Public Policy for Higher Education and Research. The Fundação para a Ciência e a Tecnologia, Instituto Público; the last common denominator of Science in Portugal and the home of PhDs

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ABSTRACT

Until the Constitution of the Portuguese Republic of 1976 – hereinafter CRP – higher education was an area of restricted access to elites. The CRP of 1976 aimed to expand this access and from the 80s of the last century onwards we have seen the first steps taken towards the implementation of a public policy for Higher Education and Research. In the 80's numerous legislation was produced in order to create a system of Higher Education, approving legal regimes and creating new institutions adapted to the new operating dynamics. With Portugal's entry into the European Economic Community –EEC, currently the European Union; EU –the identification and implementation of nudeges for scientific competition in an increasingly globalised world was realised. The constitutional revision of 1989 not only introduces changes in the structure of public administration as a result of this entry into a broad market, but also places the theme of higher education and research within the scope of the external market and the competition promoted in it. If in the 1980s the foundations of this system were created, it was in the 1990s that it became densified, probably reaching its maximum expression in the 21st century. We will follow this path, mapping what was happening in Portugal in this area and which at some point culminated in the creation of the Fundação para a Ciência e a Tecnologia IP as the main funding agency for science in Portugal.

Keywords: Public Policies, Higher Education, Research and funding.

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INTRODUCTION

BRIEF NOTES ON PUBLIC POLICIES

In order to be implemented, a public policy needs to observe the following procedures: identification of the problem (public) and definition of the agenda; formulation of the resulting policy; adoption of courses of action (cost-benefits have a great preponderance in this phase, but also in the next); implementation (exercise of free decision-making margin) and finally its evaluation. The contextualization of public policies and their identification is verified in contemporary times, when the right to education is replicated in a right to technological and scientific education - defined as its role as a differentiating factor in the current competitive dynamics between states. As BUCCI points out[2], public policies as a legal branch are integrated into a political discourse for the realization of social rights. In this essay, we will focus on what ANDERSON[3] means by public policy. "(…) a policy is defined as a relatively stable, purposive course of action followed by an actor or set of actors in dealing with a problem or matter of concern." The *paper* was based fundamentally on the collection of legislation on the subject, on the research of relevant bibliography and information collected from the archives of the Fundação para a Ciência e a Tecnologia IP – hereinafter FCT – seeking to pursue a systemic analysis of all the information collected. We also underline the relevance of the statistics made publicly available by FCT on its *website*, which gave the work a triangular dimension of cross-referencing data between theory, legislation and empirical elements that reveal the results obtained in this public policy. We recommend reading the graphs, laws and acronyms at the end of this chapter.

PUBLIC POLICIES AND THEIR CONSTRAINTS

If there is a vector of consensus regarding the object of study of this work, it lies in the fact that its implementation is effectively detected in ways that lead us to believe that it is a State policy.[4] In this context, it can be understood as a policy that goes beyond economic, political and social conjunctures or the existence of temporally variable *lobbies*[5] or the constant international and national dialectics of tension[6]. Nevertheless, we must point out that even though it is conceived by us as a national state policy, it is not completely unrelated to certain types of political, economic and

[2] Cf. BUCCI, Maria Paula Dallari, "The concept of public policy in law.", in Public Policies: Reflections on the Legal Concept, (BUCCI, org.) São Paulo, 2006, p.3-5.
[3] Cf. ANDERSON, James E.," The Study of Public Policy" in Public policymaking: An introduction, Boston: Houghton, Mifflin Company, 2003, p.2.
[4] Cf. BUCCI, Maria Paula Dallari, "The concept of public policy in law.", in Public Policies: Reflections on the Legal Concept (BUCCI, org.) São Paulo, 2006, p.18-19.
[5] Cfr. ANDERSON, James E.," The Study of Public Policy" in Public policymaking: An introduction, Boston: Houghton, Mifflin Company, 2003 p. 12 – 13.
[6] DELEON, Peter, "The Historical Roots of the Field.", in The Oxford Handbook of Public Policy, Edited by Robert E. Goodin, Michael Moran, and Martin Rein, 2008, p.49.

social constraints.[7] We adopt a perspective that underlines the existence of a social arena in which some socially well-structured and well-placed socio-historical groups assert their power – through capital of economic, intellectual, symbolic, financial, religious, and political prestige.[8] These capitals, which derive from their easy access to resources, depending on the *networks* to which they access, are managed in supra-hierarchical social networks, which implicitly establish the existence of socially hierarchical networks/groups/professional classes. We add another argument to the statement made above made above, based on the fact that we can see that those who govern or legislate in a country are those who are best prepared to do so. Such a presumption is based on an academic path that prepared them for it, a path from which various prestigious capitals emerge and consequent access to specific social networks.

(...) the *fields* are conceived by Bourdieu as specific areas of organization of the institutional social, generators of social capital corresponding to these valued specificities, capitals that facilitate access to the management of resources located in social relations (Coleman, 1990) or, depending on the perspective, which we do not subscribe; owned by the individuals (Bourdieu, 2002). In this way, Bourdieu's field places the agents as non-equals, instituting the dominance of some over the other (Vasconcelos, 2002), mediated by the *fields* where they are structured and act, taking into account the fulfillment of their own and the group's expectations.[9]

From the above understanding, we emphasize the fact that, for us, the isolated individual does not exercise capital or access resources. Both are operationalized in social interaction. In this context, GIDDENS[10] conceives the reflexive capacity supervening from the proliferation of specialized knowledge characteristic of postmodern globalized societies, as a differential power that is fenced on the social stage. Therefore, we reiterate the perspective that asymmetric power relations between

[7] Cfr. QUIGGINA, John, "Economic Constraints on Public Policy." in The Oxford Handbook of Public Policy, Edited by Robert E. Goodin, Michael Moran, and Martin Rein, 2006, p.549: "A economia é commumente, descrita, como a ciência que aloca recursos escassos ou a arte do possível." e WEISS, Carol e BIRCKMAYER, Johanna, "Social Experimentation for Public Policy" in The Oxford Handbook of Public Policy, Edited by Robert E. Goodin, Michael Moran, and Martin Rein, 2008, p.819:Interests are always powerful influences on policy. Drug manufacturers, farmers, radio station owners, state and city service workers, trial lawyers, charities, utility companies, universities, hospitals—almost every organized body in the nation seeks to promote its own well-being through public policy. The jostling among organized interests provides much of the drama in the policy arena.

[8] Cf.. BOURDIEU, Pierre, Sketch of a Theory of Practice, preceded by Three Studies in Cabila Ethnology, Celta Editora, 2002. Here we are faced with the classic question of structure vs action. In our view, to affirm, as Bourdieu does, that resources reside in individuals is to affirm a great autonomy in relation to them, to say that they fluctuate in the relations between individuals is to affirm the relevance of norms, constraints and deontologies in the processing of interaction. However, and to the extent that we only envision subjects that exist from the interaction in which they actually participate, there is no interaction without subjects, nor subjects without interaction. That is, there are no subjects and no action without powers that somehow condition them. Cf.. also COLEMAN, James, Foundations of Social Theory**.** Harvard University Press, Cambridge, 1990. and ORTNER, Sherry, "Theory in Anthropology since the Sixties", Comparative Studies in Society and History, Vol. 26, Nº 1., (Jan., 1984), p.151.

[9] LUÍS, Francisco, "Brazilian Transvestites in Portugal, Pathways, Identities and Ambiguities in the Context of Prostitution", PhD Thesis in Social and Cultural Anthropology, FCSH, UNL, 2016.

[10] GIDDENS, Anthony, The Constitution of Society. Outline of the Theory of Structuration, Polity (publisher), Cambridge, 1984

individuals and structures, or between groups of individuals, are a constant predicate in social relations. WEISS and BIRCKMAYER[11] observe, in the same vein, that:

The jostling among organized interests provides much of the drama in the policy arena. The scene is marked by the formation and dissolution of temporary coalitions of interests as the issues on the agenda shift and change. Nor does social science represent the only form of legitimate information. The policy world is awash with formation. Lobbyists hawk their own version of past events and futures. Media columnists and editorial writers add to the stew. Many organizations have their own in-house information resources - databases, research units, news services.

PUBLIC POLICY ON HIGHER EDUCATION AND RESEARCH: THE CONTEXT.

In the case of the policy followed in relation to higher education and research - hereinafter PPESI - we find that some factors are combined, which have made it possible for the definition and implementation of PPESI to be generally stable over 40 years; firstly, because since the political class is an integral part of an academic elite, knowledge of the cultural patterns of the "*culturally alien other"* is not required here as the target of a plastic [12]public policy, secondly, the consensus - especially from 1986 onwards with the entry into the EEC and in 1989 with the revision of the CRP - that competing in the area of science, technology and research was essential, thirdly, because it was the academics themselves who played and assumed decision-making powers. Take, for example, the case of Dr. Mariano Gago – himself a researcher – who began his career in the administration of the *res publica* when he assumed the presidency of the National Board for Scientific and Technological Research – henceforth JNICT, now FCT – later becoming Minister of Science and Higher Education.

BOBROW[13] states that cultural constraints emerge as factors of great importance in the identification and definition of a public policy. Although corroborating this argument, we deepen it with the importance of the discourse/utterance produced from a given object. In fact, speech and behavior are mutually integrated, making each other intelligible. Everything that is not an object of a discursive utterance production, simply does not emerge socially.

In Portugal, at the 1980s, the desire for change was eagerly breathed. Looking to other European countries, with in the hope of a better future, free of dictatorial constraints, which existed until not much time ago. In this case, not only the awareness of the need for a PPESI flowed from the

[11] WEISS, Carol e BIRCKMAYER, Johanna, "Social Experimentation for Public Policy" in The Oxford Handbook of Public Policy, Edited by Robert E. Goodin, Michael Moran, and Martin Rein, 2008, p.819.
[12] Cf. BOBROW, David B., "Social and Cultural Factors: Constraining and Enabling" in The Oxford Handbook of Public Policy, Edited by Robert E. Goodin, Michael Moran, and Martin Rein, 2008 p.578.:"In sum, which and how many differences get recognized (or denied) are political and cultural matters. Public policies shape and are shaped by those recognitions, especially with regard to the processing of actual experiences into notion-related interpretative precedents, maxims, fables, and warnings. Unfortunately, a number of often thought to be general tendencies for public policy get in the way of facing up to variety, and favor downplaying it."
[13] Cf.. BOBROW, David B, "Social and Cultural Factors: Constraining and Enabling" in The Oxford Handbook of Public Policy, Edited by Robert E. Goodin, Michael Moran, and Martin Rein, 2008

political class and academics, but also from civil society itself, which saw access to education as a free pass for a future full of successes for their children. "The analysis of the evolution of the portuguese cientific system cannot (...) be dissociated from the evolution of the higher education system in Portugal."[14]At the same time, the openness to a world that was beginning to globalize[15], allowed that more structured discourses on the need for a PPESI, had consequences at the level of a positive echo into a popular opinion and feeling, consistently supported by a Europe that seemed closer[16] and by a world system that looked like having welcomed us with open arms. It is in this context that PPESI becomes a national goal.

PPESI AND ITS ORIGINS

The Estado Novo was responsible for the creation of some laboratories. In 1946 LNEC or INSA in 1971, however, more than scientific policy objectives, these laboratories aimed to address sectoral and contextual problems of the State.[17] As we are told by CANDEIAS and SIMÕES[18] , the literacy rate in Portugal in the 50s was around 55%, which means, almost 50% of the population was illiterate. It was a school for elites and one that essentially served those elites. Public policies in the area of education formed the ruling classes in the areas of science that served their policies. There was no policy of integrative science.

