration, is low in Greece compared to other west European countries. After adapting to take account of the cost of living in Greece, average gross yearly salaries in universities and public research centres are €32,045 and €39,452 respectively (CARSA, 2007). These levels are similar to those in Hungary, Spain and Finland, and much lower than in Cyprus, Malta, Austria, Belgium, France, Denmark, Ireland and the Netherlands. Due to the fiscal crisis in Greece the salaries in the public research sector has been reduced decreasing even more the attractiveness of the sector. Within Greece, the government sector is the most attractive in terms of remuneration compared to the private sector due to the lower salaries in the latter (€29,276). This situation does not change with seniority, and researchers’ remuneration is ranked 23rd among the EU-27 and associated countries, at all career levels.

Remuneration levels in universities and government research organisations are defined centrally by government. The only differentiations are among levels of seniority and between universities and government research organisations. Researchers in universities can get extra rewards if they provide services (including research) to university clients or within the framework of national or European research projects, providing that university staff is eligible to receive fees.

The problem of lack of incentives for attracting highly paid researchers has been acknowledged by the government and one of the issues that is going to be addressed in the forthcoming reform is to give the freedom to HEIs to provide such

25 Ireland has the highest share of 25.7%
incentives (Ministry of Education, 2010). Although the salaries will continue to be defined centrally, mainly for fiscal reasons, HEIs would be in a position to use alternative sources of funding for this purpose.

In addition to remuneration, the attractiveness of research careers is also influenced by the working conditions. One of the efforts being made towards this direction is the European Charter of Researchers issued by DG Research in 2005. Several public research organisations and universities in Europe have signed this charter, but in Greece only two out of the 16 public research organisations and three out of the 23 universities and 15 technological education institutes have signed it.

The share of women PhD graduates was 34% in 2004 and increased to 40% in 2006 and 2007. Participation of women in research professions in Greece is above the EU-27 in all sectors of performance. In 2005, which is the latest year for which data are available for Greece, 36% of researchers were women compared to 30% in the EU-27. The gap between Greece and the EU-27 is wider in the business sector where 28% of the researchers in Greece are women, while in EU-27 the figure is 19%. However, the higher up the research hierarchy, the lower is the percentage of women. In the academic sector although 32% of the academic staff in 2007 were women, the percentage of female full professors was only 17%.

The difference in the remuneration received by men and women researchers is around 14.3% (CARSA, 2007). However, this is among the lowest in EU-27 and associated countries with only Malta, Denmark, Iceland, and Norway showing better figures for women.

No special measures have been taken by government for increasing the share of female researchers as recruitment in HEI, which is the larger sector, is done strictly on academic criteria.

Labour legislation provides strong protection for women working in the public sector. There is no evidence that maternity leave has a negative effect on women researchers’ careers in the public sector. On the contrary work in the private sector is less well protected and often maternity leave does affect research opportunities. According to a study implemented in 2007 (Quantos, 2007) 46% of Greek female researchers in the business sector believe that maternity is the most important obstacle to a successful research career. However, 12% of companies that have research activities have adopted policies to increase the participation of women. The study also shows that approximately 70% of women researchers stated that their companies ensured equal opportunities for men and women while 19% believe that there is gender discrimination in their companies.

The existing imbalance between brain drain and brain gain at the expense of brain gain could be attributed to several barriers. The requirement of fluency in Greek for attaining a position in the public research sector is one of them. In addition competition for a university position is high and often the influence of social networks is strong; thus, even Greeks academics working abroad are often discouraged from applying for these positions. Furthermore, the academic community often feels competitive towards incoming non-nationals due to the limited resources that are available. In addition, working conditions including working environment and infrastructures, support facilities and remuneration are unattractive compared to other European countries.

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26 National Statistical Service of Greece
3.1.3 Open recruitment and portability of grants

Researchers and academics elected as permanent staff are civil servants and, therefore, only Greek citizens or citizens of the EU are eligible for such positions. EU citizens can be hired providing that they are proficient in the Greek language which in itself is an important barrier. Researchers who are citizens of non-EU countries are only hired under short term contracts, for the completion of specific research projects.

Hiring in HEIs and research centres follows a call of expression of interest advertised at least in the national press and the websites of the organisations. Recently an increasing number of organisations advertise their vacancies in European media and mainly in the EURAXESS Jobs portal. In 2009 55 new job vacancies in Greek research organisations had been advertised in EURAXESS ranking Greece 21st among 26 countries. In 2010, 64 new job vacancies had been advertised during the first three months, bringing Greece 11th in the ranking. The selection among those expressing interest is based on their formal qualifications (defined by national law and the internal regulation of the organisation) and an interview usually performed on site. As it has been mentioned in 3.3.1 foreign degrees should be formally recognised by NARIC in order to be regarded as equivalent to degrees obtained from Greek universities which is a lengthy and bureaucratic procedure. However, individuals that have already held similar professional positions in another country are excluded from this requirement.

Research grants are not portable and if a researcher holding a grant leaves, the grant remains at the host organisation or it is cancelled depending on the specific provisions of the grant.

3.1.4 Meeting the social security and supplementary pension needs of mobile researchers

Social security is compulsory for all employees in Greece regardless of their origin, citizenship or work status. Universities are responsible for providing social security coverage for PhD students while the social insurance package and benefits for professional researchers is dependent on a combination of type of contract (self-employed, employed, fix-term-contract, long-term-contract) and their profession.

Council regulation 1408/71 has been adopted in national legislation adequately. Law 3386/2005 provides that a “scientific visa” should be obtained. In 2008 the legislation was adapted to Council directive 2005/71 which sets the conditions for residence permits for third-country researchers and the Presidential Decree 128/2008 defined the necessary procedures and documentations that should submitted for that purpose.

3.1.5 Enhancing the training, skills and experience of European researchers

Since 2005 government (both the previous and the current) is making efforts to pass reforms for the higher education sector in line with the Bologna process.

