

Task 7:

“Analysis of the results achieved in terms of employability PhD and defining of policy proposals for improvement”

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Task 7: Analysis of the results achieved in terms of employability and defining of policy proposals for improvement

Summary and recommendations

The number of doctoral candidates in Europe has risen significantly in recent years and will continue to rise in the years to come. National governments are investing heavily in doctoral education to raise the overall level of education in the population in general, contribute to the development of the research frontier and with an expectation that the growing supply of doctorates will contribute to innovation and productivity in both private and public sectors.

Even taking into account the specificities of national context, looking at e.g. employment and income levels for doctoral candidates, it is clear that there is indeed a high demand for researchers inside as well as outside of academia. This confirms the value of investing in doctoral education.

There is an expanding number of doctoral candidates across Europe and the rest of the world. At the same time, the absorption of this increase in doctoral candidates into the labour market is expected to happen mainly outside of academia. Even though only a minor part of new doctoral candidates can expect a career in academia it is still the norm to pursue one, leaving many disappointed and not optimally prepared for endeavouring on other career paths (Vitae 2013, 11).

In order to make the most of government investment in doctoral training it is necessary to focus on how doctoral candidates can be better prepared for a variety of careers through a diversification of profiles and of learning/training opportunities, e.g., structured training and close cooperation with industry. This paper explores this question by looking at a range of factors related to the employability of doctoral candidates across Europe. **It is thought as a working paper for the Madrid meeting and to promote the discussion and contributions of the group members.** It makes a number of policy recommendations, the essence being:

Recommendations

- *While unemployment rates for doctorate holders are in general low, the pressure for career opportunities outside academia is growing, prompting the need for institutions and policy-makers to help doctoral candidates achieve a broad set of skills applicable across a variety of sectors, for example by moving towards structured PhD training.*
- *There is a need to promote career perspectives and opportunities for doctoral candidates. Institutions and policy-makers should continue to implement initiatives that can ease the transition from an academic to a non-academic career.*
- *As Ministers committed to do in Bucharest, employability should stay a priority in Doctoral training policies and all the tools that can further strengthen it shall be further implemented, such as*

transferable skills training, collaboration with industries, placements during research training, career guidance and the introduction of diploma supplement

- *HEIs as well as national governments should strive to promote awareness among university staff to account for and fully acknowledge acquired transferable and transversal skills.*
- *There is a need to promote awareness in the labour market of how doctoral candidates can contribute to social progress, the advancement of the knowledge, innovation and productivity across sectors. This can be done through supportive actions involving HEIs, employer's organisations, regional industries and local authorities, such as financial support or information campaigns.*
- *The outcome of doctoral training should be not only a research project, but also a qualified researcher with a broad set of competencies within research, management, communication and creativity, etc.*
- *A common framework for understanding and promoting competencies achieved in doctoral training across Europe should be further developed in order to meet the employment challenges of doctoral candidates*
- *PhDs developed in cooperation with private entities (Industrial PhD or similar) are very effective in increasing the proportion of PhD students employed in the private sector. This strategy should therefore be promoted in European countries.*
- *The proportion of PhD students enrolled in an industrial PhD is expected to remain quite low, due to the cost and duration of doctoral training. An industrial PhD degree should be at the same research level as a normal PhD degree – and not be a stand-alone strategy. Additional initiatives to increase collaboration with industry in conventional PhD programmes should be promoted.*
- *Best practices in the improvement of PhD holders employability by Doctoral Programmes should be pushed by Ministries' policies and Quality Agencies*
- *Ministries and HE institutions should make an effort to collect data on PhD holder's careers.*

Introduction

On the basis of available data the report firstly outlines current status as well as examples of best practice. Secondly the report makes suggestions for recommendations and policy guidelines for strengthening the employability of doctoral candidates outside academia in accordance with requests taken from the description of Task 7 in the BFUG-WG working paper. Focus will be on themes related to labour-market collaboration in doctoral training, career development during doctoral studies, improving understanding of doctoral studies by public- and private-sector industry, and not least employment of doctorate holders.

There is limited existing relevant data to base the report on. However, the European Commission's "Report of Mapping Exercise on Doctoral Training in Europe" and the OECD's "Key findings of the OECD-KNOWINNO

project on the Careers of Doctorate Holders” are useful sources of information. In addition, a questionnaire has been circulated among member countries in order to gather the newest developments and policies regarding the employability of doctorate holders. At the time of writing, Germany, France, Belgium, Denmark and Armenia have answered the questionnaire. Furthermore, reports by Vitae, a UK-based organisation with a focus on researcher careers, have produced relevant UK-based material giving valuable insights. Not all Bologna countries are well represented in the data used for this report: for example, EU data are limited to EU countries. The authors will strive to include data on these countries if they gain access to it.

Given the limited availability of data, the initial focus of this report will be on describing general tendencies and the report will draw attention to examples of best practice. On the basis of these conclusions a number of suggestions will be made in relation to policy guidelines and institutional practice, as well as suggestions for further investigations. Each section is summarised in a short statement proposing further action.

The report is structured in the following four sections:

- 1) Employment: entering the private and public labour market outside academia
- 2) PhD training opening to the non-academic world including training in self-entrepreneurship
- 3) Awareness of PhDs’ competencies in industry as well as in academia
- 4) Industrial PhDs and industry financing of doctoral education

1. Employment: entering the private and public labour market outside academia

This chapter will focus on the quantitative side of this topic, presenting employment rates, average salaries of doctorate holders, etc., across fields where possible. The aim is to give a general and contemporary picture of the employability of doctorate holders in Europe. This is a prerequisite for any part of the employability discussion since we need to know the extent of the challenges we are trying to meet. Furthermore, the presentation of available data will also show if and where more data are needed in order to get a fully representative picture of PhD holder employability. In addition to quantitative data, examples of initiatives that actively contribute to easing the transition from academia to industry will be presented.

