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**Research and development expenditure in the business sector as
indicator of knowledge economy: the Portuguese experience**

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ABSTRACT

The objective of the paper is to help to understand recent changes in the structure of R&D activities, by analyzing data on the expenditure of the business sector in research and development (R&D). The results are framed in an international context, through comparison with indicators from the most developed countries, divided by technological intensity and economic activity.

The study reveals that the indicators of Portuguese R&D expenditure in the business sector are closely linked both to fiscal policy and to high foreign direct investment in knowledge-intensive industries. It also links these indicators to phenomena such as the abundance of skilled labor in pharmaceutical industries and the government intervention in some sectors of the economy (namely health and rail transportation).

JEL classification: L52; O14; O38

Key words: business sector; R&D; technology intensity; knowledge-intensive industries

1. Introduction

This article attempts to contribute to a better understanding of the Portuguese knowledge economy through the analysis of one of its most important indicators: R&D expenditure in the business sector¹. In the first part, the general indicator of Portuguese R&D expenditure will be compared with that of the most developed countries (Organization for Economic Cooperation and Development), particularly in what concerns the business sector of those economies. The second part will analyze data related to the Portuguese R&D expenditure

¹ The study aims to analyze R&D activities in the business sector, in the optic of expenditure, the indicator relative to human resources in R&D will not be analyzed in this article.

in the business sector throughout the last decade.

2. Portuguese industrial R&D activities in an international context

According to the Frascati Manual (2002), R&D activities “comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.” (p.30)

A wide variety of indicators can be employed to measure national efforts put into R&D. Input indicators, relative to expenditure and staff in R&D, tend to be the most reliable, because they employ similar data gathering methods and have generally been compiled for a relatively long period of time by national statistics centers.

These indicators are defined in the Frascati Manual, created in 1963 by Organization for Economic Cooperation and Development (OECD) countries and revised three times since. This manual is the best existing reference for gathering statistical information in the area of science and technology in developed countries. Note, however, that the existing data pertaining to resources allocated to R&D is also determined by diverse characteristics of national statistics, especially by the inquiries’ extent of coverage (in terms of industries, company size, sampling methods and frequency of the studies).

When establishing international R&D intensity comparisons, one of the most used indicators is the total expenditure in R&D. This indicator represents the sum of all domestic expenditure in R&D-related activities in a given year. However, GDP must also be taken into account in order to, not only understand the national engagement in the area of R&D, but also effectively assess the intensity of the national R&D effort in comparison with other economic activities. The GDP rate helps to put into relation the differences between countries, by providing insight into the share of national wealth that a country dedicates to these kinds of activities. In countries with big economies, however, this indicator of R&D intensity is less reliable and can mask significant efforts in R&D activities.

The Portuguese Business R&D expenditure grew gradually from 162 Millions dollars² in 1995, 434 in 2003, 565 in 2005 and 1141 in 2007³. The Portuguese Business R&D intensity⁴ has also increased consistently in the past, growing from 0.5 *per cent* in 2003⁵, 1.0 *per cent* in 2005⁶ up to 1.2 *per cent* in 2007⁷. During this period the country improved

² Million 2000 dollars, constant prices and using Purchasing Power Parities (PPP)

³ Main Science and Technology Indicators 2009-1

⁴ Business enterprise expenditure on R&D (BERD) as a percentage of value added in industry

⁵ OECD STI 2005

⁶ OECD STI 2007

⁷ OECD STI 2009

its relative position, ranking 26th out of 31 economies in 2003⁸, 27th out of 32 economies in 2005⁹ and 24th out of 36 economies in 2007¹⁰. Furthermore, the average annual real growth rate of Portuguese business R&D expenses was 12.5 *per cent* between 1995 and 2005 (ranking 4th out of 35 economies)¹¹ and 18.8 *per cent* between 1997 and 2007 (ranking 3rd out of 35 economies)¹². In conclusion, Portugal presents a relatively low (although growing) R&D expenses and intensities, when compared with other developed and emerging economies¹³. But although its R&D expenses and intensity rates are relatively small, Portugal did experienced significant R&D average annual real growth rates.

For detailed analysis and international comparisons, the R&D effort is generally divided into four sectors of execution: Companies, Superior Education, Government and Non-profit Institutions. Beyond these sectors, R&D activities can be divided according to sources of financing into five categories: the four execution sectors and foreign funds.

According to OCDE databases, the percentage of R&D expenditure has changed not only when considering the source of financing (as a percentage of the national total), but also the source of execution (see Figures in annex 1). In fact, the percentage of GERD financed by industry grew from 19 *per cent*, 32 *per cent*, 36 *per cent*, 47 and 48 *per cent*, respectively, in 1995, 2003, 2005, 2007 and 2008; and similarly, the percentage of GERD performed by the Business Enterprise sector grew from 23 *per cent*, 33 *per cent*, 38 *per cent*, 51 *per cent* and 50 *per cent*, respectively, in 1995, 2003, 2005, 2007 and 2008 (47 *per cent* for 2009¹⁴).

Although there were some structural differences in the distribution of the Portuguese industrial R&D from 1995 to 2007, when the comparison is made internationally (with the available data on OECD.stat in 2008 - see annex 1), the percentage of Portuguese GERD financed by industry ranked 19th out of 30 economies and, similarly, the percentage of GERD performed by Business ranked 29th out of 34 economies. Consequently, the percentage of R&D expenditure remained internationally at low levels and always below the OECD average or even the EU27 in 2008.

The historical difficulties that Portugal faced in involving private efforts in R&D activities led Mateus and Antunes (2000) to note that these characteristics may represent “the answer that society has found to face the incapacity of the private sector”. However, this author also pointed out that the excessive centralization of R&D in the sectors of government and higher education contributed to the inefficiency of Portuguese scientific research. Currently, although the national efforts can clearly be identified, when R&D expenditure is internationally compared the Portuguese achievements remain inexpressive.

There are several possible explanations for the private sector’s incapacity to face the

⁸ OECD STI 2005

⁹ OECD STI 2007

¹⁰ OECD STI 2009

¹¹ OECD STI 2007

¹² OECD STI 2009

¹³ These studies published in the collection “OECD Science, Technology and Industry Scoreboard” included some emerging economies that are not OECD members, such as Israel, South Africa, China and the Russian Federation.

