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Public policies for university–business collaboration in Portugal: An analysis centred on doctoral education

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Abstract:
In Portugal, as in other European countries, government policies have driven the modernization of doctoral education, in which collaboration with companies is one of its axes; however, this has been insufficiently studied at the national level. This study focuses on the role of public polices in promoting university–business collaboration by tracking higher education and science policies. The main public policy instruments are analysed, identifying objectives and narratives. The methodological strategy comprises documental analysis. The findings show public policies have played a role in facilitating collaboration of this nature throughout successive governments. These policy measures are justified by the urgency of endowing companies with more qualified staff, aimed at boosting the country's economic development; from a more individual perspective, the need to ensure the employability of doctorate holders; or from a more institutional angle, the alignment of doctoral programmes with the business sector and an interconnection of cultures.

Keywords:
doctoral education; university–business collaboration; public policies; higher education policies; science policies; innovation policies

Introduction

Doctoral education was a political domain far from decision-making in Europe (Neave and Maassen 2007). The interest in the virtue of doctoral education increased with the Lisbon Strategy and the idea of the 'Europe of knowledge'. This context elevated research and higher education policy to one of the most important strategies in order to make Europe a 'more competitive and dynamic' knowledge society. The founding of a European Higher Education Area, specifically its inclusion in the Bologna Process (2003), and the specific proposals taken for the construction of a European Research Area, created the space for doctoral education in European politics (Bao et al. 2016).

This brought implications for the debate and considerations about doctoral education processes (and their quality) and products (and their usefulness). Doctoral education was then opened to the flow of objectives from other political areas, especially economic ones, and from other sectors, such as the business sector. As a result, the promotion of university–business collaboration was politically reinforced with different requirements for doctoral students and doctorate holders – 'knowledge workers' (European Commission 2005) – and doctoral programmes.

Such orientations and narratives at the European level have influenced and/or conditioned national political agendas, but political decision-making regarding higher education, and doctoral education in particular, is ultimately carried out at the national level (Van Deynze and Santos 2020). In Portugal, doctoral education started to be seen as a 'strategic resource' (Kehm 2009), and successive governments have been investing in university–business collaboration.

As a result of public policies, the number of doctoral students in Portugal has expanded at an accelerated rate: in 1998, there were 638 students, and by 2017 there were 4924 students. There was also an increasing evolution of doctorate holders, totalizing 27,752 in 2015. As the number of graduations increased, so did the ability of universities to create doctoral programmes. In the 2017–18 academic year, there were approximately 592 doctoral programmes in several scientific areas.

It is in this context that collaboration with companies in doctoral education has become part of the political agenda. Little is known about how guidelines and measures in higher education and in the scientific system have influenced these collaborations in Portugal. This requires a better understanding of the nature and the role played by public policies.

This study focuses on the role of public polices in promoting university– business collaboration in doctoral programmes in Portugal by tracking higher education and science policies and considering three elements – doctoral students, doctorate holders and doctoral programmes. More specifically, the research question is: how and why has public policy promoted collaboration with companies in doctoral education in Portugal? It is assumed as a hypothesis that the governments in Portugal have been playing an increasingly interventionist role in this area, in the sense argued by Bourdieu (2006: 130): '[T]he more a good or service is considered indispensable, the higher the likelihood that its production will be controlled by the State'.

To answer this question, this article begins with a reflection on approaches to conceptualize the role of universities and public policy in a knowledge society. The second section briefly describes the methodology. The following analysis is based on the proposal by Enders and de Boer (2009). It focuses first

on the chronological narrative (*how?*), namely the identification of changes in policies, based on the reconstruction of the evolution of political responses, in terms of measures and instruments. Next, the objectives and content of the instruments used are analysed – justifying narratives –including values and beliefs that the political actors used to legitimize their actions (*why?*). Finally, the main considerations that emerged from this analysis are revealed, providing recommendations for public policy itself, as well as clues for future developments on this topic.

Public polices in university–business collaboration

In the so-called knowledge society, theoretical models of university and government proliferate. These models embody beliefs about the existence of certain social and economic problems and how they should be resolved.

The idea of the universities' 'third mission' has been assumed as a way of adapting the university to meet the complex demands and expectations of society (Mok and Welch 2003). This goes in the same direction as the concept of 'entrepreneurial university', which combines education and research with the capitalization of knowledge (Clark 1998). The assumption is that this role is the result of an evolution of the university: from the 'ivory tower' to a significant national actor, that provides the raw material of the economy through knowledge and graduates (Wright 2016).