[1.1 Status according to data and examples of best practice for promotion of the agenda](#)

Employment rates

There is plenty of evidence to suggest that PhDs are not in general burdened by unemployment. The OECD reports that, despite a 38 per cent increase in the number of doctorate holders in OECD countries (213,000 in 2009); there is a premium on people with doctoral degrees (OECD, 2013: 5). Moving to a European context, the OECD also concludes that an excess supply of doctoral holders does not exist in Europe (OECD, 2013: 7).

More precisely, in 2009 96 per cent of recent PhDs were employed. This is however not as high as for previous doctorate holders, but is still high compared to the broad population (OECD, 2013: 10).

In both France and Belgium, the unemployment rate is lower for doctorate holders than for graduates with a master's degree (Questionnaire France, Questionnaire Belgium). For instance France reports that very few doctorate holders have suffered from a decline in economic activity, while the rest of the generation has experienced difficulties in finding a job (Questionnaire France). In Germany, nearly all doctorate holders in all disciplines aged between 35 and 45 have a job, which means they have better employment rates than graduates without a doctorate (Questionnaire Germany). According to a report published by the Danish Ministry of Research, Innovation and Higher Education in 2012, the significant rise in doctoral candidates in Denmark is expected to be matched by a rise in demand—primarily a rise in demand in the private sector. These data give good reason to believe that, in general, unemployment for doctoral candidates compared to other candidates will not be a large problem in the future.

The data available may not allow us to spot the employment situation in all parts of the EHEA leaving the possibility that some countries in fact suffer this kind of challenge. It is therefore important that all EHEA-countries monitor the development of employment rates for doctorate holders.

Increasing number of researchers in the population

The European Commission concludes that although the number of researchers in the EU has been increasing faster than in Japan and the US since 2000, in 2008 the EU still had a lower proportion of doctorate holders in the total labour force (see Figures 2 and 3 below).