In the context of 1974, Portugal is therefore faced with a clear situation of lack of qualification of human resources. The motto is given by the CRP in 1976 in article 77, which defined that the areas of research were "encouraged and protected by the State", with the main purpose of "the progressive liberation from external dependencies, within the scope of cooperation and exchange with all peoples". Currently, research and science are integrated in article 73 of the CRP under the heading Cultural Rights and Duties, within the scope of its article nº 4 which proclaims:

[14] HEITOR, Manuel, "Science and knowledge in the modernization of Portugal: the formulation of public policies in overcoming scientific backwardness and democratizing access to knowledge", in 40 Years of Science and Higher Education Policies in Portugal, Almedina, 2015, p.22-23.
[15] In terms of technological globalization and the speed with which the flows of people, goods, commodities, images or capital – among others – occur. To trace the beginning of the processes of globalization, we would have to go back 500 years, to the date when the Portuguese discoveries began.
[16] To assess the social impact on Portuguese national emotionality – in which the self-centered discourse was subtracted from the unidirectionalism of the inevitability of *fado* – we note the effects that the entry into the then EEC caused in other geopolitical locations, namely in the Brazilian media: "A situation so attractive that it even managed to create a flow of emigration of Brazilians to Portugal." (Magazine *see* 7/29/87). "The Portugal that attracts thousands of Brazilians is not the *small*, provincial and impoverished country of the past." (Magazine *See* 11/21/88)[16]
[17] Cf. RODRIGUES, Maria de Lurdes and HEITOR, Manuel (org.) *40 Years of Science and Higher Education Policies in Portugal*, Almedina, Coimbra, 2015, p.3. During the dictatorship, some laboratories were created in Portugal, namely the IBM – Institute of Marine Biology in 1950, the LNIV – National Laboratory of Veterinary Research in 1957, LNFEN. National Laboratory of Physics and Nuclear Engineering in 1958 or INSA – National Institute Dr. Ricardo Jorge in 1971, among others. See list of acronyms at the beginning of this work.
[18] CANDEIAS, António and SIMÕES, Eduarda, "Literacy and school in Portugal in the twentieth century: National Censuses and case studies" in *Análise Psicologica*, 1 (XVII), 1999, p.168.

Scientific creation and research, as well as technological innovation, are encouraged and supported by the State, in order to ensure their freedom and autonomy, the strengthening of competitiveness and the articulation between scientific institutions and companies.

Nº 4 of the article 73º does no more than welcome the neoliberal ideologies - then emerging - with the implicit market rules that underpin them, placing the emphasis on applied science to the detriment of pure science. From the Estado Novo, the creation of JNICT in 1967 marks what for some authors is considered the beginning of science policy in Portugal, although admittedly hesitant.[19]

PPESI IN DEMOCRACY

In this context, although the CRP of 1976 immediately gives prominence to the field of education, science and research, until 1984 there was some noticeable lack of coordination in terms of organic changes in the laboratories of the state, governments and tutelage. It was only in 1980 that the research career was defined – Decree-Law 415/80, of 27 September – but still integrating the researchers into the civil service bodies of the Ministry of Education and Science (MEC), namely the National Institute for Scientific Research. In 1983, the Technological Centres (CT) were created and the technological development plan (PDT) or national technological plan (PTN) was approved, at the time as a result of the impulse promoted by LNETI.[20] Nevertheless, at this stage scientific projects were still integrated into the Ministry of Industry (MI). This example of tutelage shows the uncertainty that prevails with regard to the coordination of the PPESI. It was also at this time that an attempt was made to legislatively organize the system of social support to be granted to higher education students, even if through loans – Decree-Law Nº 132/1980, of 17 May – however, the evident dispersion and lack of coordination of legislative measures promoting the PPSEI, only allowed the issue of social action in higher education to be dealt with in 1993.[21] As we have been analysing, in this period and since 1979 we have witnessed several experiments in the tutelage and administrative organization of science policy, from being outside the tutelary scope of the Ministry of Education and therefore, outside education, first, framed in the Ministry of Culture (MC) or, at a later stage, in the Ministry of Finance and Planning (MFP). During this period, emphasis was placed on applied science, which, in this respect, despite all the improvements made subsequently, remained

[19] Cf. RODRIGUES, Maria de Lurdes and HEITOR, Manuel (org.) 40 Years of Science and Higher Education Policies in Portugal, Almedina, Coimbra, 2015, p.5 Cf. RODRIGUES, Maria de Lurdes, "Science policies in Portugal in the 40 years of democracy" in Revista Ibero-americana de Ciencia, Tecnología y sociedad, 2017 e http://act.fct.pt/acervodocumental/registos-de-autoridade-arquivistica/junta-nacional-de-investigacao-cientifica-e-tecnologica/, accessed on 12 November 2017.

[20] José Veiga Simão, president of the LNETI installation committee (1977-1979) and president of LNETI (1979-1992). LNETI – National Laboratory of Engineering, Technology and Research.

[21] Cf. RODRIGUES, Maria de Lurdes and HEITOR, Manuel (org.) 40 Years of Science and Higher Education Policies in Portugal, Almedina, Coimbra, 2015, p.11.

the cornerstone of the administration of science until 1995. Between 1985 and 1995, science was under the supervision of the Ministry of Planning and Spatial Planning (MPOT) through the superintendence exercised over JNICT. This evident functional and substantive entropy is reflected in the relations between the very organic structure of the Public Administration and between it and the citizens.

Until 1985 there was an institutional tension involving JNICT, INIC and LNETI (created in 1977), a tension that resulted in difficulties in defining their respective competences, responsibilities for coordination, execution and funding of research activities.[22]

PPSEI AND THE DEFINITION OF PRIORITIES

It was only during the second half of the 1980s and within the framework of European integration that the scientific policy mechanisms were strengthened and JNICT introduced the first Integrated Plan for Scientific and Technological Development (PIDCT). This programme envisaged well-targeted measures for the development and implementation of science policies, also focusing on a research dimension. The JNICT thus raised awareness of the need to strengthen the mechanisms and means of scientific policy, reinforcing its funding instruments and, at the same time, proactively promoting the increase in joint scientific work initiatives with external partners. Between 1987 and 1991, still denoting reminiscences of the work carried out by Mariano Gago at the head of JNICT (1986/1989), were instituted the National Days of Scientific Research and Technology and the Science and Technology Mobilizing Program (PMCT). National Days of Scientific Research and Technology and the Science and Technology Mobilizing Program (PMCT). These events mark the change in the paradigm that guides the support and incentives granted by science and research policy to applied scientific activity. From this moment on, a movement was generated for the inclusion of all areas of advanced training in scholarship programs, also encouraged by the approval in the Assembly of the Republic of Law Nº 91/1988, of May 13. This law calls on the public authorities to implement an agenda, advocating a period of 10 years for support to science and technology to reach 2.5% of GDP.[23] However, historical facts tell us that only in 2007 was 1% of GDP reached, a percentage that is substantially different from what was initially forecast.[24]

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[22] Cf. RODRIGUES, Maria de Lurdes and HEITOR, Manuel (org.) 40 Years of Science and Higher Education Policies in Portugal, Almedina, Coimbra, 2015, p.7.

[23] It also coincides with this moment the accession of Portugal to CERN - European Organization for Nuclear Research - and the preparation of the agreement with ESO - European Southern Observatory. "CERN was established in 1953 and, according to the Convention signed by the Founding Members, the main objective of this scientific organization was the "promotion and collaboration between European countries in the area of fundamental research in the field of High Energy Physics (HFS), in order to allow Europe to lead in this field". Since then, CERN has been the largest particle physics laboratory in the world, located in the northwest region of Geneva on the French-Swiss border. Available in http://www.fct.pt/apoios/cooptrans/cern/index.phtml.pt, accessed November 12, 2017.

[24] HEITOR, Manuel, "Science and knowledge in the modernization of Portugal: the formulation of public policies in overcoming the Delay, Scientific and the democratization of access to knowledge", in 40 Years of Science and Higher Education Policies in Portugal, Almedina, 2015.

In this context, we can see, from what we have been expounding, that even in a matter of general consensus, the practical guidelines of the PPESI often reflected a certain degree of navigation in sight, oscillating according to the individuals who assumed the leading role at the decision-making level. If there is a basic consensus, we find that different sensibilities are formed and instituted among the elites themselves, both with regard to the organic structure that supports politics and with regard to its *governance.* It should be noted, however, that until Mariano Gago assumed the presidency of JNICT, no other position had been assumed by someone who had been *politically generated* from the National Scientific and Technological System – SCTN. Thus, the starting point commonly accepted by most of the ruling elites in a still embryonic phase of the process, was only gaining consistency as steps were taken in this direction, while, at the same time, the external socio-political referents made it operable. In this sense, we also consider it evident, that it reflects the lack of studies prior to the application of this public policy. It had only been passed about 15 years since the revolution that had overthrown Portugal's dictatorial yoke and public policy itself, as a branch of law reflecting this, was also still in an equally gestational phase. In any case, it seems curial to us to state that, having identified the need for a public policy, there were doubts and divergences regarding its application; There was no empirical knowledge of its field of implementation, of how to implement it, and the sociocultural segment that could provide it through a study compared with other European cases, was not yet properly settled. At the same time, we must take into account the instability introduced at the level of public policies by the vulnerability that scenario projections reveal in the current globalized international contexts, in which multiple and divergent interdependencies are generated.

Even so, in the face of the operationalization of yet another attempt at organic reorganization of the administration of science policy, with the extinction of the INCT in 1992, JNICT assumes preponderance as a financing institution of the National System of Science and Technology, through the management of funds from the 1st Community Support Framework.[25] This phase of organic restructuring was also echoed in the creation of the Innovation Agency and the FCCN (Foundation for National Scientific Computing) – whose mission was the management of the RCTS (Science, Technology and Society Network) – through which projects for the creation of infrastructures and the acquisition of equipment were supported. As a result of time, the new technologies began to gain their space in the scientific and social panorama Portuguese, as well as in parallel there was a process of affirmation of national science. This statement materialized, for example, when in 1989 university

[25] Cf. RODRIGUES, Maria de Lurdes and HEITOR, Manuel (org.) 40 Years of Science and Higher Education Policies in Portugal, Almedina, Coimbra, 2015,p.11:The Science Programme, the Creation of National Science, Research and Development Infrastructures, and the Structural Programme for the Development of Scientific and Technological Research, investment in Science is now included in the Community Support Frameworks of the EEC.

professors left FENPROF and organized themselves into the Union of Higher Education Teachers – SNESUP.

