Doctoral training, European Higher Education and European Research Areas

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Abstract

This contribution analyzes the evolution of the higher education and doctorate in Europe and Spain in the last decades, and its relationship with the evolution of the economy based on knowledge. It also analyzes the strong impact that doctorate has on the research activity and the tensions between the Bologna process, that is collaborative, harmonious and open, and the productive economy based on research, which is dynamic and competitive.

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Introduction

Doctoral education remains a matter of debate throughout Europe and is clearly identified as a key element in the development strategy of all countries. The discussion about the functional definition of the doctorate is still alive and controversial, even in countries in which the productive economy benefits most significantly from it.

As recently as June 2016, the Council for Doctoral Education (CDE) of the European Association of Universities (EUA) met at its annual assembly under the slogan "Doctoral education: a dilemma of quality and quantity?" The meeting enjoyed one of the largest participant turnouts for this forum, with more than 240 attendees from 29 countries. An even more explicit reference to the aforementioned controversy can be found in the title of the final round table: "Are there too many doctors or too few?" This is not a new question, both theses have been circulating for years (*Nature*, 2011: "The PhD Factory … Is it time to stop?"). On the one hand, the most advanced countries with productive economies based primarily on knowledge need to incorporate more and more researchers with highly developed research capabilities into their companies, and such capabilities are universally recognized as corresponding to the doctoral level. On the other hand, achieving a doctorate requires peer acceptance of an original contribution to knowledge, based on the doctoral candidate's own capacity for research.

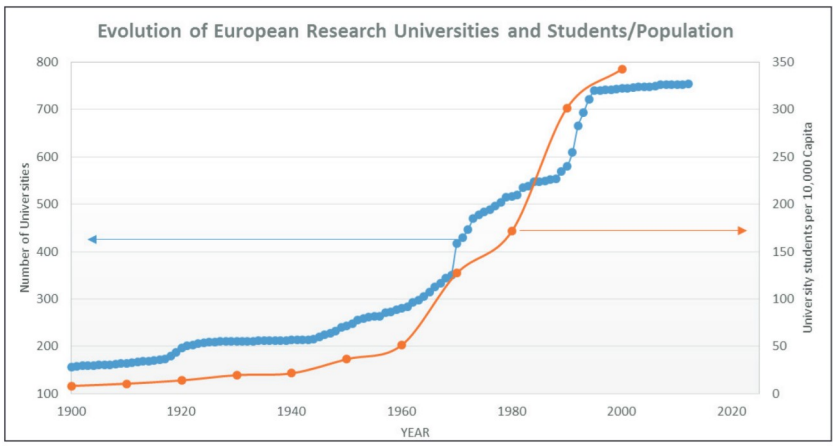
The dilemma of the title of the CDE seminar and the controversy it raises is that everything is true and false at the same time: Research training of new researchers must be incorporated into the productive economy and the admission procedure into the scientific community, always represented by the doctorate, is still indispensable. Do they always correspond to the same procedure? This is probably the bottom-line question. It is an issue that suggests the possibility of a different functional definition, which perhaps cannot yet be discussed at the European level and that would not make any sense at the regional level, but that must be expressed to provoke reflection and discussion.

The doctorate and the evolution of higher education and research in Europe

An image of the evolution of higher education in Europe over the last 100 years can be built using data from Schofer and Meyer (2005) and Rüegg (2004 and 2011), as shown in Figure 1. This graph shows how the number of research universities has fluctuated in different waves: a relatively small one after the First World War, which steadily grew until the late 1960s and early 1970s, when the first boom took place, and a third wave, perhaps definitive, in the early 1990s. The overlay with the evolution of the number of students normalized by population shows how the creation of new

universities responds to a previous increase in demand for higher education, probably due to significant changes in productive models. This evolution in higher education has gone from the exclusive training of the upper classes, to the training of senior officers and middle management and, finally, to the need for university education in numerous economic sectors, up to the current objectives of 40% of a cohort.