The first effort to open up the higher education system to non-nationals, was the setting up of the International Hellenic University in 2005, where teaching is...
exclusively in English aiming at attracting students from the Balkans and third countries.

The law 3549/2007 aiming at reforming the higher education system, provided a framework for organising undergraduate and postgraduate studies, including PhD programmes, in languages other than Greek. It also allowed for masters dissertations or PhD theses to be submitted in another language not only in Greek anymore. In 2008 law 3685/2008 provided for improvements to the existing legislative framework regulating the organisation of joint postgraduate and doctoral programmes with foreign universities including both other EU and third countries.

Despite the rapid increase of research collaborations of Greek universities with European counterparts\(^{29}\), higher education activities remain inward looking. TEIs, which have struggled to establish a position within the higher education system in Greece, have become very active in developing collaborations with European universities mainly under the Erasmus scheme. On the contrary, universities are more reluctant to collaborate for joint postgraduate studies. The main obstacle is the reluctance of universities to recognise degrees of three years undergraduate studies. Up to 2008, eleven universities have signed bilateral agreements with European (mainly French) and US universities to offer 15 joint Masters and PhD programmes;\(^{30}\) this compares with 465 postgraduates programmes currently offered in Greece. In addition, there are some ad-hoc PhD programme offerings within the framework of the Marie Curie training networks.

Participation in the Marie Curie and Erasmus schemes is encouraged by government (GSRT and Ministry of Education). Participation in Marie Curie represents 5% of the scheme’s projects which is much higher than Greece’s share in number of European researchers (2%).

Contrary to the short term mobility, long term departure from Greece is not encouraged by public policies.

The government intents to start a programme of radical changes in the higher education sector (Ministry of Education, 2010). One of the three pillars of changes aims at strengthening the international orientation of the sector. The proposed changes which are now under public consultation, include among others: efforts for standardising the recognition of qualifications by implementing and harmonising the National Qualifications Framework for life long learning with the European Qualification Framework (EQF) for life long learning and the Framework of Qualifications of the European Higher Education Area; implementation of the European Credit Transfer and Accumulation System; additional funding for joint postgraduates programmes with distinguished foreign universities and research centres; promotion of postgraduate studies taught in a language other than Greek aiming at attracting students and academics from abroad; academic staff will be able to hold positions at the same time in a Greek and a foreign HEI; support HEIs to establish branches in other countries; participation of academics from foreign HEIs in the assessment of curriculum and academic staff; establishing of a prize for Greek scientist with international recognition.

\(^{29}\) For more details see the ERAWATCH Country Report 2008 for Greece

\(^{30}\) Source Ministry of Education: [http://www.ypepth.gr/el_ec_category132.htm](http://www.ypepth.gr/el_ec_category132.htm)
3.2 Research infrastructures

Research infrastructures (RIs) are a key instrument in the creation of new knowledge and, by implication, innovation, in bringing together a wide diversity of stakeholders, helping to create a new research environment in which researchers have shared access to scientific facilities. Recently, most EU countries have begun to identify their future national RI needs, budgets and priorities in the so called National Roadmaps for Research Infrastructures. These strategic documents also set out a strategic view on how to guarantee and maintain access to research facilities. Although some countries invest heavily in RIs, none can provide all the required state-of-the-art facilities on a national basis. Several large RIs have already been created in Europe. While optimising the use and development of existing RIs remains important, new infrastructures are needed to respond to the latest research needs and challenges. European Strategic Forum for Research Infrastructures (ESFRI) was established in April 2002 to support a coherent approach to policy-making on RIs in Europe and to act as an incubator for international negotiations on concrete initiatives. This section assesses the research infrastructures national landscape, focusing on the national RI roadmap and national participation in ESFRI.

3.2.1 National Research Infrastructures roadmap

Development of national research infrastructure is a typical example of the lack of long term planning and coordination of public research policy (GSRT, 2010). The efforts to develop a few large infrastructures were fragmented bottom-up initiatives by research groups and not the result of strategic planning.

Most of the existing large research infrastructures have been developed in the area of earth and space sciences, and are run by the Athens National Observatory with collaboration from other public research centres and universities across the country. The most important of these, and which attracts transnational cooperation, is NESTOR which is Europe's first collaborative effort on a deep sea high energy neutrino telescope. The National Seismic Network is a national infrastructure with 46 stations across the country and a network of telescopes, the most important being the Aristarchos telescope which is the largest observatory in the Balkan and Eastern Mediterranean area. The Oceanographic Research Vessel is a national research infrastructure in the area of Earth exploration and the environment. In lasers, the Ultraviolet Laser Facility ULF-FORTH has been in operation as a European laser research infrastructure since middle of 1990s within the public research centre FORTH. GRNET is a significant national distributed infrastructure which provides an academic and research network and information technology infrastructure for all universities and public research centres.

During 2000-2006 €36m\(^{31}\) was directed towards research infrastructures of all sizes representing 1% of GBAORD in that period. During the period 2007-2015 it is estimated that the amount that will be made available by the National Strategic Reference Framework for research infrastructures will be increased fourfold to €144m.

In 2007 a study which was commissioned by GSRT attempted to propose a National Infrastructures Road Map. In December 2008, GSRT launched feasibility studies for developing the National Infrastructures Road Map which is expected to be ready in early 2011. The process for developing the Road Map takes into consideration the

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\(^{31}\) See section 3.3.2 Route 6.
study of 2007 and the experience from the work done in the preparatory phase of 16 ESFRI’s infrastructures with Greek participation.

3.2.2 National participation in the ESFRI roadmap. Updates 2009-2010

Greek public research organisations are very active in European research infrastructures. They participated in the preparatory phase of ESFRI under FP6. They have expressed interest in participating in 16 of the 34 infrastructures of ESFRI during the implementation phase. The involvement of research teams in ESFRI in FP6 was a bottom-up initiative supported by GSRT; however, there was no strategic plan or budget to ensure participation of Greek researchers in the implementation phase.

