


Labour market perspectives for PhD graduates in Europe

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Abstract

An increase in the number of PhD candidates in the last decades has changed the landscape of employment and the nature of what it means to be a PhD holder. Embarking on a career in academia is a challenging endeavour for early-career researchers while they are confronted with a limited number of job opportunities in academia. Taking into account that knowledge based societies need highly skilled professionals beyond the academic environment, it is important to understand what is the role and value of a PhD for the labour market; and what the current labour market perspectives are for PhD holders. To answer these questions, the authors analysed the available data on PhD holders' employment and conducted semi-structured interviews with European experts on doctoral education and career development. The data and expert interviews point to different contexts across European countries. The numbers of researchers and PhDs employed in sectors outside higher education varies to a great extent—in business enterprises, government, and private non-profit sectors. The article maps out different factors which need to be considered when assessing the labour market perspectives of PhD holders, such as the geographic area or country and its economic development, the sector of employment, type of work and the field of research.

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1 | INTRODUCTION

The doctorate has always had a direct link to employment outcomes, even if direct utility on the labour market is not necessarily the main reason for individuals to pursue this degree. Intrinsic motivation and intellectual development are important drivers for researchers (Kwiek, 2019; MORE3, 2018). In the past, those who pursued a PhD aimed for an academic career. Yet, these days PhD holders' career paths are varied, the possibilities open to PhD graduates are not limited to teaching or conducting research. The number of PhD holders graduating from doctorate programmes has been increasing in the past decades, with 154,000 new doctoral graduates registered in 2000 (OECD, 2001) and 80% more in 2017, reaching 276,800 (OECD, 2019a), with 5% average annual growth. According to Eurostat estimates, in 2019 there were 651,000 doctoral candidates in the EU. Meanwhile, the number of full-time equivalent researchers in the EU increased by more than one-third (40%) between 2010 and 2020, from 1.34 to 1.89 million (Eurostat, 2021).

What is the current value of a doctorate? What is its role in the 21st century and what are the PhD career perspectives in Europe? Due to global, societal and technological development, there is a growing range of possible careers that PhD holders can pursue across international settings and beyond academia including business enterprises, government and private non-profit sectors. Yet, to be more prepared and successful in the labour market, particular skills and competences are required, which can be developed during doctoral training. Therefore, it is important to understand how to enhance existing doctoral programmes and to better prepare doctoral candidates for a variety of career destinations. Although 92% of PhD holders find employment (OECD, 2019b), issues have been raised on the transition to employment beyond academia and finding the right job, in terms of researchers' own preferences (Vitae, 2016) as well as on working conditions and precarious employment within academia (OECD, 2021).

In 2018, just 1.1% of 25–64-year-olds held a doctorate on average across OECD countries. Although PhD holders represent a small share of the workforce, training these highly educated individuals requires a significant investment both on the part of the individual and the system of higher education. Furthermore, PhD holders are seen as crucial to stimulate innovation—on which the knowledge economy depends. It is thus crucial to monitor PhD careers to assess issues such as job to skills match, job satisfaction and employment situation. The number of researchers increased by 22% in Europe in the period from 2007 until 2015 (European Commission, 2020, 2021). According to the European Commission, *“the risk is that many of these researchers are mostly prepared for a career in academia, whereas the need is for many of them to work in other sectors”* (European Commission, 2021, p. 50). This has resulted in increased precarity: post-doctoral researchers hold temporary positions without permanent or continuous employment prospects (OECD, 2021). As a consequence of precarious working conditions, researchers are impeded from focussing on their core task, as they are performing three roles in one: they need to publish their research, conduct their current research and teaching roles, and they need to be looking for their next position. On top of that, they need to be highly productive and competitive to increase their chances. Career-related stress is a factor contributing to mental health challenges (Levecque et al., 2017) and mobility may cause difficulties administratively, fiscally, and in terms of balancing a private life. Furthermore, the COVID-19 pandemic has further worsened prospects and conditions in academic research (OECD, 2021).

It appears that PhD holders find themselves in a trap-like situation when it comes to their career aspirations, as staying in academia brings prospects of precarious employment, while moving to other sectors is associated with a stigma (OECD, 2021). This article discusses PhD career perspectives based on the available survey data and expert interviews.