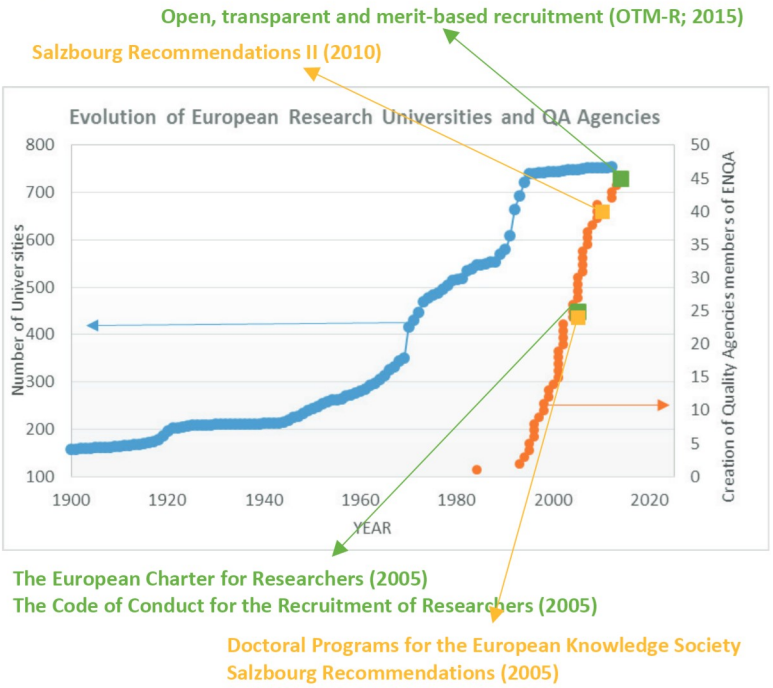
Figure 1. Evolution of research universities in Europe and the number of university students in relation to the population.



The last jump occurred in the 1990s, and was followed by a marked period of stabilization (perhaps it would be unreasonable to expect new future growth, given the current percentage of the population with a university education). This sharp upsurge has brought university education into a new dimension: It is a strategic resource for countries and at the same time difficult to manage, given the degree of autonomy universities require. This reality has given rise to a new framework, a mix of structural and political guidelines and recommendations, which link university systems and public administrations.

The Bologna Declaration emerged in 1998, right at the end of this third wave of growth, and has fostered the necessary harmonization of this expansive and diverse European university system. Since that time, university quality agencies have been established throughout Europe as essential instruments for harmonization, quality assurance and, therefore, for the generation of mutual trust. In parallel, European policy has promoted common guidelines and recommendations involving doctoral education, including joint degrees (within the framework of the European Higher Education Area, EHEA) and research (within the framework of the Area European Research, ERA). Figure 2 shows the precise evolution of the creation of agencies and the points at which major declarations and recommendations have taken place.

Figure 2 Evolution of research universities in Europe, quality agencies and European directives on higher education with a focus on the doctorate.



The successful and indispensable Bologna process has to do with the first mission of the university, higher education at all levels, and has led to an increase in the reliability of the system through quality assurance (creation of agencies, assurance of the quality of the agencies themselves, etc.) and harmonization. The Bologna Declaration makes specific mention of the doctorate, which is unique in that it also has great impact on research activity. After the definition of the EHEA that inspired the Bologna process, the Lisbon strategy (for the EU to become "… the most competitive and dynamic economy based on knowledge …") led to the creation of the European Research Area (ERA). Beyond coincidence in time and essential ideas, the Bologna and Lisbon processes are very different: one is collaborative, harmonious and open; the other is competitive and restricted to the EU. Both processes have an impact on doctoral training, but which is dominating in its definition and evolution?

Doctoral training, between EHEA and ERA

With a decisive intervention of universities through the CDE-EUA, in the last decade, doctoral training has become much more visible as the foundation of research activity that leads to knowledge-based, and therefore, globally competitive economic activity.

The recommendations of Salzburg in two editions (2005 and 2010) clearly convey three main messages, and invite the creation of specific structures (doctoral schools):

- Doctoral education occupies a singular place in the European Research Area and in the European Higher Education Area. It is based on the practice of research, which makes it fundamentally different from the first and second cycle.
- Doctoral candidates need independence and flexibility to grow and develop. PhD training is very personal and, by definition, original. The path of progress of the individual is unique, both in terms of the research project and individual professional development.
- Doctoral education must be developed by autonomous and accountable institutions that are responsible for cultivating a research mentality. *Institutions need flexible regulation to create special structures and instruments* and to continue advancing in European doctoral education.