¹⁴ Provisional data from the Portuguese R&D Survey 2009:

<http://www.gpeari.mctes.pt/index.php?idc=47&idi=518380>

challenges of the knowledge society:

- 1) The weak technological orientation of the Portuguese economy is reflected in industrial R&D. In fact, Portugal presents an economic specialization with many established activities of low technological intensity (Mateus and Antunes 2000: 10), such as shoes and textile manufacturing. In this context, it is natural that the R&D activities associated with these economic activities also have a small dimension.
- 2) The pattern of specialization of Portuguese export activities shows a closer association with the mass production of goods and equipments that have been developed in other economies rather than with the technological development of new products.
- 3) Portuguese investment in defense and security systems is not associated with the effort in R&D of the private sector. In fact, the almost inexistence of military and security R&D is a result of the direct import of military equipment, which is done generally without need for national compensations that include the need to known R&D activities.

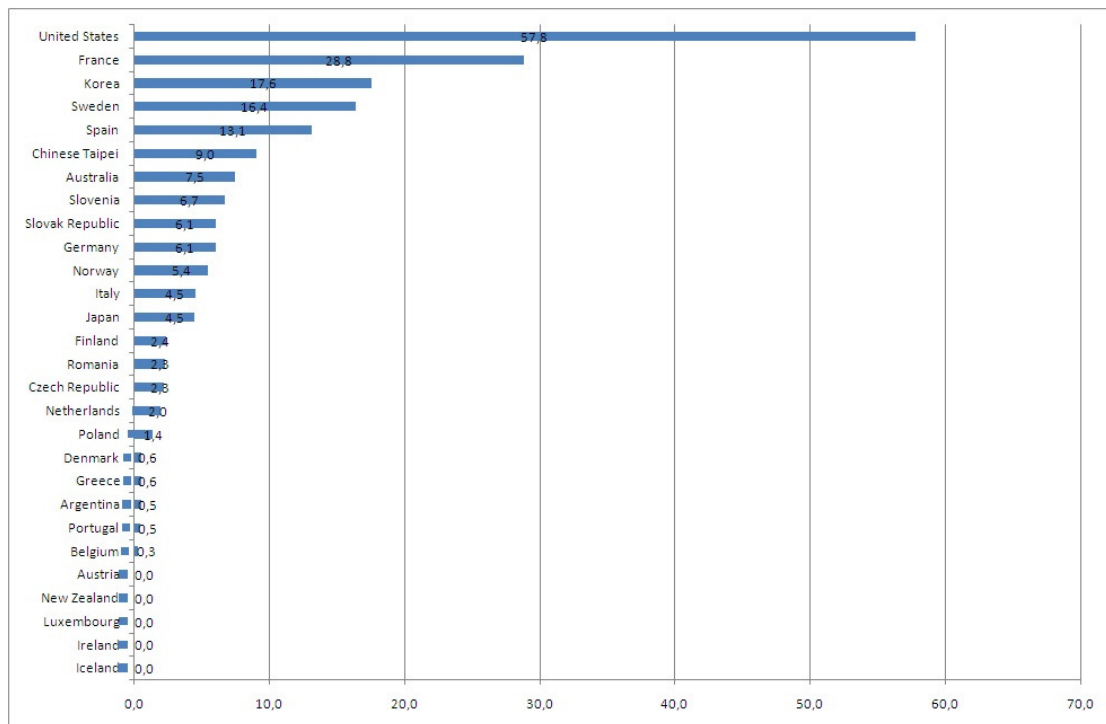
2.1 Military R&D

When analyzing the scientific and technological potential of a country, it is necessary to take into account the impact of R&D activities that are promoted by the departments of defense and economy. This issue is rather important, as several technological innovations with commercial application result from R&D activities promoted by the military and/or the security sectors.

However, the secrecy associated with military activities, and in particular with the budget and expenditure in defense, is an obstacle to accurate quantifications and often promotes speculation. The most approximate quantitative analysis one can reach is based on the indicator that relates the percentage of military R&D expenditure with the total budget for R&D (GBAORD¹⁵). This indicator is therefore to be used with caution, once the public R&D budget has not the same weight in all countries. Thus, the weight of military R&D budget in the total governmental R&D budget has different meanings according to different countries. In Japan that weight can be minor than the one in Portugal. Further studies can be done in that direction. The following figure presents the share of Defense R&D budget in relation to the total R&D budget in OECD countries.

¹⁵ Government budget appropriations or outlays on R&D

Figure 1 - Defence Budget R&D as a percentage of Total GBAORD



Source: OCDE Main Science and Technology Indicators 2009-1

This indicator reveals that the OECD countries that produce weapons and other equipment associated with the defense and security industries give a larger governmental budget share to military R&D. France, Sweden, the U.S. and the U.K. are examples of this. In these countries, the industrial base of defense and security promotes innovation and increases expenditure and human resources in R&D activities. On the other hand, countries without a strong connection between R&D and the defense sector also lack the strong industrial component, which is generally established around the military and security chains.

Since countries like Portugal do not have a strong contract research component in the Defense sector, one should bear this in mind when analyzing international cross country comparisons. It is thus important to take into account the fact that R&D expenditure in the business sector covers R&D activities carried out in the sector, by company or investigation institutes, disregarding the origin of the funding. On the other hand, while the sectors of government and higher education also execute R&D activities, the industrial R&D is generally linked to the creation of new products and production techniques as well as to the efforts of innovation in the market place.

The business sector includes all companies, organizations and institutions in which the primary activity is producing products and providing services that will be sold to the

public, generally at an economically significant price. Private not-for-profit institutes that serve these companies are also included in the definition.

In an analysis of the evolution over the years, it is important to take into account that the average growth rates per year are high, when the base values of the country are very low. But when the growth rates remain high and constant throughout a decade - like it happened in Portugal - it is important to understand the causes of the phenomenon. As a result, this significant effort to grow the R&D expenditure in the business sector will be examined with more detail in the next chapter. The aim is to identify the origin and the nature of this trend and to understand its implications to the national development effort.

2.2 R&D activities in the business sector by technology intensity

All industries create and/or explore technology and knowledge. But some do it more intensely than others. Assessing the importance of technology and knowledge in an industry requires a thorough analysis of the product leaders in technology goods, as well as of the activities that intensely use high technology or that require highly skilled labor to explore the benefits of technological innovations.