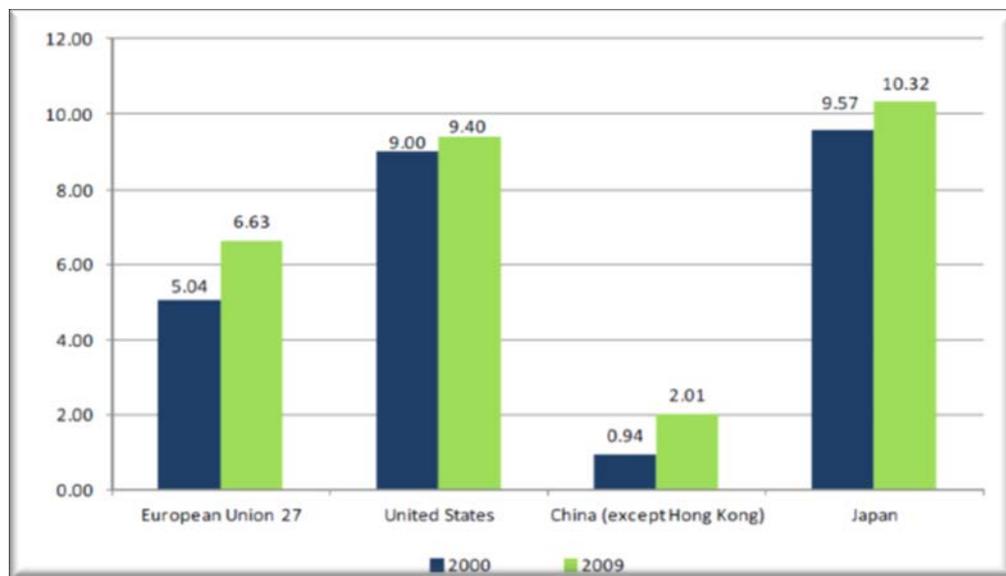


Figure 1: Researchers per thousand in labour force, EU 2013

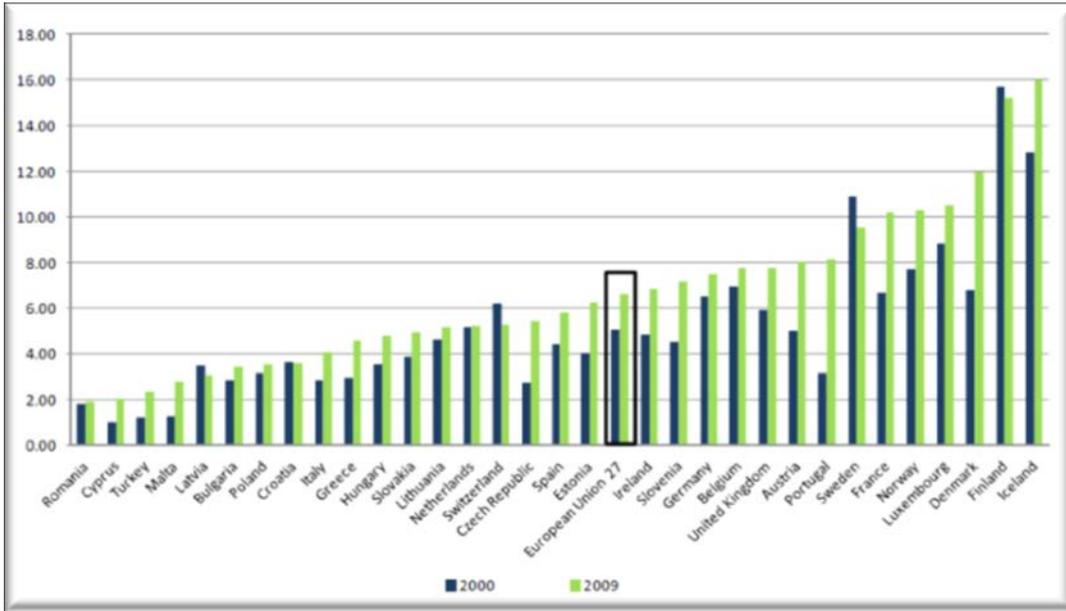
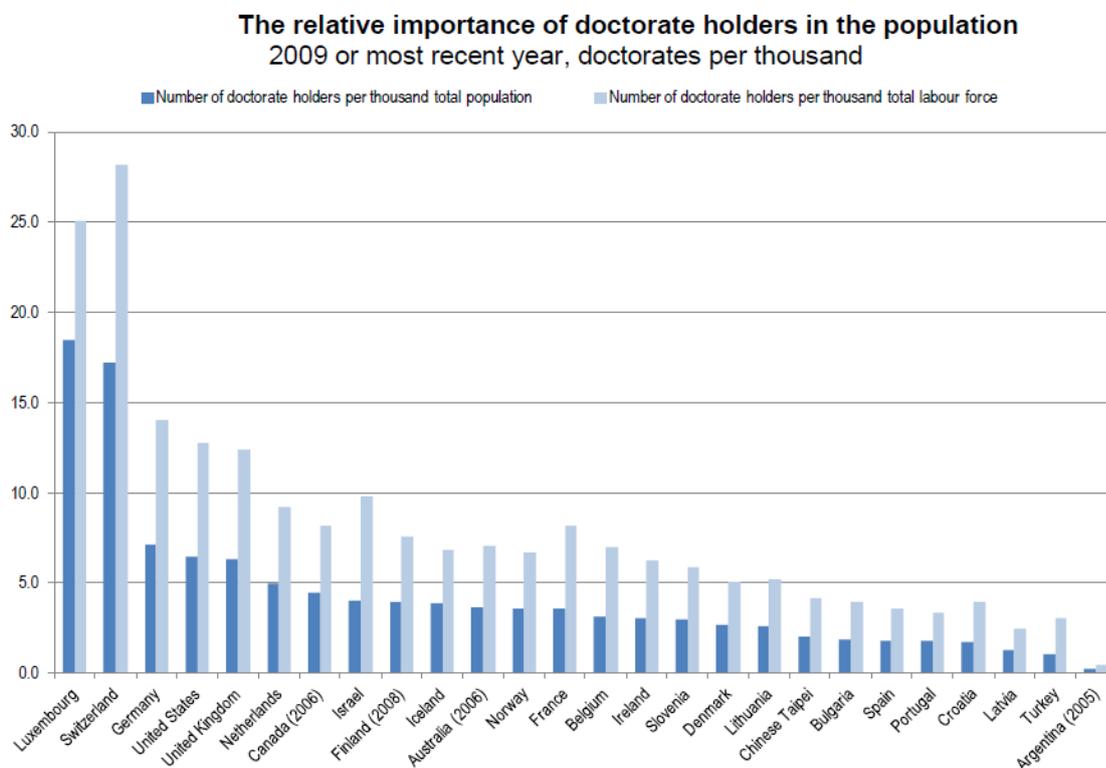


Figure 2: Researchers per thousand in labour force, EU 2013

There are significant variations across both countries and fields of study, and the overall conclusions above must be broken down into more detail in order to get a useful picture.

As noted, there are strong variations across countries. Switzerland and Sweden come top in terms of the percentage of an age cohort receiving a doctoral degree, with 3.4 per cent and 3 per cent respectively against the national average of 1.5 per cent in 2009 (OECD, 2013: 6). Additionally, Luxembourg and Switzerland have the highest number of PhDs as a percentage of the total labour force. In Luxembourg, 2.5 per cent of the total



labour force are doctorate holders, and in Switzerland the percentage is 2.8 of the total labour force (OECD, 2013: 7), according to Figure 3.

Figure 3: Doctorates per thousand population and labour force (OECD, 2013: 7)

Employment sector

Although the EU has the stated goal of providing the European economy with one million more researchers, the actual status of many doctorate holders is that outside academia or research institutions most occupy positions that do not correspond to their high level of training (for instance in Belgium only 50 per cent of respondents feel that their doctorate constitutes a needed qualification for their job, while 40 per cent view the second cycle diploma as sufficient). Higher education is still the largest employment sector for PhDs (OECD, 2013: 12).

This highlights the need to support the careers of doctorate holders outside academia and ease the transition from the completion of a PhD degree to a job in the private or public sector, outside academia.

The probability of working in academia as careers progress after graduation, as illustrated in Figure 4 below. Figure 4 illustrates the career paths of doctorate holders in the UK and shows how slight are the chances of a

permanent research position at a university, highlighting the need to promote non-academic career opportunities. Although the figure may not be representative of the situation across all European countries, it still illustrates a common tendency.

