

Ministry of Science, Technology and Higher Education, Portugal

Science, Technology and Tertiary Education in Portugal, 2011

A background report based on a seminar with the OECD's Directorates for Science, Technology and Industry and for Education, 20 April 2011, at the OECD headquarters, Paris



May 2011

Introduction

The evolution of science, technology and tertiary education in Portugal over the last five years is documented in this report, paying special attention to the transformations that have taken place following the 2006 OECD Review of Tertiary Education. It also introduces issues for discussion concerning the challenges the country is facing to sustain the growth of science and technology and to actively participate in international knowledge networks and flows.

Portugal has recently overcome its traditional gap in scientific and technological development and surpassed the average OECD level in terms of the number of researchers per thousand workforce, attaining 8.2 full time researchers per thousand workforce in 2009, as opposed to 3.5 in 2005 and only 1.5 in the late 1980s. Overall R&D expenditure more than doubled over the last five years: it was 1.71% of GDP in 2009, compared to 0.81% in 2005, and only 0.4% in the late 1980s.

At the same time, the tertiary education system has been reformed, the social basis for recruitment of students has been enlarged and industry-science links have been strengthened, together with increased business expenditure on R&D (which represented 0.8% of GDP in 2009, compared to 0.3% in 2005 and less than 0.2% until some ten years ago).

Opportunities linked to emerging themes for knowledge exploration and discovery, as well as for advanced training, represent constant challenges for small and medium-sized countries, and Portugal has experienced such opportunities through strategic partnerships with leading partners worldwide. They cover diverse areas, from deep sea biotechnology in the North Atlantic to the internet of the future, and involve building further competencies in the nano and bio-sciences, as well as in engineering systems and advanced computing.

The rapid development of Portuguese science and technology, as well as the reforms in tertiary education in Portugal, were the *raison d'être* for a special seminar held at OECD headquarters in Paris on 13 April 2010. The seminar was opened by the OECD Deputy Secretary General and the discussion included OECD policy analysts in the areas of science and technology and education, as well as representatives from member States. This was an exceptional meeting as it allowed a deepening of the debate over the advances made in recent years by Portugal in science and technology, and it was instrumental in assisting in the shaping of policies aimed at reinforcing and consolidating this growth.

The April 2010 Seminar also served to deepen the analysis of the progress made in recent years related to the ongoing modernization of tertiary education in Portugal, taking as a benchmark the comprehensive review of the tertiary education system and its policies, as conducted in 2006 by the OECD Education Directorate. At that time the performance of the Portuguese tertiary education system was examined by comparing it with other member States and recommendations were made to reform it. Following that review, a major reform of tertiary education was undertaken and a new legal framework for higher education was approved by Parliament in 2007, with a review being mooted for 2012.

Five years have elapsed since the OECD review of the Portuguese tertiary education system and about one year since the seminar held in Paris, the present report deepens analyses of the progress made in Portugal regarding science, technology and tertiary education. A preliminary version was prepared specially for a new meeting at the OECD on 20 April 2011, with policy analysts in the areas of science and technology and education, aiming to discuss the main achievements, challenges and opportunities ahead. The current version results from that discussion and includes comments derived from the debate following that meeting.

The report includes four main sections, as follows: i) access, diversity, quality and relevance of tertiary education, including financing and the social context for its recruitment base; ii) institutional building and development for knowledge production, transfer and diffusion; iii) strengthening research and development through people, knowledge and ideas; and iv) steering and funding of science and technology. An additional final section introduces major targets for the future, as included in the recently established National Plan for Reforms towards Europe 2020. It considers challenges the country is facing to sustain the growth of science and technology and the employability of graduates, as well as the modernization of the teaching/learning systems.

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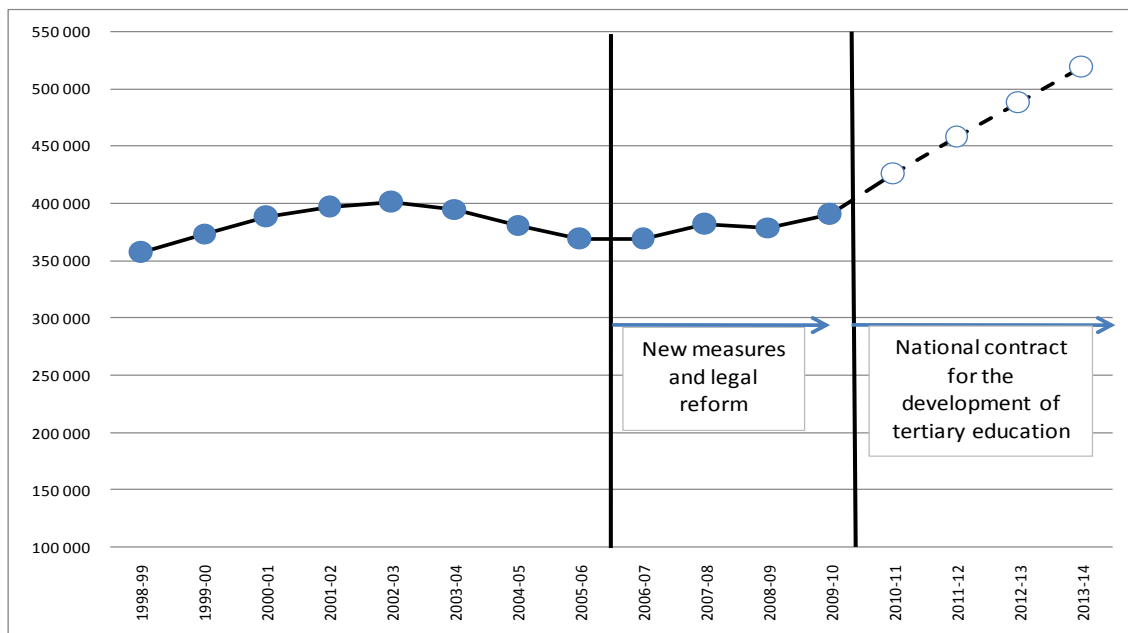
Chapter 1. An overview of tertiary education in Portugal: people, skills and competence building

1. **Student enrolment in tertiary education, 2005-2010:** Total enrolment in tertiary education of 20-year-olds has increased by 16% over the last five years, reaching about 37% of this age-group in 2010, as compared to 30% in 2005.

2. **The evolution of the tertiary education system.** The number of students currently in tertiary education is important because it determines, in part, a region's future competitiveness in terms of its ability to promote technological change and to create value. It is obvious that the rise in qualification level of the young Portuguese population is associated with the fact that the Portuguese tertiary education system grew rapidly in the 1980s and 1990s and opened up to young people of all social classes, growing from 30,000 students in the 1960s to about 400,000 students by the mid 2000s (Figure 1). After a period of relative decline, the tertiary system underwent reforms which reinforced institutional autonomy and promoted new organizational formats, among other incentives (details in Chapter 2). This reform reversed the trend towards declining enrolment in tertiary education which began in 2003, and fostered the enlargement of the recruitment base of higher education (See Annex 1 for details):
 - Enrolment in tertiary education of adults aged 30-34 has increased by about 25% over the last five years (2005/06 to 2009/10), but was still relatively low in 2009/10 at about 4.3% of the corresponding total population of the age-group (compared to 3.5% in 2005/06).
 - Adult enrolment in tertiary education for the 35-49 year old cohort was as low as 2% in 2009/2010 (although with 54% growth between 2005/06 and 2009/10).

Figure 1

Evolution of the number of students enrolled in tertiary education in Portugal, 1995-96 to 2009-10, and projections from 2010/11 to 2013/14



Note: Years 1998/99 to 2009/10 are official statistics; Years 2010/11 to 2013/14 are projections.

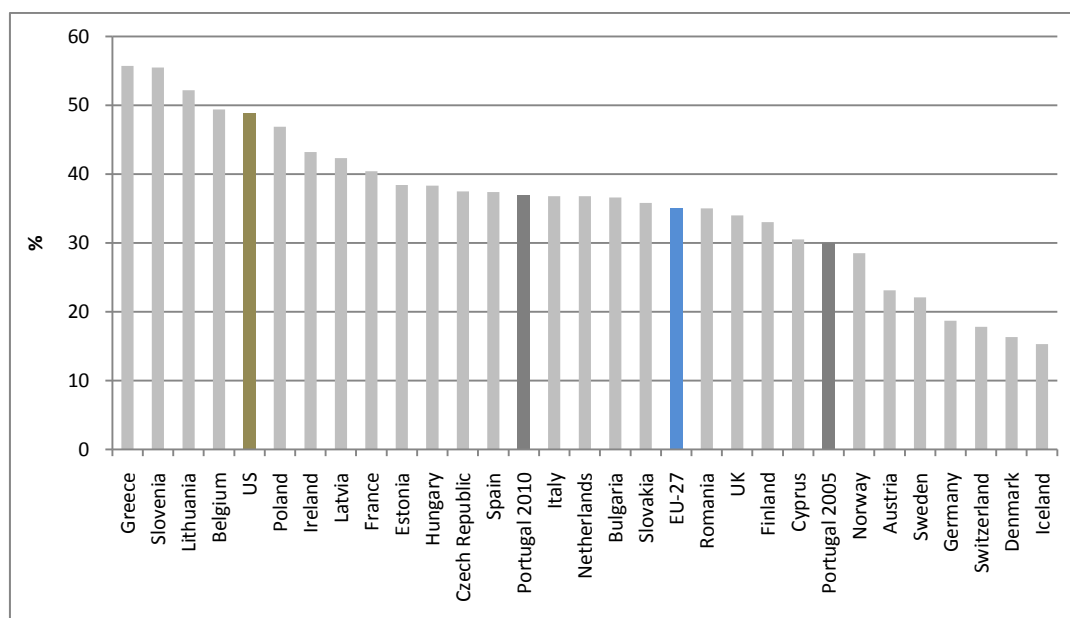
Source: MCTES/ Statistics Office (<http://www.gpearl.mctes.pt/index.php>)

3. **Comparative assessment of student enrolment.** The above figures are the result of policies in recent years designed to open up access to higher education and, above all, to increase enrolment

in polytechnic tertiary education, which grew at a higher rate than that of university education. The growth rate of enrolled students aged 20 as a percentage of the corresponding age population in Portugal was one of the highest in the European Union, growing by 22% between 2005 and 2010, well above the growth rate of the US, 3.2%, and the EU-27 average, 1.4% between 2005 and 2008 (Figure 2).

Figure 2

Enrolled students (ISCED 5 and 6) aged 20 as a percentage of corresponding age population



Notes: data for all countries refers to 2008, except for Portugal: 2005 and 2010.

Source: Eurostat (http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database)

4. **Other outcomes of the tertiary education reform, 2007-2010:** Overall, the success of the higher education reform launched in 2006 is demonstrated by the significant increase in the number of students accessing tertiary education for the first time. In fact, the decline in new students entering tertiary education observed in the OECD Review Report of December 2006 was reversed in the academic year 2006/07 (95,431 in 2006/07, compared to 84,363 in 2004/05 and 82,720 in 2005/06). This trend has accelerated in recent years with an increase in new enrolments in tertiary education, with particular impact on polytechnic education. In the academic year 2007/08 the number of newly enrolled students in tertiary education exceeded one hundred thousand, with an additional 128,000 in 2010:

- In the last four years (2006/07 to 2009/10), nearly 11,000 students over 23 years of age enrolled in the first year for the first time in tertiary education. About half of these students enrolled for the first time in the university sector, with the other half in the polytechnic sector. This distribution of enrolment is similar in both public and private sectors.
- The number of students enrolled for the first time in the first year in medicine increased by 37% from 2004/05 to 2009/10. During the same period, the total number of students enrolled in medicine increased by 44%, exceeding 9,000 in 2010. Degree programmes in medicine were extended from seven in 2005 to nine in 2011, with new programmes offered in the University of Aveiro and in the University of the Algarve. More important, these two new programmes admit medicine students directly to the 2nd cycle of higher education in the Bologna system, a possibility that did not exist in the Portuguese system before and is seen as a very promising innovation. During this period, the number of graduates grew by about 53%, with over 1,200 new graduates in medicine in 2010.

- The above figures stem from the legal reform of tertiary education, but they also reflect the current movement in Europe to modernize tertiary education and have been driven by policies designed to extend the recruitment base and the number of students in tertiary education. This has been achieved by reinforcing the upper ranks of the system, through promoting the internationalization and specialization of research universities, as well as by promoting a binary system, with polytechnic education concentrating on professionally-oriented and vocational training, while university education concentrates more on postgraduate education.
5. **The National Contract for the development of tertiary education, 2010-2014.** In January 2010 a national contract for the development of tertiary education was signed between the government and all public universities and polytechnics. This contract entails a yearly increase of public investment in tertiary education of 100 million Euros, underlining the commitment of higher education institutions (HEIs) to increase the qualification of the Portuguese population by setting the goal of graduating more than one hundred thousand individuals, in addition to the current graduation levels, by 2014.

 6. **The Development Plans of all public higher education Institutions, 2010-2014.** The national contract of 2010 was associated with specific Development Plans for all public higher education institutions, including well-defined targets fostering increased qualification levels (Annex 2), as well as measures for restructuring and improving efficiency aiming to:
 - accelerate the training of the workforce by increasing the enrolment of adults in higher education and lifelong learning perspectives;
 - differentiate and specialize polytechnic and university education, with the former centred on short-term and 1st cycle qualifications and the latter on 2nd cycle and doctorate levels;
 - raise quality levels across all pedagogical, scientific and operational levels of HEIs, as well as in their influence in society at large, particularly through measures to improve and guarantee the employability of their graduates.
 - The continuous assessment and effective annual accountability of the Development Plans signed in 2010 with all HEIs was the target of the new Evaluation and Accreditation Agency (A3ES) in close cooperation with the Council of Rectors of Public Universities (CRUP) and the Coordinating Council of Polytechnic Institutions (CCISP). Annual reports are due from 2011 and will allow yearly monitoring of the national contracts.

 7. **Strengthening a binary system in Portuguese tertiary education.** The Development Plans for all public higher education institutions preserve and strengthen their institutional integrity, together with increasing Government funding, as an important point of public policy. However, this measure is not sufficient by itself. From a more pragmatic viewpoint, HEIs should respond to the needs of society, which include rapid and unforeseeable changes in the structure of the employment market, and consequently they need to continuously adapt training schemes and procedures to ensure effective development of their graduates' skills. The need to promote dynamic and responsive HEIs requires policies that consider widening the scope of their diversity and institutional autonomy, while ensuring effective accountability. A diversified system is able to respond effectively to different demands, including the comprehensive nature of research and training covering the whole tertiary education system. In this context, policy measures taken in recent years have enabled the following major achievements, as quantified in detail in Table 1:

- Overall enrolment in universities and polytechnics has grown, respectively, by 1.9% and 2.9% since 2005, with polytechnics concentrating on professional and vocational training and most universities concentrating their growth in 2nd cycle and doctoral programmes.
- Master's and PhD students in universities increased to more than 3.5 times the number in 2005, with the relative proportion of postgraduate students in universities growing from 9% in 2005 to 31% in 2010.
- The total number of students enrolled in vocational short term cycles (Technological Specialization Courses or CETs) rose more than 20-fold relative to 2005, with polytechnics accounting for about 80% of them. Nevertheless, these short-term cycles still account for only 3.5% of all polytechnic students (although it was below 0.05% in 2005) and there is therefore still a large potential for growth in polytechnics of short-term professional and vocational training. Also, professional master's students in polytechnics have grown to 35 times their number in 2005, which indicates that the polytechnics are becoming increasingly specialized in advanced professional training.

Table 1
Number of students enrolled in higher education institutions
(public and private) by study cycle, 2004/05 to 2009/10

Universities	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Short-term cycles (CETs)	217	757	444	489	813	1,211
1st cycle (<i>licenciatura</i>)	218,840	208,220	19,8924	179,225	168,389	168,078
2nd cycle (master's) and other postgraduate programmes	14,547	16,047	21,034	46,161	53,877	59,525
Doctoral programmes	6,988	8,505	9,585	11,344	13,429	16,377
Sub-total universities	240,592	233,529	229,987	237,219	236,508	245,191
Polytechnics	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Short-term cycles (CETs)	77	502	1,809	4,322	5,019	5,003
1st cycle (<i>licenciatura</i>)	140,178	133,275	135,537	135,710	128,022	125,664
2nd cycle (master's) and other postgraduate programmes	384	1,265	1,649	4,477	9,285	13,983
Sub-total polytechnics	140,639	135,042	138,995	144,509	142,326	144,650
TOTAL - tertiary education	381,231	368,571	368,982	381,728	378,834	389,841

Source: MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>)

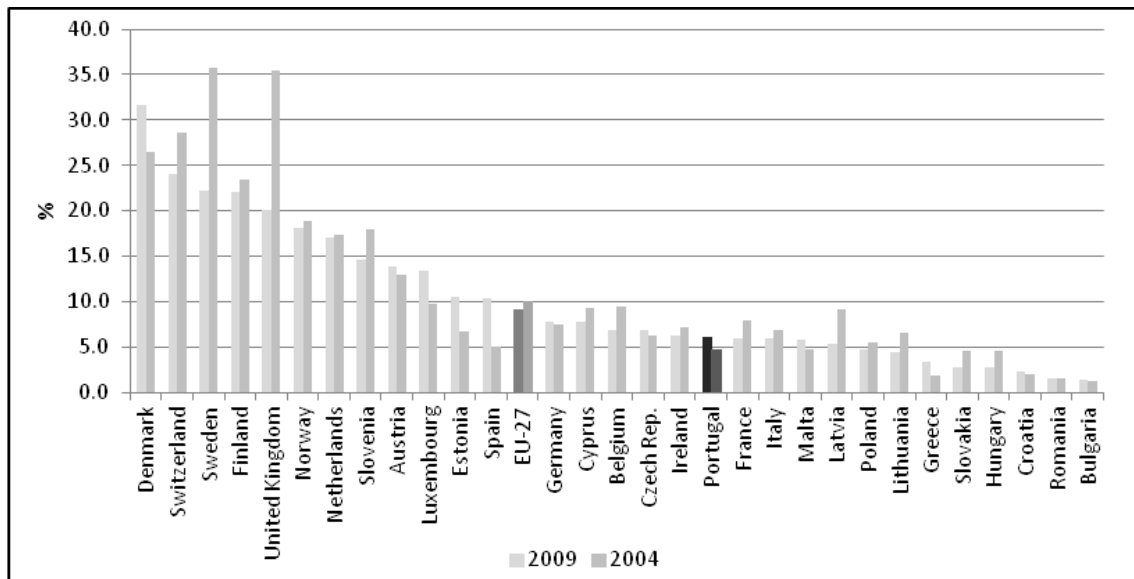
8. **Lifelong education.** The typical participation of the Portuguese population in lifelong education is still below the EU average; Figure 3 quantifies the trend across Europe. For example, in 2009 Portugal had only 6.5% of its population aged 25-64 years engaged in formal lifelong education and training, while the EU-27 average was 9.3%¹. This prompted the *Novas Oportunidades* (New Opportunities) programme, launched in 2005, to foster new training opportunities and formal competence acquisition for the least qualified population. In 2009, 455 "new opportunity centres" were functioning and more than one million people were enrolled. About 250,000 new certifications were granted. In addition, recent analysis has shown that:

- According to the UNESCO's Global Monitoring Report 2010, the adult literacy rate (15 years and older) in Portugal was 95% in 2007, while it was only 88% in 1994.
- In 2009, 6.5% of the Portuguese population aged 25-64 was involved in education and training (the EU 27 average is 9.3%), which represents a growth of 91% since 2000.

¹ Source: EUROSTAT, www.ec.europa.eu/Eurostat, accessed on 30 November 2010

- In 2008, 54.3% of the Portuguese population had completed at least secondary education (the EU27 average is 79%), which represents the second highest growth in the EU area since 2000 (Portugal's growth rate was 26%, while the EU rate was 2.5%).
- The number of part-time degrees grew significantly between 2009 and 2010, to about 5,870 vacancies distributed across 180 programmes (1,600 vacancies and 45 programmes more than in 2009).

Figure 3
Percentage of the population aged 25 to 64 participating in
Education and training (lifelong education)



Source: Eurostat, 2004-2009

9. **Tertiary education graduates.** The total number of graduates from higher education institutions (Table 2) increased by about 16% over the period 2005-2010, with graduates in science and technology rising in recent years to a figure of 15 per thousand population aged 20-29 years and, therefore, above the EU average:

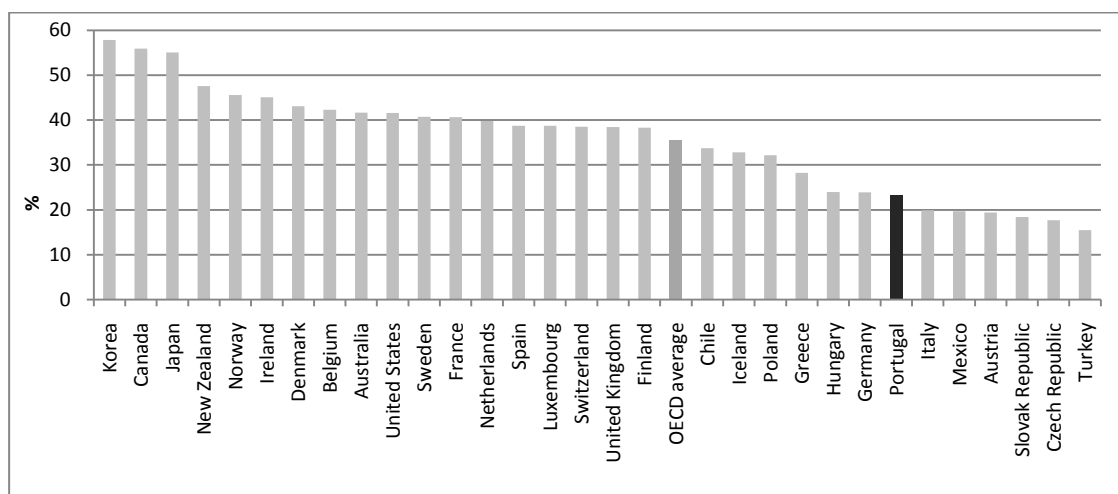
- The total number of graduates from short cycles (Technological Specialization Courses or CETs) reached 2089 in 2010, increasing more than eight-fold since the first batch of graduates in 2006.
- The proportion of total graduates aged 25-34 was about 26% of the corresponding population in 2010, while it was only 14% in 2001. The corresponding European and OECD averages were, respectively, 31% and 35% in 2008.
- In 2010, about 15% of the Portuguese population aged 25-64 had a tertiary education degree (only 9% in 2001), while the OECD average was 28% in 2008 (Figure 4);

Table 2
Number of higher education graduates (public and private institutions), 2005 to 2010

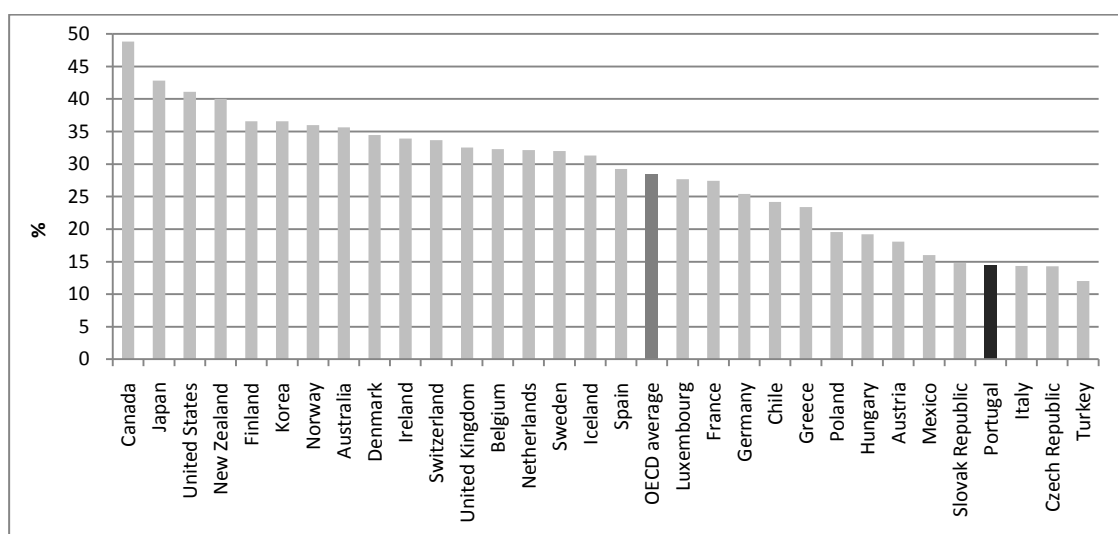
Universities	2005	2006	2007	2008	2009	2010 (e)
Short-term cycles (CETs)	-	173	241	209	258	267
1st cycle (<i>licenciatura</i>)	30,478	30,973	36,866	33,886	30,716	31,730
2nd cycle (master's) and other postgraduate programmes	4,802	6,317	8,002	12,535	16,865	17,421
Doctorate	998	1,094	1,269	1,285	1,267	1,308
Sub-Total Universities	36,278	38,557	46,378	47,915	49,106	50,726
Polytechnics	2005	2006	2007	2008	2009	2010
Short-term cycles (CETs)	-	60	637	1,573	1,764	1,822
1st cycle (<i>licenciatura</i>)	33,445	32,894	36,099	35,263	25,723	26,572
2nd cycle (master's) and other postgraduate programmes	264	550	1,040	1,040	1,996	2,062
Sub-Total Polytechnics	33,709	33,504	37,776	37,876	29,483	30,456
TOTAL - Tertiary Education	69,987	72,061	84,154	85,791	78,589	81,182

Note: 2010: estimate; 3rd cycle degrees do not include PhDs recognized by Portuguese universities. Source: MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>)

Figure 4
Percentage of the population with tertiary education, by age group



a) Age group: 25-34 years old, 2008



b) Age group: 25-64 years old, 2008
Source: OECD, Education at a Glance 2010

10. **Tertiary education graduates in mathematics, science and technology.** The number of graduates in mathematics, science and technology (MST) in Portugal grew by 38% between 2005 and 2009:

- In 2009, Portugal had 15 MST graduates per thousand population aged 20-29 (EU-27 average: 14 in 2008), of which 18 were men and 11 were women (Table 3).

Table 3

Evolution of tertiary education graduates in mathematics, science and technology, by 1000 population aged 20-29 years, in Portugal

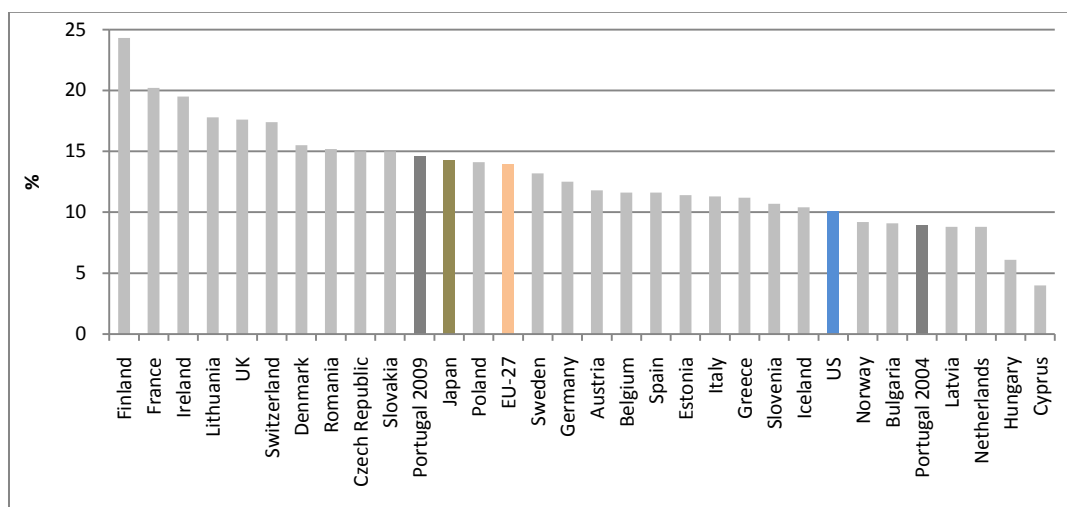
Year	Total	Male	Female
2004	8.9	10.5	7.3
2005	9.5	11.2	7.7
2006	9.6	11.4	7.7
2007	14.2	18.2	10.2
2008	16.3	20.7	11.8
2009	14.6	18.3	10.8

Source: MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>)

- A recent report on European education² identified Portugal, Slovakia and the Czech Republic as the best performers in Europe in terms of the increase in mathematics, science and technology graduates. In Portugal, the number of graduates in MST has risen by 64% since 2004, a growth rate only surpassed by the Czech Republic during the same period (Figure 5).

Figure 5

Evolution of tertiary education graduates in mathematics, science and technology, by 1000 population aged 20-29 years, for selected European countries, Japan and the US



Note: data for all countries refer to 2008, except for Portugal: 2004 and 2009.

Source: Eurostat (http://epp.Eurostat.ec.europa.eu/portal/page/portal/statistics/search_database)

11. **Employability of higher education graduates:** In December 2010, there were a total of 480,683 people seeking jobs in Portugal, of whom 35,427 (about 7%) had a higher education diploma (see Table 4 for comparison with other educational levels). This is equivalent to 3.5% of the resident population in Portugal (aged between 15 and 64 years) with a tertiary education diploma, and to 6.8% of the total unemployed population. For comparison, in December 2009, the total seeking employment totalled 467,217, of whom 30,653 (about 6%) held a higher education diploma.

² European Commission, "Progress towards the common European objectives in education and training (2010/2011) - Indicators and benchmarks", April 2011

Table 4
Evolution of the unemployment rate (%) by
Formal education level, 2009 to 2010

Education level	2009	2010	Variation
Primary education	10.1	11.6	1.4
Secondary education	9.6	11.3	1.6
Tertiary education	6.4	7.1	0.7

Source: National Statistical Office, INE

The following employment conditions should be taken into account when considering the increase in numbers with a higher education diploma registered in employment centres:

- The number of people resident in Portugal (aged 15 to 64 years) holding a tertiary education diploma in Portugal increased from about 949,000 to more than one million (about 1,015,000) between the fourth quarters of 2009 and 2010 (an increase of 7%);
- Considering only the employed population, official figures shows that those with a tertiary education diploma increased by about 3.8%, from close to 800,000 to 830,000, between 2009 and 2010 (Table 5);
- About 72% of those with a tertiary education diploma are unemployed for less than 12 months. This figure decreases to 57% for those without a tertiary degree.

Table 5
Number of employed people (thousands) by formal education

Education level	2009	2010	Variation
Primary education	3,406	3,244	-4.7%
Secondary education	849	904	6.6%
Tertiary education	800	830	3.8%

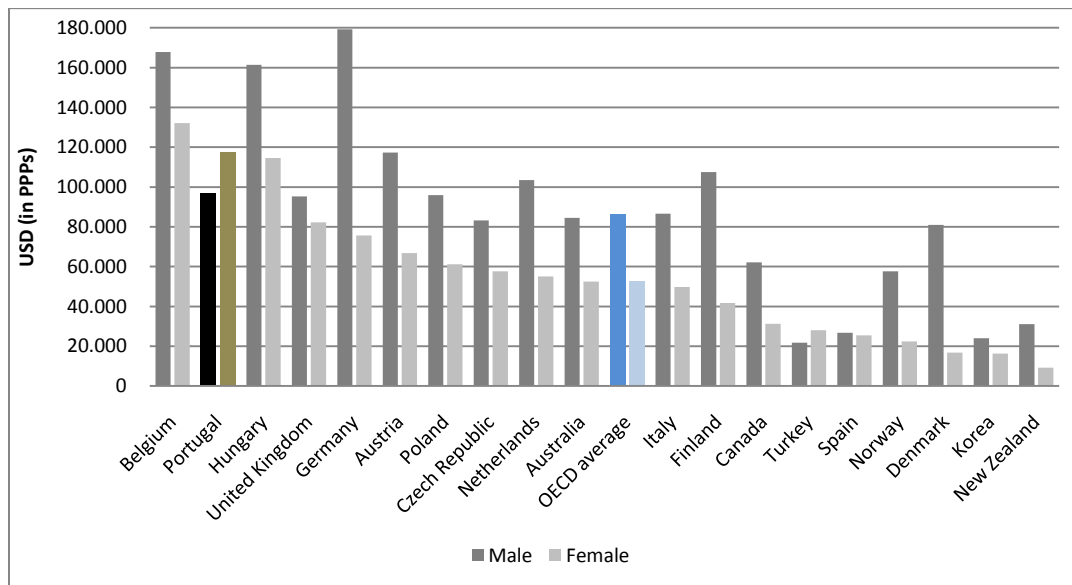
Source: National Statistical Office, INE

12. **Higher education driving social mobility.** The participation of students in higher education with parents with secondary, primary or basic education has been increasing in recent decades³. While in 1999, the proportion of higher education students in Portugal who had a parent holding at least a tertiary degree was only 28%, this figure increased to 35% in 2007. In 1999, the opportunity of access to higher education of students with a parent holding at least a tertiary qualification was 14 times greater than those whose parents had only the minimum basic education or less. In 2007, this ratio reduced to 10 times. Equity in tertiary education has improved considerably, while higher education has fostered social mobility.
13. **Economic and “private” returns of higher education:** There is today a general recognition that part of the benefit of participation in tertiary education is in individual returns (i.e., “private returns to education”, as in the economic literature), notably through the existence of an additional wage premium and a lower risk of unemployment when in the labour market. It should be noted that:

³ See António Firmino da Costa and Ana Caetano (CIES, ISCTE-IUL), “Evolução da Base Social dos Estudantes do Ensino Superior”, 2010.

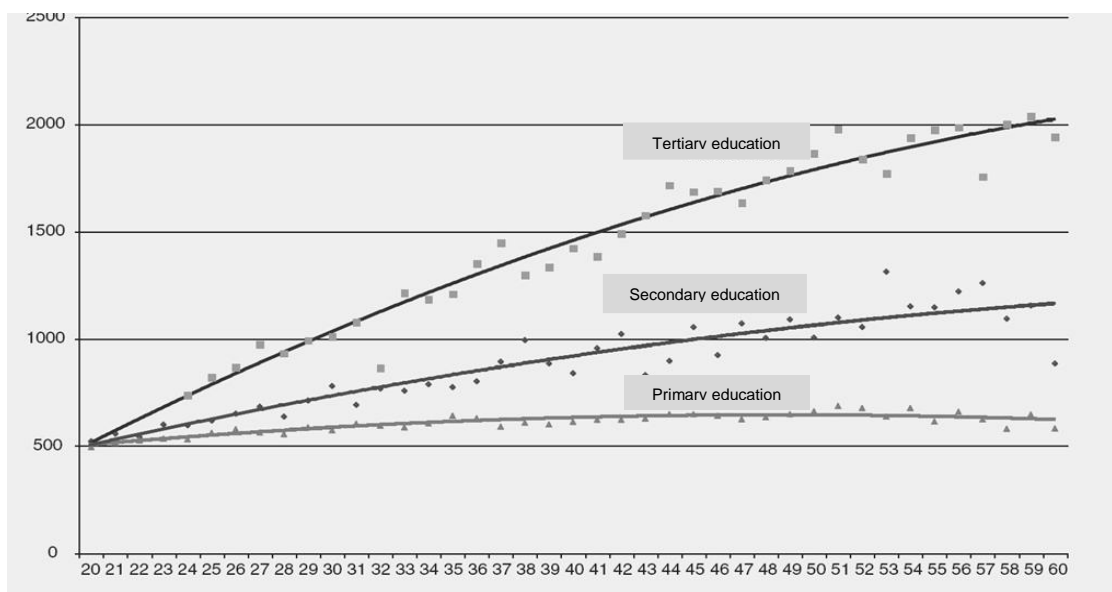
- This is the case everywhere, in particular in countries such as Portugal, where employees with a higher education degree have the highest wage premium and a lower risk of being unemployed (Figure 6).
- The argument can be further clarified by looking at typical salary profiles over the life cycle as a function of education attainment; Figure 7 shows details for the specific case of Portugal. Salaries for people with higher education degrees grow much faster over time than salaries for those with lower education attainment and are around three times higher than those with basic education 20 years after graduation.
- It should be noted that analysis has shown that our general observation is valid anywhere, although the data given are specific to Portugal. Portuguese society is unusual because it shows strongly binary characteristics concerning educational qualifications. There is an active workforce with low educational levels and a younger population with similar qualifications to countries with more developed economies. However, development in Portuguese educational structures is held back by high retention and school dropout rates in secondary education. Until a few years ago, Portugal had by far the highest premature school dropout rate in the entire European Union, particularly of individuals from 18 to 24 years of age, who left school before completing secondary education. Premature integration into the labour market, with low qualification levels, makes this population highly vulnerable in periods of economic stagnation or slowdown.