PPESI AND ACCESSION TO THE EEC

It was already with FCT in 1997 – after the extinction of JNICT in 1996 – that we witnessed the creation of research centres related to universities, which became, as legal persons, recipients of multi-annual funding. It was at the same time that science in Portugal was showing signs of strengthening that some emigrant PhDs returned, finding in these research units the necessary space for the development of their research areas. At the same time, but no less important in future terms, we are witnessing a massification of access to higher education. In 1980, 80,000 students had entered Portuguese universities and in 1995 this number more than tripled, reaching 290,000 individuals attending higher education institutions – at the time, already public and private, since the public ones no longer had the capacity to absorb student demand.[26] It is also at this moment that an emblematic episode occurs in our country, the revolt of the students regarding tuition fees and the declaration by the constitutional court of the unconstitutionality of the law that had approved this regime, Cf. SAMPAIO and the judicial control of public policies.[27]Cumulatively, there is also a strengthening of the coordination and supervision of higher education and research. The ANI – National Innovation Agency – leaves the tutelage of the Ministry of Economy (ME), which is assumed by the Ministry of Science (MCa)[28] It was then that Portugal began a process of internationalisation of its science with the integration into renowned European scientific institutions, such as EMBL, ESA and ESO, as Mariano Gago had advocated in the MCP in 1990. This snowball effect – which cannot be dissociated from demographic factors – means that in 2002 the number of students attending university and polytechnic education reached its maximum value, 400,000, and from 2003 onwards the demand was lower than the supply of education. In an obvious evolution of the SCTN, FCT sets up, Cátedras Convidadas, Ciência, Welcome e investigador FCT programs[29], establishing and

[26] Cf. HEITOR, Manuel, "Science and knowledge in the modernization of Portugal: the formulation of public policies in overcoming scientific backwardness and in the democratization of access to knowledge", in 40 Years of Science and Higher Education Policies in Portugal, Almedina, 2015, p.22-23: "The analysis of the evolution of the scientific system cannot Portuguese be dissociated the evolution of the higher education system in Portugal and the increasing qualification of the workforce in Portugal, in particular the qualification of groups younger ages. In the period under review, o Total number of enrollees not higher education in the age group of 20 to 23 years old increased about 10%, reaching 33% of this group age (compared to 30% in 2005). In other words, one in three 20-year-olds was enrolled in higher education in Portugal in 2010."

[27] Cf. Ruling nº 148/1994, of 3 May and SAMPAIO, Jorge Silva, Controlo Jurisdictional das Políticas Públicas de Direitos Sociais, Coimbra Editora, 2015 and KONDER, Fábio, "Ensaio sobre o juízo de constitucionalidade de políticas públicas" in Brasilia, a 35, nº138, April/June 1988, p.39: "With the widespread acceptance of the principle of judicial review of laws and acts of the Public Power in the light of the Constitution, including the judgment of unconstitutionality by omission, one had the impression that the long road leading to the so-called Rule of Law had finally arrived, on this threshold of the twenty-first century (...)" In 1989, another front of contestation by students emerged, the PGA – General Proof of Access.

[28] As can be seen throughout this work, after passing through the supervision of the MFOT, ME and MC, science sees its importance recognized with the creation of its own Ministry, which in the meantime has been assuming several designations, being today the Ministry of Science, Technology and Higher Education.

[29] Available in https://www.fct.pt/apoios/outros/catedras/index.phtml.pt and https://www.fct.pt/ciencia2008.phtml.pt, accessed November 13, 2017. The Science program has already ended, although there are still ongoing processes to close accounts; Plan to hire PhD researchers, started in 2006, with the aim of recruiting 1 000 PhDs by 2009. These programmes were implemented through a public tender (in 2006 and 2008) to which national R&D institutions competed, submitting applications for the hiring of researchers, for further analysis by FCT, and signing contracts. The Invited Chairs Program

promoting partnerships with international educational institutions, as MIT, CMU, UTA, HMS, etc.[30] Another dimension of the development of science and research in Portugal has to do with the REJIES approved by Law Nº 62/2007, of 10 September. Within its scope, some public higher education institutions have been opting for a private law regime, by assuming the nature of public foundations of a foundational nature. This legal figure allows them, broadly speaking, to access non-public accounting typologies, to receive multiannual budget allocations, to expedite negotiations with the financial sector and therefore to be able to strategically project their long-term future

CONCLUDING REMARKS

Evaluating the PPESI, we can say from the outset that the objective of massifying access to higher education was achieved with distinction and based on the data provided in the annex to this chaptear, which we advise the reader to consult, regarding the numbers refered bellow, that many of the policies for financing advanced studies have proved to be equally successful. Let's pay attention to the following data, that many of the policies for financing advanced studies have proved to be equally successful. Let's pay attention to the following data; Master's scholarships reached their maximum value in 1996 with 1247 applications, and in 2009 they did not exceed 9.[31] If we compare the PhD scholarships in a similar time gap, we see that since there are records – dating back to 2000 – there are about 700 PhD scholarships awarded and only in 2004 and 2005 reached the value previously mentioned for Master's scholarships - 1247.[32] This means that the PPESI began to be applied to access to higher education and that in the 1990s it was focused as its natural sequence in master's degrees. In this context, we can conclude that in 2004/2005 such a lengthy process was carried out with the award of PhD scholarships to an already considerable level of candidates[33] . As for the type of PhD scholarships awarded, we can see that this is an area more likely to be influenced by contextual political choices; if we look at the graphs - in annexe - relating to this distribution, we see that in 1994 the number of grants awarded to the social sciences it was smaller if compared to the area of engineering sciences and technology, a deficit that would be attenuated between 2004 and

continues to receive applications in 2017, more specifically 3. The Wellcome Programme aimed to attract European researchers, with PhDs, allowing the recruitment of European researchers who wanted to work in Portuguese research institutions, after three years in research in third countries. In 2011/12, contracts were signed with 38 researchers of seven nationalities, in addition to Portuguese: Germany, France, United Kingdom, Italy, Serbia, Sweden, Hungary. The FCT Investigator Programme is focused on the researcher, being a highly competitive programme for the recruitment of the most creative and innovative PhD researchers, who demonstrate the capacity for independence and leadership in their scientific area. Launched in 2012, the programme aims to hire 1,000 FCT Researchers by 2016. Available at https://www.fct.pt/apoios/contratacaodoutorados/index.phtml.pt, accessed November 15, 2017.

[30] Cf. HEITOR, Manuel, "Science and knowledge in the modernization of Portugal: the formulation of public policies in overcoming scientific backwardness and democratizing access to knowledge", in 40 Years of Science and Higher Education Policies in Portugal, Almedina, 2015, p.21.

[31] Cf. graph 2, annexes.

[32] See annexes, Graph 4.

[33] In 1980 it was around 80,000 students attending higher education, in 1995 it more than tripled, with 290,000 students and in 2002 it reached its maximum value, 400,000 students.

2011.[34] We also get to the conclusion that the years with the highest number of applications for successful PhD scholarships are concentrated in the years between 2004 and 2011, with the maximum number of scholarships awarded being reached in 2007.[35] From 2013 onwards, PhD grants fell by less than half when compared to 2007, denoting in this aspect the economic constraints resulting from the *subprime crisis.*[36] As for the number of candidates for PhD scholarships, we found that contrary to the economic cycle, it was in 2012 that about 4400 students applied,[37] and only 1200 scholarships were awarded.[38]

In this panorama of general progress, however, the last five years mark a period of contraction in investment and initiatives, which can be attributed first (though not exclusively) to the international and national financial crises. This contraction translated not only into an immediate reduction of many activities, but also into the interruption of long-term strategies and the installation of an environment of great retraction, which not only affected organizations fed by public money but extended to private companies, making it particularly difficult to find sponsorship for scientific culture activities.

Compared to 2007, the year with the highest number of scholarships awarded – 2000 – the number of applications increased from 3600 to 4400 in 2012. As for the post-doctoral fellowships funded by FCT, it was in 2006 that they reached their maximum number with 710 fellowships awarded. Comparing with 2013 – 410 – and 2015 – 520 – the downward curve already observed and corroborated by GRANADO and MALHEIROS is confirmed. In any case, it should be noted that we look at different dimensions of the PPESI when we compare postdoctoral and doctoral fellowships.

Comparing the year 1970, in which 60 individuals received their doctorates, with the year 2015, in which 2969 new doctors successfully defended their thesis, we see the exponential increase in this variable.[39] Moreover, when we compare the number of PhDs per 100,000 inhabitants between several countries, not only belonging to the EU, we find that if in 2004 they represented 8.5 in Portugal, in 2015 they already represented 22.7 individuals.[40]

Turning now to the public policy of science and technology in contemporaneity, we highlight the recently approved REC[41] - during the month of November 2017 - which provides for the

[34] Cf. annexes, graph 5.
[35] See annexes, Graph 4, and Graph 5.
[36] Cf. attachments, graph 5, and graph 7.
[37] Cf. graph 3.
[38] Cf. in a complementary sense GRANADO, António and MALHEIROS, José Vitor, Cultura Científica em Portugal, Fundação Francisco Manuel dos Santos, 2015, p.11.
[39]Available at https://www.pordata.pt/Portugal/Doutoramentos+realizados+em+Portugal+ou+no+estrangeiro+e+reconhecidos+por+universidades+portuguesas+total+e+por+sexo-681, accessed November 15, 2017.
[40] Cf. anexos.
[41] REC- Regulation of Scientific Employment, available in https://www.fct.pt/apoios/contratacaodoutorados/docs/RegulamentoDoEmpregoCientifico.pdf, accessed on November 15, 2017.

possibility of individual and institutional applications for employment contracts for PhDs for less than 6 years. In this context, the REC is the most recent FCT regulation that implements the government's policy of replacing post-doctoralscholarships with employment contracts -which the call for its attribution via FCT took place in 2016. Within the scope of projects and research units, post-doc grants still remain an available instrument. Although, shortly after, as Decree-Law 57/2016 of 29 August 2016 produced its effects, post-doc came to an end.

Finally, we note that the challenge currently lies in the design of the policies to be adopted to absorb all these doctorates, whose number has been systematically increasing, as we hope to have demonstrated. Decree-Law Nº 57/2016 of 29 August and Law Nº57/2017 of 19 July [42] correspond to instruments destinated for the implementation of a public policy, which may get a solution to this problem. Promising greater security in research work by promoting fixed-term or uncertain-term employment contracts – for a maximum period of 6 years – depending on whether the contracting educational/research institutions are public or private.[43] However, we also find that new *players* appear in the arena of social and political pressures – more or less diffuse – not only does the current governmental solution open new doors, closing others, but also the PhDs apparently begin to speak with one voice in the field of negotiations with the political and legislative power, through the ABIC lobbying . Scientific research grantees are apparently united in an attempt to end the precariousness that has accompanied them for decades. It should be noted that from 2002 to 2017 the value of the "maintenance allowance" of doctoral and postdoctoral scholarships did not change at all.[44]

Returning to FCT and its role in the application of Decree-Law Nº. 57/2016, as amended by Law Nº. 57/2017. Apparently, this boils down to the application of article 23 of the above-mentioned norm –a transitional rule/norma transitória – leaving the burden of contracting to educational institutions and research centres, with the obvious budgetary problems that emerge from this imperative.[45] The initial version of Decree-Law Nº 57/2016, of 29 August, considered as eligible under the transitional rule all post-doc scholarship holders who until 1 September 2016 performed functions under the EBIC and who, at the same time, accounted for 3 consecutive years of scholarship measured on that date. Many scholarship holders with an accumulated track record of activity of more than 3 years, but who at that moment for any reason were not exercising, would,