The objective of the ERA was defined by the European Council in 2000 and established in the Treaty of Lisbon in 2007: to achieve "a unified research area open to the world, based on the Internal Market, in which researchers, scientific knowledge and technology circulate freely and through which the Union and its Member States strengthen their scientific and technological bases, their competitiveness and their ability to collectively address grand challenges."

The ERA is not particularly concerned with universities, but research universities are responsible for 72% of the knowledge production in Europe; and they are autonomous, which creates a permanent tension in defining the research system: universities hold the most responsibility for research activity and are only identifiable as individual entities. The high number of European research universities (approximately one thousand) precludes their direct participation in the definition of policies, a role that is only limitedly assumed by the EUA.

In 2011, the European Council called on all the parties, Member States and institutions involved to bridge all the gaps and complete the ERA by 2014, in order to create a genuine single market for knowledge, research and innovation.

In 2012, the communiqué "A Reinforced European Research Area Partnership for Excellence and Growth" identified five action priorities: more effective national systems of research; cooperation and better transnational competition; a labor market open to researchers; gender equality and gender mainstreaming in research; and optimal circulation, access and knowledge transfer, including the digital ERA.

In 2014, the second progress report of the ERA highlighted the primary conclusions regarding the European labor market for researchers. The messages mainly address universities, but seldom mention them, which again demonstrates the difficulty of a political relationship with these key autonomous institutions:

1. Although the number of doctoral candidates in the EU continues to grow, the evidence suggests that they are not equipped with the skills they need to work outside the academic sphere.
2. The implementation of the principles of innovative doctoral training in 2011 by Member States and institutions has helped researchers acquire new skills and improve their capacity for employment, especially outside of academia.
3. With 45% of EU researchers in the private sector, only 10% of doctoral candidates report having received training in intellectual property rights and entrepreneurship.
4. Some Member States have made use of the available structural funds for the co-financing of the new doctoral education structures. In addition, open recruitment has allowed research institutions to hire the best researchers in all professional stages and promote effective geographical mobility.
5. The impact of internationally mobile researchers is almost 20% higher than those that never moved abroad.
6. Evidence shows that openness and innovation go hand in hand; in other words, countries with open and attractive research systems are strong in terms of innovation.
7. The Member States agreed to establish working groups in cooperation with interest groups in order to develop a set of tools on open, transparent and merit-based recruitment based on good practices.
8. More than 40,000 research positions in more than 7,500 institutions were published in EURAXESS Jobs in 2013, with partnerships with leading online job search portals. However, there is still a great deal of disparity in the hiring practices among the Member States.

As these important conclusions show, the university is highly involved in doctoral training (100% of doctoral education, most of the 7,500 institutions and the 40,000 jobs mentioned are at universities), but it is ostensibly absent. In any case, there is a clear key role attached to universities in European policy as providers of the researchers required by the knowledge society.

The Spanish perspective on doctoral training

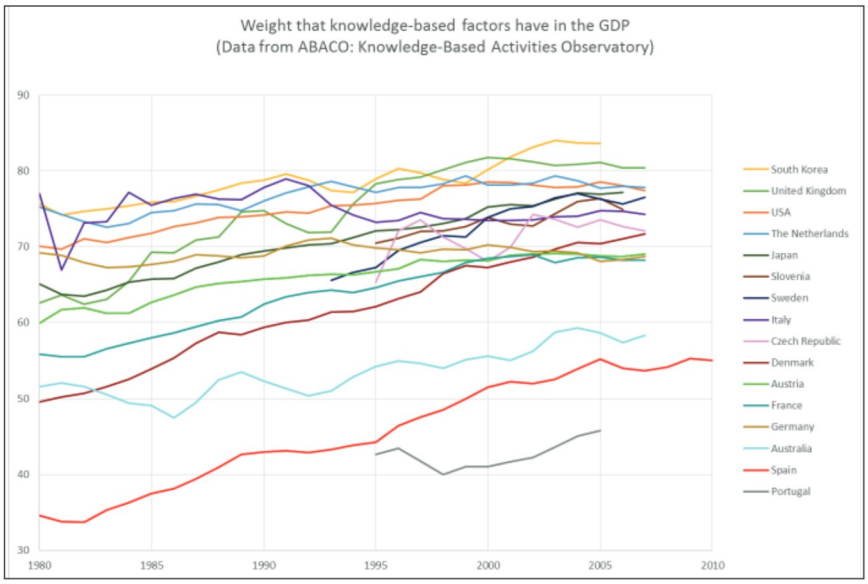
The doctoral training model that emerged from the recommendations of Salzburg (I and II) and the successive progress reports on the ERA responds to the needs of societies with knowledge-based economies. But, are all European economies equally