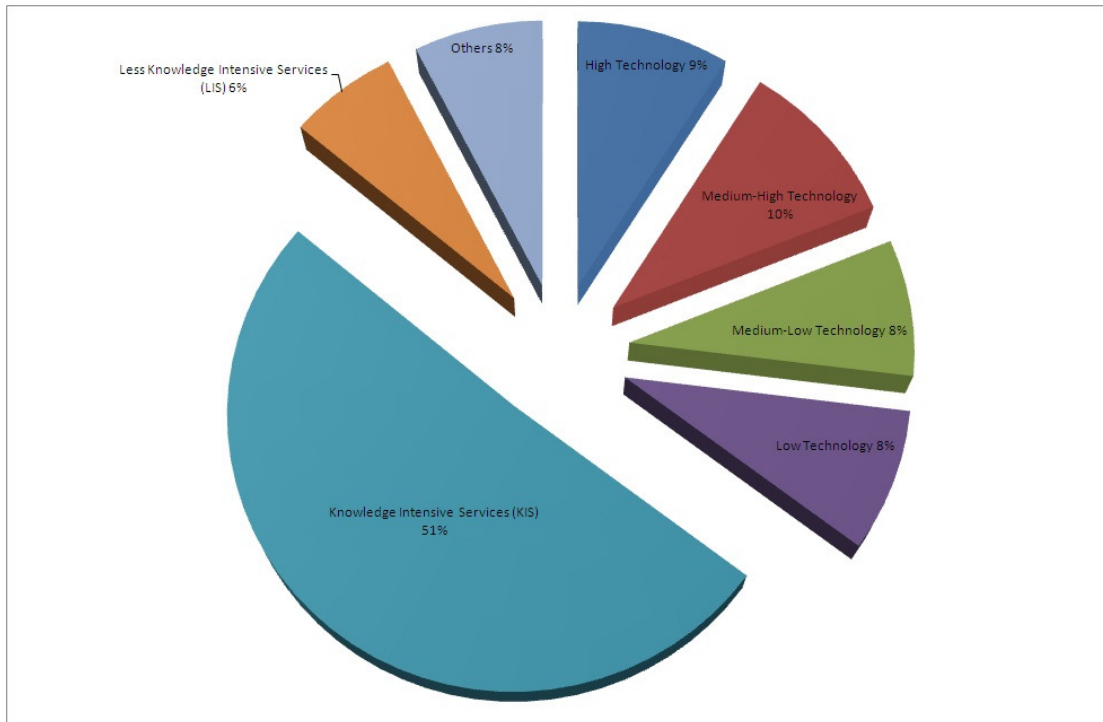
The best way to measure industries with intense technology and knowledge is to use the OECD Science, Technology and Industry Scoreboard. This index classifies manufacturing industries in terms of technology intensity, that is, industries where the technological effort is seen as a major determinant of productivity growth and international competitiveness. Technology intensity is classified in the table as high, average-high, average-low, and low. This classification is based on the groups that were created after the OECD ranked industries in 12 countries in accordance with the average for 1991-1995 of R&D intensity.

One should note that the scoreboard created to analyze the knowledge intensity in the service sector presents more difficulties. On the one hand, it reflects a relatively limited concept of knowledge intensive services and, on the other hand, it does not include sufficient data for comparison purposes. For instance, real estate activities were not included (CEA 70), while postal and telecommunications services, financial intermediation were, except for insurance and pension funds (CEA 65). Insurance, pension funds and other complementary social security activities (CEA 66), auxiliary activities of financial intermediation (CEA 67) and, lastly, rental of equipment and machinery without staff and personal and household goods (CEA 71), information technology activities (CEA 72), research and development (CEA 73) and other services activities provided mostly to companies (CEA 74).

Based on these classifications, the ensuing analysis provides a detailed examination of the most important business sectors in Portugal and their dynamics throughout the period of 1995-2005.

The next figure presents the distribution of R&D expenditure in the business sector by levels of technology intensity in 2008.

Figure 2 – Distribution of R&D expenditure in the business sector, by technology intensity (2008)

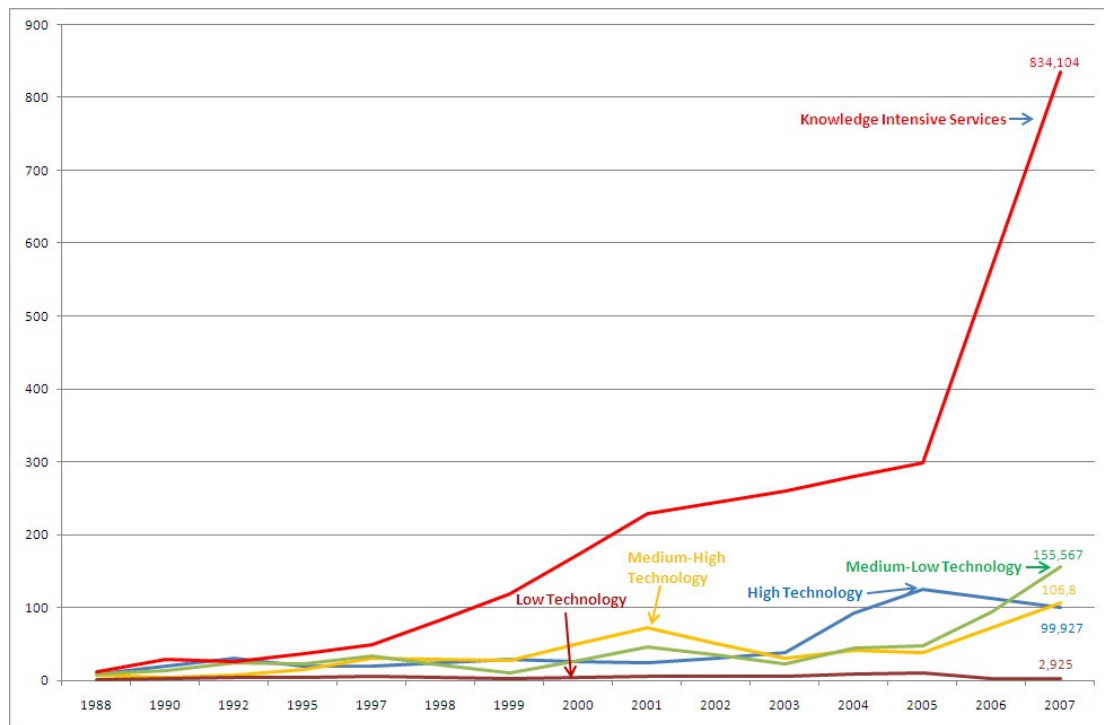


Source: GPEARI/MCTES, 2008 R&D Survey

The distribution of R&D expenditure in the business sector revealed that the Knowledge intensive services were by far the most important intensity sector of the R&D expenditure in 2008, with 51%. In the same year, 10% of the R&D expenditure came from Medium-High technology sectors, followed by the High technology sector (9%), the Medium-Low (8%) and the Low Technology sector (8%). The “Less Knowledge intensive Services” sector (LIS) was responsible for 6% of the business R&D and the remaining sectors for 8%.