[42] "The legal regime for hiring doctorates, created by Decree-Law 57/2016, and amended by Law 57/2017, of 19 July, aims to stimulate scientific and technological employment in all areas of knowledge, promote the rejuvenation of institutions and value scientific research, technological development, management and communication activities of science and technology. The entities of the National Scientific and Technological System (SCTN) now have a new mechanism to stimulate the hiring of PhD researchers, with a view to their integration into the entities of the SCTN, as well as in their multiple partnerships and collaborative forms with the economic and productive, social or cultural fabric." Available at https://www.fct.pt/apoios/contratacaodoutorados/index.phtml.pt, accessed November 15, 2017.
[43] Decree-Law nº 57/2016, of 29 August, in its article 6, paragraph 1, a) and b).
[44] Cf.. Table available in https://www.fct.pt/apoios/bolsas/valores.phtml.pt, accessed November 19, 2017.
[45] We know, however, that the scenarios are volatile and FCT will have to readapt its procedures to any new indications received from the tutelage.

according to the interpretation made by FCT, be excluded from this transitional rule, as well as those who accounted for 3 interpolated years. This transitional regime included the eligible scholarship holders to enter into an employment contract - after a tender procedure carried out by the teaching or research institutions - through a program contract signed with FCT. According to this Decree-Law, the new contracts would enter into with the placement in remuneration position 28, however, negotiations carried out by the grantees managed to ensure that the entry position corresponded to remuneration position 32 – currently 33. Especially the first aspect, which excluded scholarship holders with 10 or more years of scholarship, but who on September 1, 2016 were not carrying out any activity - also due to the precariousness that characterized their contracts - raised a great deal of controversy. ABIC and the parties to the left of the Socialist Party have rebelled against this and other aspects of the law. For a year, the problem was discussed in parliamentary committees, to which the president, the vice-president - members of the FCT's Board of Directors - were summoned, as well as the doctoral fellows who worked in science and technology management at the FCT. The overwhelming majority of institutions attentive to this political and negotiation process suspended the application of the transitional rule –article 23 –of Decree-Law 57/2016, and only 10 institutions carried out and sent their tender procedures to the FCT for validation. Of these, about 7 procedures were considered eligible after analysis carried out by the Division of Scientific Employment and, following the hierarchical procedures foreseen, sent to the Board of Directors for subsequent approval by the Ministry of Science, Technology and Higher Education and the Finance Ministry. At this point, November 2017, although the employment contracts had already been signed – some since February – the bureaucracy at the highest level had not yet made it possible to sign any program contract to finance them.

With the change implemented by Law 57/2017 of 19 July, the reference minimum remuneration position become the 32 – since 2024- 33 –not 28 – and scholarship holders who carry out research activities within the scope of the scholarship they have received under the EBIC - for more than 3 consecutive or interpolated years - are now covered, also contemplating two new deadlines for carrying out tender procedures; until 31 December 2017 and another, until August 18, 2018. As of the publication of this law and despite months of waiting for its regulation, the tender procedures were suspended under Decree-Law 57/2016, which provided for a deadline for carrying out the tender procedures between 1 September 2016 and 31 August 2017. Only those that were carried out until July 19, the date of publication of Law 57/2017, followed the normal regulated procedures. Nevertheless, and as a question which is not for us to go into in depth here, the basic problem remains; how would institutions be able to make funds from their budgets available to hire researchers/fellows who, because they are outside the scope of application of the transitional rule, would not be funded by FCT when Decree-Law 57/2016, amended by Law 57/2017, indicated that

researchers and post-doc fellows should they be hired by the institutions? Will the institutions have an increase in the budget allocation or is it intended to induce a resurgence of *private funding*? In the latter case, private funding will naturally go to applied science. What will happen to pure science? These questions remain open, which will certainly require the study, definition, analysis of cost/benefits and establishment of courses of action for the implementation of a policy that can solve a problem that, although expected, is recent in the field of science, research and technology in Portugal. Currently, the contracts signed under Decree-Law 57/2016 of 29 August are ending and a question arises; will the remaining instruments created be sufficient to absorb existing PhD researchers? Tenure, the non-academic competition, the competitions for the associated laboratories, in short. It is in this context that the creation of a research career at the FCT is being discussed in 2024 - the positions of assistant researcher have already been created, although the career does not yet exist institutionally. What solution will be provided for the PhDs hired under Decree Law 57/2016, whose contracts are coming to an end? How will the situation of FCT doctoral graduates - not hired under Decree-Law 57/2016 - who claim discrimination against colleagues hired under Decree-Law 57/2016, due to the disparity in salary, be resolved? These are crucial times for important and hopefully fair decisions.

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CASE LAW

See TC Ruling Nº 148/94, of 1994-05-03 (Declares the unconstitutionality of Articles 6(2) and 11(1) of Law Nº 20/1992, of 14 August).

LEGISLATION

LAWS

Law Nº 65/1979 - Official Gazette Nº 230/1979, Series I of 1979-10-04 – Approval of the principle of freedom of education.

Law Nº 121/1986 - Official Gazette Nº 122/1986, Series I of 1986-05-28 – Regulation of *Clausus* numbers for Higher, Private and Cooperative Education.

Law Nº 91/1988 - Official Gazette Nº 187/1988, Series I of 1988-08-13 - Law on Scientific Research and Technological Development.

Law Nº 54/1990 - Official Gazette Nº 205/1990, Series I of 1990-09-05 – Statute and autonomy of polytechnic higher education institutions.

Law Nº 20/1992 - Official Gazette Nº 187/1992, Series I-A of 1992-08-14 - Establishes rules regarding the tuition fee system. (See TC Ruling Nº 148/94, of 1994-05-03, declaring the unconstitutionality of Articles 6(2) and 11(1)).

Law Nº 38/1994 - Official Gazette Nº 269/1994, Series I-A of 1994-11-21 - Evaluation of Higher Education and its constituent institutions.

Law Nº 28-B/1996 - Official Gazette Nº 81/1996, 1st Supplement, Series I-A of 1996-04-04 - Establishes the regime of access to higher education.

Law Nº 113/1997 - Official Gazette Nº. 214/1997, Series I-A of 1997-09-16 - Defines the basis for the financing of public higher education

Law Nº 40/2004 - Official Gazette Nº 194/2004, Series I-A of 2004-08-18 – Statute of the Scientific Research Grant Holder.

Law Nº 38/2007 - Official Gazette Nº 157/2007, Series I of 2007-08-16 - Approves the Legal Regime for the Evaluation of Higher Education / creation of the Agency for Assessment and Accreditation of Higher Education – AAAES.

Law Nº 62/2007 - Official Gazette Nº 174/2007, Series I of 2007-09-10 - Legal Regime of Higher Education Institutions, amending Law Nº 38/2007, of 16 August.

Law Nº 12/2013 - Official Gazette Nº 20/2013, Series I of 2013-01-29 - First amendment, by parliamentary appreciation, to Decree-Law Nº 202/2012, of 27 August, which makes the first amendment to the Statute of the Research Grant Holder, approved in annex to Law Nº 40/2004, of 18 August.

Law Nº 57/2017 – Official Gazette Nº 138/2017, Series I of 2017-07-19 – Approves amendments to Decree-Law Nº 57/2016, of 29 August – Legal Regime of Scientific Employment.

DECREE-LAWS

Decree-Law Nº 270/1975 - Government Gazette Nº 124/1975, 2nd Supplement, Series I of 1975-05-30 – Abolition of the aptitude exam for access to higher education.

Decree-Law Nº 217/1974, Government Gazette Nº 123/1974, Series I of 1974-05-27 – Recognition as management bodies of universities of the basic commissions created following the processes of dismissal and reorganization of rectors.

Decree-Law Nº 807/1974 - Government Gazette Nº 303/1974, 6th Supplement, Series I of 1974-12-31 - Recognition as management bodies of universities of the basic commissions created following the processes of dismissal and reorganization of rectors.

Decree-Law Nº 304/1978 - Official Gazette Nº 235/1978, Series I of 1978-10-12 – Defines – but does not approve – the rules relating to the various degrees awarded by higher education institutions. Only approved with regard to master's degrees, by Decree-Law Nº 263/1980 - Official Gazette Nº 181/1980, Series I of 1980-08-07.

Decree-Law Nº 448/1979 - Official Gazette Nº 262/1979, Series I of 1979-11-13 - Approves the first Statute of the University Teaching Career.

Decree-Law Nº 132/1980 - Official Gazette Nº 114/1980, Series I of 1980-05-17 - Defines the general principles that define the structure of social services in higher education. First attempt to reorganize the support provided to families and students in higher education.

Decree-Law Nº 263/1980 - Official Gazette Nº 181/1980, Series I of 1980-08-07 – Establishes the rules regarding the creation of master's degrees in universities.

Decree-Law Nº 415/1980 - Official Gazette Nº 224/1980, Series I of 1980-09-27 - Defines and structures the scientific research career.

Decree-Law Nº 310/1981 - Official Gazette Nº 265/1981, Series I of 1981-11-17 - Regulates Teaching Cooperatives.

Decree-Law Nº 100-B/1985 - Official Gazette Nº 81/1985, 1st Supplement, Series I of 1985-04-08 – Established the General Rules of Private and Cooperative Higher Education.

Decree-Law Nº 245/1986 - Official Gazette Nº 191/1986, Series I of 1986-08-21 – Approves the Statute of the University Teaching Career – ECDU.

Decree-Law Nº 344/1988 - Official Gazette Nº 225/1988, Series I of 1988-09-28 – Creates a subsidized credit line for the acquisition of new facilities and equipment in Private and Cooperative Higher Education.

Decree-Law Nº 108/1988 - Official Gazette Nº 76/1988, Series I of 1988-03-31 - Integration of private and cooperative schools in the school network and approval of the Regime of Autonomy of Universities provided for since the CRP of 1976.

Decree-Law Nº 129/1993 - Official Gazette Nº 94/1993, Series I-A of 1993-04-22 – Defines the Policy for Social Action in Higher Education, creating CNASES.

Decree-Law Nº 28-B/1996 - Official Gazette Nº 81/1996, 1st Supplement, Series I-A of 1996-04-04 – Establishes the National Examinations, abolishing the General Access Test – PGA.

Decree-Law Nº 292/1997 - Official Gazette Nº 245/1997, Series I-A of 1997-10-22 - Grants tax benefits for the year 1997 to corporate income tax taxpayers who incur expenses with research and development.

Decree-Law Nº 123/1999 - Official Gazette Nº 92/1999, Series I-A of 1999-04-20 - Approves the Statute of the Scientific Research Grant Holder – EBIC.

1- Law Nº 40/2004 - Official Gazette Nº 194/2004, Series I-A of 2004-08-18 – Approves the new Statute of the Research Grant Holder.

2- Decree-Law Nº 202/2012 - Official Gazette Nº 165/2012, Series I of 2012-08-27 - Amends Law Nº 40/2004.

3- Decree-Law Nº 89/2013 - Official Gazette Nº 130/2013, Series I of 2013-07-09 – Proceeds to the third amendment to the EBIC.

4- Decree-Law Nº 233/2012 - Official Gazette Nº 209/2012, Series I of 2012-10-29 – Deferring the effects of the new exclusive dedication regime, introduced by Decree-Law Nº 202/2012, of 27 August.

5- Law Nº 12/2013 - Official Gazette Nº 20/2013, Series I of 2013-01-29 - First amendment, by parliamentary appreciation, to Decree-Law Nº 202/2012, of 27 August, which makes the first amendment to the Statute of the Research Grant Holder, approved in annex to Law Nº 40/2004, of 18 August.

Decree-Law Nº 125/1999 - Official Gazette Nº 92/1999, Series I-A of 1999-04-20 - Establishes the regulatory framework applicable to institutions dedicated to scientific research and technological development.