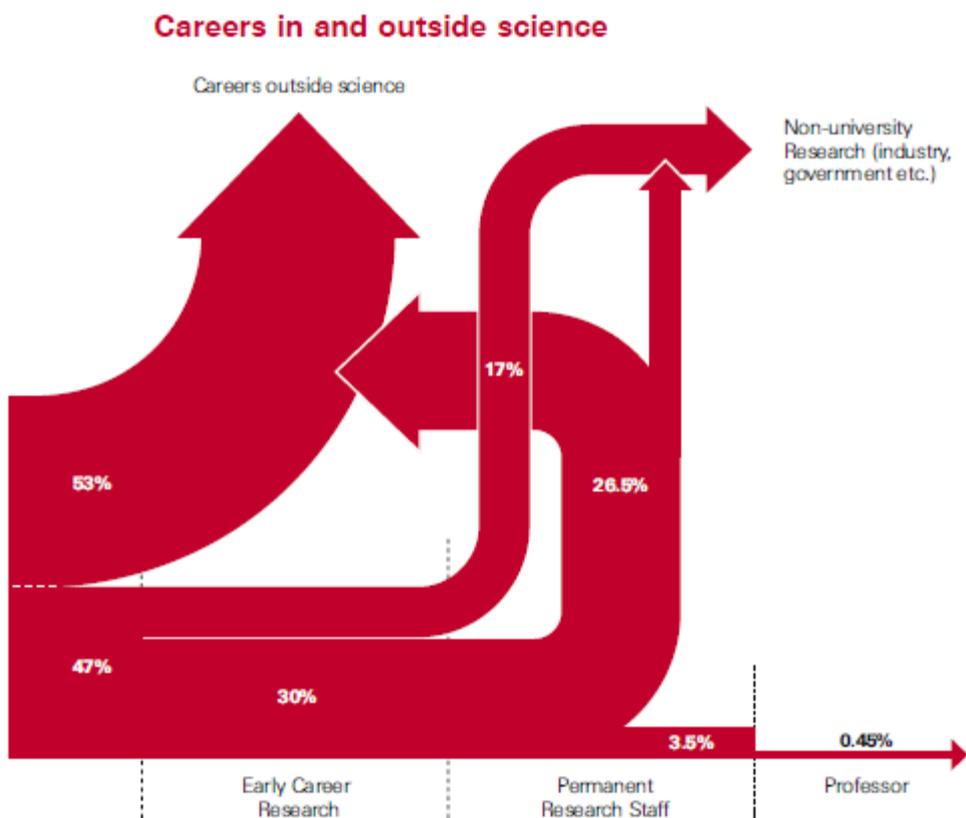


Figure 4: Careers in and outside science “Report of the Royal Society, UK, 2010”

Despite overall demand for doctorate holders, data show that for recent doctorate holders temporary contracts are common (OECD, 2013: 10). The proportion of PhDs on temporary contracts less than five years after receiving their degrees is 57 per cent in Portugal, 45 per cent in Germany, 41 per cent in the Netherlands, and over 23 per cent in 10 out of the 16 economies surveyed in the OECD report. In France, 67 per cent of doctorate holders have a fixed-term contract (Questionnaire France). Comparing these contracts with other employer conditions, data from Germany show that 20 per cent of doctorate holders have temporary employment, twice the rate of graduates without a doctorate degree in the same age group (Questionnaire Germany).

Age

There are wide variations in the graduation age of doctorate holders. The median graduation age is between 30 and 35 years. Further comparisons demonstrate that around 30 per cent of doctorate holders are younger than 45 years, but in most countries at least 20 per cent are more than 55 years and hence likely to retire in

the next ten years. In Bulgaria, Russia, Israel and Latvia, more than 35 per cent of PhD holders are older than 55 upon graduation. In the long run these patterns can have a negative effect on the research capacity of these nations (OECD, 2013), but they can also strengthen the demand for new doctorate holders.

Gender

In 2009, women were awarded 46 per cent of new doctorate degrees in OECD countries in total. Although the proportion of women among PhD holders is increasing, women still represent less than 40 per cent of all doctorate holders in 13 out of 22 countries reporting these figures. For instance, in Germany, women doctorate holders are less well placed than men when it comes to finding a job, but better placed than women graduates without a doctorate (Questionnaire Germany). Additionally, women earn less than men (OECD, 2013: 18), which relates to the next topic.

The goal of a young age of PhD-holders can in some countries affect women's possibility to enter in to a doctoral study. This topic is therefore also relevant to discuss in the context of task #3 on the link between second and third cycle.

Earnings

A wide spectrum is observable in relation to earnings. In general those in the medical and health sciences are paid above the average in most countries, while those in agricultural sciences and the humanities earn below average (OECD, 2013: 18). Gross annual earnings of doctorate holders employed as researchers exceed those of non-researchers, but this varies across countries as well (OECD, 2013: 18). For instance, the premium of doctorate holders seems to be higher in the US and Belgium than in Spain and Portugal. In Germany, doctorate holders earn above the average income (Questionnaire Germany). Additionally, earnings are typically higher in the business sector than in the research field, although this can vary from one country to another

Career progression

As concluded by the ARDE Project, the value of a doctorate in terms of career advancement in both academia and the private sector is high. Doctorate holders whose first job is at the same level as those holding other degrees progress faster, to the point where some companies see as many as 80 per cent of doctorate holders taking up management positions (Borrell-Damian, L. 2010).

Areas of employment

Looking at the different fields of study, PhDs in the natural sciences and engineering are, as expected, represented more strongly in their research field, while those who studied the humanities have a lower proportion of research positions (OECD, 2013: 15).

Researchers in industry mainly come from the natural sciences, while the most common fields of study in the higher education sector are the social sciences and the humanities. This is exemplified by Belgium, where PhDs working in industry mainly come from the natural sciences, while PhDs from the social sciences and the humanities are over-represented in the higher education sector (Questionnaire Belgium).

An analysis made by Statistics Denmark of the employment of Danish doctorate holders shows that 23 per cent of Danish PhD holders working in the private sector are employed in companies with fewer than 50 employees. A significant proportion of these companies might be entrepreneurial start-ups driven by the PhD holders.

On the other hand, 35 per cent of Danish doctorate holders working in the private sector work in large companies with more than 1,000 employees. It is clear that doctorate holders are in demand in both small and large research companies. Usually the larger research companies are very focused on recruiting skilled doctorate holders in the relevant fields.

Looking at the areas of work of Danish doctorate holders it is worth noting that 14 per cent of Danish doctorate holders work in manufacturing industry and 21 per cent in business services, while 54 per cent work in the public sector in the sectors of teaching, public administration and health. It is important to strive towards the best possible match between the focus of European industry and the scientific areas and general skills of European doctorate holders.

1.2 General conclusions, suggestions for policy recommendations, and suggestions for further investigation

On the basis of the available data it can be concluded that doctorate holders in Europe enjoy relatively high employment rates and incomes... However there is a large variation in employment rates across the EHEA-countries.