2 | METHODOLOGY

2.1 | Data collection

To search for current trends in the PhD graduate career development, we reviewed findings from the most relevant studies on careers of doctorate holders in Europe. Several thematic areas were defined, such as employment rate of

PhD holders, sector of employment, possible career paths and types of jobs for PhD holders, skills (mis)match, vertical and horizontal (mis)match, transition to a first employment position, job satisfaction, and added value of holding a PhD. We reviewed the following international studies: the OECD Careers of Doctorate Holders (OECD CDH, 2013) and the two recent surveys of doctorate holders by the European Science Foundation (ESF), the DocEnhance 2021 survey (Boman et al., 2021) and the ESF 2017 survey (ESF, 2017) of PhD graduates at several European universities and other non-university research organisations. While the OECD CDH project offers cross-country data on several indicators such as employment rates and sector, the ESF surveys, albeit with much smaller samples of PhD graduates, offer more nuanced data on e.g., education and skills match, motivation factors, and PhDs' perceptions of the added value of the doctorate. The data from these surveys is limited in that it is not representative for the whole of Europe, or any particular country. Currently, there is no comprehensive EU-wide study providing evidence on the employment and careers of doctorate holders, unlike for instance the US Survey of Doctorate Recipients which has run since 1973 (NSF, 2019).

Our qualitative analysis includes ten in-depth interviews with experts acting at the European level in key stakeholder organisations (Eurodoc, EUA-CDE, MCAA, PRIDE Network, LERU, ISE, Technopolis Group Belgium, EuroScience, YAE and ERA Governance). Online interviews were conducted in September 2021 and selected experts were asked to provide their opinion on four topics (see Table 1). Each interview was recorded, transcribed and anonymised using names based on Greek letters as pseudonyms. Transcripts were analysed by thematic areas and commonalities among the responses were highlighted. To confirm the generic conclusions, the best fitting quotes were selected. The draft manuscript for this article, with selected quotes, was cross-checked and approved by the interviewees.

3 | RESULTS

3.1 | Review of survey data

On average across OECD countries, 25–64-year-olds with a doctorate have the highest *employment rate* of all educational attainment levels, at 92% compared to 88% for those with a master's degree (OECD, 2019b). The

TABLE 1 Expert interview questions

1. The value of a doctorate in the 21 century
Q1.1: What is the role of a doctoral degree?
Q1.2: What is the value of a PhD graduate for the labour market/ society?
Q1.3: How do you see a PhD graduate nowadays? What are the skills they need to have?
2. Labour market perspectives for PhDs in Europe
Q2.1: What are the current trends in PhD employment in Europe?
Q2.2: What do you think is the best way to keep track of where PhD holders work?
Q2.3: What key challenges do you see for ECRs when entering the labour market?
3. Challenges for doctoral training
Q3.1: What do you see as key gaps in doctoral training and what are the solutions?
Q3.2: How do you envision doctoral training in 5–6 years?
Q3.3: Which obstacles/barriers do you see for the creation/organisation of such doctoral training? How can policymakers and stakeholders help to eliminate/prevent these barriers?
4. Recommendations
Q4.1: What can be improved to support professional development of doctoral candidates at the European/national level?
Q4.2: What can be improved to support professional development of doctoral candidates at the institutional level?
Q4.3: What are your recommendations for doctoral candidates?

Source: Authors.

average unemployment rate for doctorate holders (at 2%) was roughly three percentage points lower than that for other tertiary level graduates, with highest shares of unemployed PhD holders in humanities and natural sciences (OECD CDH, 2013). Similarly, low unemployment rates have been reported in the ESF studies (between 3% and 4%; Boman et al., 2021; ESF, 2017).

PhD holders do not only seem to enjoy a high employment rate, but the *transition to employment after a PhD* also appears to be relatively fast, with some variation by research field and sector of employment. The DocEnhance survey reports a high number (72%) of doctorate graduates already having a job at the time of completing their PhD, and another 15% needing only between one and three months to find employment. Only 4% reported waiting more than one year to find their first job after their doctorate (Boman et al., 2021).

As for the *sector of employment*, the 2016 OECD data point to large variations across countries in the share of PhD holders employed in higher education, with around 15% of PhD holders in Germany and Switzerland, and up to 50% in Netherlands, Finland, Belgium, United Kingdom, Czech Republic, Estonia, and Latvia (OECD, 2017). Only a few EU countries, e.g., Belgium, Denmark or the Netherlands, employ around one third of doctorate holders in the business sector. This reflects different levels of demand for this highly skilled population in the non-academic labour market. Looking at recent data on researchers (beyond PhD holders), more than half (55.4%) of full-time equivalent researchers in the EU worked in business enterprises, 32.6% in higher education and 11.1% in the government sector in 2020 (Eurostat, 2021).