Figure 6
Private net current value for an individual obtaining tertiary education as part of initial education (ISCED 5/6; last year available, or 2006)



Source: OECD (2010), Education at a Glance, Paris: OECD

Figure 7
Expected net salary level (in Euros) in Portugal, by education level

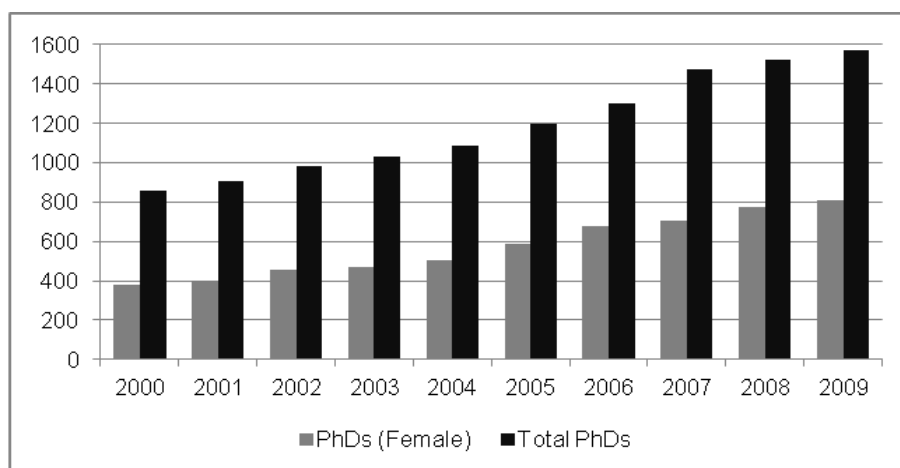


Note: vertical axis: Net salary (in Euros); Horizontal axis: age; Source: "Livro Branco das Relações Laborais, 2007; Ministério do Trabalho e das Solidariedade Social", based on data from the National Institute of Statistics (INE) - Employment Survey, 2007

14. **Doctorates.** The number of doctorates graduating has increased by over 50% in the last five years and has almost doubled in the last decade, with about 1,600 new PhDs graduating in 2010:

- This reveals the increasing capacity of Portuguese universities in offering PhD programmes, but it also poses new challenges regarding mechanisms to ensure the quality of these programmes, and the need to strengthen their internationalization and to establish international scientific research networks. Of the 1,600 new PhDs in 2010, 52% were women (Figure 8).

Figure 8
Total new PhDs graduating per year



Note: p – preliminary. Source: MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>), 2000-2009p

- The percentage of international students pursuing a PhD in Portugal has increased considerably in the last ten years. In 1998/99, there were only 172 foreign PhD students registered at Portuguese universities, representing 7% of all enrolled PhD students (of these 140 were from countries outside the EU). In 2009, there were 1,581 foreign PhD students in Portuguese universities, representing 13% of the total (1,265 from countries outside the EU).
- At the same time, the number of new PhDs in science and engineering per thousand population aged 25-34 increased to 0.45 in 2009, compared to only about 0.3 in 2001.

15. **More qualified academic staff in higher education institutions.** The increasing number of PhDs has raised the qualification level of academic staff of higher education institutions (Table 6), with absolute figures of faculty with a doctorate degree increasing in all higher education sub-sectors:

- The percentage of academic staff holding PhDs reached 68% of the total in public universities in 2009 (57% in 2005).
- A similar trend is found in private universities, where the percentage of academic staff holding a PhD reached 39% (26% in 2005).
- Also, the percentage of academic staff holding a PhD reached about 19% in both public and private polytechnics in 2009 (from about 11% in 2005).
- Advanced training programmes such as PROTEC support the qualification of teaching staff in the public polytechnic tertiary education system. This programme was first implemented in December 2008, in close collaboration with the Coordinating Council of Polytechnic Institutes (CCISP), and continues to assist polytechnic teaching staff in attaining doctoral degrees. PROTEC funds at least 50% of an ordinary PhD grant for a period of one to four years, in addition to other costs that the programme regulations cover. Overall, over the last years 1211 grants have been funded, aiming to at least to double the number of polytechnic faculty holding a PhD degree.

Table 6
Evolution of the qualifications of academic staff at public and private universities and polytechnics, 2001 to 2009

		2001	2002	2003	2004	2005	2006	2007	2008	2009
Public universities	Academic staff (with PhD)	6,870	7,301	7,604	8,076	8,535	8,858	9,314	9,589	10,010
	Academic staff (total)	14,455	14,521	14,590	14,858	14,984	14,738	14,566	14,466	14,803
	% of academic staff with PhD	48%	50%	52%	54%	57%	60%	64%	66%	68%
Private universities	Academic staff (with PhD)	1,588	1,678	1,715	1,751	1,845	1,890	1,960	2,193	2,671
	Academic staff (total)	7,424	7,381	7,339	7,176	7,027	6,605	6,331	6,479	6,899
	% of academic staff with PhD	21%	23%	23%	24%	26%	29%	31%	34%	39%
Public Polytechnics	Academic staff (with PhD)	692	805	908	1,052	1,248	1,394	1,532	1,750	1,955
	Academic staff (total)	9841	10,049	10,240	10,510	11,230	10,677	10,265	10,262	10,289
	% of academic staff with PhD	7%	8%	9%	10%	11%	13%	15%	17%	19%
Private Polytechnics	Academic staff (with PhD)	315	389	430	432	462	497	568	673	787
	Academic staff (total)	4,020	4,240	4,269	4,229	4,193	4,049	4,016	4,173	4,224
	% of academic staff with PhD	8%	9%	10%	10%	11%	12%	14%	16%	19%

Source: MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>)

16. **Funding of tertiary education.** Total expenditure on public and private tertiary education has grown steadily over the last five years at the average OECD level measured as a fraction of GDP. Quantified in terms of funding per student, average Portuguese figures have also risen considerably over the last five years, although they are still lower than the most industrialized OECD countries (Table 7):

- Total expenditure on public and private tertiary education represented 1.6% of GDP in 2007, compared to about 1.5% of GDP in 2005.
- Estimates for 2010 show a level of 1.7% of GDP, which is slightly above the current OECD average of 1.5%, but still lower than that of most industrialized regions of the world.

Total expenditure on public and private tertiary education in Portugal quantified in terms of funding per student (after correction for purchasing power parity) increased by over 30% in the period 2005-2010, from only about 76% of the OECD average in 2005 to 81% in 2007 (Table 7). Estimates for 2010 show a figure close to the OECD average for 2007 (the last year available) although still lower than those in most industrialized countries.

Table 7

Total expenditure on public and private tertiary education in OECD member states, quantified as a percentage of GDP and in terms of funding per student

Country	Total expenditure / GDP			Total expenditure per student (includes R&D)	
	Public	Private	Total	2005	2007
Australia	0.7	0.9	1.5	14,579	14,726
Austria	1.3	0.1	1.3	14,775	15,039
Belgium	1.2	0.1	1.3	11,960	13,482
Czech Republic	1.0	0.2	1.2	6,649	8,209
Denmark	1.6	0.1	1.7	14,959	16,466
Finland	1.6	0.1	1.6	12,285	13,566
France	1.2	0.2	1.4	10,995	12,773
Germany	0.9	0.2	1.1	12,446	13,823
Iceland	1.1	0.1	1.2	9,474	9,309
Ireland	1.0	0.2	1.2	10,468	12,631
Italy	0.6	0.3	0.9	8,026	8,673
Japan	0.5	1.0	1.5	12,326	14,201
Korea	0.6	1.9	2.4	7,606	8,920
Mexico	0.9	0.3	1.2	6,402	6,971
Netherlands	1.1	0.4	1.5	13,883	15,969
New Zealand	1.0	0.5	1.5	10,262	9,905
Poland	0.9	0.4	1.3	5,593	5,576
Portugal	1.1	0.5	1.6	8,787	10,398
Slovak Republic	0.7	0.2	0.9	5,783	5,736
Spain	0.9	0.2	1.1	10,089	12,548
Sweden	1.4	0.2	1.6	15,946	18,361
United Kingdom	0.7	0.6	1.3	13,506	15,463
United States	1.0	2.1	3.1	24,370	27,010
OECD average	1.0	0.5	1.5	11,512	12,907

Note: expenditure per student in equivalent USD converted using PPPs for GDP, by level of education, based on full-time equivalents.

Source: OECD (2010), Education at a Glance - 2010, Paris: OECD

17. **Funding of public higher education.** The total income of public higher education institutions has increased steadily over the last five years and, together with the overall funding for students' social support, has grown from about 1.10% of GDP in 2007 to 1.24% in 2010 (Table 8):

- The total income of public higher education institutions increased from 1,703 million Euros in 2005 to 1,984 million Euros in 2010, with the direct contribution from government funding for operation (i.e., salaries and other operating costs) accounting for about 65% of overall income during the period under analysis.

- The national contract for the development of tertiary education, 2010-2014, entails an increase of public investment in tertiary education of about 100 million Euros from 2010 onwards, underlining the commitment of higher education institutions (HEIs) to increase the qualification of the Portuguese population by setting the goal of graduating more than 100,000 individuals by 2014 in addition to the current graduation levels.
- The diversification of the income portfolio of public higher education institutions has been particularly associated with increased funding for R&D activities, which increased from 308 million Euros in 2005 to 356 million Euros in 2010, including national and European funds.
- Student tuition fees account for about 11% to 14% of the total income of public higher education institutions, including all study levels, with most PhD students funded through government grants.
- Government funding for catering services, accommodation and other student services has been kept constant at about 40 million Euros, accounting for about 41% of the total income of public higher education institutions for indirect social support to students.
- At the same time, direct social support to students (i.e., student grants) increased by about 70% from 2005 to 2010, reaching about 0.09% of GDP (i.e. 160 million Euros) in 2010, compared to only 0.06% in 2005.

Table 8

Total income of public higher education institutions (as recorded in their annual balance sheets) and social support to students, million Euros ⁽¹⁾

	2005	2006	2007	2008	2009 ⁽²⁾ p	2010 ⁽²⁾ e
1.1. Income of public higher education institutions, not including social support funds	1,418	1,447	1,420	1,467	1,500	1,609
.1.1. Direct government funding (operating budget)	1067	1130	1041	1092	1134	1234
.1.2. Government funding for infrastructure	43	27	25	24	23	19
.1.3 R&D funding and other income (public & private; includes EU funds) ⁽³⁾	308	289	354	352	343	356
1.2. Funding for indirect social support services of public institutions (catering, accommodation, and other services)	98	92	97	97	90	92
.2.1. Government funding	42	42	41	38	38	38
.2.2. Other income	56	50	56	59	52	54
1.3. Student tuition fees paid to public institutions ⁽⁴⁾	187	212	234	257	278	283
1. Total income of public higher education institutions (1.1+1.2+1.3)	1,703	1,751	1,751	1,821	1,868	1,984
2. Government funding for direct social support to students (student fellowships)⁽¹⁾	95	95	117	130	142	160
% (1+2) / GDP ⁽⁵⁾	1.17	1.15	1.10	1.13	1.20	1.24

Notes: p – provisional; e – estimate; (1) includes students at public and private higher education institutions ; (2) – includes estimate of the income of university foundations; (3) includes 1st cycle, 2nd cycle and PhDs; (4) includes funding from Portuguese S&T Foundation and European funds; (5) GDP.

Source: National Institute of Statistics/Bank of Portugal. MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>)

18. **Student social support grant system, 2005-2010:** The widened recruitment of students in tertiary education in Portugal has been supported by continuous strengthening of the social support system for students from low income families, through procedures aimed to assure equity in access and enrolment in tertiary education. The following points should be noted:

- The number of student grants has increased by about 6% since 2006, reaching about 75,000 students in 2010, and covering about 20% of all students in tertiary education.
- Government expenditure on direct support of student grants increased by over 68% between 2005 and 2010, reaching 160 million Euros.
- European funds (through the European Social Fund) have increasingly been used in recent years to ensure growth of direct social support to students. They have evolved from about 38% of public expenditure on student grants in 2007 to 21% in 2009, and again to about 38% in 2010 (Table 9). The share of European funds in 2011 is expected to be about 70%.
- In addition, a new support scheme to foster the use of public transport by students, named "Pass Sub-23", was launched in the summer of 2009, providing a 50% discount on urban transport to all students up to 23 years of age enrolled in tertiary education (in either public or private tertiary education institutions).

Table 9

Government budget and expenditure on direct social support to students (i.e. student grants), million Euros

	2006	2007	2008	2009	2010	2011
1. Initial Government <u>budget</u> for higher education student grants (direct social support)	112	123	126	137	147	147
1.1 National funds	112	78	81	92	85	44
1.2 European funds (ESF)	0	45	45	45	62	103
2. Total effective annual <u>expenditure</u>	95	117	130	142	160	n.a.
2.1 National funds	95	73	84	112	98	n.a.
2.2 European funds (ESF)	0	44	46	30	62	n.a.

Notes: includes students at public and private higher education institutions. Source: MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>)

19. **Reforming the student social support system, 2010.** In summer 2010, the direct student social support system was reformed through a broad collaborative effort involving the Council of Portuguese University Rectors (CRUP), the Coordinating Council of Polytechnic Institutes (CCISP), the Portuguese Association of Private Higher Education (APESP) and students' associations:

- The new regulatory framework was defined to foster social equity in access to tertiary education, and consequently to concentrate direct social support on low income families, as well as to ensure appropriate allocation of social support grants in times of increasing financial constraints.
- About 65,000 grants were made to students in the academic year 2010/11. These correspond to about 67% of all completed applications for social support grants registered in public and private higher education institutions. About 40% of unsuccessful applications were from families with real estate holdings valued at over 100,000 Euros, or the result of failure to respond to mandatory questions related to resources, or failure to complete the submission process; in 32% of cases the incomes of the student's families were above the minimum income allowed by law; and 19% referred to students who had not achieved adequate grades in the previous academic year.

- The new regulation has national and standardized characteristics, facilitating a similar system throughout the country and independent of each HEI.
- The new regulation has also enhanced efficiency and readiness in the social support system, by establishing a rigorous calendar for the operation of social services in each HEI.
- The impact of the new system is under evaluation and will be reported in due course.

20. **Students' living conditions.** Information on students' living conditions is scarce, but what is available through Eurostudent, a Europe-wide study on student living conditions, quantifies the sources of student income, as well as their level of diversification. The survey shows that the extent of family income support for any type of student (i.e., those maintaining their own household, or those living with parents/relatives) depends on the relative contribution of both a "job" and "state" support (including public grants and loans). For the specific case of Portugal, it should be noted that the rather small contribution of student incomes through part-time work and the absence of a public system of student loans until 2007 (see details below) has resulted in a comparatively larger contribution from families to students' overall income. It should also be noted that social support to students has increased in recent years, particularly through growth of the total public budget allocated to student grants.

21. **Student loans with mutual guarantee to foster access and student autonomy:** A new system of student loans with mutual guarantee underwritten by the State was launched in 2007/08. It is a risk-sharing scheme involving the banking sector and it is universal. This scheme supplements existing grants rather than replacing them, and hence extends students' options. It has no blanket interest subsidy, but a highly innovative element of mutuality, which is the key that makes it possible for the scheme to make use of private finance. This innovative solution was designed in times of severe financial restraints in the public sector, which has prevented the launch of a system based exclusively on public funds. The main outcomes are as follows:

- **Student loans have grown continuously at a moderate rate.** Achieving an accumulated level of more than 14,000 loans by the fourth academic year of operation (see Table 10), the system has grown at an average rate of about 3,500 new loans per year, and is therefore considered adequate for Portugal and Portuguese families, following current practices in modern societies at the OECD level. Through the attribution of about 163 million Euros in credit since its launch, the new loan system has also enabled public investment to be leveraged through the mutual guarantee scheme in gathering private resources under significantly beneficial conditions.

Table 10
Cumulative evolution of student loans with mutual guarantee,
2007/08 to 2010/11

Academic year	Date	Number of loans
2007 / 2008	December 2007	1 524
	August 2008	3 693
2008 / 2009	December 2008	6 452
	August 2009	7 943
2009 / 2010	December 2009	11 108
	August 2010	11 058 (*)
2010 / 2011	December 2010	14 019 p

Notes: (*) Available information by 31 September, with preliminary data from some credit institutions; p – provisional data.

Source: MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>) / DGES

- **Student loans have fostered student access and autonomy as a complement to public grants.** Systematic assessments of the new loan system have confirmed its complementary role vis-à-vis public grants through the direct student social support scheme. Students with loans come from all types of social groups and the new system has facilitated diversifying student income sources to improve both student access and autonomy in tertiary education (Table 11).

Table 11

Take-up of loans in Portugal: Social-professional category of family background

Social-professional category of family background	Students with loan (%)		Overall tertiary education students (%)	
	Father	Mother	Father	Mother
Entrepreneurs, administrators and liberal professionals	15.8	7.6	16.2	9.0
Technical professionals	25.8	22.4	35.1	39.4
Self-employed	9.8	5.1	8.9	6.6
Farmers	1.9	1.0	2.6	0.8
Service sector workers	25.5	47.2	14.7	35.0
Industrial workers	20.2	15.7	21.4	8.5
Farm workers	1.0	1.0	1.1	0.7
Total	100.0	100.0	100.0	100.0

Sources: Costa et al. (2009) and Eurostudent (2005)

- **The growth potential of student loans.** The number of students enrolled in tertiary education in Portugal who benefit from loans is only about 3% of all students enrolled in higher education, and is therefore minimal in comparison with other countries. As a means of comparison, 21% of students enrolled in the Portuguese tertiary education system are supported by direct social support schemes. Still, of those benefiting from loans, only less than one third also benefit from public grants (Table 12).

Table 12

Percentage of students benefiting from loans while enrolled in tertiary education in relation to total enrolment, 2010 or latest available year

Country	% of students with loans
Iceland (a), (c)	63%
Norway (a), (c)	65%
USA (a), (c)	55%
Australia (a), (c)	80%
Sweden (a), (c)	75%
Netherlands (a), (c)	30%
Portugal (b), (d)	3%

Notes: Source a) OCDE Education at a Glance 2009; Source b) Report concerning credit values for higher education students supported by the mutual guarantee scheme, August 2010; c) refers to 2006/07; d) refers to 2009/10; student loans in other countries refer to public loans; total loans in Portugal and in other countries exclude students enrolled in CETs and PhDs.

Chapter 2. Institutional and legal developments: reforming tertiary education and strengthening research institutions

22. **Assessing and reforming the Portuguese tertiary education system.** The full regulation designed to bring tertiary education in Portugal in line with the Bologna process was implemented in the period 2006-2008 as part of a profound legal reform of the tertiary education system:

- This overall reform process was launched in the autumn of 2005 through an international assessment of the tertiary education system and its institutions, involving organizations of recognized experience and standing, including the Organization for Economic Co-operation and Development (OECD)⁴, the European Network for Quality Assurance (ENQA)⁵ and the European University Association (EUA)⁶.
- By the end of 2006 the OECD presented an overall assessment of tertiary education, while ENQA presented an evaluation of the system of quality assurance and accreditation practices in higher education, which drove the reform for the following years.
- A voluntary programme of institutional assessment was also conducted by EUA from 2006 until the new Higher Education Evaluation and Accreditation Agency (A3ES) became fully operational in 2009/10.
- In addition, in 2009 two separate international evaluation committees were formed to assess the system for distance education and the specific characteristics of higher education in the arts.
- In 2010/11 the National Qualifications Framework underwent international evaluation following current Bologna procedures and in line with the European Qualification Framework.

23. **Reforming degrees and diplomas.** The first step in the reform of degrees and diplomas was an Act amending the Basic Law of the Education System, passed by Parliament in order to provide the legal basis for implementing the Bologna Process of tertiary education reform. This was followed by the regulatory Decree-Laws passed by the Cabinet, in particular the Legal Framework of Tertiary Education Degrees and Diplomas (Decree-Law no. 74/2006), establishing the general principles for the organization of degree programmes and their accreditation, and establishing transition rules for the reorganization of existing degree programmes and the creation of new ones. This has had a significant mobilizing effect throughout the tertiary education system and full institutional adaptation to Bologna was achieved in the academic year 2008/09 (it was about 90% in 2007/08). The following developments have also taken place:

- New legislation was passed, regulating the creation of post-secondary education programmes (Technological Specialization Courses, by Decree-Law no.88/2006), aiming at increasing the availability of technical and vocational education and widening access to such programmes for new publics. This process has brought a new dynamism to post-secondary education in Portugal, in particular at polytechnic institutes. About 5,000 students have enrolled in these programmes every year since 2007/08 (compared to around 300 in 2005); in 2009/10 more than 6,000 students were enrolled in CETs, 81% of them in the polytechnic system, which represents a significant opening up of tertiary education in Portugal.

⁴ OECD (2007) Reviews of National Policies for Education: Tertiary Education in Portugal, OECD, Paris.

⁵ ENQA (2006), Quality Assurance of Higher Education in Portugal: An assessment of the existing system and recommendations for a future system”, European Network for Quality Assurance (ENQA), Helsinki, Finland.

⁶ For details, see www.dges.mctes.gov.pt

- New legislation was passed, providing greater flexibility in admissions and access to tertiary education, in particular for students aged over 23 and those meeting certain specific educational qualification criteria, thereby widening the recruitment pool and making it possible to reverse the decline in student numbers in tertiary education observed in recent years. Over 10,000 new students have been enrolled in tertiary education through this type of mechanism since 2007/08 (up from around only 900 adults who started tertiary education in the 2005/06 academic year), representing another significant opening up of tertiary education in Portugal.
- Mechanisms have been implemented to ensure compliance with the Bologna Process, by creating follow-up methods to monitor the transition from an education system based on knowledge transmission to one based on development of students' skills, in which experimental and project work components, among others, and the acquisition of key skills will play a decisive role.
- Easier and more flexible procedures for access to tertiary education have been implemented. This includes the possibility for anyone interested to attend individual curricular units/courses, with a guarantee of certification and accreditation in the case of successful completion, when they enter a programme which includes those curricular units/courses; the opportunity for students on a given tertiary education programme to attend curricular units/courses not included in their cycle of studies and provided in any tertiary education establishment, with a guarantee, in the case of successful completion, of certification and inclusion in the diploma supplement; and the opportunity to attend a tertiary education programme on a part-time basis.

24. Reforming the legal framework – the process. Following the OECD and ENQA reports of December 2006, the reforms of the legal framework for tertiary education, as well as that of the tertiary education quality assessment system, were passed by Parliament and published in the second half of 2007. They bring about significant changes in the internal governance of tertiary education institutions (including their management structure), as well as in their relations with society (including internationalization, research partnerships and business links, as well as external assessment and accountability). Each of the legal documents described below was implemented after a wide-ranging consultation process with diverse tertiary education stakeholders, notably the Council of Portuguese University Rectors (CRUP), the Coordinating Council of Polytechnic Institutes (CCISP), the Portuguese Association of Private Higher Education (APESP), students' associations, and professional associations. The following points should be noted:

- The new Legal Regime of Higher Education Institutions (RJIES; Law no. 62/2007), establishes the organizational principles of the tertiary education system, defining the autonomy and accountability of institutions, establishing governing Boards with external participation, allowing for diversity of organization and of legal status of public institutions (these can become public foundations under private law), allowing for the establishment of consortia, and recognizing research centres as part of the university management framework.
- The new legal framework for the assessment of higher education (Law no. 38/2007) and the creation of the Higher Education Evaluation and Accreditation Agency (Decree-Law no. 369/2007), are both designed to ensure the quality of tertiary education through the assessment and accreditation of tertiary education institutions and their cycles of studies, according to best international practices, in which independent external assessment is mandatory.
- The creation of a National Qualifications System (Decree-Law no. 396/2007) and the establishment of the National Qualifications Agency (Decree-Law no. 276-C/2007, of 31st July), have specific functions to regulate, accredit and control the quality of vocational and professional education, establishing the necessary conditions to foster access to tertiary education.

- The continuous strengthening of research institutions and the adoption of policy measures to foster and strengthen international partnerships are key elements in driving the reform of tertiary education in close interaction with the increasing national research capacity.
- The introduction in autumn 2007 of an innovative system of student loans with mutual guarantee underwritten by the State complements the system of public grants, thereby improving access to tertiary education for all students. More than 14,000 loans had been contracted by December 2010 through the banking system, representing an important new achievement for Portugal and Portuguese families, which follows current practices in modern societies at the OECD level.
- The reform of the student social support system, undertaken in 2010, strengthens social equity in access to higher education.

25. **Strengthening institutional autonomy: The new “University foundations”.** Following the OECD review, the new approved legislation (RJIES; Law no. 62/2007) allows public institutions (universities and polytechnics), on a voluntary basis, to acquire independent legal status in the form of public foundations governed by private law. Granting independent legal status to institutions of tertiary education is one means of giving them greater autonomy:

- By the end of 2009, three universities had acquired this status, namely: i) the University of Porto, the largest Portuguese public university, with about 30,000 students, which brought together into the Foundation four large non-profit research organizations created over the last two decades by several research groups associated with the university; ii) the University of Aveiro, a middle-size public university, with about 13,000 students; and iii) ISCTE – Lisbon University Institute, one of the smallest public universities, with about 6,000 students, which brings together a business school and two large non-profit research organizations created over the last two decades by several research groups associated with ISCTE.
- By the end of May 2011, the University of Minho has also internally approved the transformation to the form of a public foundation governed by private law and submitted an application for Government approval.
- A university foundation has typically four main defining features⁷: (i) it is an independent legal entity; (ii) it has a mission (or charter or mandate) to serve defined public (or national or societal) interests in tertiary education and research; (iii) it is a not-for-profit public interest legal entity, with favourable tax treatment on its incomes, assets and trading activities undertaken in the pursuit of its goals; and (iv) it has the autonomy to raise funds and manage its assets in pursuit of the foundation’s goals. In its more extensive form, it may grant the rights to: borrow and raise funds; own buildings, equipment and other financial assets; fully control budgets to achieve objectives; set internal administrative and management procedures; set academic courses and evaluation procedures; employ and dismiss academic and other staff; set salaries and reward systems; set criteria and size of student enrolment; and set the level of tuition fees.
- University foundations have a number of advantages. First, institutional leadership has the maximum autonomy to pursue its goals with little external constraint. Second, institutional leadership can plan for the long term without being subjected to changes in the government’s budgetary policies. Third, there are new opportunities for generating additional resources. Fourth, the strategic influence wielded by the curators regarding the establishment of institutional and research agendas can lead to closer collaboration with external stakeholders

⁷ A. Hasan (2007), Independent Legal Status and Universities as Foundations, a paper prepared for the Ministry of Science, Technology and Higher Education of Portugal.

in the university. Finally, accountability is placed on the shoulders of those in whom responsibility rests.

- There are also a number of potential shortcomings. For example, international experiences with the development of university foundations, particularly in Germany, Austria and Sweden, suggest a number of challenges, mainly those associated with managerial skills to run foundations. In addition, staff might see the transition from the status of public servant to university employee as fraught with uncertainties. Concern about the viability of foundations persists – for example, insufficient scale to permit economies to be made. Still, the expectation remains that universities which opted for the status of public foundations would become more flexible, more adaptable to the demands of society and more alert to the structural problems that could affect both their research proficiency and productivity.

26. The new Evaluation and Accreditation Agency. Following the ENQA report of November 2006, the new Legal Framework for the Evaluation of Tertiary Education was introduced (Law no. 38/2007) and a new Higher Education Evaluation and Accreditation Agency was implemented. The Agency, A3ES, which has been fully operational since July 2009, was created by Decree-Law no. 369/2007, as a private and independent foundation established for an indeterminate period of time. It is responsible for the assessment and accreditation of tertiary education institutions and their study cycles, as well as the execution of every task intrinsic to the integration of Portugal in the European system of quality assurance of tertiary education.

27. Early outcomes of the new evaluation and accreditation procedures. By 2010 the new Evaluation and Accreditation Agency had completed the first cycle of the accreditation process for the academic year 2010/11. By that time, the electronic submission of new degrees for the academic year 2011/12 had also been concluded. The main outcomes achieved are as follows:

- The process of accrediting ongoing and current study cycles led to a decrease of almost 900 degree programmes until June 2010 and over 1200 degree programmes by end of 2010, as compared to those previously registered at the Directorate-General of Higher Education (see Table 13 for details regarding June 2010). This represented the initial major impact of the new agency and also underlines the efforts made by higher education institutions in the reorganization of their educational portfolio.
- The submission process for accreditation of new study cycles planned to begin in 2011/12 was concluded in 2009, with the submission of 327 proposals, including 203 from the university sector and 124 from the polytechnic sector. The net result was that 51% of the proposals were accepted, 11% were accepted conditionally, and 38% were rejected.
- In addition, the new agency has promoted internal systems of quality assurance throughout universities and polytechnics. Major guidelines have been promoted as laid out in the report entitled “Comparative analysis of European processes of accreditation and certification of internal systems of quality assurance”.

Table 13

Variation between courses registered at DGES and those proposed for accreditation by A3ES

		1st cycle	Integrated master's	2nd cycle	3rd cycle	Total
Courses registered at DGES	Total universities	974	130	1914	697	3715
	Total polytechnics	971	-	576	-	1547
	TOTAL	1945	130	2490	697	5262
Courses submitted for accreditation by A3ES	Total universities	830	138	1487	568	3023
	Total polytechnics	837	-	516	-	1353
	TOTAL	1667	138	2003	568	4376
Variation between numbers proposed for accreditation and registered	Total universities	-144	8	-427	-129	-692
	Total polytechnics	-134	-	-60	-	-194
	TOTAL (change)	-278	8	-487	-129	-886

Source: A3ES (<http://www.a3es.pt/en>). Data refer to June, 2010.

28. **Promoting a National Qualifications Framework with a European dimension.** The National System of Qualifications was implemented in January 2008 by Decree-Law no. 396/2007, and covers qualifications at all education levels, including tertiary education. Ministerial Order no. 782/2009 approved the Framework, including formal qualifications in all the national subsystems of education and training and non-formal qualifications obtained through professional experience. The National Framework of Qualifications is organized into eight levels. The National Agency for Qualification (ANQ) was established in the same legal document as a national point of coordination of the European Qualifications Framework, in accordance with the Recommendation of the European Parliament and of the Council, 23 April 2008, concerning the establishment of the European Qualifications Framework for lifelong learning. The National Agency for Qualification works in coordination with the Directorate-General for Higher Education (DGES) regarding levels 5 to 8 of the National System of Qualifications.

29. **The Framework for Higher Education Qualifications in Portugal, FHEQ-Portugal.** The framework has been defined in conjunction with the Portuguese National Qualifications Framework, but covers a completely independent system under the scope of legal autonomy given to tertiary education institutions. FHEQ-Portugal is established in Portugal in accordance with the overarching Qualifications Framework and in alignment with the Framework of Qualifications for the European Higher Education Area:

- The Directorate-General for Higher Education (DGES) develops and maintains the FHEQ-Portugal in close collaboration with A3ES in a way that fosters the institutional identity and autonomy of tertiary education institutions.
- This process also involves the Council of Rectors of the Portuguese Universities (CRUP), the Coordinating Council of the Portuguese Polytechnic Institutes (CSISP) and the Portuguese Association of Private Higher Education (APESP), representing Portuguese tertiary education institutions, with the ultimate goal of promoting a qualifications framework that is in accordance with both the European Qualifications Framework developed under the Bologna process and the need to preserve the institutional autonomy and identity of tertiary education institutions.
- FHEQ-Portugal has been developed according to the ten criteria and procedures set out by the European Commission's Advisory Group. It was certified by an international panel based on the basis a site visit in February 2010 and reported in May 2011. The full certification report, together with details of FHEQ-Portugal, are available through the DGES website, <http://www.dges.mctes.pt/DGES/pt/AssuntosDiversos/FHEQ/>

30. **Implementing FHEQ-Portugal:** Following similar practice in Europe, auditors and reviewers assess how institutions align the academic standards of their degrees with the levels referred to in FHEQ-Portugal. They also ascertain whether institutions have the means to ensure that degrees and qualifications are of an academic standard consistent with the standards referred to in FHEQ-Portugal:

- A3ES uses FHEQ-Portugal as a reference when auditing or reviewing the establishment and management of academic standards by tertiary education institutions.
- The qualification descriptors of FHEQ-Portugal reflect the distinct levels of intellectual achievements associated with the typical qualifications awarded by tertiary education institutions in Portugal in accordance with their degree-awarding powers (Table 14). Each level is illustrated by, and each degree determined by reference to, a qualification descriptor. Typically, programmes leading to tertiary education qualifications, particularly those taken over a number of years, include learning that is progressively more challenging. For the award of a tertiary education qualification at a particular level, the outcomes of this learning must, in overall terms, reflect the qualification descriptor for that level. Similarly to several National Frameworks of Qualifications in Europe, including Portugal, the Framework for Qualifications in the European Higher Education Area (FQ-EHEA) has generic qualification descriptors for each cycle, called the 'Dublin descriptors'. These illustrate the typical abilities and achievements associated with qualifications that signify the completion of each cycle.

Table 14
Typical tertiary education qualifications of FHEQ-Portugal and the corresponding EQF level and cycle of FQ-EHEA

FHEQ-Portugal Higher education qualifications	Corresponding FQ-EHEA cycle	Corresponding EQF levels
Doctoral degrees	Third cycle qualifications	8
Doctoral course diplomas	-	-
Master's degrees	Second cycle qualifications	7
Integrated master's degrees		
Master's course diplomas	-	-
<i>Licenciatura</i> degrees	First cycle qualifications	6
Technological Specialization courses	Short cycle qualifications linked to the first cycle	5

31. **A new framework fostering student mobility:** The reform of the tertiary education system in Portugal included the implementation of a series of measures which seek to ensure the effective and less bureaucratized national and international mobility of students and graduates, aimed at attracting and encouraging the settlement in Portugal of qualified human resources, both Portuguese and foreign. Mobility of students and graduates depends on the recognition of their prior learning and qualifications, which is required when they move between qualifications or cycles in order to access more advanced programmes.

- First, new regulations were introduced for mobility of students between national tertiary education institutions, from the same or different subsystems, as well as between national and foreign tertiary education institutions, based on application of the European Credit Transfer and Accumulation System (ECTS). These regulations are based on the principle of mutual

recognition of the value of training undertaken and competences acquired. This aim was specifically set out in the Legal Framework for Degrees and Diplomas (Article 45 of Decree-Law no. 74/2006), which establishes that tertiary education institutions will take into account the level of credits and the academic area in which they were obtained and will: i) credit within their cycles of studies training undertaken within the scope of other tertiary education cycles in national or foreign tertiary education institutions; ii) credit within their cycles of studies training undertaken within the scope of Technological Specialization Courses (CETs) under the terms fixed by the respective statute; and iii) recognize, through the award of credits, professional experience and post-secondary training.