Figure 3 shows the evolution of R&D expenditure of the Portuguese business sector from 1995 to 2005, divided by sector of technology intensity.

Figure 3 – Evolution of R&D expenditure in the business sector, by technology intensity



Note: Millions of €, current prices.

Source: OECD - Data extracted on 27 Jan 2011 10:59 UTC (GMT) from OECD.Stat - Dataset: Business enterprise R-D expenditure by industry

One can observe that all sectors of technological intensity have been growing in terms of expenditure with R&D activities. However, the sectors with highest technology intensity are the ones that stand out for their greater capacity to grow. For example, the high technology sector in 2005 was already responsible for 27 per cent of the total R&D expenditure in the business sector. The sectors with low technology intensity are the ones that grew the least. These facts help sustain the idea that the coexistence of two economies in Portugal: one, more linked to the knowledge economy and to the most dynamic sectors of society, with capacity to capture more investment (and the best human resources) and more proficient in R&D activities; and another less dynamic economy, without a tendency to develop R&D activities and, consequently, with less need to invest in knowledge and to capture highly skilled labor. This economy is, nevertheless, of significant importance to the national economy and employment.

The introduction of a fiscal incentive system (SIFIDE) helped to increase R&D activities

and, in a significant way, the report of R&D to statistical authorities. The SIFIDE was first introduced in 1997, discontinued in 2003 and reinstated with better incentives in the fiscal year 2006.

The analysis of Figure 4 shows three particular sectors that have evolved steadily throughout the decade:

- 1) Services with intensive knowledge have become the sector with the highest level of R&D expenditure in Portugal. In fact, while in 1995 this sector had expenditure levels as large as the sector of high technology intensity, by the end of the decade it is the clear leader in expenditure in R&D activities. The re-introduction of R&D tax incentives in 2006 explains the significant increase in the expenditure of knowledge intensive services.
- 2) The sector of high technology intensity went to an important growth period between 2003 and 2005 (AAGR¹⁶ 01-03=27 *per cent* and AAGR 03-05=45 *per cent*).
- 3) The sector of medium-high technology intensity had an unusual growth in 1997 (AAGR 95-97=38 *per cent*) e 2001 (AAGR 99-01=56 *per cent*).

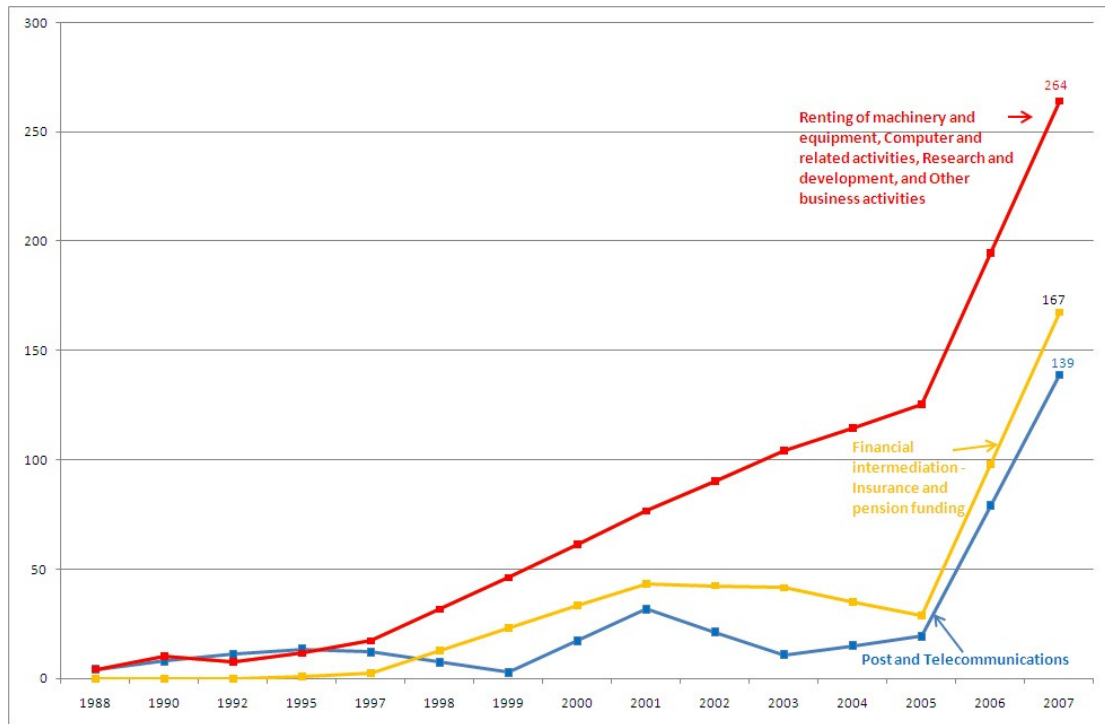
The above-mentioned patterns are confirmed by the analysis of the evolution of a number of variables: total staff numbers, number of research employees, number of companies engaged in R&D activities.

In this context, it is important to know which industries contributed the most to these patterns. Figures 4, 5 and 6 show the evolution of business R&D expenditure by the different Classifications of Economic Activity (CEA) that fit in these sectors of technology intensity.

¹⁶ AAGR is the acronym of Annual Average Growth Rate

The following figure 4 shows the evolution of business R&D expenditure by CEA in the knowledge intensive services, from 1988 to 2007.