based on knowledge? Figure 3 provides an image of the differences between countries in terms of percentage of economic activity based on knowledge, according to data prepared by ABACO, an observatory of knowledge-based economic activity.

As Figure 3 shows, although Spain, like Portugal, shares economic and social models with the rest of Western Europe, its rate of knowledge-based activity is much lower, between 20 and 30 points below the leading countries.

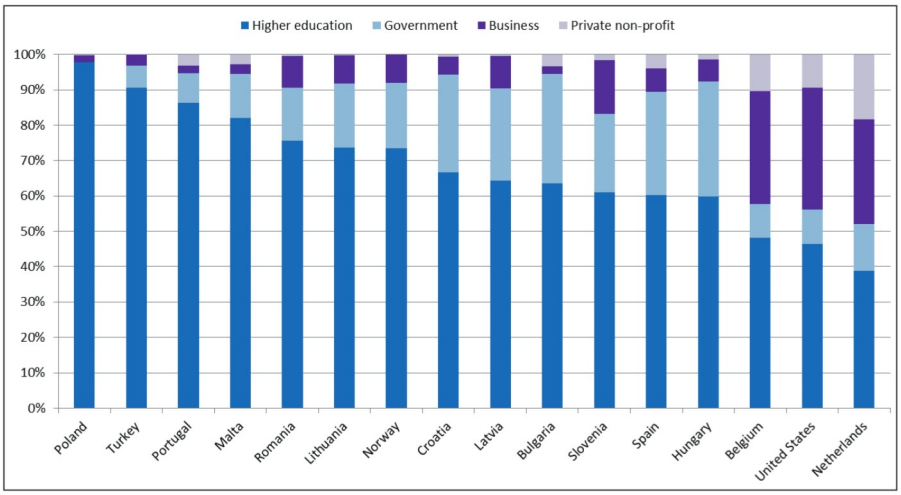
So, to what extent does the model of prevailing doctoral training in Europe adhere to the reality of Spanish universities and the needs of the society that supports them?

Figure 3. Evolution of the weight of economic activity based on knowledge in GDP.



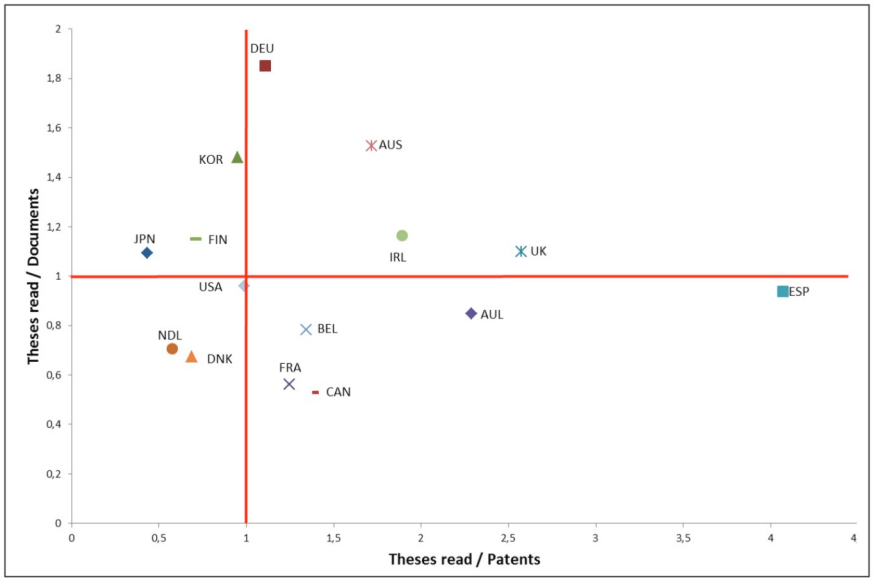
In coherence with the profile of economic activity, there are indeed many differences regarding the professional prospects of PhD holders in Europe, as shown by a study by the OECD/UNESCO (2010) on the employment and professional careers of doctoral graduates. The study includes a profusion of relevant information, including the distribution of PhD holders who work as researchers (Figure 4). As shown in the figure, Spain has a relatively low percentage of doctors working as researchers in companies, while more advanced countries in the knowledge economy, such as Belgium, the United States and the Netherlands, have percentages four to five times higher.