- Second, new regulations were implemented for re-entering tertiary education, changing programmes and transferring between tertiary education institutions (Ministerial Order no. 401/2007), by means of which all obstacles to re-entry are removed for those who have interrupted their tertiary education studies, and the procedures for transfer or change of course are altered, integrating students coming from both national and foreign institutions into a single system, extending limits to admission and simplifying procedures.
- Third, a new regime was implemented for the recognition of foreign academic degrees of the same level and nature (and with the same objectives) as *licenciatura* (bachelor's), master's and doctoral degrees awarded by Portuguese tertiary education institutions, entitling holders to all the rights associated with these academic degrees (Decree-Law no.40/2007):
 - This new regime is based on the extension to *licenciatura* and master's degrees of the system established for doctoral degrees in 1997 (Decree-Law no. 216/97). It is based on the principle of reciprocal trust that should be adopted by the international academic community, replacing, in all cases where applicable, the process of equivalence based on the academic re-assessment of work carried out with the aim of obtaining a foreign degree.
 - The simplified mechanism for the recognition of foreign degrees is entrusted to a committee presided over by the Director-General of Higher Education, and including one representative each of the bodies representing tertiary education institutions (the Council of Portuguese University Rectors, the Coordinating Council of Polytechnic Institutes and the Portuguese Association of Private Higher Education), and a fifth member, co-opted by the others.
 - For the purposes of the simplified recognition process, a number of foreign degrees are recognized after consultation with the above-mentioned committee, and this group is then constantly updated and extended. The recognition process includes (i) academic degrees awarded by foreign tertiary education institutions of a state signatory to the Bologna Process, following a first, second or third cycle organized in accordance with the Bologna Process and accredited by an accreditation body recognized within the scope of that process, and (ii) all academic degrees awarded by foreign tertiary education institutions which, through a decision from the above-mentioned committee, are classified as such. The recognition mechanism also includes a simplified mechanism for recognizing the final classification.
 - This has removed a serious obstacle to the free circulation of diploma holders who wish to study in Portugal after obtaining their academic degree abroad, and are now welcomed without the bureaucratic impediments and delays that hitherto existed.
- Fourth, with the aim of ensuring greater flexibility in accessing and attending tertiary education, new norms were introduced (Decree-Law no. 107/2008), in order (i) to enable any interested citizen to enrol in individual curricular units, with a guarantee of both certification and accreditation in the case of successful completion and when they enrol in a cycle of studies that includes it; and (ii) to enable students enrolled in a tertiary education cycle of studies to enrol in curricular units which are not part of their cycle of studies and in any tertiary

education institution, with a guarantee of certification in the case of successful completion, and inclusion in the diploma supplement.

- Finally, similarly to the practice in other countries, particularly in the USA, and to promote diversity of academic and educational backgrounds for candidates applying for tertiary education programmes in Medicine, a new regime for access to *licenciatura* degrees in this area was created (Decree-Law no. 40/2007) specifically designed for undergraduates with a diploma in a related scientific field (such as biology, physics, or chemistry), thus broadening the areas of training which will permit people to be admitted into a course of Medicine, although guaranteeing an appropriate level of knowledge in the core subjects which are an enrolment condition.

32. **Reforming Distance Learning:** In 2007, the new legal framework for higher education institutions (RJIES) introduced the commitment to expand distance learning tertiary education in Portugal. The Government's objective was to assess the need to expand the distance learning sector that until then had mainly been offered by the *Universidade Aberta* (Open University), which accounted for 2.6% of total enrolment in the tertiary education system. Consequently:

- A panel of external international experts was formed to guide the nature of reforms needed to foster distance learning in the Portuguese tertiary education system and a report was published in 2009, following discussions with all major stakeholders.
- In the national contract for the development of tertiary education, 2010-2014, signed in January 2010, the goal was set to increase the number of graduates in distance learning tertiary education by 15% in both university and polytechnic sub-systems.
- Besides some structural changes in the *Universidade Aberta*, the polytechnic system has created a distance learning programme, "e-Politécnico", based on a consortium of all polytechnic institutions, which became operational during 2011.

33. **Strengthening R&D institutions:** Over the last decade, institutional building and development in R&D has been initially based on two main pillars (Table 15):

- **National Research Assessments.** Strengthening and restructuring the network of research centres throughout the country (in universities and related private, non-profit institutions) has been achieved through systematic international research assessments every three years, with direct impact on their funding levels, which have been consistently implemented in Portugal since 1996. After four consecutive assessment exercises (i.e., 1996, 1999/00, 2002/03 and 2007/08), a new exercise is planned to be launched in 2011.
- **Associate Laboratories.** Promoting critical mass across all scientific disciplines was the aim of establishing a network of selected "Associate Laboratories" in the form of relatively large research institutions oriented towards strategic lines of thrust and thematic networks, on the basis of an international assessment (see Annex 5).

By 2010, the network of scientific institutions included 510 research centres (compared to 257 after the first international research assessment in 1996) and 25 Associate Laboratories (with the first three launched in 2001), with an overall level of institutional funding of about 85 million Euros in 2010 (as opposed to only 25 million Euros in 2000). In recent years, institutional building has continued and was deepened by two major new developments, as follows:

- **University Foundations.** These have strengthened networks of academic departments and research centres, bringing together university schools and their research units, Associate Laboratories and related private, non-profit institutions, with leading examples in the University of Porto, University of Aveiro, and ISCTE-IUL in Lisbon;

- **Research and advanced training networks, through thematic international partnerships.** These set out to foster critical mass across the Portuguese research landscape by establishing selected partnerships with leading US research universities in the form of relatively large consortia bringing together Portuguese universities, research centres, end users, and innovative businesses.

Table 15

Main institutional breakthroughs fostering increasing academic and research capacity in Portugal

Main institutional breakthrough	Rationale for breakthrough	Independent research assessments	Independent higher education assessments
Associate Laboratories, to foster research excellence through networks of academic research centres (as created since 1999, with a few initial developments in biomedical and physical science, but reaching 25 Laboratories by 2007)	Fostering critical masses, aggregating several R&D groups and attracting new talent, under the direct support of FCT	Every 3 years, since 1996, through the Portuguese Science Foundation (FCT), involving international review panels:	---
University Foundations (includes three leading examples in 2008: University of Porto, University of Aveiro and ISCTE-IUL in Lisbon)	Enable flexible management and organizational mechanisms; institutional autonomy and responsibility of tertiary education institutions; more responsive institutions	1996/97 exercise 1999/00 exercise	Since 2009, the Agency for Assessment and Accreditation of Higher Education (A3ES), through the assessment and accreditation of study cycles in tertiary education institutions, is impacting their organization (about 1200 courses were discontinued by 2010)
Research and advanced training networks, through thematic international partnerships (includes partnerships with MIT, CMU, Harvard and UT Austin in emerging themes, including ICT, energy, bioengineering, design, and clinical research)	Networks of research centres across leading Portuguese Universities brought together to cooperate with leading institutions worldwide, involving business and industry and end users. These networks are reviewed on a yearly basis.	2002/03 exercise 2007/08 exercise Planned: 2011/12	

34. **Promoting scientific institutions through Associate Laboratories.** Associate Laboratories have opened the way for advancing a culture of large scientific institutions in Portugal, grounded in institutional autonomy, sustained by the provision of incentives and stimulated by regular and continuous application of independent scientific evaluation:

- Associate Laboratories have facilitated the expansion of science-based jobs by recruiting doctorate researchers and technicians. In 2010, data from the Portuguese Science and Technology Foundation show that Associate Laboratories grew more than 30% in the previous five years, from an average of about 97 to 130 researchers (FTE) per laboratory;
- In addition, Associate Laboratories facilitated critical masses around scientific disciplines, bringing together researchers engaged in thematic networks across a number of selected institutions.

35. **Fostering research and advanced training networks through international partnerships.** An important new element driving institutional building in the Portuguese research landscape, together with accelerating university reform, has been strategically-oriented international partnerships, bringing together universities, research centres, end users, and innovative businesses:

- These partnerships have been aimed at fostering high-quality research platforms associated with the design, testing and implementation of new products and systems for markets worldwide, as well as at training future leaders in cutting-edge areas of science and technology. They have created some fully-integrated “test beds” in Portugal, as scalable “living laboratories” to test emerging technologies and systems in a way to facilitate the access of businesses and industry to leading markets worldwide.
- They have brought together several Portuguese universities and other world-ranking universities, including MIT, Carnegie Mellon University, Harvard Medical School and the University of Texas at Austin. These initiatives, unprecedented in Portugal and with innovative features worldwide, have opened the way for setting up a number of thematic networks with industry and across various Portuguese universities.
- By September 2007, the first national doctoral and advanced studies programmes within these partnerships were operational (in some cases offering dual degrees between US and Portuguese universities). These international partnerships involved funding of over 177 million Euros for the first five years, and brought together a large number of Portuguese research institutions and private sector companies through collaborative advanced research projects and sustainable efforts to stimulate new knowledge and exploit new ideas for markets worldwide.
- The networks brought together a large number of Portuguese institutions with the purpose of pushing forward their international outreach through advanced studies projects and through ongoing ventures for generating new knowledge and exploiting new ideas in conjunction with firms and institutions of high international repute and standing.

36. The recent establishment of new scientific institutions in Portugal

- **The International Iberian Nanotechnology Laboratory (INL).** The International Iberian Nanotechnology Laboratory is the first, and so far the only, fully international research organization in Europe dedicated to nanoscience and nanotechnology. It is the result of a joint decision of the Portuguese and Spanish governments, taken on 19 November 2005 at the XXI Portugal-Spain Summit in Évora, whereby the two Governments made clear their commitment to close cooperation in ambitious science and technology joint ventures for the future. The new laboratory is being established by Portugal and Spain, but in the future membership will be open to other countries in Europe and other regions of the world.
 - INL has an international legal framework similar to that of the few international laboratories in other areas located in Europe (e.g., CERN – European Organization for Nuclear Research at Geneva, ESO – European Southern Observatory, EMBL – European Molecular Biology Laboratory, and ESRF – European Synchrotron Radiation Facility).
 - INL was installed in Braga, Portugal, on a 47,000-m² site, close to the Gualtar campus of Minho University, with the Spanish professor José Rivas as its first director. It is planned to recruit with 200 researchers from all over the world, aiming at international excellence.
 - INL was officially launched on 18 January 2008, at the XXIII Portugal-Spain Summit in Braga, with a symbolic “foundation stone” formed 500 million years ago when the Iberian Peninsula was taking shape and a nano-inscription.
 - INL was officially inaugurated on 17 July 2009, with a built area of about 20,000 m², comprising advanced specialist facilities and several laboratories with state-of-the-art equipment, among them a class-100 central micro- and nanofabrication clean room of about 700 m².
 - By the end of 2009 several new international partnerships had been signed with leading scientific institutions worldwide, including MIT and the Max Planck Society, which are facilitating joint recruitment of senior and junior researchers, as well as the development

of an internationally recognized research agenda. The choice of priority research areas was based on the strategic areas recommended by INL's Management Board, in existing current areas of excellence in nanoscience and nanotechnology in Portugal and Spain and on economic needs and opportunities identified in both countries. Based on these criteria four priority research areas were selected: nanomedicine; environmental monitoring, safety, and food quality control; nanoelectronics (beyond CMOS); and nanomachines and nanomanipulation.

- **The Fraunhofer Portugal Research Association.** The *Associação Fraunhofer Portugal Research* (Fraunhofer Portugal) is a non-profit private association founded by Fraunhofer-Gesellschaft, the largest organization for applied research in Europe, and the Portuguese-German Chamber of Commerce. It was formally declared an Institution of Public Common Interest in March 2010. Fraunhofer Portugal aims at the creation of scientific knowledge capable of generating added value for its partners, exploring technological innovations oriented towards economic growth, social well-being and the improvement of the quality of life of its end-users. The following developments have taken place since 2008:
 - The Fraunhofer Portugal Research Center for Assistive Information and Communication Solutions (Fraunhofer AICOS) is the first research centre operated by *Associação Fraunhofer Portugal Research*, which is located in Porto. It aims to enhance people's living standards by offering them intuitive and useful technology solutions, capable of facilitating their access to information and communication technologies, and thereby leading to the integration of an increasingly large sector of the population in the information and knowledge society.
 - By the end of 2010, Fraunhofer AICOS had about 35 collaborators, 76% of which are dedicated to scientific activities (based on the headcount of R&D departments), and 24% involved in support activities (based on the headcount of the other departments).
- **Champalimaud Centre for the Unknown.** The Champalimaud Foundation was created in 2004 by the bequest left by the Portuguese industrialist and entrepreneur, the late António Champalimaud. It focuses on biomedical science and seeks to extend research in the fields of oncology and nEuroscience, as well as to advance the field of ophthalmology.
 - On 5 October 2010, the Champalimaud Foundation inaugurated a state-of-the-art research facility, the *Champalimaud Centre for the Unknown*, to contribute to its objective of developing biomedical research in Portugal. It will be a multidisciplinary centre for translational research of excellence, with the best possible conditions to attract and retain the best researchers, academics and medical doctors from Portugal and abroad in the fields of nEuroscience and oncology.
 - Through a detailed programme of research and clinical support, the Foundation strives to make significant scientific progress, particularly in the fields of cancer research and nEuroscience.

Chapter 3. Strengthening the R&D system

Portugal has recently exceeded the average EU level in terms of the number of researchers per thousand workforce. The need to continue fostering the advanced training of human resources and the concentration of knowledge integrated communities as drivers of larger communities of users is discussed in this chapter in the broad context of changing and evolving patterns in Portugal. Two aspects are considered: i) training and employability of human resources in S&T; and ii) promoting knowledge and ideas.

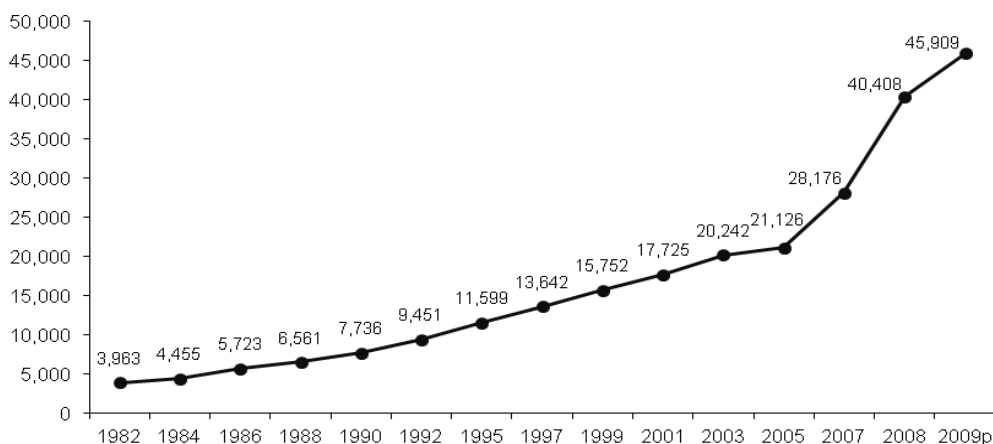
3.1. Human Resources in S&T: training and employment

37. **Researchers – overall:** The number of researchers in Portugal reached about 8.2 per thousand workforce in 2009 (i.e., about 46,000 full time equivalent researchers, nearly a quarter of whom are in the business sector (Figure 9 and Figure 10). It is thus now above the EU and even the OECD average, and is similar to (and in some cases even higher than) the levels of Austria, France, and the US. Analysis also shows:

- In recent years Portugal had the highest percentage growth rate in Europe in terms of the total number of researchers (measured in full time equivalent, FTE) per thousand workforce (about 95%), well above the European average (which only grew by 14% from 2003 to 2008), Spain (21%) and Ireland (13%).
- The total number of researchers has increased about 9-fold since the early 1980s, from 0.9 per thousand workforce in 1982 (i.e., about 4,000 researchers FTE) to 3.5 in 2002 and 8.2 in 2009.
- There has been an increase of 25% over the last two years in the number of researchers working in academic R&D centres (12,000 doctorate researchers FTE) and a doubling of the number of doctorate researchers since 2000.
- The distribution of researchers (headcount) in Portugal has increased in all scientific areas since 2005. In 2008, 69% of the total researchers in Portugal were performing research in the aggregated scientific areas of the exact, natural, and agrarian sciences and engineering. Figure 11 quantifies the share of researchers per area, with 27% in engineering, 25% in the exact and natural sciences and 21% in social sciences.

Figure 9

Total researchers (as measured in “full time equivalent”, FTE) in Portugal

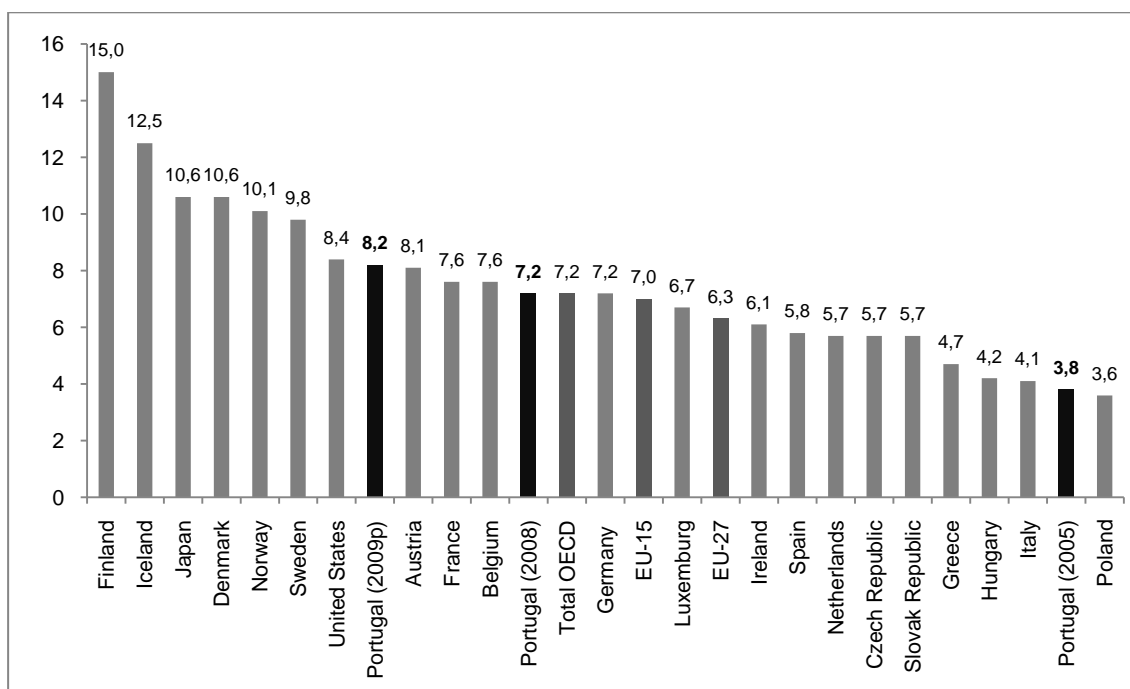


Note: 1982-2009p; p – preliminary.

Source: MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>)

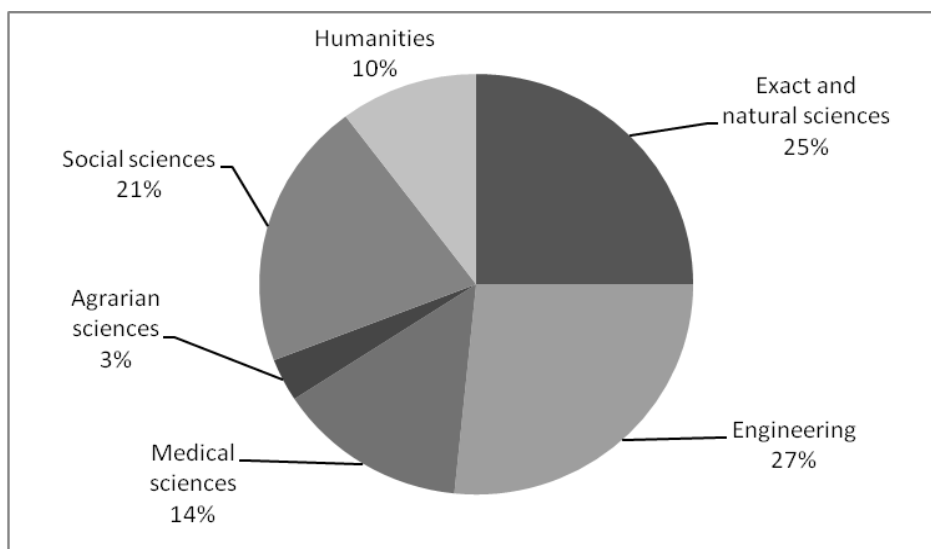
- The number of researchers quantified above is defined based on the OECD's Frascati Manual and annually surveyed through the national statistical services for S&T (i.e., GPEARI/MCTES). This information is annually reported to the EUROSTAT since 2007 and complements the data on "HRST – Human Resources in S&T", as defined by the OECD's Canberra Manual and described below in this report (see §46).

Figure 10
Total researchers per thousand workforce



Note: data for 2008; France, Germany, Greece, Hungary, Ireland, Japan, Mexico, EU-27, EU-15: 2007; US, OECD total: 2006; Portugal: 2005, 2008 and 2009p (p – preliminary).
Source: OECD, Main Science and Technology Indicators

Figure 11
Researchers (headcount) by scientific area in Portugal, 2009



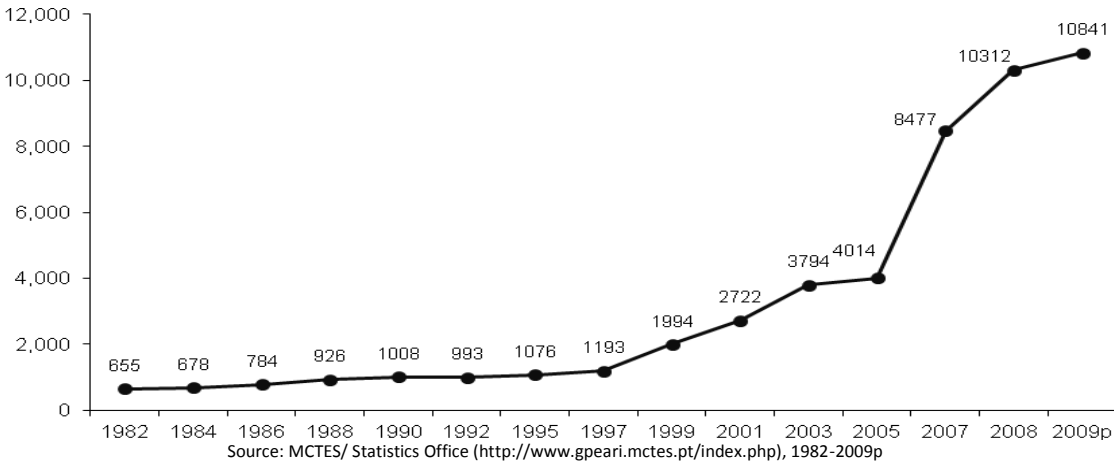
Source: OECD, Main Science and Technology Indicators

38. **A more qualified research base and the promotion of scientific employment:** Recent years have seen the promotion of increased numbers of PhD holders, together with scientific employment, through a new programme launched in 2007 to support contractual arrangements for researchers through academic university research centres and Associate Laboratories:

- About 1,200 new PhD researchers were hired by 2009 (of whom 41% were foreigners), based at 264 research units (with some 43% in the natural and exact sciences and 24% in engineering and technology)
- This programme is stimulating major changes in the academic community and facilitating the renewal of teaching and research staff. It has doubled the number of foreign researchers/teachers in Portuguese universities, which increased to about 6% (compared to only 3% in 2005).
- The qualifications of academic staff are improving in the Portuguese higher education system. In 2009, the percentage of academic staff holding a PhD reached 68% in public universities, 39% in private universities, and 19% in both public and private polytechnics.
- The growing number of foreign highly qualified human resources in the last decade has been reflected in the number and share of foreign academics in the Portuguese tertiary education system, which totalled 1,400 academics in 2009 (an increase of 26% since 2001). The share of foreign faculty in both public and private universities increased from nearly 3% in 2001 to 6% in 2010. Additionally, the number of foreign researchers almost doubled, from nearly 1,900 in 2005 (6% of the total number of researchers) to about 3,800 in 2008 (7% of the total).

39. **Researchers – business sector:** Although part of the increase reported above in the number of researchers in Portugal can be attributed to the increased quality of statistical data collection, which has brought the figures closer to reality by more rigorous treatment of the statistical inputs from particular areas of business, the data also show that the increase in overall research personnel has been matched by a significant increase in the total number of R&D personnel in the business sector, which nearly tripled from 4,014 to 10,841 researchers (FTE) between 2005 and 2009, reaching 24% of the total researchers (FTE) working in Portugal (Figure 12).

Figure 12
Business enterprise sector: researchers (FTE)



The analysis also shows:

- This evolution was seen particularly in knowledge-intensive sectors where the growth in human resources was especially significant, with the number of researchers (FTE) growing nearly fourfold between 2005 and 2009.
- Human resources in the ICT sector grew from 650 FTE in 2005 to 3,100 FTE in 2007. The financial services have also tripled their human resources in R&D, and the automotive sector had a fivefold increase between 2005 and 2007 and 50% growth between 2007 and 2008.

40. **Specialization of business R&D (researchers):** The services sector employed 66% of researchers working in Portugal in 2009, or 7,175 researchers (FTE), corresponding to a 10% growth since 2008 and a threefold increase since 2005 (Figure 13). Looking at the top 100 companies with the largest investments in R&D in 2008:

- 45% of researchers were in activities associated with ICT and electronics; 14% in manufacturing; 12% in financial services, in which the largest Portuguese private bank employs 400 researchers (FTE), more than half of the sector's total; and 11% in other services (including engineering, consultancy, transportation and logistics).

Box 1.

Nokia Siemens Networks developing patents from Portugal

Nokia Siemens Networks Portugal, the largest employer of researchers (FTE) in Portugal, also leads the European patents ranking regarding patents originating from an inventor based in Portugal, being responsible for 14 of the company's patents published by the European Patent Office in 2008 and 22 in 2009.

Patents originating from Portugal include research work in optical networks, data processing, network security, network management and communication protocols.

- The largest increase in specialized human resources was seen in companies working in the energy and environment sector, where researchers increased fourfold between 2007 and 2008, reaching 604 researchers (FTE), of which 378 are with Galp Energia, the national oil company. In manufacturing, the case of the automotive industry is noteworthy, where the number of researchers has grown by 56%, with Autoeuropa, the main auto supplier, employing 130 researchers (FTE).

Box 2.

Galp Energia and Portuguese universities develop a PhD programme in oil refining and implement life-long learning programmes for employees

Galp Energia, the Portuguese oil company, has been implementing a strategy towards evolving from a strong player in refining and marketing to become an international player in the oil exploration and production markets, mainly through partnering with international players such as Petrobras and through promoting research and training, together with several Portuguese universities and their research laboratories.

Galp and four Portuguese universities have developed a PhD programme in Refining, Petrochemistry and Chemical Engineering, involving the sector's industrial association, to develop internal capabilities in this field. Through Galp Academy, the company is providing its employees with a 10-year training programme, designed to support and accompany their career development. It also provides a postgraduate training programme designed for its managers and decision makers.

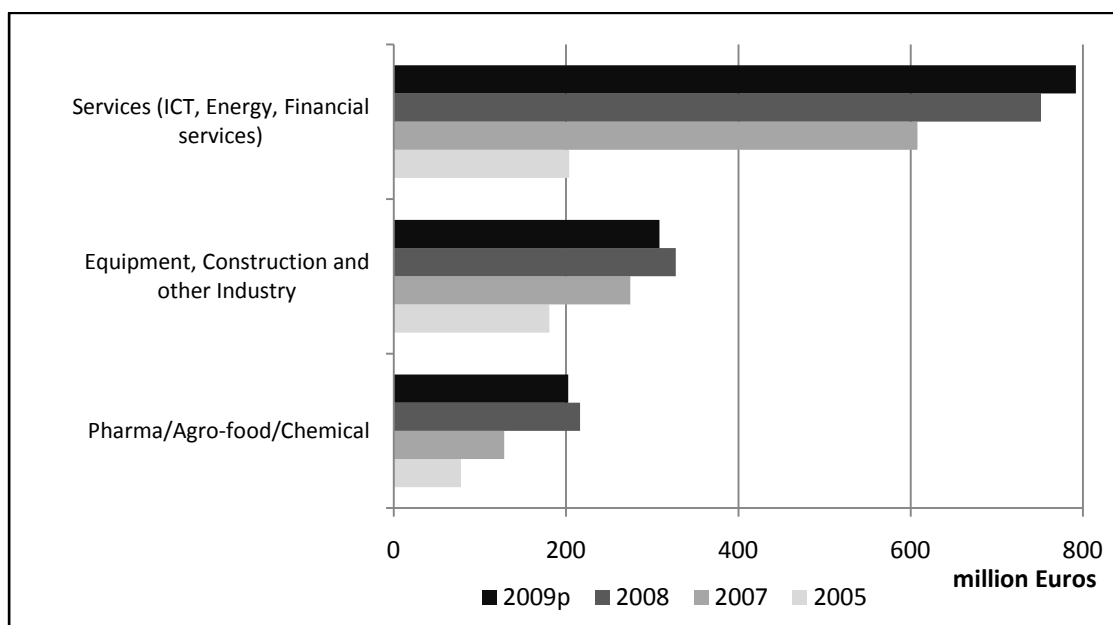
- In 2008, the pharmaceutical, agro-food and chemical industries employed about 7% of the researchers (FTE) working in the 100 most research-intensive companies, or 435 researchers (FTE), representing an increase of 7% compared with 2007. The number of researchers (FTE) in the pharmaceutical industry increased by 10% between 2007 and 2008, to 284 researchers (FTE), a quarter of whom work for the industry's main employer for researchers, Hovione, closely followed by Bial and Tecnimede, both employing 52 researchers (FTE).

Box 3.
Bial, the Portuguese applicant with most European patents

Bial is a Portuguese pharmaceutical company that recently developed an anti-epileptic drug that is being exported to 10 European countries and has been licensed in the USA and Canada.

In 2008 and 2009, Bial had the largest number of patents published by the European Patent Office of any Portuguese applicant, nearly ten per year, related to new compounds, processes and applications.

Figure 13
Researchers (FTE) by business sectors in Portugal

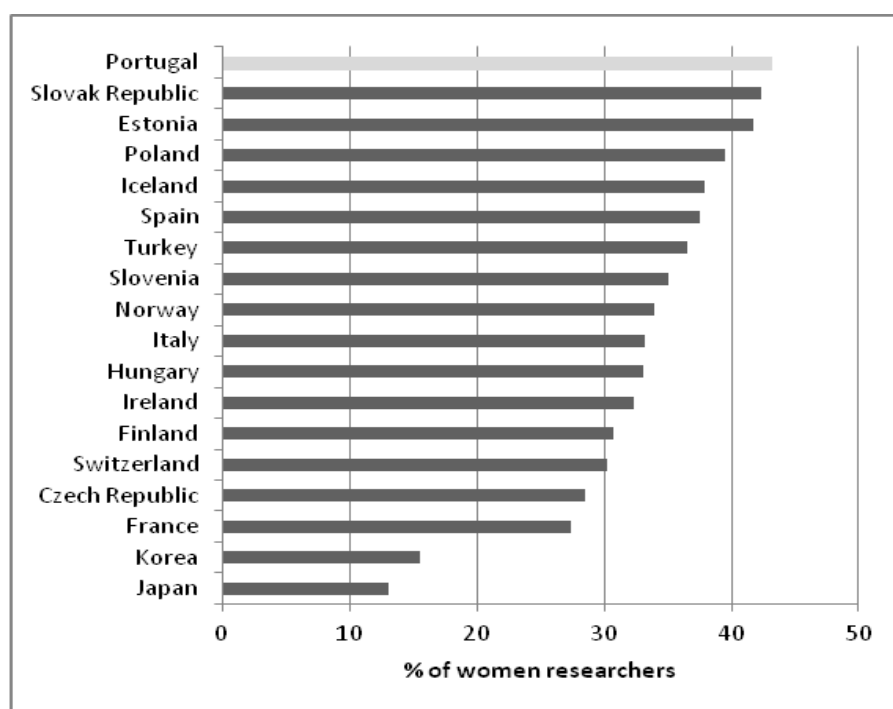


Source: MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>) – Inquérito ao Potencial Científico e Tecnológico Nacional (IPCTN), 2005-2009p

- 41. Women in science:** The latest available data show that Portugal has achieved a remarkably high rate of women researchers, particularly in academic research, with their share of the total number of researchers increasing from about 41% in 1997 to 44% in 2009. As Figure 14 shows, Portugal has the highest participation rate of women in the national scientific and technological system (about 44% of researchers in Portugal are women).

Figure 14

Women researchers as a percentage of total researchers, 2008



Source: OCDE, OLIS

42. Initiating higher education students into research. In 2008, the Foundation for Science and Technology (FCT) launched a new scholarship programme aiming to support students who show good performance in the early years of their higher education, and are enrolled in national institutions:

- This type of scholarship is intended to stimulate the beginning of scientific activity and to foster the development of higher education students' critical thinking, creativity and autonomy through the practice of research, by putting them in research project teams under the supervision of a PhD researcher.
- FCT supports these scholarships by increasing the funding of the institutions that host the students. The scholarship lasts for one year at a host institution, but the same student will be eligible for another scholarship at another host institution.
- During the period 2008-2010 FCT supported 3,279 students with these scholarships.

43. Promoting science and technology culture and education: The systematic development and promotion of activities to foster science awareness, science education and the role of science in the daily life of citizens has been implemented primarily through the National Agency for Scientific and Technological Culture's *Ciência Viva* programme. The guiding principles of *Ciência Viva* include: i) the promotion of science and technology to foster experimental learning in the traditional education systems; and ii) the recognition of the role of schools in enhancing the promotion of scientific and technological culture. The activities of *Ciência Viva* are based on three main instruments:

- **Promoting science and technology to the general population.** The "Science in the summer" programme started in 1996 and operates annually throughout the country, involving different research units and other institutions. In 2010, from August to September, it involved about 170 institutions, including tertiary education and scientific institutions, non-profit institutions, local

government and private enterprises. In collaboration with these institutions, about 1800 actions were undertaken in which over 17,000 people participated. In addition, 28 projects coordinated by local museums and other institutions were supported throughout the country, including international robotics competitions and exhibitions.

- **Supporting experimental learning at secondary schools.** Every year, more than a thousand students in secondary education from all over the country undertake short-term internships in more than 80 research units and tertiary education institutions in the framework of the “Science Vacations” programme. In addition, more than 500 high schools all over the country have been involved in initiation research projects in the fields of oceanography, forestry and renewable energy.
- **National network of *Ciência Viva* Centres.** The *Ciência Viva* Network is an integrated network of 20 science centres throughout the country, which was launched in 1999, and extended initially to 10 centres by 2005. Ten different centres have been inaugurated over the last five years and four had their facilities renewed in 2010. This includes the “Knowledge Pavilion” in Lisbon (the first and largest *Ciência Viva* centre), which now boasts a new conference room with more than 200 seats, a laboratory and a school, among many other rooms and offices with the facilities to promote scientific exploration.

44. Immigration of qualified people from third party countries: According to the Ministry of Foreign Affairs, since 2008 Portugal has granted between 530 and 650 visas for highly qualified foreigners of about 50 nationalities outside the European region (Table 16). For 2010, this included 84 researchers (99 in 2009), 171 academics (185 in 2009) and about 393 business professionals, medical and paramedical practitioners, computer experts, electrical engineers, chemical specialists, legal specialists, liberal professionals, and other highly trained personnel.