However, while doctorate holders still work in large numbers in institutions of higher education, many young PhDs have to accept the uncertainties of temporary contracts in the first years of their careers, and only a minority can expect permanent employment in academia afterwards. Furthermore, only a low proportion of the rapidly rising number of PhDs can be absorbed by this sector, leaving a high proportion of these to find employment elsewhere in the future—which was the main purpose of increasing the numbers of PhDs to begin with. The main reason for investing in doctoral training is to create highly skilled researchers who can contribute to innovation and productivity in society by entering public and private sectors outside academia—a goal that can only be achieved if a career outside academia becomes a natural choice for doctorate holders.

This again emphasises the need for institutions and policy-makers to implement initiatives that can ease the transition from an academic to a non-academic career.

Recommendations:

- *While unemployment rates for doctorate holders are in general low, the need for career opportunities outside academia is growing, prompting the need for institutions and policy-makers to move forward towards PhD programmes that secure candidates a broad set of skills applicable across a variety of sectors.*
- *There is a need to promote career perspectives and opportunities for doctoral holders. Institutions and policy-makers must continue to implement initiatives that can ease the transition from an academic to a non-academic career.*
- *Starting from admission HEI's should focus on employment opportunities for the doctoral candidate throughout the entire PhD education. This should be combined with more transparent information on the employability and career opportunities related to a PhD program for the doctoral candidate.*
- *Even if the employment rate is quite high compared to other societal groups, closer monitoring of the mismatch between Doctoral holders competencies and their job placement should be implemented, in order to ensure the true contribution to innovation;*
- *There is a specific need to identify and address the challenges faced by countries where PhD employability is low. Even though international mobility is in general encouraged it is important to be aware of and take specific measures against "brain drain" at both regional and national levels, for example through jobs outside academia or promotion of entrepreneurship.*

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2. PhD training opening to the non-academic world

The rising number of doctoral candidates across Europe, with more and more having to look outside academia for employment, strengthens the need for doctoral candidates to acquire more diversified skills as part of their training (transversal skills, transferrable skills, interdisciplinary).

2.1 Status according to data and examples of best practice

The purpose of this part of the report is to identify the extent to which initiatives aimed at enhancing the qualifications of doctoral candidates in the pursuit of a non-academic career (e.g. in the form of transferable skills training or career coaching) are found to be integrated into doctoral training across Europe.

The report by the European Commission, "Report of Mapping Exercise on Doctoral Training in Europe," of June 2011 outlines recent developments in doctoral training in Europe. The report refers to the European Commission's Principles for Innovative Doctoral Training, which state that doctoral candidates should be exposed to a variety of sectors and should be able to acquire transferable skills through training or work experience. This is in line with the Salzburg II recommendations, which state that "...doctoral training must increasingly meet the needs of an employment market that is wider than academia." The European Commission additionally urges European countries to achieve a common understanding of the principles and practice desired in order to qualify doctorate holders more effectively.

In order to reach the R&D target of 3 per cent of GDP by increasing the research intensity of the European economies, the European Commission states that it will require at least an estimated one million new research jobs. This means that a better matching of supply and demand is needed. Many European countries as well as American and Latin American countries have increased their intake of PhDs heavily the past 5-10 years.

Based on the European initiatives it seems that improving the use of transferable skills training is warranted. However, a look at specific countries in Europe shows variations in the extent to which transferable skills are being implemented as an integrated part of doctoral training.

Integration of transferable skills as an integrated part of doctoral skills

In France and Armenia, the employability of doctorate holders is being prioritised at a national level (Questionnaire France, Questionnaire Armenia). In France this is illustrated by the recent law on higher education and research of July 2013, paying particular attention to the employment of doctoral candidates (Questionnaire France). Policies promoting doctorate holders' employability in the private sector are also to be found in Belgium, where the Wallonia–Brussels Federation promotes access to jobs for doctorate holders by focusing on a broad “personal and professional development” perspective (PPD) rather than a narrow “employability” vision (Questionnaire Belgium). Another Belgian policy supporting the employability of doctorate holders is Action 20 of a law concerning “Partnership for researchers” (Questionnaire Belgium). The German questionnaire reveals a noticeably different view of researchers. Doctorate holders in Germany are considered to be future researchers and the aim is therefore mainly to qualify candidates for positions inside academia (Questionnaire Germany). In accordance with this there are no current national policy initiatives to strengthen the transferable skills of doctoral candidates. However it is worth noting that a doctorate in Germany has traditionally been considered a general qualification for executive positions outside academia as well.

There are numerous examples of ongoing initiatives at both national and institutional level across Europe that seek to equip doctoral candidates with transferable skills.

- Ghent University, for instance, offers seminars in transferable skills within the following categories: communication skills, research and valorisation, career management, and efficiency and leadership (European Commission, 2011: 32).
- The TCD–UCD Innovation Academy in Ireland is an interesting national initiative launched in 2010 by the Irish prime minister. It is a unified educational initiative that involves innovation alongside research and education (European Commission, 2011: 32).
- Another cross-institutional example is Vitae's Researcher Development Statement in the UK, where universities offer training in four different areas: knowledge and intellectual abilities, personal effectiveness, research governance and organisation, and engagement, influence and impact (European Commission, 2011: 34).

- The University of Vienna has an ongoing project with industry called UNIMIND. This seeks to improve collaboration between science, technology and industry by connecting industry with both doctorate holders and doctoral candidates (Questionnaire Austria).
- As a continuation of the LEADER transferable skills course jointly developed by Aarhus University and the University of Edinburgh, Aarhus University offers a transferable skills summer course for PhDs entitled "Research, career, and innovation: developing your future career as a PhD researcher."

Structured training

A basis for offering doctoral candidates transferable skills and enhancing their employability is the degree of structured training including credited coursework, supervision, change of academic environment, internationalization etc. offered to doctoral students. A structured doctoral programme is more likely to secure all students a set of skills at a particular standard than a non-structured programme. The MORE2 Higher Education Survey asked doctoral candidates to what extent they had received structured training in the course of their doctoral education. As an average, just over half of PhD candidates and recent PhD holders in the EU-27 member states, associated countries and candidate countries (referred to as the EU-33) received structured training during their PhD (52 per cent). The percentage of PhD candidates who received structured training during their PhD in the EU-33 varies between 35 per cent in Italy and 79 per cent in Norway, leaving room for improvement in most countries (Cheps 2012: 17). Being a survey, these numbers express a perception among students and not e.g. the actual extent of obligatory training.