Figure 4. Percentage of PhD graduates working as researchers in different sectors.



On the other hand, Figure 5 shows another perspective of the same reality: the comparison of scientific production and protection of intellectual property in relation to theses read in different OECD countries.

Figure 5. Theses compared to scientific and patent production in OECD countries. (Created by the author based on data from OECD, WIPO, SCImago Journal & Country Rank)



As Figure 5 also illustrates, the Spanish scenario is very different from that of countries with more knowledge-based economic activity, so the productive sector is still far from demanding researchers at the levels which it occurs in these countries.

In spite of the aforementioned differences with leading European countries, Spain has been strongly committed to promoting and renovating doctoral studies in accordance with the recommendations of Salzburg, and using the structures of the doctoral school as the main instrument. Some necessary actions must undeniably be taken in order to shorten the distances between Spain and other countries in terms of knowledge-based economic activity, but in the meantime, the system must bear an additional burden, as doctoral education as it currently stands does not adequately correspond in extension or quality with the demands of the market.

Concluding remarks

Doctoral training today must be oriented towards ensuring the competencies associated with achieving this level of education. This requires institutional commitment and the development of an entire system aimed at ensuring that the personal training experience that every researcher must undertake in his or her field of research is accompanied by training in the competencies and abilities established in the Dublin Descriptors for the third cycle of higher education. In this system, doctoral schools play a leading role, above all to ensure that the personal relationship between the supervisor and doctoral student includes the necessary training elements. Among these, it is worth emphasizing some recommendations for universities:

- Provide adequate mentoring which includes:
  - developing written guidelines for mentors;
  - allowing for multiple mentors;
  - providing adequate preparation for mentoring (which may involve research into effective mentoring practices).
- Provide exposure to wide variety of career options:
  - publicize the careers for PhDs that exist in academia, business and industry, government, and non-governmental organizations;
  - teach students about the different missions of institutions in higher education, the roles of faculty and the different types of appointments;
  - encourage visits from professionals outside the university; faculty should go off campus to explore where their students go and the various applications of their PhD training.

- Prepare students to teach in a variety of settings; students need to acquire wide-ranging teaching skills.
- Produce scholar-citizens who view their specialized training as more closely connected to the needs of society and the global economy.
  - encourage graduate students to talk about how their professional work is connected to the needs of other disciplines, society, and the global community;
  - provide occasions for graduate students to explore the dramatic changes facing academia, the implications for their own careers, and changes in wider society and internationally.

European policy in the field of universities and research, and particularly in doctoral studies, is clearly oriented towards the needs of the knowledge-based competitive economy advocated by the Lisbon strategy and referred to in Europe2020. Spanish universities do not yet work within an environment strictly governed by this policy, but it would not be a good idea to define different objectives, not even in the field of doctoral studies.

Thus, in keeping with that expressed in an article currently in press (Grau, 2016), what is clear is that a more productive economy based on knowledge needs research in companies, either within the companies themselves or in research institutions, but with its own capacity for conception and direction. For this purpose, more PhD holders are needed, and they need to be employed by companies.

In fact, the European university system accepts the basic hypothesis that more PhDs are needed all over Europe, and with well-defined cross-disciplinary competencies, which are essential for their future professional activity and must be developed mainly in the productive economy. This hypothesis implies the need to transform the old, rather artisanal mechanisms of doctoral training based on an almost exclusive relationship between the doctoral student and the supervisor or, at the most, his or her team and colleagues, into an institutional responsibility. This type of supervision is exercised more collectively, focuses more on placing the candidate at the center of the process, on developing competencies and on assuring the quality of his or her training. These are the components that can lead Europe to the constitution of structures like doctoral schools, and to the consideration of doctoral programs within national strategies.

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