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Doctoral education from its medieval foundations to today's globalisation and standardisation

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Abstract

The doctorate, as a ritualised form of evaluation, has existed for more than eight centuries—initially linked to Western medieval forms of knowledge production framed by religion, and to the professional training of lawyers and doctors. It nearly disappeared at the end of the modern era. Recast as a requirement for academic professions, it proceeded to play an important role in the production of new knowledge and became a key to scientific and research development in the 19th and 20th centuries. Since less than half a century ago, doctoral education has gone through tremendous changes due to both the globalisation and standardisation of higher education and public policies designed to encourage knowledge transfers from academia to society at large. Doctoral education has become a crucial part of knowledge production and the transfer of knowledge into the broader economy, but it faces huge obstacles that can only be understood by taking into account the history of its transformations, the anthropological role it played and still plays, and also the controversial effect of efforts to standardise knowledge production, which goes against the non-standard nature of human knowledge creation.

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1 | INTRODUCTION

The long history of doctoral degrees shows that one of the doctorate's most important outcomes has always been the perpetuation of professional academic bodies. This orientation, which has framed doctoral education as well as scientific knowledge and discourses of knowledge production for at least two centuries, has clashed with the great transformation and the new objectives of mass higher education in the last few decades. Through major reforms and changes, doctoral education and the graduation of doctorates and PhDs has acquired new aims: today it has largely become an essential piece of a standardised system of knowledge production devoted to technical-scientific and industrial development, innovation in all its forms as well as efforts to improve managerial and administrative efficiency.

Doctoral education in the last two centuries; that is, the doctorate in its traditional form, required candidates to go through a long, difficult and ritualised preparation. The production of a lengthy written work was supposed to prove the candidates' ability to integrate into a community of peers—comprising both teachers and researchers. In Europe, where this traditional form was well established within venerable institutions, we have witnessed a relatively radical change in the last thirty years. The process, which began in the English-speaking higher education sector, particularly in the United Kingdom, has gradually spread to all of Europe (including France, Denmark, Belgium and Austria) and other countries in the last two decades. The changes that have been made are associated with the increase in the number of doctoral students and the spread of an increasingly internationalised doctoral and post-doctoral curriculum, particularly in terms of research. The highest university degree has recently—especially in Europe—been the subject of much criticism, focused on its unsuitability for non-academic labour markets, supposedly more useful forms of learning or knowledge production, the length of time it takes to complete, and other issues (Kehm, 2006).

The purpose of this article is to shed light on the current transformations in doctoral training by contextualising them within the long history of European higher education, from which they stem. First, by describing reasons for the emergence of graduate degrees (master's and doctorate's) and practices at medieval universities, as well as the establishment of procedures and rituals that remain today. A paradoxical university expansion in the modern era, from the 15th to the 18th century is discussed, and its weakening in the context of new forms of knowledge production, and thus the devaluation—particularly clear in some countries—of the prestige of higher university degrees. Finally, we will see how the doctorate has been reborn as a formal test allowing for integration into academic professions that are increasingly important and increasingly more centred on processes of scientific production and research. To understand the current tangle of different types of doctoral training and the many questions that the ongoing reforms inevitably raise, it is necessary to consider the long history of the doctoral degree.

Indeed, how can we consider professional doctorates to be a form of training through research, capable of producing *new and original knowledge*, if construed purely as *application tools*, whose supposed usefulness is above all a formidable standardisation of industrial, managerial or other practices? How, on the other hand, can we understand the value of knowledge produced by research processes which, in essence, must remain unique and partly *artisanal*; particularly, in research fields such as the behavioural and social sciences and humanities?

2 | THE WESTERN FORM OF KNOWLEDGE PRODUCTION

2.1 | Universities from the middle ages to the enlightenment

Universities were gradually founded from the 12th century onward as networks of students (Bologna) or communities of teachers (*corporations of masters* in Paris) rather than as institutions with a specific location, building and regulation. The creation of housing for the less fortunate students, or those from more distant regions, was

the development that paved the way for the universities we know today, both as physical buildings and intellectual institutions.

Reaffirmation of central powers and urban expansion led to the empowerment of the first small institutions, each of which initially had a few hundred students. At the same time, the southward expansion of conquering armies, in Sicily and on the Iberian Peninsula, and then during the Crusades, played a crucial role in the transformation of the medieval *ways of knowing* which made the rediscovery of Greek and Islamic knowledge possible (Abattouy, 2012). The interaction between a growing demand for administrators and professionals of the written word and the (re)discovery of knowledge through the translation of Arabic and Greek were the circumstances that set the stage for the Western universities to first take shape (De Libera et al., 2009). These first institutions, founded under the protection of the emperors or the pope, were conceived at the time as being entirely dedicated to teaching and the transmission of knowledge.