Decree-Law Nº 369/2007 - Official Gazette Nº 212/2007, Series I of 2007-11-05 - Creates the Agency for Assessment and Accreditation of Higher Education and approves its statutes – AAAES.

Decree-Law Nº 309-A/2007 - Official Gazette Nº 173/2007, 2nd Supplement, Series I of 2007-09-07 - Aims to create a specific system of loans to students and scholarship holders of higher education, researchers and institutions of scientific research and technological development

Decree-Law Nº 205/2009 - Official Gazette Nº 168/2009, Series I of 2009-08-31 - Amends the Statute of the University Teaching Career, approved by Decree-Law Nº 448/79, of 13 November.

Decree-Law Nº 207/2009 - Official Gazette Nº 168/2009, Series I of 2009-08-31 - Proceeds to the amendment of the Statute of the Career of Teaching Staff of Polytechnic Higher Education, approved by Decree-Law Nº 185/81, of 1 July.

Decree-Law Nº 57/2016 - Official Gazette Nº 165/2016, Series I of 2016-08-29 - Approves a regime for the hiring of doctorates aimed at stimulating scientific and technological employment in all areas of knowledge.

RESOLUTIONS OF THE COUNCIL OF MINISTERS

Resolution of the Council of Ministers Nº 135/2002 - Diário da República Nº 268/2002, Série I-B de 2002-11-20 – Defines the new institutional framework for the Government's activity in the field of information society, innovation and e-government. Creates the Information and Knowledge Mission Unit – UMIC.

Resolution of the Council of Ministers Nº 107/2003 – Diário da República Nº 185/2003, Série I-B de 2003-08-12 – Approves the Action Plan for the Information Society, the main instrument for the strategic and operational coordination of the policies of the XV Constitutional Government for the development of the information society in Portugal.

REGULATORY OFFICES

Legislative Order Nº 340/1993 - Official Gazette Nº 252/1993, Series I-B of 1993-10-27 - Approves the rules for the awarding, in the academic year 1993-1994, of tuition subsidies to students of private and cooperative higher education.

ACRONYMS

AAAES- Agency for Assessment and Accreditation of Higher Education.

ANI – National Research Agency.

CERN- European Organization for Nuclear Research.

CT - Technology Centers.

CNASES- National Council of Social Action for Higher Education.

CMU – Carnige Mellon University.

CRP - Constitution of the Portuguese Republic.

EBIC – Statute of the Scientific Research Grant Holder.

ECDU- Statute of the University Teaching Career.

EMBL- European Molecular Biology Laboratory.

ESA – European Space Agency.

ESO – European Southern Observatory.

FCCN- Foundation for National Scientific Computing.

FCT – Fundação para a Ciência e a Tecnologia IP, which replaces JNICT in 1996/97.

FENPROF- National Federation of Teachers.

HMS – Harvard Medical School.

INIC- National Institute for Scientific Research.

INSA – Instituto Nacional Dr. Ricardo Jorge.

JNICT- National Board for Research in Science and Technology.

JNICT a)- National Days of Scientific Research and Technology.

LNEC – National Laboratory of Civil Engineering.

MC- Ministry of Culture.

MCa – Ministry of Science.

MCP – Science Portugal Manifesto, dating from 1990, by Mariano Gago.

ME – Ministry of Economy.

MEC – Ministry of Education and Science.

MFP- Ministry of Finance and Planning.

MI – Ministry of Industry.

MIT – The Massachusetts Institute of Technology.

MPOT- Ministry of Planning and Spatial Planning.

PASI- Society and Information Action Plan.

PIDCT - Integrated Plan for Scientific and Technological Development.

PDT - Technological Development Plan or PTN - National Technological Plan.

PGA- General Access Test instituted in 1989 and abolished by Decree-Law 28-B/1996 that institutes the National Exams.

PMCT - Science and Technology Mobilizer Program.

PPESI- Public Policy for Higher Education and Research.

RCTS - Science, Technology and Society Network.

REC – Regulation of Scientific Employment.

REJIES - Legal regime of higher education institutions, first approved by Law Nº 38/2007, of 16 August, amended by Law Nº 62/2007, of 10 September.

SCTN- National Scientific and Technological System.

SNESUP- National Union of Higher Education Teachers following the creation of the University Teaching Career.

UNIC- Information and Knowledge Mission Unit.

UTA – University of Texas at Austin.

ATTACHMENTS

Image 1 - number of PhDs per 100,000 inhabitants

Groups/Countries	PhDs per 100,000 inhabitants	
Years	2004	2015
European Union (28 countries)	16,8	N/Available
Germany	28,0	35,8
Austria	29,9	25,4
Belgium	14,2	24,8
Bulgaria	5,1	20,1
Cyprus	1,8	9,1
Croatia	8,3	20,9
Denmark	14,6	38,3
Slovakia	15,9	35,3
Slovenia	17,8	48,5
Spain	19,0	24,4
Estonia	15,3	15,8
Finland	26,8	36,5
France	N/Available	20,7
Greece	11,8	N/Available
Hungary	8,8	12,3
Ireland	16,8	37,4
Italy	14,7	17,3
Latvia	3,7	12,9
Lithuania	8,9	14,4
Luxembourg	N/Available	18,8
Malta	N/Available	6,9
Netherlands	16,5	27,5
Poland	14,3	10,0
Portugal	8,5	22,7
United Kingdom	25,4	40,9
Czech Republic	17,0	23,1
Romania	12,5	20,1
Sweden	30,6	37,2
Iceland	3,4	N/Available
Norway	16,5	27,1
Switzerland	37,5	46,5
United States of America	16,4	N/Available
Japan	11,9	N/Available

Sources/entities: Eurostat | UNESCO-UIS | OECD | National Entities, Eurostat | NU | National Institutes of Statistics, PORDATA.
Last update: 2017-09-25. Available at https://www.pordata.pt/Europa/Doutoramentos+(ISCED+8)+por+100+mil+inhabitants-2409, accessed on November 17, 2017.