Table 16
Number of visas granted to highly qualified foreigners, 2007-2010

	2007	2008	2009	2010
Number of visas granted to highly qualified foreigners	156	533	577	648

Source: MNE

45. Flow of doctorates – a measure of ‘brain gain’ in Portugal: Recent data on flows of doctorates (PhD holders) in Portugal over the last 40 years have confirmed the increasing capacity of the country to attract talent and employ doctorates (Table 17). Out of a total of 19,876 PhD holders working in Portugal in 2009 and/or graduating since 1970, only 667 were found to be working abroad, while 1,836 foreign PhDs are working in Portugal. It should also be noted that about 83% of these foreign PhDs are working in R&D-related activities. Further details are as follows:

- The preliminary findings for 2009 revealed that of the 14,147 PhDs graduating from Portuguese universities since 1970, only 3.7% were working abroad. The great majority of PhDs are working in R&D-related activities (84%), mainly in higher education and research institutions.
- Most of the PhDs awarded abroad and recognized by Portuguese universities since 1970 are working in Portugal (83%), mainly in higher education and research institutions.
- This is an ongoing study from a nominal dataset of all PhDs awarded or recognized by Portuguese universities from 1970 to 2008, in collaboration with the statistics offices of the Ministries of Labor and Social Security, Finances, and Education.

Table 17
Main flows of doctorates (PhDs) over the last 40 years, 1970-2008

1. Doctorates (PhDs) awarded by Portuguese universities between 1970 and 2008	14147
1.1 % PhDs working in R&D-related activities in Portugal (2009)	84.4%
1.2 % PhDs working in non- R&D-related activities in Portugal or in other circumstances (e.g. retired)	9.3%
1.3 % PhDs working abroad (2009)	3.7%
1.4* % PhDs with no identified workplace	2.6%
2. Doctorates (PhDs) awarded abroad and recognized by Portuguese universities between 1970 and 2008	4206
2.1 % PhDs working in R&D-related activities in Portugal (2009)	83.3%
2.2 % PhDs working in non- R&D-related activities or in other circumstances (e.g. retired) in Portugal (2009)	6.0%
2.3 % PhDs working abroad (2009)	3.5%
2.4* % PhDs with no identified workplace	7.0%
3. Foreign Doctorates (PhDs) working in Portugal (in 2009)	1836
3.1 % foreign Doctorates (PhDs) working in R&D-related activities in Portugal (in 2009)	82.9%
3.2 % foreign Doctorates (PhDs) working in non R&D-related activities in Portugal (in 2009)	17.1%
4. Doctorates (PhDs) awarded or recognized by Portuguese universities working abroad in 2009 (1.3+2.3)	667

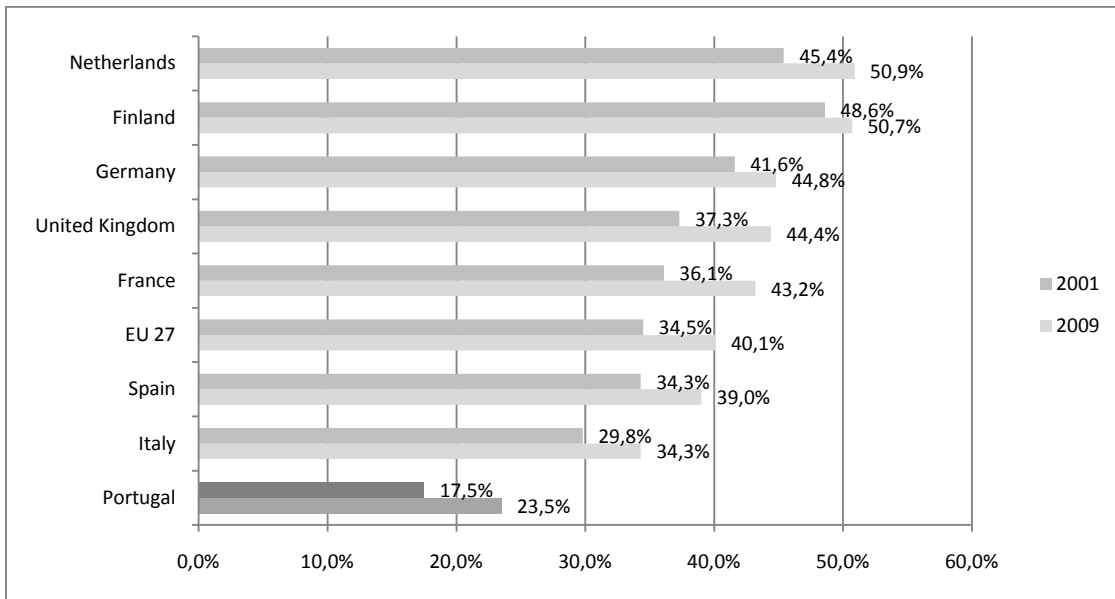
Note: * The maximum expected uncertainty of this analysis is associated with those PhD holders with no identified workplace.

Source: MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>)

46. **The potential for growth of human resources in science and technology:** Despite the accelerated growth in researchers in Portugal described above, there is still considerable potential for further growth, together with a need to maintain this growth, as follows:

- First, human resources in science and technology (HRST) represented only 24% of the active workforce aged 25-64 in 2009 in Portugal, while the corresponding figure was about 40% for the EU-27 average (as well as for Spain) and over 50% for the Netherlands, Finland and Denmark (Figure 15). It should be noted that HRST (as defined by the OECD's Canberra Manual) refers to those human resources that either successfully completed education at the third level in an S&T field of study (levels 5a, 5b or 6 of ISCED 97) or are employed in an S&T occupation where the above qualifications are normally required (according to the ISCO 88 COM codes 2 or 3):
 - The percentage of human resources in science and technology that successfully completed education at the third level in an S&T field of study (levels 5a, 5b or 6 of ISCED 97) was about 18% in 2009 in Portugal, while the EU-27 average was about 27%;
 - The percentage of human resources in science and technology that are employed in an S&T occupation (such as engineering, health, teaching, business and administration, software companies, legal, social and cultural professionals, or associated technicians; as in ISCO 88 COM code 2 or 3) represented in Portugal 17%, while the EU-27 average was 29% in 2009.
 - The percentage of human resources in science and technology that successfully completed education at the third level in an S&T field of study (levels 5a, 5b or 6 of ISCED 97) and are employed in an S&T occupation was 12% in 2009 in Portugal, while the EU-27 average was 18%.
 - The percentage of scientists and engineers employed in physical, mathematical and engineering occupations or in life science and health occupations was 3% in 2009 in Portugal, while in the EU-27 average was 5%.

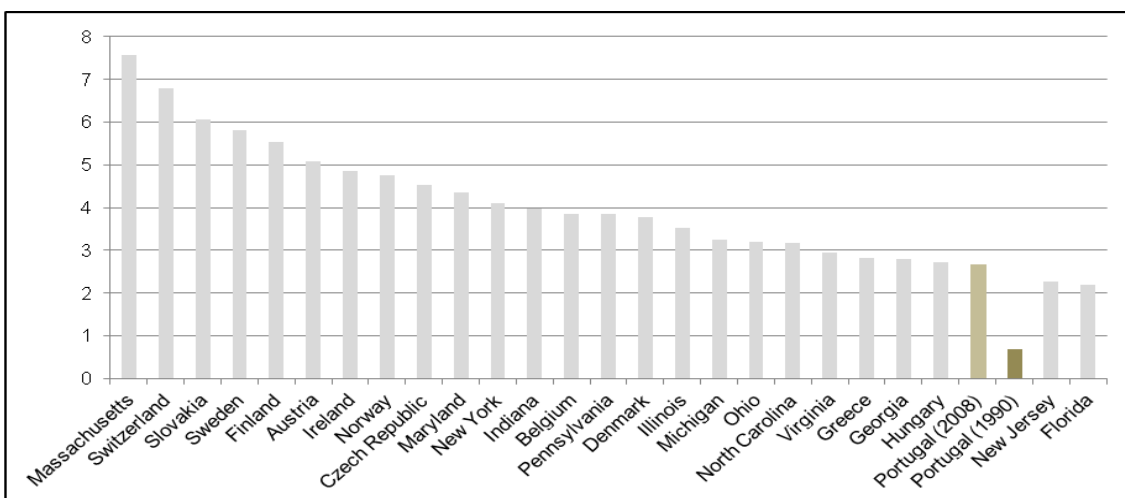
Figure 15
Human resources in science and technology (HRST) as a percentage of the labour force
(population aged 25-64 years old), 2001-2009



Source: EUROSTAT; Note: HRST are defined by the OECD's Canberra Manual and refer to those human resources that either successfully completed education at the third level in an S&T field of study (levels 5a, 5b or 6 of ISCED 97) or are employed in an S&T occupation where the above qualifications are normally required (according to the ISCO 88 COM codes 2 or 3)

- Second, the need to maintain the growth of researchers is clear when annual numbers of new PhDs are plotted against the country's workforce (Figure 16). According to this indicator, Portuguese universities graduated some 2.7 new PhDs per ten thousand workforce in 2008. By contrast, the state of Massachusetts (US), Switzerland, Slovakia, Sweden and Finland produced more than twice that number. Particularly revealing is the number of new PhDs awarded per ten thousand workforce in the state of Massachusetts, which stands at 7.6, and Switzerland with 6.8 – a growth rate almost three times that of Portugal. Still, Portugal awards more doctorates per year than such US states as Florida or New Jersey, having reached that position from a very low starting point not long ago. For example, it should be noted that twenty years ago, in 1990, Portugal produced a mere 0.68 new PhDs per ten thousand workforce.

Figure 16
Number of new PhD per ten thousand workforce in selected
North American states and European countries, 2008



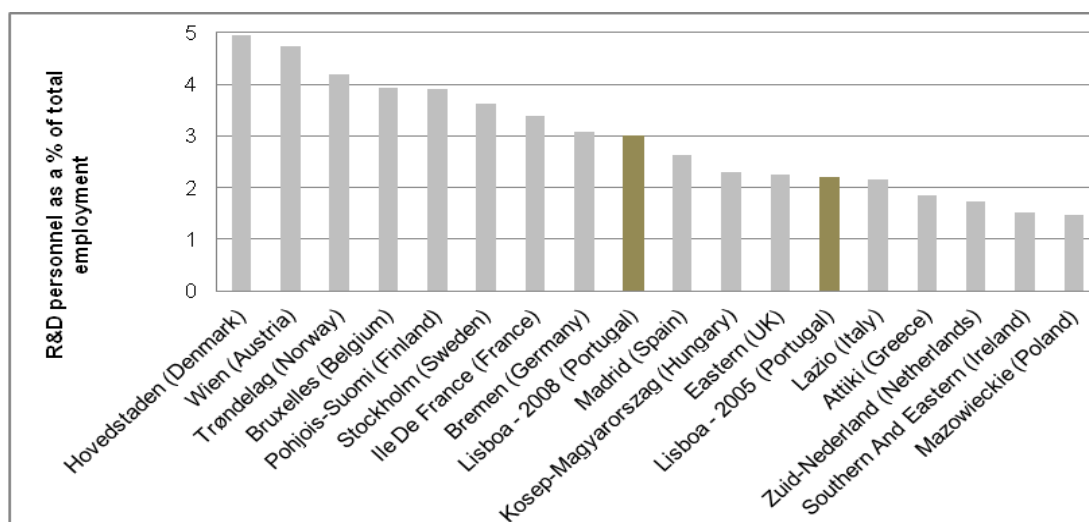
Note: The US figures refer to the civilian workforce; other countries and US states have a small or mid-sized workforce of between 2 and 9.5 million individuals. Data refer to headcounts.

Sources: NSF/NIH/USED/USDA/NEH/NASA, 2008 Survey of Earned Doctorates; Eurostat; GPEARI/MCTES

- Third, it has become a commonplace to argue that achieving critical mass is key in sustaining the quality of research, in forging stronger links between the different sectors engaged in research, and in stimulating creativity and innovation at regional and national levels. With this in mind and taking Lisbon as the Portuguese region with the largest proportion of people employed in R&D, it should be pointed out that the related concentration of research personnel is only about 60% of that in the most knowledge-intensive European regions, such as London (UK), Wien (Austria) or Hovedstaden (Denmark; Figure 17). Moreover, only about 3% of the total employed population in the region of Lisbon perform R&D work, still a low value compared with European regions where this number reaches 4% (e.g. Bratislavský kraj in Slovakia or Oslo og Akershus in Norway) or 5% (e.g. Buckinghamshire and Oxfordshire, in the UK, or Brussels in Belgium).

Figure 17

R&D personnel (including researchers and technical support) as a percentage of total employment in selected European regions, 2007 or latest available year



Note: Data for 2007: Denmark, Austria, Norway, Belgium, Finland, Sweden, Spain, Hungary, UK, and Portugal; Data for 2005: Germany, Italy, Greece, The Netherlands; Data for 2001: France. Data refer to headcounts.

Source: OECD, OLIS Regional Statistics dataset

- Fourth, in spite of the steep rise in the number of R&D personnel as a proportion of total employment throughout all Portuguese regions, there are still significant disparities between regions (Table 18). In 2008, 45% of all R&D personnel were concentrated in the Lisbon area, a share that has only fallen slightly in the last decade – from 53% in 2001. Such statistics strongly suggest that raising the number of highly qualified human resources should be a priority for Portuguese science policy over the coming decades if both Portugal and its regions are to attain sufficient critical mass.

Table 18

Total R&D personnel and researchers by region in Portugal, 2008

Region	Total personnel in R&D (headcount)	%	Total personnel in R&D (FTE)	%	Total researchers (headcount)	%	Total researchers (FTE)	%
North	24,051	27%	12,409	26%	20,432	27%	10,515	26%
Central	17,040	19%	8,853	18%	14,367	19%	7,454	18%
Lisbon	39,245	45%	22,779	48%	34,121	45%	19,343	48%
Alentejo	3,771	4%	1,914	4%	3,242	4%	1,541	4%
Algarve	1,930	2%	993	2%	1,790	2%	895	2%
Azores	787	1%	492	1%	586	1%	364	1%
Madeira	748	1%	444	1%	540	1%	295	1%
Total	87,572	100%	47,882	100%	75,078	100%	40,408	100%

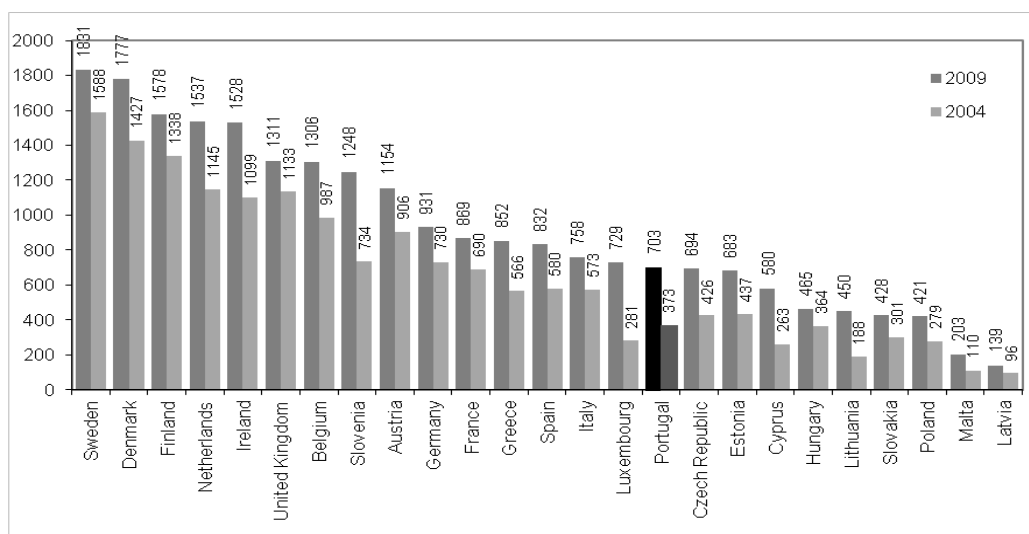
Source: MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>)

3.2. Promoting Knowledge and Ideas

47. **Scientific production – publications in the Science Citation Index Expanded (SCI).** The scientific output of Portuguese research institutions, as measured by the number of internationally refereed scientific publications in SCI (which relate to scientific publications in the fields of exact, natural, and health sciences, as well as agriculture and engineering) reached 7,470 articles, letters, notes and reviews in 2009, up from 2,702 article, letters, notes and reviews in 2000. Analysis also shows:

- Internationally refereed Portuguese articles, letters, notes and reviews in the exact sciences, natural sciences, health sciences, agriculture and engineering have increased nearly 2.8 times since 2000.
- This growth can also be seen in the number of publications by total population, which reached 703 articles per million population in 2009, from 373 in 2004 (Figure 18).
- The number of articles by total population is now 77% of the EU-27 average, whereas it was only 51% in 2004, suggesting that Portugal’s science base in the fields of science, technology, engineering, and mathematics is becoming internationally competitive, although still lacking critical mass.

Figure 18
Number of articles in the Science Citation Index per million population for selected European Union countries



Source: GPEARI/MCTES/Reuters ISI Thomson/Eurostat, 2004-2009

48. **Scientific production – internationalization.** An important factor concerning increasing Portuguese scientific production measured through international refereed publications is the trend towards international collaboration. In 2009, nearly half of all publications were published in co-authorship with scientists and engineers based abroad, while this share in 1990 was only 39%.

49. **Scientific production – impact.** The quality of Portuguese publications in international refereed journals as measured by the number of citations has also shown impressive growth:

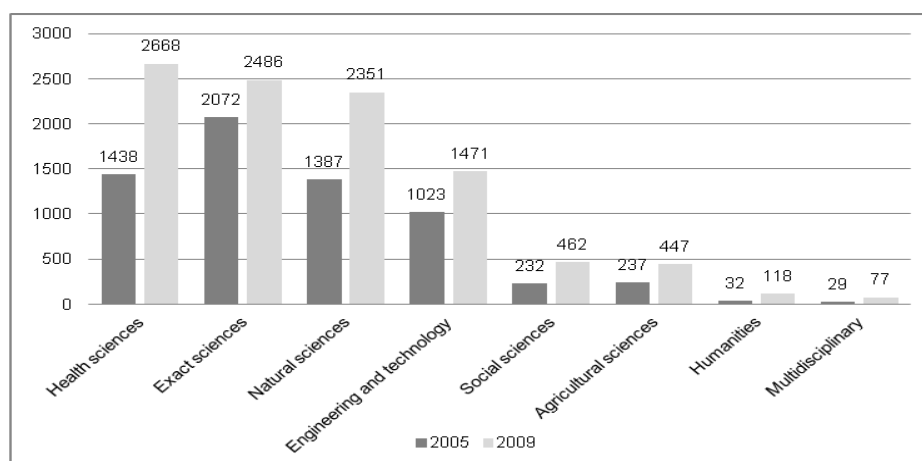
- In the period 2004-2008, Portuguese publications received more than 131,000 citations. This is to be compared with 66,000 citations for the period 2000-2004 and only 5,662 during 1986-1990.

- While for 1986-1990, only 45% of Portuguese publications were cited internationally, this figure reached 57% in 2000-2004 and 62% in 2004-2008.
- The impact of Portuguese scientific publications in aerospace, physics, clinical medicine, agriculture and engineering was higher than the world average impact of related publications in the period 2004-2008. Their impact also increased in another 16 of the 22 scientific areas analyzed by ISI Thomson Reuters compared to the world average from 1999-2003 to 2004-2008.

50. **Overall scientific production.** The scientific output of Portuguese research institutions in all scientific fields, as measured by the Science Citation Index Expanded (SCI), together with other databases such as the Social Science Citation Index (SSCI) and the Arts & Humanities Citation Index (AHCI) using the fractional counting method, reached 10,081 publications in 2009, from 6,450 publications in 2005, and just 3,792 publications in 2000 (Figure 19). Analysis also shows:

- Output in the natural sciences and agriculture reached 2,798 publications in 2009, from 1,624 publications in 2005, and only 889 in 2000.
- The number of publications in the exact sciences reached 2,486 in 2009, almost doubling from 1,279 in 2000 (and 2,072 in 2005). Publications in engineering fields also grew from 621 publications in 2000 to 1,472 in 2009 (with 1,023 in 2005).
- Output in health sciences and medicine grew from 782 publications in 1990 to 1,438 in 2005 and 2,668 in 2009.
- Output in the social and human sciences rose from 216 publications in 2000 to 264 in 2005 and 580 in 2009.

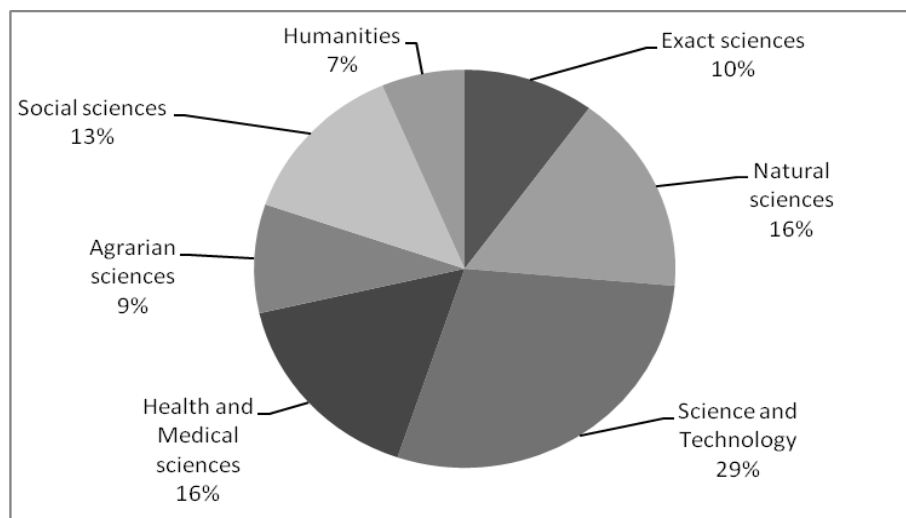
Figure 19
Number of publications, by scientific field, 2005 and 2009 (p)



Note: p – provisional. Source: MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>)

51. **A broad and diversified science base:** The Portuguese R&D system is characterized by having a relatively broad science base across different scientific fields (Figure 20), similar to that found in most industrialized countries. For example, 29% of the R&D projects supported by the Portuguese Science and Technology Foundation are in technical areas and engineering, 16% in health and medical sciences, 16% in natural sciences and 13% in social sciences, 10% in the exact sciences and 7% in the arts and humanities.

Figure 20
R&D projects supported by the Portuguese Science and Technology Foundation,
last available year



Source: MCTES/ Science and Technology Foundation (<http://www.fct.mctes.pt/>)

52. Technology transfer and commercialization. Competences in technology transfer and commercialization have been systematically developed throughout the country and, today, most Portuguese universities, Associate Laboratories and research institutions are able to provide specialized technical support fostering technology transfer and commercialization:

- This development has been strengthened since 2007 through the University Technology Enterprise Network (UTEN), which was designed to emphasize technology transfer and commercialization on an international scale.
- This initiative is promoted and supported by the Foundation for Science and Technology (FCT), in close collaboration with the Council of Rectors of Portuguese Universities (CRUP) and the Portuguese Industrial Property Institute (INPI), and includes strategic partnerships with leading institutions worldwide. It was launched in close cooperation with the University of Texas at Austin, and now involves increasing collaboration with Carnegie Mellon University and the Massachusetts Institute of Technology (MIT).
- UTEN has evolved over the past four years and its mission has been strengthened to help build a professional, globally competitive and sustainable technology transfer and commercialization network in Portugal oriented towards worldwide markets.

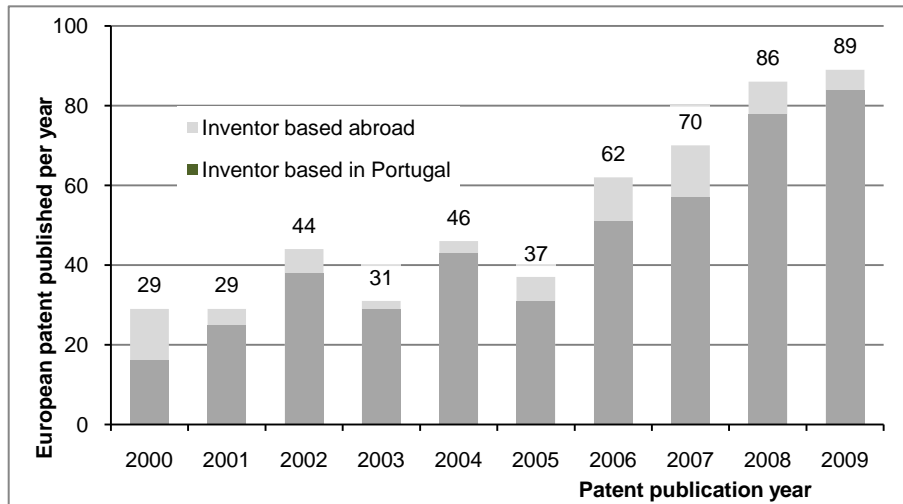
53. Publication of patents. Patent applications have increased considerably over the last decade, starting from rather low values, but with an increasing contribution from academic research groups⁸. Analysis shows that:

- Portuguese patent applications to the EPO grew 2.4 times from 2005 to 2009 (89 patents in 2009), while the number of Portuguese patents registered in the US Patent and Trademark Office (USPTO) more than tripled in this period (22 in 2009). The number of patents published by inventors based in Portugal increased 3.5 times between 2005 and 2009 (see Figure 21 and Figure 22).

⁸ The data retrieval was performed in the esp@cenet dataset on 2 December 2010, using the following search terms: [(Inventor(s) = "PT") OR (Applicant(s) = "PT")] AND [Publication date = (2000 OR 2001 OR 2002 OR 2003 OR 2004 OR 2005 OR 2006 OR 2007 OR 2008 OR 2009 OR 2010)].

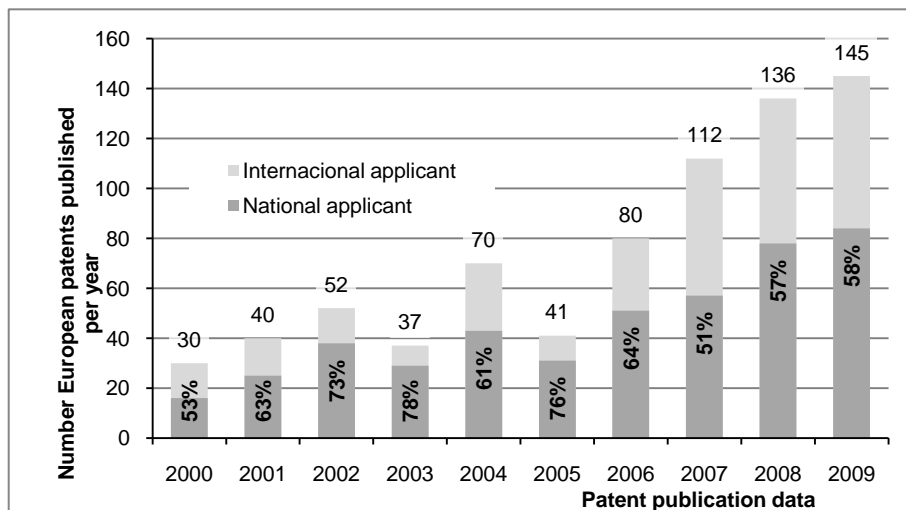
- o Figure 21 indicates that there is a substantial percentage of patents published through international applicants by inventors based in Portugal. In 2009, only 58% of the 145 patents published by inventors based in Portugal could be considered national applicants. This is explained by multinational companies based in Portugal that prefer to have their applications published in the country of origin, or where their headquarters is located.

Figure 21
European applications published by Portuguese applicants



Note: The percentages in the columns refer to those published patents in which the applicant is a Portuguese applicant

Figure 22
European patents from inventors based in Portugal



Note: The percentages in the columns refer to published patents in which the applicant is Portuguese.

54. **European cooperation in science and technology:** The development of the Portuguese science base over the last 30 years has been achieved in close international cooperation, with emphasis on training Portuguese researchers in leading institutions in Europe and the USA, as well as on their active participation in European S&T networks and organizations. Examples of Portuguese participation in European S&T organizations include:

- **CERN:** Portugal has been a member of CERN since the mid-1980s and this participation has provided advanced training for several generations of researchers, as well as their access to state-of-the-art facilities to perform research and to promote technology transfer. Among CERN's 20 member states, Portugal is ranked 4th, immediately after France, in terms of service sales and 6th in the sales of goods, immediately after Hungary (Table 19). Portugal has a particular good balance of payments regarding services, with a return rate of 1.30 (above the <0.40 threshold).

Table 19
Industrial return rate of CERN member states, 2010

Countries	Goods	Countries	Services
Switzerland	5.77	Switzerland	6.40
France	2.00	Netherlands	2.99
Czech Republic	1.41	France	2.86
Poland	0.90	Portugal	1.30
Hungary	0.78	Denmark	1.26
Portugal	0.66	Bulgaria	1.09
Finland	0.63	Poland	0.88
Germany	0.62	Belgium	0.83
Netherlands	0.61	Spain	0.52
Italy	0.60	Austria	0.18
Slovak Republic	0.48	Germany	0.16
Austria	0.43	Italy	0.13
Sweden	0.43	UK	0.08
Denmark	0.26	Sweden	0.03
Spain	0.25	Hungary	0.02
UK	0.25	Czech Republic	-
Belgium	0.22	Finland	-
Greece	0.22	Greece	-
Norway	0.17	Norway	-
Bulgaria	0.12	Slovak Republic	-

Note: industrial return coefficient - ratio between the percentage of national acquisitions by CERN from the member state and the percentage of the national contribution to the overall CERN budget; Well balanced and poorly balanced status: for 2010, a member state of CERN is to be considered poorly balanced if its coefficient is <0.89 (goods) and <0.40 (services). Data based on payments in 2007, 2008, and 2009 and pending payments for 2010). Source: FCT/Office for the promotion of the 7th Framework programme.

- **European Space Agency (ESA):** Portugal has invested about 112 million Euros in ESA programmes since becoming a member, with 91% of the ESA contracts for Portugal attributed to firms. In 2009, these contracts were worth about 17 million Euros (plus one million in contracts with universities). Also in 2009, the Portuguese return rate reached 99%, whereas this value was only around 75% in 2005. Moreover, Portuguese participation in ESA has evolved from a focus on software research in 2000 to one in which 25% of contracts relate to hardware and 33% to R&D and services. Today, Portugal's participation in ESA is focused mainly on the following areas: telecommunications and integrated applications (about 36%), earth observation (25%), and satellite navigation.
- **EUREKA:** data on the six most recent calls made through the EUROSTARS programme in the period 2007-2010 shows that 24 projects with Portuguese participation have been accepted for funding, corresponding to a public investment of nearly 5 million Euros.

55. **Furthering the internationalization of tertiary education and S&T.** Strengthening the internationalization of tertiary education and S&T is recognized as a way to stimulate the integration of national institutions in emerging scientific networks at an international level. In this context, a unique set of international collaborations with leading institutions worldwide has been successfully developed in recent years based on thematic R&D networks, integrating advanced training initiatives and industrial affiliation programmes. Projects of interest to Portuguese industry have been launched, and this synergy has been extended by industrial affiliation programmes, especially in stem cell engineering for regenerative medicine, automotive engineering, low-energy systems (via the MIT-Portugal Program), information and communication technologies (via the CMU-Portugal and Fraunhofer-Portugal programmes) and interactive digital media (via the UT Austin-Portugal Program). Below is an overview of the activities of these international partnerships:

- The MIT-Portugal joint venture (www.mitportugal.org) was launched in October 2006 in the field of engineering systems, with particular emphasis on the complex processes associated with energy systems, bioengineering, transportation, and industrial production. In these areas, Portuguese and MIT faculty and researchers identified three main thematic thrusts for research and development, in close cooperation with a diverse group of industrial affiliates. These research thrusts include sustainable energy and transportation systems, stem cell engineering for novel therapies in regenerative medicine, and materials and design-inspired products with specific applications in electric mobility and new medical devices.
- Over the past five years the programme has had significant impact on graduate education in Portugal. It involves a total of six Portuguese universities, 20 Portuguese research centres and national laboratories, and 210 Portuguese faculty members, together with 25 MIT departments, all five Schools within MIT, and 70 MIT faculty members. Seven new doctoral, master's of business engineering and master's of science programmes have been created in the areas of Bioengineering Systems, Sustainable Energy and Transportation Systems, and Engineering Design and Advanced Manufacturing. These programmes currently include 276 PhD and 60 master's students from over 44 countries around the world. About 89 master's degree students have already graduated. Altogether 71 new courses have been developed for teaching in the various educational programmes, many of which introduce curricular elements novel to Portuguese and international engineering education.
- Another joint programme was launched in co-operation with the MIT Sloan School of Management in 2008, aimed at creating an international MBA, the "Lisbon MBA" (www.thelisbonmba.com), which is offered through two top Portuguese business schools, the Portuguese Catholic University and the New University of Lisbon. It is a full-time degree programme in business administration framed in an international environment with a focus on both the academic component and the interpersonal competencies that develop strong business leaders. It involves co-funding from seven major Portuguese companies and banks and will stimulate new research and enhance the quality of education in management sciences in Portugal. About 60 new graduates have already completed this programme.
- The collaboration with MIT was further extended through a strategic and long-term joint research collaboration agreement with the International Iberian Nanotechnology Laboratory (INL, www.inl.int). This laboratory was created by an international treaty between Portugal and Spain signed at the end of 2006, and is now in the initial stage of operation in Braga (northern Portugal). It is expected to become an international institution of excellence in the areas of food and water quality, environmental monitoring, and nanomedicine, and will engage about 200 researchers from all over the world, with an annual operating budget of around 32 million Euros by 2015 (funded equally by Portugal and Spain). The Laboratory plans to develop strong collaborative links with industry and will foster new research cooperation worldwide. In particular, INL has been launched together with Portuguese-Spanish networks oriented towards new developments and applications of nanosciences;

- The Carnegie Mellon-Portugal Program (www.cmuportugal.org) was launched in October 2006 with emphasis on information and communication technologies, in particular future internet technologies and services. The areas covered include new generation networks, software engineering, cyber-physical systems for ambient intelligence, human-centric computing (including language technology), public policy and entrepreneurship research, and applied mathematics. The growing Carnegie Mellon-Portugal research community is producing world-class research with 70 co-supervised PhD students and more than 100 faculty members and senior researchers. There are currently 22 collaborative research projects selected through two research calls (the first in 2008 and the second in 2009) that involve teams from at least two institutions in Portugal, one company, and one research team at Carnegie Mellon. More than 290 papers have been published in peer-reviewed journals and international conferences. The number and quality of joint publications with authors from one or more Portuguese universities and Carnegie Mellon is increasing steadily.
- Nine Portuguese universities, namely University of Aveiro, Portuguese Catholic University, University of Coimbra, University of Lisbon, New University of Lisbon, University of Madeira, University of Minho, University of Porto, and Technical University of Lisbon, have established advanced training programmes with dual degrees awarded by at least one of the Portuguese partner institutions and Carnegie Mellon. Several of these programmes involve partnerships and knowledge-sharing among multiple Portuguese universities and Carnegie Mellon in the general areas of computer science, electrical and computer engineering, applied mathematics, technological change and entrepreneurship, and engineering and public policy. Courses are shared among partners and taught through video conferencing facilities either from Carnegie Mellon to Portugal campuses, or among Portuguese campuses, and, at least in a few instances, from Portuguese universities to Carnegie Mellon. Three new innovation networks have been launched between partner institutions and industrial affiliates: Security and Critical Infrastructure Protection (NET-SCIP); Future Internet Services and Technologies (NET-FIT); and Services and Technologies for Interactive Media (NET-STIM).
- Under the University of Texas in Austin-Portugal Program, the Collaboratory for Emerging Technologies (CoLab) was launched in March 2007 (www.utaustinportugal.org), focusing on collaborative research in advanced interactive digital media and integrating advanced computing and applied mathematics. Overall, the programme involved about 80 doctoral students by the end 2010.
- CoLab has launched a doctoral degree programme in digital media at the New University of Lisbon and the University of Porto, and supports a growing and vibrant MA programme in multimedia at the University of Porto. The collaboration has initiated joint research projects and launched events of international calibre that have drawn an international body of experts to Portugal. Over the last four years the programme has recruited over 50 doctoral students, with 96 students also enrolled in the MA programme, as well as four postdoctoral fellows who have spent time at UT-Austin. Faculty and students have produced more than 125 publications and presented at major international conferences. Numerous shorter workshops have been delivered, of one to five days duration, that have served over 200 students at the Future Places Festival, the Monstra Film and Animation Festival, and the International Symposium on Online Journalism, among others. The digital media programme has formed both deeper and broader relationships over time. The breadth is evident in the growing web of businesses and organization involved with the programme, catalyzed in part through nine new research projects funded by FCT, but also through events such as the International School on Digital Transformation and Future Places. The programme has also supported research and professional internships for 19 students including ZON prize winners.