In the implementation phase Greece participates in the XFEL with a budget of €4m representing 0.4% of the total budget. Participation in the KM3NET is also considered provided that the infrastructure will be hosted by the national infrastructure NESTOR. In this case Greek contribution will amount to €5m representing 0.7% of the budget. Participation in 11 more infrastructures is considered however the decisions will be made based on the result of the feasibility study for the preparation of the national road map (see 3.2.1).

3.3 Strengthening research institutions

The ERA green paper highlights the importance of excellent research institutions engaged in effective public-private cooperation and partnerships, forming the core of research and innovation ‘clusters’, mostly specialised in interdisciplinary areas and attracting a critical mass of human and financial resources. The Universities/research institutions should be embedded in the social and economic life where they are based, while competing and cooperating across Europe and beyond. This section gives an overview of the main features of the national higher education system, assessing its research performance, the level of academic autonomy achieved so far, dominant governing and funding models.

3.3.1 Quality of National Higher Education System

Size and composition of the HE sector

The higher education sector is comprised mainly of public institutions of which 24 are universities, 16 are Technological Educational Institutes (TEI) and 3 are schools of fine arts. According to the Greek constitution higher education is only public and therefore Greek State does not recognise the degrees of private universities operating in Greece. Nevertheless, several private universities of various types are operating in the country as follows: 4 non-profit institutions accredited by a foreign state (USA); 4 non-profit institutions that are not accredited by a foreign state or validated by a foreign university; and approximately 21 for-profit institutions that award degrees validated by a foreign university (19 of them are validated by UK universities). None of the private universities provides PhD studies. Due to the fact

32 Accreditation is a legal act of state that grants an institution the right to award academic degrees. All private accredited universities in Greece are legally registered in the USA.
33 Validation of a degree is given by one university or college that is accredited to another university or college that is not.
that the private universities are not recognised as such by the state official data exist only for the public universities.

The share of the enrolled students in Greek universities represented in 2008 approximately the 5.7% of the population. The average share during the last five years (2008-2004) is slightly smaller approximately 5.6%. Comparing Greece with EU-27, the share of the former is much higher than that of the latter which was 3.8% for the same year. A reason which could explain part of the difference is that drop outs are not registered in Greece so they are included in the Greek data. The number of graduates (ISCED5-6) has been slightly increased during the period 2004-2008 amounting to 66,956 in 2008 representing 0.6% of the population. Female graduates accounts in average for 61% of the total graduates for the period 2004-2008. Details on the PhD (ISCED6) statistics can be found in 2.2.3 section.

A structural characteristic of the Greek educational system, that is the high number of Greek citizens studying abroad, is gradually changing. According to OECD (OECD, 2009), 38,042 Greek citizens were studying abroad in 2007, representing 6.5% of the enrolled tertiary students in Greek HEIs a figure which is three times lower compared to 2000 (19.6%)35. The main destination country is UK hosting 42.2% of the students studying abroad. In the same year 3.5% of the enrolled students in Greek HEIs were non Greek citizens mainly coming from Asian countries (61.8%). The number of non-national in Greek HEIs has been increased by 2.4 times compared with 2000.

In terms of fields, graduates from social sciences, business and law disciplines is the largest group representing 30.0% of the graduates. The second in terms of size group is that of engineering, manufacturing and construction representing 14.0% of the total with a trend to increase its share. Humanities and arts account for 12.9%, with a trend to slightly decrease their share. Health and welfare represent 11.6% with a trend to increase. Science, mathematics and computing account for 10.9% of the total following a downward trend (the share in 2004 was 17%).

HEI sector is the largest R&D performer representing 0.29% of GDP and 50% of GERD (data for 2007). Government provides 87% of funding including the funding from Structural Funds36 while businesses funding represents only 9% of the total funding.

Mission of HEIs

All universities and TEIs share the same mission defined by law (Law 3549/2007). The mission goes beyond the three traditional missions, as teaching and research should contribute not only to the wealth and economic development (“third mission”) but to the development of culture and students’ personality and to meeting societal challenges. The mission as defined by the law include the following dimensions: production and transfer of knowledge through research and teaching; contribution to the development of responsible citizens with scientific, professional and cultural competences; response to societal and development challenges, respecting the principles of sustainable development and social cohesion; development of researchers and promotion of cooperation with academic and research organisations within the country and abroad; and finally contribution to the strengthening of gender equality and egalitarianism.

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35 Data for 2000 are provided by Eurostat. Eurostat's time series stop in 2006 and therefore the OECD have been used for 2007 instead.
36 Latest available data are for 2005
Students are admitted to HEIs according to their performance at national exams taking place at the final year of the secondary school (Lykeio) and the final year school grade. Students which are members of the Greek Muslim community are admitted based on quotas even if their scores are lower than the floor score for entrance in a specific department.

Foreign citizens enter Greek HEIs based on their graduation score from the secondary education. Greek origin foreign citizens are also admitted according to quotas.

Research performance in the international and European context

The Greek universities demonstrate low ranking positions in the world university rankings. National and Kapodistrian University of Athens is ranked in places between 201-300 in the Academic Ranking of World Universities (2010), while at the same time Aristotle University of Thessaloniki is ranked between 301-400. The rest of the Universities in Greece have no share in the first 500 universities in the world ranking (ARWU, 2010). However significant progress has been made in the improvement of research in terms of productivity. Between 2004 and 2008, the number of scientific publications in universities increased by 53%, while in TEIs by 133% (Sachini et al, 2010). The number of publications produced by both universities and TEI represent 86.1% of all publications produced between 2004 and 2008. Due to the significant share of publications produced in universities, the conclusions presented in 2.4.1 regarding the higher productivity of Greece in the production of publications compared to EU-27, could be attributed mainly to universities.

Comparing the relative citation impact of the Greek research organisations, universities are ranked third (0.87) behind GSRT’s research centres (1.14) and private hospitals (1.34) while according to international co-authorships, universities are not the most outward oriented organisations. During the period 1993-2008, 41.5% of the university publications had international collaborations compared with the 56% of the public research centres, 63.3% of the private hospitals and 82.9% of public research centres in the defence sector.

