



DocEnhance
Deliverable 1.2

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Organisation responsible:
European Science
Foundation (ESF)

What comes after a PhD?

**Findings from the DocEnhance
survey of doctorate holders
on their employment
situation, skills match,
and the value of the doctorate**

6 December 2021



DocEnhance: Enhancing skills intelligence and integration into existing PhD programmes by providing transferable skills training through an open online platform



This project has received funding from the European Union's Horizon 2020 Science with and for Society programme under grant agreement no. 872483



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Project acronym:

DocEnhance

Project title:

“Enhancing skills intelligence and integration into existing PhD programmes by providing transferable skills training through an open online platform”

Grant agreement No: 872483

**Project funded by the European Commission
within the Horizon 2020 Programme**

Start date of project: 1 January 2020

Duration: 36 months

Deliverable No. 1.2

What comes after a PhD? Findings from the DocEnhance survey of doctorate holders on their employment situation, skills match, and the value of the doctorate

Due date of deliverable	30/06/2021
Submission date	06/12/2021
File Name	D1.2 Report on career tracking of PhD graduates
Organisation Responsible of Deliverable	European Science Foundation
Author name(s)	Julia Boman, Harry Beeson, Mabel Sanchez Barrioluengo, Mihaela Rusitoru
Revision number	01
Status	Final ¹
Dissemination Level	PU ²

¹ Document will be a draft until it is approved by the coordinator.

² PU: Public, PP: Restricted to other programme participants (including the Commission Services), RE: Restricted to a group specified by the consortium (including the Commission Services), CO: Confidential, only for members of the consortium (including the Commission Services).

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Revision History			
Version	Date	Modified by	Comments
0.1	12/10/2021	Julia Boman, Harry Beeson, Mabel Sanchez Barrioluengo, Mihaela Rusitoru (European Science Foundation)	Version for DocEnhance partners's review
0.2	20/10/2021	Robin Lucke and Tim Klinge (TUM), Maria Schina (AUTH), Hanne Johnsen and Leena Korsnes (UiT), Alexandra Bitusikova and Kamila Borsekova (UMB), Marisol Pastor (FUE), Alfredo Gardel and Ignacio Bravo (UAH), Heinz Grein (UM), Patricia Pinto and Elsa Caetano (UNL), Pavel Matejka (UCT)	Consortium feedback
0.3	8/11/2021	Anneleen Mortier (Ghent University, ECOOM), Rosemary Deem (Royal Holloway University of London), Inge van der Weijden (Leiden University), Eva Hnatkova and Iryna Degtyarova (EURODOC), Alexander Hasgall (CDE-EUA), Carolina Cañibano, (INGENIO, CSIC-UPV)	External expert review
0.4	06/12/2021	Julia Boman, Mabel Sanchez Barrioluengo, Mihaela Rusitoru, Colette Schrodi and Camelia Steinmetz (European Science Foundation)	Finalised version

Suggested citation:

Boman, J., Beeson, H., Sanchez Barrioluengo, M., and Rusitoru, M. (2021). What comes after a PhD? Findings from the DocEnhance survey of doctorate holders on their employment situation, skills match, and the value of the doctorate. Strasbourg: European Science Foundation (ESF)
Available at: <https://docenhance.eu>



ACKNOWLEDGEMENTS

Authors would like to thank the DocEnhance project partners for their participation in this survey, as well as the following individuals outside the project consortium for providing feedback and useful suggestions both on the questionnaire and the resulting report with the findings: **Dr. Nejc Berzelak**, the National Institute of Public Health, Slovenia; **Dr. Anneleen Mortier**, Ghent University (ECOOM); **Dr. Eva Hnatkova** and **Dr. Iryna Degtyarova**, European Council of Doctoral Candidates and Junior Researchers (EURODOC); **Dr. Inge van der Weijden**, Leiden University; **Dr. Alexander Hasgall**, Council for Doctoral Education, European University Association, of the DocEnhance Advisory Board; **Dr Carolina Cañibano**, INGENIO (CSIC-UPV), a mixed research institute of the National Research Council and the Polytechnic University of Valencia. We also particularly wish to thank **Emeritus Professor Rosemary Deem**, Royal Holloway University of London, for her constructive suggestions on the final draft of this report.

The financial support of the European Commission under the DocEnhance project is gratefully acknowledged.



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1. EXECUTIVE SUMMARY

1.1. MAIN OUTCOMES

Doctorate holders are mostly satisfied with their doctorate programmes

If making the decision again, more than six in ten of the PhD graduates surveyed would do the same doctoral training programme at the same institution. Fewer than one in ten would decide not to do any doctoral training programme. Doctorate holders reported good levels of satisfaction with most aspects of their doctorate programmes, although satisfaction with the support offered by programmes for pursuing academic and non-academic careers could be improved.

Doctorate holders quickly find employment after graduation both in and outside the academia although temporary contracts persist as a common (and unwelcome) situation

A large proportion of respondents had found a job by the time they graduated from their doctorate programme and most others found a job within three months of graduation. Unemployment was very low and lower than the average across the whole European Union workforce (3% compared to 7%).

The academic sector (universities and research organisations) remains the largest sector of employment for doctorate graduates, where most doctorate holders are employed as postdoctoral researchers, assistant or junior professors or research fellows. Slightly over half of the doctorate holders are working outside the academia in a variety of sectors as analysts, specialists, engineers, medical positions, and teachers.

Temporary contracts were relatively common, with one quarter of employed respondents in temporary employment. This is more than double the rate of the European Union workforce, although it is lower than the rates reported by several other similar surveys. The prevalence of temporary employment was driven by the large proportion of respondents employed in universities and research organisations, where temporary contracts were much more common than in other sectors (such as the private, government and healthcare sectors).

Over two thirds of employed doctorate holders were engaged in research, although more would like to be

Over two thirds of doctorate holders are engaged in research in their current jobs. Of those working in non-academic sectors only 31% were engaged in research. PhD graduates from agricultural sciences or natural sciences were most likely to be engaged in research while those who had studied humanities, or engineering and technology were least likely to be engaged in research. Those engaged in research in, and outside academia appear more satisfied overall with the various aspects of their job (e.g., autonomy and responsibility, prestige of the organisation, skills development, intellectual challenge associated with the job, etc.) than those not engaged in research activities. When asked what motivated them to pursue a non-research job, doctorate holders' responses clearly indicate that for many it was a "second best" choice.



Nearly half of doctorate holders work in jobs that do not require a PhD, especially those not in research positions

While doctorate holders largely work in jobs at least partially related to their doctorate, almost half of all respondents said that the minimum educational requirement for the position they were currently employed in was a Master's degree or lower. The requirement for a PhD was markedly higher for those engaged in research for their work, where it was required for a majority of respondents, compared to those that were not, where it was required by a small minority. Correspondingly, 'overeducation' was most prevalent outside of the university and research institution sectors, although it was not as extreme in the private sector as it was in the non-higher education, government and non-governmental sectors. However, while not required, PhD may be a "desired" degree and that doctorate holders have more interesting or demanding jobs and perform better in their jobs than those with lower qualifications would do. Evidence for this includes the high employment and short gaps between graduation and employment for doctorate holders as well as the significant proportion over two thirds of respondents agreeing that their doctorate had enabled them to progress towards their desired career.

Most doctoral programmes offer transferable skills training, although these tend to focus on academic skills

Approximately half of respondents to our survey said that their doctorate had mainly been achieved through individually supervised research with the rest undertaking structured training programmes, and three quarters were offered transferable skills training during their doctorate. For 24% of respondents, there were no training transferable skills offered at their university.

The skills training PhD holders received focused mostly on research and other academic skills. Overall, personal competencies such as critical-analytical thinking and problem-solving were rated highest among the most important competences acquired at doctorate completion and needed in the current job. Outside this group of skills/competences, doctorate holders rated their subject knowledge and methodology among the strongest skills at doctorate completion, and effective communication, team working and project management as most needed ones in the current job. Entrepreneurship and Intellectual Property related skills were by far least acquired and least needed out of all the skills listed.

The skills of doctorate holders upon graduation match the skills needed for employment, although skills (mis-)matches vary across the sectors of employment

Comparing the self-reported skills acquired by doctorate holders during their doctorate programme with those required for their current jobs revealed a reasonably strong match. As would be expected, the average skills (mis)-match between graduation and employment was smallest for those working in universities or research performing organisations. No single skill was associated with a great (mis)-match across all employment sectors. Instead, different skills gaps were prominent for different sectors. The variety in skills needs across different sectors suggests that universities seeking to improve transferable skills training should aim to target a broader set of skills. Currently, most skills training taken up by doctorate holders were focused



on academic skills (methodology, research valorisation, research ethics and integrity, teaching/mentoring/supervision, etc.). However, it was only those working in universities and research organisations that reported needing greater competence in these areas than had already been delivered by their doctorate programme. The skills (mis-)matches reported in the non-academic sectors consisted of doctorate graduates having greater research and broader academic skills than required for their job.

1.2. THE PERCEIVED IMPACT OF DOCTORATE

Survey respondents were asked a series of questions exploring different aspects of the impact they thought their doctorate had had on their career. Most respondents thought that their programme had made a difference to their career path and that it had enabled them to progress towards their desired career. A substantial majority also thought that their doctorate programme had contributed significantly to improving skills and competencies relevant to their career. There are however differences between those who are engaged in research in their current job and those who are not³, as well as across the various sectors of employment. Those in research jobs and those working in the academic and private sector are clearly more positive about the impact of the doctorate their career and about the added value of the doctorate (e.g., for the nature of tasks, salary, a better position in the labour market). Those in non-research positions, as well as those especially in the non-HE and to a lesser extent healthcare and government sectors were more negative about the added value and impact of the doctorate. Asked about the contribution of their doctorate programmes to specific aspects of their career and situation on the job market, however, respondents tended to report only moderate satisfaction.

The added value of the doctorate on careers was overall positive, but less so for those in non-academic, healthcare and government sectors

Almost two thirds of respondents agree that their programme had made a difference to their career path smoothing the transition to the first job after the doctorate, regardless of the career path chosen. In contrast, however, the aspects of doctorate programmes related to careers tended to be associated with the least satisfaction of doctorate holders. Only half of them were satisfied with the preparation provided by the doctorate programme to pursue an academic career and just a third were satisfied with the preparation to pursue a non-academic career.

The respondents also reported positive contributions to improved skills and competencies. There are however differences between those who are engaged in research in their current job and those who are not, as well as across the various sectors of employment. Those in research jobs

³ In our survey, respondents were asked the following question, "In your current main job are you engaged in research? The Frascati Manual defines researchers as professionals 'engaged in creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications'".

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and those working in the academic and private sector were clearly more positive about the impact and the added value of the doctorate, while those in non-research positions were more negative about these items. The rather negative scores in the non-HE sector should get special attention – this sector mainly employs 21% of all Humanities graduates as well as 6 % of Social Sciences graduates in our sample.

The content and structure of doctorate programmes exerts a clear influence on skills development

Doctorate holders who had received transferable skills training reported statistically significantly greater competence in 20 of 24 skills upon completion of their course than those who had not received such training. Other components of doctorate programmes that appeared to have a significant, but smaller, impact on skills development included collaboration with external organisations and international research stays during the PhD. Doctorate holders who had collaborated with an external organisation reported statistically significantly greater competence in 4 of 24 skills upon completion of their course than those who had not collaborated. Those who had conducted research abroad during their PhD reported statistically significantly higher competences in 6 of 24 skills. Although some of these could be explicitly linked to a stay abroad (such as improved intercultural skills), others were less obviously related.

Doctorate holders undertook their programmes with a mixture of career aspirations, but these were not the main motivation

Despite the focus of universities and policymakers on the employment prospects of doctorate holders, this was not the sole - or even principal - motivation for those undertaking doctoral programmes. The most common motivation for pursuing a PhD was interest in the research topic, which had motivated just over half of survey respondents. The next most common factors were a mix of career-focused motivations as well as reasons unrelated to careers, including the desire to work as a researcher in academia, the desire to work as a highly skilled expert and personal accomplishment. Wanting to work as a researcher outside of academia had motivated a minority of doctorate holders.

It will be critical to consider any measures introduced to improve the employability of doctorate holders in the context of these results. Doctorate holders may willingly take on jobs that do not require a PhD if they completed their studies for personal fulfilment rather than to improve career prospects, which will affect the impact of any measures aiming to reduce 'overeducation'. As there is relatively low proportion of doctorate holders who pursued their doctorate programmes specifically to become researchers in academia, this again strengthens the argument for universities aiming to provide doctorate programmes that prepare graduates for a wider variety of future careers.

1.3. RECOMMENDATIONS FOR DOCTORAL TRAINING INSTITUTIONS

Below we provide some possible recommendations for institutions in charge of doctoral training stemming from this survey.

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Provide transferable skills trainings covering more than just research and academic skills and work with supervisors on promoting these

More than half of doctorate graduates are employed outside the academia, where a broader set of skills is required. Yet, most of our respondents followed trainings focused on research and academic skills (subject knowledge, research methods, research ethics and integrity, research valorisation, etc.). The skills gaps for those working outside academia concerned mainly broader non-academic transferable skill groups (e.g., professional or management skills), indicating that universities should diversify training offer to include these categories of skills training courses.

Encourage skills development through different routes – formal skills training, collaboration and mobility during PhD as well as on-the-job training

Our survey demonstrates positive relationships between all these various routes of skills development and self-reported levels of skills attainment at doctorate completion. It is therefore important to support various forms of skills development (not just through e.g., courses), as these may prove to be complementary to help develop various sets of skills. As one quarter of respondents did not have a possibility to take any transferable skills training (or were not aware of these), it is important that institutions are able to offer such trainings to all doctoral researchers as well as raise awareness of the courses available and their importance for subsequent careers.

Collect information on doctorate graduates career destinations and skills utilisation through career-tracking surveys

Universities should invest in sustainable tools and methodologies to track their graduates (not just one-off surveys) and collect valuable information in their career destinations and skills usage, especially where no such data is collected at a national or European level. The DocEnhance career tracking survey has been helpful to start collecting such data for several DocEnhance partner universities in a coordinated fashion.

Collect information on the skills valued and needed in the various employment sectors and in various types of jobs

Our survey clearly showed that skills deficiencies varied across the various non-academic sectors of employment. Therefore, it would be advisable for universities to collect information on the skills needs of the various relevant employment sectors and types of jobs (e.g., available studies and surveys of employers, university networks with non-academic employers of doctorate graduates, joint events and meetings with local and regional employers, etc.). The DocEnhance online consultation of employers, that complemented our PhD graduates' survey as well as stakeholder workshops with various organisations employing doctorate holders, is likely to provide some data in this regard.



Provide informed career advice early in the doctoral training, with more targeted approach for some groups

The findings from this report indicate that those heading for non-academic careers feel overall less prepared for the job transition than those who remain in academia and are also less positive about the added value of the doctorate to their career. It is important that university career centers offer professional advice targeted at PhD researchers (e.g. using career advisors with relevant science background and experience outside academia), at the start of their training, to help them develop a good understanding of the possible career paths and prepare relevant training plans. Using available information on potential career destinations, university career centers (or similar) could for instance also map out several main career paths for the various fields and disciplines, and associated skills sets required. This can be done in collaboration with local and regional stakeholders and potential employers. Dedicated career advice for the doctoral researchers in the various fields of research might be needed.

Promote transferable skills strategically depending on the desired career path and help doctoral researchers build their skills portfolios

Offering transferable skills trainings depending on the PhD career plans should also be accompanied with support for building skills portfolios of the doctoral candidates that may help them to make their skill-sets visible and understandable to potential employers outside the academia, who may not always be aware of the content of the doctoral training or doctorate added value.

Encourage collaborations with non-academic partners during PhD to develop skills and increase employability prospects

Collaborations with other organisations, academic or non-academic, may strongly determine or impact future career destinations. In our survey, this is particularly true for collaborations with the private sector, whereby the vast majority of those who collaborated with a private sector organisation during their PhD ended up working in the private sector. However, collaborations with firms and other non-academic sector organisations are still much less common than those with universities or research organisations. Therefore, further support and promoting collaborative education and exposure to industry and other non-academic organisations should remain high on the agenda of HEIs.



2. INTRODUCTION

This report presents a career-tracking survey of recent PhD graduates from nine European universities, undertaken as part of the DocEnhance project.⁴ The DocEnhance project's overall aim is to integrate transferable skills development into existing PhD programmes, to improve PhD graduates' transferable skills, by:

- involving the non-academic sector in developing a more employment- and innovation-oriented transferable skills curriculum for PhD programmes;
- facilitating work-based learning and business-education partnerships through developing PhD courses; and
- tracking PhD graduate career paths.

As the third major element of the DocEnhance project, the career-tracking survey is intended to inform the transferable skills curriculum recommended by the project, as well as the roadmap for making use of the resources developed over the course of the project. The definition of transferable skills adapted to the research context is borrowed from the ESF Member Organisations Forum report (2009) titled "Research Careers in Europe – Landscapes and Horizons":

Transferable skills are skills learned in one context (for example research) that are useful in another (for example future employment whether that is in research, business etc). They enable subject- and research-related skills to be applied and developed effectively. Transferable skills may be acquired through training or through work experience⁵.

2.1. DOCTORATE-HOLDERS CAREER TRACKING

The number of PhD holders graduating from doctorate programmes is increasing each year, with a growth of around 8% recorded across OECD countries between 2013 and 2017.⁶ In addition to this, PhD graduates are increasingly moving into careers outside of the higher education sector, which has traditionally been place where graduates have been concentrated.⁷ Given the significant investment of time and money, from both individuals and governments or other funding bodies, involved in doctorate programmes, there is therefore growing policy interest in the outcomes of these doctorate holders in the labour market.⁸

⁴ For more information about the DocEnhance project, see: <https://docenhance.eu>

⁵ European Science Foundation, [Research Careers in Europe – Landscapes and Horizons: A report by the ESF Member Organisation Forum on Research Careers](#) (Strasbourg: ESF, 2009), 13.

⁶ OECD, [Education at a Glance 2019](#) (Paris: OECD Publishing, 2019), 248.

⁷ OECD, [Education at a Glance 2019](#) (Paris: OECD Publishing, 2019), 254.

⁸ OECD, [Education at a Glance 2019](#) (Paris: OECD Publishing, 2019), 71.

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Although the number of doctorate holders is growing, this group still makes up only a small proportion of the labour force (1% of the population across OECD countries in 2020).⁹ This makes it difficult to compile comparative information on the careers of doctorate holders using statistical measures of the whole labour force.¹⁰ Instead, initiatives focusing on doctorate holders specifically have aimed to gather this data. The European Commission's Expert Group on graduate tracking has identified several purposes for graduate tracking initiatives:

- to strengthen career guidance for prospective students, current students and graduates;
- to support the design and updating of curricula to improve the acquisition of relevant skills and employability;
- to improve skills matching so as to support competitiveness and innovation at the local, regional and national levels, and to resolve skills shortages;
- to plan for and forecast evolving employment, educational and social needs; and
- to contribute to policy development at both national and EU levels.¹¹

Other benefits can include evaluation of the economic benefits to society and individuals of investing in doctorate training programmes and exploration of the factors that influence graduates' careers (depending on the information covered in tracking initiatives).