Figure 4 – Evolution of business R&D expenditure by CEA in the Knowledge Intensive Services (1988-2007)



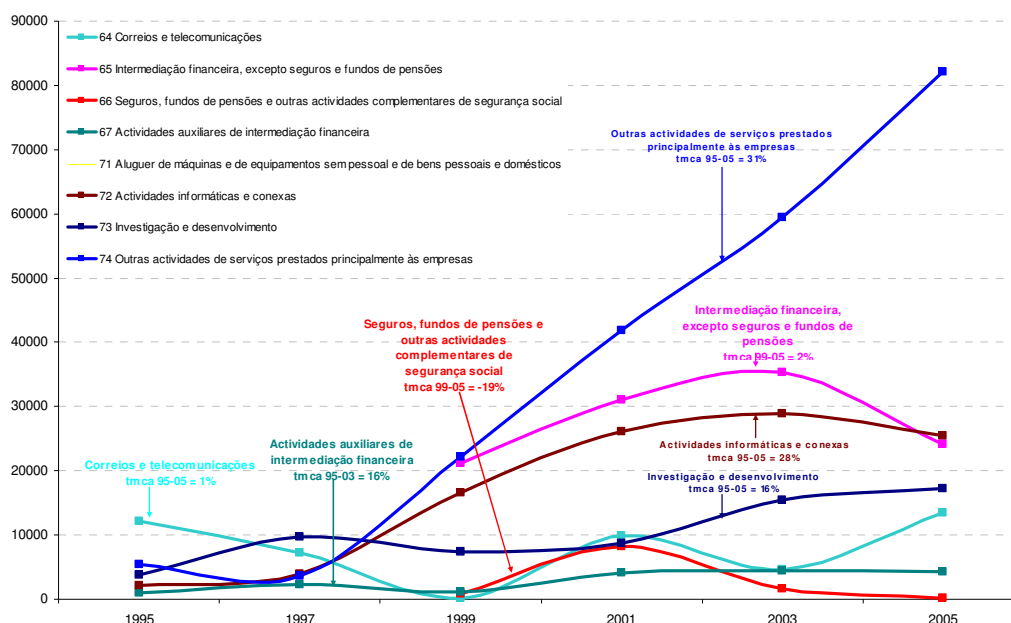
Note: Millions of €, current prices. Several estimates and projections by OECD and authors.

Source: OECD - Data extracted on 27 Jan 2011 10:59 UTC (GMT) from OECD.Stat - Dataset: Business enterprise R-D expenditure by industry

One can observe that since 1997 the “Renting of machinery and equipment”, “Computer related activities”, “Research and Development” and “Other business activities” became responsible for the most significant share of service R&D activities. This group of CEA is named Knowledge intensive business services (KIBS). Furthermore, since 1998 the “Financial intermediation” became the second most important type of knowledge services. Lastly, the “Post and Telecommunications” were reporting R&D expenditures close to the “Financial services”, particularly after 1999.

The next figure shows the evolution of business R&D expenditure by CEA in the services of intense knowledge, from 1995 to 2005.

Figure 5 – Evolution of business R&D expenditure by CEA in the services of intense knowledge



Note: Thousands of €, current prices

Source: GPEARI/MCTES, Survey of the national potential in science and technology

One can observe that the aggregate “Other service activities provided mainly to companies” [Outras actividades de serviços prestados principalmente às empresas] (CEA 74), is the one with most R&D expenditure in the sector since 1999 in Portugal. The aggregate has witnessed an average annual growth rate (AAGR, or TMCA in Portuguese,) of 31 *per cent* in the considered period.

In addition, this economic activity was responsible for 18 *per cent* of all R&D expenditure by the business sector in 2005, despite only representing 13 *per cent* of the total number of companies with R&D activities in that year.

The following table presents the evolution of the R&D expenditure and its distribution since 2001 to 2007 in the KIBS category and in other sectors of the economy.

Table 1 – Evolution and distribution of Business R&D expenditure in KIBS and other sectors of the economy

CEA	2001		2003		2005		2007	
	Value	%	Value	%	Value	%	Value	%
Computer and related activities	26	8%	29	9%	26	6%	108	11%
Research and development	9	3%	15	5%	17	4%	19	2%
Other business activities	42	13%	59	18%	82	18%	137	14%
Real estate, renting and business activities	77	23%	104	31%	125	27%	264	26%
SERVICES SECTOR	163	49%	179	53%	203	44%	608	60%
MANUFACTURING SECTOR	160	48%	151	45%	213	46%	343	34%
OTHER SECTORS	8	2%	8	2%	46	10%	60	6%
TOTAL BERD*	330	100%	338	100%	462	100%	1011	100%

Note: Millions of €. *BERD = Business Expenditure on Research and Development

Source: Based on data extracted on 26 Nov 2012 10:33 UTC (GMT) from OECD.Stat

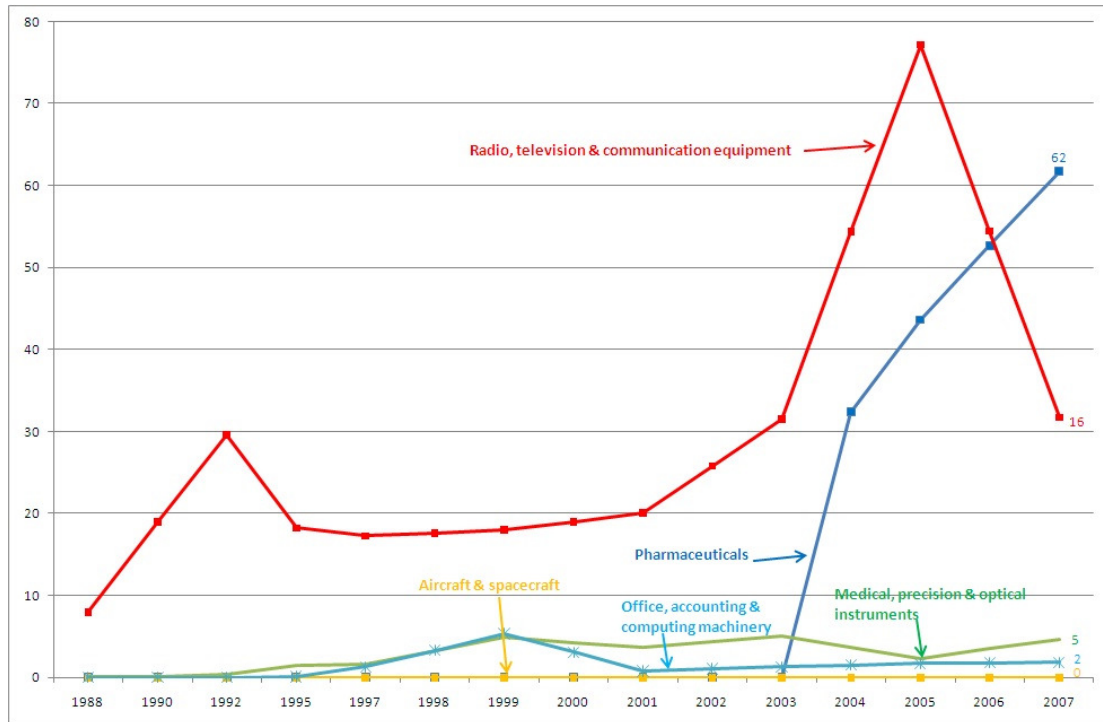
It can be observed in Table 1 that the business expenditure of KIBS was concentrated in the “Other business activities” in 2007 and, increasingly in Computer and related activities. The distribution of the latter expenditures increased from 8 *per cent* in 2001 to 11 *per cent* in 2007 and the former expenses from 13 *per cent* to 14 *per cent* during the same period. Furthermore, the CEA of “Real estate, renting and business activities” increase its share of expenditure from 23 *per cent* to 26 *per cent*.