With this framework, universities started to be considered key agents in the future of Europe, in need of restructuring and modernization. Doctoral education has also started to consider accommodating new configurations of knowledge production, establishing alliances with an increasing number of actors. Bleiklie and Hstaker (2004) found that doctoral degrees were redefined in public policies in Norway, Sweden and the United Kingdom to serve the economy and society in general.

Among the restructurings proclaimed and promoted in universities by the narrative of 'knowledge society' is the defence of better connections with the business sector (Roolaht 2015). The underlying idea is that this collaboration would facilitate knowledge transfer and sector mobility, generating ideas and innovation, boosting productivity and, therefore, economic growth (Odei and Anderson 2018). A range of studies emphasizes a variety of intersectoral collaboration and its consequences for innovation and economic development, in particular, the dissemination of knowledge through publications and conferences, the graduation of doctorate holders and the creation and licensing of spin-offs (Cosh and Hughes 2010; Lakitan et al. 2012).

The persistent barriers between universities and companies were at the centre of the discussion of these proposals, associated with the belief that economic growth would be dependent on a new way of knowledge production. It is in this context that 'mode 2' of knowledge production was conceived. According to Gibbons and colleagues (1994), 'mode 2' is a more interdisciplinary, intersectoral and heterogeneous way of doing research, for more practical purposes compared to 'mode 1'.[1] Later, Carayannis and Gonzalez (2006) developed the concept of 'mode 3' underlining that an advanced knowledge system can integrate different knowledge and innovation paradigms. It would be composed of a pluralism and diversity of agents, actors and organizations in a dynamic relationship (linear and non-linear).

Taken together, these proposals have given rise to theoretical models on the role of the university and knowledge, but also on the changing role of

[1] 'Mode 1' is a disciplinary model that implied that basic university research was converted into applied research that, subsequently, companies transform into experimental development and introduce into the market (Gibbons et al. 1994).

national governments. The best known is the model of production and transfer of knowledge between universities, companies and government, designed by Etzkowitz and Leydesdorff (2000): the 'triple helix'. In this model the three 'helices' intertwine to produce changes in higher education and research systems.[2] It is an approach that aims to link universities, companies and government to facilitate the economic development and competitiveness of countries. For Assbring and Nuur (2017), this model has become the starting point for political discourse, assuming that provides a framework for policy-maker to mobilize these actors for knowledge-building processes.

In general, the idea is that the role of the State in a 'knowledge society' is to optimize the capacity of resources to generate 'knowledge' that can be transformed into 'innovation', dynamizing and diversifying the economy and maximizing the development of the country (Wright 2016). Governments encourage collaboration between universities and business through a range of means and instruments, including tax incentives, direct funding or programmes whose funding encourages cross-sectoral collaboration in various fields (Bloom et al. 2002; Guellec and Potterie 2003), including in doctoral education.

Ferlie and colleagues (2009) propose the idea of network governance, with a greater range of actors and in which the government plays an influential role, assuming itself as a facilitator of the relationship. In Portugal, a study that analysed 244 doctoral programmes found that 57.8 per cent of the programmes funded by a specific government scheme involved collaboration with companies (Santos et al. 2020). The role of public funding has also been considered central. Odei and Anderson (2018) analysed different public-funding schemes for collaboration between universities and companies and found that this funding was the most significant source for companies, because it helps to overcome the obstacle of funding scarcity that prevents sharing knowledge and innovation.

Other authors have analysed the consequences of public support for inter-sectoral collaboration in the business sector. Santos and colleagues (2016) pointed to the trajectory of countries, such as Germany, suggesting that public– private partnerships financed by public funds, such as support for collaborative research and employment of doctorate holders, may have critical roles in promoting innovation in the 'traditional' sectors and in the creation of high-tech sectors, contributing to the diversification of the economy. Falk (2007), on the other hand, concluded that the increase in public funds does not necessarily lead to more innovation in companies, but that the originated behavioural changes must be considered results that justify the investment. In the specific case of doctoral education, Cruz-Castro and Sanz-Menéndez (2005) found that, after government support for the insertion of doctorate holders in Spanish companies, most of the graduates remained in the companies.

For some authors, the collaboration between universities and companies comes from a new public management and managerialism imposed by government policies (Alexander et al. 2015). This has pushed academic research to increase competitiveness and higher education towards issues of social relevance and efficiency (Olssen 2016). The adoption of the 'strategic research' concept, according to Henkel (2004), represented this path of recognition of the importance of research and, at the same time, places limits on public support. Regarding doctoral education, Harman (2008) considers that the new organization of doctoral programmes aims to improve quality and efficiency, which imposes an increase in regulations, criteria, defined rights and obligations, and procedures for success assessment.