The founding of universities continued at the end of the Middle Ages and throughout the modern period, mainly in growing medium-sized cities in Western Europe (Roy, 2006) as well as in Eastern and Northern Europe and in its expanding periphery. During this period, universities still derived their legitimacy from their monopoly to grant degrees, which stemmed from authorisations provided by religious (church) and state authorities, and gradually even by regional or urban authorities (De Ridder-Symoens, 1992). Despite this expansion, universities were broadly criticised from the Renaissance onwards, and even more so in modern times. Universities were not seen to respond sufficiently to societal needs to develop the training of elites and support the emergence of new professions. In particular, the concern that students could not easily find a job after a university education, which is a recurrent concern to this day, and the changing demands and expertise required for different professions. Universities were criticised for a problematic distance between academic content and what was considered more useful or important knowledge, whether commercial, scientific, military or administrative.

In addition to these criticisms of the usefulness of doctoral degrees in the professional world, the nature of the knowledge and the forms of learning it was associated with were increasingly questioned. Formalised languages and methods, in particular mathematics and logic, became a more central part of university education. These new forms of knowledge were initially taught in the Latin language. Radical criticism on the form of university learning was advanced by authors like Erasmus or Rabelais who were themselves products of the universities (Durand, 2004). This contributed to advancing a new understanding of rationality. From the 18th century onward, universities gradually incorporated advances in the natural sciences, as well as developments in what were then called the *mechanical arts*, including techniques and burgeoning professional and industrial knowledge (Dubourg & Verin, 2008).

While scholastic knowledge, strongly bound to theology, remained within older institutions like Oxford or Paris, new universities, including ones in Scotland, Russia (Saint Petersburg, Moscow) and the Netherlands, were open to a questioning of research methods. However, the establishment of the Academy of Sciences (Sturdy, 1995) and of more specialised schools throughout Europe was the movement that characterised the second half of the 18th century. The founding of these types of institutions clearly called into question the very existence of universities, and thus, earlier forms of university graduation. For example, in many cases, it was not, or no longer, necessary to be a doctor in order to join the teaching and scholarly faculty of specialised schools in modern Europe.

3 | THE DOCTORATE

3.1 | To become a *master*

As far as we really know, the word *doctor* dates back to antiquity and the *doctorate* to the beginning of the establishment of episcopal or urban schools from the 9th to the 12th century in Italy and western France (Gaul), the

northern Iberian peninsula, England and some parts of the Holy Roman (and Germanic) Empire. The existence of the doctorate (the doctorate of philosophy dating back to the Renaissance) as a set of rituals and titles obtained at the end of a process for entry into dominant positions in guilds or professions, and also the acquisition of skills in the sciences (law, medicine, theology, and then natural philosophy) refers directly to the very long institutional history of universities (Verger, 1992).

In the middle ages, the granting of doctorates was linked to the increasing autonomy of university teaching guilds and the socialisation of students whose goal was to become *professionals* within those guilds. This paradigm of integrating students into the academic community lasted throughout the medieval and modern periods (over the course of three to six centuries, depending on the university) and still characterises the rituals of doctoral graduation today—a testament to the extraordinary strength and resilience of the *aristocratic* and guild-based roots of contemporary universities, even though, as will be discussed further, things are dramatically changing (Picard, 2020). Which doctoral student in the 21st century would suspect that, for example, by standing up during the defence, or by being prepared for an oral essay, or even by offering a snack at the end of the defence, the doctoral candidate is reproducing rituals which have changed little in their form (if not in their function) for nearly eight centuries? An essential goal of these practices of community integration in the middle ages (and even today, symbolically) was to show humility towards both the masters and knowledge in general. The ability to hold forth and argue on the basis of authorities, which still remains as an *ideal* of doctoral education in our times, also allowed students to join the communities of *Master Doctors*, i.e., individuals authorised by their peers to transmit and teach to future masters and other students.

A concrete observation using a socio-anthropological lens, highlights in such practices rituals that aim at different outcomes: integration within administrative, political or knowledge elites (within adulthood, within professions, and even within castes or aristocracies) but also obviously, the acquisition of knowledge (or, anachronistically, *self-accomplishment*).