Graph 1

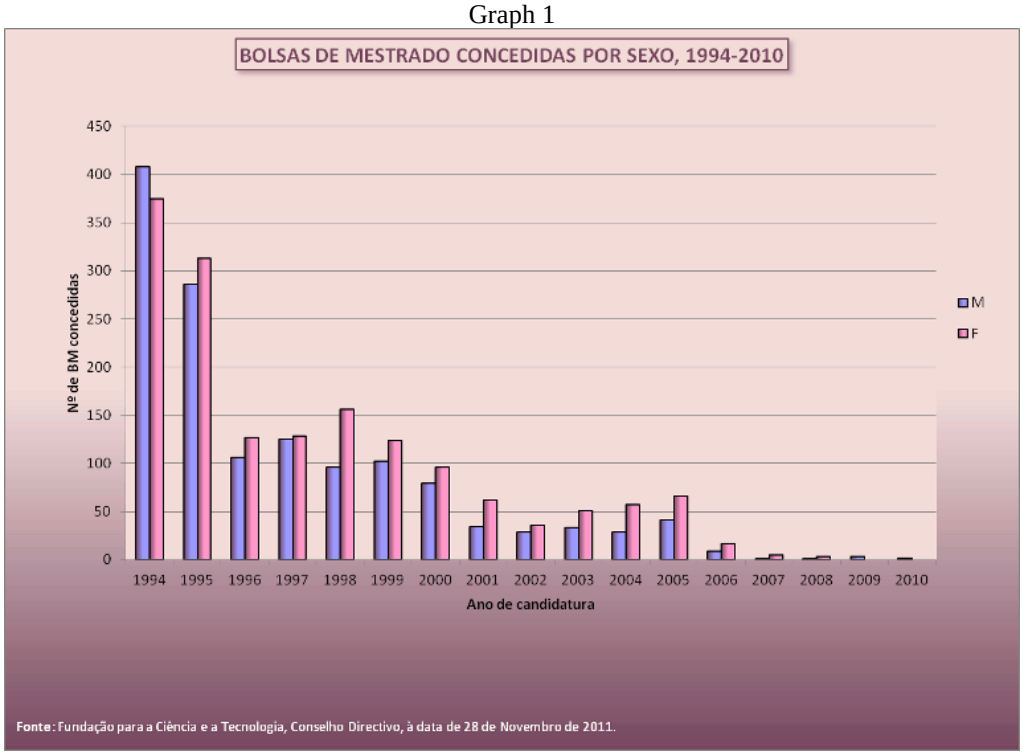


Figure 2

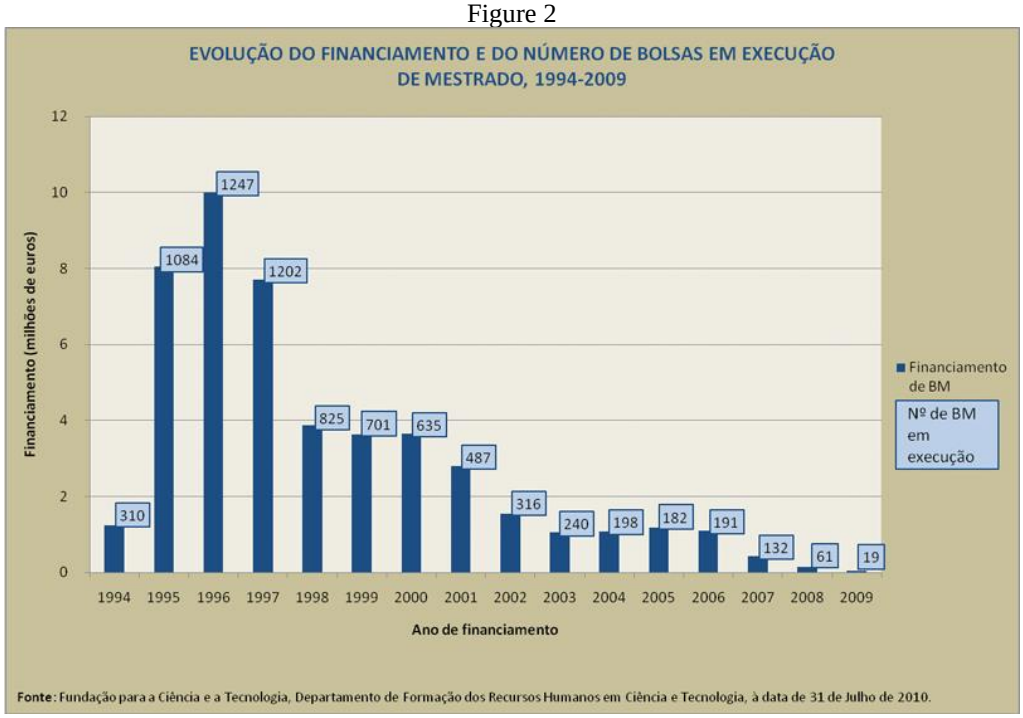


Figure 3

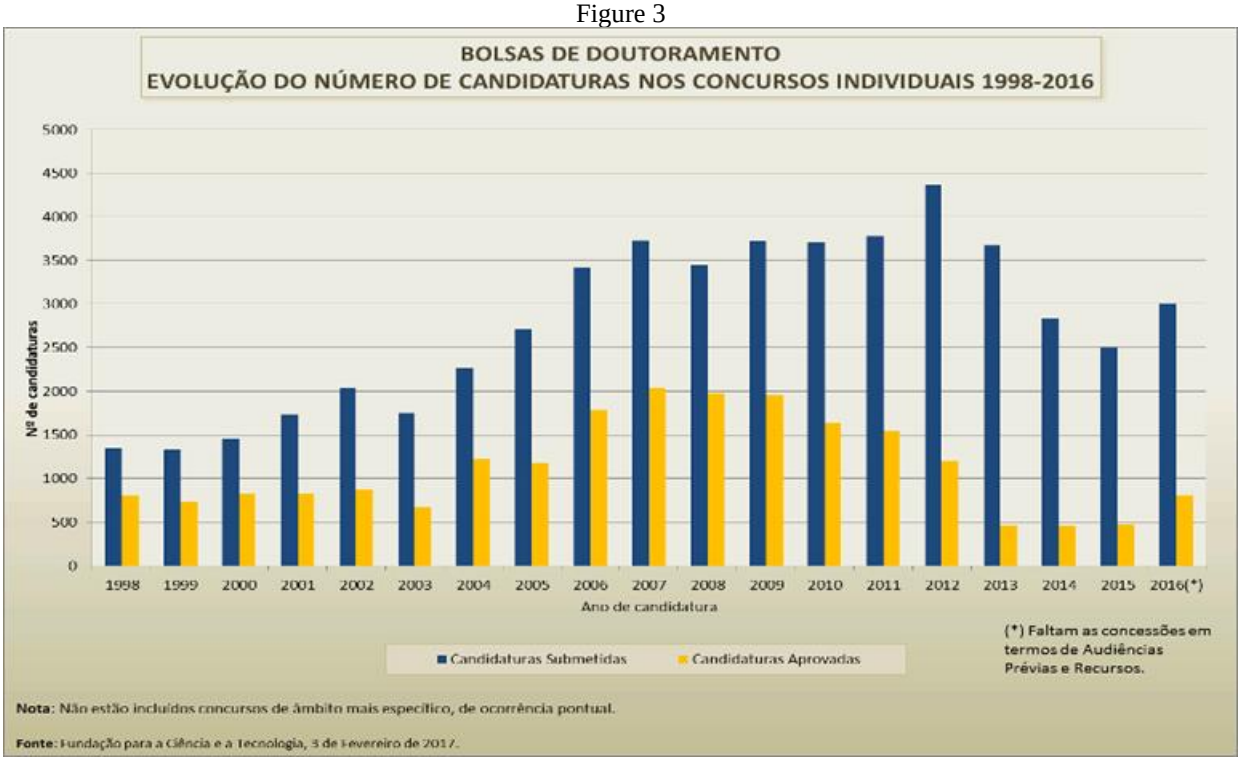


Figure 4

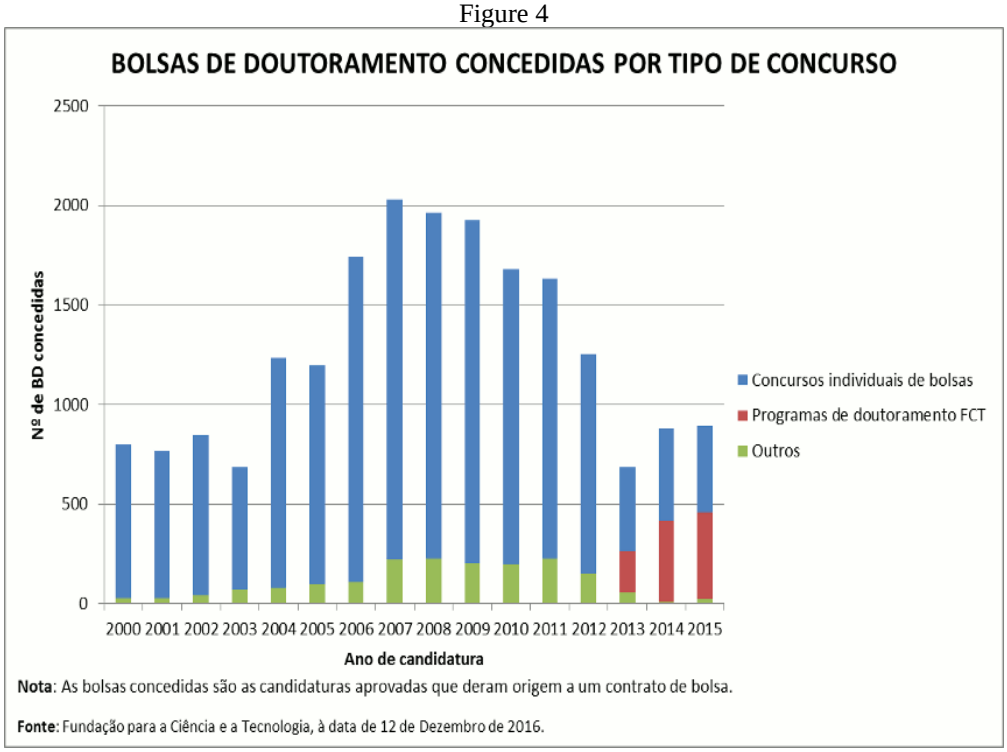


Figure 5

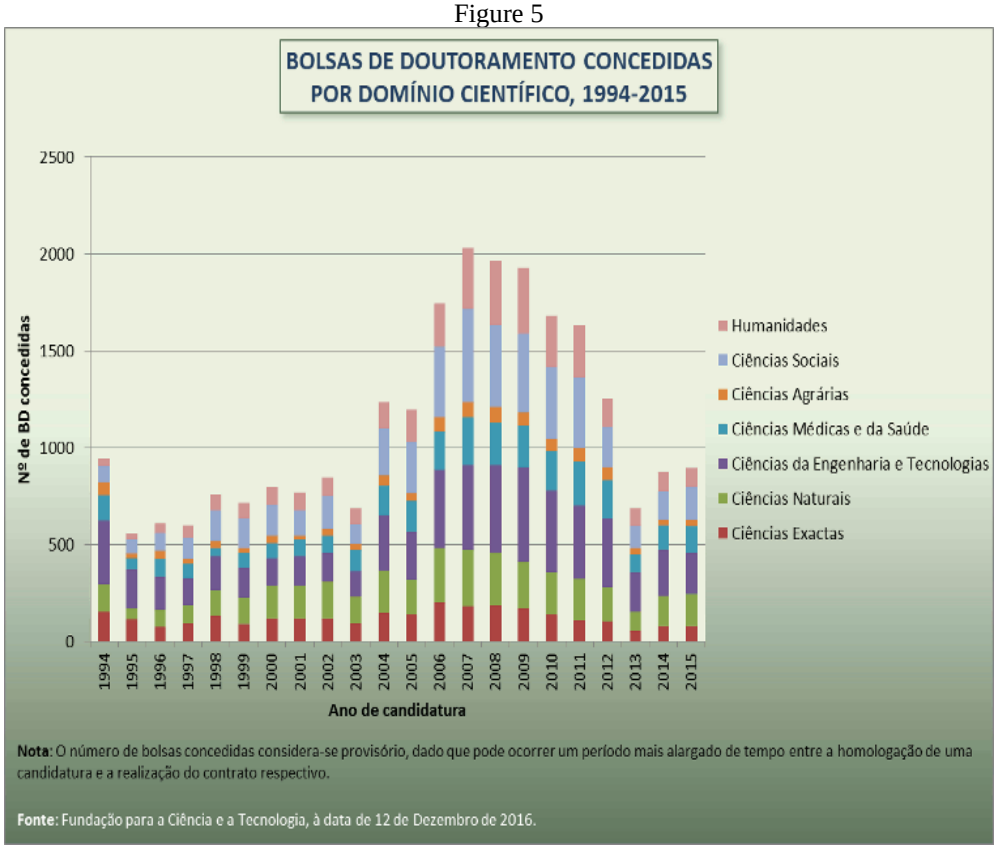


Figure 6

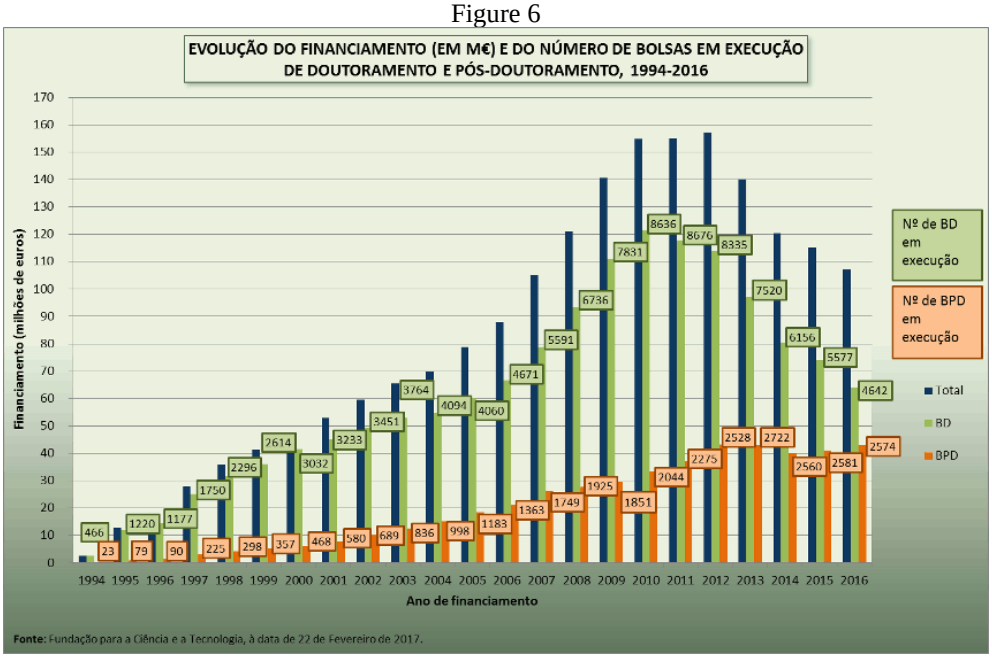


Figure 7

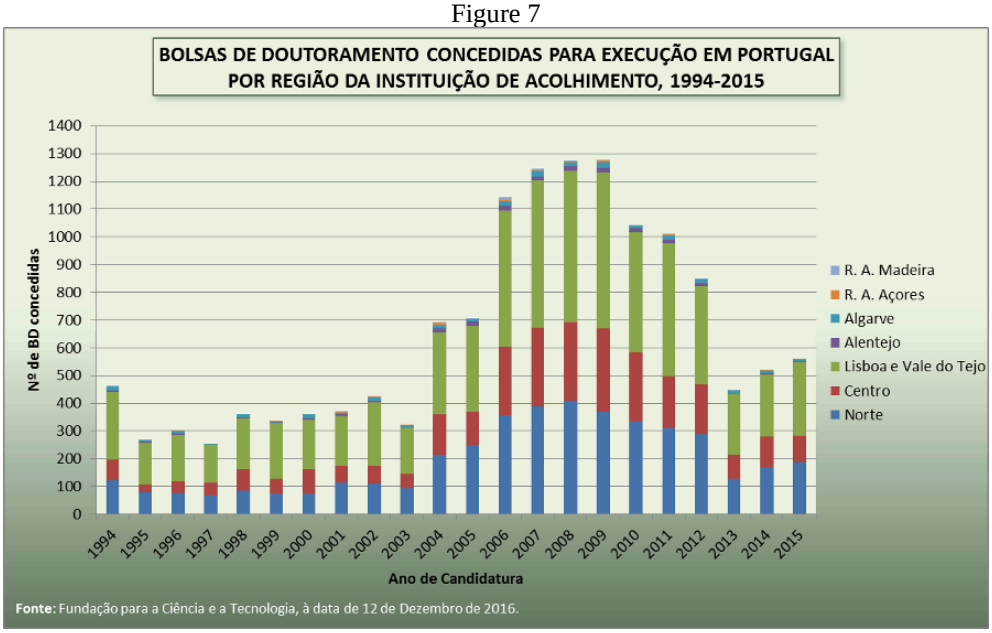


Figure 8

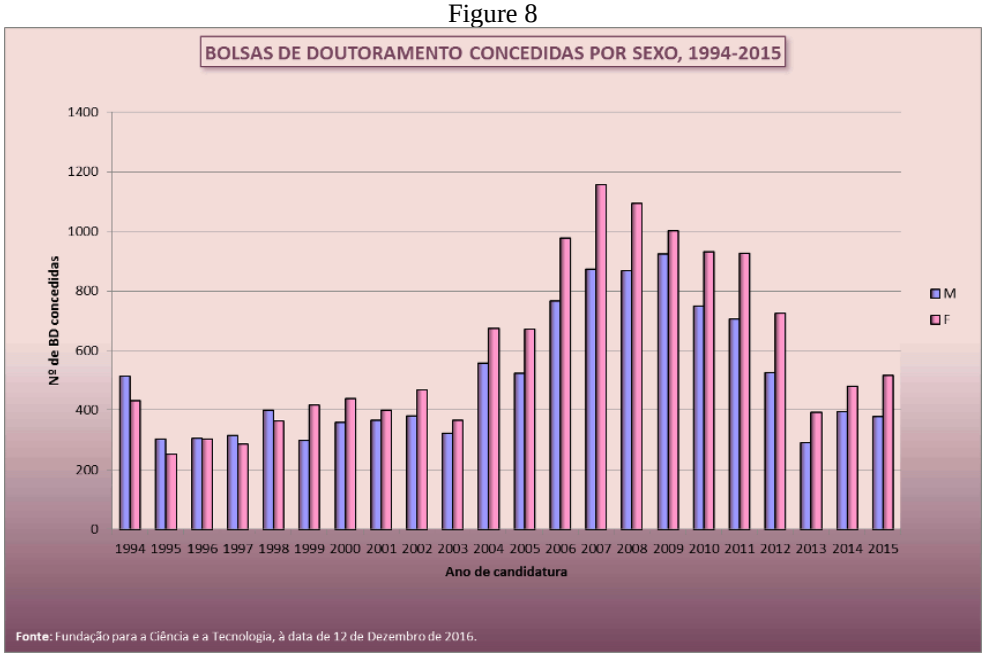


Figure 9

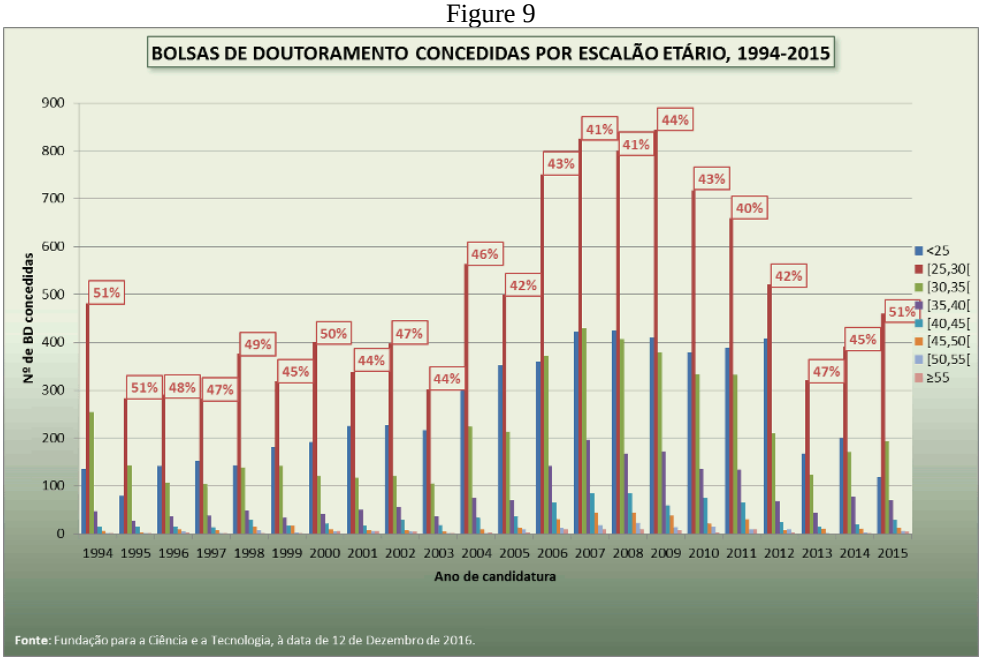