Work experience during doctoral education

Creating ties with employers as part of regular doctoral education is another way to promote non-academic careers while simultaneously enhancing students' employability. In 2012 Vitae published the report "What do researchers want to do? The career intentions of doctoral researchers," which included survey material on people undertaking doctoral education in the UK. The study showed that most respondents undertaking study-related work experience as postgraduates (35 per cent overall) evaluated it very positively, even more highly than their undergraduate work experience. As many as 58 per cent described it overall as very helpful to their postgraduate study/research. In much the same way, 60 per cent of respondents rated their postgraduate study-related work experience overall as very helpful to their career and work choice. Among these respondents, as a result of their postgraduate work experience just under half (46 per cent) decided this was the sort of work they wanted to do, although 20 per cent realised that they needed further qualifications or training to do so. One in five of respondents (19 per cent) had been offered a job by their work experience employer.

The same report presents an analysis of the use of university careers services, showing that overall a quarter of respondents had used their university careers service during their doctoral programme. Unsurprisingly the level was higher (32 per cent) among those in their final year or third year of four than among first- or second-year respondents (19 per cent). When analysed by their current career intention, somewhat fewer of those seeking a long-term career in higher education teaching had used their careers service than respondents with

other career aspirations. Otherwise there was no significant evidence to suggest that those seeking careers outside research had used their careers services more than others, or vice versa.

One measure to increase awareness of knowledge gained in work experience during PhD training is to include information about the work experience in a diploma supplement describing the doctoral degree. The diploma supplement could likewise reflect additional transferable skills activity performed by the PhD candidate as part of the doctoral training. BFUG-WG Task 5 on transparency tools suggested working towards a better match of the Diploma Supplement information with the needs of the doctoral cycle.

Self-entrepreneurship in PhD training

Supporting entrepreneurship and promoting self – employment is one of the priorities mentioned in the Bucharest Communiqué by Ministers when committing on how to improve employability to serve Europe's needs.

In most countries where entrepreneurship is promoted, it is done for secondary education and for all levels of higher education including bachelors, masters and doctoral degrees as well as vocational education. However, there are also many examples of good practice in universities around the world (FUE, 2012a, b). The FUE reports describe many examples of entrepreneurial formation including some specifically aimed at doctoral candidates. Examples include the Centre for Entrepreneurial Learning at the University of Cambridge (United Kingdom), which undertakes postgraduate studies in entrepreneurship and specific courses for women researchers (EnterpriseWISE), or Tumentrepreneurship at the Technical University of Munich (Germany). At the latter, a selected group of master's and doctoral students are offered an entrepreneurial course involving an industrial partner, presenting new material from the students, to the company's benefit. The Universidad de la Laguna, Spain, organises the encounter "Spin-off, why not?" for doctoral students and researchers.

Essential to both entrepreneurship and the employment of doctorate holders is the creation of spin-offs. Many spin-offs are established in technology-based industries where doctorate holders are perceived as highly qualified and highly necessary employees. The creation of spin-offs is thereby closely linked to doctorate holders' employment rates. National governments as well as the European Commission strive to promote technology-based entrepreneurship. Universities, which are the principal source of spin-offs, often seek to promote these through science and technology parks. Examples of these are the Business Shuttle at the Universidad Pompeu Fabra (Spain), the Tut Innovation and Business Centre in the Tallinn University of Technology (Estonia), and the Centre for Entrepreneurship at the Technical University of Berlin (Germany). These centres support the birth and growth of university spin-offs and technology-intensive companies. Their facilities normally include specialised business preincubators and incubators. The research transfer offices at almost all universities are the meeting-point for research groups and companies. Their main activity consists of identifying research results, analysing their transfer potential, contract and patent management, etc.

2.2 General conclusions and suggestions for policy recommendations and suggestions for further investigation

The available data shows a tendency towards a general and increasing focus on enhancing the employability of doctoral candidates as an integrated part of their education through, for example, training in transferable

skills. There is however a clear variation across countries and institutions in how the issue is handled. Currently a number of interesting initiatives are being launched throughout Europe, and a lot can be gained by more consistent evaluation and exchange of knowledge and experience.

Recommendation:

- *The focus on employability as a necessary and weighty part of structured PhD programmes through, e.g., transferable skills training, collaboration with industries, placements during research training, career guidance, and a better use of diploma supplements for the doctoral cycle, where appropriate, in accordance with Task 5 of the BFUG-WG on third cycle must be a key priority in European doctoral education.*
- *Supervisor's role in supporting the structured training and career guidance should be encouraged*

3. Awareness of PhD holder competencies outside academia

It is generally considered that a better matching of supply and demand of doctorate holders' skills is needed to enhance their employability outside academia. Universities and national governments on the supply side share a responsibility with the public and private sector on the demand side to create an adequate and competent pool of doctoral candidates for recruitment.

3.1 Status according to data and examples of best practice for promotion of the agenda

Meeting the demands of the labour market is of course an obvious element in the employability of doctorate holders. Close interaction between enterprises (in the broader sense) and universities will give the universities the information and the tools needed to adapt and adjust to industry's needs. On the other hand there is also a lack of awareness on the demand side of how PhDs differ from holders of graduate degrees and of the added value of hiring the former over the latter. The survey carried out by Vitae in 2009 among UK employers, "Recruiting Researchers," shows that a majority of UK employers (73 per cent) would like to receive more applications from doctoral candidates. At the same time only a minority (31 per cent) of UK employers actually recruit doctoral candidates directly. Although this indicates a general acknowledgement of PhD competencies, it signals a lack of understanding of how doctoral graduates differ from other graduates, leaving room for more awareness among employers (Vitae 2009: 3).