The strong ritualisation of diplomas, and not only the doctorate, remained central regardless of the period, until the 19th and even 20th century, corresponding to social integration. Throughout Europe, the highest university degree gave rise to ceremonies and more or less brutal tests, signifying both graduation and the entry into adulthood. In Salamanca, in the early modern period, for example, new graduates were not considered full doctors unless they had killed a bull in the bullring and written their name with its blood on a city wall: the doctorate ceremony corresponded to the age of majority—25 years (Frijhoff, 2003).

The history of university graduation is primarily the demonstration of the entanglement between knowledge acquisition processes and integration into the elite. Evidently, the valuation of university graduation faced huge difficulty in times of challenges to methods of knowledge acquisition, such as during the Reformation and the Counter-Reformation, and the era of scientific development from the 16th century onward. Permanent anthropological and ritual foundations remained, however, from the middle ages and the modern period to the second half of the 20th century. Since the origin of doctoral degrees, candidates have presented themselves to a select jury of masters composed of university authorities—for an oral defence of a thesis, according to the methodological or epistemological postures of the time, which, unlike integration rituals, changed significantly in the modern period. This process granted the *licencia docendi*, allowing the candidate to teach, except in university. The candidate, previously a position accessible only to men, then moved on to the public part of the ceremony, which gradually from the medieval to the modern period, and particularly during the 19th and 20th centuries, required more and more preparation time, emphasising the growing importance of the *research process*. During this second part of the ritual, the title of master or doctor was conferred.

Only a tiny fraction of students, who made up an infinitesimal part of the population, could afford to complete a doctorate. The majority were, by force or will, satisfied to receive the simple licence to teach (the ancestor of the present-day *licence* or bachelor's degree), delivered by church authorities. Little interest for the degree was partly because of the prohibitive costs of the public defence, (in particular, the banquets required for the integration ritual), but also because the doctorate's and master's degrees were only really useful for those who

integrated into the community of masters of the university. Physicians, doctors and jurists did not need the most advanced higher education degrees. It is important to understand the purpose of the medieval and modern forms of both the *private* and the *public* components of the rituals of the doctorate. The private represents the humility in front of knowledge that comes from good or scientific truth and natural order. The public display demonstrates integration into professional communities and demonstrating belonging to the aristocracy, professional communities or castes. The *aristocratic and integrative* part of doctoral education and graduation is one of the remarkable long-term characteristics of the doctorate, this remains as it was during the pre-democratic European development of doctoral training one of the ways for aristocrats to acquire their position. Taking a *Bourdiesian* approach (Sullivan, 2002), one could say that aristocracies still exist, and *knowledge aristocracies* are stronger than ever. In that sense, post-graduate and doctoral education still play a major role in the competition for positions of power, even though, since the 19th century and industrial development, engineering and now business school degrees have played a central role. The current process of globalisation and standardisation is blurring differences between, and integrating, all kinds of higher education degrees, as will be discussed further. However, rituals persist, but the contemporary purpose has transformed to the acquisition of skills for the *knowledge society*, based on research methodology and employability in the private or public sector. The ongoing third modification of doctoral education in France is a clear example of this extraordinary resilience of rituals, but with a completely new orientation: the French Ministry of Higher Education proposes for the next reform in 2022 to add, according to many European PhD rituals, a third public presentation (a dissemination of findings for a large audience).

4 | THE AFTERMATH OF REVOLUTIONS

Historians agree that the political upheaval of the French Revolution and Napoleon's conquests devastated the university landscape in Europe (Rüegg, 2004). A considerable number of universities simply ceased to exist. While in 1789 there were 143 universities, only 83 remained in 1815. All 24 French universities were closed and replaced by specialised schools or isolated faculties. In what would become Germany, 18 of the 34 universities were abolished. In Spain only ten universities out of 25 remained after the Napoleonic turmoil. This radical transformation was accompanied, except in the United Kingdom, by a change in the university landscape, the consequences of which were considerable until the 1960s or 1970s at least.

Two models emerged from the transformation of the old medieval and early modern forms of universities, academies and the first specialised engineering schools of the 18th century. The first was the French model, in which the training of the administrative, political, economic and industrial elites was carried out through faculties of law (19th–20th centuries). The administrative and political elites were in the 20th century educated in the *Ecole libre des Sciences politiques*. Industrial elites were educated in the *Grandes écoles* which included engineering schools (whose dominant model predates the 19th century) and then (in the 19th and 20th centuries) scientific institutes and schools of administration, agronomy and business schools. In the French model, the universities did not disappear, but remained central only for the humanities, law and medicine. As a counterpoint, a German (Prussian) model developed, starting at the University of Berlin during the reforms of the early 19th century. This model is often studied today as a successful model that also influenced higher education systems in America and northern Europe.