- As part of the collaborations with the University of Texas in Austin, Carnegie Mellon, and MIT, the University Technology Enterprise Network (UTEN) was established in 2007 (www.utenportugal.org). It is aimed at commercialization of international technology and the professionalization of university technology managers, and comprises a network of about 40 university and research institutions in Portugal. Working together with counterparts in the US, where new business ventures have been incubated and technology transfer officers trained, it also includes an international business competition for technology-based start-ups - the ISCTE-MIT Portugal Venture Competition (www.mitportugal-ieii.org).
- The Harvard Medical School-Portugal Program (www.hmsportugal.org), was launched in May 2009 to foster translational and clinical research programmes and the development of new infrastructure for delivering information produced by medical schools to medical students across academic institutions, health practitioners, and the general public. This innovative collaborative framework will thus contribute to strengthening the relationships between medical schools and health science institutions and their main constituencies.
- Co-operation with the Fraunhofer Gesellschaft facilitated the establishment in Portugal in 2008 of the first Fraunhofer Institute in Europe outside Germany, through the *Fraunhofer Portugal Research Association* (www.fraunhofer.pt). This is an ambitious project focusing on emerging information and communication technologies, such as “Ambient Assisted Living”, to be complemented by the establishment of R&D consortia and cooperative projects involving several Portuguese institutions and Fraunhofer institutes in Germany.

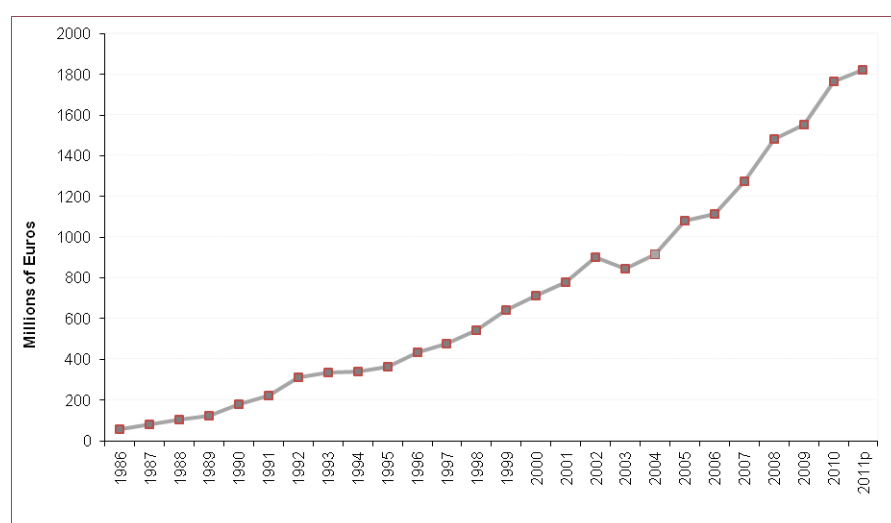
Chapter 4. Steering and Funding of R&D

Gross expenditure on research and development in Portugal has grown at one of the fastest rates observed in the OECD in recent years. This growth is explained by a substantial accumulation of public investment in science and technology over more than two decades, aiming at developing the national knowledge base. It has resulted in a recognized development of scientific activities, but above all, it has leveraged private investment in research and development, which is facilitating access of Portuguese industry to markets worldwide. It is in this context that this chapter is structured under six main topics:

- the evolution of the public budget for R&D through the Government's budget appropriations or outlays for research and development (GBOARD), including its instruments and funding sources;
- public expenditure on R&D through the Portuguese Science and Technology Foundation (FCT), particularly in terms of key investments for the advanced qualification of human resources, the development of scientific institutions and efforts to foster research activities and further internationalize scientific institutions in Portugal, as well as in the national Science and Education Communication Network (RCTS);
- the evolution of gross expenditure on research and development (GERD);
- business expenditure on research and development (BERD), which is illustrated by brief descriptions of case studies;
- funding for R&D through the 7th European Framework Programme;
- the intensity of research funding, both in terms of funding available per researcher and the contribution of each citizen to the overall R&D effort.

56. **The public budget for R&D - GBOARD (Government Budget Appropriations or Outlays for Research and Development).** GBOARD in Portugal grew by about 70% from 2005 to 2011, reaching 1,820 million Euros (Figure 23). It was about 778 million Euros in 2001 and has therefore more than doubled over the last decade.

Figure 23
Government budget appropriations or outlays for research and development in Portugal (GBOARD) 1986-2011, million Euros



Note: p – provisional. Source: MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>)

57. **The share of GBOARD in relation to overall public expenditure.** Portuguese GBOARD exceeded 1% of GDP in 2010, representing 3.1% of the overall public budget in 2011. It grew by 33% from 2005 to 2011 in relation to GDP and by 23% in relation to the overall state budget (Table 20). Only Estonia, Luxemburg, South Korea, Iceland, and Slovenia grew at a faster rate.

Table 20
Government budget appropriations or outlays for research and development in relation to GDP
and the total State budget in Portugal, 2003-2011

	2003	2004	2005	2006	2007	2008	2009r	2010	2011p
GBOARD/GDP	0.61%	0.67%	0.78%	0.83%	0.78%	0.89%	0.92%	1.02%	1.03%
GBOARD/State budget	2.31%	2.51%	2.53%	2.59%	2.57%	2.90%	2.79%	2.79%	3.11%

Note: p – provisional. Source: MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>)

58. **Building the public budget for R&D - GBOARD.** Table 21 describes the evolution of the various components of the Government budget for R&D (see Annex 4 for details) and the following aspects should be noted:

- The major contributions to GBOARD are associated with: i) salaries of research faculty in tertiary education institutions; ii) investment in R&D through the Portuguese Science and Technology Foundation (FCT), involving both national and European structural funds (ESF and ERDF); iii) operation of State Laboratories; and iv) more recently, European structural funds (ERDF) allocated through the Ministry of Energy and Innovation, mostly to foster R&D in business and industry.
- The salaries of research faculty in tertiary education institutions account for 37% to 39% of GBOARD, with a total value of about 700 million Euros in 2011, compared to only 397 million Euros in 2005. This considerable increase in the net value associated with this contribution to GBOARD is associated with the rapid penetration of R&D in the university and polytechnic sectors, together with the increasing qualification of faculty staff, as reported elsewhere in this report.
- The budget allocated to the Science and Technology Foundation has increased continuously from 2005 to 2011, with a total value approaching five hundred million Euros in 2011. It accounted for 38% of GBOARD in 2005, falling to 27% in 2011, as GBOARD diversified its funding sources.
- The diversification of sources contributing to GBOARD has been particularly noticeable since 2010 and particularly associated with increases in European structural funds (FEDER) allocated through the Ministry of Energy and Innovation. These have increased from about 100 million Euros in 2005 (i.e., 10% of GBOARD) to over 400 million Euros in 2011 (accounting for 22% of GBOARD), mostly to foster R&D in business and industry;
- The budget allocated to State Laboratories increased from about 130 million Euros in 2005 (representing 12% of GBOARD) to 175 million Euros in 2011, accounting for 10% of GBOARD.
- Unlike large OECD countries, the share of GBOARD associated with health and defence is minimal. For 2011, the R&D budgets of the Ministries of Health and Defence represent respectively 0.1% and 0.3% of GBOARD.

- Overall, the growth of GBOARD from 2005 to 2010 relied largely on national funds, which accounted for 76% of GBOARD in 2010. On the other hand, financial constraints over the last year in the availability of national funds have been overcome by increasing the relative share of European structural funds, which account for 31% of GBOARD in 2011.

Table 21

Government budget appropriations and outlays for R&D in Portugal (%) by main instruments and source of budget funding, 2005, 2010 and 2011 (see Annex 4 for details)

Ministries	Instruments	2005			2010			2011 p	
		Source of funds	%	Share of instruments in relation to total	%	Share of instruments in relation to total	%	Share of instruments in relation to total	
Ministry of Science, Technology and Higher Education	R&D budget (includes Portuguese Science and Technology Foundation, FCT)	National	60%	38.3%	76%	31.4%	66%	26.6%	
		EU	40%		24%		34%		
	Contribution from tertiary education budget (proportion of salaries for research faculty)	National	100%	36.7%	100%	39.3%	100%	38.6%	
		EU	0%		0%		0%		
Research institutes associated with the tertiary education system	National	100%	2.1%	100%	1.8%	100%	1.7%		
	EU	0%		0%		0%			
Various	State Laboratories	National	89%	12.2%	98%	10.4%	98%	9.6%	
		EU	11%		2%		2%		
Ministry of Economy and Innovation	Includes European structural funds	National	0%	9.5%	0%	15.5%	0%	22%	
		EU	100%		100%		100%		
Ministry of Health (except the INSA State Laboratory)		National	-	-	100%	0.1%	100%	0.1%	
		EU	-		0%		0%		
Ministry of Defence		National	100%	0.1%	100%	0.3%	100%	0.3%	
		EU	0%		0%		0%		
Total		National	73.8%		75.8%		68.6%		
		EU	26.2%		24.2%		31.4%		

Note: p – provisional. Source: MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>)

59. Public expenditure on R&D through the Portuguese Science and Technology Foundation (FCT).

The Portuguese Science and Technology Foundation (FCT) is the main R&D funding agency in Portugal. Its effective expenditure on R&D almost doubled from 2006 to 2010, reaching nearly 500 million Euros (see Table 22 and Annex 3). This has been achieved through several funding programmes and actions, as follows:

- Advanced training of human resources, including a competitive programme of PhD fellowships, which has been considerably enlarged since 2006 to about 2,000 new grants per year (it was about 1,000/year in 2005) and a postdoctoral grants programme, also on a competitive basis (about 500 new grants per year). By the end of 2010, over 11,000 grants were actively funded (about 5,000 in 2005), with an overall public expenditure of over 160 million Euros (see Figure 24 and Figure 25).
- Scientific employment, through a new programme launched in 2007 to hire postdoctoral researchers on a competitive basis (five-year contracts), which involved over 1,200 new contracts by Portuguese universities and research establishments by the end of 2010, 41% with foreigners, with an overall public expenditure of over 67 million Euros.
- Institutional development, through a seed-funding programme for research units and Associate Laboratories throughout the country (in universities and related private, non-profit institutions), based on periodic evaluations, which involved over 85 million Euros in 2010.

- Fostering competitive activities, through the systematic opening of national competitions for funding R&D projects in all scientific areas, with more than 4,000 active projects by the end of 2010, and an overall public expenditure of 85 million Euros.
- Promoting nationwide scientific and technological culture, through the systematic development and promotion of activities to foster science awareness, science education and the role of science in the daily life of citizens, as implemented through the National Agency for Scientific and Technological Culture's *Ciência Viva* programme, with an overall public expenditure of over 15 million Euros in 2010.
- Promoting internationalization of R&D and advanced training through systematic participation in large international organizations (CERN, EMBL, ESFR, ESO and ESA, among others), the development of bilateral cooperation in S&T and the promotion of strategic international partnerships (MIT, Carnegie Mellon University, UT Austin, Harvard Medical School). Overall public expenditure on these programmes reached 55 million Euros in 2010.
- Promoting scientific infrastructure, which has involved funding a diversified network of physical facilities and equipment, with an overall public expenditure of over 90 million Euros in the last six years.

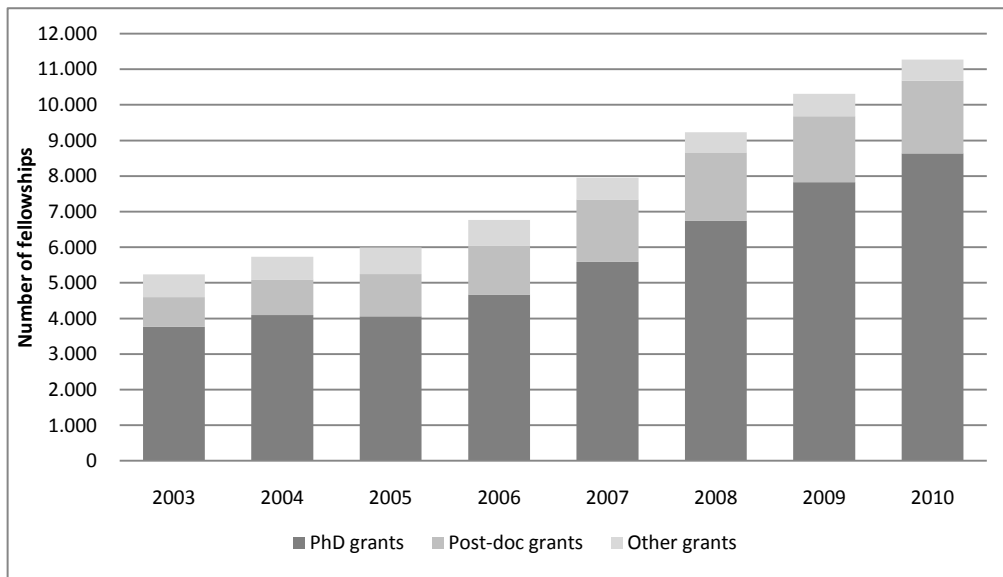
Table 22

R&D expenditure through the Portuguese Science and Technology Foundation (FCT)
(excluding operating costs; thousand Euros)

Funding items	2006	2007	2008	2009	2010 (p)	2011 (e)
People:	99,757	126,846	178,003	197,713	217,340	227,000
Qualification of human resources: PhD, postdoctoral and other grants	99,757	126,846	178,003	152,848	167,077	160,000
Scientific employment (five-year contracts for doctorate researchers)	--	--	--	44,865	50,263	67,000
Institutions and activities:						
Associate Laboratories, R&D units and State laboratories	36,304	76,669	93,803	78,513	85,071	89,357
International Nanotechnology Laboratory	--	5,000	3,000	9,000	8,000	10,700
R&D projects	32,926	65,746	81,027	79,367	85,138	85,610
S&T culture	9,074	22,445	16,689	16,488	13,559	15,000
International cooperation in S&T	40,002	42,702	41,721	54,665	55,801	54,064
Scientific equipment	45,455	23,555	8,137	6,521	1,928	2,950
Scientific Community Support Fund (mostly supporting meetings, publications, and conferences)	1,712	3,368	2,979	2,841	1,819	2,580
Technical assistance (management of EU structural funds)	2,365	3,052	1,836	1,088	635	1,132
Total	267,595	369,383	427,195	446,196	469,291	488,393

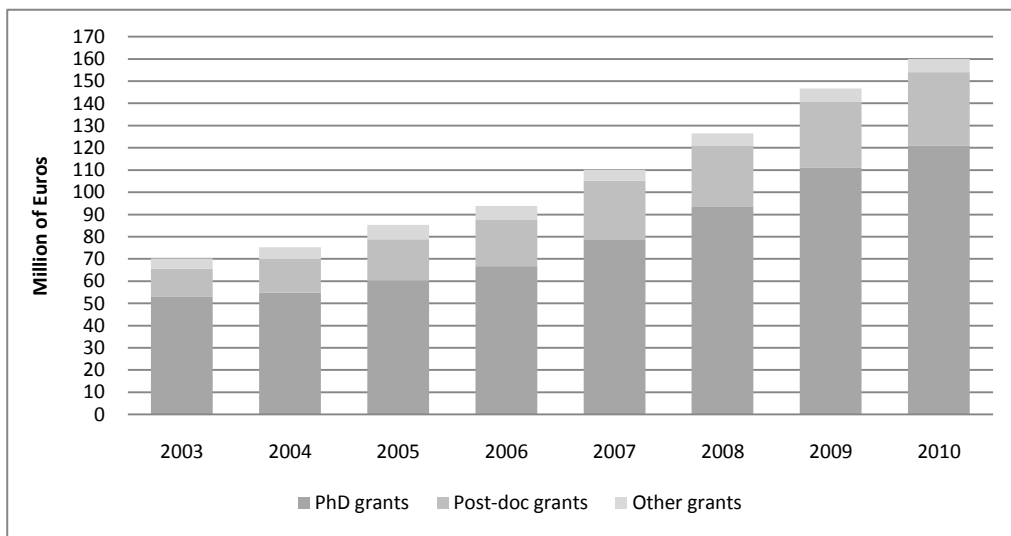
Note: units in thousand Euros; p – provisional; e – estimat e.

Figure 24
Advanced training of human resources supported by FCT:
Number of ongoing grants by type, 2003-2010



Source: FCT

Figure 25
Advanced training of human resources supported by FCT:
Expenditure on ongoing grants by type, 2003-2010



Source: FCT

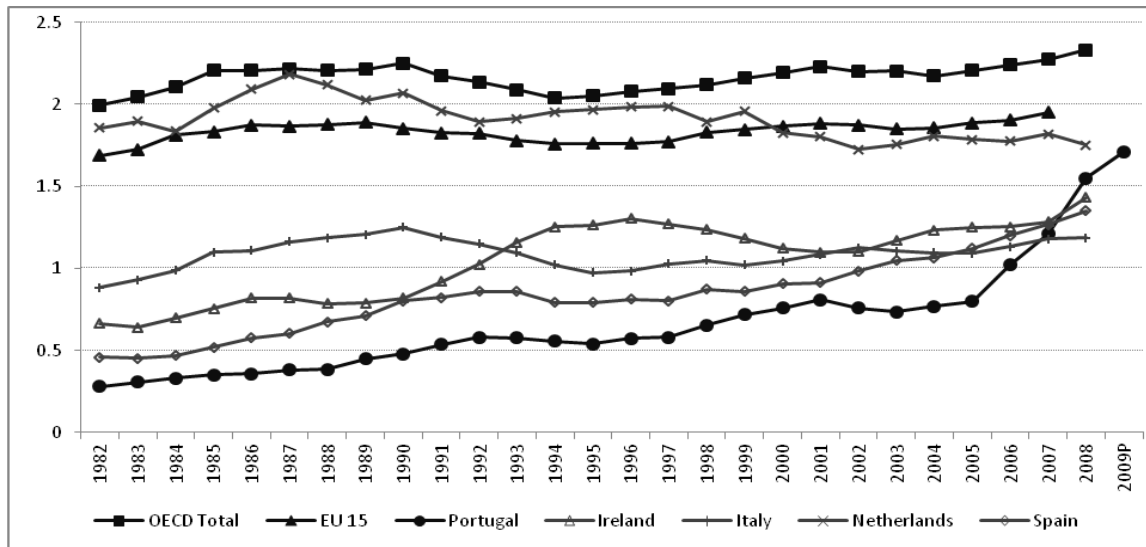
60. **The national Science and Education Communication Network (RCTS) and associated “e-Science” applications.** This network, and the associated applications developed through the Knowledge Society Agency (UMIC) and the Foundation for Scientific Computation (FCCN), have had overall annual public expenditure of over 25 million Euros in recent years. It provides the communications infrastructure for the scientific and higher education system, and is a fully fledged “next-generation network” connecting all research establishments and tertiary education institutions, as follows:

- It provides dark fibre connectivity to 80% of all the national scientific and tertiary education system, operating at 10 Gbps on the basis of fibre cables owned by the RCTS itself and redundantly connected by a ring to the Spanish National Research and Education Network and through it to the European GEANT network, and connectivity to all other scientific and public higher education institutions and the private higher education institutions that subscribe to it with bandwidths above actual needs through lines rented to commercial operators.
- It provides free online access in all scientific institutions and public tertiary education institutions, as well as private tertiary institutions that subscribe to it, to about 17,100 scientific journals, 18,200 e-books, 12,400 proceedings and transactions titles and 10 reference databases, subscribed to the main international scientific publishers through “big deals” at national level;
- It provides access to the Open Access Scientific Repository of Portugal (RCAAP), which now includes 33 institutional repositories, in particular those of all public universities and several polytechnics, private universities, National Laboratories and other scientific institutions and hospitals. It has grown eightfold since its creation in 2008, to reach 58,300 documents by April 2011, and was integrated in November 2011 with OASIS.PT, the main open access scientific repository of Brazil, following an agreement signed by the ministers of science and technology of both countries in October 2010.
- It provides dedicated 10 Gbps connectivity through specific fibre or lambdas for the National Grid Initiative (INGRID), launched in 2006, which is integrated with that of Spain through IBERGRID and contributes to the European Grid Initiative (EGI); it also provides the main grid computing cluster in Portugal, with a dedicated data centre built in 2008 which houses more than 1,200 CPU cores.
- It provides the national infrastructural support for the Voluntary Scientific Computing initiative (IBERCIVIS), launched in 2009, which operates in collaboration and full integration with the Spanish initiative.
- It provides internal voice communications to the entire national public higher education system through VoIP at zero cost and external low cost VoIP communications as a result of aggregated procurement of communications from the major fixed and mobile communication operators, facilitating collaborative work and providing free video- and tele-conferencing easily available at each researcher’s desk.

61. **Gross expenditure on R&D (GERD):** Portugal’s gross domestic expenditure on R&D (GERD) exceeded 2,791 million Euros in 2009, i.e. 1.71% of GDP. This figure represents a growth of approximately 10% (as a percentage of GDP) compared to the previous year and brings Portugal closer to the current average of R&D intensity in the European Union (1.9% of GDP). In 2008, the national figures for R&D were 1.55% of GDP, compared to 0.81% in 2005. GERD in Portugal therefore more than doubled between 2005 and 2009 (Figure 26):

- R&D expenditure has grown in both the business and public sectors and also reflects the efforts made to improve data collecting mechanisms for R&D statistics in Portugal. This does not represent a methodological change, but rather an attempt to uncover hidden and/or underestimated R&D efforts within a stable methodology, bringing the figures closer to reality under the OECD Frascati Manual prescriptions. In fact, the total public budget for R&D grew at 11% per year from 2004 to 2009, while it had grown at 10% a year from 1995 to 2002, among the highest figures in Europe.
- Portugal had the highest annual growth rate of any European country in terms of total R&D expenditure in the period 2005-2009 (20.8%; almost doubling the investment as a percentage of GDP from 2005 to 2009), well above the EU-27 average (2.5%), Spain (5.4%), and Ireland (9.1%).

Figure 26
GERD as a percentage of GDP for Portugal, Spain, Ireland, and Italy



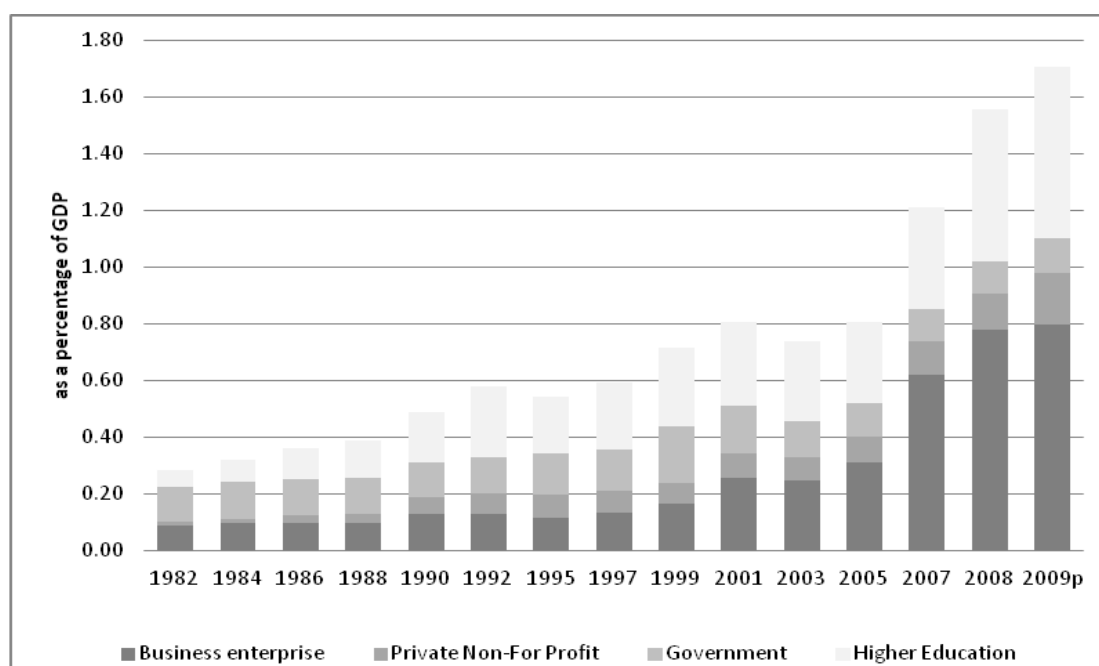
Note: data for 1982-2009p; Portugal: preliminary value for 2009. OECD Total, EU15, Ireland and Italy: preliminary values for 2008.
Source: GPEARI/IPCTN (Portugal); OECD, Main Science and Technology Indicators (OECD Total, EU15, Ireland, Italy, Netherlands and Spain)

62. **Major contributions to gross expenditure on R&D (GERD):** The above data reflect the increased scientific capacity of higher education and private research institutions. In addition, the figures reflect the creation of new scientific institutions, public and private, and the broadening of the base of businesses, hospitals and other institutions engaged in research activities in Portugal (Figure 27 and Table 23):

- The number of enterprises in all business sectors that are active in R&D reached 1,989 in 2009, an increase from approximately 930 in 2005 and 1,833 in 2008. This figure is particularly significant in the context of the global economic downturn that marked 2009. Business expenditure on R&D (BERD) has almost tripled since 2005 (at current prices), to 1,303 million Euros in 2009 (as against 462 million Euros in 2005, 1,010 million Euros in 2007 and 1,295 million Euros in 2008). BERD is now approximately 0.80% of GDP (as against 0.78% in 2008 and 0.31% in 2005).
- R&D expenditure by private non-profit institutions rose to approximately 295 million Euros in 2009 (from 210 million Euros in 2008), reaching 11% of GERD.
- Accordingly BERD (business enterprises and private non-profit institutions) still accounted for approximately 58% of Portugal's GERD in 2009, as it did in 2008.
- The data shows the increasing role of higher education institutions as a driver of growth in Portugal's R&D. Between 2008 and 2009, R&D expenditure on higher education grew by approximately 11%. The higher education sector now accounts for approximately 35% of total Portuguese GERD and amounts to 987 million Euros, up from 425 million Euros in 2005.
- In the state sector, the construction and establishment, in 2009, of the International Iberian Nanotechnology Laboratory (INL) in Braga was of particular importance. Total expenditure in this sector grew by 10% between 2008 and 2009 and totalled 206 million Euros in 2009 (amounting to 7% of GERD).
- According to published statistical data, increased training and qualification of new human resources and their institutional integration, and attraction and retention in Portugal of researchers from the rest of the world, are distinctive features of current Portuguese scientific and technological development.

Figure 27

R&D expenditure as a percentage of GDP, by sector of performance, 1982-2009



Note: p – provisional. Source: MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>)

Table 23

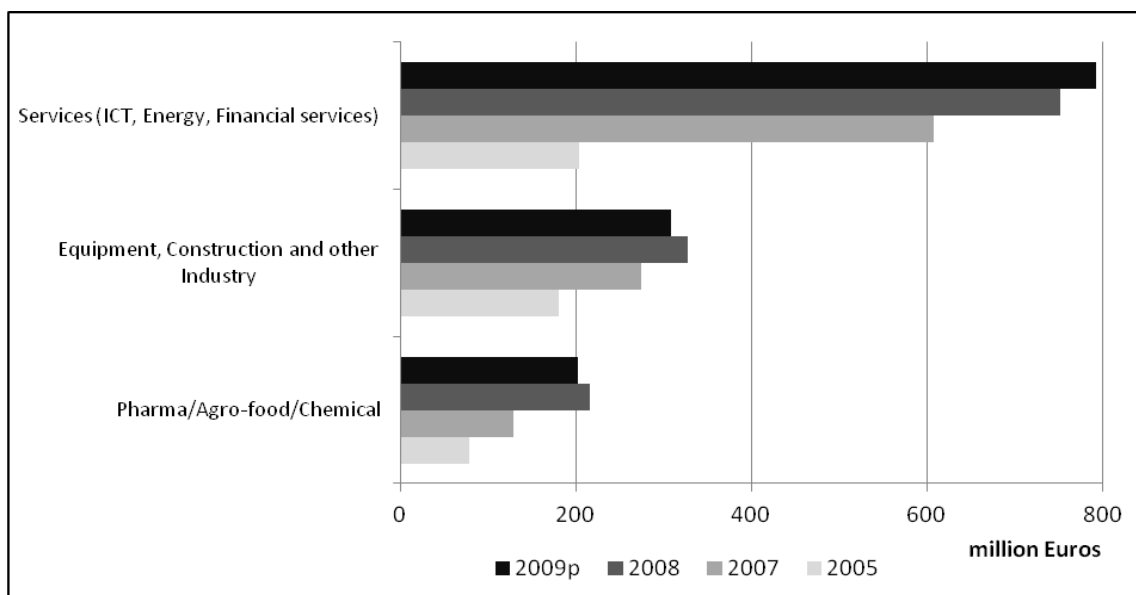
R&D expenditure by sector of performance, by expenditure on salaries and construction, 2005 to 2008 (last year available)

	2005			2008		
	Human resources	Infrastructure	Total	Human resources	Infrastructure	Total
Business enterprises	327.7	134.3	462	893.0	402.1	1,295
Private non-profit Institutions	118.2	20.2	138	180.8	29.6	210
Tertiary education - universities	364.2	22.6	387	721.8	18.9	741
Tertiary education - polytechnics	36.2	2.3	38	148.1	2.5	151
Hospitals	14.2	0.8	15	19.2	1.7	21
Government (including State Laboratories)	141.0	19.6	161	150.3	17.1	167

Notes: Human resources: salaries; Construction: equipment and buildings. Units in millions of Euros.
Sources: GPEARI and MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>)

63. **Business expenditure on R&D (BERD) and its specialization:** Knowledge-intensive services, including ICT, energy and financial services, are the sectors with the highest investments in R&D, and simultaneously those that grew most between 2005 and 2009, 3.9 times in this period (Figure 28 and Annex 5).

Figure 28
Evolution of business R&D expenditure in Portugal between 2005 and 2009



Note: p – preliminary. Source: Source: MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php/IPCTN>, 2005-2009p)

- R&D investment in knowledge-intensive sectors has quadrupled since 2005, of which the financial services and insurance are responsible for the highest increase (nine-fold), led by the largest Portuguese private bank with 82 million Euros invested in R&D in 2008, while communications registered an eight-fold increase, followed by computing (six-fold), with Portugal Telecom, the largest Portuguese investor in R&D, leading in these two sectors.

Box 4.
Portugal Telecom partnering with Portuguese universities in international R&D joint ventures

Portugal Telecom is one of the main industrial partners of the Carnegie Mellon Portugal joint venture, participating actively in professional master's programmes and in several research projects together with Portuguese universities and companies. Major areas of R&D include network security and resilience, through collaborative R&D projects: TRONE - Trustworthy and Resilient Operations in a Network Environment; and WESP - Web Security and Privacy: Weaving Together Technology Innovation with Human and Policy Considerations. Other R&D topics include energy management in data centres being studied under the SENODs project - Cyber-Physical Systems Technologies for Energy-Optimized Data Centres.

Various R&D and student projects led to the establishment in September 2009 of *PTSecurityLab*, a new Portugal Telecom laboratory focused on security issues. *PTSecurityLab* includes a core group of alumni of the Professional Masters in Information Security developed under the Carnegie Mellon Portugal joint venture who did their project internship within CyLab at Carnegie Mellon.

- Private expenditure in the energy sector increased 80-fold from 2005 to 2008, with EDP – the major national electricity DSO – leading the sector with 69 million Euros invested in R&D in 2008, while that in the automotive sector increased seven times, led by Autoeuropa with a 25-million euro R&D expenditure in that year (Autoeuropa is also the firm with the largest number of researchers in the sector).

- During the same period, R&D investment in the agro-food sector increased 3.5 times, with a significant contribution from the beverages conglomerate Unicer. Despite the slight reduction in the sector's R&D expenditure in 2009, there are companies countering this trend, such as Frulact, which increased its R&D expenditure nearly three-fold in just one year.
- R&D in the pharmaceutical industry also grew 1.5 times between 2005 and 2008, led by Bial, which invested nearly 60 million Euros in R&D in 2008.

Box 5.

EDP leading the way in smart grids

EDP (*Electricidade de Portugal*), the major electricity DSO operating in Portugal, has been investing in the development of technologies and systems aiming for increased exploration and integration of renewable energy sources in the power grid. A major smartgrid pilot project – InovGrid – involves the installation of more than 30,000 smart meters in Évora, covering more than half of its inhabitants, and the development and test of the corresponding information, communication and management systems.

EDP is a partner in the project entitled Toward Dynamic Monitoring and Decision (DYMONDS)-Based Smart Distribution Systems, which has been developed under the Carnegie Mellon Portugal joint venture to establish a framework for designing and operating future smart distributed electric power systems. A collaborative effort is introducing the fundamentals of a smart distribution network system. Such a system should be capable of integrating demand response, and many new distributed resources, such as electric vehicles, photovoltaics and small-scale wind generation, while dealing with issues of reliability. The project is led by a consortium that involves researchers from Lisbon and Porto, research institutes (INESC Porto, CIEEE), companies (EDP, EPRI, Logica) and Carnegie Mellon University.

Through the MIT-Portugal joint venture, EDP is a partner in the Green Islands Project for modelling electric grid demand and power system impacts resulting from the market penetration of electric vehicles.

Box 6.

Unicer, R&D to boost competitiveness

Unicer is one of the two companies sharing the Portuguese beer market (totaling 600 million litres per year) and has a strong foothold in the bottled water segment.

Having implemented nearly 100 research projects from 2006 to 2009, it has been using R&D to consistently develop its competitiveness in the beer market, through projects like the dealcoholization process using membranes developed with a Portuguese university that boosted exports to Arab countries; and in the bottled water market, notably through a project with a Portuguese packaging company that helped to create the lightest water bottle in the Portuguese market, reducing the annual consumption of PET (polyethylene terephthalate) by 248 metric tons.

- On the other hand, R&D expenditure decreased during the period 2005-2007 for the electrical appliance and construction sectors, although with a relatively low absolute level overall. This is partly due to methodological issues affecting the classification of companies in the various sectors listed and also to market-related adjustments in these two sectors, which are particularly affected by the demand for construction (especially public infrastructure).

64. **Growth potential of business expenditure on R&D (BERD):** The sustainability of the recent increase in business' share of BERD is discussed on the basis of the relative spread of the number of companies investing in R&D, which has grown at a considerable rate. For 2008 the analysis shows that (see Annex 5 for details):

- The top 5 most R&D-intensive companies account for 30% of BERD
- The top 20 most R&D-intensive companies account for 59% of BERD
- The top 100 most R&D-intensive companies account for 80% of BERD.