Figure 10

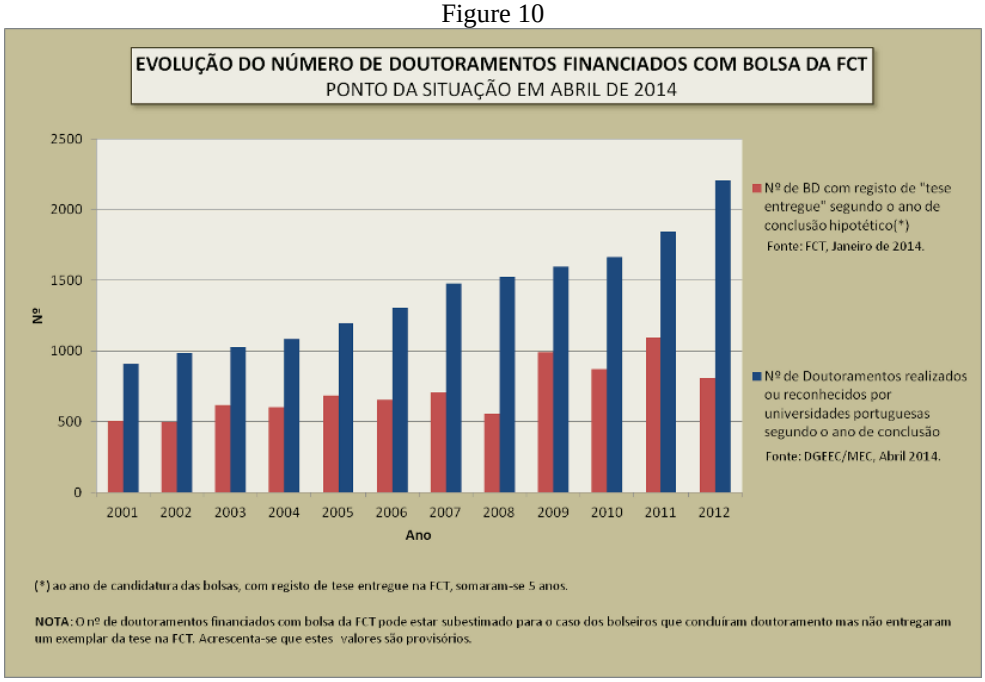


Figure 11

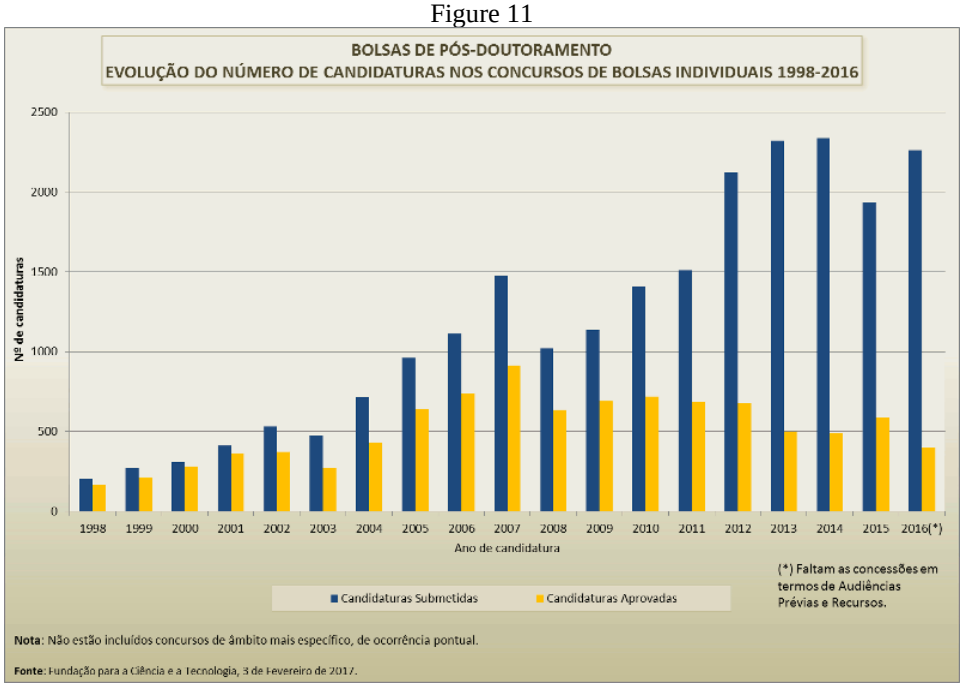


Figure 12

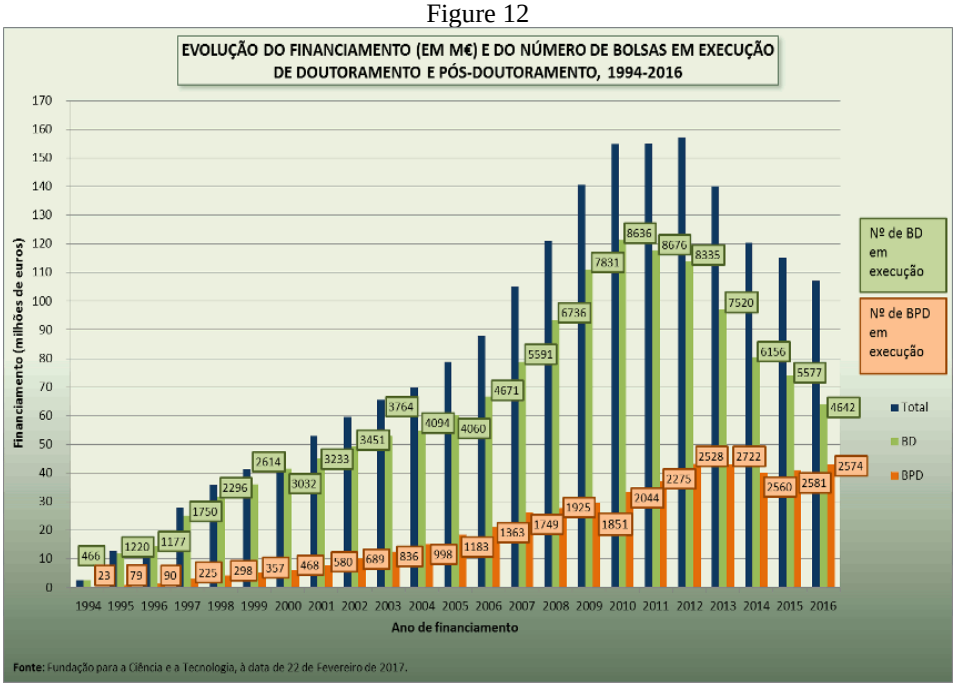
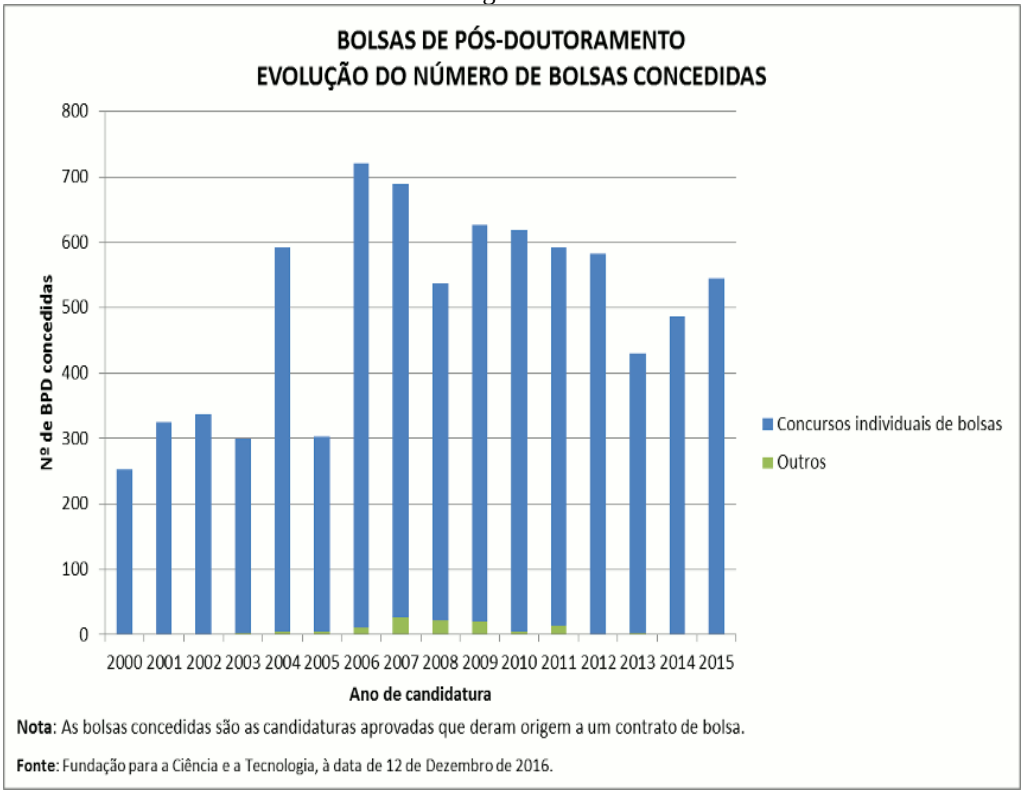


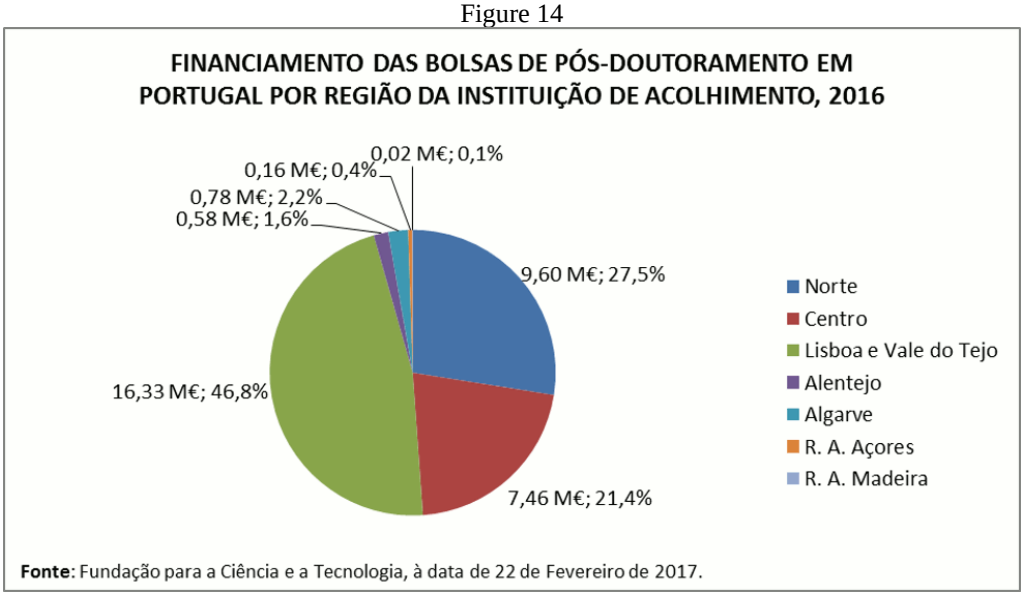
Figure 13



Nota: As bolsas concedidas são as candidaturas aprovadas que deram origem a um contrato de bolsa.

Fonte: Fundação para a Ciência e a Tecnologia, à data de 12 de Dezembro de 2016.

Figure 14