[2] The 'triple helix' model has also evolved and Carayannis and Campbell (2006) conceived the 'quadruple helix', which adds media and culture as the fourth helix.

This discussion raises important questions for an analysis about the Portuguese context, where there is very little literature on the importance of public policy in strengthening university–business collaboration, and non- existent in terms of its relationship with doctoral education. Do measures that promote collaboration between universities and companies in doctoral educa- tion move away from a model where there is a single starting point of research (the university) and an endpoint of the economy (companies) to a non-linear model? Is the role of the Portuguese State mainly that of a financier? Are the justifications for action related to the terms of the new public management?

Methodology

The methodology is based on the collection and analysis of political documents, from 1994 to 2015. Primary sources consist of 50 documents with implications for university–business collaboration in doctoral education, including programmes, regulations, resolutions, plans, strategies, decree laws and public interventions (see Table 1 and supplementary material).

A content analysis was carried out based on a longitudinal dimension to report the evolution of these policies. This enabled us to chronologically sort the documents under review, reconstructing the political attention given to this topic and the changes in the agenda over time. It also allowed their classification and clustering into thematic groups, in terms of the nature of the instruments used and the type of justifications involved.

Table 1: Number of documents per time period and type of document

Time period	Total number	Type	Number for type
1994–2001	18	Law	6
		Programme	4
		Regulation	5
		Council of Ministers Resolution	1
		Report	1
		White paper	1
2002–10	16	Law	8
		Programme	3
		Regulation	2
		Report	2
		Minister's speech	1
2011–15	16	Law	4
		Programme	6
		Regulation	2
		Council of Ministers Resolution	1
		Report	2
		Manifest	1
Total	50		50

This analysis was triangulated with reports and indicators from Portuguese and international institutions in order to support interpretation. At the national level, these are mainly reports from organizations that populate the so-called 'intermediate space' (Rip and Van der Meulen 1996), mediating the level of policy definition and the main pillars of execution (such as the National Innovation Agency [ANI], and the Foundation for Science and Technology [FCT]). At the international level, consultation of reports was mobilized to characterize the national context, compared to European trends, and to understand how national responses are part of a larger political discussion (Gornitzka 2013).

Public policies bringing together doctoral education and the business sector

Chronological narrative

The purpose of this section is to understand how collaboration between doctoral education and companies has been promoted through a chronological narrative of the political attention given to this subject between 1994 and 2015. To this end, three phases of change are distinguished based on the nature of the instruments created, as 'a set of techniques by which governmental authorities wield their power in attempting to ensure support and affect or prevent social change' (Vedung 1998: 21).

1994–2001: Hiring of doctorates by companies

Policy measures in the 1990s implemented mechanisms of greater proximity between the university and the business sector, for example, through the creation of the Innovation Agency in 1993, technology parks and partnership projects. In the second half of the 1990s, a new government led to a shift in the orientation of scientific policy (Rodrigues 2015). In 1997, the FCT, replacing the National Board of Scientific and Technological Research, gave priority to doctoral and postdoctoral scholarships. These doctoral grants would be an important tool in promoting advanced qualification, including in higher education, and scientific and technological production. By 2019, FCT funding for advanced training already reached 98 million Euros (FCT 2020).

This is also the period when the first outlines of public policies promoting collaboration between universities and companies in doctoral education were defined, arising from a marked science policy for growth and European convergence objectives. This phase is characterized by supporting the hiring of doctorate holders for the qualification of the business sector (PRAXIS XXI in 1994 and POCTI in 2000), being at the forefront of European developments. The purpose of the PRAXIS Programme was to increase and ensure the competitiveness of national companies. Hiring doctorate holders was done for a period of up to three years, with open-ended contracts benefiting from an additional subsidy. Between 1997 and 2001, government supported the hiring of 43 doctorate holders (FCT 2002). This programme was extinguished with the closure of the III Community Framework, but the issue of support for hiring doctorate holders has remained on the political agenda up to the present time, embodied in different instruments.

As a result of the Lisbon Agenda (2000–04), which required 'more and better' researchers, the reinforcement of the research system in this period led

to growing research and development (R&D) activity in companies, testified by the increased number of companies that declared such activities and by the increase in company expenses associated to R&D. For these, a tax incentive was promoted for companies that develop R&D (SIFIDE). This instrument contributed to foster collaboration in R&D that went beyond the logic of projects (Fernandes 2014) and remains active today, having been reformulated to support directly the hiring of doctorate holders by companies.