According to ESF surveys, the share of doctorate holders at universities and research organisations was between 48% and 62%, with 40% to 52% working across the various non-academic sectors. Across non-academic sectors, industry attracts the highest shares of graduates (17%–22%), followed by healthcare, government, education and non-governmental sectors (each employing less than 10% of all PhD holders). There are also differences by research field: while universities remain the main destination for doctorate holders in the social sciences and humanities, engineers are also very present in industry, and social scientists in the government sector (ESF, 2017).

The issue of PhD holders' precarious employment contracts was raised in all studies, reporting high shares of recent PhD graduates employed on temporary contracts, between 20% and 49% (Boman et al., 2021; ESF, 2017; OECD CDH, 2013). This was noted also in some major national and regional surveys (e.g., Bebiroglu et al., 2019; Mortier et al., 2020; Vitae, 2019). In comparison, the proportion of temporary contracts of the overall EU workforce in temporary employment was only 11% in 2020 (Statista, 2021). The share of temporary contracts is typically highest among those working in academia, where about half of doctorate holders are employed in postdoctoral positions (Boman et al., 2021). In stark contrast, 90% of PhD holders in industry are employed on permanent contracts, as are around 80% of those in the healthcare sector and in the non-academic education sector (Boman et al., 2021). A growing awareness of limited career prospects may also be the reason for fewer PhD graduates embarking on an academic career, as for instance reported by a similar National Fund for Scientific Research (FNRS) study in Belgium (Bebiroglu et al., 2019).

According to the OECD CDH data, at least 50% of PhD holders were *engaged in research* across all sectors of employment, with the highest share in Portugal and Poland, and lowest in Belgium, the Netherlands, Spain or Romania (OECD CDH, 2013). In most countries, PhD holders work as researchers in higher education, but the business enterprise sector also employs a large share of doctorate holders in Belgium and the Netherlands. The ESF and FNRS (Bebiroglu et al., 2019) studies reported between 70% and 80% of doctorate holders being engaged in research, and where doctorate holders are not engaged in research, it was largely due to the lack of opportunities rather than by choice (Bebiroglu et al., 2020; Boman et al., 2021; ESF, 2017).

Most PhD holders, in the OECD CDH sample, work in jobs at least partly related to their degree (*horizontal match*), with some variation across different countries (OECD CDH, 2013). In the ESF surveys, the horizontal match is best for those at universities and research organisations, having their jobs *closely related*, while most of those in non-academic sectors have jobs *partly related* to their doctorate (Boman et al., 2021; ESF, 2017).

Between 35% to 55% of PhD holders are at least formally *overqualified* for their current jobs. That is, the minimum educational requirement for their job is a Master's degree or lower, which represents *vertical (mis-)match*. The

mis-match is most evident in employment sectors such as government, services or hospital and to a lesser extent in industry (Bebiroglu et al., 2020; Boman et al., 2021; ESF, 2017). A high level of vertical (mis-)match could be interpreted as a sign that a *surplus* of PhD graduates is being produced. However, while not required, a PhD may often be a *desired* degree and the unique skill set of PhD holders may be valuable for performing their jobs, even if the doctoral degree is not a specific requirement.

Studies report overall close *skills matching*, i.e., the match between the skill levels that they had developed by the end of their doctoral programme and the skills that are important or used in their current jobs (Bebiroglu et al., 2020; Boman et al., 2021; ESF, 2017). Those working in the academic sector have the best skills match. Still, in some countries, most PhD holders outside the university do use their research skills in their jobs, at least to some degree (Bebiroglu et al., 2020).

Being able to do research as part of the job has an impact on *job satisfaction* for doctorate holders, with researchers being overall satisfied at least as much as those working as non-researchers across the OECD CDH participating countries. Researchers are especially satisfied with intellectual development and opportunities for advancement, a degree of independence and the level of responsibility offered by their jobs. Satisfaction levels with salary and benefits were reported the lowest rated aspects in most countries (OECD CDH, 2013). The ESF surveys consistently showed that those engaged in research are overall clearly more satisfied than those not engaged in research (Boman et al., 2021; ESF, 2017).

3.2 | Interviews with experts

3.2.1 | Value and role of a doctorate

Discussing the role of a doctorate, all respondents agreed that traditionally doing a PhD was perceived as a career path to research and teaching in academia, while nowadays doing a PhD leads to much broader career prospects.