In 1810, the King of Prussia agreed to follow the recommendations of Wilhelm Von Humboldt, director of ecclesiastical affairs and education at the Ministry of the Interior, to establish a University in Berlin. Hence, the term *Humboldtian model* has been used for the German model of higher education. The Berlin model, or Humboldtian model, is important because it clearly asserted that research was an imperative. The reformers mixed a vision of education of the nation (dear to Fichte) with a *pre-romantic* vision of the development of the individual through *research*, including scientific research: this is the historical strength of the model for our world. It is not founded on *personal development* through individual research but on broad based exchange of knowledge. This has supported

the development of broad ranging transfers of knowledge on a massive scale that include sectors of industry, producers of research and the rest of society, including public policy. The desire to encourage personal development through research motivated Von Humboldt (who however did not remain in office) to link the new University to the Prussian Academy of Sciences. From the 11th to the 18th century, the academies had been places where scientific knowledge of the highest level was produced and collected (Donato, 2015). This conception established the framework for the introduction of scientific practices and ideals within the universities that imitated the Berlin model, and thus of practices of developing knowledge through individual improvement and regulated competition within peer communities. It coincided with the vast movement of bureaucratisation and administrative centralisation of nation-states in the 19th century.

The Berlin model spread within German-speaking countries, and in northern Europe (Watson, 2010). It was also emulated in the United States, particularly because of its effectiveness in industrial, administrative and political development from the last third of the 19th century. It was at this time that universities developed distinct doctoral (PhD) degree programmes, based on a clear differentiation with colleges, which had been dominant at the beginning of the nineteenth century and were more oriented towards finalised forms of education (Geiger, 2014; Lucas, 1994). The growth of American universities, and the number of degrees granted, was spectacular in the twentieth century. The influence of US doctorates for half a century was internationally so important, that this has in turn extended the global influence of the Humboldtian model—which has influenced the US model (Goldin & Katz, 2008). However, in the 19th century, the French *Grandes écoles* model was very prestigious, and was adopted in several countries in Central Europe and Latin America. Additionally, during the nineteenth century and beyond, the universities in the United Kingdom retained a model of independence from the nation-state, where medieval traditions remained.

The reform of the university, and more generally of higher education in the nineteenth century, was accompanied by profound changes in the forms of graduation, particularly for the doctorate. Critiques dating back to the middle ages prevailed during the early modern period, particularly targeting the fact that the model was based on religion, guilds and increasingly sclerotic procedures. Until the 18th century, for example, a candidate had to be a man, Christian, and a legitimate child, which of course excluded many social categories (women, Jews, children out of wedlock, etc.). However, the social and legal rules for obtaining a doctorate changed as early as the 18th century: we know, for example, that at the University of Göttingen, on August 25, 1787, a woman (Dorothea Schloezer) was for the first time granted—not without difficulty—the degree of Doctor of Philosophy. Throughout the 19th century, this remained a rarity. Although she was declared a doctor of philosophy, Dorothea Schloezer could not attend the public proclamation of her diploma, which paradoxically was a sign of *progress* since a woman had been allowed to become a doctor without departing from tradition (Clark, 2007).

5 | THE DOCTORATE DURING THE 19TH AND 20TH CENTURIES

5.1 | From weakness to revival

After a long disappearance in Europe and the United States, the doctorate once again became the most emblematic marker of the affirmation of academic professions in the 19th century. In the 20th century, and especially in the recent period, the doctorate has been systematically affirmed as an indispensable diploma in scientific and university curricula, even in systems where the university was not always the most central institution, such as in France. In France, the doctorate was first established as a regulatory requirement for entry into the academic professions. However, its influence remained limited for a long time by the well-known role of the *Grandes écoles d'ingénieurs*; and then, in the twentieth century, by the creation of specific research institutions that did not require a doctorate; for example, the *Centre national de la Recherche Scientifique* (CNRS) from 1937 onwards. Another

example is the *Ecole des Hautes Etudes en Sciences Sociales* (EHESS) after the Second World War. In France, the doctorate only became indispensable for entry into the academic career later. In the United Kingdom, a doctorate was not a condition for access to positions at Oxford or Cambridge until 1920, and moreover is still not statutorily indispensable (Paye, 2013; Porciani & Lutz, 2011).