People with a doctoral degree will often face the challenge of presenting their competencies and skills to industry and/or other employers outside academia.

A good model for how to promote awareness is the Vitae Researcher Development Framework for academic and personal competencies, which broadens the view of doctoral training as a research project so as to include the development of personal competencies.

The Framework is designed for:

- Researchers—to evaluate and plan their own personal, professional and career development
- Managers and supervisors of researchers—in their role of planning and providing support for the development of researchers, trainers, developers, human resources specialists and careers advisors
- Employers—to provide understanding of the blend of skills unique to researchers and their potential as employees.

Four domains capture the competencies that researchers need to attain in their approach to research when working with others and in contributing to the wider society and environment.

- Domain A: Knowledge and intellectual abilities
- Domain B: Personal effectiveness
- Domain C: Research governance and organisation
- Domain D: Engagement, influence and impact

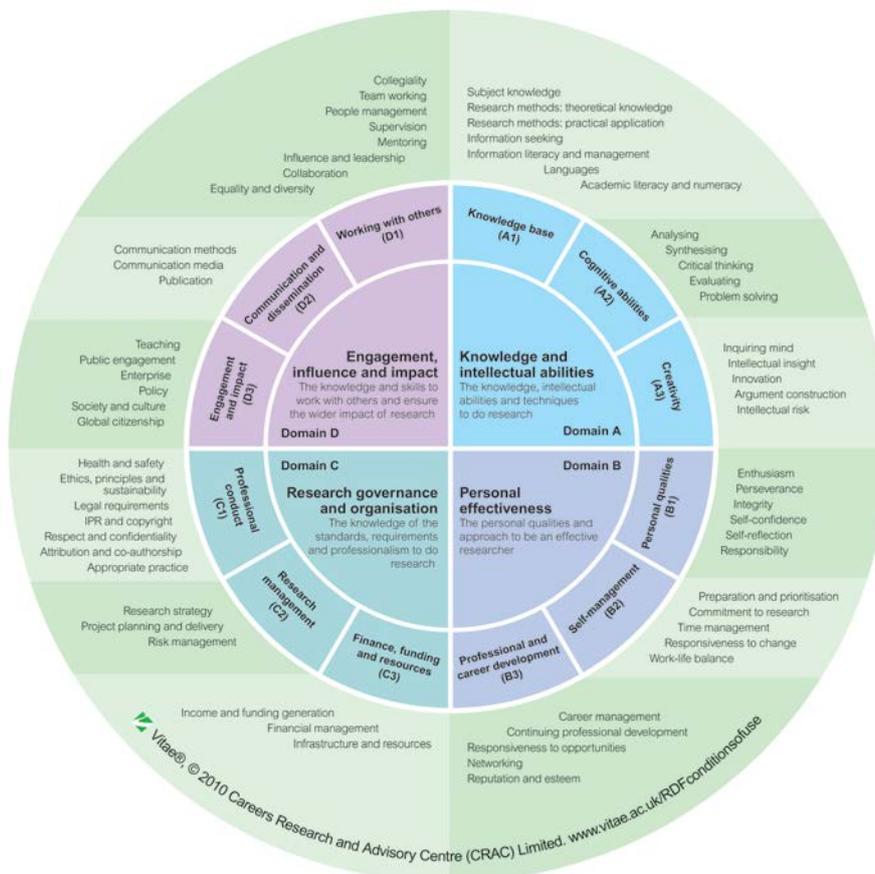


Figure 5: Researcher Development Framework, Vitae, 2010

A Danish report in 2012 by the Centre for Economic and Business Research for the Ministry of Higher Education on PhDs and productivity has analysed the link between hiring doctoral candidates and productivity in industry. The report concludes that doctoral candidates do indeed contribute to an increase in productivity (CEBR 2012). Publicising and promoting results like these among employers could be another way to increase awareness of doctoral candidates and their skills.

3.2 General conclusions and suggestions for policy recommendations and suggestions for further investigation

Finding ways of overcoming the lack of awareness of PhDs' competencies outside academia is a task both for universities, for doctoral students themselves and for national authorities, depending on the main features of the national HE system. Doctoral candidates sometimes find it difficult to identify and explain how they distinguish themselves from other candidates other than by their field of research. This is a theme that should be addressed throughout the doctoral training process, so as to give doctoral candidates a full understanding of their future career opportunities from the start of their education. At the same time, HEIs and enterprises should engage in a closer dialogue about how doctorates can contribute to innovation and development in a given company, about what are the expectations of the enterprise and how can a higher academic profile ensure forward looking company development strategy. The Vitae Researcher Development Planner provides a model of how to promote awareness among both researchers and industry.

Recommendations:

- *National Government should encourage HEIs in strengthening the transferable skills to be acquired during the PhD programme by paying more attention to them already in the programme development HEIs should support PhD mentors in ensuring that these skills are achieved by the candidates;*
- *There is a need to promote awareness in the labour market of how doctoral candidates can contribute to social progress, the advancement of the knowledge, innovation and productivity across sectors. This can be done through supportive actions, such as financial support, or through information campaigns, for example in collaboration with regional industries.*
- *The outcome of doctoral training should be not only a research project, but also a qualified researcher with a broad set of competencies within research, management, communication and creativity etc.*
- *A common framework for understanding and promoting competencies of doctorates across Europe should be further developed in order to meet the employment challenges of doctoral candidates*

4. Industrial PhDs and industry financing of doctoral education

The Salzburg Principles of 2005 specifically mention that institutions have the responsibility to provide—among other things—“career development opportunities” for their doctoral candidates. Many universities have, in line with this, strengthened their focus on collaboration with industry, seeking both funding and career perspectives for their students. The ARDE survey shows that many institutions cultivate close relations with private-sector partners through job fairs, internships or collaborative university–private-sector programmes.