The OECD's Careers of Doctorate Holders initiative has sought to collect and compile data on the labour market, career path and mobility of doctorate holders since 2004.¹² However, the latest available data from this initiative was published in 2017. The OECD has additionally warned that the "results have to be interpreted with caution as data submitted by countries are based on a combination of multiple data sources" (OECD, 2019).

In the USA, the Survey of Doctorate Recipients has collected demographic and employment information on US-trained doctoral scientists and engineers every two years since 1973.¹³ Each survey involves a sample of around 120,000 doctorate holders representative of the overall population of over 1 million individuals. In contrast, Europe has not had comprehensive, regular surveys of its doctorate population. In 2019, the European University Association reported that although European universities were increasingly collecting data about their PhD graduates'

⁹ OECD, *Education at a Glance 2020* (Paris: OECD Publishing, 2020), 50.

¹⁰ OECD, *Education at a Glance 2019* (Paris: OECD Publishing, 2019), 71.

¹¹ European Commission Expert Group on Graduate Tracking, *Towards a European graduate tracking mechanism* (Luxembourg: Publications Office of the European Union, 2020), 9.

¹² OECD, OECD work on careers of doctorate holders (Paris: OECD Publishing, 2019). Available at: <https://www.oecd.org/innovation/inno/careers-of-doctorate-holders.htm#latest-data>

¹³ US National Science Foundation, *Survey of Doctorate Recipients* (2019), accessed 24 June 2021.

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career pathways, under half tracked the careers of doctorate holders from at least most of their doctoral programmes and 26% did not track their PhD graduates' careers at all.¹⁴

The DocEnhance career-tracking survey was therefore designed to gather information on several aspects of the population of PhD graduates from the eight universities involved in the project, and by extension the wider population of individuals with PhDs from universities across Europe, including:

- the careers pursued by PhD graduates following their studies (covering aspects such as the sector of employment, the qualifications required, the type of contract, etc.);
- the structure of doctorate programmes and the training provided;
- the motivations for those undertaking doctorate programmes and the satisfaction with those programmes as well as with subsequent careers;
- the skills developed during doctorate programmes, compared with the skills required in subsequent careers; and
- the mobility of doctorate holders between different employment sectors and different countries.

The survey responses were analysed for the whole cohort as well as broken down into different groups, for example categorised by gender or employment sector, to provide further insights.

The survey built upon the European Science Foundation's '2017 Career Tracking Survey of Doctorate Holders' and 2014 'Career Tracking of Doctorate Holders' pilot study.¹⁵ In particular, the current survey expanded on the 2017 survey with new questions focusing on transferable skills training, satisfaction with PhD courses, collaboration with external organisations during the PhD and intersectoral mobility during the career. This survey included participants from universities involved in the 2017 survey (Maastricht University and the Technical University of Munich) as well as universities new to this survey (the Arctic University of Norway, the Aristotle University of Thessaloniki, NOVA University Lisbon, Matej Bel University, the University of Alcalá, the University of Sassari and the University of Chemistry and Technology in Prague).

¹⁴ European University Association Council for Doctoral Education, [Doctoral education in Europe today: approaches and institutional structures](#) (Geneva: EUA-CDE, 2019), 19.

¹⁵ European Science Foundation, *Career Tracking of Doctorate Holders* (Strasbourg: ESF, 2015) and European Science Foundation, [Career Tracking of Doctorate Holders](#) (Strasbourg: ESF, 2014).
[What comes after a PhD? Findings from the DocEnhance survey of doctorate holders on their employment situation, skills match, and the value of the doctorate](#)



3. PROJECT PARTNERS

3.1. ARCTIC UNIVERSITY OF NORWAY, TROMSO

Established in 1968, the Arctic University of Norway (UiT) is the third largest university in Norway and the northernmost university of the world. With 17,000 students and 3,700 staff, UiT is a medium-sized research university that contributes to knowledge-based development at the regional, national and international level. It is a founding member of the University of the Arctic, an international network of 160 study and research institutions of the circumpolar region. Despite its focus on Northern issues, UiT has eight faculties offering a broad range of study programmes, covering all classical subject areas from Health Sciences, Social Sciences, Education and Humanities, Science and Technology to Economics, Law, Social Work, Tourism, Sports and Fine Arts. Teaching is research-based at all levels, and research education is offered in all of UiT's main research areas. UiT has an average population of 950 PhD candidates and a special focus on PhD training through the High North Academy, an academy for providing transferable skills courses for researchers at all career stages. Around 110 PhD degrees are awarded each year.

3.2. TECHNICAL UNIVERSITY OF MUNICH, GERMANY

Technical University of Munich (TUM) was founded in 1868 and is currently the highest-ranking technical university in Germany. Currently, TUM has more than 45,000 students of which 34% are from abroad. Among its more than 8,500 doctoral candidates, the share of internationals is as high as 29%. In 2020, the university awarded more than 1,080 doctoral degrees. The departments and Schools at TUM focus on the research areas Engineering & Design, Computation, Information & Technology, Life Sciences, Natural Sciences, Medicine & Health, Management as well as Social Sciences.

TUM is committed to excellence in research and teaching, interdisciplinary education and the active promotion of promising young scientists. The university also forges strong links with companies and scientific institutions across the world. TUM was one of the first universities in Germany to be named a University of Excellence.

3.3. ARISTOTLE UNIVERSITY OF THESSALONIKI, GREECE

Aristotle University of Thessaloniki (AUTH) is the largest Higher Education Institution in Greece and Southeastern Europe, with 13 faculties and a total of 42 departments and four independent Schools. It has around 75,310 undergraduates and 129,000 graduate students, of which around 4,500 are following doctorate programmes. The university was founded in 1925 with an initial focus on the humanities but has since expanded to cover a wide range of subjects including science, agriculture, law, medicine, theology, modern languages, art, physical education and journalism. AUTH participates in International Organizations, Unions and University Networks, coordinates and implements Bilateral Agreements between the AUTH and universities all over the world, as well as implements the European Policy of the Aristotle University of Thessaloniki through the Erasmus+ programme and various other European Educational Programmes (Erasmus Mundus, Erasmus+ International etc.). The UNESCO Chair on Education for Human Rights, Democracy and Peace, the UNESCO Chair and International Network of Water-

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Environment Centers for the Balkans and the UNESCO C2c Center for Integrated Water Resources Management play an integral role in continually advancing the prestige of the Aristotle University of Thessaloniki.

3.4. MAASTRICHT UNIVERSITY, THE NETHERLANDS

Established in 1976, Maastricht University (UM) is the most international university in the Netherlands and, with more than 20,000 students (half of which are foreign students) and 4,400 employees, is still growing. The university stands out for its innovative education model, international character and multidisciplinary approach to research and education. Around 300 PhD degrees are awarded each year. Maastricht University has six faculties: Faculty of Arts and Social Sciences, Faculty of Health, Medicine and Life Sciences, Faculty of Science and Engineering, Faculty of Law, Faculty of Psychology and Neuroscience, and School of Business and Economics. Maastricht University is a research university where fundamental and applied research are inextricably linked with education and educational innovation. The university has defined a set of core values that serve as key principles for the conduct and attitude of staff and students: realise social impact, create value, encourage dialogue, nourish initiative and work from intrinsic curiosity.

3.5. NOVA UNIVERSITY LISBON, PORTUGAL

Founded in 1973, NOVA University Lisbon (NOVA) is a public university that has adopted since its inception an innovative multidisciplinary model in the Portuguese university context. NOVA has been developing its activities across a broad range of areas from engineering and technology to humanities, medicine, health and life sciences, economics, social sciences, law, and information and data science, with the mission to serve society through knowledge and education on a local, regional and global level. The university has nine academic units, more than 20,000 students and 1,800 teaching staff and researchers, and over 2,500 international students from 109 nationalities enrolled in its programmes. In the last six years, there were 1455 PhD graduates, with 248 PhD graduates in 2015, 300 in 2016, 214 in 2017, 256 in 2018, 264 in 2019 and 173 in 2020.

NOVA is a global and civic University. Global because its teaching and research is absolutely international in its quality, agendas and partners; and civic, because it is deeply committed to the development of society, culture and economy of the Greater Lisbon region, of the country, of Europe and also of the Portuguese-speaking countries to which we are connected throughout centuries of common history. Delivering high quality teaching that assures the preference of employers and the success of graduates in the job market is a key priority for NOVA, together with the development of top-notch research that contributes to tackle major societal challenges in line with the United Nations Sustainable Development Goals. The recognition of this quality, both in teaching and research, guarantees the presence in prestigious international rankings, and the participation in networks such as UNICA, YERUN, EUA and CESAER. NOVA is the Portuguese university with the best performance in the Horizon 2020 Programme, boasting a track record of 20 ERC grants awarded to its researchers.



3.6. MATEJ BEL UNIVERSITY, BANSKÁ BYSTRICA, SLOVAKIA

Established in 1992, Matej Bel University (UMB) is a public university that provides high quality university and further education and performs excellent research in a number of research areas. The university is the first Slovak institution to be a holder of the 'HR Excellence in Research' award granted by the European Commission. It is a member of numerous international university networks (including the European University Association) and signatory of contracts and agreements with more than a hundred institutions all over the world.

The university offers a range of university education opportunities at all three levels and forms of studies in the areas of education, social studies and humanities, economy, natural sciences, law, political studies, international relations and diplomacy. Around 65 PhD degrees are awarded each year. Research – both basic research and partly applied research – is performed in all research fields. The university is successful in national and international grant schemes including European Structural Funds. UMB has been successful in FP7 and H2020, particularly in the social sciences and humanities, and has an ambition to be the best Slovak university for social science and humanities international research collaboration.

3.7. UNIVERSITY OF ALCALÁ, SPAIN

The University of Alcalá (UAH) is a public university located in the historic city of Alcalá de Henares, 30 kilometers from Madrid. The University has about 28,000 students, 2,000 teaching staff and 800 service and administration staff. Its three campuses (the Historic, the Science and Technology and the Guadalajara Campuses) play home to 40 undergraduate degree programs, 78 official postgraduate programs and a broad offer of lifelong training courses in all fields of knowledge. Around 200 PhD degrees are awarded each year.

The UAH can trace its origin as far back as 1293 and the medieval Studia Generalia. In 1499, Cardinal Cisneros founded the College of St Hildephonse with a view to creating a prototype university city which would act as a model for others in Ibero-America. Its unique university model and the conservation of its rich architectural and artistic heritage led to its declaration as World Heritage by UNESCO in 1998. The University of Alcalá is also a world benchmark for the teaching of Spanish language and culture. Not for nothing is its historic Paraninfo or assembly hall, the stage for award ceremonies of the stature of the Cervantes Prize for Literature in Spanish.

3.8. UNIVERSITY OF SASSARI, ITALY

The University of Sassari was founded in the year 1562. It is headquartered in the city of Sassari, having units also in Alghero, Olbia, Nuoro and Oristano (Sardinia, Italy). Today, it has over 13,000 students and around 650 scholars. It consists of 10 Departments, covering both the humanistic and the scientific area. It offers 60+ institutional courses and a wide range of post-graduate studies and research activities, including PhD courses, medical specialisation schools, advanced training programs and international exchange projects. Indeed, the University of Sassari is in the top three Italian universities in terms of international programmes involving students exchanges.



The university has more than 40 interdisciplinary research centres and 12 libraries, with about 830,000 books and monographs and more than 44,000 paper and electronic journals. The University has many Departments and centralized laboratories, a human hospital, an animal hospital, 3 research farms, a business incubator and many other facilities that can be used by students of any level.

The PhD School of the University of Sassari is composed by 12 PhD Programmes, of which several are included in national and international consortia. It currently has 260 PhD students: about 24% are foreigners (from 15 different countries) and 53% are women. About 20% of the doctoral PhD positions are developed in collaboration with private companies. Over several past years, it offered about 90 new positions with scholarship per year and awarded about the same number of PhD degrees.

3.9. UNIVERSITY OF CHEMISTRY AND TECHNOLOGY IN PRAGUE, CZECH REPUBLIC

Founded in 1952, with its roots going back to the beginning of 19th century, the University of Chemistry and Technology in Prague (UCT Prague) is a natural centre of first-rate study and research in the area of chemistry in the Czech Republic. It is one of the country's largest educational and research institutions focused on technical chemistry, chemical and biochemical technologies, material and chemical engineering, food chemistry, and environmental studies.

UCT Prague has more than 900 staff members and over 4,000 students (almost 800 PhD candidates included). Each year, more than 80 PhD degrees are awarded. UCT Prague cooperates with more than 180 universities and institutions worldwide. PhD candidates work closely with their advisors on their dissertation topic, assisting with research projects conducted at UCT Prague in addition to completing any required coursework. The UCT Prague doctoral experience also includes opportunities for teaching and, of course, writing and defending a doctoral dissertation related to their research project.



4. METHODOLOGY

4.1. TARGET POPULATION AND SAMPLING

The target population of the DocEnhance Career Tracking Survey of Doctorate Holders were doctorate holders who obtained their degree in the last five years, that is, over the period between 2016 and 2020 including PhD graduates from the nine participating universities in nine different countries. Each university identified the doctorate holders over this period and established a list of individuals eligible to participate in the survey.

The survey aimed to collect data from all doctorate holders in the target population and therefore uses a census-like approach without any specific statistical sampling. The main advantage of this approach includes the possibility of obtaining information from a larger number of respondents and the absence of statistical and technical issues related to sample selection. However, because not all doctorate holders in the target population were reached and/or responded to the survey, we can still refer to participating individuals as the sample of doctorate holders.

4.2. QUESTIONNAIRE DEVELOPMENT

The questionnaire was developed by ESF, the partner organisation responsible for the DocEnhance Career-tracking Survey and built on the questionnaire used in the ESF Career-tracking study conducted in 2017. The current questionnaire was further developed to adapt to various career paths of the doctorate working in and outside the academia and to explore the aspects related to the skills training. The list of skills was enlarged and clustered based on results of the DocEnhance project activities (e.g., skills prioritisation workshops, brainstorming and group work at the project kick-off meeting) and discussions.

The questionnaire was in English and included seven sections: 1) doctorate education, 2) skills and competencies, 3) transition from doctorate to the first or next employment, 4) employment situation and related career experience, 5) intersectoral mobility, 6) geographical mobility and 7) demographics.

Several early drafts of the questionnaire were reviewed by the representatives of the DocEnhance partner organisations. In addition, the following international experts and representatives of stakeholder organisations provided their valuable feedback on the questionnaire:

- **Dr. Nejc Berzelak**, the National Institute of Public Health, Slovenia (formerly head of the Centre for Social Informatics, University of Ljubljana)
- **Dr. Mabel Sanchez Barrioluengo**, the Alliance Manchester Business School, University of Manchester
- **Dr. Anneleen Mortier**, Ghent University (ECOOM)
- **Dr Carolina Cañibano**, INGENIO (CSIC-UPV), a mixed research institute of the National Research Council and the Polytechnic University of Valencia, Spain



- **Dr. Alexander Hasgall**, Council for Doctoral Education, European University Association, member of the DocEnhance Advisory Board
- **Dr. Eva Hnatkova** and **Dr. Iryna Degtyarova**, European Council of Doctoral Candidates and Junior Researchers (EURODOC)

The online questionnaire included skip logic, and the number of questions varied from 30 to 62 questions depending on the profile of the respondent (employed/unemployed, researcher/non-researcher, etc.) The questionnaire took from 10 to 20 min to complete. Only a few of the questions were obligatory, to facilitate the collection of basic characteristics of respondents / profiling variables / for subsequent analysis.

4.3. DATA COLLECTION AND SURVEY PARTICIPATION

The survey was launched on 9 March 2021 using the SurveyMonkey service for web surveying. Data collection was carried out for a period of five weeks (until 16 April). Participating universities sent out invitations to their doctorate graduates with a link to the online survey, with reminders sent one week and two weeks after the initial invitation. In addition, some data collection took place using social media channels.¹⁶

The survey collected **2,217 valid responses** (i.e., where consent was provided and at least one question answered)¹⁷, which represents **23% of the target population**, that is, all those who received the survey invitation (sample size) and represents 21% of all graduates of the real objective population. In general, the responses are representative of the population of doctorate holders for the majority of universities at 5% significance level, with the exception of Maastricht University, Matej Bel University, University of Alcalá and UCT Prague, and therefore the results should be treated with caution.

The survey completion rate across all participating organisations was 80%, i.e., about 80% of all those who started filling out the survey reached the end of the questionnaire. All respondents who started the questionnaire were included in the analyses of this report.

¹⁶ An additional question was included in this case asking respondents for the university where they graduated.

¹⁷ 22 valid answers from social media data.

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Table 1: Participating institutions

	PhD graduates (2016-2020) -Obj. population-	E-mails sent -Target population -	Responses	Participation % of contacts Response rate	Participation % of all graduates
Arctic University of Norway	593	580	123	21%	21%
Technical University of Munich	5360	4728	1128	24%	21%
Aristotle University of Thessaloniki	1442	165	28	17%	2%
Maastricht University	1088	1088	201	18%*	18%
NOVA University Lisbon	1207	1207	311	26%	26%
Matej Bel University	337	291	92	32%*	27%
University of Alcalá	1047	790	90	11%*	9%
University of Sassari	430	425	120	28%	28%
UCT Prague	406	406	124	31%*	31%
Total	11910	9680	2217	23%	21%

* They significantly differ (chi-square $p < 0.05$) when compared to the overall response rate (23%) of the other universities in our sample.

4.3.1. Arctic University of Norway

Between January 2016 and December 2020, 593 PhD holders graduated from the Arctic University of Norway. Of these, the University had email contact details for 580. Emails inviting graduates to participate in the survey were sent to these 580 addresses. No-one responded to explicitly opt out of participating in the survey and 14 e-mail addresses bounced due to an invalid address or another technical reason, such as a full mailbox. A total of 123 doctorate holders from the Arctic University of Norway participated in the survey, which represents 21% of graduates with obtainable contact information and 21% of all graduates in the organisation's target population. The questionnaire was validly returned by 123 respondents, corresponding to 21% of the individual university target.



4.3.2. Technical University of Munich

Between January 2016 and December 2020, around 5,360 PhD students graduated from the Technical University of Munich. Of these, the University had email contact details for 4,728. Emails inviting graduates to participate in the survey were sent to these 4,728 addresses. Sixteen responded to explicitly opt out of participating in the survey and around 170 e-mail addresses bounced due to an invalid address or another technical reason, such as a full mailbox. A total of 1,128 doctorate holders from the Technical University of Munich participated in the survey, which represents 24% of graduates with obtainable contact information and 21% of all graduates in the organisation's target population. The questionnaire was validly returned by 1128 respondents, corresponding to 24% of the individual university target.