Efficiency, excellence and competition became key words in political statements during these years, inspired by the New Public Management (as mentioned by Amaral et al. 2013). This has resulted in a more rational allocation of resources, in which policy-makers seek effectiveness and efficiency through the identification of scientific sectors with the greatest economic potential and the granting of competitive funding to researchers and institutions.

2002–10: Socialization and training of doctoral students in companies

Crossed by different political cycles, this period is situated in the context of the expansion of the scientific system and the doctoral education system in Portugal. The vision focused on reducing the deficit in the Portuguese research system's capacity compared to the European average (Heitor 2015). The Commitment to Science (2005) describes this vision through the title 'Overcoming scientific and technological backwardness' and assumed the importance of encouraging the employment of doctorate holders, considering that this would facilitate the creation of 'critical mass' and the dissemination of knowledge, stimulating scientific development.

As a consequence, this period is the one in which Portugal is closer to the average of European countries (Rodrigues 2015). The *Towards a European Research Area: Key Figures 2001* (European Commission 2001) emphasized the growth and dynamism in the research sector, both the growth of doctorate holders (the highest in the European Union), and the growth of R&D financed by companies (one of the three highest). In 2007, the goal of 1 per cent of GDP invested in R&D was met and the business sector started to represent 51 per cent of R&D expenditure (FCT 2013a).

An innovation policy also started to be part of the political discourse at this time, namely from the launch of PROINOV (Integrated Programme to Support Innovation) whose purpose was to 'develop the innovation system, defined as a set of interconnected institutions that contribute to create, develop, absorb, use and share economically useful knowledge in a given national territory' (Council Ministers 2001, see Supplementary Material). From here, this concept was adopted by a significant part of the policy documents in Portugal, such as the Technological Plan (2006–09).

Measures related to the hiring of doctorate holders in companies continued to be created and implemented, but were boosted through the use of virtual means. This was the case, in 2004, of the creation of the deGRAU Científico website, a job exchange for postgraduate careers in companies. From 2005 to 2008, the Neotec programme was managed by Innovation Agency (ADI), leading to the creation of new technology-based companies that hired highly qualified human resources. Another programme encouraging the placement of doctorate holders in companies was the Stimulus for Hiring Doctorate Holders in R&D Institutions and Companies (2007), aimed at financing at least 1000 new individual research contracts until 2009.

Political instruments were introduced that focused not only on doctorate holders and their employability but also on doctoral students and their socialization process. Doctoral Scholarships in Companies were created and are still active today. These are grants for the development of research work in a business environment that, according to the regulation, presuppose a work plan specifying 'the objectives, the conditions to support the researcher's research activity in the company and the expected interaction between the company and the university institution' (FCT Regulation No. 234/2012). Between 2010 and 2012, 398 scholarships were approved; however, these grants corresponded to an average of 1.2 per cent of the total financed grants (FCT 2013b).

In 2007, as a result of the review of the Portuguese higher education system requested to the OECD (2007), the Portuguese government launched another programme, Partnerships for the Future. One of the objectives of the programme was to promote academic collaboration with companies based on the integration of doctoral students in research projects developed with both sectors in areas considered to be of high priority. Doctoral programmes were created with institutions in the United States, such as the Massachusetts Institute of Technology. In a study about this partnership, a questionnaire for doctoral students and doctorate holders of these programmes showed limitations of the university–company collaboration (Patrício and Santos 2020). Nevertheless, about 40 per cent of students had some link to companies, where the most significant link was access to technology and/or data provided by the company, followed by having a company as a partner and input or feedback from companies.

2011–15: Promotion of a collaborative model of doctoral programmes

This phase coincides with the economic crises that interrupted the growth path. Budgetary control was imposed, and public investment in R&D decreased, reinforcing private divestment. There was a decrease in support for scientific employment, putting an end to a large majority of supported doctoral research contracts, and funding for doctoral and postdoctoral fellowships. This decrease is visible when comparing the number of approved grants in 2007 (2031 grants) and 2014 (453 grants). The argument that there were too 'many doctorate holders' gained ground at that time.

Seeking to align the doctoral education offer with national priorities and the needs of the business community, during this period public policies promoted the reconfiguration of doctoral programmes away from the traditional 'master–apprentice model' (Kehm 2009). That was the central idea for adopting new funding schemes for doctoral programmes – the FCT Doctoral Programmes (2012), including Doctoral Programmes in the Business Environment. Here, European processes can be understood as a 'window of opportunity' (Kingdon [1984] 2011), making available to the national government justifications that would facilitate this kind of change.