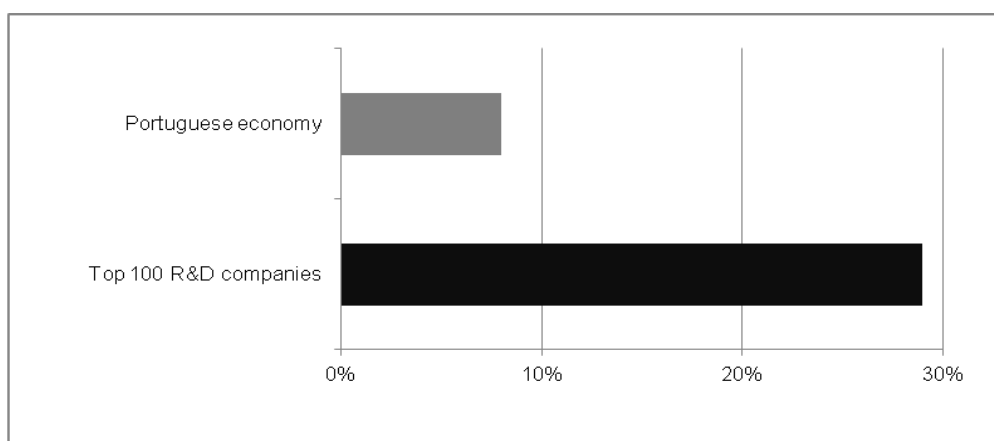
These figures suggest, on the one hand, that business R&D is not dependent on a few large companies, which is a positive sign in terms of the goal of increasing the participation of the private sector in the overall national effort to increase the country's technological intensity. On the other hand, they also suggest that large companies do need to significantly increase their R&D investment in order to enhance routines of scientific employment in the private sector, as well as improving specialization of capacities in emerging areas. In particular, consortia of leading technology companies and scientific institutions can be oriented towards increasing Portuguese exports as a specific way to better facilitate the penetration of Portuguese companies in emerging markets worldwide.

65. **Impact of business expenditure on R&D (BERD):** The top 100 most R&D-intensive companies (as listed in Annex 5) account for 80% of BERD, employing 5% of the total employment by companies in Portugal. These 100 companies represent 23% of the total turnover of companies in Portugal, corresponding to 84,000 million Euros.

- The same group of companies registered around 15,000 million Euros in exports, which corresponds to 29% of total national exports. In fact, the data also show that the exports of this group grew 4 times more between 2007 and 2008 than the total exports of the Portuguese economy (Figure 29).

Figure 29

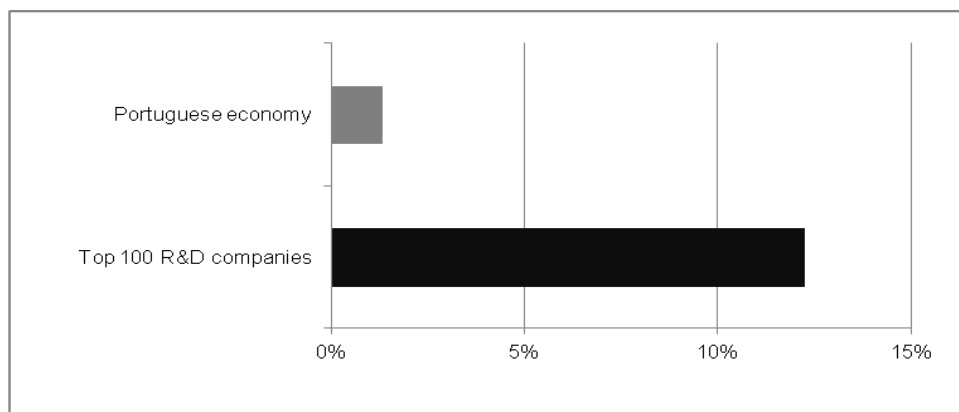
Growth rate of exports between 2007 and 2008 for the Portuguese economy and the 100 companies with the largest R&D expenditure (Annex 5)



Source: INE. GPEARI/IPCTN

- The top 100 most R&D-intensive firms also generated 11,000 million Euros of gross value added (GVA), corresponding to 13% of the total national figure. The value generated in Portugal by these 100 firms, when expressed in terms of GVA, grew by 12% between 2007 and 2008, a growth rate almost 10 times higher than that of the whole of the Portuguese economy in the same period (Figure 30).

Figure 30
Gross value added (GVA) growth rate between 2007 and 2008 for the Portuguese economy and the 100 most R&D-intensive companies



Source: INE; GPEARI/IPCTN

66. **Technology-based start-ups:** Research universities and institutions worldwide are establishing a range of technology transfer offices and commercialization activities, together with industrial liaison programmes, mostly intended to foster entrepreneurial environments and the launching of technology-based start-ups. Bringing ideas to the market is their main goal, and related activities in recent years in Portugal have been particularly promoted by the University Technology Enterprise Network (UTEN). A recent assessment of national inventors, entrepreneurs and companies shows (Annex 6): i) an emerging technological capacity located in Portugal; ii) increasing commercialization interest and potential. Analysis also shows:

- The process of academic spin-off creation has been particularly dynamic throughout the country.
- Indicators of economic activity show that the proportion of knowledge-based firms in Portugal has more than doubled in the last 15 years. Many new firms have been founded in this period, the number of new firms in knowledge-intensive sectors having tripled. In terms of industries, Portuguese academic spin-offs have been created mainly in information and communication technologies, energy/environment and biotechnology.
- Individuals starting these new high-tech firms vary in their education background: 27% of the entrepreneurs graduated in engineering, 18% in medical sciences, 9% in administration and commercial trade, and 9% in humanities.

Box 7.

Innovnano to build the first nanomaterials plant in Portugal

Innovnano is a new technology-based startup, a spinoff of the Grupo José de Mello's chemicals branch, dealing with the production and application of nano- and micro-sized particles in materials.

The start-up has signed a deal to build the first nanomaterials plant in Portugal in a phased investment that will reach 10 million Euros. The plant will start operations in 2012 and will produce 1,000 metric tons of nanomaterials once at full capacity. More than half of its research budget, 3 million Euros in 2010, was devoted to the renewable energy sector.

67. **Funding for R&D through the 7th European Framework Programme (FP7):** The Portuguese participation in the 7th Framework Programme has accounted for about 238 million Euros since 2007, corresponding to about 1.15% of the total EU funding available (as against only 1.03% of the total EU funding available for the 6th Framework Programme, 2002-2006, when it accounted for 172 million Euros). It has been particularly prominent in the components “Ideas” and “Cooperation”, as follows (Table 24):

- In “Ideas”, the Portuguese success rate in terms of funding is above the EU average.
- In “Capacities”, Portuguese teams have been particularly successful in obtaining funding in the themes Knowledge Based Bio-Economy (KBBE), ICT, Environment, Space and Safety, also obtaining high success rates in the thematic areas of Energy, Social Sciences and Humanities, as well as in the ERA-NETs.
- In 2010 there were 243 Portuguese participations (approved projects) in the 7th Framework Programme, of which 94 were firms, corresponding to about 39% of all Portuguese participations (Table 24). The number of projects involving higher education institutions was the second largest, with 69 participating organizations.

Table 24
Summary of Portuguese participation in FP7

		2007	2008	2009	2010
Projects – approved EU		3259	2517	3123	2461
Projects – approved PT		260	181	196	174
Projects - coordinated PT		33	44	48	26
Number of participations PT (approved projects)					
	Higher education, research units and others	67%	70%	67%	61%
	Firms	33%	30%	33%	39%
Funding EU (MEuros)		6732	4095	4835	5081
Funding PT (MEuros)		70	55	55	58
Success rate (EU)		13%	20%	19%	14%
Success rate (PT)		16%	19%	20%	22%
Percentage of funding obtained by Portugal		1.04%	1.34%	1.15%	1.14%

Source: FCT/Office for the promotion of the 7th Framework Programme

68. **The potential and the need to continue to grow research expenditure in Portugal: comparing research intensities across the OECD.** The number of researchers in Portugal and related gross expenditure have been rising in recent years at one of the highest rates seen in the OECD, and analysis clearly indicates that they need to continue to grow. This can be analyzed in terms of research intensities measured through research funding available per researcher or research expenditure per inhabitant, both of which are still relatively low compared with the majority of European countries (Table 25). This is important because low research intensities are associated throughout the OECD with constraining factors affecting research activities and related research outcomes. Two main issues should be considered, as in the following paragraphs.

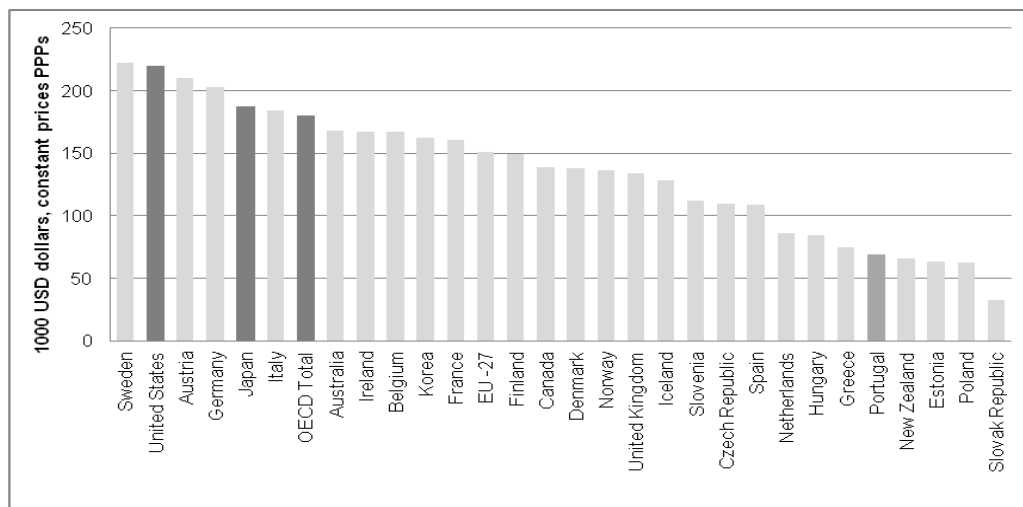
Table 25
R&D expenditure per researcher (1000 USD / FTE) and GERD per capita
for 2009 or last available year, in selected OECD countries

Country	R&D expenditure per researcher				GERD/ population	Reference year
	Total	Business sector	Higher education sector	Government sector		
Sweden	223	250	163	311	1114	2009
United States	220	199	n.a	n.a	1030	2007
Austria	210	234	157	256	866	2009
Germany	203	240	133	188	773	2009
Japan	188	196	116	320	966	2008
Italy	184	251	137	157	311	2009
OECD Total	181	197	110	276	599	2007
Australia	168	347	70	229	711	2008
Ireland	168	211	113	195	558	2009
Belgium	168	241	85	189	578	2009
Korea	162	158	123	297	787	2008
France	161	178	107	324	574	2008
European Union -27	151	206	88	161	463	2009
Finland	150	185	94	123	1145	2009
Canada	139	125	147	228	603	2007
Denmark	138	150	121	107	882	2009
Norway	137	144	128	133	754	2009
United Kingdom	134	243	59	355	527	2009
Iceland	129	145	115	110	929	2008
Slovenia	112	164	61	80	408	2009
Czech Republic	109	149	59	107	299	2009
Spain	109	164	64	121	318	2009
Netherlands	86	199	186	170	593	2007
Hungary	84	108	58	69	169	2009
Greece	75	69	63	151	139	2007
Portugal	69	137	40	70	299	2009
New Zealand	66	109	32	157	287	2007
Estonia	63	93	48	58	203	2009
Poland	63	112	38	100	101	2009
Slovak Republic	33	109	12	54	81	2009

Note: figures are in US dollars at 2000 constant prices (PPPs). Total R&D expenditure per researcher at national level was calculated by dividing GERD by the total number of researchers (FTE); total R&D expenditure per business researcher was calculated by dividing BERD by the total number of business sector researchers (FTE); total R&D expenditure per higher education researcher was calculated by dividing HERD by the total number of higher education researchers (FTE); total R&D expenditure per government researcher was calculated by dividing GOVERD by the total number of government researchers (FTE).
Source: OECD, MSTI indicators accessed online through OLIS, April 2011.

- First, total funding available per researcher in Portugal in 2009 was only 46% of the EU-27 average, while the average funding available for a university researcher in Europe was 80% of that for a Japanese researcher and 31% of that for a US researcher (Figure 31). For example, R&D expenditure per researcher in Portugal is only 63% of that in the Czech Republic or in Spain.

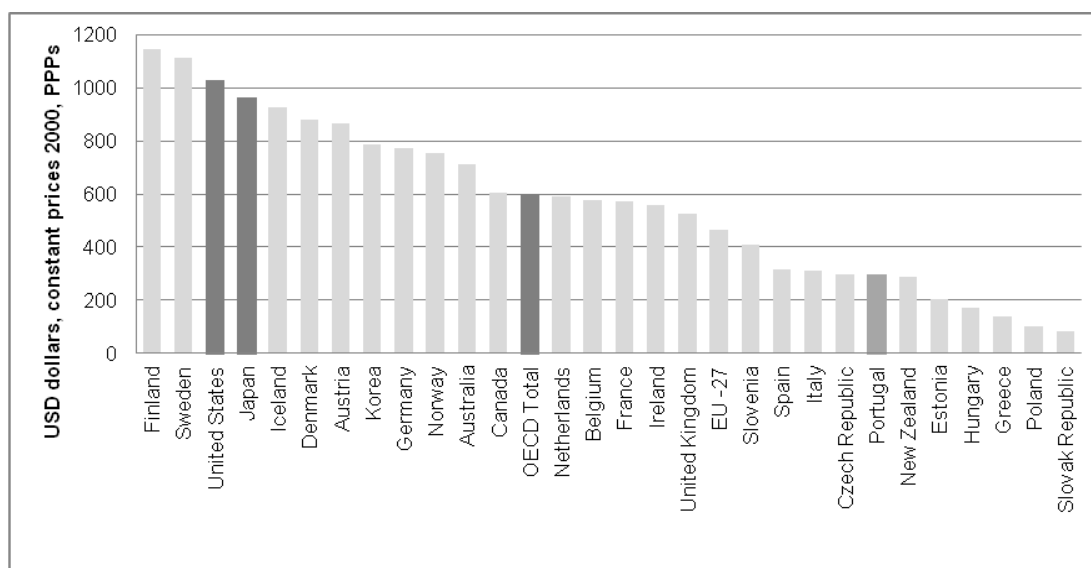
Figure 31
R&D expenditure by researcher (1000 USD / FTE), 2009 or last available year, in selected OECD countries



Source: OECD, MSTI indicators accessed online through OLIS, April 2011.

- Second, gross R&D expenditure per inhabitant in Portugal in 2009 was about 65% of the average for EU-27. This indicates that the contribution of the Portuguese population to science is still low compared with that of other OECD countries (Figure 32). For example, the average contribution of each Portuguese citizen to science is similar to countries such as the Czech Republic, but is still lower than that in Spain, Slovenia or Italy (i.e., countries which Portugal has surpassed in terms of researchers per one thousand workforce).

Figure 32
GERD per capita for 2009 or last available year, in selected OECD countries



Source: OECD, MSTI indicators accessed online through OLIS, April 2011.

69. **Promoting wealth creation through technological change.** The above analysis indicates the need to give constant priority to people and knowledge in a way that provides networks of institutions with the necessary critical mass capable of promoting the international standing of Portuguese scientific and tertiary education institutions. The analysis has emphasized the following:

- First, innovation must be considered together with competence building and advanced training in individual skills through the complex interactions between formal and informal qualifications. This requires a broadening of the social basis for knowledge activities, including higher education enrolment, and strengthening the top of the research system leading to knowledge production at the highest level.
- Second, strengthening experimentation in social networks necessarily involves flows of people. It is organized cooperation among networks of knowledge workers, together with different arrays of users, that will help diffuse innovation. But establishing these innovation communities requires the systematic development of routines of collaboration on the basis of sophisticated research projects, as well as the design of products and services. This requires public policies to foster “brain circulation” between leading institutions worldwide.

Chapter 5. Planning the future: the National Plan of Reforms towards EU 2020

The previous chapters show that recent years have been characterized by rapid development of science, technology and tertiary education in Portugal, based on a framework of continuous institutional reform, but also in a context of increasingly strained public finances. The National Plan of Reforms, Portugal 2020, was defined in the first quarter of 2011 and presented to the European Commission as a way to plan future developments in line with the EU2020 strategy. It takes into consideration increased financial constraints affecting the development of the Portuguese economy and society in coming years, as well as the need to foster growth. In this context, the present chapter discusses the two targets included in the National Plan of Reforms, Portugal 2020, regarding science, technology and tertiary education.

70. **Tertiary education – setting the goals.** Despite the rapid development of tertiary education in Portugal in recent years, the national contract for the development of higher education 2010-2014 focuses on further developing skills in the population to increase its broad competitive participation in knowledge-related activities. Tertiary education graduates aged 30-34 years represented 11% of this population cohort in 2000 and 22% in 2008. A simple projection of current tertiary education students aged 20-24 years, plus those that already hold a tertiary education degree, and keeping the current rates of completion of tertiary education degrees constant, leads us to assume that Portugal will reach about 30% of graduates in the population aged 30-34 years in 2020. Consequently, in order to achieve the EU 2020 goal of 40% of graduates in that population cohort by 2020, it is necessary for more than 60,000 people aged between 20 and 24 to graduate in addition to the current graduation levels.

Main Goal (2020): to achieve 40% of graduates in tertiary education (or equivalent, including EQF level 5) in the population aged 30-34 years.

Medium-term goal (2014): to increase the qualification levels of the Portuguese population, graduating more than 100,000 people in tertiary education (or equivalent, including EQF level 5), achieving 30% of graduates in the population aged 30-34 years.

The reasons supporting these targets are the following:

- The extension of compulsory education in Portugal to a minimum of 12 years by 2015;
- The national contract of higher education, signed in 2010, aimed to increase the number of graduates by 100,000 by 2014;
- The potential for growth of short-term cycles, EQF level 5 (CETs) in Portugal;
- The potential for growth of distance learning in Portugal;
- The progressive increase of completion rates in tertiary education;
- The expected increase of young adults who will complete secondary education later in their lives (through the New Opportunities Programme);
- The work of A3ES, which assures the quality of tertiary education degrees.

At the same time, the evolution of the Portuguese tertiary education system depends on the following:

- The continuation of public policies supporting the qualification of human resources;
- The continuation of the budget priority given to the development of tertiary education, in a context of demanding budget constraints;
- The continuation and reinforcement of European Structural Funds to sustain student grants, the student social support system and other instruments promoting greater inclusiveness in tertiary education.

In this context, three major guidelines have been identified to continue the development of the Portuguese tertiary education system (as described in Table 26): i) the need to qualify; ii) the need to restructure the range of degree programmes and improve the efficiency of higher education institutions; and iii) the need to promote the employability of graduates.

Table 26
Major guidelines for the future of tertiary education in Portugal: Qualify, restructure range of degrees and reinforce efficiency and employment

Major guidelines/objectives	Main policy instruments	Targets for 2020
<p>Qualify: To enlarge the social base of recruitment in tertiary education</p>	<ul style="list-style-type: none"> • Widen the offer of EQF level 5 degrees (CETs) • Enlarge the distance learning network • Promote professionally oriented master’s degrees • Improve mechanisms to optimize social support for wider participation in tertiary education 	<ul style="list-style-type: none"> • Qualify 100,000 more students by 2014 and achieve 40% of graduates in tertiary education (or equivalent, including EQF level 5) in the population aged 30-34 years by 2020. • Triple the number of students enrolled in CETs • Quadruple the number of students enrolled in distance learning
<p>Restructure range of degree programmes and reinforce efficiency: Optimize resources and degree offering</p>	<ul style="list-style-type: none"> • Reinforce self-regulatory mechanisms to foster systemic efficiency • Rationalize the structure of academic staff <ul style="list-style-type: none"> • Share services • Reduce energy and communication costs 	<ul style="list-style-type: none"> • Reduce the number of curricular units <ul style="list-style-type: none"> • Reorganize the range of degrees • Support evaluation and accreditation processes and exercises
<p>Foster employment: Support the employment of tertiary education graduates</p>	<ul style="list-style-type: none"> • Systematize procedures to inform tertiary education students and graduates about the employability prospects of different tertiary education degrees • Foster an integrated network of services that support employment of graduates and entrepreneurship • Create a Permanent Forum for the Employability of Young Graduates 	<ul style="list-style-type: none"> • Foster the employment of young graduates

71. **Research and Development – setting the goals:** R&D and tertiary education systems in Portugal have had a much more integrated development in recent years, as the country finally managed to tackle the scientific backwardness that characterized the last century. Public and private expenditure on R&D has increased consistently, attaining 1.71% of GDP in 2009 (as against only 0.81% in 2005 and 0.68% in 2001). This growth has been matched by an increase in the number of researchers, which exceeded the EU average in 2009, when measured per thousand workforce (the number of researchers per thousand workforce in Portugal grew to 8.2 in 2009 from 3.8 in 2005 and 3.3 in 2001). Overall, in just four years, R&D intensity and the number of researchers per thousand workforce more than doubled, and made Portugal the European country where these indicators had the fastest growth. But, still, these figures remain relatively low compared to the most developed European regions, and so growth should continue to foster productivity levels and modernize the structure of Portuguese exports, which already represent a key feature in the modernization of the national economy.

Main Goal (2020): to achieve between 2.7% and 3.3% expenditure on R&D as a percentage of GDP (1.0% to 1.2% in the public sector and 1.7% to 2.1% in the private sector)

Medium-term goal (2014): to reach the European average in R&D expenditure as a percentage of GDP (1.9%)

In setting these goals, it is recognized that the evolution of the Portuguese R&D system for the coming years depends on the following:

- The continuation of public policies that support scientific and technology development;
- The need to maintain and increase the research and development budget, in a period of financial constraints;
- The need to continue to use European Structural Funds to support the qualification of human resources, to promote scientific employment, and to provide better conditions for young researchers to develop their skills and activities, also promoting knowledge-based entrepreneurship;
- The availability and access to European Union science policy instruments to attract and retain highly qualified human resources from outside the EU, to support the build-up of critical mass and integration in high quality scientific networks, and the launch of high-tech firms;
- The capacity of the business sector to expand, to invest in research and development and to become more innovative.

Meanwhile, the State budget of 2011, approved by Parliament in November 2010, assured the upgraded continuation of the R&D tax incentive scheme for firms for the next five years (SIFIDE II, 2011-2014). This tax scheme particularly benefits the hiring of doctorates by firms, and is considered one of the most attractive R&D tax schemes in the European Research Area.

Nowadays, it is clear that the knowledge dynamic, as well as scientific production, technological development, integration between tertiary education and science, and national and international relevance are key assets for the future of any country. In Portugal, the potential for growth is still substantial, in both public and private sectors. Therefore, three major guidelines, focused on people, institutions and internationalization, are key to assure the sustainable development of science and technology in Portugal (Table 27).

Table 27

Major guidelines for the future of science in Portugal: People, Institutions, Internationalization

Major guidelines/objectives	Main policy instruments	Targets for 2020
<p>People Train, attract and hire more researchers, fostering the concentration of researchers in Portugal</p>	<ul style="list-style-type: none"> • Sustain excellence and internationalization in doctoral programmes • Foster and systematize the hiring of researchers with PhDs • Promote scientific experimentation in schools and continue to foster public understanding of science, through <i>Ciência Viva</i> 	<ul style="list-style-type: none"> • Increase by 30% the proportion of the population engaged in R&D activities • Increase by 20% the number of doctorates working in firms. • Double the number of researchers and other highly qualified human resources
<p>Institutions Reinforce and promote the role of scientific institutions in society, and their links with the private sector (promoting R&D in business enterprises)</p>	<ul style="list-style-type: none"> • Reinforce institutional evaluation mechanisms, in order to improve systemic and organizational efficiencies • Adopt policies that foster the creation of critical mass, including policies oriented towards fostering R&D consortia. Promote the training of a new generation of technicians and other human resources to support R&D activities 	<ul style="list-style-type: none"> • Double the technicians/researchers ratio • Double the number of researchers in firms
<p>Internationalization Facilitate the integration of researchers and scientific institutions in international networks focused on the production and dissemination of knowledge</p>	<ul style="list-style-type: none"> • Reinforce ongoing international partnerships and foster participation in other European and international knowledge-based networks as a way to improve scientific quality and the employability of researchers holding PhDs • Foster S&T thematic networks that can boost Portuguese companies' capacity to export and access emerging markets. Foster scientific and technology cooperation among Portuguese-speaking countries. Promote scientific and technology cooperation with other regions of the world, particularly Asia, Latin America, the Middle East, and other countries in the Mediterranean basin. 	<ul style="list-style-type: none"> • Double the number of internationally refereed publications; • Increase the number of S&T thematic networks that focus on companies' capacity to export and access emerging markets.

Annexes

- 1: Agenda and list of participants of the OECD seminar on Science, Technology and Innovation and Higher Education Policy Developments in Portugal, 20 April 2011, OECD, Paris
- 2: Sample Tertiary Education Indicators for Portugal (2003-2010)
- 3: Summary of the Development Plans of all public higher education institutions, as associated with the national contract for the development of tertiary education (2010-2014)
- 4: Sample Science and Technology Indicators for Portugal (2003-2010)
- 5: Associated Laboratories: List and Development
- 6: Main contributions to Government Budgets for R&D – GBOARD (Government Budget Appropriations or Outlays for Research and Development), 2005-2011
- 7: Portuguese Participation in the European Union 7th Framework Programme – overall summary 2010
- 8: Business enterprises with the largest R&D expenditures (intramural):
 - 8.1: Ranking for 2008
 - 8.2: Ranking for 2009
- 9: Sample list of academic spin-offs and technology-based start-ups created in the period 2005-2010, as identified through the University Technology Enterprise Network (UTEN)

Annex 1:

Agenda and list of participants of the OECD seminar on

**Science, Technology and Innovation and Higher
Education Policy Developments in Portugal,**

20 April 2011, OECD, Paris

Wednesday, 20th April 2011 – 14:30
Chateau de la Muette – Room G

14.30- 14.35 **Welcome and introduction to the seminar**

Yuko Harayama, Deputy Director, Directorate for Science, Technology and Industry
Bernard Huggonier, Deputy Director, Education Directorate

14.35-15.45 **Session 1: Innovation, R&D to Boost Productivity and Economic Growth**

Investments in intangible assets such as R&D and human capital are increasingly driving productivity growth in OECD and in some OECD countries investments in intangibles exceed investment in machinery, equipment and buildings.

Portugal has invested heavily in intangibles such as public and private R&D and human capital in the past decade, helping to improve innovation performance in firms and growth of the export sector. However, the productivity performance of Portuguese industry has remained extremely poor despite the increasing investment in R&D both by the government and by businesses. That might point to a number of complementary conditions which need to be met and complementary policies which need to be implemented in order to transform investments in intangibles and innovation into productivity gains. In fact, a key lesson from the OECD Innovation Strategy is that innovation is more than R&D and includes marketing, design and organizational capital. Investment in ICTs in particular (as a general purpose technology) is also important for increasing productivity in services and manufacturing as well as enabling entrepreneurship.

This session will explore what conditions enable investment in intangibles like R&D and innovation to be transformed into productivity gains and growth. In particular, what is the scope for improving the contribution of the scientific system to business innovation? What role for firms and government in improving the skills and productivity of the adult working population? What is the role and scope for demand-side innovation policies and instruments -- such as regulations, public procurement, user-driven innovation initiatives, etc. -- to increase incentives for R&D and innovation performance in the business sector, both services and manufacturing?

Debate by OECD experts, the Portuguese delegation and other participants

Initial interventions:

José Mariano Gago, Minister of Science, Technology and Higher Education, Portugal
Manuel Heitor, Secretary of State for Science, Technology and Higher Education, Portugal

Roundtable Discussion

Debate to be initiated by:

Dominique Guellec, DSTI

Possible issues for discussion

- *Investment in intangible assets for innovation and growth*
- *Improving the contribution of the scientific system to business innovation in old and new growth sectors*
- *Linking supply and demand-side innovation policies and instruments to enhance innovation performance, productivity and economic growth*
- *Developing skills for innovation, including through adult education and training*
- *Entrepreneurship*

Debate by OECD experts, the Portuguese delegation and other participants

15.45-16.00 *Coffee break*

16.00-17.15

Session 2 Building, Preserving and Expanding Capacity for Higher Education, Science, Technology and Innovation

Portugal has rapidly expanded its capacity for science, technology and innovation. A key element of capacity building has centred on higher education and human capital. The number of researchers increased from 7.2 to 8.2 per 1000 labour force. The number of business researchers has increased as the number of firms carrying out R&D has expanded. In addition, Portugal has made progress in the quality of the scientific infrastructure and output and established linkages to global scientific and innovation networks. At the same time, capacity building is a dynamic and cumulative process. In the context of fiscal consolidation, growing unemployment and limits to fiscal stimulus to domestic demand, how can Portugal preserve these recent investments and even expand further its capacity to carry out R&D and innovation? What types of R&D investments need to be prioritised in a context of extreme budgetary constraint? How to better link higher education to industry's needs?

Roundtable Discussion

Debate to be initiated by:
Deborah Roseveare, EDU

Possible issues for discussion

STI capacity building

International higher education and research networks

Priority setting for public research and researcher training

Sectoral mobility and international mobility

Debate by OECD experts, the Portuguese delegation and other participants

17.15-17.30

Close of the Seminar

José Mariano Gago, Minister of Science, Technology and Higher Education of Portugal

List of Participants

Portuguese Delegation

José Mariano Gago, Minister of Science, Technology and Higher Education
Manuel Heitor, State Secretary for Science, Technology and Higher Education
João Sentieiro, President, Foundation of Science and Technology
António Rendas, President, Portuguese Universities Rectors' Council
João Sobrinho Teixeira, President, Portuguese Coordinating Council of Polytechnic Institutions
Alexandre Quintanilha, Secretary, Portuguese Council of Associate Laboratories

Portuguese Enterprise Association

José António Barros, President
Diamantino Costa, President/CEO, Critical Software
Domingos Almeida, Director of Innovation, FRULACT

OECD Secretariat

Directorate for Education

Bernard Hugonnier, Deputy Director
Richard Yelland, Head of Division, Education Management and Infrastructure Division
Deborah Roseveare, Head of Division, Education and Training Policy Division

Directorate for Science, Technology and Industry

Yuko Harayama, Deputy Director
Dominique Guellec, Head of Division, Country Studies and Outlook Division
Mario Cervantes, Principal Administrator, Science and Technology Policy Division
Alistair Nolan, Senior Economist, Structural Policy Division
Fernando Galindo-Rueda, Senior Economist, Science and Technology Policy Division

Economics Department

David Haugh, Senior Economist, Country Studies, Portugal

**Annex 2:
Sample Tertiary Education Indicators for Portugal (2003-2010)**

Indicator	Source	2003	2004	2005	2006	2007	2008	2009	2010(e)
A – ENROLLED STUDENTS AND GRADUATES									
Enrolled students (first time, first year, public and private HEIs)	(1)	89,269	84,586	83,773	96,769	117,665	119,298	126,735	128,000
Total students enrolled (public and private HEIs)	(1)	395,063	381,231	368,561	368,982	381,721	378,834	389,841	425,802
Enrolment in tertiary education in relation to the same age group population	(1)								
18 years		19.0%	18.9%	18.9%	19.9%	19.2%	21.9%	26.0%	27.4%
19 years		26.0%	26.5%	25.8%	26.6%	27.3%	30.7%	32.9%	34.2%
20 years		29.8%	30.0%	30.2%	29.5%	30.5%	33.0%	35.7%	36.8%
30-34 years		3.6%	3.6%	3.5%	3.5%	3.8%	4.1%	4.1%	4.3%
35-39 years		2.1%	1.9%	1.9%	1.9%	2.1%	2.4%	2.5%	2.6%
40-44 years		1.3%	1.3%	1.2%	1.2%	1.4%	1.6%	1.7%	1.8%
Enrolled students in short term cycles (Technological Specialisation Courses, CETs)	(1)	-	-	294	1,259	2,253	4,811	5,832	5900
Tertiary education graduates (public and private HEIs)	(1)	-	-	69,987	71,828	83,276	84,009	76,567	81,182
New graduates in S&T per 1000 population aged 20-29 (public and private HEIs)	(1)	-	-	12.0	12.6	18.1			
B - FUNDING									
Student direct social support system: Number of student grants in public and private HEIs	(2)	-	-	-	70,603	73,493	73,063	74,935	n.a,
% of tertiary education students supported by public grants	(2)	-	-	-	19.2	19.9	19.3	19.2	n.a.
Total student loans (public system of mutual guarantee; accumulated)	(2)	0	0	0	0	1.524	6.452	11.108	14.019
Total expenditure on tertiary education (public and private) as percentage of GDP	(3)	-	-	-	1.4%	1.6%	n.a.	n.a.	n.a.
Total income of public HE as % of GDP, including student grants	(1)	-	-	1.17%	1.15%	1.10%	1.13%	1.20%	1.24%
Total income of public HEIs, excluding student grants (million Euros)	(1)			1.703	1.751	1.751	1.821	1.868	1.984
Total tuition fees in public HEIs (million Euros)	(1)	-	-	187	212	234	257	278	283
% tuition fees income in relation to total income of public HE	(1)	-	-	10.4%	11.5%	12.5%	13.2%	13.8%	13.2%

Sources: (1) MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>);
(2) Direcção Geral do Ensino Superior (DGES); (3) OCDE. Education at a Glance

Annex 3:

Summary of the Development Plans of all public higher education institutions, as associated with the national contract for the development of tertiary education (2010-2014)

INSTITUTION	TOTAL Graduates 2009	TOTAL Graduates 2011	TOTAL Graduates 2012	TOTAL Graduates 2013	TOTAL Graduates 2014	Increase of Graduates 2010-2014	%
UNIVERSIDADE ABERTA	587	1,730	1,882	2,015	2,055	5,334	4.9%
UNIVERSIDADE DOS AÇORES	633	700	695	770	815	800	0.7%
UNIVERSIDADE DO ALGARVE	1,751	2,619	2,674	2,634	2,684	3,607	3.3%
UNIVERSIDADE DE AVEIRO	3,139	3,347	3,892	4,544	5,155	4,382	4.1%
UNIVERSIDADE DA BEIRA INTERIOR	1,236	1,796	1,821	1,891	1,891	2,455	2.3%
UNIVERSIDADE DE COIMBRA	4,042	4,958	5,529	6,060	6,481	6,860	6.4%
UNIVERSIDADE DE ÉVORA	1,200	1,645	1,770	1,885	1,900	2,400	2.2%
UNIVERSIDADE DE LISBOA	3,957	4,459	5,073	5,595	6,159	5,458	5.1%
UNIVERSIDADE DA MADEIRA	660	684	930	1,073	1,051	1,098	1.0%
UNIVERSIDADE DO MINHO	3,943	4,573	5,213	5,703	6,073	5,790	5.4%
UNIVERSIDADE NOVA DE LISBOA	3,231	4,150	4,467	5,001	5,267	5,961	5.5%
UNIVERSIDADE DO PORTO	7,200	8,800	9,630	10,170	10,900	10,700	9.9%
UNIVERSIDADE TÉCNICA DE LISBOA	4,953	5,583	6,373	7,048	7,708	6,900	6.4%
UNIVERSIDADE DE TRAS-OS-MONTES E ALTO DOURO	1,189	1,410	1,789	1,994	2,146	2,583	2.4%
ISCTE - INSTITUTO UNIVERSITÁRIO DE LISBOA	1,458	2,050	2,150	2,270	2,400	3,038	2.8%
SUB-TOTAL - Universities	39,179	48,504	53,888	58,653	62,685	67,366	62.5%
		23.8%	37.5%				
INSTITUTO POLITÉCNICO DE BEJA	625	770	922	1,072	1,221	1,485	1.4%
INSTITUTO POLITÉCNICO DE BRAGANÇA	1,310	1,542	1,849	2,138	2,333	2,622	2.4%
INSTITUTO POLITÉCNICO DE CASTELO BRANCO	1,147	1,275	1,581	1,928	2,146	2,342	2.2%
INSTITUTO POLITÉCNICO DO CÁVADO E DO AVE	356	378	476	626	711	767	0.7%
INSTITUTO POLITÉCNICO DE COIMBRA	2,255	2,432	2,749	2,910	2,998	2,069	1.9%
INSTITUTO POLITÉCNICO DA GUARDA	724	944	1,018	1,128	1,228	1,422	1.3%
INSTITUTO POLITÉCNICO DE LEIRIA	2,090	2,965	3,200	3,375	3,598	4,778	4.4%
INSTITUTO POLITÉCNICO DE LISBOA	1,767	1,847	2,512	2,882	2,956	3,129	2.9%
INSTITUTO POLITÉCNICO DE PORTALEGRE	649	691	768	977	1,299	1,139	1.1%
INSTITUTO POLITÉCNICO DO PORTO	2,290	3,494	3,713	3,956	4,230	6,233	5.8%
INSTITUTO POLITÉCNICO DE SANTARÉM	872	902	1,293	1,752	1,803	2,262	2.1%
INSTITUTO POLITÉCNICO DE SETÚBAL	1,400	1,519	1,717	1,887	2,139	1,662	1.5%
INSTITUTO POLITÉCNICO DE TOMAR	754	957	1,081	1,380	1,276	1,678	1.6%
INSTITUTO POLITÉCNICO DE VIANA DO CASTELO	624	747	870	993	1,118	1,232	1.1%
INSTITUTO POLITÉCNICO DE VISEU	1,185	1,576	1,956	2,195	1,829	2,816	2.6%
ESC NÁUTICA INFANTE D. HENRIQUE	67	119	136	163	166	316	0.3%
ESC SUP DE HOTELARIA E TURISMO DO ESTORIL	278	503	814	886	999	2,090	1.9%
ESC SUP DE ENFERMAGEM DE LISBOA	295	526	578	625	631	1,180	1.1%
ESC SUP DE ENFERMAGEM DE COIMBRA	484	662	662	738	738	864	0.8%
ESC SUP DE ENFERMAGEM DO PORTO	328	328	384	497	499	396	0.4%
SUB-TOTAL - Polytechnics	19,500	24,177	28,279	32,108	33,918	40,482	37.5%
			45.0%	64.7%	73.9%		
Total	58,679	72,681	82,167	90,761	96,603	107,848	