4.3.3. Aristotle University of Thessaloniki

The average number of PhD graduates/year during 2016-2020, was 290. A total of 1442 PhD graduated from Aristotle University of Thessaloniki during the period between September 2015 to August 2020. The contact data is unfortunately not kept centrally, whereby each Department handles their graduates and usually no contact is kept after graduation in a systematic fashion. The university email address does not function after graduation. Therefore, it was not feasible to implement the survey centrally, via the University Administration and to overcome this barrier, info email/invitation was sent to professors known in person by the members of the project's team, with the request to forward it to their PhD graduates. Around 33 emails have been sent, where each of them was forwarded to approximately 5 graduates, resulting in an overall estimate of 165 emails sent. Additionally, the link to the survey was published on the University's website. This data collection method did not prove to be efficient, and the questionnaire was validly returned by 28 respondents.

4.3.4. Maastricht University

Between January 2016 and December 2020, 1088 PhD students graduated from Maastricht University. Emails inviting graduates to participate in the survey were sent to all 1088 graduates. One responded to explicitly opt out of participating in the survey and 15 e-mail addresses bounced due to an invalid address or another technical reason, such as a full mailbox. A total of 201 doctorate holders from Maastricht University participated in the survey, which represents 18% of graduates in the organisation's target population. The questionnaire was validly returned by 201 respondents, corresponding to 18% of the individual university target.

4.3.5. NOVA University Lisbon

Between January 2016 and December 2020, 1207 PhD holders graduated from NOVA University Lisbon. An administrative error meant that emails were sent to holders who had graduated between January 2015 and December 2015 as well as to those who graduated between January 2016 and December 2020. This amounted to 1453 graduates, composed of the 1207 target graduates plus 246 who graduated a year earlier (the latter were excluded from the analyses). Of the 1453 total graduates contacted, two responded to explicitly opt out of participating in the survey and 124 e-mail addresses bounced due to an invalid address or another technical reason, such as a full mailbox. Using respondents' self-reported year of graduation from the survey to filter responses, a total of 311 doctorate holders from the target population from NOVA University



Lisbon participated in the survey, which represents 26% of graduates in the organisation's target population. The questionnaire was validly returned by 311 respondents, corresponding to 26% of the individual university target.

4.3.6. Matej Bel University

Between January 2016 and December 2020, 337 PhD holders graduated from Matej Bel University. Of these, the University had email contact details for 291. Emails inviting graduates to participate in the survey were sent to these 291 addresses. Eight responded to explicitly opt out of participating in the survey and 17 e-mail addresses bounced due to an invalid address or another technical reason, such as a full mailbox. A total of 92 doctorate holders from Matej Bel University participated in the survey, which represents 32% of graduates with obtainable contact information and 27% of all graduates in the organisation's target population. The questionnaire was validly returned by 92 respondents, corresponding to 32% of the individual university target.

4.3.7. University of Alcalá

Between January 2016 and December 2020, 1,047 PhD students defended their thesis at the University of Alcalá. Of these, the University had email contact details for 790. Emails inviting graduates to participate in the survey were sent to these 790 addresses. Thirteen responded to explicitly opt out of participating in the survey and 284 e-mail addresses bounced due to an invalid address or another technical reason, such as a full mailbox. A total of 90 doctorate holders from the University of Alcalá participated in the survey, which represents 11% of graduates with obtainable contact information and 9% of all graduates in the organisation's target population. The questionnaire was validly returned by 90 respondents, corresponding to 11% of the individual university target.

The relatively low response rate for the University can partly be explained by the fact, that the email addresses were recorded at the beginning of the university coursework and were not updated in during subsequent years. After the PhD completion, graduates may have changed their personal email. Moreover, the university email address is deleted one or two years after the end of the study. This means that if the email recorded in the database for contacting students was the university one, it was not possible to reach them.

4.3.8. University of Sassari

Between January 2016 and December 2020, 430 PhD students graduated from the University of Sassari. Of these, the University had email contact details for 425. Emails inviting graduates to participate in the survey were sent to these 425 addresses. No-one responded to explicitly opt out of participating in the survey and one e-mail address bounced due to an invalid address or another technical reason, such as a full mailbox. A total of 120 doctorate holders from the University of Sassari participated in the survey, which represents 28% of graduates with obtainable contact information and 28% of all graduates in the organisation's target population. The questionnaire was validly returned by 120 respondents, corresponding to 28% of the individual university target.



4.3.9. University of Chemistry and Technology, Prague

Between January 2016 and December 2020, 406 PhD students graduated from the University of Chemistry and Technology, Prague. Emails inviting graduates to participate in the survey were sent to all 406 graduates. No-one responded to explicitly opt out of participating in the survey and 51 e-mail address bounced due to an invalid address or another technical reason, such as a full mailbox. A total of 124 doctorate holders from UCT Prague participated in the survey, which represents 31% of graduates in the organisation's target population. The questionnaire was validly returned by 124 respondents, corresponding to 31% of the individual university target.

4.4. DATA PROTECTION ARRANGEMENTS

PhD graduates invited to participate in the survey were sent an informed consent form setting out the purpose of the study, the format of the survey, the sorts of questions that would be asked and the selection criteria for those invited to participate. It was made clear that participation was voluntary, that participants could choose to answer as many or as few questions as they wished, and that consent could be withdrawn at any time. Contact details for the study coordinators (the European Science Foundation) were provided so that prospective participants could ask any further questions they had about the survey.

The only personal data collected by the survey were participants' year of birth, gender and citizenship (for those who chose to answer these questions). This information was used only for statistical analysis of aggregate trends. Participants were also asked if they would agree to potentially being contacted again for follow up surveys in the future. The contact data of those who consented was processed and stored separately from the survey data.

The European Science Foundation appointed a data protection officer for the study, who was responsible for ensuring that personal data collection and processing in the frame of this survey was carried out according to EU and national legislation.

4.5. NOTES ON ANALYSIS

4.5.1. Notes on analyses and the survey dataset

While each partner organisation received their own report and data for its cohort of doctorate holders, this report provides a general overview of survey results across all participating organisations. When interpreting the results throughout this report, it is important to bear in mind that, due to significant differences in the sizes of organisations, weighted data were used for the current analysis. The weights were set for each organisation to contribute an equal number of total graduates (246 responses). This means that universities with higher sample size have lower weights while universities with smaller number of respondents have higher weights. Using this approach, we avoid that our results are biased towards university characteristics and labour markets of universities with more respondents. Such an approach gives more emphasis to the specifics of individual organisations, which would be otherwise largely masked by the overwhelming influence of the largest participating universities. Allowing organisational specifics to be reflected in the presented results is especially important because the participating organisations vary greatly in characteristics that may influence the career paths of doctorate



holders, such as organisation type, study fields offered, and varying socio-economic and cultural contexts of the country in which the organisation is based.

It is also important to keep in mind that universities differ across fields: some universities like Maastricht University have more than half of PhD holders from medical fields while Matej Bel University mainly focus on social sciences. Table 2 below represents the distribution of PhD holders by field in each university in the sample. This is important to consider in the analyses of field combined with other variables as we could be potentially explaining the local/regional economic characteristics of the place where the university is located.

Table 2: Distribution of doctorate holders by field in each institution (%)

	Natural science	Engineering and technology	Medical and health science	Agricultural science	Humanities	Social sciences
Arctic University of Norway	37.4	0.9	30.4	0.9	11.3	19.1
Aristotle University of Thessaloniki	19.1	19.1	9.5	4.8	14.3	33.3
Maastricht University	7.3	0.5	50.3	0.0	1.1	40.8
Matej Bel University	16.5	0.0	0.0	0.0	25.3	58.2
NOVA University Lisbon	22.7	18.2	15.1	1.4	17.5	25.1
Technical University of Munich	43.7	35.2	11.4	1.2	0.7	7.9
University of Alcalá	22.2	21.0	27.2	1.2	13.6	14.8
University of Chemistry and Technology Prague	58.8	39.5	0.0	0.8	0.8	0.0
University of Sassari	14.0	7.5	20.6	21.5	22.4	14.0

4.5.2. Questions not answered by all respondents

Many questions did not apply to all respondents and some respondents did not answer all the questions. The number of respondents included in analyses, therefore, varies between questions. When interpreting the results, it is important to consider to which respondents the question applies. This is particularly true for the interpretation of percentages, which are always calculated relative to the number of applicable respondents. It is therefore recommended to check the notes below the tables in this report to avoid misinterpretation.

The response rate per question was stable across the questionnaire. It should be also noted that some questions with filters applied were answered by a very low number of respondents. The analyses of such questions should be interpreted with caution, as the results may be unreliable. This is especially the case with the segmentation of data by various groups of respondents.

4.5.3. Derived and recoded variables in the dataset

The survey dataset contains some variables that were derived or recoded from original survey questions to allow performing specific analyses. Examples include age (calculated from the reported year of birth) or sector (recoded from the detailed classification used in the questionnaire to avoid small samples in some categories).



5. RESULTS

This section provides the most important results related to the profile of doctorate holders from all participants institutions. It follows the same structure as the questionnaire: profile of doctorate holders, skills and doctorate training, job transition, employment situation and mobility. In addition, Annex I includes all the univariate analyses for each question of the questionnaire.

5.1. PROFILE OF DOCTORATE HOLDERS

Among respondents participating in the survey, 51% were women and 48% men (29 respondents described their gender as “other” or preferred not to say). The average age of respondents was 36.9 years¹⁸ and the majority of them (56.1%) did not have children. For most of the respondents, the time to completion was 4 years or less (48.1%) followed by those who needed between 5-7 years to complete the PhD (40.2%).

Table 3. Demographic profile of respondents

Gender	Freq.	Percent.
Women	901	51
Men	842	48
Other/Prefer not to say	29	2
Total	1772	100
Age	Freq.	Percent.
Less than 30	68	3.9
30-34	626	35.9
35-39	506	29.0
40-44	201	11.6
45-49	166	9.5
50 or more	176	10.1
Total	1743	100
No. of children	Freq.	Percent
0	994	56.1
1	400	22.6
2	299	16.9
3	57	3.2
4 or more	21	1.2
Total	1772	100
Years for completion	Freq.	Percent
4 or less	998	48.1
5-7	834	40.2
8-10	144	6.9
More than 10 years	97	4.7
Total	2073	100

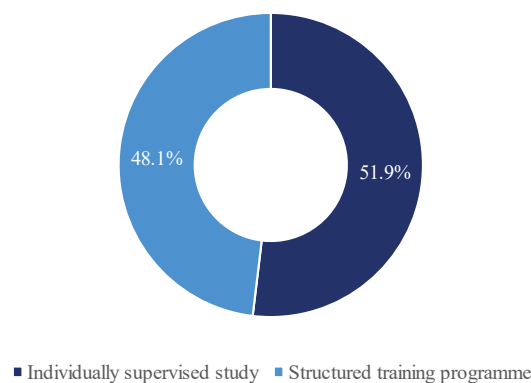
¹⁸ It is worth to mention that older PhD holders (50 years old or more) are concentrated mainly in two countries: Portugal and Spain. In all other institutions this category represents the lowest value.

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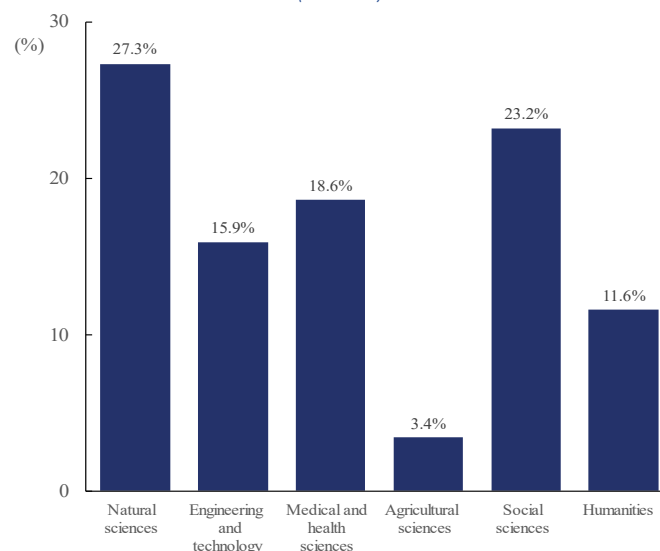
More than half of the respondents followed an individually supervised study, i.e. achieved through independent research in an apprenticeship type relationship with supervisor (52 %) and 48 % followed a structured training programme, i.e. achieved through a mix of defined courses of study/training and independent research, e.g. graduate school/doctoral programme (Figure 1).

Figure 1. Doctorate training programme type
(n=2023)



Regarding the field of study, 27.3% of the respondents obtained their degree in natural sciences (Figure 2). There was also a considerable proportion of respondents who graduated in social sciences (23.2 %), medical and health sciences (18.6 %), engineering and technology (15.9%) and humanities (11.6%). Agricultural sciences represent only 3.4% of respondents.

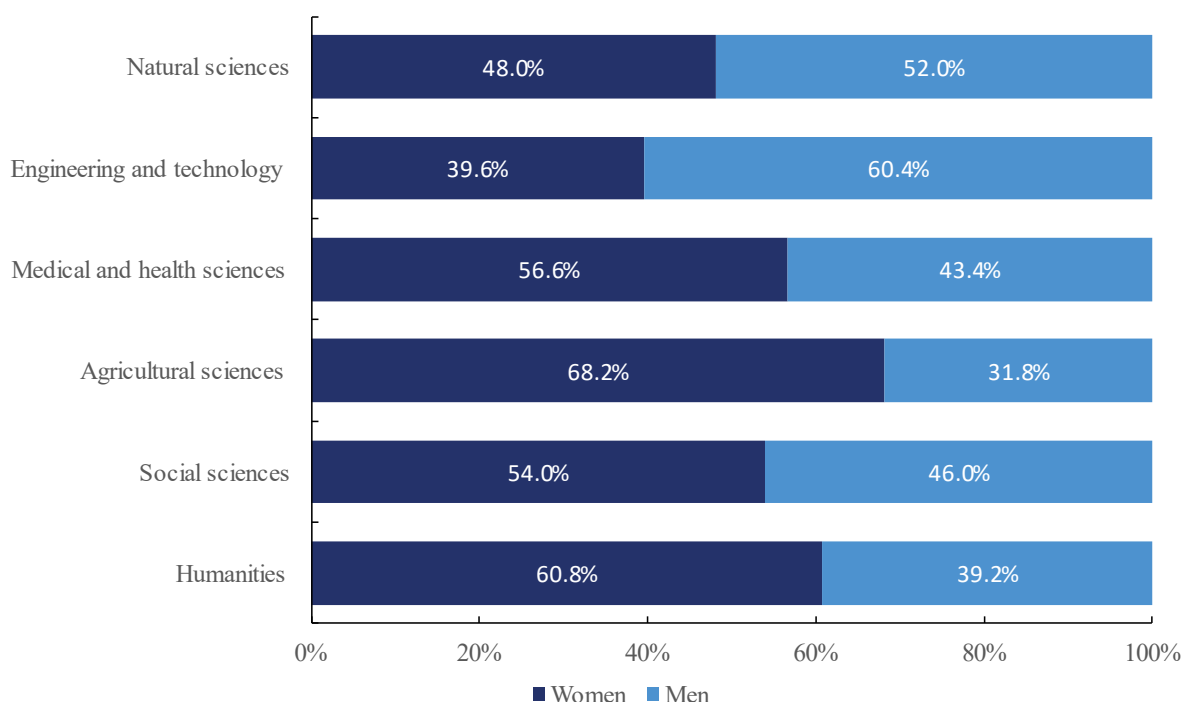
Figure 2. Respondents by doctorate field
(n=2071)



In natural sciences and engineering, male doctorate holders prevail, while in all other fields of study - medical and health sciences, agricultural science, social sciences and humanities -, there are more female doctorate holders (Figure 3).



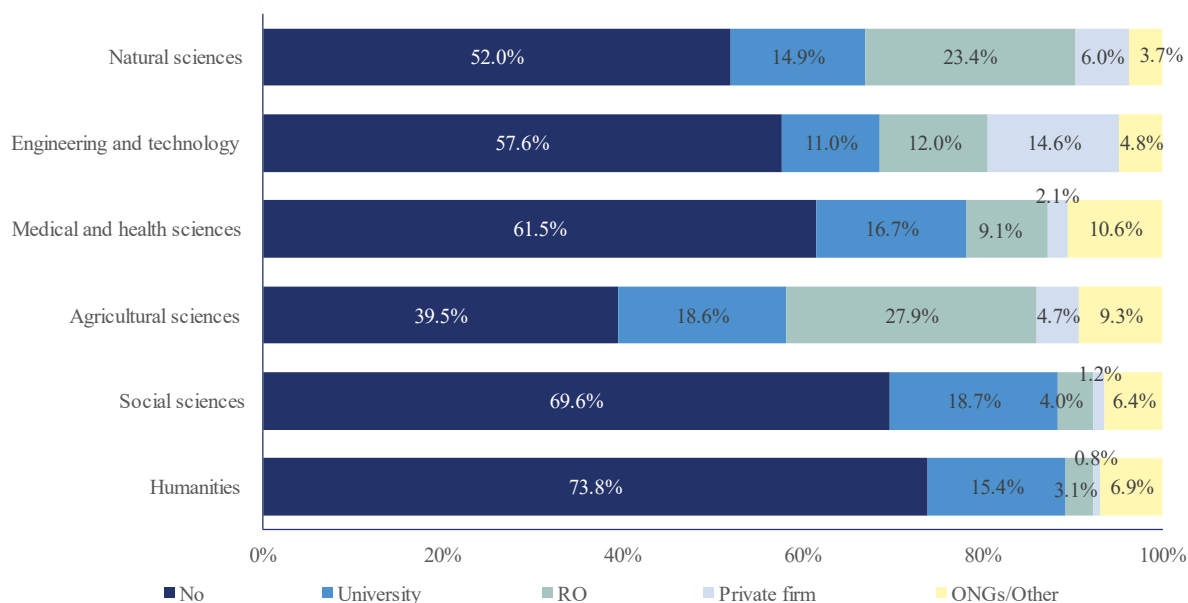
Figure 3. Doctorate field by gender
(n=1741)



The survey explored whether doctorate holders collaborated with other academic and non-academic organisations during their PhD research, providing examples of what possible collaboration may mean (e.g. external co-supervision, industrial partner, additional training, etc.). Doctorate holders in social sciences and humanities collaborated less compared to those in science, technology, engineering and mathematics (STEM) areas. In agricultural sciences, more than 60% of the respondents collaborated with other organizations to pursue the doctorate and a research organization (RO) was the main partner (27.9%). A similar pattern applies in the case of natural sciences. Universities were the main counterparts for medical and health sciences (16.7%), social sciences (18.7%) and humanities (15.4%) doctorate holders. Private sector organisations were dominant partners in the case of engineering and technology doctorates (14.6%).