However, from the middle of the 19th century, the doctoral examination was progressively modernised and a written dissertation (a transformation of the old oral defence of a thesis) became an essential requirement for showing one's capacity to produce new knowledge (which was not necessary before). In some cases, as in France, where universities remained a fundamentally speculative place, it was gradually imposed as the work of a lifetime, sometimes becoming the end result of decades of work, characterising a long progression of efforts to advance in academia (Waquet, 2008). Until the reforms of the 1970s and 1980s in France, especially in humanities and social sciences, theses were supposed to constitute a new paradigm or the inauguration of new fields of thinking. Researching and writing a thesis was part of the set of activities that a master authorised to a disciple, and which allowed him to become a master himself. The disciple had to carry out original scientific research on a high level. The example of Michel Foucault's thesis on madness in the age of reason (1972), a monument destined to set a precedent and launch an academic career of outstanding international influence, is emblematic of this specifically French system (Clark, 2007).

However, it is important to note that examples of some very long preparations of doctoral dissertations in philosophy, the social sciences or the humanities in France during the 20th century (Braudel, Foucault, etc.) often presented as characterising doctoral training, were only one part of the doctoral training landscape. Science faculties have been offering professional doctorates since the 1920s, with the title of *ingénieur-docteur*, which was created precisely for this purpose. The latter degree required two years of work, as did the postgraduate doctorate created in 1954 (Verschueren, 2016).

The examples of famous French scholars as Michel Foucault and Fernand Braudel are sometimes considered an archetypal horizon of a research education process emphasising strong commitment to produce *original* results, common in all fields and in institutions of scientific production throughout the world (universities, academies in the Soviet Union, institutes and schools), even if often without the objective of becoming a universal master. Even in France, the defence of a paper has been possible (and frequent) since 1966. Doctoral degrees in science, medicine, and law have never represented the *work of a lifetime*, even in the humanities. Average academics in France do not propose new paradigms or establish new fields of thinking. The common French literary academic, up to the 1960s, was a Latinist, a field in which conceptual revolutions were remarkably rare.

Despite those nuances, one can consider that there remained a kind of *nostalgia* in academia for an old European and Western idea. An idea with its origins in Greek philosophy, carried on by Christian institutions. Namely, that the individual quest for reason (philosophical Knowledge) through ritualised and purification processes, can bring *salvation* through an increased consciousness. In some cases, such as in the example of Foucault and other renowned masters, this has been associated with a kind of *sanctification* that students still progressing towards their doctorate can (try to) imitate.

This was a *swansong*, however, even in France where the university tradition of the thesis had paradoxically remained very much alive, since the universities were in some ways still a vestige of the past. The doctoral degree in France, which had endured since the 19th century, was profoundly transformed during the 1970s and 1980s, in particular because of the questioning of the relations of domination and submission induced by the long apprenticeship, leading to the defence of not one, but two doctoral theses (one main, supposed to open new fields of research, and the other one, more academic and *traditional* (Clark, 1973)). Shorter procedures were put in place and even theses composed of multiple, shorter articles were recognised. A two-level system comprising (1) a doctoral thesis and (2) a *Habilitation à diriger des recherches*—an *original thesis* composed of several shorter articles—respectively allowing access to positions as (1) lecturers and (2) professors, was established, and has been maintained to this day. In France, such a system, even if it was simplified, was and still is partially based on the definition of university professions from the Napoleonic period. At the end of the 20th century and the beginning

of the 21st century, it would undergo important changes, or ruptures, as it was gradually diluted and integrated into increasingly standardised forms at the international level (guided by the European Bologna process).

The recent transformation of French doctoral education is emblematic of a rupture that France's higher education system has undergone.

Indeed, the same goes for all higher education systems worldwide, for the past half-century, as they have gone through an unprecedented process of globalisation, standardisation and reorientation. The start of this process originated in the immediate aftermath of the Second World War, stimulated initially by geopolitical competition during the Cold War (Solovey, 2020). It continued in the 1970s and 1980s as Western nations vied to catch up with or compete directly with emerging industrial countries, particularly in Asia (Popp-Berman, 2012). The current globalisation of higher education (Weber & Duderstadt, 2008) has spread dramatically over the last three decades.

6 | GLOBALISATION OF DOCTORAL EDUCATION

6.1 | The massification of doctoral education (Trow, 2007)

Contemporary internationalisation and globalisation of higher education is characterised by the differentiation between a large set of research institutions—which, at a thousand out of a total of 17,000 universities worldwide in the last decade, still constitute a small minority—and a much larger number of higher education institutions of all kinds. The most prestigious, visible and financially endowed of these research universities are the ones that make up the most internationalised parts of the world's higher education systems, which have become increasingly complex (Altbach, 2016). On the other hand, a majority of these same higher education systems have not internationalised, even though they are under direct pressure from the globalisation and managerial transformation processes at work (Paradeise & Thoenig, 2015). The extension of a competitive and polarised system over the entire planet now affects ever more considerable numbers of students and academic staff, which obviously brings profound changes to the way universities work: it has affected admissions, graduation, the relationship to knowledge and models of knowledge production (Engvall, 2020).