Annex 4:
Sample Science and Technology Indicators for Portugal, 2003-2010

indicator	Source	2003	2005	2007	2008	2009 p	2010 e
A - EXPENDITURE							
Total Government budget appropriations or outlays for R&D (GBAORD) as percentage of GDP (%)	(1,3)	0.61	0.78	0.78	0.89	0.92	1.02
Gross domestic expenditure on R&D -- GERD (million Euros)	(1,3)	1,020	1,201	1,972	2,585	2,791	n.a.
GERD as percentage of GDP (%)	(1,3)	0.74	0.81	1.21	1.55	1.71	n.a.
Business expenditure on R&D -- BERD as percentage of GDP (%)	(1,3)	0.24	0.31	0.62	0.78	0.80	n.a.
BERD (million Euros)	(1,3)	338	462	988	1,295	1,303	n.a.
Funding of S&T institutions by FCT (includes research units, Associate Laboratories and INL; expenditure in million Euros)	(2)	56,478 (2004)	56,074	81,669	96,803	87,513	94,071
Funding of R&D projects (competitive) by FCT (expenditure in million Euros)	(2)	25,035 (2004)	29,040	65,746	81,027	79,367	85,138
Funding of R&D projects by FCT (number of projects)	(2)	-	2,078	-	3,310	-	3,800p
Research and advanced training grants directly funded by FCT (includes PhD and post-doc grants; expenditure in million Euros)	(2)	-	99,758 (2006)	126,846	178,003	152,848	167,077
Scientific employment (five-yeaR contracts for doctorate researchers, million Euros)	(2)	-	-	-	-	44,865	50,263
National Science and Education Network infrastructure (expenditure in million Euros)	(7)	6.2	18.2	23.8	24	25	25
B - HUMAN RESOURCES							
Total researchers (FTE)	(1,3)	20,242	21,126	28,176	40,408	45,909p	n.a.
Total researchers per thousand workforce	(1,3)	3.7	3.8	5.0	7.2	8.2p	n.a.
Higher education researchers (FTE)	(1,3)	10,062	10,956	13,114	23,138	28,086p	n.a.
Percentage of faculty holding a PhD at public universities	(1)	52%	57%	64%	66%	68%	n.a.
Percentage of faculty holding a PhD at private universities	(1)	23%	26%	31%	34%	39%	n.a.
Percentage of faculty holding a PhD at public polytechnics	(1)	9%	11%	15%	17%	19%	n.a.
Business sector researchers (FTE)	(1)	3,794	4,014	8,477	10,312	10,841p	n.a.
Business sector researchers as percentage of total researchers	(1)	19%	19%	30%	26%	24%p	n.a.
Total business sector R&D personnel (FTE)	(1)	6,124	6,133	12,784	14,510	14,698p	n.a.
Number of new PhDs yearly	(1)	1,027	1,199	1,461	1,520	1,569p	n.a.
Number of new PhDs yearly (female)	(1)	46%	49%	48%	51%	52%	n.a.
New PhD grants sponsored by FCT	(2)	684	1,195	2,029	1,935	1,922	1556
New postdoctoral grants sponsored by FCT	(2)	299	302	689	519	625	689
New doctorate research contracts sponsored by FCT	(2)	-	-	42	538	629	0
Total PhD grants sponsored by FCT (ongoing – excluding PhD grants in business and industry)	(2)	-	4,017	5,497	6,620	7,707	8,504
Total PhD grants sponsored by FCT in collaboration with business and industry	(2)	-	43	94	116	124	132
Total postdoctoral fellowships sponsored by FCT (ongoing)	(2)	-	1,183	1,749	1,925	1,851	2,044
Total doctorate research contracts sponsored by FCT (ongoing)	(2)	0	0	42	580	1,110	1209
C - OUTPUT							
Number of Portuguese patent applications to the EPO	(5)	31	37	70	86	89	95p
Number of Portuguese patents granted by the USPTO	(6)	46 (2004)	8	14	27	22	22p
Scientific publications	(4)	-	3,906 (2004)	5,514	6,758	7,470	n.a.

Note: p – provisional data. Sources: (1) MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>); (2) Science and Technology Foundation, www.fct.mctes.pt; (3) OECD, Main Science and Technology Indicators; (4) GPEARI/MCTES, ISI Thomson Reuters SCI Portugal; (5) European Patent Office EPO; (6) US patent and Trademark Office USPTO; (7) Knowledge Society Agency (UMIC);

Annex 5: Associate Laboratories

5.1 Associate Laboratories created between 2000 and 2006:

2000:

- Centro de Neurociências e Biologia Celular – CNC
- Instituto de Biologia Molecular e Celular – IBMC-INEB
- Instituto de Patologia e Imunologia Molecular da Universidade do Porto – IPATIMUP
- Instituto de Tecnologia Química e Biológica – ITQB

2001:

- Instituto de Plasmas e Fusão Nuclear – IPFN
- Instituto de Medicina Molecular – IMM
- Laboratório Associado de Química Verde -Tecnologias e Processos Limpos – REQUIMTE
- Laboratório de Instrumentação e Física Experimental de Partículas – LIP
- Instituto de Telecomunicações – IT
- Instituto de Sistemas e Robótica Lisboa – ISR Lisboa

2002:

- Centro de Investigação em Materiais Cerâmicos e Compósitos – CICECO
- Centro de Investigação Marinha e ambiental – CIMAR
- Centro de Estudos Sociais – CES
- Instituto de Ciências Sociais – ICS
- Instituto de Engenharia de Sistemas e Computadores do Porto – INESC-Porto

2004:

- Centro de Biotecnologia e Química Fina – CBQF
- Centro de Estudos do Ambiente e do Mar – CESAM
- Instituto Dom Luís – IDL
- Instituto de Engenharia de Sistemas e Computadores, I&D – Lisboa – INESC-Lisboa
- Laboratório de Processos de Separação e Reacção – LSRE
- Centro de Malária e Outras Doenças Tropicais – CMDT

2006:

- Instituto de Biotecnologia e Bioengenharia – IBB
- Instituto de Nanotecnologias – IN
- Instituto de Nanoestruturas, Nanomodelação e Nanofabricação – I3N
- Laboratório Associado de Energia, Transportes e Aeronáutica – LAETA

5.2 Associate Laboratories and Consortia, April 2011

- Centro de Neurociências e Biologia Celular – CNC
- Instituto de Biologia Molecular e Celular – IBMC – INEB
- Instituto de Patologia e Imunologia Molecular da Universidade do Porto – IPATIMUP
- Instituto de Tecnologia Química e Biológica
- Instituto de Plasmas e Fusão Nuclear – IPFN
- Instituto de Medicina Molecular - IMM
- Laboratório Associado de Química Verde – Tecnologias e Processos Limpos – REQUIMTE
- Laboratório de Instrumentação e Física Experimental de Partículas – LIP
- Instituto de Telecomunicações – IT
- Laboratório de Robótica e Sistemas em Engenharia e Ciência – ISR Lisboa
- Centro de Investigação Materiais Cerâmicos e Compósitos – CICECO
- Centro de Investigação Marinha e Ambiental – CIMAR
- Centro de Estudos Sociais – CES
- Instituto de Ciências Sociais – ICS
- Instituto de Engenharia de Sistema de Computadores do Porto – INESC Porto
- Centro de Biotecnologia e Química Fina – CBQF
- Centro de Estudos do Ambiente e do Mar – CESAM
- Instituto Dom Luís – IDL
- Instituto de Engenharia de Sistemas e Computadores I&D – INESC Lisboa
- Laboratório de Processos de Separação e Reacção – LSR
- Instituto de Biotecnologia e Bioengenharia – IBB
- Instituto de Nanotecnologia – IN
- Instituto de Nanoestruturas, Nanomodelação, e Nanofabricação – I3N
- Laboratório Associado de Energia, Transportes e Aeronáutico – LAETA
- ICVS / 3Bs – Laboratório Associado

Consortia:

- Consortia I3S (IPATIMUP and IBMC-INEB)
- Consortia IBB and ICVS/3Bs
- Consortia NanoBio (IN and IBB)

Annex 6:
Main contributions to Government Budgets for R&D – GBOARD (Government Budget Appropriations or Outlays for Research and Development). 2005-2011

Government budget appropriations and outlays for R&D in Portugal. by ministries. instruments and source of budget funding. 2005. 2010 and 2011

Ministries	Instruments	2005			2010			2011		
		National funds	EU funds	Total	National funds	EU funds	Total	National funds	EU funds	Total
Ministry of Science. Technology and Higher Education	R&D budget (includes Portuguese Science and Technology Foundation; FCT)	247	167	414	419	134	554	317	167	484
	Higher education budget	397	0	397	694	0	694	702	0	702
	Research institutes - higher education system	22	0	22	31	0	31	30	0	30
Various	State Laboratories	118	14	132	181	3	184	172	3	175
	Central public administration	0	0	0	5	0	5	6	0	6
Ministry of Economy and Innovation	Other European Structural funds	0	103	103	0	274	274	0	401	401
Ministry of Health (except the State Laboratory INSA)		0	0	0	2	0	2	3	0	3
Ministry of Defense		1	0	1	6	0	6	6	0	6
Autonomous regions - Açores and Madeira		12	0	12	0	14	14	14	0	14
TOTAL		797	284	1.082	1.339	426	1.765	1.249	571	1.820

Note: Millions of Euros

**Annex 7:
Portuguese Participation in the European Union 7th Framework Programme – overall summary 2010**

Table A1: EU FP 7 specific programmes: Cooperation

		Cooperation												
		<i>Health</i>	KBBE	ICT	NMP	Energy	Environment	<i>Transportation</i>	<i>SSH</i>	<i>Space</i>	<i>Safety</i>	<i>Joint Calls</i>	ERA NETs	TOTAL
Proposals - submitted EU		3297	1599	8066	1883	1201	1593	1763	1691	386	824	465	105	22,873
Proposals - submitted PT		254	256	873	194	146	271	252	215	46	132	38	23	2700
Proposals - coordinated PT		31	36	119	46	24	24	32	23	9	10	7	1	362
Projects – approved EU		547	242	1216	384	196	278	389	148	118	122	61	48	3749
Projects – approved PT		40	42	133	50	32	39	64	18	19	29	10	19	495
Projects - coordinated PT		0	4	15	3	2	0	9	2	0	2	0	1	38
Number of participations PT (approved projects)	Higher Edu.	25	26	41	22	11	21	21	12	11	3	10	1	204
	Firms	4	4	72	32	40	10	69	0	22	25	3	0	281
	R&D units	9	21	73	19	18	17	4	4	7	5	3	2	182
	Other	5	2	4	4	6	4	15	2	6	7	1	20	76
Total		43	53	190	77	75	52	109	18	46	40	17	23	743
Funding EU (million Euros)		2444.29	788.73	4194.38	1563.22	884.49	831.35	1302.34	268.52	328.11	512.65	243.23	81.90	13,443.23
Funding PT (million Euros)		10.87	10.32	61.09	21.01	11.04	10.25	18.80	3.02	5.21	6.76	2.66	1.83	162.87
Success rate (EU)		16.6%	15.1%	15.1%	20.4%	16.3%	17.5%	22.1%	8.8%	30.6%	14.8%	13.1%	45.7%	16.4%
Success rate (PT)		15.7%	16.4%	15.2%	25.8%	21.9%	14.4%	25.4%	8.4%	41.3%	22.0%	26.3%	82.6%	18.3%
Percentage of funding obtained by Portugal by area		0.44%	1.31%	1.46%	1.34%	1.25%	1.23%	1.44%	1.13%	1.59%	1.32%	1.09%	2.23%	1.21%

Source: FCT/Office for the promotion of the 7th Framework program

Table A2: EU FP 7 specific programmes: JTIs

		JTIs					
		ENIAC	ARTEMIS	IMI	Clean	H ₂ and Fuel Cells	TOTAL
Proposals - submitted EU		31	71	134	720	82	1038
Proposals - submitted PT		5	18	n.d	35	7	65
Proposals - coordinated PT		0	3	n.d	24	0	27
Projects – approved EU		20	25	15	159	47	266
Projects – approved PT		3	4	1	14	0	22
Projects - coordinated PT		0	1	0	7	0	8
Number of participations PT (approved projects)	Higher education	1	2	1	3	0	7
	Firms	2	3	0	34	0	39
	R&D units	3	0	0	1	0	4
	Other	0	0	0	1	0	1
Total		6	5	1	39	0	51
Funding EU (million Euros)		72.91	70.85	123.00	59.93	98.52	425.21
Funding PT (million Euros)		0.29	0.43	0.20	0.84	0.00	1.75
Success rate (EU)		64.5%	35.2%	11.2%	22.1%	57.3%	25.6%
Success rate (PT)		60.0%	22.2%		40.0%	0.0%	33.8%
Percentage of funding obtained by Portugal by area		0.39%	0.60%	0.16%	1.40%	0.00%	0.41%

Source: FCT/Office for the promotion of the 7th Framework program

Portuguese Participation in the European Union 7th Framework Programme – overall summary 2010 (continued)

Table A2: EU FP 7 specific programmes: Capacities, People, Ideas and Euratom

	CAPACITIES							TOTAL	PEOPLE	IDEIAS	EURATOM	TOTAL GLOBAL
	PME	Infra-structures	Regions of Knowledge	R&D Potential	SiS	Coh Devel. R&D Strat.	Cooper. Internac.					
Proposals - submitted EU	2555	645	296	1598	563	19	266	5942	20620	20,127	177	70,777
Proposals - submitted PT	364	114	19	19	127	0	34	677	573	316	15	4346
Proposals - coordinated PT	42	8	1	12	12	0	10	85	339	299	0	1112
Projects – approved EU	412	197	50	147	135	7	116	1064	4528	1690	58	11,355
Projects – approved PT	64	44	3	2	18	0	6	137	125	16	10	805
Projects - coordinated PT	5	3	0	1	3	0	1	13	78	16	0	153
Number of participations PT (approved projects)	Higher Edu. Firms	16	18	2	0	7	0	43	38	7	1	300
	R&D units	42	0	2	0	1	0	46	6	0	0	372
	Other	20	12	0	0	5	0	37	41	8	8	280
	Total	15	15	6	2	7	0	8	53	14	1	146
		93	45	10	2	20	0	9	179	99	16	10
Funding EU (million Euros)	522.61	1011.41	54.86	147.45	129.25	11.91	68.47	1945.96	1711.98	2897.17	242.37	20,665.91
Funding PT (million Euros)	10.37	7.50	0.84	0.90	1.85	0.00	1.05	22.51	24.48	25.63	0.52	237.77
Success rate (EU)	16.1%	30.5%	16.9%	9.2%	24.0%	36.8%	43.6%	17.9%	22.0%	8.4%	32.8%	16.0%
Success rate (PT)	17.6	38.6%	15.8%	10.5%	14.2%	0.0%	17.6%	20.2%	21.8%	5.1%	66.7%	18.5%
Percentage of funding obtained by Portugal by area	1.98%	0.74%	1.54%	0.61%	1.43%	0.00%	1.53%	1.16%	1.43%	0.88%	0.21%	1.15%

Source: FCT/Office for the promotion of the 7th Framework program

Annex 8:
Business enterprises with the largest R&D expenditures (intramural)

8.1: Ranking for 2008

Rank in 2008	Business enterprise designation	R&D expenditure (thousand Euros)	Researchers (FTE)	Business sector
1	Grupo PORTUGAL TELECOM	147,117	320	Services – ICT
2	BCP - Banco Comercial Português	81,749	399	Services – Financial services
3	Grupo EDP	68,662	62	Services – Energy and Environment
4	BIAL - Portela & Cia	56,364	53	Pharmaceutical
5	ISBAN PT - Engenharia e Software Bancário	51,047	364	Services – ICT
6	Nokia Siemens Networks Portugal	45,237	984	Services – ICT
7	a)			
8	UNICER Bebidas	29,965	31	Agro Food
9	SONAE, SGPS	25,272	138	Services
10	AUTOEUROPA - Automóveis	24,653	127	Industry – Automotive
11	Grupo JOSÉ DE MELLO	20,170	176	Services: Health and Energy and Environment; Industry: Chemical / Equipment
12	Banco BPI	19,199	80	Services – Financial services
13	Grupo ESPÍRITO SANTO	15,986	66	Services – Financial services
14	Grupo CTT	13,202	42	Services – Postal
15	Grupo CAIXA GERAL DE DEPÓSITOS	12,939	54	Services – Financial services
16	MIPSABG CHIPIDEA	12,686	132	Services – ICT
17	Grupo BOSCH	12,571	146	Services – ICT; Industry – Electronics
18	TAP - AIR Portugal	10,570	16	Services – Transport and Logistics
19	HOVIONE FarmaCiencia	10,202	76	Pharmaceutical
20	GRUPO NOVABASE	9,930	146	Services – ICT
21	Grupo GALP ENERGIA, SGPS	9,178	378	Services – Energy and Environment
22	Grupo BIPADOSA	8,988	13	Industry – Materials
23	Grupo SIMOLDES	7,686	91	Industry – Automotive and Tooling
24	Grupo PORTO EDITORA	7,599	74	Industry – Publishing
25	NAV - Navegação Aérea de Portugal	7,522	33	Services – Transport and Logistic
26	Grupo MARTIFER	7,182	54	Services – Energy and Environment; Industry
27	ALERT-LIFE Sciences Computing	6,571	157	Services – ICT
28	ALCATEL-LUCENT Portugal	6,331	71	Services – ICT
29	Grupo HEINEKEN	6,044		Agro Food
30	Grupo EMPORDEF - Empresa Portuguesa Defesa	5,991	78	Industry – Defence
31	Grupo CONSULGAL	5,968	61	Services
32	VISTEON Portuguesa	5,479	25	Services – ICT
33	TECNIMEDE - Sociedade Técnico-Medicinal	5,412	52	Pharmaceutical
34	Grupo SALVADOR CAETANO	5,291	17	Industry – Automotive
35	Grupo SIBS	5,173	30	Services – Financial services
36	Grupo JERÓNIMO MARTINS, SGPS	5,133	10	Services – Retail
37	Grupo CIMPOR	5,066	19	Industry – Materials
38	Qimonda Portugal	4,969	91	Services – ICT
39	Grupo CONTINENTAL	4,799	17	Industry – Automotive
40	a)			
41	Delphi Automotive Systems Portugal	4,580	34	Industry – Automotive
42	a)			
43	EEM - Empresa de Electricidade da Madeira	4,434		Services – Energy and Environment
44	ISQ - Instituto de Soldadura e Qualidade	4,357	50	Services – Engineering
45	Grupo SONAE INDÚSTRIA, SGPS	4,243	32	Industry
46	Grupo RAR	4,225	24	Agro Food
47	BRANDIA CENTRAL - Design e Comunicação	3,946		Services - Communication
48	MAHLE - Componentes de Motores	3,862	11	Industry – Automotive
49	a)			
50	Grupo SECIL	3,781	21	Industry – Materials
51	DEIMOS Engenharia	3,776	22	Services – ICT
52	a)			
53	HIKMA Farmacêutica (Portugal)	3,675	14	Pharmaceuticals
54	Grupo AdP - ÁGUAS DE PORTUGAL	3,668	21	Services – Energy and Environment
55	SANOFI AVENTIS - Produtos Farmacêuticos	3,651	16	Pharmaceuticals
56	INCM - Imprensa Nacional - Casa da Moeda	3,567	10	Industry
57	Banco Popular Portugal	3,472	3	Services – Financial services
58	ABLYNX	3,455	25	Services
59	a)			
60	a)			
61	CEIIA - Centro para a Excelência e Inovação na Indústria Automóvel	3,037	51	Services - Engineering

Rank in 2008	Business enterprise designation	R&D expenditure (thousand Euros)	Researchers (FTE)	Business sector
62	Liberty Seguros	2,922	14	Services – Financial services
63	LogicaTI Portugal	2,900	21	Services – ICT
64	EUOTRIALS - Consultores Científicos	2,855	58	Services
65	a)			
66	a)			
67	a)			
68	a)			
69	a)			
70	YAZAKI SALTANO OVAR - Produtos Eléctricos	2,558	16	Industry – Automotive
71	BLUEPHARMA - Indústria Farmacêutica	2,533	32	Pharmaceuticals
72	SOMINCOR - Sociedade Mineira de Neves Corvo.	2,420	1.4	Services – Energy and Environment; Industry – mining
73	a)			
74	PRIMAVERA - Business Software Solutions	2,365	54	Services – ICT
75	CITEVE - Centro Tecnológico das Indústrias Têxtil e do Vestuário de Portugal	2,323	37	Services – Textiles
76	FISIPE - Fibras Sintéticas de Portugal	2,253	13	Industry – Textiles
77	Grupo IRMÃOS VILA NOVA	2,225	12	Industry
78	a)			
79	OUTSYSTEMS - Software em Rede	2,188	26	Services – ICT
80	Wipro Portugal	2,180	21	Services – ICT
81	Legrand Eléctrica.	2,137		Industry
82	a)			
83	AMTROL - Alfa Metalomecânica	2,078	7	Industry – Metalworks
84	Oliveira & Irmão	2,065	6	Chemicals
85	Nestlé Portugal	2,002	4	Agro Food
86	Grupo VISABEIRA, SGPS	1,974	19	Services – ICT; Industry
87	Grupo TMG	1,963	27	Industry – Textiles
88	a)			
89	Grupo LS - LUÍS SIMÕES, SGPS	1,920	17	Services – Transport and Logistics
90	NEC PORTUGAL - Telecomunicações e Sistemas	1,861	26	Services – ICT
91	Grupo FINIBANCO	1,855	35	Services – Financial services
92	a)			
93	a)			
94	APDL - Administração dos Portos do Douro e Leixões	1,809		Services – Transport and Logistics
95	Grupo CRITICAL, SGPS	1,743	47	Services – ICT
96	BROWNING VIANA - Fábrica de Armas e Artigos de Desporto	1,720	2	Industry
97	GLINTT - Healthcare Solutions	1,718	37	Services – ICT
98	BIOCANT - Associação de Transferência de Tecnologia	1,716	22	Services
99	FARMA APS - Produtos Farmacêuticos	1,708	8	Pharmaceuticals
100	a)			

Note: a) public disclosure authorization still underway, by May 2011.
Source: MCTES/ Statistics Office (<http://www.qpeari.mctes.pt/index.php>)

8.2: Ranking for 2009

Rank in 2009	Rank in 2008	Business enterprise designation	R&D expenditure (thousand euros)	Business sector
1	1	Grupo PORTUGAL TELECOM	201,218	Services – ICT
2	3	Grupo EDP	59,318	Services – Energy and Environment
3	5	ISBAN PT - Engenharia e Software Bancário, S.A.	51,249	Services – ICT
4	6	Nokia Siemens Networks Portugal, S.A.	48,784	Services – ICT
5	9	Grupo SONAE, SGPS, S.A.	45,300	Services
6	4	Bial - Portela & Cia, S.A.	43,013	Pharmaceutical
7	2	BCP - Banco Comercial Português, S.A.	38,787	Services – Financial services
8		Grupo Volkswagen	38,194	Industry – Automotive
9		a)		
10	11	Grupo José de Mello	24,750	Services: Health and Energy and Environment; Industry: Chemical / Equipment
11		COBA - Consultores para Obras, Barragens e Planeamento, S.A.	17,871	Services - Engineering
12	21	Grupo Galp Energia	16,701	Services – Energy and Environment
13	8	Grupo UNICER	14,845	Agro Food
14		a)		
15	12	BANCO BPI, S.A.	14,290	Services – Financial services
16	27	Alert-Life Sciences Computing, S.A.	12,042	Services – ICT
17	17	Grupo BOSCH	11,329	Services – ICT; Industry – Electronics
18		a)		
19	24	Grupo PORTO EDITORA	9,565	Industry – Publishing
20	20	Grupo NOVABASE	9,173	Services – ICT
21	22	Grupo BIPADOSA	9,172	Industry – Materials
22	14	Grupo CTT	9,101	Services – Postal
23	15	Grupo Caixa Geral de Depósitos	9,039	Services – Financial services
24		a)		
25		a)		
26	25	NAV - Navegação Aérea de Portugal, E.P.	7,464	Services – Transport and Logistic
27		a)		
28	28	Alcatel-Lucent Portugal, S.A.	6,681	Services – ICT
29		SUGALIDAL - Indústrias de Alimentação, S.A.	6,222	Agro Food
30	19	HOVIONE FarmaCiencia, S.A.	6,167	Pharmaceutical
31	50	Grupo SECIL	6,026	Industry – Materials
32	31	Grupo CONSULGAL	5,905	Services
33	33	TECNIMEDE - Sociedade Técnico-Medicinal, S.A.	5,755	Pharmaceutical
34	30	Grupo EMPORDEF	5,014	Industry – Defence
35		Grupo FAURECIA	4,988	Industry – Automotive
36		a)		
37	61	CEIIA - CENTRO PARA A EXCELÊNCIA E INOVAÇÃO NA INDÚSTRIA AUTOMÓVEL	4,782	Services - Engineering
38		REFER - Rede Ferroviária Nacional, E.P.E.	4,739	Services – Transport and Logistics
39	44	ISQ - Instituto de Soldadura e Qualidade	4,557	Services – Engineering
40	46	Grupo RAR	4,512	Agro Food
41		Grupo BANIF	4,499	Services – Financial services
42		IBERFER-EQUIPAMENTOS E CONSTRUÇÕES TECNICAS S.A.	4,345	Services – Energy and Environment; Industry
43		Altitude Software - Sistemas e Serviços, S.A.	4,149	Services – ICT
44		Grupo Portucel Soporcel	4,059	Chemical – Paper
45	36	Grupo Jerónimo Martins	3,936	Services – Retail
46	95	Grupo CRITICAL	3,916	Services – ICT
47	47	BRANDIA CENTRAL-DESIGN E COMUNICAÇÃO, S.A	3,903	Services - Communication
48	87	Grupo TMG	3,408	Industry – Textiles
49	94	APDL - Administração dos Portos do Douro e Leixões, S.A.	3,298	Services – Transport and Logistics
50	43	EEM - Empresa de Electricidade da Madeira, S.A.	3,287	Services – Energy and Environment
51		Silvex - Industria de Plásticos e Papéis, S.A.	3,224	Chemical – Plastics and Paper
52	98	BIOCANT - Associação de Transferência de Tecnologia	3,133	Services
53		QUINTILES, SOCIEDAD LIMITADA - REPRESENTAÇÃO PERMANENTE EM PORTUGAL	3,054	Services – Health
54		a)		
55	41	Delphi Automotive Systems Portugal, SA	2,964	Industry – Automotive
56	64	EUROTIALS - Consultores Científicos, S.A.	2,927	Services
57	51	DEIMOS ENGENHARIA, S.A.	2,850	Services – ICT
58		BERD - PROJECTO, INVESTIGAÇÃO E ENGENHARIA DE PONTES, S.A.	2,792	Services – Engineering
59		ANA - Aeroportos de Portugal, S.A.	2,722	Services – Transport and Logistics

60		a)		
61		Cerealis SGPS	2,631	Agro Food
62	58	ABLXNX S.A.	2,611	Services
63	71	Bluepharma - Indústria Farmacêutica, S.A.	2,545	Pharmaceuticals
64	79	OUTSYSTEMS - Software em Rede, S.A.	2,524	Services – ICT
65	76	Fisipe - Fibras Sintéticas de Portugal, S.A.	2,508	Industry – Textiles
66		a)		
67		a)		
68	34	Grupo Salvador Caetano	2,429	Industry – Automotive
69		a)		
70		Grupo IVN Serviços Partilhados, S.A.	2,365	Industry
71		a)		
72		Grupo SOLVAY	2,336	Chemical
73	80	Wipro Portugal, S.A.	2,335	Services – ICT
74		Metropolitano de Lisboa, E.P.E.	2,286	Services – Transport and Logistics
75		CONTINENTAL MABOR - Indústria de Pneus, S.A.	2,179	Industry – Automotive; Chemical
76		a)		
77		a)		
78		a)		
79		Grupo Saint-Gobain	2,052	Industry – Materials
80		REN - Redes Energéticas Nacionais, SGPS, S.A.	2,040	Services – Engineering
81		a)		
82		COFIDIS	1,966	Services – Financial services
83	72	Somincor - Sociedade Mineira de Neves Corvo, S.A.	1,947	Services – Energy and Environment; Industry – mining
84		Grupo SGC	1,936	Services – ICT, Energy and Financial services
85		a)		
86	26	Grupo Martifer	1,935	Services – Energy and Environment; Industry
87		a)		
88	75	CITEVE - Centro Tecnológico das Indústrias Têxtil e do Vestuário de Portugal	1,907	Services – Textiles
89	54	Grupo AdP - Águas de Portugal	1,895	Services – Energy and Environment
90		ECCOLET PORTUGAL - Fábrica de Sapatos, Lda.	1,804	Industry
91	37	Grupo CIMPOR	1,780	Industry – Materials
92		a)	1,758	
93		INDASA - Indústria de Abrasivos, S.A.	1,751	Chemical
94		a)		
95		a)		
96		Grupo Azevedos	1,713	Pharmaceutical
97		LACTOGAL - Produtos Alimentares, S.A.	1,698	Agro Food
98		PDM&FC	1,690	Services – ICT
99		Luís Leal & Filhos, S. A.	1,682	Agro Food
100		Grupo ATRALCIPAN	1,664	Pharmaceutical

Note: a) public disclosure authorization still underway, by May 2011.
Source: MCTES/ Statistics Office (<http://www.gpeari.mctes.pt/index.php>)

Annex 9:
Sample list of academic spin-offs and technology-based start-ups created in the period 2005-2010,
as identified through the University Technology Enterprise Network (UTEN)

This sample list of academic spin-offs includes identification of the technology transfer office (TTO) associated with the process of firm creation

Spin-off	Description	Area	Year of establishment	Location	TTO/ Incubator/ Science Park
Vinalia	Academic spin-off of the University of Minho Interlocutor multidisciplinary ID for the wine business. A link to the University of Minho Vinalia through its Spin-Off status is: - direct Interlocution custom research projects and directed to Customer-Support Teachers and mentors scientific _Researchers from UM-Provision of scientific know-how and technology. Quality and Innovation. Research and Development are the main vectors of this action company.	Agri-Food	2005	Braga	TecMinho
Technophage	TechnoPhage, SA is a biotech company with labs located at IMM, under a collaboration protocol signed by these two entities. TechnoPhage SA is engaged in two main R&D programmes: 1) Bacteriophages – R&D of novel products, based on the unique properties of bacteriophages for the treatment, diagnosis and prevention of bacterial infections. Current work is focused on the R&D of new products targeting nosocomial, community and food industry infections. Different products are being developed with two main purposes: a) Specific elimination of antibiotic-resistant bacteria (therapy and sanitation) b) Detection and quantification of live microorganisms (diagnostic devices) 2) Recombinant antibodies R&D on recombinant antibodies with therapeutic and diagnostic applications TechnoPhage. SA continuously strives to increase the number of proprietary products, through an active R&D program and collaboration agreements. TechnoPhage, SA also delivers R&D services for diverse pharmaceutical companies.	Bio/Pharma	2005	Lisbon	IMM
EDIT VALUE – Consultoria Empresarial	EDIT VALUE aims to contribute in a decisive way to the business success of its customers reducing / eliminating waste or improving / optimizing the performance of the company / client organization. This company differentiates itself by an avant-garde philosophy and by its innovation powered by two units of strong scientific penchant. This is a Junior Enterprise that with an Advisory Board wants to bring together students / graduates and future teachers / researchers as a bridge between the EDIT VALUE and the University of Minho.	Energy/Environment/ Sustainability	2005	Braga	TecMinho
UAVision	UAVision was founded in April 2005 with the aim to develop and build an unmanned aerial vehicle (UAV) with low cost by integrating technologies such as aircraft control remote sensing data management and telecommunications. In parallel, our department of remote sensing is dedicated to providing services for applications in precision agriculture environmental monitoring and management of forests. The UAVision is equipped with cameras to collect aerial photography digital spectrum bands in the visible and near infrared, to produce maps of NDVI (Normalized Difference Vegetation Index). The acquisition and processing of information from these sensors mounted on airborne platforms (manned or unmanned). UAVision adds the collection of data from ground sensors, which provide information on the soil surface.	ICT/Software/ Digital Media	2005	Lisbon and Torres Vedras (production centre)	Inovisa

Ubisign	The UBISIGN is a new technology based company whose mission is to add value to business processes centered on spaces physical integration solutions. The UBISIGN designs develops and implements solutions for interaction and adaptation to physical surroundings for organizations that seeking new ways to communicate with their target audience in order to maximize their business.	ICT/Software/ Digital Media	2005		TecMinho
Fibersensing, Sistemas Avançado de Monitorização, S.A	With the beginning of commercial activity in 2005, this company is currently considered one of the 10 most competitive companies in the area of structural monitoring systems based on optical fiber technology. Among its major customers are Airbus, Siemens, Petrobras, European Space Agency and REN.	Microelectronics/ Robotics	2005	Maia	INESCPorto
Dandlen&Vasques, Lda.	Essential oil production and development of new products and differentiated services resulting from innovation	Agri-Food	2006		CRIA
Foodmetric	Development and implementation of solutions for the analysis Chemical and quality of food	Agri-Food	2006		grupUNAVE Aveiro
Micoplant - Micologia Aplicada, Lda.	Mushroom production	Agri-Food	2006	Gondomar	OTIC-GAPI UTAD
WineID	Wine ID is a company formed by three winemakers, who advises enological high scientific value to support the production of wine. Its mission is to build more value in projects, using the same resources, are based on "turning ideas into wine." Also implies the production of wine in cost style and range appropriate to the concept and scale of projects and for producing wines with a "concept" that meets the needs and expectations of the target consumer and / or wine critics. Wine ID is a young, innovative, with vast international experience and national understanding of world trends and styles of wine that makes the approach of "concept" for wine production and its viability in the global context. It also offers logistic support (laboratory and back office) for organizing and scheduling production over the years scientific approach to winemaking viticulture and oenological winemaking and develops the central means - from production to distribution.	Agri-Food	2006	Lisbon	Inovisa
ECOINSIDE	The company is dedicated to provide services in the areas of business eco-efficiency and environmental sustainability.	Energy/Environment/ Sustainability	2006	Porto	UPIN
GyRad, controlo de qualidade e protecção radiológica, Lda.	Meeting the needs of the several operators of health services that have radiology facilities and ensure the quality and safety of equipment and services	Energy/Environment/ Sustainability	2006		CRIA
IndAircontrol	IndAirControl provides the monitoring and control of air quality in indoor environments particularly with regard to allergic particles (biological and chemical) in order to improve the environment quality of life and welfare of the occupants, especially the ones with allergies.	Energy/Environment/ Sustainability	2006		TECMU Madeira