Quality control for both research and educational activities was introduced in 2008 for all HEIs. Every faculty undergoes its own internal quality assessment which is followed by an external evaluation. The evaluation procedures pertaining to higher education institutions are coordinated and supported at national level by an independent administrative authority called The Hellenic Quality Assurance Agency for Higher Education (HQAA). The goal of the HQAA is to establish and implement a framework for the quality assessment of the work and achievements of the HEIs. The HEIs have the freedom to develop their own evaluation approach in compatibility with the quality assessment framework. The reports of the external evaluations are published on the HQAA site. The composition of internal evaluations started in 2008 with largo pace but until 2010 was accelerated. External evaluations followed in slower pace and since November 2010 only 12 university and 15 TEI departments had been evaluated representing only 10% of the target.

Under the new framework the funding of HEIs is going to be linked with performance based on indicators and the results of the evaluation exercises. The indicators will be defined as a result of the undergoing public consultation.

3.3.2 Academic autonomy

Autonomy in research
Traditionally, the involvement of the Ministry of Education in the shaping of research environment and activities in Universities has been limited. Academic staff at all levels has the freedom to define research priorities. In practice this freedom is further ensured by the lack of research policy at the level of institution and lack of specific orientation of public funding of academic research.

HEIs have also autonomy in human resource management. Departments, which are the principal academic units in the HEI structure, have the freedom to define the specification of the scientific area for each position and to hire and promote academic staff. However, the Ministry of Education has the authority to determine the number of positions to be filled every academic year for each Department mainly on the base of budget criteria. Although HEIs enjoy freedom in hiring personnel, they cannot define the salaries and the benefits for the academic and non academic staff as they are defined by the Ministry of Education in collaboration with the Ministry of Economics. The new reform, which is currently under public consultation, aims at increasing the autonomy of the institution by introducing some flexibility in defining bonuses and benefits. However there is a strong opposition by the academic community as there are fears that the measure will result in the reduction of the salaries especially in disciplines with low opportunities for participating in competitive projects or providing services to the business sector.

**Governance**

The opening up of the HEIs to society through the participation of stakeholders in the management of education institutions began in 1982 with Law 1268. The 1982 reform introduced participation of all members of the academic community in the management of the university and the election of Rectors. The influence of student representatives in the election of Rectors was very strong as they represent 40% of the votes. However, the participation of external members in the institution’s governing body was never an issue for public policy or the subject of public debate.

The 2007 reform did not introduce many significant changes in the governance of HEIs. The main ones were opposed by members of the academic community. First, the reform was aiming at professionalising the administration of HEIs by introducing the position of Secretary, recruited for four years through an open application process. The secretary would be responsible for the management of the financial and administration services of the HEI. Second, the influence of the student political organisations in the election of the Rectors (or Presidents in the case of TEI) is reduced through a change from voting through student representatives to direct voting by all students.

The forthcoming reform radically changes the management of the HEIs by setting two management bodies, the Council and the Senate. The Council consists of elected members of the academic community, students, non academic staff and of external members. The Council is responsible for setting the strategy of the institution, creating the operation plan and negotiating the programming agreement with the Ministry, is responsible for the administration of the institution and the selection of the Rector, for universities, or the President, for TEIs. The Rector/President is elected by the Council following a call of expression of interest open not only to the academic community of the institution but to academics of other domestic or foreign institutions.

The Senate consists of the Deans for universities or the Head of Schools for TEIs, and elected members of the community including students and non academic staff.
The Rector and the Senate are responsible for the management of the academic affairs.

All proposed changes have been rejected by the Conference of Rectors arguing that they undermine the independence of HEIs and they will hinder management efficiency.

3.3.3 Academic funding

Research funding is channelled through the "Direct Government Budget" and through the general university funds (GUF) which are directed to areas mainly defined internally by the research community. The size of the GUF is not related to the quality of the research or its outcomes, but to the size of the research community. In 2005, for which the most recent data are available, almost 71% of public funding for universities was GUF. This share is much higher than the EU-27 average which for the same year was 44%. Non-GUF government research funding for HEIs is channelled through competitive programmes. During the programming period 2000-2006 all the main research areas were funded by four research programmes to a total budget of €115m. In the new programming period 2007-2013 the budget for programmes supporting academic research are being increased three fold to approximately €380m. The intention of government to set quotas for allocating this funding to research areas will not affect the freedom of researchers to define their priorities, as quotas will apply to broad research areas.

The forthcoming reform will link part of the institutional funding with the performance of the HEIs on the base of performance indicators and the outcome of evaluation exercises.

3.4 Knowledge transfer

The importance of knowledge dissemination and exploitation in boosting competitiveness and contributing to the effectiveness of public research has been increasingly recognised by EC and EU Member States. Following the publication of the ERA Green Paper in April 2007, the EC Communication "Improving knowledge transfer between research institutions and industry across Europe" was issued, highlighting the importance of the effective knowledge transfer between those who do research, particularly HEIs and PROs, and those who transform it into products and services, namely the industry/SMEs.

Several Member States have taken initiatives to promote and facilitate knowledge transfer (for instance new laws, IPR regimes, guidelines or model contracts) and many others are planning to intensify their efforts in this direction. However, these initiatives are often designed with a national perspective, and fail to address the transnational dimension of knowledge transfer. This section will assess the national policy efforts aimed to promote the national and trans-national public-private knowledge transfer.

3.4.1 Intellectual Property Policies

Patent and intellectual property rights (IPR) laws and the relevant institutions have been in place since 1987. The law for the commercial exploitation of IPRs by universities and research centres provides incentives to both research organisations and researchers to exploit research results as it decrees that the researcher owns 60% of the IPR and the research organisation 40%. Furthermore, researchers in research centres are allowed to work part time for a short period on a reduced salary,
while retaining their status, in order to devote time to other activities such as the commercialisation of their research. Similar provisions exist for academics.