Although it has been described in detail, the influential process of globalisation and standardisation is not so easy to interpret. It is in fact the result of numerous pressures and strategies within groups of actors, from competition between nation-states to governance of institutions, involving multiple scholars, researchers, and students, families, firms, and other actors. On a macro-level, it is characterised by a strong polarisation determined by American norms and regulations (Altbach, 2016), European higher education space transformations (Croché, 2010) and the dissemination of strong models from prestigious American and European institutions (Pfothauer, 2019) as well as China's policies, even if these have been increasingly challenged recently.

Thus, the forms of contemporary research and higher education are the fruit of endogenous mutations such as the push for autonomy carried out by university administrations. At the same time, however, as shown by an abundant literature, they are the fruit of multiple exogenous pressures: since at least the 1970s and 1980s, the transformation has been linked to the increasingly strong involvement of governments and private corporations in the definition of institutions and course content. These various pressures have converged to modify existing curricula, but also (in the name of the hypothesis of the necessary development of the knowledge society) led to the creation of numerous new institutions of higher education worldwide. The global characteristic is a powerful promotion of utilitarian knowledge, oriented towards entrepreneurship and industrial innovation, following the transformation and dissemination of research and higher education systems following the US model (Brint, 2018) and reforms in higher education in Europe. However important this orientation determined by economic and managerial considerations may be, universities' *missions* are not limited to it, and they continue to include service and commitment to communities and individuals, particularly a commitment to fostering democratic norms (Roper & Hirth, 2005; Solbrenke & Sugrue, 2020). In any case, the entrepreneurial and utilitarian direction that higher

education has taken has had considerable and increasingly profound consequences on institutional structures (Kromydas, 2017), including doctoral education.

Although the growth of undergraduate education has accelerated during the last three decades (in the United States, for example, there were 30 million people with an undergraduate degree in 2000, and in 2018 there were 50 million), its proportional growth has been even more spectacular compared to master's and doctorate's degrees.

The number of doctoral students has grown all over the world. In the 1990s, the highest proportional growth took place in Korea (from 1,000 PhDs granted in 1991 to 8,000 in 2004) and in some European countries (from 8,000 to 15,300 in the United Kingdom). In the following decade the progression accelerated, as shown by the statistics of the American National Science Foundation. The number of doctorates awarded increased in China, for reasons of internal policy and development, in Korea to a lesser extent, in Brazil, and also in English-speaking countries with a long university tradition, such as the United Kingdom, Australia, and the United States. This reinforced the attractiveness of these higher education systems in an increasingly internationalised higher education market. For example, in the United States, between 2000 and 2018, the number of master's degree holders in the population increased from about 10 to 21 million, and at the same time the number of PhD holders more than doubled (from 2 to 4.5 million according to US Census Bureau). The percentage of the US population with an advanced degree increased overall during this period from 8.6 to 13.1 percent. In emerging countries, the growth of higher education has been even more impressive in volume. In China, according to the Chinese Ministry of Higher Education the growth in master's level education is particularly striking, going from between 40,000 and 50,000 graduates at the end of the 1990s to 400,000 graduates in 2011 and nearly 600,000 at the beginning of the 2020s. For doctoral degrees, the growth has been less clear-cut in terms of the number of degrees acquired, but still remarkable (from approximately 7,300 degrees in 1997 to approximately 60,000 at the turn of the 2020s).

The increase in the number of doctoral graduates has not been the same for all countries, for a variety of reasons, sometimes related to the economic situation, sometimes to the institutional structure of higher education. For example, the number of doctoral degrees increased slightly in India between 2004 and 2014 (from 18,000 to 22,000 graduates per year). It even declined in Japan from 17,000 in 2004 to about 15,000 ten years later. In France, according to the Ministry of Higher Education and Research, after a slight increase at the turn of the 2010s, the number of doctoral graduates stabilised at around 18,000 graduates at the end of the 2020s.

The situation of the last two decades thus shows that research training (doctoral education) is growing overall, but in a singularly differentiated way. Moreover, notable disparities stand out when curricula and fields of research are considered more closely. The specific French situation, for example, can probably be explained by the persistence of a dual system of higher education despite the fact that international standards and powerful reforms have spread to France just like everywhere else.