These programmes had a direct financing line; companies were included in the planning and development dynamics, as well as in their co-financing (at least in 25 per cent); and doctoral grants were no longer centralized at FCT but managed by the universities. In 2012 and 2013, seven programmes were approved, corresponding to 184 doctoral grants. As an example, the Ph.D. Programme in Refining, Petrochemical and Chemical Engineering

brought together more than twenty institutions, including national and multinational companies (such as GALP) and a consortium of five universities. It was also planned at this stage to reinforce the incorporation of projects developed in small- and medium-sized enterprises in the curricular plan of doctoral programmes, namely in the areas of management, technologies and innovation, development and technology ('Industrial Development Strategy for Growth and Employment 2014–20', 2013).

However, despite this effort to promote collaboration based on external incentives, a questionnaire applied to directors of doctoral programmes in Portugal in the 2016–17 academic year, designed to access university– business collaboration trends and practices, has found that the initiative to establish a collaboration between doctoral programmes and companies is mainly the result of individual action (72.3 per cent), with the initiative being of governmental origin only in 2.3 per cent of cases (Santos and Thune 2021). The way in which collaboration is operationalized is mainly due to requests from academic actors (professors, researchers, doctoral students) or entrepreneurs (human resources, including those who are doing a Ph.D.).

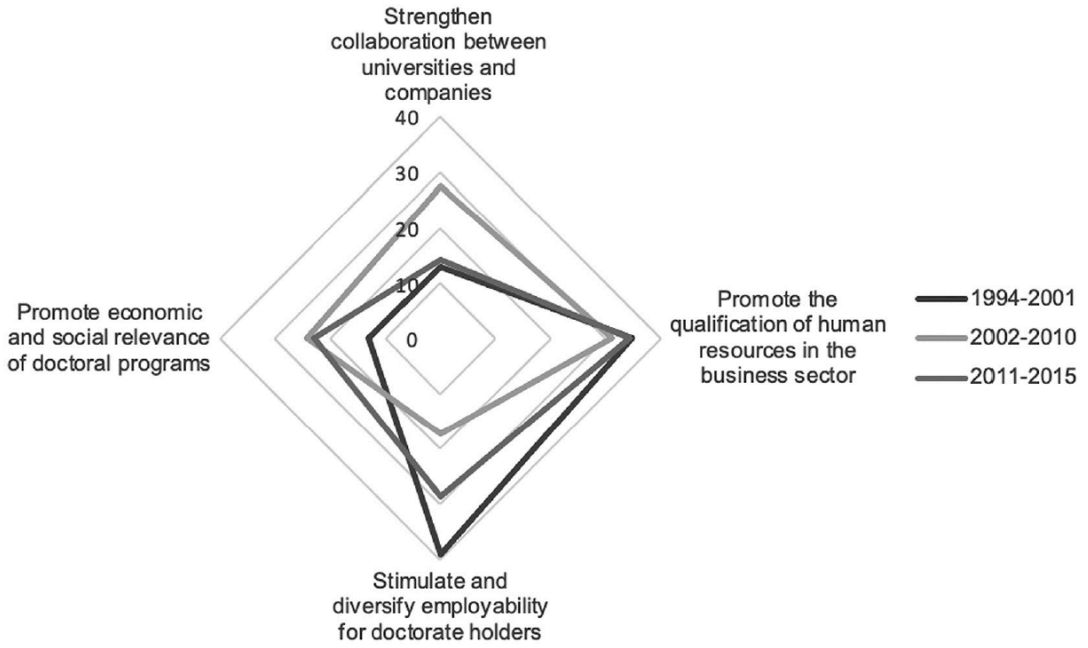
This is a period with significant political investment in collaboration. There was a recurrent orientation of public support to companies, mainly to strengthen their competitiveness, embodied in indications for fostering collaboration with companies. This vision is reflected in the Operational Programme for Competitiveness and Internationalization (2014), integrated in the Portugal 2020 Strategy, which prioritizes the 'promotion of business investment in R&D, development of links and synergies between companies, research and development centres and the higher education sector' (XIX Government 2014, see Supplementary Material).