Despite the existence of a legal framework, only after 2001 research centres and universities started developing a strategy and clear rules for IPR exploitation, patenting and creation of spin-offs as a result of the programme PRAXE, which provided significant incentives for the creation of spin-offs and commercialisation of research. Despite the progress made, commercialisation of IPRs remains a controversial issue as many oppose the involvement of academics in entrepreneurial activities. The number of applications for patents submitted at EPO is indicative of the attitude and the existing priorities. In 2005 and 2006 only one application per year was submitted.

There is not a common approach among the HEIs and public research centres regarding the management of IPRs. Some universities and research centres have Technology Transfer Offices however most of them have no capacity on IPR management and technology transfer. Efforts for patenting of IPRs are usually driven by the researchers and academics. Some times patenting is done on a private base as the institutions have neither the capacity to monitor the process, nor the budget for patenting.

3.4.2 Other policy measures aiming to promote public-private knowledge transfer

Circulation of knowledge, collaboration between research organisations and business sector and the establishment of spin-off companies remain high in the policy agenda the last ten years. However, as it has been argued in section 2.2.2, the effectiveness of policies remained low due to the structural characteristics of the economy and the inefficiencies in the implementation of the policies.

Spin-offs

The inefficiency of the mechanisms providing support for technology transfer in universities and public research organisations has been already mentioned. Furthermore, the creation of spin-offs has been regarded by many academics as not compatible with the mission of public research organisations. Therefore, despite the efforts of GSRT to promote exploitation of IPRs and spin-offs there are universities and research organisation reluctant to adapt their policy accordingly. In 2008 34 spin-offs were operating (only 2 had been established in 2008) and 8 research organisations and universities (out of 67 public research organisations) had at least one spin-off (Logotech, 2009).

In 2009 GSRT launched a programme providing funding for the support of spin-offs (see Route 2 in section 2.2.2) and the first 7 contracts were signed in 2010. Due to the absence of business angels and the reluctant of the local VCs to support high risk investments, Ministry of Education has made an agreement with an incubator and a network of business angels in the Silicon Valley for providing assistance to the most promising of the selected spin-offs.

Inter-sectoral mobility

There are significant structural barriers for long term mobility from the academic to the business sector. Low attractiveness of and low demand from the business sector (see discussion in section 3.1.2) discourage changes in the career path of researchers working in the public research sector. Among the university researchers approximately 16% have been employed in the private sector before, while 30% of
them left university in order to work in the private sector and returned back in the university (MORE, 2010b).

Short term mobility or sharing positions in the public and private sector is easier. Several academics often participate in the Management Board of, or work as consultants in private firms. Even, they work as Managing Directors or Chairmen of the Board in firms with public participation. In addition researchers in research centres are allowed to work part time for a short period on a reduced salary, while retaining their status, in cases they want to provide services in the private sector. Similar provisions exist for academics.

**Promoting research institutions - SME interactions**

SMEs constitute more than 99.9% of the firms in Greece with micro enterprises amounting to 97%. Furthermore, the vast majority of them have limited ability to create or absorb new knowledge. Therefore, collaboration of SMEs with public research organisations is among the priorities of research and innovation policy. In addition to “Collaboration”, which supports collaborative research, however without a focus on SMEs, there are three programmes aiming mainly at them. The “Creation-support to new innovative and notably knowledge intensive enterprises” supports spin-offs and spin-outs, the programme “Support for new firms and SMEs” promote industrial research, and the “Innovation voucher for SMEs” supports innovation and research subcontracting from SMEs to public research organisations (see also 2.2.2).

**EU cohesion policy**

All public support measures for R&D and innovation are co-funded by structural funds. Therefore all support measures referred in the present section and in the section 2.2.2 regarding the evolution of the national policy mix are funded by the European Regional Development Fund (ERDF). Overall both ERDF and ESF contribute annually 10% of GERD which is 50% of all competitive funding.

**Involvement of private sectors in the governance bodies of HEIs and PROs**

Under the current legislative framework HEIs and PROs are managed by bodies consisting only of members of the community of the institutions.

The forthcoming reform for the HE sector foresees the participation in the new management body the Council of external to the institution members. The external members should be distinguished members of the society including the business community. The Conference of Rectors strongly opposes the involvement of non-academics in the management of universities (see discussion in 3.3.2).

### 3.5 Cooperation, coordination and opening up national research programmes within ERA

The articulation between the R&D Framework Programmes, the Structural Funds and the Competitiveness and Innovation Programme is still underdeveloped in terms of coordination, synergies, efficiency and simplification. The policy fragmentation at EU and national level and between EU and national policies can hinder the build of critical masses of research excellence, leads to the duplication of efforts, sub-optimal impacts of the different instruments and unnecessary administrative overheads. Differences between research selection procedures and criteria can also be an obstacle to the overall spread of excellence. This section assesses the effectiveness of national policy efforts aiming to improve the coordination of policies and policy instruments across the EU, all part of the drive to create an integrated ERA.
3.5.1 National participation in intergovernmental organisations and schemes

As it has been discussed in section 2.5.2 participation in intergovernmental organisations such as in CERN and ESA is of strategic importance for Greece. Participation in FPs contributes with an annual inflow of funding approximately 10% of GERD which is equivalent around to 50% of the average annual public competitive funding. GSRT is now performing a mid-term review of the participation of Greek research teams in FP7 and it is expected to release the results early in 2011.

Greek teams are also active in COST participating in more than 75% of all actions (around 190 projects), ranking Greece 12th in terms of number of projects participation (COST, 2010).

Finally participation in EUREKA is also considered important by the government although the available public funding is relatively low. In the former programming period 2000-2006 €21m national contribution was given, while in the current programming period 2007-2015, only the participation in EUREKA-EUROSTARS has been decided with a small budget of €1.78m.