In addition, there was a *terciarization* of business R&D. In fact, the Services sector expenditure increased from 163 to 608 Millions of Euros from 2001 to 2007, whereas de “Manufacturing sector” increased only from 160 to 343 Millions of Euros, respectively.

During the same period, the structure of business R&D changed with the “Services sector” increasing from 49 *per cent* in 2001 to 60 *per cent* in 2007, whereas the “Manufacturing sector” decreased from 48 *per cent* to 34 *per cent* during the same period.

The following figure presents the evolution of business R&D expenditure by CEA of high technology intensity, from 1995 to 2005.

Figure 6 – Evolution of business R&D expenditure by CEA of high technology intensity



Note: Millions of €, current prices. Several estimates and projections by OECD and authors.

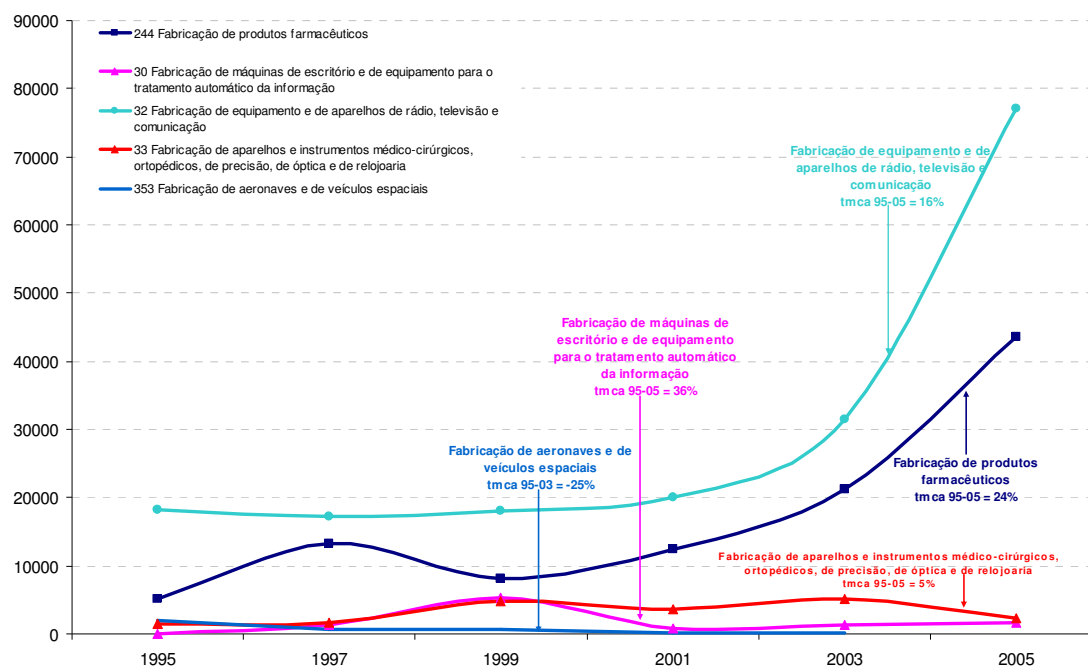
Source: OECD - Data extracted on 27 Jan 2011 10:59 UTC (GMT) from OECD.Stat - Dataset: Business enterprise R-D expenditure by industry

As previously mentioned, this intensity sector showed an important growth rate since 1997. The CEA of Radio, television & communication equipment was responsible for most R&D expenditures.

Furthermore, since 2004 the “Pharmaceuticals” industry has been the second most important sector, reporting in 2007 the “Radio, television & communication equipment” sector expenditures in R&D.

The next figure presents the evolution of business R&D in the high technology sector by CEA.

Figure 8 – Evolution of business R&D expenditure by CEA of high technology intensity



Note: Millions of €, current prices. Several estimates and projections by OECD and authors.

Source: OECD - Data extracted on 27 Jan 2011 10:59 UTC (GMT) from OECD.Stat - Dataset: Business enterprise R-D expenditure by industry

The observation of Figure 8 reveals that, since 1995, the manufacture of goods and equipment related to radio, TV and communications [Fabricação de equipamentos e de aparelhos de radio, televisão e comunicação] (CEA 32) is the activity of high technology intensity with the greatest R&D expenditure in Portugal. In addition, this expenditure increased at the average annual rate of 56 *per cent* between 2003 and 2005.