To summarize, the chronological analysis demonstrates that this topic aroused a continuous and growing interest of the governments, evident in the number of documents. It should also be noted that two types of measures coexist: permanent measures aimed at developing national, country and business sector capacities (such as the integration of doctorate holders in companies); and non-permanent measures, which substantiate the choices of political leaders (including new formats of doctoral programmes). It was also found that public intervention was evinced through the adoption of a range of instruments that acted on the supply side (socialization and training of doctoral students, and adaptation of doctoral programmes) and on the demand side (fostering collaboration and hiring doctorate holders by companies). Financial instruments – offered to companies, doctoral students and universities – were the most frequently used. Information instruments, in the form of recommendations and guidelines, are rarer, comparatively at the European level.

Justifying narratives

Public intervention in this area is also embodied through the adoption of objectives and narratives. In general, these policies are organized around the following objectives, in decreasing order of importance: (i) promote the qualification of human resources in the Portuguese business sector (in 32.7 per cent of the documents analysed), (ii) stimulate and diversify employability for doctorate holders (28.6 per cent), (iii) promote economic and social relevance of doctoral programmes (in 19.4 per cent) and (iv) strengthen collaboration

Figure 1: Objectives of political instruments, 1994–2015 (percentages)



between universities and companies (in 19.4 per cent). Figure 1 presents the relevance of these objectives in each of the phases indicated in the chronological narrative. The narrative associated with each of the objectives is discussed below.

(i) Promote the qualification of human resources in the Portuguese business sector

This is the most prominent objective for public intervention in this area. The justification is that the availability of a highly qualified workforce (doctorate holders) stimulates business R&D and innovation processes in companies and, consequently, the country's economic development. This argument, also infiltrated in European discourses (Johnston and Murray 2004), is organized around assumptions on the nature and requirements of the knowledge economy, where elements such as competitiveness are increasingly present.

The logic of encouraging the modernization of companies is based on a negative diagnosis. The Operational Programme for Competitiveness and Internationalization emphasizes the'insufficient relevance of activities producing goods and services' and the 'low intensity of innovation, technology and knowledge of the productive fabric' (XIX Government 2015: 69–70). The 'lag' that separates Portugal from other countries is also an important argument in this speech in order to justify political intervention.

State intervention underlines the idea that formal knowledge and tacit knowledge required by companies are incorporated in highly qualified human capital, supporting the justification of hiring of doctorate holders in companies. In the Technological Plan, support for the integration of doctorate holders in companies was linked to the idea of creating 'a new economic model, […] fostering competition based on qualified human resources, R&D and

innovation' ('Great Options of the Plan 2005–09'). Likewise, in the 'Industrial Development Strategy for Growth and Employment 2014–2020', tax incentive and financial support measures, which promote the integration of doctorate holders in companies, are justified by 'promoting technological innovation and scientific development in companies and improving productive structures' (Conselho de Ministros 2013: 69).

The term 'innovation' is invoked in an apparently shared understanding of development and growth. The human capital theory also seems to be impregnated with this discourse and measures focused on the creation of a work-force that stimulates the country's economic development. Loxley and Kearns (2018) consider that this discourse and these arguments are central to the macro-policy of repositioning doctoral education in society.

(ii) Stimulate and diversify employability for doctorate holders

This is one of the most prominent objectives in European discourse (Van Deynze and Santos 2020) and the second most prominent in national policies. Here the focus is on doctoral students and doctorate holders, especially in their ability to integrate innovation and development processes in the business sector.

The discourse is manifest by associating the employability of doctorate holders and their knowledge and skills with the rapid changes in the labour market. The notion of employability is defined in terms of attributes that graduates must have, relying not only on their disciplinary expertise but also on relevant knowledge and skills for a wide range of sectors. Capabilities become a subcomponent of human capital (Tomlinson 2018).

One of the assumptions of this approach is that doctoral students are trained very narrowly in their field and lack professional skills necessary for employment outside the academy. This is visible, for example, in the document titled *Science in Portugal* (Gomes 2010, see Supplementary Material) prepared by a committee of the Assembly of the Republic. The justification for this debate was linked to the idea that 'other essential competencies for the subsequent qualification of the doctorate holders in society and its institutions […] are not generally developed during the doctoral programme' (2010: 15). The Portuguese government's *Specific Regulation of the Domain of Human Capital* (Council Ministers 2015) also considers that '[t]he doctoral and post-doctoral training should contemplate the acquisition of transversal skills, […], which facilitate the transfer of knowledge, with a view to socio-professional insertion […] and employability in the productive sector' (Article 22). This issue remains on the agenda at a national level.[3]

Another and more recent line of discourse for public action and funding is the lack of professional opportunities in academia compared with the increased number of doctorate holders. This is highlighted in the Industrial Development Strategy for Growth and Jobs 2014–20 (2013), but also at European level (see EUA 2005). The aim is to improve the range of skills that doctoral students develop and acquire as a way of improving their job prospects in a broader job market and in a context where academic positions are scarce. This logic reinforces the application of knowledge in specific professional situations and justifies measures such as doctoral scholarships in companies, whose intention would be to provide opportunities for doctoral students to acquire knowledge in the private sector and, with this, a greater probability of professional insertion.