What happened is the massification of the doctoral degree in the last 25 years [...] The idea was that the more people have PhDs, the better for society [...] in terms of their research ability to create the services and profits.

(Alfa)

The role of a PhD for *filling in the positions in academia* remains. However, interviewees stressed that the *role of the doctorate nowadays is multidimensional* and is seen not as much as a licence to teach but as a licence to conduct research; and that a PhD is the highest qualification in higher education that develops strong research skills that can be transferred to any professional context. Doctoral training is a way to produce researchers, to develop the skills to work independently and take intellectual risks, and to become an expert in a particular field or topic. *"The role is to train creative, critical, autonomous, and responsible intellectual risk-takers. It is very relevant today [...] This is the value well beyond academia: it is across the whole of society"* (Epsilon). Moreover, for individual experts, being able to do a doctorate is *"already a value and privilege"* (Beta) and it is *"an additional educational enrichment"* (Kappa).

Interviewees highlighted the *utilitarian, economic, social and ethical value of a PhD for the labour market and society* and the importance of the need for highly-qualified intellectual workers in all spheres. The *"[...] economic value is clear, they work on complex research topics in the industry, they create new products, services for Europe, which makes the market more competitive, which [...] drives GDP and makes countries more competitive [like the US, China]"* (Alfa).

The societal value of doctoral holders in the labour market is recognised because of the major societal challenges the world is facing:

Society has huge challenges, with climate change, energy, poverty, problems with the divided society that we have at the moment and all sorts of things [...] and we need imaginative new ideas that we can really take forward. So this is the value of a PhD graduate to the labour market.

(Epsilon)

Experts also stressed that the *high ethical standards* for conducting research, taught during doctoral training, can be transferred to wider society and other professional environments.

[In academia] we put enormous efforts into ethics [...] If these [ethical] values are transferred to the society through the labour market, this is excellent. I really think PhD graduates working outside academia is actually a great opportunity to create a better world.

(Zeta)

Most of the interviewees highlighted that *becoming independent researchers* is the unique outcome of the doctoral journey and that PhD graduates are experts in a particular topic, with focus on specific problems, and who have a deeper understanding of various contexts and interconnections. At the same time, they see them more independent, autonomous and therefore often may have a higher level of responsibility. In addition to their knowledge of their subject area and research methodology, PhD holders also develop other transferable and transversal skills that can be applied and add value in different professional contexts, among them e.g., independent critical thinking, communication, teaching and coaching, leadership, time and project management, taking intellectual risks and handling uncertainty, and problem solving.

It [a PhD degree in the labour market] gives the possibility to have people with this extensive experience, with skills for different roles which require familiarity with research, with special knowledge, transferable skills, ability to excel in a research environment, to interact with different actors involved in research, capacity for critical thinking and experience with specific research questions.

(Beta)

3.2.2 | Expert views on current trends in PhD employment in Europe

All interviewees agreed that the *current trends in PhD employment are diverse across Europe*. There is no homogeneous trend in Europe, but there are trends in one country or within similar groups of countries. What plays a role is the country or region and its economic development, industrial potential and also the development of the higher education system. How diverse the situation in Europe can be, seen from statistics based on how many PhD graduates stay in academia and how many are employed in other sectors, was discussed in the earlier section.

The fact is that in some countries you have only 10% staying in academia and 90% actually trying to find a place in other sectors. And in some other countries in Europe you still have 90% staying within academia and only 10% leaving to the other sectors. Maybe there is a kind of [European] *wish* trend, because we all would like to see more people being employed outside academia and working in different sectors.

(Kappa)

According to interviewees and the data, generally in Europe, the *unemployment of PhD holders is not an issue*. Many interviewees stressed that we already have a *large number of doctoral candidates* and an increased number of post-doctoral researchers. Today it is hard to get a tenure position in academia as a professor, assistant or associate

professor. There are very limited numbers of academic positions which are not going to increase, leading to increasing competition.

One of the biggest difficulties is to get a job as an academic. If you look on the way how the current system works, it is very limited. It doesn't matter if you are the best teacher or mentor in the world, if you don't have publications in high impact journals, you will not get a job.