SINERGEO	The SINERGEO - Solutions Applied Geology, Hydrogeology and Environment Ltd, intends to intervene in the market by offering its customers various services in the areas of geology hydrogeology and environment. The target market is diverse encompassing among others sector exploitation of the masses and mineral deposits, resources water, environment, construction, agriculture and archeology.	Energy/Environment/ Sustainability	2006	Vila Verde	TecMinho
Marca Líquida Produções, Lda	Web design, Advertisement, Cinema	ICT/Software/ Digital Media	2006		Parkurbis
Omnisys	Global solutions for Registration and Control of Resources based on the latest technologies, Providing reliable and secure applications	ICT/Software/ Digital Media	2006	Covilhã	UBIACTIVA - Gabinete de Apoio a Projectos e Promoção da Investigação da UBI
Pugnatrix, Technologias da Informação, Lda.	Software development applied to driven schools	ICT/Software/ Digital Media	2006	Covilhã	Parkurbis
spectralBlue - Pervasive Technologies	It is an engineering company focused particularly on the Urban Computing. Its mission consists in extracting knowledge of an area then applying this knowledge in actual use thus favoring the emergence of new applications and technology solutions.	ICT/Software/ Digital Media	2006	Guimarães	TecMinho
SAR – Soluções de Automação e Robótica	The mission of SAR is to be an international reference in the areas of robotics and automation, through the development of new technologies and integrating existing technologies, Aiming to solve the problems of industry and improving the quality of life	Microelectronics/ Robotics	2006	Guimarães	TecMinho
Covieng, Gestão de Projectos e Obras, Lda.	Engineering and structure projects, Applied to construction. New solutions for construction projects optimization	Other	2006	Covilhã	Parkurbis
Cooking.Lab	Cooking.Lab is a company for research, development training and consultancy in the field of molecular gastronomy which aims to revolutionize the world of the kitchen through a combination of science art and innovation and aims to become a world reference in this area. This project is led by researchers in microbiology, chemistry and kitchen science. Through research on food grade ingredients, many of them already used in the food industry develops new textures, shapes and uses for food additives in order to use in dishes inspired by local cultures, accessible to all on a global scale and enabling amazing dining experiences with food plus benefits - even Develops Concept For All gourmet products, innovative applications of products and represents and markets specialty products in Portugal. To support the use of these products and innovative techniques to Cooking.Lab disseminates and provides training in the field of molecular gastronomy and is the consulting chefs to carry out personal projects and companies for launching new products.	Agri-Food	2007	Lisbon	Inovisa
DietGest, Lda.	Company specialized in the field of dietetics and nutrition that is dedicated to developing and marketing solutions for telemedicine to improve health and quality of human life	Agri-Food	2007		CRIA

Lumisense	sensores para a maturidade do vinho (FCUL)	Agri-Food	2007		INDEG
Mercearia Bio, Lda.	Organic Groceries Online	Agri-Food	2007		CRIA
ProSense	Prosense is a company that provides services and advice on physical and sensory analysis of food and nonfood. With a young team consisting of qualified employees with basic training in agro engineering, with expertise in physical and sensory analysis and experience in research and development, commitment to constant upgrading of their skills in order to guarantee customers high quality services. Cooking.Lab is a company for research, development, training and consultancy in the field of molecular gastronomy, which aims to revolutionize the world of the kitchen, through a combination of science, art and innovation and aims to become a world reference in this area. This project is led by researchers in microbiology, chemistry and kitchen science. Through research on food grade ingredients, many of them already used in food industry, developing new textures, shapes and uses for food additives in order to use in dishes inspired by local cultures, accessible to all on a global scale and enabling amazing dining experiences with food plus benefits - even Develops Concept For All gourmet products, innovative applications of products and represents and markets specialty products in Portugal. To support the use of these products and innovative techniques Cooking.Lab disseminates and provides training in the field of molecular gastronomy and is the consulting chefs to carry out personal projects and companies for launching new products.	Agri-Food	2007	Lisbon	Inovisa
Biodevices, SA	Development, marketing and export biomedical engineering solutions to support of diagnosis.	Bio/Pharma	2007		grupUNAVE Aveiro
NZYTech	NZYTech is a company positioned in the area of biotechnology, dedicated to the development and production of recombinant enzymes used as biocatalysts in industrial processes. The company also offers a wide range of products and services in the area of Molecular Biology, establishing contracts with companies and research universities to develop related projects. The main key factor of success lies in NZYTech knowledge acquired by its staff of human resources, highly qualified, with a deep know-how on microbial enzymes and DNA recombination. The products and services NZYTech are especially suited for the European and North American and can be found at www.nzytech.com .	Bio/Pharma	2007	Lisbon	Inovisa
AMBISYS	The Ambisys, SA is a BIO / TECHNOLOGY ENVIRONMENTAL company which have the technical capability to design plan and perform the monitoring of water treatment processes wastewater and organic waste. In close collaboration with its customers, Ambisys provides for each problem the most effective solution in the economic, energy and environment field	Energy/Environment/ Sustainability	2007	Póvoa do Varzim	TecMinho
Ecoceanus	Services in areas such as Scientific Research and Ecotourism	Energy/Environment/ Sustainability	2007		CRIA
Marsensing, Lda.	Development of marine technology-based sensors as well as in measurement and processing of acoustic signals	Energy/Environment/ Sustainability	2007		CRIA

XXL Refill, Lda	Development of machinery and new solutions for renewable cartridges franchising of concepts	Energy/Environment/ Sustainability	2007	Covilhã	Parkurbis
Acutus	Acutus is a company that uses new technologies on graphical simulation and modeling to meet the challenges of education today, Thus to cover various learning aspects and the major areas of education science in schools and promoting science and culture through tourism. Acutus' main objective is to complement the best treatment technologies and graphical modeling with a pedagogical approach.	ICT/Software/ Digital Media	2007	Póvoa do Varzim	TecMinho
Digital View, Unipessoal, Lda.	Technologies automatically scan of cadastral maps	ICT/Software/ Digital Media	2007		CRIA
ESI – Engenharia, Soluções e Inovação	The ESI is a technology based company that aims the design development and innovation in capital goods. This type of company practically doesn't exist in Portugal, since there are few companies with the skills and knowledge to design and build equipment from scratch. Moreover this company covers all types of industries not being restricted to any particular area.	ICT/Software/ Digital Media	2007	Famalicão	TecMinho
iUZ Technologies, Lda	Software Engineering Company specializes in integration Systems and Geographic Information Systems	ICT/Software/ Digital Media	2007		grupUNAVE Aveiro
Metatheke Software Lda	Development of integrated tools for managing digital content	ICT/Software/ Digital Media	2007		grupUNAVE Aveiro
SOMATICA M&S - Materials & Solutions	Based on the potential of piezoelectric polymers and its most recent applications, this company has the idea of produce better materials with the application of technology. The company will focus on two business areas: production and consultancy.	ICT/Software/ Digital Media	2007		TecMinho
Sonatrix, Lda.	Software development, networks	ICT/Software/ Digital Media	2007		Parkurbis
TECNOWAVE	The TECNOWAVE is a consulting firm in civil engineering specializes in the inspection and diagnosis of concrete structures armed and masonry. The technology used is based on the emission and propagation of electromagnetic waves through various kinds of materials. This technology is used through a digital system called Ground Penetrating Radar.	ICT/Software/ Digital Media	2007	Guimarães	TecMinho
Tendências e Conceitos, Lda.	Travel agency based on online platforms	ICT/Software/ Digital Media	2007	Covilhã	Parkurbis
Tomorrow Options	Tomorrow Options is dedicated to developing and producing electronic devices to satisfy a niche market as a global strategy for B2B. At this time the company has concentrate all efforts in the area of medical devices. The first device developed is WalkinSense a medical device that is noninvasive portable, wireless and easy to use for clinical monitoring of activity and trends plantar pressure, Allowing a complete characterization of mobility patterns of its bearer.	Medical devices/diagnostics	2007	Porto	UPTEC

Audolici	Established in 2007 as the result of the identification of the existence of a market opportunity for audio amplification products the valves of superior quality. These are products which being quite innovative, they combine, however, the traditional valves and modern methods of engineering and construction, ensuring sound reproduction with high definition dynamic and transparency.	Microelectronics/ Robotics	2007	Porto	INESCPorto
Loggin	Architecture, domotic and energetic sustainble constructions	Microelectronics/ Robotics	2007	Covilhã	Parkurbis
Xarevision	Established in 2007 and specialized in the developing of private television networks and new media – Digital Corporate Signage and TV Networks – that allow the exploration of new more local and contextualized forms of communication and interaction with the consumer complementing other actions communication and marketing organized by major trade areas.	Microelectronics/ Robotics	2007	Porto	INESCPorto
Douro Prime	The Douro Prime SA is a company producing and selling table wine, olive oil, vinegars and sauces. In order to gain "critical mass" they started the production of wines table in 2008 and will shortly start its marketing. Its objectives over the middle term include the growth and exports and the development of new products and Douro wine. They are in small scale to develop a new product a seasoning racy, based on the Port and oriented soups and consommé.	Agri-Food	2008	Porto	UPTec
FOOD IN TECH	The idea consists in commercializing management solutions for fresh food during the distribution process.	Agri-Food	2008		UPIN
GoodMoments, Lda.	Creative Industry in Culture and Traditional Food	Agri-Food	2008		CRiA
NaturalConcepts	The NaturalConcepts Ltd. is a company dedicated to the development production and marketing of products based on medicinal and aromatic plants (MAP). Among his products are teas / infusions and extracts for incorporation in the food industry and production of supplements food.	Agri-Food	2008	Guimarães	TecMinho
AquaExam, Lda.	Integrated management of aquatic systems	Energy/Environment/ Sustainability	2008		CRiA
ArborValue - Valorização do Património Vegetal	The Arborvalue has as its mission the development and the implementation of solutions with a scientific and technological base, that add heritage value to the plant, fulfilling the legal requirements and standards and maintaining respect for the environment.	Energy/Environment/ Sustainability	2008	Caldas das Taipas	TecMinho
ArqSense, Lda.	Organizing events and thematic exhibitions	Energy/Environment/ Sustainability	2008		CRiA
Carbono Eficiente, SA	Development and implementation of systems for anaerobic waste of breeding digestion, to produce biogas and its subsequent conversion into energy.	Energy/Environment/ Sustainability	2008		grupUNAVE Aveiro

Ecoticket	The company has expertise and technology propriety to produce ecological nanoparticles and to develop these nanoparticles applications in textiles fields. The most important applications are the functional nanoparticles. Other nanoparticles with features that have been tested with success and will be produced are nanoparticles application of oxidative products that act as antibacterial products and free radical inhibitors in oxidative degradation processes	Energy/Environment/ Sustainability	2008	Braga	TecMinho
IDEIA Critica, Lda.	Solutions R & D on Renewable Energy	Energy/Environment/ Sustainability	2008		CRIA
INOVSea, Lda.	Production of marine polychaetes	Energy/Environment/ Sustainability	2008		CRIA
Naturanáutuca. Lda.	Ecotourism, aiming at spreading the historical, cultural and environmental heritage of the Algarve and Portugal with exclusivity and high quality.	Energy/Environment/ Sustainability	2008		CRIA
OCEANSCAN-Marine Systems & Technology, Lda	The OceanScan - Marine Systems & Technology, Ltd, is a company that develops systems and technology tools that make economically acceptable and easy access to the ocean. The company is a "Start-Up of the Faculty of Engineering, University of Porto (FEUP), and the elements that drove the constitution of the company belongs, or belonged to the body of Researchers from the Laboratory of Systems and Technology Underwater (LSTS). The company maintains a strategic partnership with this institution, one of the most renowned in Europe in terms of underwater technology. One objective of this project is to provide the technology and sell the know-how developed over more than a decade.	Energy/Environment/ Sustainability	2008	Porto	UPTEC
OMNITA	OmniTI develops robotic platforms for the purpose of monitoring and remote observation. Apart from developing and monitoring their own solutions, the company provides services data collection at three levels: air, land and sub-water, allowing real time monitoring and interaction. The company's mission is to provide services and develop solutions for integrating remote monitoring autonomous systems and sensor technology for precision maximizing the quality of information collected.	Energy/Environment/ Sustainability	2008	Porto	UPTEC
Smartwatt – Eficiência Energética e Microgeração	Founded in 2008, is one of the few companies in Europe to feature list ESCO - Energy Service Company, the name given to companies operating in the energy market through provision of services with a significant positive impact on energy consumption patterns of customers.	Energy/Environment/ Sustainability	2008		INESCPorto
SolarEarth, Lda.	Development of new solutions for renewable energies applications	Energy/Environment/ Sustainability	2008	Covilhã	Parkurbis
Sparos, Lda.	Innovation in developing new products, technologies and processes for feeding fish	Energy/Environment/ Sustainability	2008		CRIA
StarEnergy, Lda	Development of new solutions for renewable energies applications	Energy/Environment/ Sustainability	2008	Covilhã	Parkurbis
Terraprima – Serviços Ambientais, Sociedade Unipessoal, Lda.	Environmental Services aiming the inventory and quantification of direct and indirect environmental impacts of human activities and the assembly of integrated systems to compensate these impacts.	Energy/Environment/ Sustainability	2008	Belmonte	TT@IST

EDS – Engenharia, Desenvolvimento e Suporte	EDS turns ideas into products. It is a company that operates in product development area, creating solutions constructively, through design and choice of materials. The proposed solutions may still be validated and optimized through a prototyping process and mechanical characterization. We intend to creatively meet the needs of companies, that don't have the skills in the product development area.	ICT/Software/ Digital Media	2008	Braga	TecMinho
EXVA – Experts in Video Analysis	The EXVA - Experts in Video Analysis is technology company, working on research and development in the processing area and video analysis. The products / services marketed by EXVA incorporate techniques resulting from the scope of several research papers on segmentation of objects in motion, face detection, tracking of persons and vehicles, with their analysis behaviors, using Intelligence Artificial next generation algorithms.	ICT/Software/ Digital Media	2008	Guimarães	TecMinho
idTour - unique solutions, lda	Research and development of innovative and differentiated solutions applied to organizations (state and private) operating in the area of tourism.	ICT/Software/ Digital Media	2008	Aveiro	grupUNAVE Aveiro
KEEP SOLUTIONS	KEEP SOLUTIONS is a company that aims to provide IT consultancy services in the field of digital preservation, document management, analysis, processing and data migration, maintenance and support of digital repositories (based on Digitalq technology, DSPACE, and others), design solutions for electronic publication, publication of papers and magazines in the information society area and to organize conferences.	ICT/Software/ Digital Media	2008	Braga	TecMinho
New Textiles	The strategy of the New Textiles is to design and produce technical and functional textiles with specific applications, extrinsic to the nature of the product. The first product developed by New Textiles is for the health segment, namely the users who suffer from skin problems. The New Textiles makes the link between different areas of knowledge, health sciences and textile engineering.	ICT/Software/ Digital Media	2008	Guimarães	TecMinho
Next-To-You Network Solutions	Created in 2008 by pursuing a logic of generalization of concept of community or user groups in the network, develops, markets and manages network products and systems corporate shares (cost and benefits) of access data, voice and multimedia over IP networks in residential and business.	ICT/Software/ Digital Media	2008	Porto	INESCPorto
NWC Network Concept, Lda.	Contribution to the democratization of citizens' access to technology in order to improve their quality of life.	ICT/Software/ Digital Media	2008		TT@IST
Openside, Lda.	Open source software development	ICT/Software/ Digital Media	2008	Covilhã	Parkurbis
Process Net, Sistemas de Informação Lda	This company works in the Business Process Management (BPM) in organizations that in their activity need innovative and personalized solutions, basing its holding in the Software plus Service model (SS).	ICT/Software/ Digital Media	2008	Porto	INESCPorto
SSIAGRI, Soluções e Sistemas de Informação para a Agricultura, Lda	Software and hardware development applied to agriculture and product tracing	ICT/Software/ Digital Media	2008	Covilhã	Parkurbis

Tecla Colorida	Tecla Colorida is specialized on development of web 2.0 platforms and solutions for educational purposes. Specialties: Web 2.0, Social Software, e-Learning, Educational Software for Kids.	ICT/Software/ Digital Media	2008	Porto	INESCPorto
VoiceInteraction – Tecnologias de Processamento da Fala, S.A.	Innovative solutions that focus on speech processing technologies, creating competitive advantages in products from partners and customers.	ICT/Software/ Digital Media; Medical devices	2008	Lisbon	TT@IST
Crucial Sky Technologies	Next generation hardware / software solutions to control, navigation and data acquisition for the aviation market	ICT/Software/ Digital Media; Microelectronics/ Robotics	2008	Covilhã	UBIACTIVA - Gabinete de Apoio a Projectos e Promoção da Investigação da UBI
SelfTech, Lda.	Engineering and Hardware development	ICT/Software/ Digital Media; Microelectronics/ Robotics	2008	Covilhã	Parkurbis
PETsys – Medical PET Imaging Systems, S.A.	Petsys presents an innovative technology of Positron Emission Tomography (PET) applied to early diagnosis of breast cancer. The aim is to launch on the world market through a new diagnostic aid.	Medical devices/diagnostics	2008	Oeiras	TT@IST
WeAdapt	WeAdapt develops and market online products, having as main objective to improve the quality of life of people with special needs, particularly moving in wheelchairs, Down syndrome, blind, bedridden, elderly, and other.	Medical devices/diagnostics	2008	Braga	TecMinho
Digital Domus, Lda.	Home Automation Solutions	Microelectronics/Rob otics	2008		CRIA
Science4you	Toys: Production, Development and Commercialization; Training: Holiday Camps and Workshops of Science.	Other	2008	Lisbon	INDEG
Chiratecnics	Chemical industry. Production of chiral and achiral technologies, such as catalysts, ligands and building blocks essential for the production of chiral drugs in the pharmaceutical industry. It also provides services in the area of fine chemicals, such as screening the catalysts, technology development and consulting.	Bio/Pharma	2009	Évora	Uévora
ICNAS Produção unipessoal Lda	Radiopharmaceutical production and Know-How Transfer.	Bio/Pharma	2009		OTIC-UC
INOVAPOTEK	This company provides consulting services, pharmacist research and development, as well as quality safety and efficacy control tests for pharmaceutical products.	Bio/Pharma	2009		UPIN
Luzitin	Development of technologies in the area of photodynamic therapy in cancer treatment.	Bio/Pharma	2009		OTIC-UC

Cosero	Development of environment solutions.	Energy/Environment/ Sustainability	2009	Covilhã	Parkurbis
Equivicentinos, Lda.	Eco-Tourism Equestrian	Energy/Environment/ Sustainability	2009		CRIA
Wild Paradise, Lda.	production of fish and corals in closed recirculating systems	Energy/Environment/ Sustainability	2009		CRIA
BPO Consulting, Lda.	Consultants in connection with investment projects in systems and information technology	ICT/Software/ Digital Media	2009		CRIA
Cidades obscuras - Arquitectura e urbanismo Lda	Development chain using 3D software for automated fabrication of objects.	ICT/Software/ Digital Media	2009		OTIC-UC
Inovmapping	Geographic Information Systems, 3D geospatial modeling and WEBSIG	ICT/Software/ Digital Media	2009	Coimbra	OTIC-UC
Ivigisoft, Lda.	Software development	ICT/Software/ Digital Media	2009	Covilhã	Parkurbis
Printable Version	Informatic Thecnical Assistance	ICT/Software/ Digital Media	2009		Parkurbis
RN2S, Lda, (Confinium)	Consulting in Telecommunications (Project Networks, Telecommunications, indoor and outdoor location, GPS / GSM GPS / Satellite, RFID tags and RF Amplifiers	ICT/Software/ Digital Media	2009	Aveiro	grupUNAVE Aveiro
Roff SDF, Lda	Software House	ICT/Software/ Digital Media	2009	Covilhã	Parkurbis
WIVDO	In the area of IPTV, develops equipment \-art to mobile broadband networks, DVB-T / H and WiMAX16e. The WiVDO also produces video encoders SD / HD for IP networks broadband.	ICT/Software/ Digital Media	2009	Aveiro	grupUNAVE Aveiro
GenoGla Diagnostics, Lda.	Research and Diagnosis	Medical devices/ diagnostics	2009		CRIA
iSurgical3D	The iSurgical3D intended to be a company focused on research, development and marketing of surgical personalized implants. It already provides a first service / product that allows the modeling /bending of surgical prosthesis used in correction of pectus excavatum (3DPectus System), and others in development, such as: developing customized surgical implants for craniofacial, the developing of a system to predict the outcome after operative and bending their prosthesis for the correction of scoliosis, and 3D virtual simulation of the correction ortodontal.	Medical devices/ diagnostics	2009		TecMinho
SeixeConcept, Lda.	Sustainable design	Other	2009		CRIA

TecTraining, Lda.	Training Solutions	Other	2009	Lagos	CRIA
Smart Medicines	Development of drugs in the therapy of breast cancer.	Bio/Pharma	2010		OTIC-UC
Nano SmarTek	Developing of nanotechnology solutions applied to corrosion protection.	ICT/Software/ Digital Media	2010		grupUNAVE Aveiro
Orbis Global – Management Systems	Technological Solution for Quality Management in IPSS. The Orbis Global is a software solution, simple and intuitive, with a powerful innovation content in methodologies, processes and procedures tailored to the real needs of social sector and satisfies the requirements of the Quality Manuals of the Institute Social Security.	ICT/Software/ Digital Media	2010		TecMinho
TELAVE	The developing of DSRC - Dedicated Short Range Communications solutions	ICT/Software/ Digital Media	2010		grupUNAVE Aveiro
Korange, Lda.	Development of autonomous robotic systems (without need for human intervention). In the beginning, the bet will be in the the development of robot lawn mowers	Microelectronics/ Robotics	2010	Aveiro	grupUNAVE Aveiro
InfraLab	Test and analysis lab for construction materials	Other	2010	Covilhã	Parkurbis
Basetec	The BaseTec is a company that intends to provide (bio) products, including antioxidants and preservatives for food, pharmaceutical and cosmetics industries. The company also provides services in bioinformatics at the analysis of the toxicity of drugs to improve and ensure safety, hygiene, quality and authenticity raw materials and products.	Bio/Pharma			UPTEC
Biognosis	The Biognosis is a company that aims to optimize and produce diagnostic methods for the health markets human and / or feed, ensuring compliance with the requirements of customer, legal, regulatory and other requirements for products and the activity of the organization and also ensure the continuous improvement and an effective quality management system. Their target audiences are utilities in the area of diagnostic products for human and veterinary use, for both the domestic market or for the international market.	Bio/Pharma			UPTEC
Grisp	GRISP is a company that develops produces and sells solutions for laboratory, focusing on the chemical solutions area and buffers for molecular biology. Their biggest aim is to establish themselves as a reference in the research and development area of the Biotechnology. Additionally, they distributed in Portugal and Spain a wide range of chemical reagents and high quality solutions, produced by their partners in the U.S., Canada and Germany.	Bio/Pharma		Porto	UPTEC

Bilobite Engenharia, Lda	The mission of Bilobite based on the principle that a KW saved energy costs less than 1 kW of energy produced by alternative sources. The company proposes a significant invoice reduction of electricity entities. Makes use of an approach "pay as spare." Its markets are very diverse: mining, wood pellets, ceramics, metal-mechanical, injection molding all that involves ragmentation and milling, pharmaceuticals.	Energy/Environment/ Sustainability			UPTEC
Bluemater	The Bluemater is a company that has as one of its main objectives, treating municipal and industrial affluent. Currently, Bluemater is developing projects in water treatment waste in Rio Tinto. Moreover, develops technologies to the cultivation of macro and micro algae, with applications at the cosmetics, pharmaceuticals and oils for biodiesel other value added products.	Energy/Environment/ Sustainability			UPTEC
Efisenergy	The Efistec intends to implement in dwellings a modular solar concentrating technology that allows the electrical energy generation with high efficiency and heating sanitary water, as required by current law (Decree-Law 80/2006), using the same catchment area. The proposed solution comes this way to bring the buildings technology highly efficient and double-use of solar radiation solar.	Energy/Environment/ Sustainability		Porto	UPTEC
Planeta Vivo	The key element to this company is the unique approach used in contact with the nature, by observing and intervening, testing methods and discovering solutions that, once proven, may be useful for a more healthy interaction with our planet. It's currently developing two research work. The first is a recovery plan for the migratory fish Douro basin. The other aims to address the valuation of Património Natural do Vale do Sousa.	Energy/Environment/ Sustainability		Matosinhos	UPTEC
Adclick	The AdClick is a company that combines expertise in the technology, retail, commercial and engineering and search areas providing innovative solutions in the areas of collection and distribution of information over the Internet and in advertising online.	ICT/Software/ Digital Media		Porto	UPTEC
Advantage – Ciência para vencer	Provide advanced consulting services in the area of high competition sport are an objective of the Advantage – Science Good to Great. The project, still in pre-incubation, to revolutionize the sport performance of athletes high competition, investing in improving their performances.	ICT/Software/ Digital Media		Porto	UPTEC
Auditmark	This project aims to introduce innovations in the market of online marketing to enable the analysis of advertising online through the validation of web traffic servers. This tool presents a set of effective solutions that help advertisers and companies. The Auditmark technologies also allow a trade analysis, and also provide detailed information resulting from creating technological tools that allow a large and rigorous analysis of the data collected.	ICT/Software/ Digital Media		Porto	UPTEC
BrandFive	Web design, advertisement	ICT/Software/ Digital Media		Covilhã	Parkurbis

Cardmobili	The Cardmobili develops services for people who want take advantage of technology, particularly the potential of their phone, and simplify their day-to-day. The company places innovation in the service of people and creates reliable solutions and secure, acting responsibly and fully in the protection the interests of all its customers and partners. The Cardmobili is developing a service based on the identification and loyalty of customers to use the phone. For consumers, this service provides not only simplicity and adherence and convenience in use of programmes and cards loyalty of the brands, but also offers ways to enjoy the full benefits. For businesses, particular retailers, this service is a natural extension of their loyalty programmes, creating a new channel interaction with the consumer, focusing on electronic transactions rather than paper and providing tools for closer personalized and effective communication.	ICT/Software/ Digital Media		Porto	UPTEC
Clínica de Arquitectura	The Clinic of Architecture is a multidisciplinary platform dedicated to design spaces, and search for solutions on innovative ways of living, based on the study of relationship between local and space. We defend the idea of an architecture where the imagination, desires, memories are essential components. We propose a service-centered client, flexible and adaptable to their needs and adjustable for all scales of intervention. In collaboration with the our partners, we provide an integrated service that can include the construction, architecture, engineering, design interior, execution and delivery of furniture, a better coordination among all stakeholders at all stages of process, reducing costs and increasing efficiency. The result is a unique process that begins with the dreams of customers and only ends when the space is ready for the client. The association with University of Porto will promote continued cooperation with highly qualified professionals from different fields with the institution. The introduction of a strong sense of research and experimentation will give a clear sense of contemporaneity.	ICT/Software/ Digital Media			UPTEC
Consispro	Diagnosis and Design of Systems	ICT/Software/ Digital Media		Covilhã	UBIACTIVA - Gabinete de Apoio a Projectos e Promoção da Investigação da UBI
CorSimTec	The purpose of CorSimTec is to create partnerships with small companies, providing low-cost technology services, with an initial investment and a reduced low monthly fee, create an online presence and improve proximity to their customers. Through the use of automation task, free software, module and standardization simple customization, they provide differentiated high-value websites technology. These help the customer has some control over the content and updating in a simple and intuitive.	ICT/Software/ Digital Media			UPTEC
Declarativa	The Declarative conducts projects, design and develops institutional software as using "Web information Systems "as the main platform. Reuse of tools common to several projects allows the development with great resilience and pragmatism, in a more Declarative than the current practice in software industry.	ICT/Software/ Digital Media		Porto	UPTEC

Gema	The Gema is a company focused on the exploration of Multimedia and Interactive Marketing solutions. Internet services and Video allowed penetration in the context that today marks the day today of Gema. The evolution for interactive marketing solutions, achieved through a regime of expansion standing and creation of several partnerships, particularly with SAI Interactive Portugal, secured differentiation other competitors and greater market reach.	ICT/Software/ Digital Media			UPTEC
Ideia M.	This is a company whose initial goal is the research and the development for alternative ways to construct musical instruments and accessories, formed by students and alumni of the Faculty of Engineering, University Porto.	ICT/Software/ Digital Media		Porto	UPTEC/UPIN
I-Zone Knowledge Systems	Software development, Web design, training	ICT/Software/ Digital Media		Covilhã	Parkurbis
Lobby	Film production / video / advertising; creative advertising; Marketing; Webdesign; Multimedia Post Production	ICT/Software/ Digital Media		Covilhã	UBIACTIVA
Methodus Inovação, Lda	Software House	ICT/Software/ Digital Media		Covilhã	Parkurbis
Neoscopio	The Neoscopio company that was founded by four young entrepreneurs from de Porto University. This spin-off develops and markets software solutions on Open Source having the ambition to be a European reference in this area. The Open Source products created by Neoscopio have been already used by companies and laboratories of international renown as NASA Jet Propulsion Laboratory, Lufthansa, European Agency for Safety and Health at Work, Oxfam, the CIA and the United Nations	ICT/Software/ Digital Media		Porto	UPTEC/UPIN
Netflow	This is a company that operates in the planning perspective and network management. It is now working to optimize a tool for monitoring network services and systems information, and also holds technical services in the field of Open Source. The Netflow covers the following areas of intervention: planning, installation, auditing, and alarmist signage, security and risk analysis, voice over IP, video surveillance.	ICT/Software/ Digital Media		Porto	UPTEC
Newmensus	The Newmensus is an engineering company whose main business is the development and integration of new technologies in the construction industry. In addition, make consultant projects, project development and other engineering services, testing, characterization and control of materials and structures, taking care of supply and also application of control systems in civil engineering works.	ICT/Software/ Digital Media			UPTEC

OSTV	OSTV new television project is designed to offer an alternative for those seeking a cultural content increasingly fragmented landscape. The Traditional Model television business, pressured by the public (mainstream) it is assumed today as a burdensome cost structure and rigid programming schedule is inadequate to meet a reality far more complex and diverse, composed of various niches and consumer participation, OSTV represents not only an open-source TV, but also allows the viewer greater freedom of choice. This project is based on online platform open to participants of talent in each discipline (Music, Journalism, Architecture, Cooking ...), where may be possible to contribute a video, a comment or vote. The best content selected by the criteria community and paid, will be broadcast on cable TV for provide the highest quality experience of spectator. OSTV is a non-profit organization aimed: (1) promote a wide media coverage of events cultural (2) encourage the production of sustainable projects, artists scheduled mainly through small monetary incentives, (3) support collaboration between disciplines, (4) develop the production of innovative content crowdsourced (4) help build skills in editing video, the format of today's most powerful media.	ICT/Software/ Digital Media		Porto	UPTEC
Practical Way	A Practical Way Software is a company whose mission is the development of web application with innovative and high quality technique to try to meet customer needs. The Practical Way Software aims to become a company well known in the development of integrated solutions for web environments market. This company is responsible for creating the Portal ORZARE.COM oriented to the construction area. This tool includes a community, a catalog of materials and a budgeting tool for engineering civil, all available online.	ICT/Software/ Digital Media		Porto	UPTEC/UPIN
Projecto Construir	Projecto Construir is social entrepreneurship initiative, in the form of an association, which aims to support children, to provide them with involvement in recreational and artistic activities of great impact, which may contribute to an improvement in their state of mind and general well-being, allowing face internment and its implications a more positive way. These fun activities and artistic consist mainly in the construction of models LEGO large-scale thematic whose construction could include national monuments, important buildings, among others. Experience LEGO represents a very peculiar junction between the playful aspect and the artistic aspect, offering beneficiaries with a unique experience not only for leisure but also enriching educational and soul.	ICT/Software/ Digital Media		Porto	UPTEC
Red Desert	The Red Desert works with images and sounds, fragments of the world in which we live. They believe that in promoting culture, in discussing it, in debate it, they are encouraging the formation to produce content. The Red Desert wants to show films that fail to distribution in the distribution, programming exhibitions, courses and festivals anywhere in the country. Red Desert wants to produce documentaries and fiction features and promote collaboration for the development of audiovisual projects. They think the public needs and go beyond that. They aim to meet this challenge.	ICT/Software/ Digital Media		Porto	UPTEC
Strogstep	The Strongstep is a company specialized in Software Engineering that helps to improve the quality of software. Our approach is based on pragmatic principles efficiency and excellence, supported by a team with lots of experience, by the use of best practices and partnerships with reference institutions worldwide.	ICT/Software/ Digital Media		Porto	UPTEC

Wad Software	The Aroso & Associados - Inovação SA is an innovative Technology-based company owner of the WAD Software brand that develops software solutions specific and innovative. Operating in the area of digital communication, develops Web-based products, striving to be always at the forefront of the latest technologies and given the highest quality standards.	ICT/Software/ Digital Media		Porto	UPTEC
A3P	The A3P proposes the construction of an information network in place Porto region, which includes various types of news and content about it: the network Porto24. This network will be made by a set of thematic websites that will exchange information with links to others. In addition, the network will be built with underpinned by a strong bond with their users. They will be able to interact with each other and discuss issues of Porto24 news portal using the network as a platform. We want the community to have a strong participation in the network Porto24. One of the sites is an online newspaper focused on the region Porto, where we discovered a gap in coverage.	Microelectronics/ Robotics		Porto	UPTEC
Bimet, Lda.	Process re-engineering and industrial maintenance	Microelectronics/ Robotics		Covilhã	Parkurbis
Delira net	Delira net is a telecommunications company. Currently provides consulting services and technique assistance, and has established partnerships with Ericsson, with Mitel Networks, March Networks and Novis Enterprises.	Microelectronics/ Robotics			UPTEC
Nonius	The Nonius is a Telecommunications Equipment Portuguese Manufacturer that develops and markets products and solutions for Internet access management. The current product line - Wireless GEST allows you to manage, control, ensure security and charging for Internet access service for Hotspots.	Microelectronics/ Robotics			UPTEC
Silicon Gate	The SILICONGATE is a project microelectronics ("IP Design") company specialized in power management circuits for mobile applications. The main types of products in this market segment are switched regulators (DC / DC) linear regulators (LDO Low Drop-Out Regulator), circuits generation Reset (POR-Power-On_reset) and circuits generation of voltage reference (Band-Gap). The low consumption, ease of integration, and modularity are some of the attributes that make SiliconGate products a reference in terms of performance. The ongoing research effort and development is greatly enriched by the close collaboration with some of the most prestigious national research institutions among which stand out INESC-ID, the Higher Technical Institute and the Faculty of Engineering University of Porto.	Microelectronics/ Robotics		Porto	UPTEC
Timendi	Research, creation and development of new technological solutions for psychological treatment and training in virtual environments (Lusófona)	Other			INDEG