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# Too many PhDs? An invalid argument for countries developing their scientific and academic systems: The case of Portugal

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## ABSTRACT

This article contradicts recent arguments in Portugal that there are “too many PhDs” and argues that there is a need to understand better the changing nature of doctorates and doctorate holders. The article analyzes whether there is a surplus of doctorate holders in Portugal based on five critical dimensions, using data provided by supranational and national public organizations: stocks and flows; university academic staff qualifications; age structure; research output; and labor market for PhDs. The analysis shows that rather than a surplus, there is a shortage of doctorate holders in many sectors of activity, which is expected to be exacerbated in the next few decades. These findings underline the need to consider active public policies to attract and retain PhDs, as well as enhancing the degree of involvement of new doctorate holders in the modernization of higher education and in the internationalization of the economy. Intermediary institutions, public–private research partnerships and public administration may play a critical role in the process but require new economic actors and instruments with the capacity to invest in and employ doctorate holders.

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## 1. Introduction

Disparities in economic development between countries have highlighted differences that cannot be attributed to natural resources and demographics alone (Phelps, 2013). These differences draw attention to the role that skilled people play as critical resources in fostering science, innovation, competitiveness and development in global knowledge economies (De, 2014). The relevance of knowledge and of skilled people has brought to the policy agenda of governments worldwide the need to modernize science and higher education systems and institutions to cope with the complex economic, societal, cultural and scientific challenges that modern societies face (Scott, 2000). This includes doctoral training because PhDs have a substantial ability in recombining existing knowledge and articulating it in novel ways, paving the way for a multitude of innovations (Forfás, 2009), even if they represent a relatively small proportion of skilled workers.

Doctorate holders are expected to acquire a combination of technical and soft skills, transferable competencies, behaviors and high levels of adaptability during their studies (Durette et al., 2014). These competences remain unchanged, despite the fact that doctoral training has been undergoing transformation in recent times (Wildy et al., 2013).

However, concurrent with recent changes in doctoral training, claims have been put forward that “too many PhDs” are being trained (Cyranoski et al., 2011). These claims have been fueled to a large extent by the media, based on data of mature science and technology systems<sup>2</sup> (Larson et al., 2014; Stephan, 2012a). The rapid increase in contingent-staff at US and UK universities is one of the most visible facets of this phenomenon, and it is undisputable that, in many scientific systems, doctoral graduates are facing increasingly precarious employment prospects (Stephan, 2012b).<sup>3</sup>

This has become an alarming situation for the doctoral graduates themselves and for the sustainability of these scientific systems (Schwartz, 2014). However, to what extent is this an issue that pertains to scientific systems still in their developing stages? This is a matter of key importance because discourses of “too many PhDs”, which originate from mature scientific systems, are often taken as truths in systems where such claims may not apply. Moreover, they may lead to misguided policies that hamper the development of science in those countries developing their scientific systems.

The assessment of the “too many PhDs” claim in a country that is developing its scientific and academic system is the focus of this article.

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<sup>2</sup> E.g., Weissmann, J. “The PhD Bust: America’s Awful Market for Young Scientists – in 7 Charts”, The Atlantic, Feb. 20 2013: <http://www.theatlantic.com/business/archive/2013/02/the-phd-bust-americas-awful-market-for-young-scientists-in-7-charts/273339/>.

<sup>3</sup> This, in part, is also due to concerns which have been emerging regarding the quality of doctoral education given the rising number of doctoral programs and sometimes unclear or conflicting quality-assurance regulations (see for example Byrne et al., 2013); although relevant, this is a topic which is beyond the scope of this article.

The focus of our analysis is Portugal – a country with a poorly qualified workforce in European average terms, facing structural barriers to economic growth in recent years (Carneiro et al., 2014). It is also a country that has witnessed one of the fastest developments of its scientific system at the onset of the 21st century (Heitor et al., 2014), but where the argument that there are “too many PhDs” is gaining much attention from the national mass media and has been partly used to justify substantial public budget cuts in recent years (Rodrigues and Heitor, 2015). These have included a significant cut in grants awarded to new doctoral students per year, with the number of grants reduced from about two thousand new grants awarded in 2009 and 2010 to less than thirteen hundred in 2012.<sup>4</sup> This context, associated with the fact that the country continues to develop its scientific system, makes it an interesting case study to analyze to what extent the claim of “too many PhDs” is applicable to countries developing their scientific capacity.

Similarly to other studies about doctoral holders (e.g., Pedersen, 2014), the analysis is based on secondary data mostly sourced from the OECD’s Career of Doctorate Holders (CDH) survey, which started to be implemented in 2006. This dataset is, to the best of our knowledge, the only dataset that provides comparable data concerning stocks of doctorates for several countries. Our analysis of PhD stocks is complemented by our own (properly identified) estimations based on both CDH data on stocks as well as number of new PhDs per year (data retrieved from Eurostat). Other data sources, such as the Portuguese Ministry of Science and Education (and its directorates) are also used when appropriate. The article’s finding is based largely on analyzing data trends but correlations are also provided in some instances for informative purposes.