(Delta)

Most of the interviewees also highlighted precarious conditions of postdocs related to employment on short term contracts and without further job security. *"The majority of people doing a PhD still go on to a postdoc, at least after the PhD"* (Eta). *"You do your PhD, then do a postdoc, then another postdoc, another postdoc, and so on."* (Delta). Then *"[...] you have a postdoc situation where you have people waking up one day being, whatever, 45 or even 50 and they say this is my fourth postdoc position"* (Kappa).

Some of the interviewees mentioned that a PhD is pursued because of a passion for research, and that the academic environment is perceived as enriching, challenging, international and creative—alternative career paths may not be taken into consideration. However, those who transition to jobs outside academia are generally more satisfied with working conditions than those working in academia.

The best jobs are outside academia, not only in terms of salaries, but also in terms of satisfaction. Because a career in academia is very hard. First of all, gaining a tenure takes many years of work and frustration after the PhD.

(Iota)

According to interviewees, there are many *opportunities beyond academia* in the public, private or non-profit sector which may fit PhD holders very well. Some interviewees pointed out that a PhD as a qualification can often be beneficial in relatively high ranking organisations, multinational companies or governmental organisations, as well as industry, high-tech companies, think tanks, or charities. But there are again geographical differences, which are connected to an understanding of the role and the value of the doctorate by potential non-academic employers. Some experts highlighted that countries with less economic development employ less PhD holders.

Europe is a very diverse continent, in countries like Germany, Netherlands, Sweden, there are many opportunities outside of the universities for PhD graduates, like tech start-ups, high-tech companies, NGO sector or in charities [... but] there are other countries, where a PhD isn't as highly valued.

(Gamma)

In terms of the type of work suitable for PhD holders, some interviewees stressed that in research and development sectors there was a difference between doing research and supporting research. There are various occupations in running research, teaching, management, business development, marketing, communication, human resources management and the Third Space (working between professional and academic domains). Then we have librarians, people who work as intellectual property agents, and those who work on the financial, legal and administrative side. And there are also new positions, like data stewards. *"There is a whole ecosystem to support research and researchers in and outside academia and there are a lot of jobs linked here, so, there can be many places for PhDs"* (Alfa).

Most of the interviewees highlighted that *doctoral degree holders do not just occupy jobs, but also can create jobs*. Despite PhDs being perceived as prepared intellectually and professionally to become entrepreneurs and for

generating jobs, it is still a new emerging trend and does not take place everywhere. Moreover, on average doctoral training does not take into account the entrepreneurial context. *"The number [of PhDs] is growing, but the big thing that we would like but we are not tackling well enough is that real employment comes from creating jobs, not accepting jobs"* (Epsilon). *"[...] if you think about start-ups, entrepreneurship—there are a lot of PhDs who are moving to these types of commercial work [...] which was not in the picture about five to ten years ago"* (Eta).

The idea is also that PhD graduates create jobs for themselves, at least I think this is still the weakest point, that not many PhD graduates are really focused on creating their own jobs.

(Kappa)

According to interviewees, we should also consider that there are *differences in various research fields* for PhD holders. Alfa noted that PhDs from STEM fields are usually better paid and have better contracts, with most of them working in companies. Most of the PhDs in the arts and humanities would like to stay and continue working in academia and typically are not involved in industry. The latter tend to be employed more on temporary or part-time contracts and are paid less.

3.2.3 | Challenges for early-career researchers when entering the labour market

There are many challenges today for early-career researchers to enter the labour market. Due to the massification of doctoral education, the numbers of PhD candidates have increased a lot, almost exponentially in the last few decades. And this has completely changed the landscape of employment.

[...] All people getting their PhD some decades ago had some kind of luxury position. They were the highest level of education, they came to the system like being wanted, being needed and this is a completely different situation as it is today.

(Kappa)

Expectations seem to be a big part of the challenges. The problem is that the majority must leave academia, possibly to do research, ultimately to do anything stemming from the skills gained during doctorate and that they are not fully aware that they need to leave. Many of them are in denial that they have to leave.

There is a massive disconnect between what was expected on their behalf and what ultimately the reality is, they need to leave. The problem then is they are not ready to leave, they are not trained to leave, they don't have skills to leave, they don't have networks to leave.

(Alfa)

"So the safe choice is of course the university or a career where you do the research. I think that's why many people want to stay in academia as well, because this is the environment they know, this is the environment they can navigate." (Zeta) Theta noted that *"There is a big emotional component in what are your expectations, and what's the reality"* (Theta). Similarly, Iota noted that *"Doctoral schools should work on setting the expectations of what happens next [after the PhD] very clearly. And this can be done with key labour market actors e.g., government, non-profit organisations"* (Iota).