Figure 4. Doctorate in collaboration with other organizations
(n=2027)



5.2. DOCTORATE TRAINING AND TRANSITION TO THE FIRST POSITION

5.2.1. Doctorate programme

This section highlights different aspects related to the satisfaction, usefulness and value-added of the doctorate programme. The questionnaire explored motivation aspects based on the closed question with several answer options. Doctorate holders have different motivations to pursue a doctorate (see Table 4 below). The interest in the research topic (50.9%), the possibility to work as a researcher in academia (47.9%) and personal accomplishment (45.6%) are the main reasons that motivate respondents to pursue a doctorate. However, these differences change depending on the field of the programme. The main reason for those in the area of natural sciences and engineering and technology are the interest in the research topic, followed by the intention to work as a highly-skilled expert (68.6%) or personal accomplishment (64.7%). A sense of agreement is particularly evident among engineering and technology graduates as approx. 85% of the respondents have chosen these motivation factors. The main motivation for respondents in medical and health sciences is personal accomplishment (52.5%), while in the case of agricultural sciences – diversification of career opportunities (35.2%). For those in social science and humanities, interest in the research topic is the main reason to pursue a doctorate (40.4% and 31.7%). Regardless of the field, social recognition and work as a researcher outside the academic sphere are the least important reasons.



Table 4. Motivations to pursue a doctorate by field of a doctorate degree.

	Natural sciences	Engineering and technology	Medical and health sciences	Agricultural sciences	Social sciences	Humanities	Total
To work as a researcher in academia	63.0%	67.4%	38.7%	28.1%	38.3%	31.7%	47.9%
To work as a researcher outside academia	36.4%	35.5%	14.3%	14.1%	10.2%	7.9%	18.8%
To work as a highly skilled expert	68.6%	84.9%	36.1%	18.3%	30.6%	22.5%	40.9%
To diversify career opportunities	50.8%	65.5%	40.0%	35.2%	25.4%	18.4%	34.9%
Personal accomplishment	64.7%	88.9%	52.5%	26.7%	38.7%	30.0%	45.6%
Interest in the research topic	80.1%	99.2%	43.1%	26.7%	40.4%	31.7%	50.9%
Social recognition	16.6%	25.5%	17.4%	12.7%	14.4%	5.4%	12.1%

Note: percentages do not sum 100% because each respondent could choose all the motivations that apply in his/her particular case.

Doctorate holders are, in general, satisfied with the training received during the PhD programme. In fact, 64% of the respondents would do the same doctoral training programme at the same institution. In particular, the most highly scored aspects are the quality of the research training received and the supervision provided by the supervisor. On the contrary, the support to pursue a particular career path - both academic and especially the non-academic path - are aspects of the training that received the lowest scores, followed by the services available for doctoral candidates at the university.

Figure 5. Satisfaction with the training received



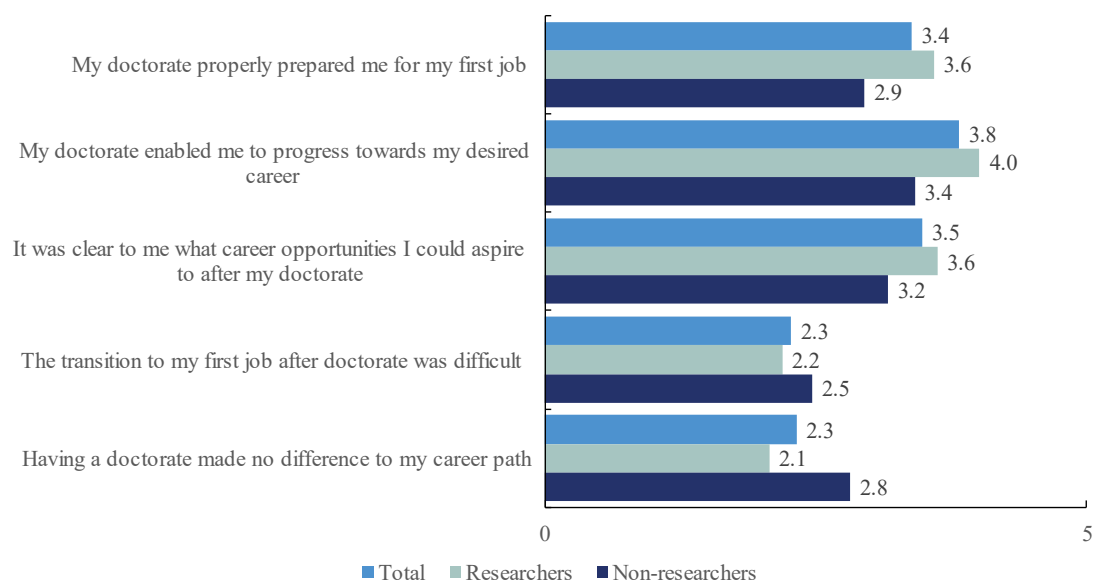
Note: Level of satisfaction measured using a Likert scale from 1=very dissatisfied to 5=Very satisfied.



Although the level of satisfaction is similar regardless the type of program, those PhD holders that followed a structured training programme tend to score slightly higher some of the scores compared to supervisor-led doctorate studies. This is the case for quality of transferable skills training (3.9), support to pursue an academic career (3.8) and services for doctoral candidates (3.8).

On average respondents see their doctoral training as a positive experience and an added value. In particular, the doctorate enabled doctorate holders to progress towards their desired career (rated 3.8 out of 5). When comparing the answers provided by researchers and non-researchers¹⁹, respondents engaged in research are, in general, more positive regarding their doctorate and the doctoral programme providing higher scores for the being prepared for the first job after the doctorate (3.6), the progression towards a desired career (4.0), and clarifying career opportunities after PhD completion (3.6). Those not working as researchers agreed more with the statements having a negative connotation: the transition towards the labour market being difficult (2.3) and the statement that a doctorate does did not make a difference to their career path (2.3).

Figure 6. Average rated benefits of the doctoral programme for career development

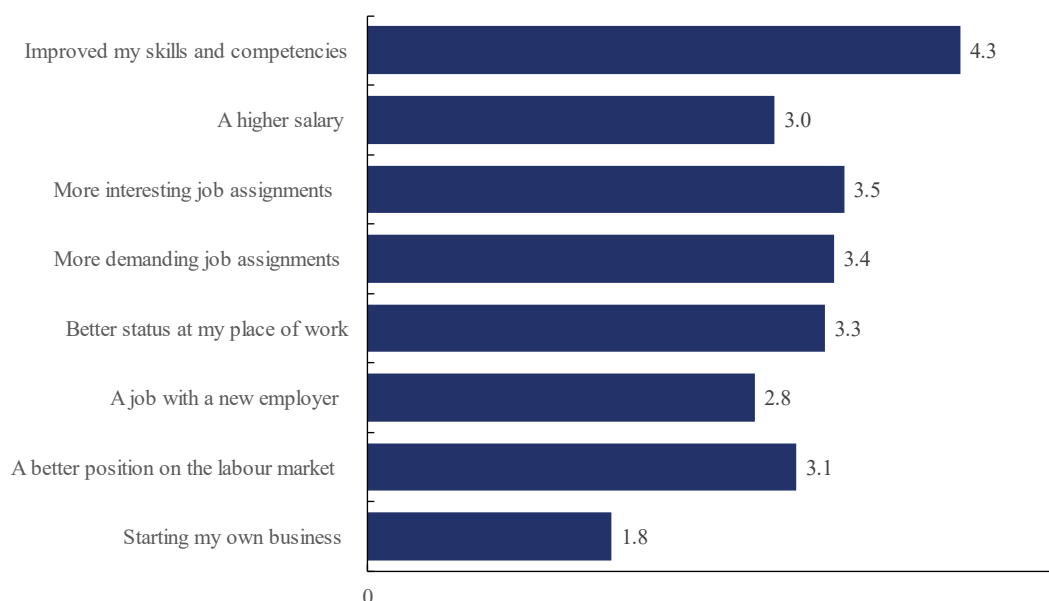


Note: Average rates measured using a Likert scale from 1=strongly disagree with the statement to 5=strongly agree with the statement. The distinction between researchers and non-researchers only applies to those employed respondents.

¹⁹ By researchers and non-researchers, we refer to those PhD holders that have reported they are/aren't involved in research activities in their current job.



Figure 7. Contribution of the doctorate programme to the working life.



Note: scores measured as a Likert scale from 1=not at all to 5=a great deal.

There is an agreement among the respondents that the doctorate mainly contributed to improving the skills and competencies of the doctorate holders (scored as 4.3 in Figure 7). Other positive contributions of the programme to the current career situation are related to the more interesting and demanding job assignments (3.5 and 3.4 respectively) as well as better status at the workplace (3.3). On the contrary, starting a new job with a new employer or as self-employment²⁰ are the parts of the working life where the doctorate contributed the least (2.8 and 1.8 respectively).

5.2.2. Skills

Doctorate holders were asked about the training received in transferable skills (e.g. communication, management, research ethics and integrity, etc.) during their PhD and 60% responded positively including those that received the training as mandatory (29%) or optional (30%). Training in transferable skills was not available for almost one quarter of the respondents (24%).

Among the different types of skills, research (subject knowledge and methodology) and other academic skills (e.g. research valorisation, ethics and integrity, etc.) are the most common, with

²⁰ It is important to note here that this question did not include the option “not applicable” that could be potentially relevant for those who have not had an intention to develop a self-employment path. That could be the reason why only 1.8% of the self-employed respondents consider relevant the contribution of the PhD programme into their careers, while for the other 98.2% other issues may arise.

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83.8% of doctorate holders and 62.3% having undertaken these trainings. Other training activities in management (27.1%), professional (31.3%) or personal skills (34.2%) seem to be less popular among the PhD holders.

This section focuses on the skills, including subject knowledge as well as transferable skills, gained during doctoral training as well as those important in their current jobs. The definition of the transferable skills used is borrowed from ESF Report “ESF Member Organisations Forum report (2009) titled “Research Careers in Europe – Landscapes and Horizons”²¹, which includes skills as e.g., working with others/team working, communication/presentation skills, both written and oral, communication/dialogue with non-technical audiences (public engagement), project and time management skills, research management and research leadership, creativity and the ability for abstract thought, knowledge of research methods and technologies beyond the Doctoral project, teaching skills, mentoring and supervisory skills, enterprise skills (entrepreneurship, commercialisation, innovation, patenting and knowledge transfer, research ethics and research integrity, use of science in policy making, problem solving, negotiation skills, networking skills, grant application writing skills, career planning skill.

The list of competencies and personal attributes from the above-mentioned report, the OECD survey “Careers of Doctorate Holders” (Auriol et al., 2013)²² and from the “Career Tracking Survey of Doctorate Holders” (ESF, 2017)²³ were used as a starting base for creating a (non-exhaustive) list of 24 skills and their definitions clustered in five groups:

a) Research skills:

- Subject knowledge: demonstrating a theoretical and practical understanding of your subject area and its wider research context.
- Methodology: applying research methodologies, tools and techniques appropriately.
- Intellectual Property (understanding how to manage Intellectual Property rights, e.g. how to file a patent).
- Research valorisation, engagement and innovation: understanding principles, rules, values and professional standards governing research for ensuring scientific rigour, honesty, trust and confidence.

²¹ European Science Foundation, [Research Careers in Europe – Landscapes and Horizons: A report by the ESF Member Organisation Forum on Research Careers](#) (Strasbourg: ESF, 2009), 13.

²² Auriol, L., M. Misu and R. Freeman, [Careers of Doctorate Holders: Analysis of Labour Market and Mobility Indicators, OECD Science, Technology and Industry Working Papers, No. 2013/04](#) (Paris: OECD Publishing, 2013), <https://doi.org/10.1787/5k43nxgs289w-en>.

²³ European Science Foundation, [2017 Career Tracking Survey on Doctorate Holders](#) (Strasbourg: ESF, 2017) [What comes after a PhD? Findings from the DocEnhance survey of doctorate holders on their employment situation, skills match, and the value of the doctorate](#)



- Teaching/ mentoring/ supervision: using appropriate tools and methods to facilitate learning and assessment, to encourage and support learners developing their potential.
- b) Personal skills:
- Critical-analytical thinking: critically analysing and evaluating findings and results.
 - Problem-solving: formulating and applying appropriate solutions to problems and challenges.
 - Creativity: being imaginative, thinking out of the box and developing new insights.
 - Flexibility: responding quickly to changes and adapting easily to new situations.
 - Personal effectiveness: making use of the resources at your disposal (e.g. time, skills and talents) to achieve professional and personal goals.
 - Resilience: ability to cope with and overcome challenges and setbacks on a daily basis, including adaptation to change.
- c) Professional skills:
- Team working: working constructively with colleagues, acknowledging their contribution.
 - Entrepreneurship: ability and willingness to develop, organise and manage a business venture along with its risks.
 - Networking: developing, maintaining and using networks or collaborations.
 - Negotiation: ability to discuss, communicate and cooperate for reaching an agreement.
 - Self-branding: the ability to properly identify your personal skills and to communicate them to different audiences.
- d) Communication skills:
- Effective communication: communicating information effectively and confidently to different audiences.
 - Languages: communicating effectively in a language other than your mother tongue.
 - Intercultural skills: having acquired cultural sensitivity and openness to other cultural horizons and viewpoints.
 - Digital communication: using the newest digital tools to undertake, manage and promote research, products or goals to the public.
- e) Management skills:
- Project management: effectively planning, managing and delivering projects on time.
 - Career management: actively manage your professional development.
 - Data stewardship: handling information and knowledge to facilitate their management, ensuring data meets FAIR standards.

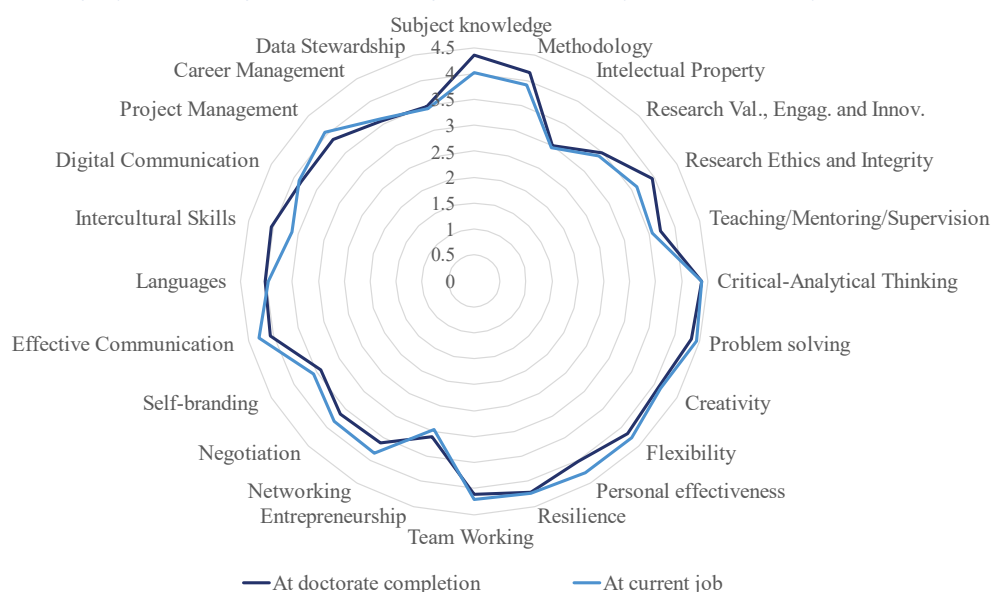
We compare a self-reported view of the acquired (at PhD completion) and needed (at current job) skills and if there are any major differences according to the sector of employment and field of research. As seen in Figure 8, personal skills are the most important competencies acquired and needed, in particular, critical-analytical thinking (4.4 at completion and current job) and problem-solving (4.3 at completion and 4.4 at current job). Outside this group, subject knowledge

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is particularly relevant at doctorate completion (4.3) and effective communication at the current job (4.3). Within the group of professional skills team working is the most relevant skill (4.1 at completion and 4.2 at current job) compared to other skills in the group like negotiation, networking and project management where a slight skill (mis-)match is more evident. The least important skills across all the sample are entrepreneurship skills and understanding of intellectual property (approx. 3 points each). There are no major skill (mis-)matches between needed and acquired skills and the respondents perceive that they have mostly acquired sufficient levels of competencies required in the current job.

Figure 8. Self-reported level of skills at the time of the doctorate completion and their importance at current job.



Note: skills measures using a Likert scale from 1=very poor to 5=very good.

Looking at the different sectors of employment (Figure 9) we see that the respondents working at the university have exhibit good skills matches between the acquired and required skills. There are two exceptions: they rated their acquired competencies of intercultural skills and entrepreneurship somewhat higher than their importance in the current job.

Except for personal effectiveness, networking, self-branding and effective communication, in all other skills, there are significant differences²⁴ in the comparison between skills acquired and skills needed at job by the doctorate holders working across different sectors. Doctorate holders working at universities feel better prepared compared to those working in other sectors, in particular, compared to those in the private sector or the non-higher education sector.

²⁴ Based on ANOVA tests comparing the average scores for each skill by sector of employment (results of upon request).

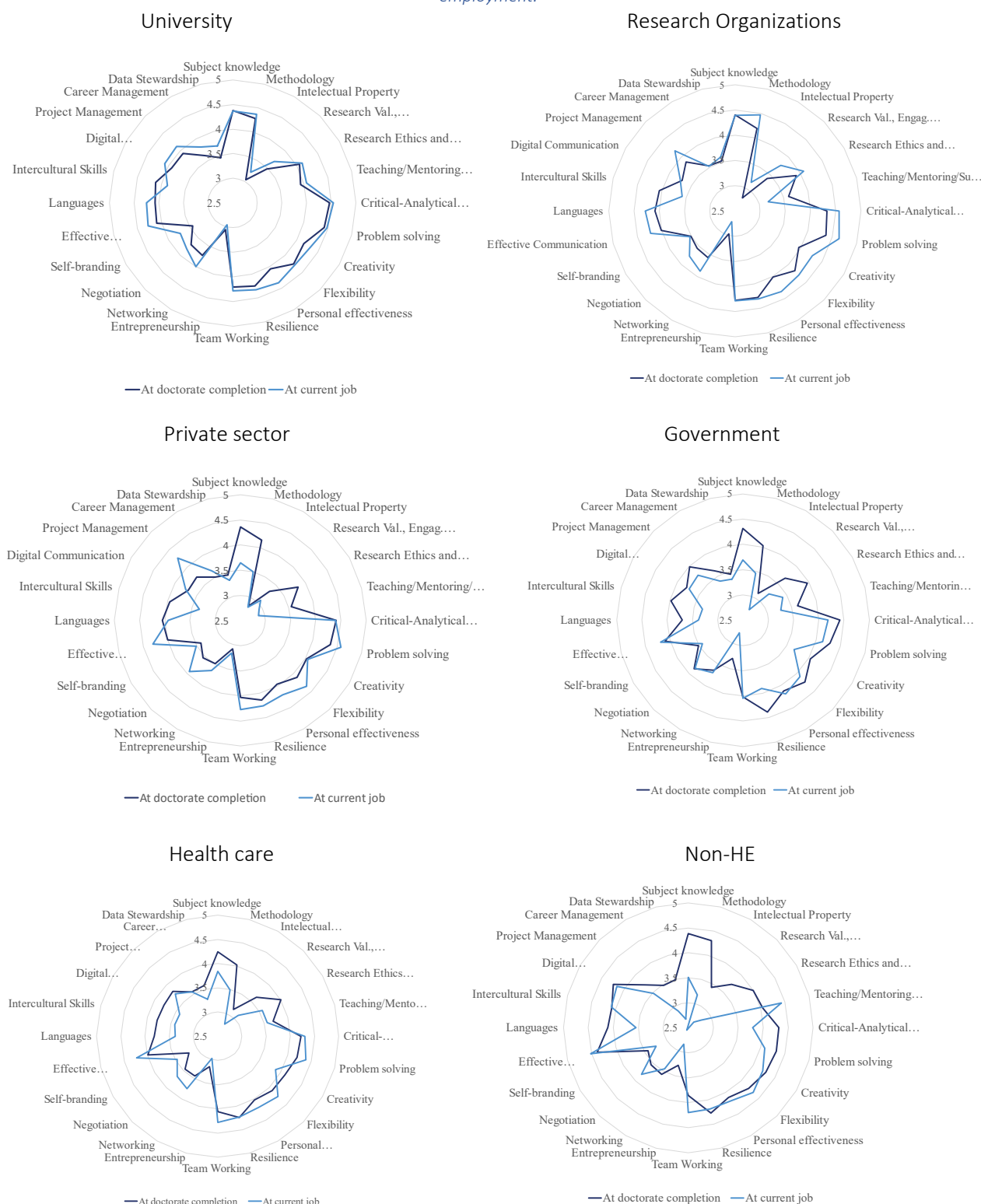


Respondents working at Research Organisations (ROs) overall appear to have more skills (mis)-matches than those working at universities, especially when it comes to skills such as intellectual property and project management. They perceive that the project management was underdeveloped during doctoral training, whereas they are highly relevant for the current job. This mismatch is also evident in other skills like languages and communication that are more relevant.