As it has been mentioned in section 2.5.2 Greece participates in CERN and ESA contributing each year approximately €13m, €11m respectively.

3.5.2 Bi- and multilateral agreements with other ERA countries

Bilateral research agreements are a well established practice for Greece although their budgets are relatively small and participants are mainly academics. Currently only two agreements are open (with Turkey and Romania) with a total budget of only €0.74m but it is expected that more will come in the near future.

The research areas selected for funding in both active bi-lateral agreements include: ICT, biotechnology, fisheries and agriculture, health, renewable energy and energy saving and environment. In addition collaboration with Romania includes research on cultural heritage.

3.5.3 Other instruments of cooperation and coordination between national R&D programmes

Involvement of Greece in ERA-NETs is relatively high in terms of number of participations although it is limited in terms of participation in joint calls and financial contribution. In total, Greek teams have participated in 48 actions of those 30 are active (NETWATCH, 2010). Participation in FP7’s ERA-NETs amounts to 50% and in ERA-NETs Plus to 8%, grouping Greece together with Sweden, Poland, Romania, Ireland and Hungary; Together with the increase of participation the number of the participating organisations increased as well. During the first cycle of ERA-NETs, GSRT was the main participant. Now 23 organisations are participating.

Despite the relative high number of participations given the size of the country and of its research system, participation in joint call and public funding is very low amounting to only 7 out of 46 calls with an average budget below €400,000. The main barrier for the participation is the low overall government budget for R&D.

Greece participates also in some initiatives undertaken under Art. 185. The country is among the first members of the “European and Developing Countries Clinical Trials Partnership” (EDCTP). Also research teams participated in two out of the three calls of Ambient Assisted Leaving with public funding of €2.5m and €3m respectively. Participation in the 4th call is under consideration as there is strong interest from
industry. The country participates also in EUROSTARS with a small budget of €1.78m.

Greece is not participating in the European Science Foundation and therefore only marginal funding through ad-hoc collaborations with Greek researchers is directed to Greece.

Greece participates in 23 Joint Technology Platforms Initiatives. The most important in terms of national priority and budget are: ARTEMIS, ENIAC, Innovative Medicine Initiative and Clean Sky.

Finally Greece participates in the first Joint Programming Initiative “Alzheimer’s and other neurodegenerative diseases” however no budget has been allocated so far. Also there is strong interest for the forthcoming initiative “Antimicrobial Resistance”.

Currently there is no coherent strategy for the participation in programming collaborations and for co-ordination with other national programmes; therefore decisions are taken ad-hoc. A strategy for the international collaborations of Greece and the coordination with European countries within the ERA is under preparation by GSRT and it is expected to be announced soon.

### 3.5.4 Opening up of national R&D programmes

Opening up of national research and innovation programmes is among the priorities of research and innovation policy. The Strategic Development Plan for Research, Technology and Innovation 2007-2013 explicitly provides for the participation in programmes of non-national researchers in the current programming period 2007-2013. However, few steps have been made towards this direction. Although there are variations among the programmes, participation of non-nationals is possible without funding, with the exception of subcontracting. In this case non-nationals are paid at market prices for the provided services.

Exception to this approach is the new programme supporting postdoctoral research, where participation of non nationals is feasible providing that they are going to undertake their research in a Greek university or public research centre.

The main barrier for supporting non-nationals is that public funding of the national research system is low and therefore funding of non-nationals will further decrease the resources channelled to the national system.

### 3.6 International science and technology cooperation

In 2008, the European Commission proposed the Strategic European Framework for International Science and Technology Cooperation to strengthen science and technology cooperation with non-EU countries. The strategy identifies general principles which should underpin European cooperation with the rest of the world and proposed specific orientations for action to: 1) strengthen the international dimension of ERA through FPs and to foster strategic cooperation with key third countries through geographic and thematic targeting; 2) improve the framework conditions for international cooperation in S&T and for the promotion of European technologies worldwide. Having in view these aspects, the following section analyses how national policy measures reflect the need to strengthen the international cooperation in S&T.

#### 3.6.1 International cooperation

Research collaboration with third countries is organised through bilateral agreements. In the previous programming period (2000-2006) an extended
programme of research programmes based on existing bilateral agreements with USA, Japan, Korea, China, India and the Southern Mediterranean countries was implemented. In the current programming period only a small research programme with a budget of €300,000 based on the bilateral agreement between Greece and US started in November 2010. Although no country is excluded from collaborations there is a focus on Balkan, Mediterranean and Black Sea countries

3.6.2 Mobility schemes for researchers from third countries
No specific measures particularly targeting researchers from third countries exist. Researchers from EU member states, associated countries and third countries are all regarded as non-nationals and treated the same way.

4 Conclusions

4.1 Effectiveness of the knowledge triangle
After almost three years of stagnation in public funding of research and innovation, the first support measures under the NSRF, have started to be implemented. The significant delays in the plan and implementation of policy, reflects the deterioration of the capacity of the administration, complex and rigid funding structures and the lack of clear long-term policy. In addition the severe debt and deficit crisis reduce even more the available resources.

Under the pressure of the crisis the country is undergoing significant structural changes and radical reforms that should have been undertaken long time ago. Changes affect all aspects of the knowledge triangle as new framework laws for both the research and the higher education system are under consultation. The main aims of the reforms are to open the systems to the society and its needs; consolidate structures and funding; link funding with performance and multi-annual strategies; and increase international presence and co-operation. At the same time efforts are made to improve framework conditions and innovation financing, especially early phase and micro financing. The main challenge for the government is to develop consensus for the reforms and overcome the resistance, especially in the higher education sector, in a creative manner.

Coordination among the different aspects of knowledge triangle policy is still underdeveloped although certain steps toward this direction have been taken. The move of GSRT to Ministry of Education is expected to strengthen co-ordination of research with education policies. However, coordination of innovation policy is now split among GSRT and Ministry of Regional Development. Furthermore, it is government’s intention under the new laws (for research governance and for the HE sector), block funding of research organisations and universities to be agreed on the base of multi-annual programming agreements with the organisations. Also funding for research and innovation will be coordinated through a multi-annual framework programme (NFPRI) which will replace in terms of strategic planning the Operational Programmes.