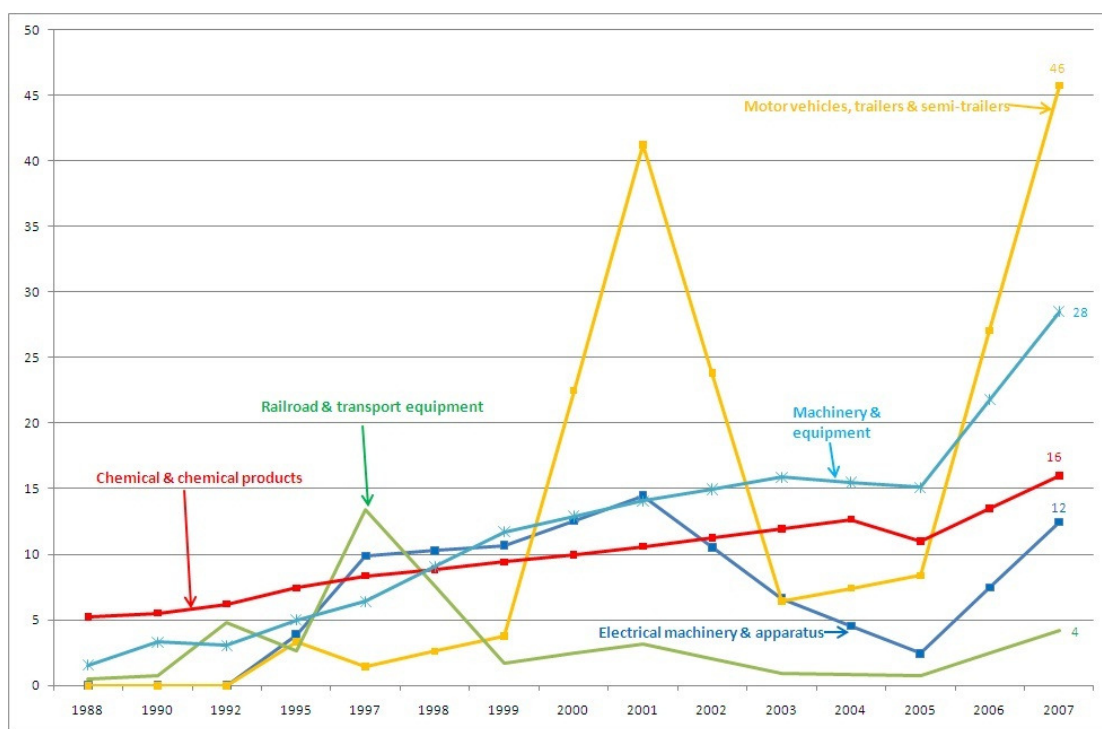
One should also note that in 2005 this industrial activity was responsible for 17 *per cent* of the total R&D expenditure, despite only representing 2 *per cent* of the total number of companies with R&D activities. This reveals that the growth between 2003 and 2005 is probably related to the influence of big established firms in Portugal that resulted from foreign investment.

In 2005, the manufacture of pharmaceutical products [Fabricação de produtos farmacêuticos] (CEA 244) was the activity with the second greatest technological intensity (AAGR 95-05=24 *per cent*). It was the third most important activity of the national total, accounting for 9 *per cent* of R&D expenditure, despite representing only 2 *per cent* of the

total number of companies with R&D activities. The importance of the pharmaceutical products relies mostly on the R&D carried out by established Portuguese medium size companies.

The following figure shows the evolution of R&D expenditure in the business sector by CEA of medium/high technology intensity between 1995 and 2005.

Figure 9 – Evolution of R&D expenditure in the business sector by CEA of medium/high technology intensity



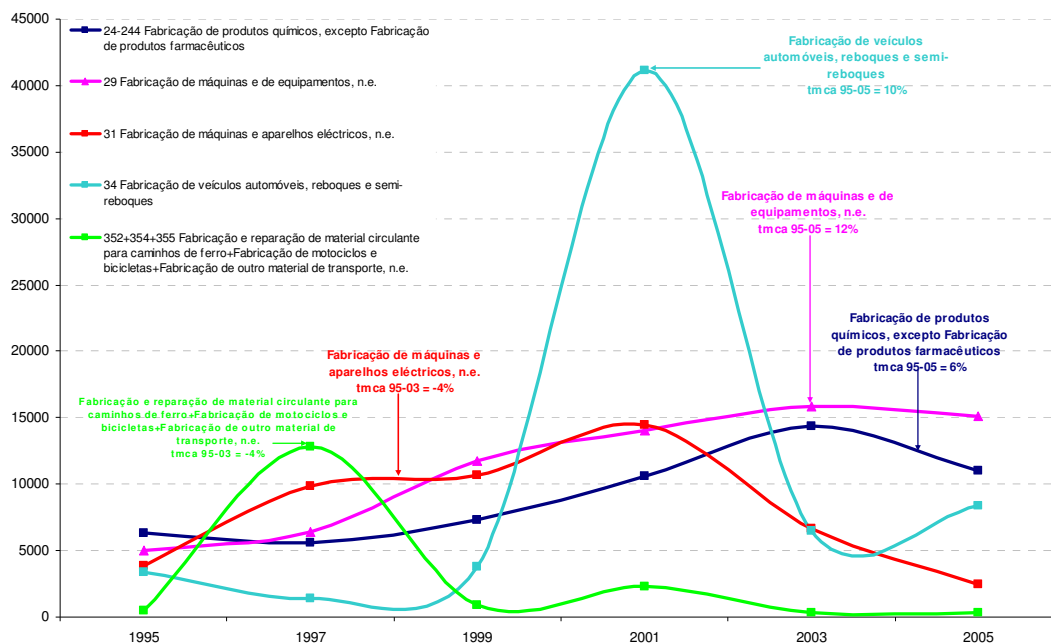
Note: Millions of €, current prices. Several estimates and projections by OECD and authors.

Source: OECD - Data extracted on 27 Jan 2011 10:59 UTC (GMT) from OECD.Stat - Dataset: Business enterprise R-D expenditure by industry

As previously presented in Figure 2, this sector presented an unusual growth in 2001. In Figure 9, it can be observed that the peak in 2001 was related to expenditures in “Motor vehicles, trailers & semi-trailers” sector. It can also be observed a second peak in 2007 in the same sector, probably related to direct foreign investment in R&D activities.

The next figure presents the evolution of business R&D expenditure in the medium/high technology sectors by CEA.

Figure 10 – Evolution of R&D expenditure in the business sector by CEA of medium/high technology intensity



Note: Thousands of €, current prices

Source: GPEARI/MCTES, Survey of the national potential in science and technology

In 1997, the manufacture and repair of railroad material [Fabricação e reparação de material circulante para caminhos de ferro] was the industrial activity of medium/high technology intensity with the highest growth rate (this figure aggregates other economic activities which, after a more detailed examination, did not reveal significant R&D expenditures).