Doctorate holders working in the private sector exhibit, in general a good match between acquired and needed competencies when it comes to personal skills, professional, communication and management where for most of the cases skills at doctorate completion are higher than at current job. Some exceptions are project management followed by negotiation, communication and flexibility. However, in the case of subject knowledge skills, scores are lower for those needed at current job compared to those at completion. The biggest skill gaps according to the scores provided appears for project management skills (3.7 and 4.3 respectively), effective communication (scored 4 at completion and 4.3 at work) and negotiation (3.6 versus 3.9 respectively).



Figure 9. Self-reported level of skills at the time of the doctorate completion and their importance in the current job by sector of employment.

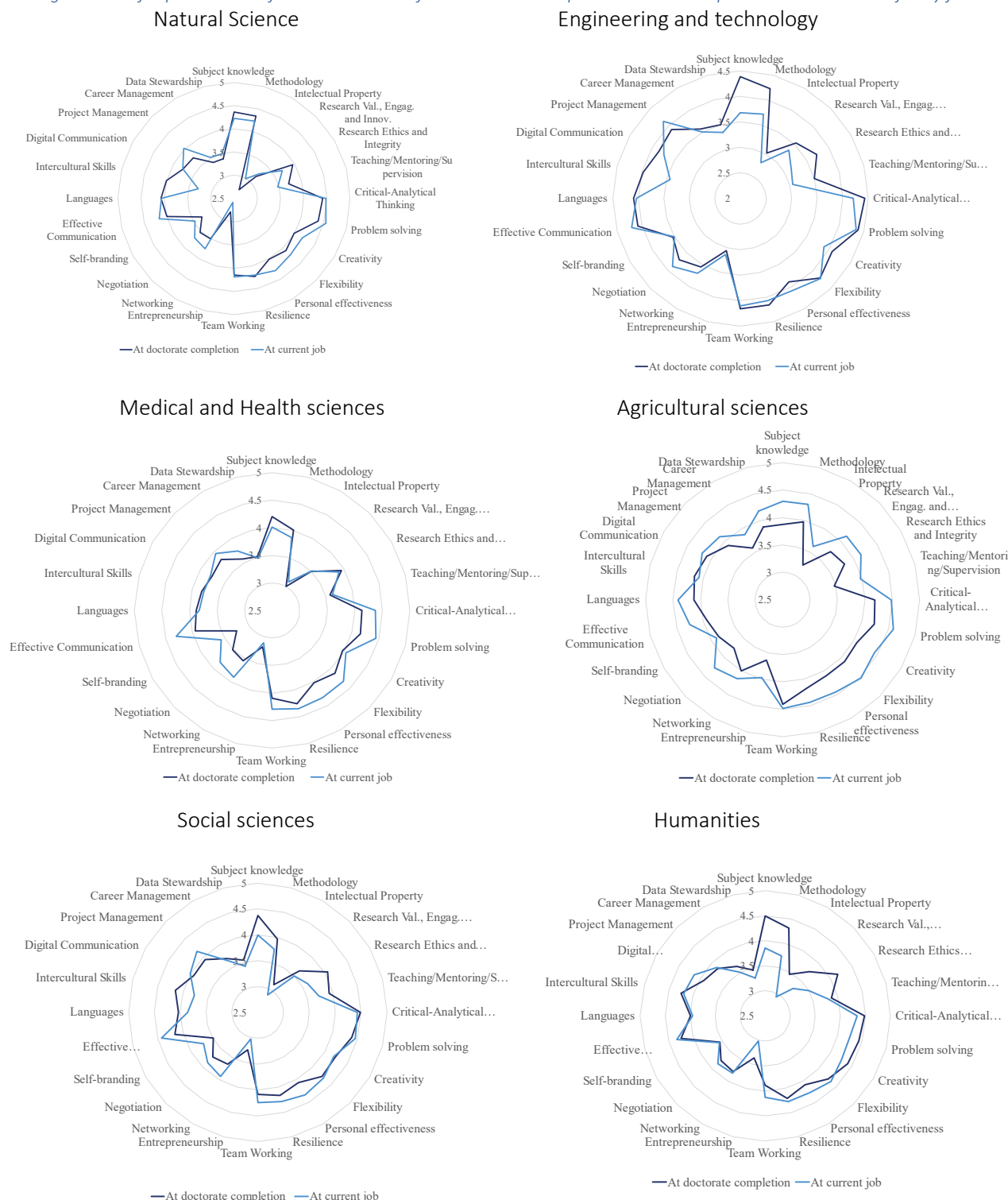


Note: skills measures using a Likert scale from 1=very poor to 5=very good.

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Figure 10. Self-reported level of skills at the time of the doctorate completion and their importance in the current job by field.



Note: skills measures using a Likert scale from 1=very poor to 5=very good.

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For those doctorate holders working in the government, most skills at completion are scored higher compared to skills needed at work (subject knowledge with 0.6-point difference, intercultural skills (0.6), research ethics and Integrity (0.6)); professional skills levels are matched well with needs at current jobs. For the non-HE sector, while skills at completion are scored higher than skills needed at work, with teaching (0.4) being an exception. Respondents employed in the healthcare sector gave similar ratings to the importance of skills at work and the skills acquired during their doctoral studies. Those on the NGOs/Other sectors (not shown in graphs) scored highly on communication and personal skills at PhD completion, the latest being highly important at their current job too, while researcher skills are in general less important.

Figure 10 analyses skills at doctorate completion and at current job by field of research. Results are consistent across fields with personal skills and team working including the highest scores both at doctorate completion and at current job. While respondents in natural and agricultural sciences report that these personal skills are more important at work compared to the level of these skills at doctorate completion, those in social sciences and humanities report higher skill levels at doctorate completion than required by their current position. Other skills within the professional cluster received consistently lower scores, except for doctorate holders in agricultural sciences where the job requires high skills in networking and negotiation. Effective communication is a high scored skill in social sciences and humanities at both completion and at current job.

5.2.3. *Transition to the first or next paid job*

This section focuses on different aspects of transition from doctorate to the first or next job, including average time to find a job after completing a PhD, the availability of resources helping in the transition and the postdoctoral jobs in which the doctorate holder has been involved.

Figure 11. PhD holders with a paid job before/during the doctorate (n=1872)

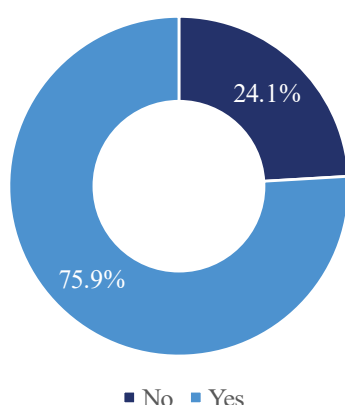
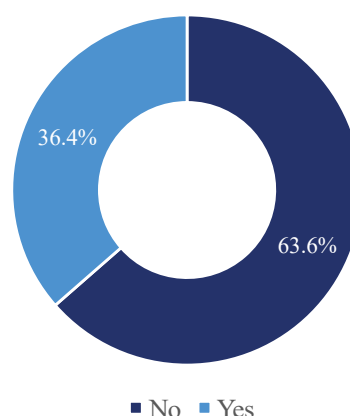


Figure 12. Postdoctoral positions (n=1745)



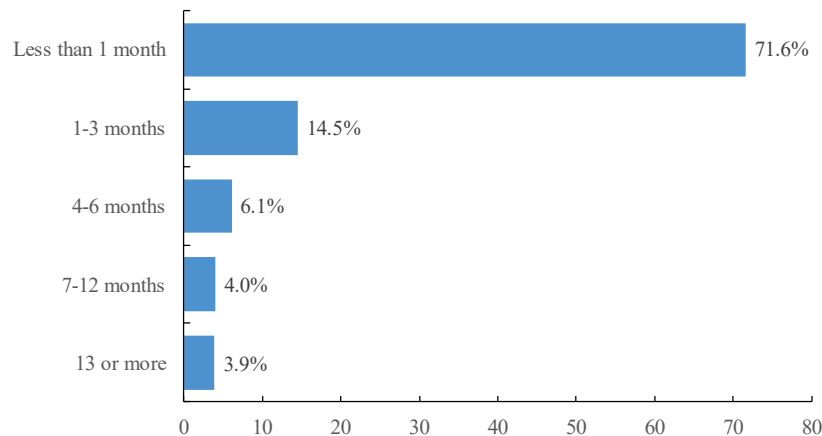
Note: Only applicable to those having a job after completing their doctorate



Almost 76% of the PhD holders have had a paid job before or during their doctorate²⁵. When the age at enrolment into the PhD programme is taken into consideration, around 90% of the doctorate holders with 30 or more years old had a paid job before/during the doctorate compared to 69.1% at 25-29 years old and 61.7% with less than 25 years old. By looking at post-doctoral positions, 36.4% of the doctorate holders had worked as post-doctoral researchers. In particular, 80% had only one postdoctoral position, 17.8% had two post-doctorate positions and 2.2% three or more.

The average time to find a job after completing the doctorate was quick, with 71.6% finding new employment in less than 1 month, followed by 14.5% who needed between 1 and 3 months. Around 10% dedicated between 4 months and one year to find a job while less than 4% needed more than a year to find appropriate work (Figure 13).

Figure 13. Average time to find a paid job since PhD completion
(n=1751)



Note: Only applicable to those having a job after completing their doctorate

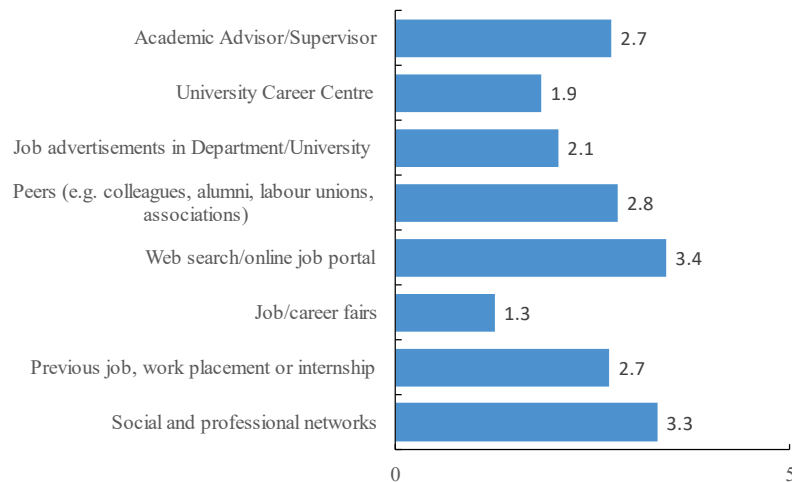
The most important resource for (a first) job search after completing the PhD was web search (3.4), followed by social and professional networks (3.3), peers (2.8) and academic advisor/supervisor or a previous job, work placement or internship (2.7). University career centres and job/career fairs were not perceived as important for job search – respondents rated

²⁵ The questionnaire asked, "Did you have a paid job before or during your doctorate?", which could also have been mis-understood by some respondents as the doctorate itself, rather than a job next to or other than, the doctorate itself. The low share of respondents (20%) who indicated that their doctorate was funded by contracted employment with the university leads us to assume that the majority meant a job other than doctorate when replying to this question. For future surveys it would be important to specify this question more.



their importance with an average score of 1.9 and 1.3 respectively, which was the lowest-rated resource for job search (Figure 14).

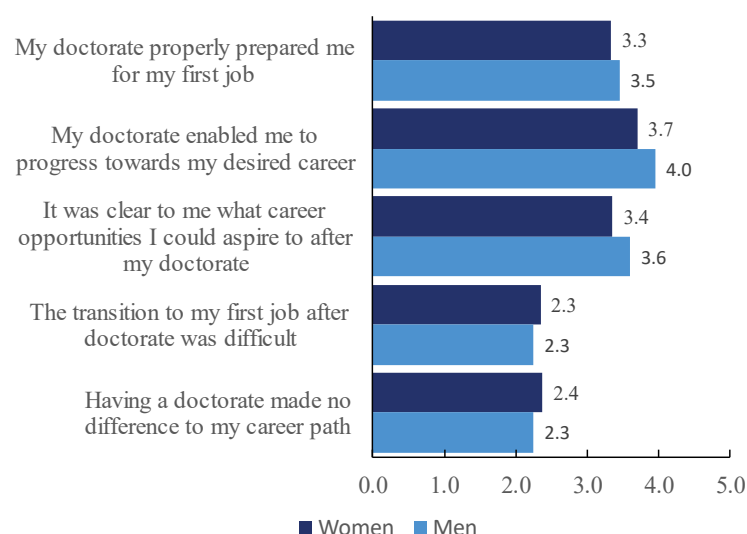
Figure 14. Importance of different resources when looking for a first job after the completion of the doctorate



Note: Only applicable to those having a job after completing their doctorate. Importance measured as a Likert scale from 1=not at all important to 5=extremely important.

How did respondents perceive the added value of the doctorate? On average respondents see their doctorate as a positive experience and an added value (Figure 15). When we compare the attitudes of men and women, we can observe some minor differences: men are, in general, more positive regarding their doctorate and the doctoral study feeling more prepared for the first job after the doctorate (3.5), feeling that it enabled to progress towards their desired career (4.0) and providing a view of what career opportunities they could aspire to after the doctorate (3.6) compared to women. Female respondents tended to agree with the statement indicating a difficult work transition towards the first job or a lack of effect on the career path more than male respondents (2.3 and 2.4 respectively).

Figure 15. The average rated benefits of a doctorate degree for career development





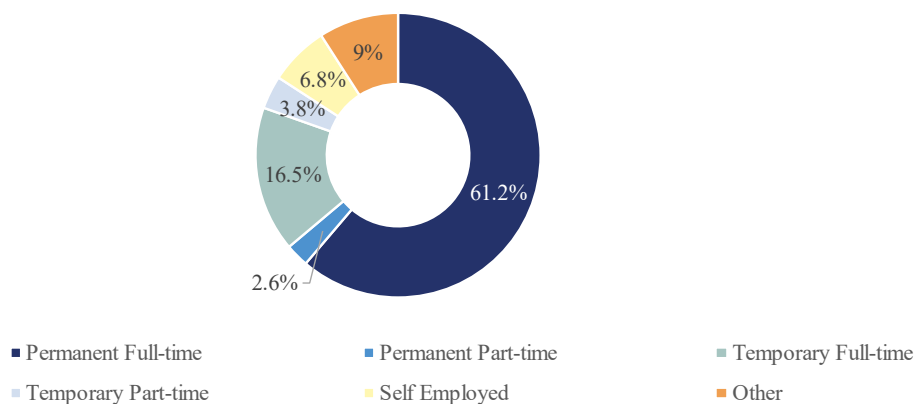
There are no important differences in the scores provided for the benefits of the doctorate when looking at different types of programs in which the doctorate holders were enrolled. One minor difference concerned preparedness for the first job: e.g., those following a structured training program agreed somewhat more strongly with the statement that the doctorate prepared them better for the first job (3.5) compared to individually supervised research programs (3.2). Both doctorate holders on an individually supervised doctoral programme and structured doctoral programme agreed that the doctorate enabled them to progress towards the desired career (3.9 and 3.8).

5.3. EMPLOYMENT SITUATION

5.3.1. *Employment status*

The vast majority of respondents are employed (90.9 %), yet their employment situations differ. 61.2% of all respondents are in full-time permanent employment (30 hours per week or more), 16.5% are in full-time temporary employment, 2.6% are in part-time permanent employment (less than 30 hours per week) and 3.8% are in temporary part-time employment. 6.8% of respondents are self-employed. The 9% who are not employed are either on a career break (2.7%), full-time studying (0.3%), retired (0.4%), unemployed (3%) or other (2.3%).

Figure 16. Current employment status
(n=1855)



When looking at the employment status by gender, the pattern between men and women is similar. The majority of men or women doctorate holders are employed as full-time permanent status (53.3 and 68.7% respectively), followed by those on full-time temporary jobs (16.8% and 16.7% respectively). In general, men are better positioned compared to women as 75.4% of men are in a permanent position (full time or part-time) compared to only 56.8% of women.