Industrial PhD programmes

Good examples of university–private sector programmes are the CIFRE programme in France, CASE in the UK, PRODOC in Belgium, UNIMIND in Austria, and the industrial doctorates in Denmark and Sweden. These programmes not only provide career development in industry for the doctorate holders but also contribute to changing the perception of PhD training among employees and employers. These programmes also help overcome many medium and small businesses' reluctance to include university research and innovation in their business, often due to the non-representation of higher education in management.

The Danish industrial PhD is an industry-focused doctoral project conducted in cooperation between a private company, a PhD student and a university. The industrial PhD student is employed by a private company and the company applies for a subsidy from the Danish government. Approximately 10 per cent of Danish PhD students are enrolled in an industrial PhD. The cost and duration of PhD education may make it difficult to increase the level of enrolments in industrial PhDs.

A report on the Danish industrial PhD shows that industrial doctorate holders, unlike conventional PhDs, are typically recruited by the private sector. Close to 80 per cent of industrial PhDs are employed in the private sector. Among conventional PhDs, the rate is just under 50 per cent. Industrial PhDs are typically employed in industrial/manufacturing and business sectors, while most conventional PhDs are employed in education, health and public administration, as shown in Figure 6.

Figure 6 Sectoral employment 2010 by type of PhD

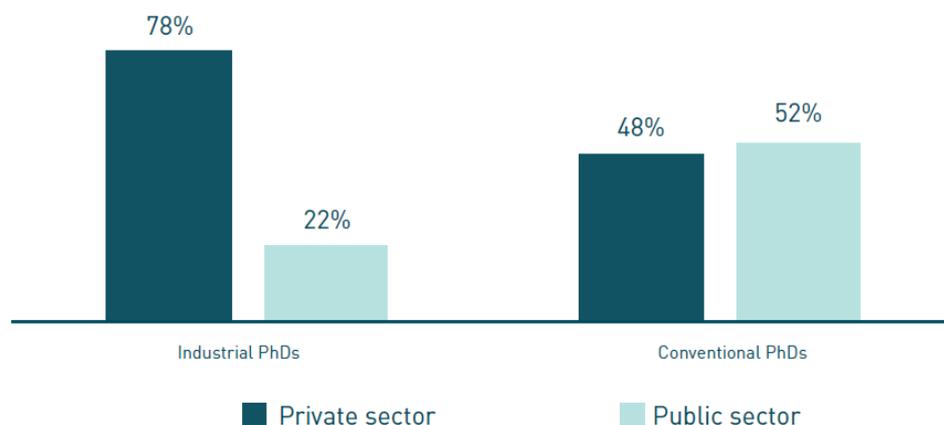


Figure 6: Sectoral employment 2010 by type of PhD

Notes: Public sector here includes public administration and services, public companies, and public quasi-companies. Sectoral employment is determined in accordance with the international guidelines in SNA (System of National Accounts. N (industrial PhDs) = 624, N (conventional PhDs) = 603. Oxford Research based on data from Statistics Denmark.

Reference: "The Effect of the Industrial PhD Programme on Employment and Income," 2013, Danish Agency for Science and Innovation, <http://fivu.dk/publikationer/2013/the-effect-of-the-industrial-phd-programme-on-employment-and-income>.

The data moreover show that most Danish industrial PhD holders (85 per cent in 2010) perform functions that require knowledge at the highest level, while 8 per cent hold positions in management. By comparison, conventional PhD holders are even more specialised, with 90 per cent performing a work function that requires knowledge at the highest level and only 5 per cent employed as managers. Thus completing an industrial PhD seems to slightly increase the likelihood of becoming a manager.

Almost all European countries support industrial doctorates, understood as research projects carried out within industry with a university supervisor or in collaboration between both organisations. As shown by the DOC-CAREERS project, universities enrolled in such programmes estimate that employment of their doctoral students is higher. Benefits for both industry and students are recognised in the surveys done by DOC-CAREERS. For students, the benefits lie in employability and in transferable skills; for industry, in the close relationship with innovation.

Other forms of collaboration with industry on PhD education

Today there is a large variety of forms of collaboration and co-funding by industry for PhD education. These forms may in some cases be less costly, and thus easier to promote, for private-sector companies.

Figure 7 below shows that collaboration with industries can take a variety of forms.

Outline of initiatives in collaborative doctoral programmes and their main characteristics

Initiative	Initiated by ...	Framework Drivers	Primary level of engagement
Individually-driven	Faculty member, professor, company employee, Bachelor/ Master graduate	Research Employability	Individual (with approval from partner organisations)
University-driven	A group of faculty members, a Rector, Vice Rector/s, a member of the administration, knowledge transfer body, groups of universities	Research Institutional profile – quality of doctoral education Employability of graduates Contribution to society	Organisational – relevant level (with commitment and support from individual professors, researchers, managers, etc.)
Industry-driven	CEO, Company Board, groups of companies	Access to Knowledge Access to Human Resources Business Competitiveness	
Government-driven	Local/Regional/National/EU Government Bodies and Agencies	Economic Development Social Benefit	
Jointly-driven	Any combination of the above	Synergy of drivers from partners	

Source: EUA DOC-CAREERS Project

Figure 7: Outline of initiatives in collaborative doctoral programmes and their main characteristics

Source: EUA, DOC-CAREERS project.

European funding opportunities encourage the university–industry relationship, as shown in the “People” Specific Program of the Seventh Framework Program (2007 to 2013) and “Horizon 2020—the Framework Program for Research and Innovation (2014–2020),” for example through the Marie Curie programme and the Principles of Innovative Doctoral Training.

Recommendations:

- *Industrial PhDs are a very effective means of increasing the proportion of PhD students employed in the private sector and should be promoted by national governments and institutions across Europe.*
- *The proportion of PhD students enrolled in an industrial PhD is expected to remain quite low, due to the cost and duration of training: therefore, industrial PhD programmes should not be a stand-alone strategy. Other initiatives to increase collaboration with industry in the conventional PhD education should be promoted.*

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