The findings of this article show that for countries that have not achieved the critical mass, research proficiency and human resource qualification levels of more developed countries, the “too many PhDs” argument may not be valid. Our rationale for this assertion is based on three main reasons. First, new PhDs are required to improve the qualifications of academic staff and modernize the higher education system, being the PhD a pre-requisite for quality scholar activities both in teaching and in research (Cishe, 2014). Second, new PhDs are major drivers of knowledge production at universities, which increasingly rely on doctoral training to foster new findings and promote new research areas and themes (Larivière, 2011). Third, the low rates of PhDs employed in sectors outside academia represent both a challenge and an opportunity for the employment of PhDs. It is a challenge, since many low and medium technology businesses have limited use for doctorate holders but also an opportunity, because as national economic structures evolve and businesses develop products and services further up in the value chain, so does increase the demand for highly qualified human resources. In this context, a large stock of new PhDs needs to be available for these sectors to meet the demands of the global economy (see, for example, the evidence described by Phelps, 2013, and Chaloff and Lemaitre, 2009).

This article is organized as follows. The next section discusses the changing nature of PhDs. Section 3 provides background context for the Portuguese case. Section 4 discusses the Portuguese case, with respect to five analytical issues: i) The stock and flow of PhDs in Portugal compared with other countries in Europe; ii) the qualification level of higher education teaching staff; iii) the aging of the doctorate holder population and academic staff; iv) the evolving level of scientific production; and v) the non-academic labor market for PhDs. Section 5 discusses the data and facts presented, and justifies our main argument, which is summarized in the last section, together with policy implications.

<sup>4</sup> Source: Fundação para a Ciência e Tecnologia: [http://www.fct.pt/images/stat/B6\\_en.gif](http://www.fct.pt/images/stat/B6_en.gif) [accessed on the 9th of July 2015].

## 2. The changing nature of PhDs

Obtaining a doctorate degree is considered a high educational achievement, and the starting point of a research career (Jairam and Kahl, 2012). Traditionally, a PhD was pursued mainly by those of a strictly academic persuasion, intent on spending their lives in academia and engrossed in research and teaching endeavors (Delanty, 2002). The dawn of global knowledge societies and the rise of mass education led to a multitude of higher education reforms worldwide, and to universities and academics adapting to new times (Bleiklie and Kogan, 2007; Heitor et al., 2014; Cattaneo et al., 2014). These adaptations included challenging some of academia’s basic values (such as collegiality; see Ferlie et al., 2008) and the traditional idea of doctoral education, among others (Usher, 2002).

Although doctoral training has maintained its focus on research, doctoral students are increasingly being asked to acquire diverse, transferable and flexible skillsets that enable them to adapt to work in sectors other than higher education and research (Jackson, 2013). Their emerging role is not limited to research, and some studies have found PhDs working in industry to have less of a “taste for science” than those working in academia (Roach and Sauermann, 2010). The increasing number of PhDs moving into sectors other than academia can be interpreted as a tacit recognition of the importance of PhDs to the knowledge economy (Castro-Cruz and Sanz-Menéndez, 2005). For example, in the US, whereas in the 1960s, it was estimated that 85% of doctorate recipients took on academic positions, in 1994–1998 only 36% took on full-time positions at universities (Pion et al., 2003).

The fact that more PhDs began to be employed in non-academic sectors, necessarily because of a lack of positions in academia or because of their desire to work outside academia (Enders, 2002), led some universities – in times of growing accountability – to transform their PhD program training to increase employability and efficiency (Cuthbert and Molla, 2014). Many PhD programs now are intended to develop specific workplace skills perceived as desirable by employers to the detriment of knowledge production skills (Craswell, 2007). New types of doctoral training have emerged to meet new professional options for doctoral students. A paradigmatic case is the “professional PhD”, which aims to provide specific training to those who seek to work outside academia (Fenge, 2009). Entrepreneurship and knowledge transfer skills have been particularly highlighted in many programs worldwide, in association with the ultimate goal to foster skills for the creation of new science-based firms (Breschi et al., 2014).

Also, many universities worldwide are increasingly adopting the practice of “PhD by publications” as a pragmatic approach towards doctorate training (Jackson, 2013) that increases the levels of knowledge productivity, together with the visibility of new doctorate holders (Horta and Santos, 2015). However, there is some evidence that those who pursue non-traditional doctoral programs are not necessarily departing academia but remain there with a different profile from those pursuing traditional PhDs (Wellington and Sikes, 2006).

For all the changes to doctoral training, studies show that the motivation to undertake a PhD remains unchanged and continues to be mainly aligned with interest in independent work, curiosity-driven engagement, and the influence of family and learning agents (including influential university faculty). These motivations are less related with financial incentives, downstream work and access to resources (Guerin et al., 2015; Roach and Sauermann, 2010; Zhou, 2014). In general, doctoral students are interested in learning skills that are not necessarily those for which there is a demand in non-academic sectors, and this has been discussed in the literature as a major challenge to the employment of doctorate holders in non-academic sectors (see De Grande et al., 2014). It is also clear that financial motivation has not been critical for many doctoral applicants (Guerin et al., 2015; Roach and Sauermann, 2010; Zhou, 2014), although studies present mixed findings concerning the salary premium of holding a PhD when compared

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