Figure 17. Employment status by gender
(n=1737)

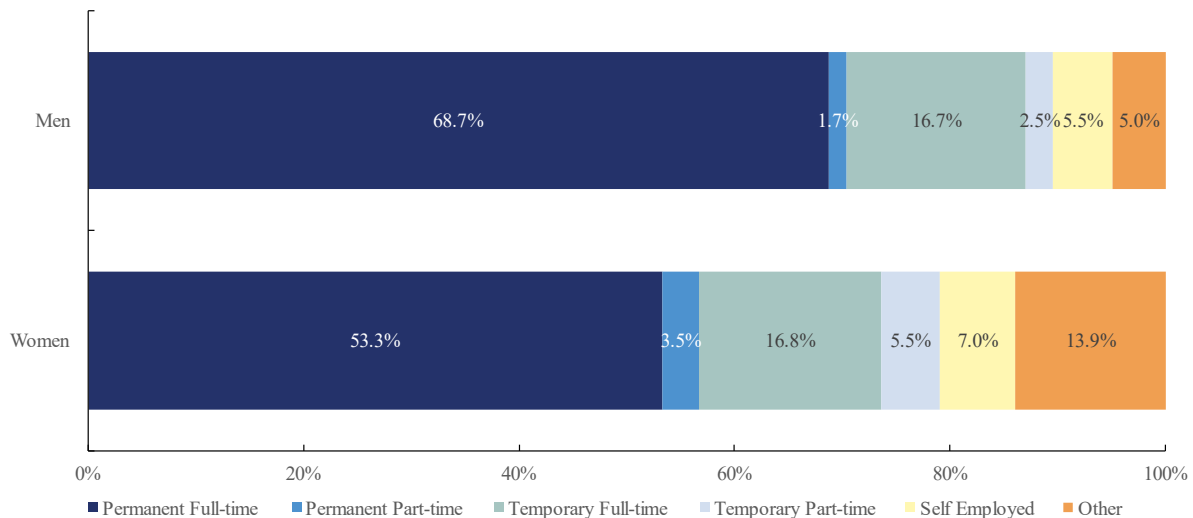
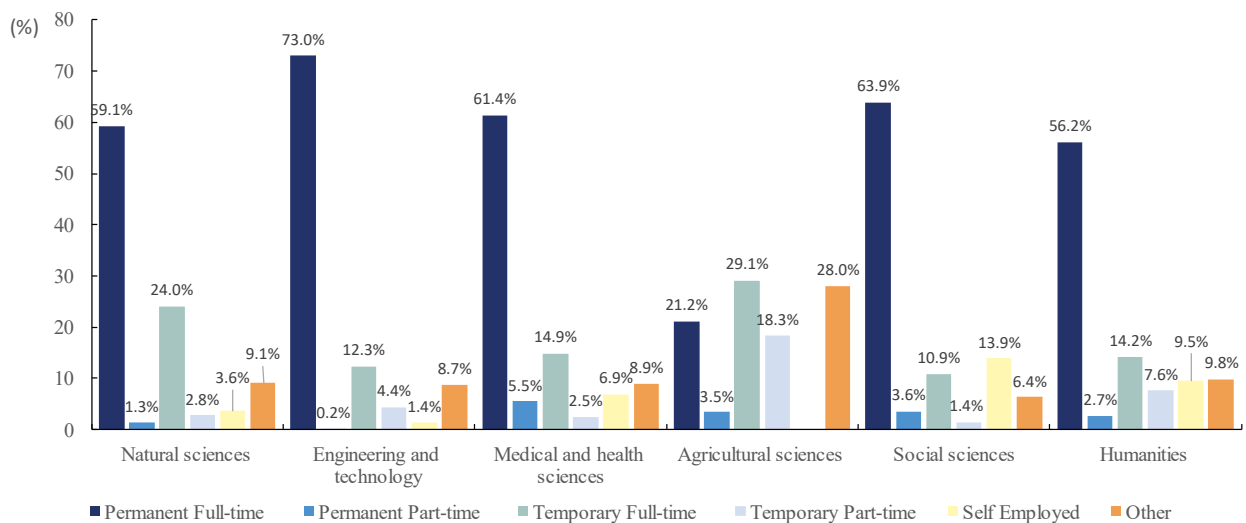


Figure 18. Employment status by doctorate field
(n=1853)



Employment status also varies by doctorate field. The highest share of permanently full-time employment is in the group of respondents who did the PhD in engineering and technology (73%), while in the group of respondents with a doctorate in agricultural sciences just 21.2% are permanently full-time employed and a high share are temporary full-time employed (29.1%). The share of temporary full-time contracts among doctorate holders in natural sciences (24%) is significantly higher compared to other fields such as social science and engineering and technology, where we observe, respectively, 10.9 and 12.3 percent.

While the overall unemployment rate is 3%, there are minor difference by research field: 3% in the medical and health sciences, 2.3% in natural sciences, 2% in humanities, 1.3% in social



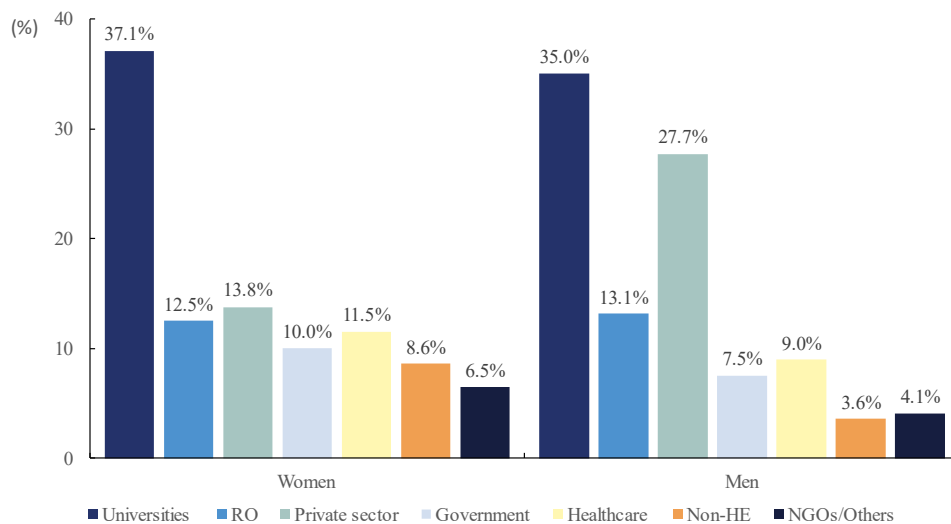
sciences and 0.9% in engineering sciences. The highest share of unemployed (10%) can be observed in the group of respondents with a doctorate in agricultural science²⁶.

5.3.2. Sector of employment

The largest share of employed respondents work at universities (36.7%), 12.2% work at ROs, 21.7% are employed in the private sector, 8% in the government, 10.1% in the health care sector and 10.9% at other sectors. This pattern is similar amongst the first-time employees: an important percentage of doctorate holders are currently working in universities (36.5%), followed by those in the private sector (22.4%) and around 12% involved in a RO or the healthcare system. When looking at the share of doctorate holders working in academia by number of years since graduation, we notice that this is highest amongst most recent graduates (1-2 years after graduation) and lowest amongst those who graduated 5 years ago.

The sector of employment presents some differences between men and women (Figure 19). Women work in universities and the government slightly more often than men, while men work in the private sector significantly more often than women.

Figure 19. The sector of employment by gender
(n=1599)



Note: Only applicable to those currently employed full-time, part-time or self-employed

Some differences appear when we take into consideration the field of the PhD. While respondents with a doctorate in social sciences, humanities and agricultural science mainly work at universities (social sciences: 44.5%; humanities: 41.5%; agricultural science: 52.7%), respondents in engineering and technology, as expected, often work in the private sector (47.2%).

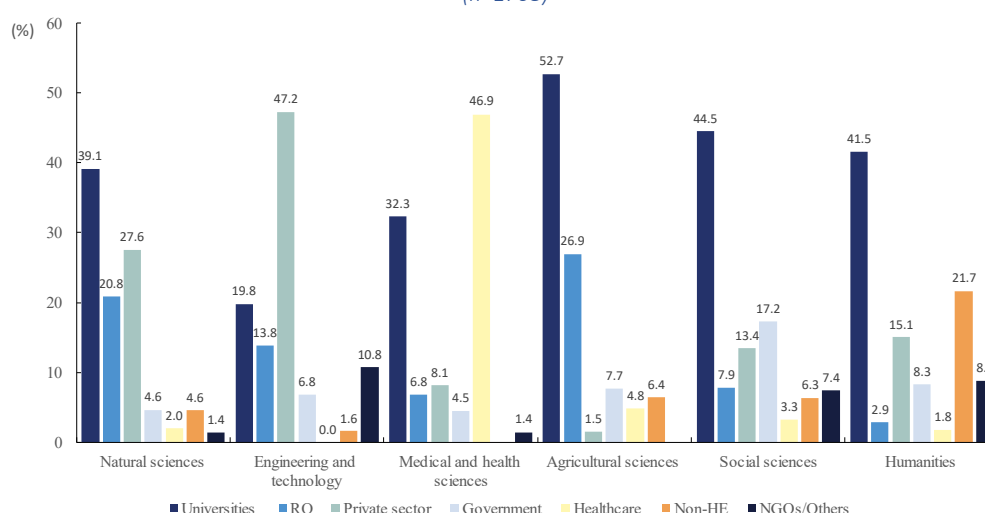
²⁶ Most of the respondents within the agricultural sciences are from the University of Sassari. See information in the methodology section.



In fact, in this group of respondents, employment at universities is the lowest compared to other groups (19.8%). It is also unsurprising that respondents studying medical and health sciences are most often employed in the health care sector (46.9%) (Figure 20).

Looking at respondents by sector of employment, we see that universities are the institutions with the smallest percentage of permanently employed doctorate holders: only 56.2% of respondents are in permanent full-time positions and 26.4% have temporary full-time contracts. In industry, by contrast, the vast majority of respondents are permanently full-time employed (86.5%), and other forms of employment are more the exception than the rule. At the ROs the share of permanent full-time positions is also relatively low (56.7%) compared to other sectors. In the non-HE sector, 76.9% of respondents are permanently full-time employed, compared to 70.1% in the government sector, 79.7% at the healthcare sector and 49.6% in NGOs/Other categories.

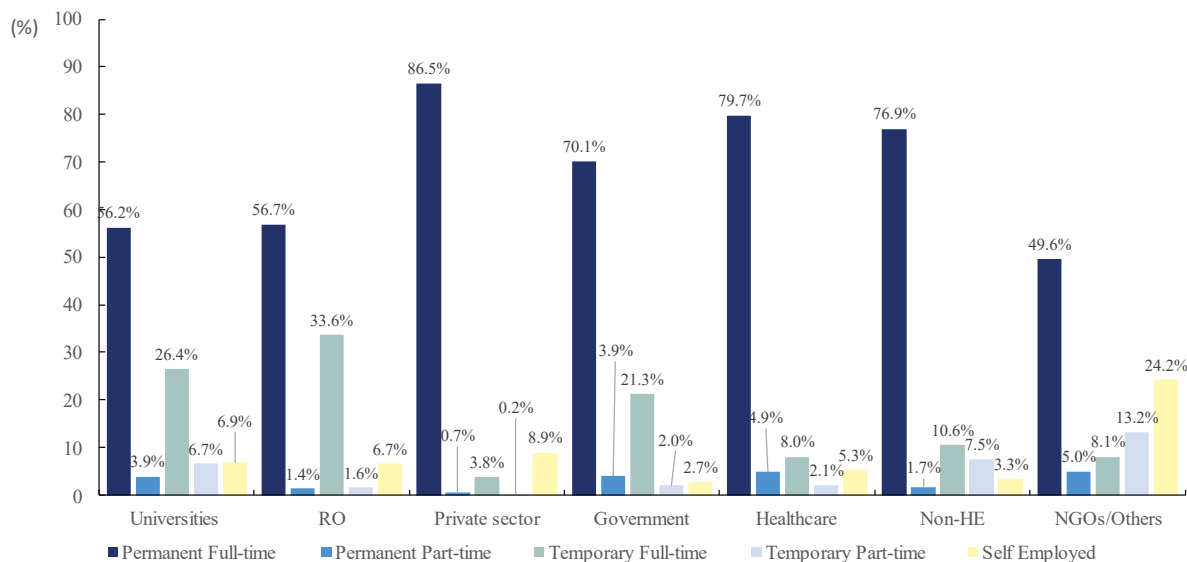
Figure 20. The sector of employment by field
(n=1708)



Note: Only applicable to those currently employed full-time, part-time or self-employed



Figure 21. Employment status by sector of employment
(n=1709)



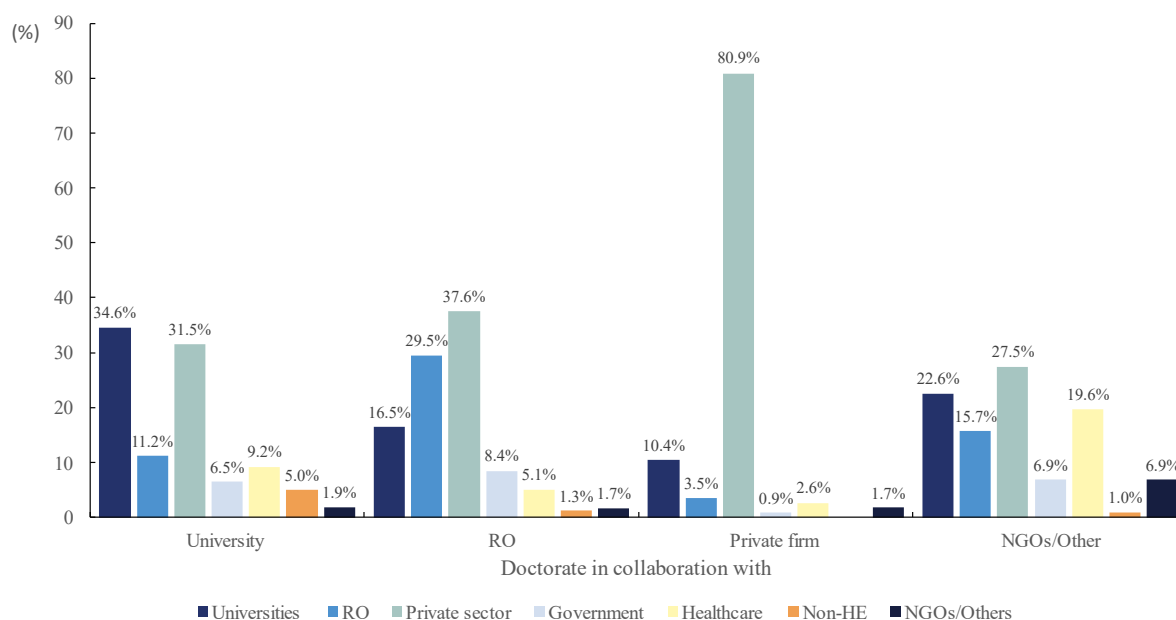
Note: Only applicable to those currently employed full-time, part-time or self-employed

The employment status seems to be homogeneous regardless of the number of children. Approximately 60% of the doctorate holders are in permanent full-time employment regardless of whether they have or don't have children. The more children the doctorate holders have, the greater the percentage involved in a part-time job (both permanent and temporary).

Among all respondents, almost 40% of the doctorate holders developed a doctorate in collaboration with other organizations, mainly with another university (14.6%) or a non-academic research institution (11.8%). Only 3.1% did their doctorate in collaboration with the private sector. The distribution of collaborators differs depending on the current sector of employment of the respondents (Figure 22). Those currently working in universities developed the doctorate in collaboration with other universities or with NGOs/other organizations (34.6% and 22.6% respectively). Doctorate holders currently working in a research organization had collaborations with other RO or with NGOs (29.5% and 15.7%). It is important to acknowledge that the vast majority of doctorate holders employed in the private sector also collaborated with a company during their doctorate (80.9%). While it is common that those who did the PhD in collaboration with another university remain working at the academic institution (34.6%) and those that collaborate with a RO are still working in this sector (29.5%), figures are even larger for those PhD holders whose doctorate was done in collaboration with the private sector and who are currently still working there (80.9%). Those working in an NGO or other institution had a mix of partners during their doctorate.



Figure 22. Doctorate in collaboration with other organizations by sector of employment (n=714)



Note: Only applicable to those currently employed full-time, part-time or self-employed

Looking at the current position of the doctorate holders, there are 21.2% working as postdocs or early career researchers and 19.6% in other positions like a consultant, teacher, data scientist, patent attorney or laboratory staff among others. Among these positions, some differences by gender are important to mention. In general, men present higher percentages for high academic ranks like Senior Researcher (6%) or Full professor (8%) and leadership positions like Director/Head of Unit (8%). Women are more present in lower rank positions like postdoc/early career researchers (24.2%) or other categories (22.3%). By sector of employment, those doctorate holders working in universities and ROs are mainly engaged in postdoc/early career positions (37.6% and 48% respectively) followed by research fellow/researcher positions in ROs (24.5%) and assistant professor/Junior professor (17.1%) at the university. Analyst/Specialist is the most common position among those working for the government (22.8%) and in the private sector (21%). Doctorate holders working in the health sector, non-HE or NGOs/other have mainly selected "Other" as a category of position. Doctorate holders within the health sector mainly mentioned medical positions as main position, non-HE mainly work as teachers and those in NGOs/Other sectors reported a heterogeneity of positions like broker, freelance, local agent at an embassy, etc.



Table 5. Main position at current employment: Total and by gender and sector of employment

	Total		Gender		Sector						
	Freq.	(%)	Women (%)	Man (%)	Univ. (%)	RO (%)	Priv. sec. (%)	Government (%)	Healthcare (%)	Non-HE (%)	NGOs/Others (%)
Postdoc/early career researcher	360	21.2	24.2	18.4	37.6	48.0	1.5	2.7	8.2	3.1	1.0
Research Fellow/Researcher	157	9.2	8.6	10.4	12.1	24.5	4.1	5.6	3.5	1.1	0.3
Lecturer	60	3.6	2.7	4.8	5.9	0.0	1.4	6.1	1.4	7.3	0.0
Senior Researcher	83	4.9	3.4	6.0	3.0	14.1	5.2	3.3	5.0	0.0	3.5
Assistant Professor/Junior Professor	128	7.5	8.6	7.0	17.1	0.0	0.0	1.2	5.1	0.9	12.5
Associate Professor/Reader	63	3.7	3.4	3.7	8.8	0.0	0.1	2.0	2.4	0.0	1.5
Full Professor	32	1.9	1.0	2.1	3.9	0.0	0.0	0.0	2.0	4.7	0.0
Director, Head of Unit	97	5.7	3.5	8.0	1.8	1.7	13.9	11.8	6.5	0.2	2.8
Analyst, Specialist	146	8.6	8.0	9.1	0.2	3.6	21.0	22.8	13.7	0.0	3.1
Technician	37	2.2	2.7	1.4	0.5	0.0	1.9	10.6	1.9	5.1	4.5
Engineer	91	5.3	4.1	6.7	0.4	1.8	16.7	8.0	0.1	0.0	12.5
Project Manager	82	4.8	4.7	4.8	0.5	2.3	12.6	5.8	0.9	0.0	20.2
Coordinator	33	1.9	2.6	1.4	1.0	1.5	1.9	2.8	3.2	2.9	4.8
Other (please specify)	333	19.6	22.3	16.2	7.3	2.6	19.8	17.6	46.3	74.8	33.4
Total (count)	1703		785	811	621	207	372	144	174	99	85

By looking at the value-added of the PhD according to the sector of employment, in general we can see that those PhD holders working on Universities and ROs feel in general more positive than those working outside a research institution. For example, they ranked with a 4 or more the fact that the doctorate enabled them to progress towards their desired career, while this option was ranked as 3.8 for those in the private sector and 3.1 for those working on the non-HE



sector. More important differences appear when looking at the preparation for the first job. In this case again those in academia and ROs felt better prepared (3.9) compared to those in the private sector (3.5), government (3.0), the healthcare sector (2.8) and especially in the non-HE sector.