The main policy changes and the effectiveness of knowledge triangle policies are summarised in the following table.

Table 4: Effectiveness of knowledge triangle policies
### Research policy

- A new target for GERD to go to 2% of GDP until 2020 has been set.
- After three years of funding stagnation, the first support measures have started.
- GSRT moved to Ministry of Education thus increasing coordination with education policies.
- A new law for the restructuring of the research and innovation governance is underway including the creation of a new funding instrument (NFPRI) which is going to consolidate research and innovation funding.
- The share of competitive and performance related funding is going to be increased at the expense of the block funding.
- The policy mix implemented the last decade failed to mobilise private sector and increase knowledge demand and R&D investments.
- The overall budget for research and innovation for the period 2010-2015 is significantly higher compared to the previous programming period.
- Administrative shortcomings and lack of planning and implementation capacity jeopardise the effectiveness of the measures.
- Recent fiscal crisis is expected not to affect competitive funding provided by the NSRF although investments on infrastructures and human resources will be significantly reduced.

### Innovation policy

- There is a gradual shift in the support of innovation from subsidies to intelligent financial mechanisms.
- The creation of new financial mechanisms focusing on early stage and micro financing has been announced.
- New measures are launched after almost three years of stagnation.
- Innovation capacity of firms remains low despite the efforts of innovation policy.
- Responsibility of innovation policy is now shared among GSRT and Ministry of Regional Development setting the issue of coordination.
- Administrative shortcomings and lack of planning and implementation capacity jeopardise the effectiveness of the measures.

### Education policy

- A new reform of the higher education sector has been initiated, focusing on improving the quality, efficiency and relevance of the provided education.
- Funding will be linked with performance and will be distributed on the base of multi-annual programming agreements.
- The focus on life long learning is strengthened.
- The academic community strongly opposes the announced reforms leading to an open confrontation with the government.
- There is a mismatch between supply and demand for life long learning.

### Other policies

- New laws are under consultation for improving framework conditions including: reduction of red tape; simplification of the procedures for establishing firms; simplification of the tax system.
- Bureaucracy is hindering efforts to improve framework conditions.
- Both economic crisis and the strict austerity programme and the rise of taxes (both VAT and corporate taxes) reduce liquidity from the market and worsen prospects for entrepreneurs.

### Recent policy changes

<table>
<thead>
<tr>
<th>Research policy</th>
<th>Assessment of strengths and weaknesses</th>
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<tbody>
<tr>
<td>A new target for GERD to go to 2% of GDP until 2020 has been set.</td>
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### 4.2 ERA 2020 objectives - a summary

In terms of national research policy, ERA provides the opportunity to tap into additional sources of funding, profit from international knowledge and increase local research capacity through collaborations and use of European resource infrastructures. Furthermore, ERA is seen by government as the mean of increasing the role of Greece in the Balkans and Southeast Europe. However, few steps
towards the achievement of ERA objectives have been done the last three years due to lack of a coherent strategy and adequate budget. In 2010 the main efforts of the Ministry of Education, which is responsible for the research policy, have been on the one hand, the formulation of a new strategy for research, education and the internationalisation of the research system, and on the other hand the introduction of the necessary reforms for the implementation of the strategies. As it can be seen in the following table the reforms address several of the ERA objectives.