[3] The Evaluation Report on the Implementation of the Scientific Employment Stimulus Programme states that 'the training of doctorate holders does not promote certain transversal skills seen as relevant by companies, namely the ability to communicate, plan, lead and management' (2020: 8).

(iii) Promote economic and social relevance of doctoral programmes

This objective was reinforced by the previous ones, but it focuses, to a greater extent, on the universities that promote doctoral programmes. The political agenda in the improvement of doctoral programmes is centred on the quality and relevance of the training of doctorate holders towards using the knowledge of doctoral students and graduates for innovation and also for enhancing their own job opportunities. The Portuguese government's Operational Programme for Human Capital (2014), as part of the Europe 2020 Strategy, is an example by highlighting one of the specific objectives as '[b]ringing higher education and advanced training offerings closer to market needs with a view to the transition of graduates to the labour market' (Article 19). This objective is still recurrent in the *Evaluation Report on the Implementation of the Scientific Employment Stimulus Programme* (2020).

The narrative for a new organization of doctoral programmes can also be seen as part of an effort to make programmes more efficient and predictable. Additional explicit standards in terms of objectives, competencies to be promoted and demonstration of results achieved and returns on public investment may reflect the New Public Management model, as noted by Halse and Mowbray (2011).

This narrative suggests a supposed incompatibility between what doctoral education provides and what entrepreneurs demand. The relationship between universities and employers in doctoral education is characterized as loosely coupled. The active intervention of governments in the restructuring of doctoral programmes, more clearly designed for the demands and needs of the labour market, influenced by the North American model, gains strength in this context. The first step was taken with the launch of the FCT Doctoral Programmes in Business Environment. These doctoral programmes are viewed as arenas for the development of university–business relations and restructured as a way to fill the gaps identified by employers in the private sector concerning the profile of doctorate holders and their skills, as well as the nature of the research developed in order to support innovation in companies (related to the first justification).

This is where the public intervention zone has more conflicts. Academics draw attention to the possible consequences of the participation of the private sector, its interests and procedures, in its scientific autonomy. The 'meddling' of the State as something that would delegitimize the freedom and autonomy of academics and disciplinary groups in the creation of doctoral programmes is also a highlighted aspect.

(iv) Strengthen collaboration between universities and companies

Based on the assumption that there is a significant cultural divide between universities and companies, to a lesser extent, some political discourse is centred on the importance of measures and instruments designed to help the two sectors communicate and collaborate more effectively. The focus here is on both types of institutions: universities and business.

This narrative is based on an understanding of innovation as a network phenomenon (Winslett 2014). Enthusiasm is nested in assumptions about the possibility of transferring knowledge and innovation, due to the juxtaposition of ideas, tools and people from different domains, which can bring long-term benefits and provide access to resources, materials, knowledge and experience

that might not be available in each sector. It is in this sense that the *Specific Regulation on Competitiveness and Internationalization* (XIX Government 2015) considers that one of the thematic goals is 'to reinforce the transfer of scientific and technological knowledge to the business sector, promoting greater efficiency in the R&I System and the creation of value'.

Various barriers to the connection of doctorate holders to companies that restrict the mechanisms of knowledge transfer are highlighted. One of these barriers emphasizes that universities have a 'degree of relationship with the business sector that is less than desirable' (XIX Government 2015). Research is considered for mainly academic purposes and, therefore, has a minor impact on the production and competitiveness process. It should also be considered that the productive sector does not actively support R&D, which results in a low capacity for innovation.

The central argument for political intervention is that measures are needed to influence the behaviour of companies and universities, such as the creation of partnerships in doctoral programmes to encourage and establish bonds. This includes a debate in favour of intersectoral mobility and its possible virtues. In this field, doctoral students and doctorate holders are understood as 'agents of change' (Stewart 1999), contributing, during or after their graduation, to transform research results and skills into economic development and diversity.