Figure 23. Average rated benefits of the doctoral programme for career development by sector of employment

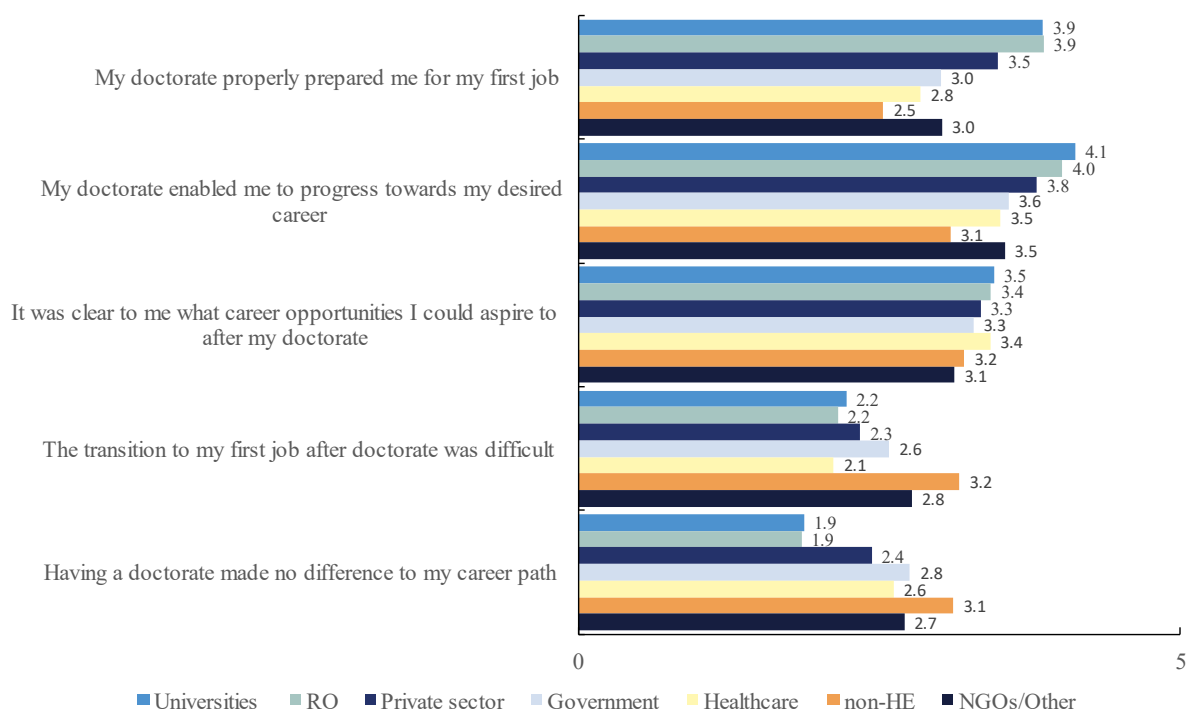
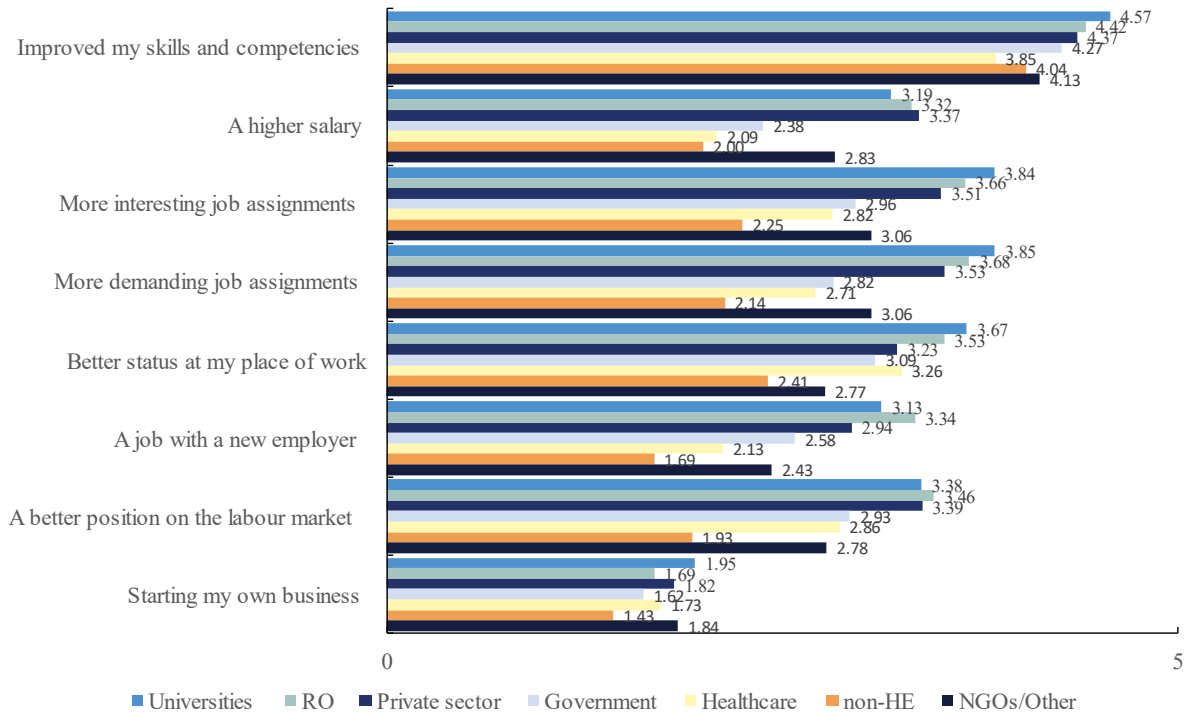


Figure 24 looks at the perceived contribution of the doctorate to various aspects of the current working life. Doctorate holders overall showed high levels of agreement with the statement that the doctorate improved their skills and competences. However, with regard to other aspects (e.g., a high salary, more interesting or demanding work assignments, a better position in the labour market), there were some marked differences across the various sectors. Those employed in universities, ROs and the private sector mostly agreed that their doctorate contributed to the various aspects (with scores above 3 out of 5 on most aspects), while those working in the government, healthcare and particularly in the non-HE sectors mostly reported varying degrees of disagreement (less than 3 out of 5).



Figure 24. Doctorate contribution to the different aspects of the working life



5.3.3. Career break

Among employed respondents, 2.7% took a career break since their doctorate completion. Although there are more women (37.3%) than men (22.8%) having a career break, the length of the break is shorter in the case of men (42.1% going on leave less than 3 months) compared to women (31.6% having between 3-6 months of break). Among the reasons to take a career break, the main one is related to childcare commitments, in particular for women (55.7%), followed by unemployment (38.8% of men versus 29.5% of women). There is a small percentage of respondents that selected the current COVID-19 pandemic as a reason for taking a career break (3.9% of the total).

Figure 255. Respondents who took a career break since doctorate completion: total and by gender

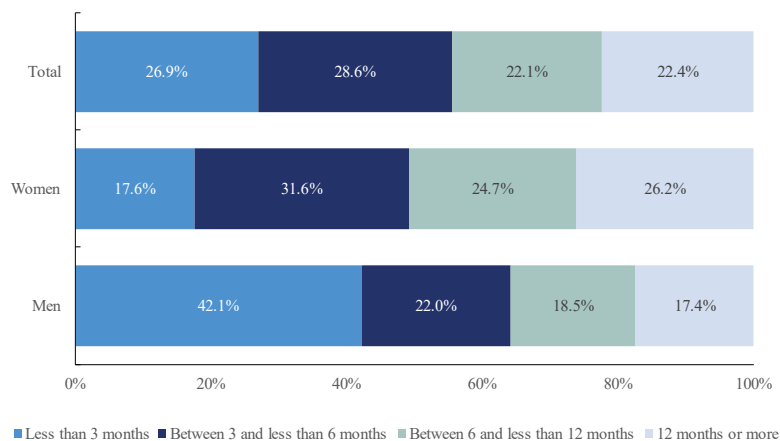
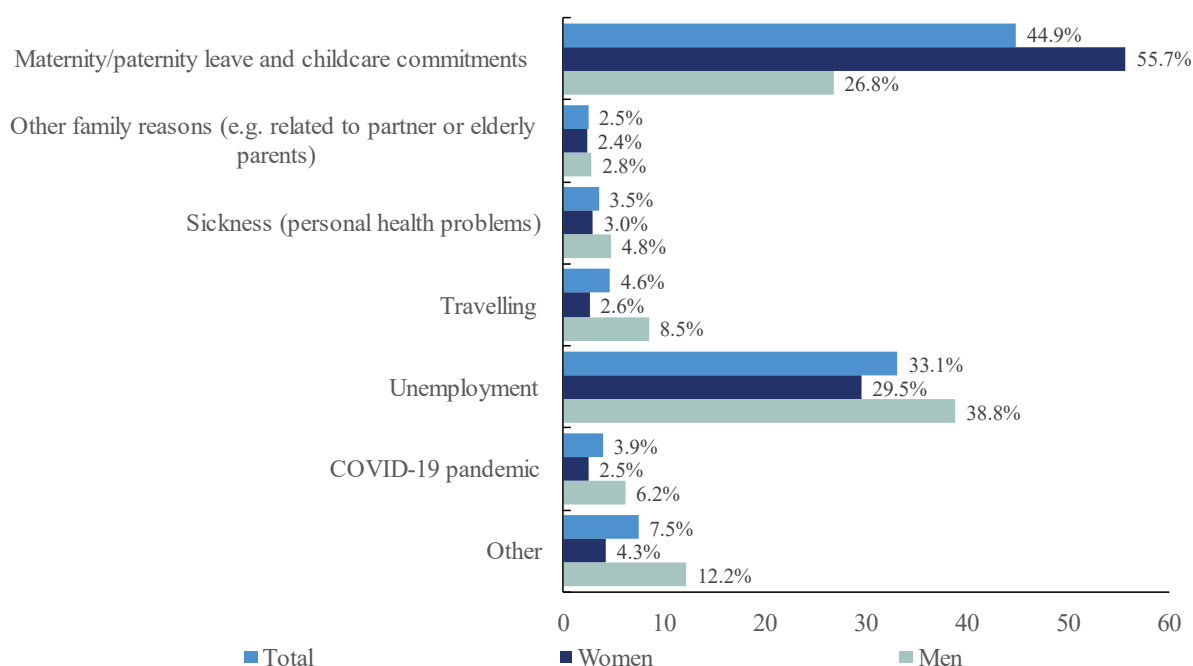




Figure 266. Reasons for taking a career break



5.4. HORIZONTAL AND VERTICAL (MIS-)MATCH

This section focuses on how doctorate holders fit the job post. We compute two measures: vertical and horizontal (mis-)match. Vertical (mis-)match relates to the level of education and captures those candidates that are overeducated for the current job. That is, a doctorate holder is overeducated if he/she has more education than required for the job (e.g., Master, Bachelor or lower). The doctorate holder is qualified if the post required a doctoral degree or a postdoctoral experience.

Horizontal (mis-)match is based on the question “to what extent is the content of your work in your current job related to the thematic field of your doctorate”. In this case, three potential answers were available: closely related, partly related and not related.



Table 6. Vertical and horizontal (mis-)match: total, by gender and research engagement

				Gender		Research engagement	
		Total		Women (%)	Man (%)	Non-researchers (%)	Researchers (%)
		Freq.	(%)				
Vertical (mis-) match	Qualified	789	46.3	46.2	47.2	11.4	61.6
	Overeducation	916	53.8	53.8	52.8	88.6	38.4
	Total (count)	1705		785	814	519	1180
Horizontal (mis-) match	Closely related	807	47.4	47.4	48.9	24.0	57.7
	Partly related	637	37.4	37.1	37.6	41.1	35.8
	Not related	257	15.1	15.5	13.6	34.9	6.5
	Total (count)	1702		782	813	520	1176

Note: Only applicable to those currently employed full-time, part-time or self-employed.

Table 7. Vertical and horizontal (mis-)match by sector.

		Sector						
		Universities (%)	RO (%)	Private sector (%)	Government (%)	Healthcare (%)	Non-HE (%)	NGOs/Others (%)
Vertical (mis-) match	Qualified	80.9	71.1	21.0	6.4	23.7	2.9	7.8
	Overeducation	19.1	28.9	79.0	93.7	76.3	97.1	92.2
	Total (count)	620	209	372	144	174	99	87
Horizontal (mis-) match	Closely related	66.8	54.4	29.2	32.4	45.7	26.5	24.6
	Partly related	27.6	41.2	43.0	41.3	45.2	50.5	37.0
	Not related	5.5	4.5	27.8	26.3	9.1	23.1	38.5
	Total (count)	620	209	372	144	174	99	87

Note: Only applicable to those currently employed full-time, part-time or self-employed.

Results in Table 6 suggest that almost 54% of the respondents were overeducated for their current job and in particular, those that are not engaged in research activities (88.6%). For those involved in research activities, there is a better vertical match with the job post. In general, the field in which the doctorate holders work is closely or partially related to the thematic field of the doctorate (84.8%) and that is even more true in the case of those involved in research (93.5%). Among those not involved in research, there are almost 35% working in a non-related field. Differences between men and women are minimal in this case.

Looking at the differences by sector, we can identify some patterns. Those working in the university or ROs are in general qualified (80.9% and 71.1%) and working in a closely or partly related field (54.4% and 41.2% respectively). However, those working in any other non-academic



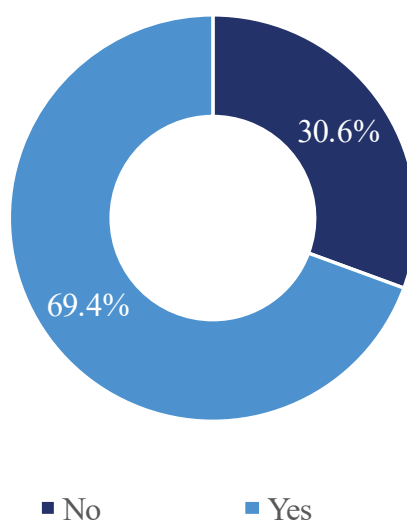
sector are mainly overeducated and the thematic area of the job is mainly only partly related to their doctorate degree.

5.5. ENGAGEMENT IN RESEARCH

The OECD's Frascati Manual (2002) defines researchers as professionals engaged in: 'creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications'²⁷. This definition was used to ask respondents if they were engaged in research activities in their current job. In this section, we first analyze doctorate holders' involvement in research activities and then we distinguish between attributes of researchers and non-researchers. We define researchers as those doctorate holders whose current jobs require research activities (in academia and other employment sectors) while, on the contrary, non-researchers are those who are not involved in research activities.

Among the employed respondents, a vast majority (69.4%) are engaged in research in their current job (see Figure 26), with minor differences among men (71.3%) and women (67.7 %).

Figure 277. PhD holders involved in research (researchers VS non-researchers)
(n=1702)



Note: Only applicable to those currently employed full-time, part-time or self-employed.

There are differences across different sectors of employment. Not surprisingly, it is in the academic sector that doctorate holders are most engaged in research, with 98 % of those working at ROs and 95.7% of those at universities engaged in research. In the other sectors, the largest

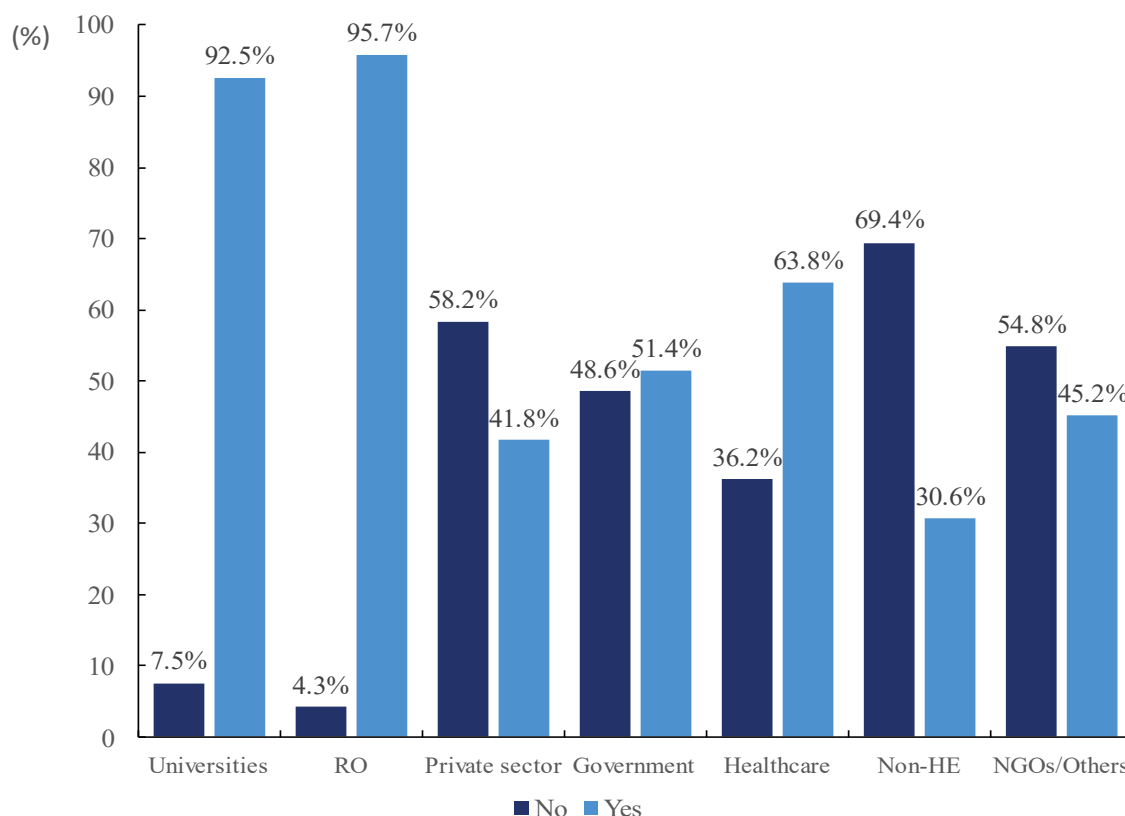
²⁷ OECD, [Frascati Manual: Proposed Standard Practice for Surveys on Research and Experimental Development](#), (Paris: OECD, 2002), 30.

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shares of researchers are working in healthcare (63.8%) and in government (51.4%), followed by the private sector (41.8%) and the NGOs/Others (45.2%). The sector with the lowest share of researchers is the non-HE sector (30.6%). Shares of researchers in each sector are presented in Figure 27.

Figure 288. Engagement in research in the current job by sector of employment



Note: Only applicable to those currently employed full-time, part-time or self-employed.