Most PhD holders have to leave academia. According to some of our interviewees, when they leave the biggest challenge for them is finding and sometimes negotiating the *right job* with the *right conditions*. *"You'll hardly find a job with PhD in the title.... The big challenge is to identify which job is actually for them, which qualification is right for them if it is not explicitly mentioned"* (Beta).

We don't know that a PhD has the biggest value [as a degree for the job market] and we should negotiate a higher salary [...] This is a kind of negotiation that you must do outside the PhD, outside academia. Instead in academia, salaries are usually lower and you tend to agree on anything that's proposed just because the only choice you have is to stay or leave.

(Theta)

Experts highlighted that there is a *lack of knowledge about the potential careers outside academia*. PhDs in general have a very limited view of the labour market outside academia, as they are fully focused on their research during their PhD. This prevents them from learning about the possible job market early in their PhD, meaning they have to learn about the (new) employment context outside academia once already there.

I think a lot of PhD candidates are not aware of the structure of the enterprises outside the university, until they get there. If you are not aware of the structure, you need to go to the entry level position, which pushes you as early as possible.

(Gamma)

Recognising the relevance of a PhD outside academia is also a big challenge. Beta noted that many small to medium sized enterprises do not want to hire PhD holders, as they do not see an added value in comparison to those with lower levels of education. Similarly, Theta noted that *"If I am on the other side, if I have to hire a person, and choose between Master and PhD with the same characteristics, even if I know that PhD is different, maybe the Master will cost me less"* (Theta).

All experts highlighted that *self-awareness* is a key challenge. PhDs are not aware about their skills and what they can offer when entering the labour market. They do not recognise the value they bring. They are not trained enough to be able to say to a company what they can do for them. It is very difficult for them, as researchers, to demonstrate why *"they are creative, critical, autonomous intellectual risk-takers"* (Epsilon) and show the contribution that they have made to society.

Sort of self-awareness, goal-orientation, strategic planning, knowing why and what, why we are where we are and having the ability to discuss this with those people who are around us. This is critical and we don't have it and this is one of the key challenges.

(Zeta)

One of the common challenges is the way *how PhDs communicate their doctoral experience*, with many focusing on their research ideas and the degree itself, rather than on the actual skills they have acquired. *"If you ask a PhD [in a job interview] they mostly talk about the technicalities of their thesis, when what most employers want to know is 'what are you going to do for us?'"* (Epsilon).

When applying for a job outside academia ... they need to identify what you did during the doctorate and explain to the future employer. And this is not just doing research, it's many skills and capacities.

(Beta)

Often early-career researchers do not have *networks outside academia* or may not be even aware of the networks they do have. Building their own networks and discussing career perspectives in wider communities may be helpful to overcome challenges with finding the right job. *"I think 80 or 90% of jobs in general are given away through networks, those jobs are never advertised, never been published. [...] So networking is a key issue"* (Gamma).

3.2.4 | Key gaps in doctoral training

Interviewees agreed that current doctoral programmes prepare doctoral candidates for an academic career quite well, but not for a diverse career path.

It's a problem for everyone, for people who don't know what to do when they can't find a job, for the labour market which doesn't sell it properly; for the government which spends a lot of money for the training system that trains PhDs to stay in academia, but they can't. So they go to the labour market but the system doesn't train them for that.

(Alfa)

Gamma noted that there was a particular gap or challenge for PhDs to “[...] *find this specific training which may have nothing to do with your PhD and will sometimes have to do with transitioning to a career outside academia*” (Gamma). Some interviewees mentioned that current doctoral training models are not PhD-centred and do not put enough value on Open Science, intersectoral mobility and interdisciplinarity. They also mentioned challenges in the status of doctoral candidates and underscored the role of supervision. “The first differentiator between a good and bad PhD is mentorship. If they have a good mentor, they may be more successful than those who don't have a good mentor” (Iota).

It's not a good idea to have one supervisor who is responsible for all aspects of the PhD; it's a potentially dangerous situation for a PhD candidate [...] you're completely dependent on the supervisor for a career, and in cases of scientific misconduct—who suffers, not the professor, it's the PhD candidate.

(Delta)

The experts also highlighted the lack of funding and insufficient prioritising of doctoral training in university governance. “*The profile of doctoral education is not very high among university leaders—it is not seen as a priority*” (Epsilon).