In 2001, the industrial activity with an unusual increase in R&D expenditure was the manufacturing of motor vehicles, trailers and semi-trailers [Fabricação de veículos automóveis, reboques e semi-reboques] (CEA 34). One should also point out that this industry went through an outstanding annual growth rate of 230 *per cent* in R&D expenditure from 1999 to 2005. In addition, in 2001, it was the second most important activity of the national total, accounting for 12 *per cent* of R&D expenditure, despite representing only 3 *per cent* of the total number of Portuguese companies with R&D activities.

3. Conclusions

The comparison with other developed economies revealed that Portugal has a national S&T system with low intensity in R&D, not only in general terms, but particularly in the business sector. The business R&D expenditure has increased and, to a certain extent, its variations seemed dependent of the introduction of tax incentives policies to R&D activities. These policies changed also along the recent years and influenced the reporting of the volume of business R&D expenditure.

However, in the period between 1995 and 2005 Portugal revealed significant annual R&D growth rates. These rates were the result of growth in services, foreign investment in telecommunications and automotive industries, as well as national investment in railroad material. Furthermore, the international comparison shows that the system has a strong component of public investment, despite not having a strong military system associated with R&D.

When observing the evolution of R&D activities in the Portuguese economy, one can conclude that:

- 1) The knowledge-intensive services have assumed an outstanding position in the past decade, in terms of R&D expenditure in the Portuguese business sector. The CEA that most contributed to this phenomenon was the one related to other activities of services provided to companies and, recently, the computer and related activities.
- 2) The sector of high technology intensity showed a high growth rate since 2003. The CEA that most contributed to this strong growth were the manufacture of goods and equipment related to radio, TV and communications and, to a lesser extent, the manufacturing of pharmaceutical products.
- 3) The years 1997 and 2001 presented sharp increases in activities of medium-high technology intensity, although they had no continuity. The industrial activity responsible for the 1997 spike was the manufacturing and repair of railroad material. In 2001, the unusual increase in R&D expenditure was the result of a boost in activities of manufacture of motor vehicles, trailers and semi-trailers.

It can be concluded that the above mentioned characteristics are associated with a structural change, based on the emergence of phenomena such as the *terciarization* of Portuguese R&D (and, possibly, the creation of knowledge-intensive services that emerged from the manufacturing industry), as well as the presence in Portugal of intense foreign direct investment in technology. Fiscal policy played a significant role explaining recent increases in knowledge-intensive services, promoting the reporting of R&D expenditures. Other, more attenuated determinants of R&D expenditure in the Portuguese business sector can be found in both the relative abundance of skilled labor in the pharmaceutical industry and in the government's intervention in some sectors of the national economy, such as health and transportation.

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OECD STAN industry list: <http://www.oecd.org/dataoecd/5/30/40729523.pdf>
<http://ce.desenvolvimento.gov.br/remtech/docs/OECD%20-%20ann-a.pdf>

Acronyms

Average Annual Growth Rate	AAGR
Classification of Economic Activity	CEA
European Union	EU
Gross Domestic Product	GDP
Department of Planning, Evaluation and International Relations	GPEARI
Inquiry to the National Scientific and Technologic Potential	IPCTN
National Bureau for Science and Technology Research	JNICT
Ministry of Science, Technology and Superior Education	MCTES
Observatory of Science, Technology and Superior Education	OCES
Observatory of Sciences and Technologies	OCT
Organization for Cooperation and Economic Development	OECD
Research and Development	R&D
Science and Technology	S&T

Annex 1

Figure A – Percentage of GERD financed by sector, 2008

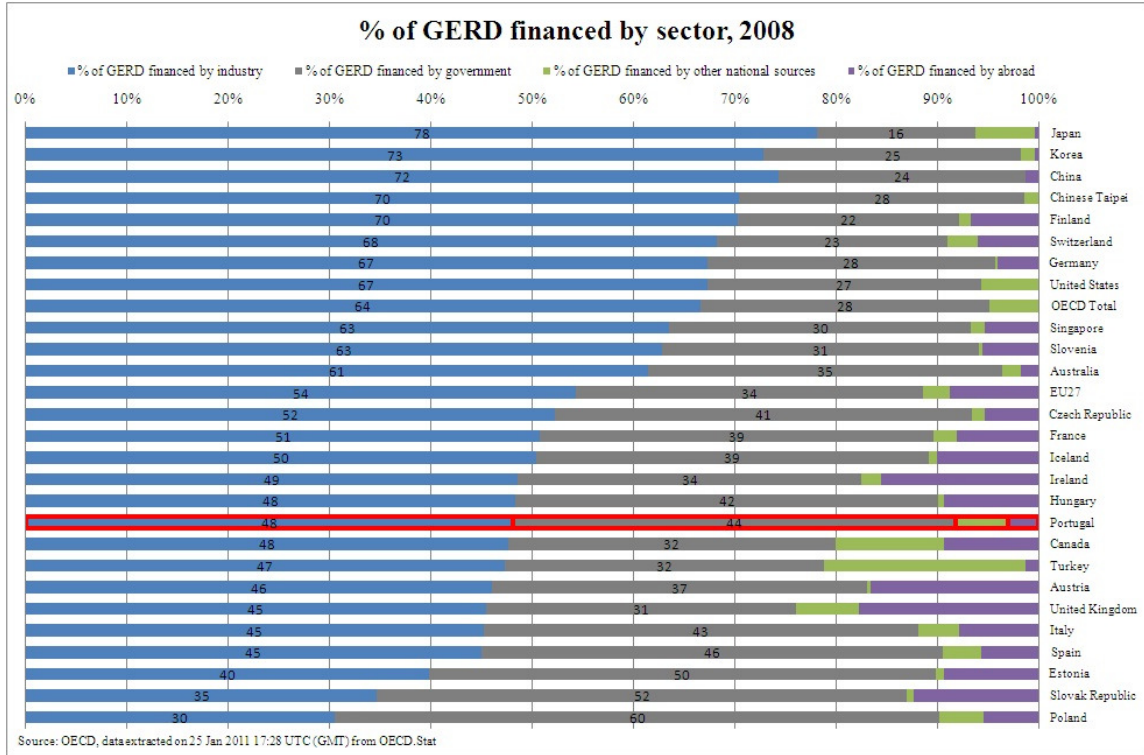


Figure B – Percentage of GERD performed by sector, 2008