There are several reasons for an increase in the number of master's and doctoral programmes. First, it corresponds, mechanically one might say, to the increase in undergraduate enrolment throughout the world. This increase is often considered to be mainly the result of both social demand and changes in government and industry expectations to higher education. As we have seen, during the 1980s and 1990s, universities were increasingly regarded as instruments for the development of innovation and economic development (Deico et al., 2012), even though their activities were not oriented towards these goals. This resulted in a strong pressure to change, linked to the implementation of competitive policies in so-called *knowledge economies* that valued highly the production of skilled labor on the one hand and transfer of scientific research into the economy on the other. Though essential, this is not the only explanation for these phenomena. As shown by institutional and organisational approaches (Popp-Berman & Paradeise, 2016), transformations in higher education are linked to the encounter between this powerful mutation and long-lasting institutional regimes and traditions, producing differentiated internal forces within the higher education systems themselves (Bloch et al., 2018).

Finally, for almost half a century now, managerial rationalisation has become the embodiment of multiple pressures at work within contemporary higher education systems (Redding et al., 2019). Following this interpretation,

rationalisation would be responsible for *isomorphism* and powerful institutional convergences, but would also be a factor in the growth of the systems themselves. Another possible interpretation for the growth of doctoral education, and more generally training of scientific and managerial elites through research involves common characteristics. For example, the development of a shared doctrine around the need for entrepreneurship and innovation spurred by the production and transfer of knowledge, but also internal pressures and constraints of the systems themselves.

6.2 | Hybridisation behind convergences

As we have seen, the transformations of doctoral training in the contemporary world can be interpreted first and foremost as the result of macro-systemic pressures (global competition within knowledge-based economies), and as the consequence of policies designed to foster competitive and internationally recognised universities. These policies are strongly anchored to the capacity to produce knowledge that can be transferred to the economy and society in the form of innovations. Policies that have produced programmes aimed at strengthening research and training through research (from the master's degree to the post-doctorate level). Japan, for example, founded its *centers of excellence* between 2002 and 2007, and established its Leading Graduate Schools programme between 2011 and 2019. Similarly, China launched the 985 programme and the more recent Double First-Class Initiative (Qiang et al., 2019). In Europe, many policies have been introduced, including the *excellence* programmes in Germany (Estherazy, 2018). In France, an investment plan for the future has been made and an initiative for an *excellence* programme launched in 2011 (Aust & Gozlan, 2018). This type of initiative has a real impact, particularly because through cross-fertilisation and reciprocal borrowing, the forms of governance and the objectives of the programmes have tended to converge. They feature a common form of funding based on calls for projects, resulting from the generalisation of regulatory and governance reforms that are often referred to as New Public Management. With regard to doctoral education in particular, national research management and development agencies support these efforts mainly through grants or contracts. These funding practices have prioritised the need to respond to technological, economic and managerial problems, as well as systemic and transversal issues in recent years. This transformation of the main objectives of research and knowledge is embodied in particular in *multidisciplinary* approaches and those emphasising innovation, public-private partnerships (universities, public institutions, companies) and international cooperation.

In most countries, these models of doctoral, post-doctoral and research training have been developed especially in the STEM fields and disciplines (science, technology, economics and mathematics). New funding practices, employing calls for projects within *excellence* initiatives, have successfully sought to affect pedagogical practices and the production of knowledge itself. "Although they primarily fund student and program expenses rather than academic staff, they are intended as a catalyst for cultural change at the micro level, targeted at the education and training of students, professors and institutions alike" (Nerad, 2021, p. 43). Numerous programmes designed to support and orient research training now follow this model which can be found in industrialised countries; for example, as seen in European Commission programmes (Erasmus at the master's level and the Innovative Training Network/ITN, at the doctoral level). Other examples include national initiatives in France, Australia, the United States (National Research Trainee/NRT of the National Science Foundation), Germany and other countries.

The contemporary transformation of higher education and research training (mainly doctoral studies) is a complex phenomenon, both in terms of its causes and its consequences.

In Europe, for example, the process originated at the dawn of the construction of the European Community which was established to deal with tensions and to support collaborations between nation-states and higher education institutions and economic organisations. The process that led to the establishment of common norms in Europe (the Bologna process from the end of the 1990s to the 2000s) is as much a result of the autonomy of large research universities, (which worked together as a powerful pressure group), as of public policies with

various motivations (Huisman et al., 2012). The French government, for example, used European requirements, which ironically it had itself promoted, to initiate reforms for better alignment with international standards (Aust & Crespy, 2014). More generally, the process has involved the reinforcement of political will, as well as increasingly clear economic pressure from large firms, but also a voluntary empowerment of universities.