3.2.5 | Expert recommendations

Experts stressed that Europe has a very good policy framework but at the same time the real implementation on the national and institutional level is not sufficient. Experts call for a wider discussion at the European and national levels about the massification and the focus of doctoral education, about the role of industry sectors in research development, and specifically in doctoral research, and the role of researchers today. The list of recommended actions to improve PhD career perspectives is presented in [Table 2](#).

4 | DISCUSSION AND CONCLUSIONS

According to interviewees, the recognition of the value of a doctorate and its relation to PhD employment prospects varies across Europe. Value accorded to doctorates depends on factors such as the economic development of the country; the need for PhD holders' skills in non-academic sectors; as well as industry involvement in the doctoral training process or the field of science (e.g., STEM fields versus arts and humanities). Most interviewees also noted the traditional understanding that PhD holders are perceived as future academics, alongside a broader understanding of PhDs as drivers for social and economic transformation towards *knowledge economies*. This

TABLE 2 Expert recommendations

European and national levels	Institutional level	Individual level
<p>The European Commission and individual EU governments can</p> <ul style="list-style-type: none">• implement and raise awareness of the Salzburg principles, and Charter and Code for researchers• make professional development part of all research projects• introduce governmental incentives to support companies to hire PhD graduates• value and support diversity of future professional roles for PhDs in all sectors• create more flexible legal frameworks for more individualised and diversified doctoral education• strengthen intersectoral mobility and communication between universities and industry sectors• create new financial schemes for more individualised research and skills training• create better working conditions for supporting mental health	<p>Universities and doctoral schools can</p> <ul style="list-style-type: none">• support the professional development of doctoral candidates (e.g., create supportive structures, ensuring proper funding)• provide more transferable skills training (e.g., open science, patenting, marketing, entrepreneurship)• track PhD careers, develop contacts with alumni• raise awareness of career perspectives for doctoral candidates• demonstrate and communicate the value of PhD degrees to society and industry more clearly• take care of the quality of trainers and supervisors	<p>Early-career researchers can</p> <ul style="list-style-type: none">• do self-reflection and self-assessment of their professional interests and needs• take personal responsibility for their own professional development• focus on research but also invest time and resources in skills training• be flexible and open to different contexts, career options and adapt to dynamic and changing conditions• develop their networks in and outside academia

Source: Authors. [Corrections made on 19 July 2022, after first online publication: In the 'European and national levels' column, 'Salzburg Principle Charter and Code for researchers' has been corrected to 'Salzburg principles, and Charter and Code for researchers', in this version.]

aligns with literature on the changing focus and role of doctoral education, which no longer remains an academic affair but is an object of national and European policy-making (Bao et al., 2016).

Despite concerns of growing numbers of PhD holders, the data indicate that PhD holders are highly employable. The available survey data discussed in this paper, and a significant body of literature highlight the importance of the non-academic labour market for PhD holders (Mangematin, 2000; Neumann & Tan, 2011; Pedersen, 2016; van der Weijden et al., 2016). Postdoctoral researchers are often employed on temporary contracts in academia. However, non-academic sectors, and especially the private sector, offer better chances for finding a secure position.

It can be expected that the share of PhD holders working beyond academia will continue to increase across EU countries—both due to an over-saturated academic labour market, and growing demands for PhD holders in knowledge-intensive sectors of the economy and possibly other fields, e.g., services, public administration, or media (Bao et al., 2016).

However, PhD holders face a number of challenges when entering the labour market and the biggest one is to find the *right* job fitting their level of qualification and salary expectations (Boulos, 2016). According to the interviews, leaving academia may be difficult as PhD holders may not be aware of how their skills would be relevant in other professional contexts. Therefore, there is an urgent need to raise awareness about, and train PhDs in, transferable skills that are needed in a variety of jobs (Weber et al., 2018).

As highlighted by the interviewees, a real problem is a disconnect between expectations, reality and awareness. The way doctoral candidates are trained, assessed and supported does not reflect their diverse career perspectives and needs. To address the issue of expectations, data on career destinations should be collected and disseminated to PhD candidates early in their training.

Another issue is that understanding the added value of the doctoral degree by employers outside academia varies importantly depending on the country, as does the connection between doctoral education and destination employment (Marini, 2022). Appreciation of a PhD outside academia, as testified by our interviewees, may be an issue and has been also raised in the literature (Casey, 2009). Furthermore, interviewees note that non-academic employment is often perceived by PhD holders as an exit from an academic career, a *second best choice*, often undertaken after having invested a number of years in an academic career.