Fonte: Fundação para a Ciência e a Tecnologia, à data de 22 de Fevereiro de 2017.

Figure 15

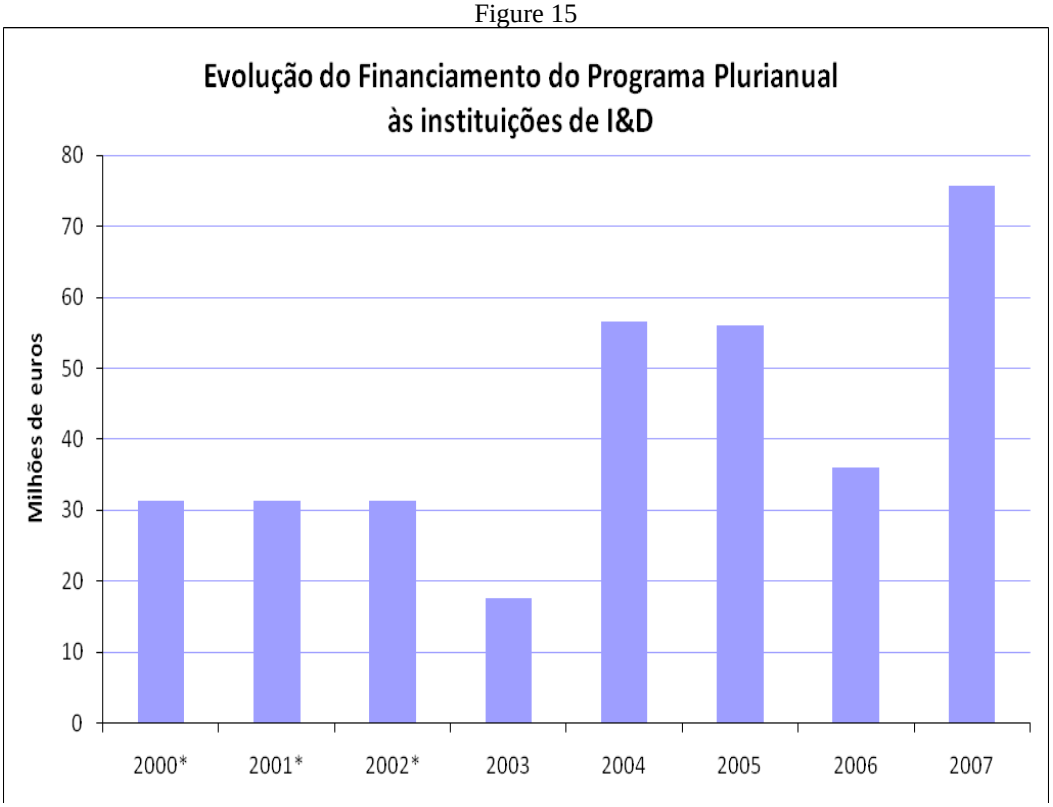
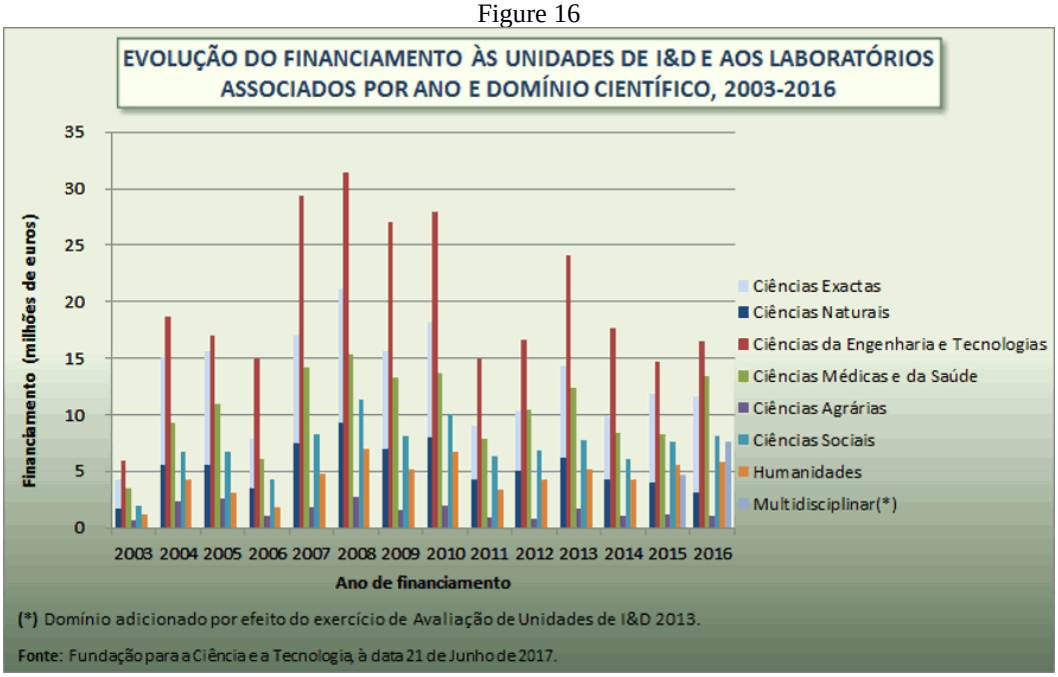
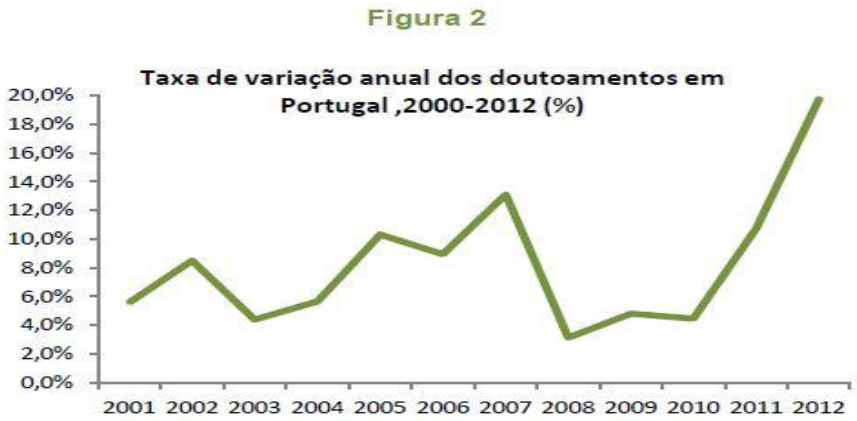


Figure 16



All charts are available in https://www.fct.pt/apoios/bolsas/estatisticas/index.phtml.pt, accessed November 13, 2017.

Figure 17



Available at https://www.ipl.pt/iplisboa/comunicacao/noticias/numero-de-doutorados-aumenta-em-portugal, accessed November 17, 2017.