For example, the European Rectors' Conference (ERC) has played a role in promoting the independence of universities and encouraging a utilitarian transformation. This has contributed to developing the missions of innovation and direct economic development that has become common sense (Croché, 2010). The ERC has been campaigning since the end of the 1950s for increased university autonomy and has progressively acquired important weight in European debates on higher education. In September 1988, the ERC was able to initiate a process of discussion and close collaboration with industrialists (the European industrialists' round table, then led by the president of Nokia), driving major transformations centred on the promotion of useful, if not utilitarian, knowledge in the following decades in Europe. In the same month, the Rectors' Conference adopted the Magna Charta Universitatum on the occasion of the 900th anniversary of the University of Bologna. The main objectives of the Magna Charta Universitatum were to recall the traditional values of the European University and to strengthen the academic links around universal values that the very name of *university* carries.

The types of skills developed through doctoral education are now common and internationally recognised. The shortening of the duration of the thesis has been imposed as has the grouping of doctoral students within doctoral schools or colleges. There has been a diversification of doctoral education models by types of institutions (research, entrepreneurial universities, graduate schools of management, art, etc.), *professional* doctorates have appeared or been reinforced.

All these transformations have changed the perception and practices of learning by and for research, which has become more *scholastic* or at least constrained by rules independent of various scientific or humanities traditions and disciplines. Despite this, the realities of doctoral training remain disparate. Doctoral education is still differentiated by established models of doctoral learning, which are defined by each field of research internally (Ehrenberg et al., 2010); considerable variation has also endured because the production of new knowledge does not, and cannot, obey unified methodological or epistemological standards (Burke, 2014; Pickstone, 2001; Steup et al., 2014).

7 | CONCLUSION

The current form of doctoral training retains features from its very long history, initially European and Western, characterised by long written research dissertations and formalised thesis defence tests, as well as the doctorate's role as an indispensable credential for the academic profession.

The most advanced higher education degrees (the doctor's and master's degrees) were first established in the middle ages and have since undergone two historical transformations. The first occurred between the end of 18th and the end of the 19th centuries, due both to public policies accompanying the rise of nation-state administrations and the rise of science and research. The other transformation, related to massification, globalisation and standardisation of higher education, is currently in progress. The current form of the doctorate may also be interpreted as having been determined by major characteristics of the three historical periods in which it developed: (1) the middle ages and modern times, (2) the era of scientific development and research in the 19th and 20th centuries, and (3) the era of innovation and *useful knowledge* that began in the middle of the 20th century.

For these reasons, we are currently witnessing the receding of the secular guild-based and aristocratic nature—if not its disappearance in certain institutional forms—of master and apprentice style training, in favour of the creation of a collective form of training (doctoral schools or doctoral colleges). The dissertation or thesis has been reduced (but not eliminated) in favour of a balance between the production of standardised forms of articles, assembled into a possibly coherent whole, and a more scholastic model for the training and development

of skills that are presumed to be usable outside academia (Kehm, 2020). As a consequence of the victory of standardised forms of knowledge production and transfer (including research based knowledge), one of the main characteristics of the current transformation has been the emergence of two principal forms of doctorates throughout Europe, North America, and in other countries: (1) the research doctorate, (which remains indispensable for academic careers) and (2) the professional doctorate (including multiple types, such as doctorates in business administration, doctorates in education, etc.), allowing access to careers outside academic institutions (Kot & Hendel, 2012).

In some countries, such as in France, because of its own specific organisation of higher education, there have been attempts to set up *creative* doctorates that emphasise the creation of works of art. A related major characteristic of this emphasis on *useful knowledge processes* is the growing concern for the support and development of new skills. Particularly skills corresponding to the definitions of international organisations (e.g., the OECD's skills for the 21st century) emphasising the development of skills such as communication skills, adaptability to complex environments and skills for working in an intercultural context (Pretorius et al., 2019).

This strong shared orientation in public policies and managerial actions has rationalised doctoral education and developed radically different forms of degrees under similar names. Despite being presumed as inevitable, these agendas have clashed with professional practices in higher education, individualised ways of constructing knowledge, and also with specific national and institutional contexts (Bregvadze & Medjad, 2022). Important tensions thus remain, both in terms of the value of doctorates (especially professional doctorates) in the labour market; and, mainly in the case of research doctorates, their ability to produce excellent research and allow their holders to pursue an academic career.

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