Table 5: Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

<table>
<thead>
<tr>
<th>ERA objectives</th>
<th>Main policy changes</th>
<th>Assessment of national strengths and weaknesses with regard the specific ERA objective</th>
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<tbody>
<tr>
<td>1 Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers</td>
<td>- The law for the HE sector under consultation is expected to:</td>
<td>• Low demand for researchers by the business sector</td>
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<td>2 Increase public support for research</td>
<td>- The budget for competitive funding for the current programming period has increased significantly compared to the previous period amounting to €1.3b.</td>
<td>• Policy and administration inefficiencies delayed the planning and implementation of the OPs.</td>
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<tr>
<td>3 Increase European coordination and integration of research funding</td>
<td>- A strategy for the internationalisation of the research system will be announced soon.</td>
<td>• No specific strategy for cross-border collaboration exists.</td>
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<td>4 Enhance research capacity across Europe</td>
<td>- The forthcoming law for the HEIs intents to introduce some flexibility for universities to set incentives for academics; links funding with performance; and adopt European standards in postgraduate studies.</td>
<td>• Strong opposition from the academic community hampers changes.</td>
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<tr>
<td>ERA objectives</td>
<td>Main policy changes</td>
<td>Assessment of national strengths and weaknesses with regard the specific ERA objective</td>
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| 5 Develop world-class research infrastructures (including e-infrastructures) and ensure access to them | • The national road map for research infrastructures is under preparation. | • Greece is interested in hosting a European Research Infrastructure  
• Overall low public funding of research, restricted resources for participating in European infrastructures. |
| 6 Strengthen research institutions, including notably universities | The forthcoming law for the HEIs intents to:  
• further enhance the quality assurance processes and links funding with performance;  
• strengthen autonomy of HEIs increases accountability and opens management to stakeholders. | • Quality of research has been improved in the HE sector although it is still beyond the European average  
• Quality of education is hindered by several drawbacks.  
• Strong opposition from the academic community hampers changes. |
| 7 Improve framework conditions for private investment in R&D | • The new fund NFEP intents to close the gap in the funding of innovative and new firms.  
• The new Investment Law provides tax incentives for innovative and research performing enterprises  
• Recent reforms reduced barriers in setting up enterprises | • There are significant barriers for private R&D investments including red tape, lack of competition in several segments of the economy, lack of funding due to the risk adverse culture of the financial system. |
| 8 Promote public-private cooperation and knowledge transfer | Most of the measures funded by GSRT are addressing science-industry cooperation and technology transfer either through collaborative research projects or research and innovation subcontracting. | • Low demand for research based knowledge by the private sector and low collaboration skills in universities and research centres hinders public-private cooperation.  
• The existing public technology transfer mechanisms are lacking the necessary competences and skills |
| 9 Enhance knowledge circulation across Europe and beyond | • The recently launched programme for postdoctoral research facilitates inward and outward mobility of post doc researchers. | • Greek research teams are very active in FP7 and COST programmes.  
• Participation in bilateral agreements and other co-operation instruments is limited due the low overall budget for research. |
<p>| 10 Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world | • In the current programming period no policy measures or activities have been undertaken. | • Particular interest for Balkan, Mediterranean and Black See countries. There are several links and co-operations. |</p>
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<tr>
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| 11 Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle | Efforts are made to improve coordination of knowledge triangle policies:  
- Move of GSRT to Ministry of education increase opportunities for better co-ordination with education policy;  
- The new multi-annual programme NFPRI co-ordinates funding for research and innovation. | Procedures for coordination of design and implementation across policy domains are underdeveloped. Recent efforts to develop some coordination mechanisms need time to break rigid boundaries. The effort is further hindered by the lack of competences and skills of the public administration, the frequent rotation of the hierarchy and the lack of organisational memory. |
| 12 Develop and sustain excellence and overall quality of European research | • Evaluation of HEIs continues in a faster pace.  
- The new law under consultation for HEIs intents to: link funding with performance; consolidate HEIs; improve procedures for appointment and promotion of staff.  
- The new forthcoming law on research sets as a priority research excellence. | Quality is hinder by low institutional funding, limited autonomy, and inefficiencies in the peer review system and in the promotion and appointment of staff, geographical fragmentation of HEIs. |
| 13 Promote structural change and specialisation towards a more knowledge-intensive economy | • The new measure for the promotion of spin-offs and spin-outs contribute to the increase of the dynamic new knowledge intensive companies.  
- The new measure supporting research in non-research performing firms facilitate firms to climb up the value chain. | Greek economy is specialised towards less knowledge intensive segments.  
- It is among the aims of the existing policy mix to facilitate the restructuring of the economy towards knowledge intensive activities. |
| 14 Mobilise research to address major societal challenges and contribute to sustainable development | GSRT organises further elaboration of the research priorities towards sustainable development and eco innovation. | Research priorities set in 2007 take into consideration societal challenges and are inline with the Grand Challenges. However no specific budget has been attached to the priorities. |
| 15 Build mutual trust between science and society and strengthen scientific evidence for policy making | A budget of approximately €5m is going to be allocated during the period 2011-2015. | Activities developed during the previous programming period were not continued in the current period leaving a gap of almost three years. |
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List of Abbreviations

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<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>BERD</td>
<td>Business Expenditures for Research and Development</td>
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<td>CERN</td>
<td>European Organisation for Nuclear Research</td>
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<td>COST</td>
<td>European Cooperation in Science and Technology</td>
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<td>EDCTP</td>
<td>European and Developing Countries Clinical Trials Partnership</td>
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<td>EMU</td>
<td>European Monetary Union</td>
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<td>EQF</td>
<td>European Qualification Framework</td>
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<td>ERA</td>
<td>European Research Area</td>
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<td>ERA-NET</td>
<td>European Research Area Network</td>
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<td>ERDF</td>
<td>European Regional Development Fund</td>
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<td>ERP Fund</td>
<td>European Recovery Programme Fund</td>
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<td>ESA</td>
<td>European Space Agency</td>
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<td>ESF</td>
<td>European Social Fund</td>
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<td>ESFRI</td>
<td>European Strategy Forum on Research Infrastructures</td>
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<td>EU</td>
<td>European Union</td>
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<td>EU-27</td>
<td>European Union including 27 Member States</td>
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<td>FDI</td>
<td>Foreign Direct Investments</td>
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<td>FP</td>
<td>European Framework Programme for Research and Technology Development</td>
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<td>FP7</td>
<td>7th Framework Programme</td>
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<tr>
<td>FTE</td>
<td>Full Time Equivalent</td>
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<tr>
<td>GBAORD</td>
<td>Government Budget Appropriations or Outlays on R&amp;D</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<tr>
<td>GERD</td>
<td>Gross Domestic Expenditure on R&amp;D</td>
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<tr>
<td>GOVERD</td>
<td>Government Intramural Expenditure on R&amp;D</td>
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<tr>
<td>GSRT</td>
<td>General Secretariat for Research and Technology</td>
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<td>GUF</td>
<td>General University Funds</td>
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<td>HEI</td>
<td>Higher education institutions</td>
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<td>HERD</td>
<td>Higher Education Expenditure on R&amp;D</td>
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<td>HES</td>
<td>Higher education sector</td>
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<td>HQAA</td>
<td>Hellenic Quality Assurance Agency for Higher Education</td>
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<td>IP</td>
<td>Intellectual Property</td>
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<td>LLL</td>
<td>Life Long Learning</td>
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<td>NCRT</td>
<td>National Council for Research and Technology</td>
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<td>NFED</td>
<td>National Fund for Entrepreneurship and Development</td>
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<td>NFPRI</td>
<td>National Framework Programme for Research and Innovation</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
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<td>PRO</td>
<td>Public Research Organisations</td>
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<td>R&amp;D</td>
<td>Research and development</td>
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<td>RI</td>
<td>Research Infrastructures</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>RTDI</td>
<td>Research Technological Development and Innovation</td>
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<tr>
<td>S&amp;T</td>
<td>Science and technology</td>
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<td>SF</td>
<td>Structural Funds</td>
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<tr>
<td>SME</td>
<td>Small and Medium Sized Enterprise</td>
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<tr>
<td>TEI</td>
<td>Technological Educational Institution</td>
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<tr>
<td>VA</td>
<td>Value Added at factor prices</td>
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<tr>
<td>VC</td>
<td>Venture Capital</td>
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