Interviewees stressed that universities could do more to anticipate a variety of career paths and implement relevant policies. Universities could be advised to develop supporting schemes for intersectoral to sectoral mobility and cooperation, bring more industry professionals to academia, and vice-versa, through internships, networking, projects, and industrial or professional doctorates. These recommendations are in line with the literature showing that, for instance, those PhD holders who engaged in collaboration with the private sector during their PhD or whose PhD is funded by companies, are also more likely to work in a company after completing their PhD (Boman et al., 2021; Marini, 2022).

The data on career destinations points to a broad range of sectors employing PhDs outside academia (e.g., private sector, healthcare, not-profit, and other sectors beyond academia). Doctoral training should therefore be more individualised and ensure more freedom and responsibility to doctoral candidates to design their own training in line with their career aspirations. Supervision should become less hierarchical and more collaborative.

The recommendations of the experts align with those made at the European and international levels. For example, recommendations in the Declaration on Sustainable Researcher Careers (Kismihók et al., 2019), Hannover Recommendations (2019), and the DIOSI Model for Doctoral Learning (Kersschot, 2021).

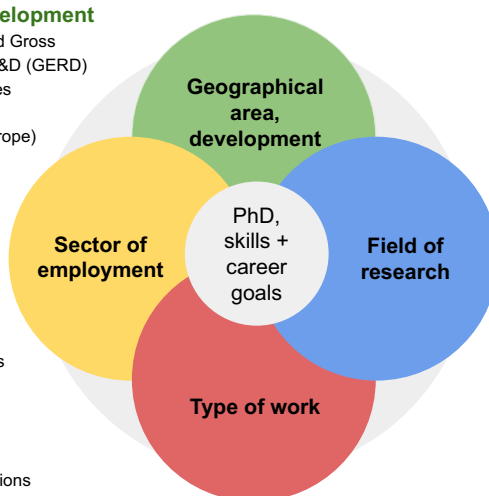
To conclude, based on our review of survey data and interviews, relevant factors are outlined that should be considered when assessing PhD labour market perspectives and career prospects (Figure 1). We note the following four key take-aways from the data and interviews. (1) The *geographical area and economic development* of a country or region play an important role. National or regional context must be taken into account. For example,

Geographical area, development

- Economic development and Gross domestic expenditure on R&D (GERD)
- Differences among countries (Western and Northern vs. Eastern and Southern Europe)
- Differences within regions

Sector of employment

- Higher education and research organisations (e.g. research institutes)
- Government or another public sector
- Business (industry, services and other)
- Healthcare (e.g. hospitals, clinical centres)
- Education (non-academic)
- Private non-profit organisations
- Other

**Field of research**

- Natural Sciences
- Engineering and Technology
- Medical and Health sciences
- Agricultural sciences
- Social sciences
- Humanities

Type of work

- Research and supporting research
- Entrepreneurship
- Communication
- Consulting
- Research Management
- Policy making
- Creative jobs (e.g. writers)
- Teaching
- Other

FIGURE 1 Factors affecting PhD career opportunities. *Source:* Authors. [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com)]. [Corrections made on 19 July 2022, after first online publication: In this version, 'Field of research' in Figure 1 has been corrected to include 'Natural Sciences'.]

the scenario of employment trends of PhD holders in Eastern and Southern Europe can vary quite significantly. (2) The *sector of employment* can be categorised by business enterprises, government, higher education and private sectors—including academic, industry, government and non-profit organisations. It would be important to explore factors facilitating the transition of PhDs to these sectors as well as different types of skills required. (3) The *type of work* for PhD holders both within and beyond academia, can be seen in terms of doing research, supporting research or it can be not related to research. For example, in the higher education sector there are different roles including research, teaching, working in research support roles, engaging in management, business development, marketing, communication, human resources management and positions in *Third Space* roles. (4) There are also *differences across research fields and disciplines* for employment perspectives; especially, between STEM and the arts, social sciences and humanities.

On an individual level, it is important for doctoral candidates to start thinking about job opportunities from the beginning of their PhD and to build their own networks. Universities could help doctoral candidates to set up their career and personal development plan based on their career goals and skills they want to develop. There should be professional support in place from day one of doctoral training, e.g., mentoring, advice or access to courses, to information, mental health support, etc. More space for communication should be created to discuss career perspectives.

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