Political measures present solutions (or instruments) to problems (or objectives) that vary over time and focus on different actors. Although these narratives are articulated, our analysis reveals that some discourses emphasize individual actors (doctoral students and doctorate holders) while others focus on the role of organizations (universities and companies). Also, government policy has ceased to prioritize justifications related to the need for critical mass for companies, adding justifications focused on issues such as the types of skills required by the knowledge-based economy or the adaptation of doctoral education to the growing needs of the labour market. In other words, without abandoning justifications on the demand side, justifications on the supply side have been added.

Conclusions

This political framework for university–business collaboration in doctoral education has been submerged in narratives whose emphasis is mainly economic and whose discourses are clearly reactive in response to the needs and transformations of the 'knowledge society', as pointed out by Bleiklie and Hstaker (2004) for other countries. The recurring image is that the merits of doctoral education depend, to a large extent, on its social and economic utility. It is the adoption of the theoretical thinking of human capital that makes doctoral education, its programmes, doctoral students and doctorate holders unavoidable aspects of policies, justifying investment in this area.

Regarding doctoral education, Harman (2008) considers that the new organization of doctoral programmes aims to improve quality and efficiency, which imposes increased layers of regulations, criteria, defined rights and obligations, and procedures for success assessment.

These policies have different focuses. In the first phase, priority was given to interventions for hiring doctoral students and graduates in companies. Then, without abandoning the supply-side measures, the focus shifted to doctoral students and their socialization and training in the business context; and,

finally, it moved to focus on changes in the objectives and structures of doctoral programmes, including greater involvement of business partners. In general, the responsibility for collaboration lies mainly with doctoral students and doctorate holders – who must develop attributes to be 'employable'; universities and their doctoral programmes – which must be active in creating collaboration and receptive to the interests of companies; and, to a lesser extent, on business partners – who should value collaboration and doctorate holders.

The policy measures under analysis have provided models for university–business collaboration in doctoral programmes. In general, the discourses associated with these models are linked to non-linear knowledge paradigms in which knowledge flows in several directions. The reinforcement of knowledge transfer and circulation is promoted based on a diversified array of instruments that stimulate collaboration routines and circulation of people, as described in the literature. But these models do not seem to significantly transform the traditional government approach. Governments echo a 'triple helix' model in an attempt to increase collaboration between universities and companies in doctoral education, taking on the role of a promoter based on financial incentives. This may have to do with the importance of this incentive for companies (as suggested by Odei and Anderson 2018), but also for universities.

It is important to note that the measures are consistent with European trends and are in line with the dominant explanatory logic. In some cases, European guidelines triggered the emergence of the problem and its timing, as in the promotion of collaborative doctoral programmes. In other cases, they reinforced the guidelines and paths already started, such as in supporting the employability of doctorate holders in the business context.

There is evidence that public policies in Portugal, and their respective instruments, were active promoters of the articulation between doctoral education and the business sector. The manifesto of scientists and entrepreneurs – 'Scientists and entrepreneurs, we speak with one voice' (2020) – is the most recent example of a rapprochement between the two sectors. However, integration rates for doctorate holders in the business sector are low and collaboration in programmes is mostly informal. These are time-consuming processes where the power of experience and prior relationships is important. In addition, the way in which these processes are developed and the extent of the effects of these measures remain untapped. What are the intended and unintended consequences of these programmes and instruments? This question can serve as a motto for subsequent studies. It is also important to investigate how policies of this nature, in particular the new models of doctoral programmes, are appropriated and transformed according to the institutional, organizational and relational characteristics of the actors involved.

Although this theme challenges simple solutions, three political recommendations are made. First, the intersection between different fields of policy in this domain – higher education, science, innovation and economics – leads to the coexistence of documents and instruments focused on different processes and funding. In this context, better coordination between the two main agencies in this field – the FCT and ANI – would be beneficial. The second recommendation is linked to the idea that some measures have been developed to promote intersectoral mobility, but more in the university–business direction and less in the business–university direction. One possibility to address this would be the creation of financial support to train companies' human resources in doctoral programmes. The third recommendation refers to the concentration of investment in specific scientific fields, which integrated

the narratives in the period under analysis and in the current period, based on the idea of concentrating on scientific sectors with the greatest economic potential. It is necessary to value policies that boost the (economic and social) contribution of each area in the composition of the Portuguese economy. It would be important, for example, to promote collaborative programmes with the public sector or third-sector organizations, where doctorate holders also represent a minor percentage.

Supplementary material

Consulted documents are organized chronologically by year of publication, separated by case. Titles have been translated, with the original title indicated in brackets.

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