5.5.1. Researchers

The majority of employed researchers describe themselves as already recognized (47.8 %) or established researchers (44.8 %) according to the European Framework for Research Careers ²⁸

²⁸ The following categories from the European Framework has been used in the survey: a) Recognised researcher (R2) as doctorate holders or equivalent who are not yet fully independent; b) Established researcher (R3) as researchers who have developed a level of independence, e.g. publishing papers as lead author or leading collaborative research projects; and c) Leading researcher (R4) as researchers leading their research area or field.

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(EC, 2011).²⁹ A high proportion of men are established researchers (48.9%) compared to the 54.1% of women that are recognized researchers.

As seen in Table 8, most of researchers are in postdoctoral positions (30%), with significant shares also working as research fellows (12.5%) or assistant/junior professors (9.3%). When looking at the different sectors, in universities and ROs, doctorate holders mainly concentrate on postdoctoral positions (40.7% in universities and 50.2% in ROs) followed by the job as assistant professor/junior professor in the case of the academic (17.4%) and research fellow/researcher in the case of ROs (25.5%). In the private sector doctorate holders mainly work as analysts (18.4%), in the managerial roles as director or head of unit (16.6%) and engineers (16.5%). Similarly, at the government level, PhD holders work in positions such as analysts, directors/head of units or other categories. This last position “other” is mainly predominant for those researchers working in the healthcare system (they are mainly consultant, physician and clinicians) and the “non-HE” (being mainly teachers). This is not surprising as the categories selected are mainly related to the academia and other research institutions. Beyond previous categories, doctorate holders work as project managers in the NGOs/Others sectors (33.1%).

Table 8. Researchers' position by sector of employment (%)

	Univ.	ROs	Private sector	Government	Healthcare	Non-HE	NGOs/Others	Total
Postdoctoral position/early career researcher	40.7	50.2	3.4	1.3	11.7	2.8	2.1	30.0
Research Fellow/Researcher	13.0	25.5	8.3	4.2	5.1	2.8	0.6	12.5
Lecturer	5.1	0.0	0.0	3.9	2.2	0.0	0.0	2.9
Senior Researcher	3.2	14.7	11.1	6.4	7.8	0.0	7.6	6.9
Assistant Professor/Junior Professor	17.4	0.0	0.0	2.3	5.4	2.8	3.3	9.3
Associate Professor/Reader	8.3	0.0	0.2	3.9	2.6	0.0	3.3	4.7
Full Professor	4.1	0.0	0.0	0.0	3.1	9.8	0.0	2.5
Director, Head of Unit	1.7	1.8	16.6	15.1	8.8	0.0	3.3	5.2
Analyst, Specialist	0.0	2.1	18.4	30.8	15.6	0.0	6.0	6.4
Technician	0.5	0.0	2.0	11.5	0.8	0.0	0.0	1.3
Engineer	0.4	1.8	16.5	1.1	0.0	0.0	3.3	2.8
Project Manager	0.1	0.5	10.6	3.6	1.2	0.0	33.1	3.0
Coordinator	0.4	1.5	0.8	0.3	5.0	0.0	0.0	1.0
Other	5.1	2.0	12.2	15.7	30.8	81.7	37.5	11.6
Total (Count)	544	188	147	70	105	28	38	1119

Note: Only applicable to those currently employed full-time, part-time or self-employed and involved in research activities.

²⁹ European Commission, [Towards a European Framework for Research Careers](#) (Luxembourg: Publications Offices of the European Union, 2011).



Table 9. Researchers: activities performed as part of the main job (%)

	Univ.	RO	Private sector	Government	Healthcare	Non-HE	NGOs/ Others	Total
Research performing activities	93.7	97.5	65.0	70.2	81.3	46.9	53.6	85.4
Teaching/mentoring/supervision activities	82.6	49.5	53.5	47.2	77.1	97.2	39.0	69.4
Administrative activities	50.3	46.0	47.5	66.9	46.9	22.5	61.5	49.6
Staff management responsibilities	24.0	19.0	34.8	36.5	31.9	2.8	28.1	25.7
Budget management responsibilities	23.1	23.6	30.5	16.1	21.2	2.8	41.1	23.7
International partnerships	24.3	33.7	34.2	13.3	18.5	2.8	55.2	26.5
Entrepreneurship, start-up activities	6.2	2.4	20.4	6.9	2.4	2.8	27.9	7.8
Communication or scientific journalism	22.9	20.5	24.0	20.1	20.4	0.0	31.1	21.9
Artistic creation	4.0	2.8	8.6	1.8	3.3	10.2	12.2	4.6
Other	1.0	1.3	10.0	9.0	19.1	5.7	20.4	5.2
Total (Count)	544	188	148	70	105	28	38	1121

Note: Only applicable to those currently employed full-time, part-time or self-employed and involved in research activities.

Looking at the different activities in which doctorate holders (researchers) have been involved, Table 9 demonstrates that research-related activities are the main element of the current job (85.4%), followed by teaching, mentoring and supervision activities (69.4%) and administrative activities (49.6%). Among the least selected activities, only 7.8% of researchers are involved in entrepreneurship and start-ups activities while 4.6% are involved in artistic creations. This table also illustrates some differences by sector. A large proportion of current researchers at the university are involved in research performing activities and teaching, mentoring options (93.7% and 82.6% respectively). At research organizations, the candidates concentrate on research performing activities as well as teaching/mentoring/ supervision and administrative activities. While the percentages are not so high for the rest of the sectors, doctorate holders are mainly working in research activities in the government sector (70.2%) and in teaching activities for the health care sector (77.1%). Those in non-HE are mainly engaged in teaching activities. Entrepreneurship activities, artistic creation and others are the least selected activities.

When asked about the satisfaction with the current job, researchers are, in general, most satisfied with the autonomy and responsibility of the job (4.5), followed by the prestige of the organization (4.4), and the intellectual challenge associated with the job (4.2). On the contrary, they are least satisfied with the mentoring and training received (3.7), as well as the salary and work/life balance (3.8). Looking at the different sectors of employment (Table 10), respondents working in the government sector are most satisfied with the various aspects of employment (total mean



satisfaction 4.2), and respondents working at NGOs/Others are the least satisfied (total mean satisfaction 3.9). In all sectors of employment, respondents are most satisfied with autonomy and responsibility (total mean satisfaction 4.5) and least satisfied with mentoring and training (total mean 3.7) in non-academic sectors. At universities, respondents are least satisfied with the salary (3.5) and job security (mean 3.6). As for job security, the most satisfied respondents can be found in the government sector (4.5), the health sector (4.4) and the private sector (4.2). At universities and ROs, respondents are most satisfied with the intellectual challenge (4.4 and 4.5 respectively), which is also the highest rated attribute at ROs. Respondents working at hospitals are the least satisfied with mentoring and training (3.6), work/life balance (3.9) and organisation culture (3.9).

Table 10. Researchers: job satisfaction by sector

	Univ.	RO	Private sector	Government	Healthcare	Non-HE	NGOs/ Others
Skills development	4.3	4.4	4.3	4.4	4.3	4.3	3.5
Career growth opportunities	3.9	3.7	4.1	3.9	3.8	4.1	3.4
Intellectual challenge	4.4	4.5	4.4	4.6	4.3	4.4	3.9
Autonomy and responsibility	4.5	4.5	4.5	4.6	4.6	4.5	4.7
Reputation of organisation	4.3	4.5	4.3	4.4	4.3	4.3	4.5
Organisational culture	3.8	3.9	3.9	3.9	3.8	3.9	4.3
Job security/stability	3.6	3.5	4.2	4.5	4.4	4.2	3.6
Salary	3.5	3.6	4.1	4.0	3.8	4.1	3.4
Mentoring and training	3.8	3.8	3.6	3.8	3.7	3.6	3.5
Work/life balance	3.8	3.7	3.9	3.9	3.8	3.9	3.7

Note: Only applicable to those currently employed full-time, part-time or self-employed involved in research activ.

5.5.2. Non-Researchers

Non-researchers are, in general, less satisfied with their current job compared to researchers as the majority of the scores are lower. As in the case with researchers, non-researchers are mainly satisfied with the autonomy and responsibility of the job (4.2). On the contrary though, they are less satisfied with the salary and the mentoring and training received (3.3). Looking at the different sectors of employment (Table 11), respondents working in the private sector are the most satisfied with all aspects of employment (total mean satisfaction 4.0), and respondents working at NGOs/Others are the least satisfied (total mean satisfaction 3.0). Autonomy and responsibility are highly valued by those working at universities, the government sector, non-HE institutions and NGOs/Other, while the reputation of the organisation is the main satisfactory point for those in the ROs, private sector or those working in the healthcare sector. Salary (for universities and NGOs/Other), mentoring and training opportunities (private sector, government



sector and healthcare) and career growth opportunities are a challenge for those working in ROs and non-HE sectors.

There are several reasons why doctorate holders working in non-research positions took their current job. The main reasons selected indicate that for many taking a non-research job was a 'second-best' choice that was made due to unavailability of suitable research positions (3.6) and difficulties securing a tenured/permanent research post or position (3.7). Considering that most non-researchers work in non-academic sectors, it may, therefore, mean that, at least for a share of respondents, the move from academia to other non-academic sectors, and for non-research jobs, might not have been their most preferred option.

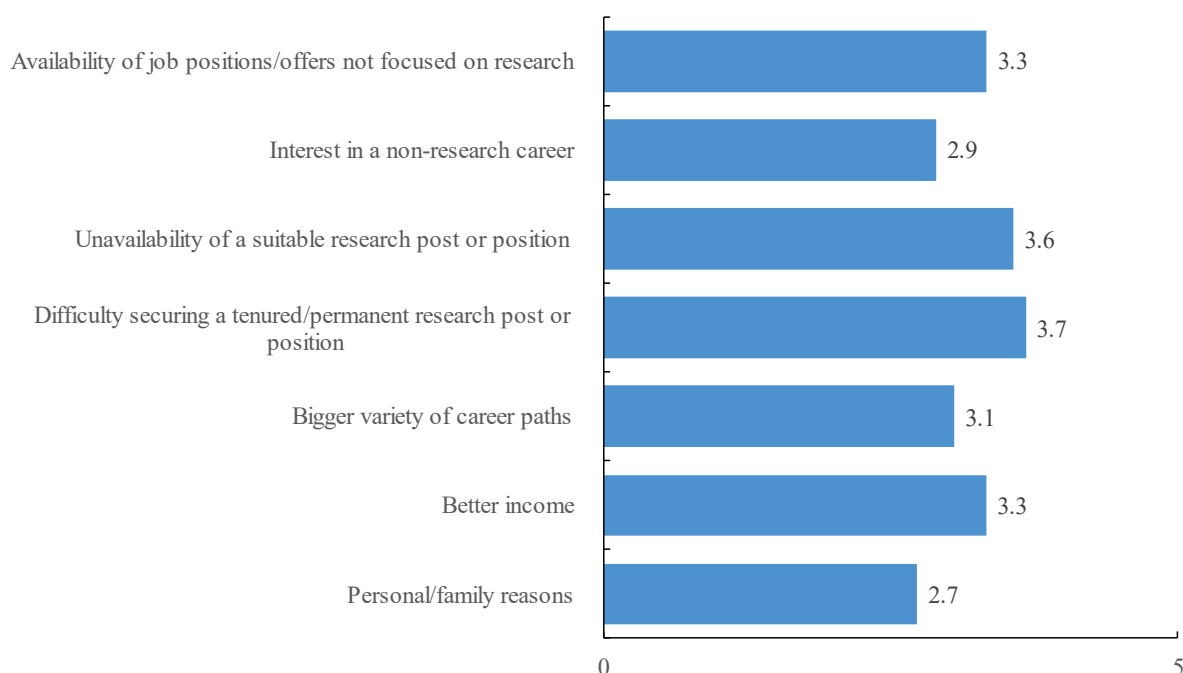
Table 11. Non-researchers: job satisfaction by sector

	Univ.	RO	Private sector	Government	Healthcare	Non-HE	NGOs/ Others
Skills development	4.2	4.0	4.2	3.7	4.1	3.7	3.2
Career growth opportunities	3.2	3.3	3.8	3.4	3.7	3.1	3.0
Intellectual challenge	3.8	3.4	4.1	3.7	4.1	3.2	3.3
Autonomy and responsibility	4.5	3.9	4.3	4.3	4.0	4.1	3.9
Reputation of organisation	4.2	4.0	4.1	4.1	4.1	3.6	3.4
Organisational culture	4.3	3.6	3.6	3.1	3.5	3.7	3.0
Job security/stability	3.1	3.7	4.3	4.2	3.8	4.0	2.5
Salary	2.7	3.5	4.0	3.2	4.2	3.2	2.3
Mentoring and training	3.7	3.7	3.4	3.0	3.5	3.3	2.5
Work/life balance	3.7	3.5	3.8	4.0	3.5	3.6	3.2

Note: Only applicable to those currently employed full-time, part-time or self-employed and NOT involved in research activities.



Figure 29. Non-researchers: reasons for non-working as researchers



Note: Only applicable to those currently employed full-time, part-time or self-employed and NOT involved in research activities.

5.5.3. Researchers VS non-researchers

Figure 29 highlights the contributions of the doctorate to the current working life of the doctorate holders. In general, looking at the overall scores, researchers feel more positive towards the contribution of the doctorate compared to those not engaged in research. In both cases, improving skills and competencies seems to be the first contribution of the doctorate, followed by the possibility of having more interesting and more demanding job assignments and better status at the workplace. On the contrary, the doctorate does not seem to contribute to starting up a new business³⁰.

There are several reasons why researchers and non-researchers decided to take their current job. Researchers valued equally reasons like taking the next step in a desirable career path, improving/gaining new skills, the intellectual challenge and the autonomy and responsibility (3.8) as key elements in the decision process to be involved in research activities in their current job. Among non-researchers improving/gaining new skills (3.6) and the job/security stability (3.5) are the main reasons selected. Both researchers and non-researchers gave low scores to the

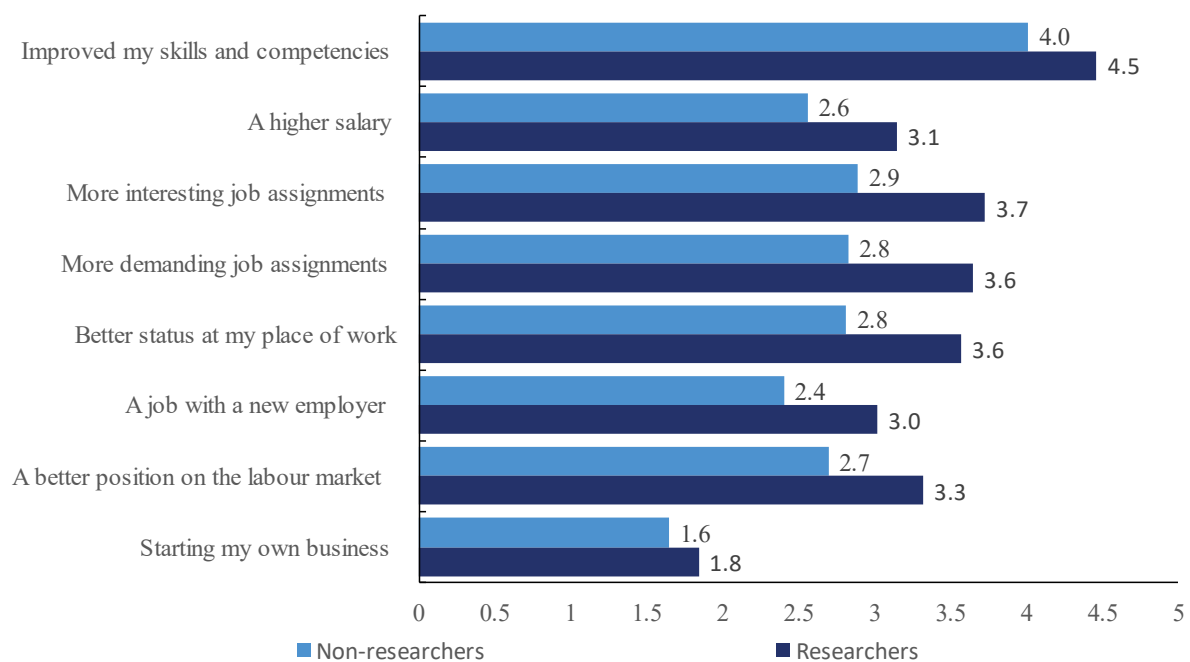
³⁰ As previously mentioned, the lack of a “not applicable” option could biased the results and those who have not had an intention to start-up a business declare that the programme does not contribute, while in reality the respondent has never had in mind to move into a self-employment path.

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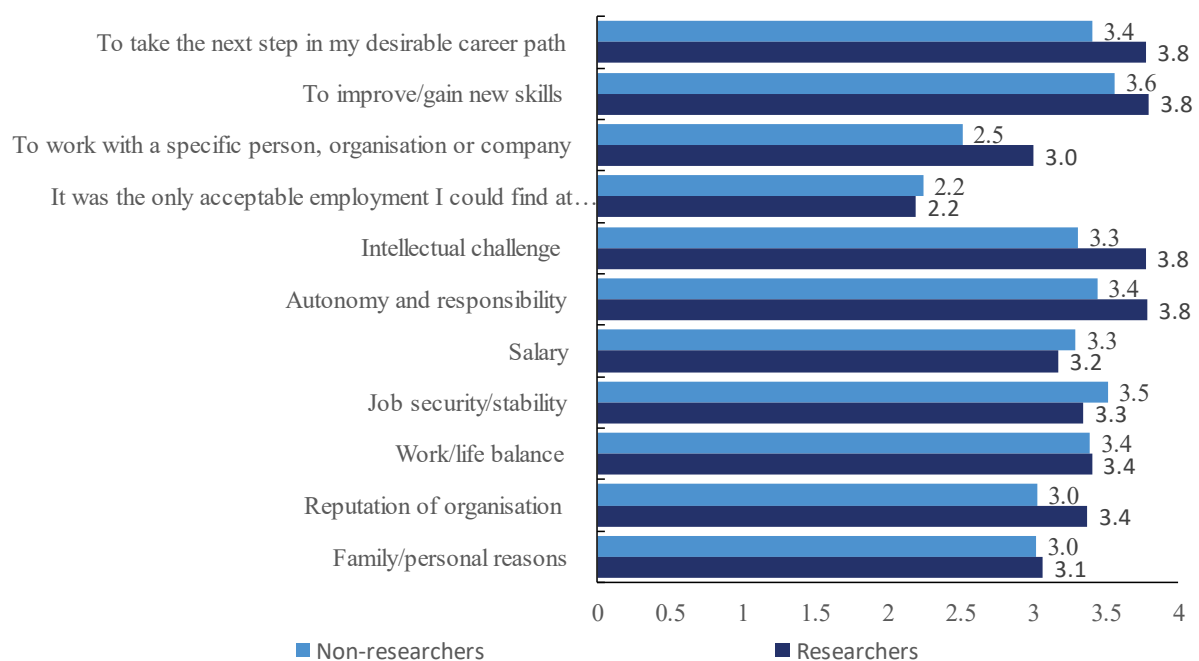
option “that was the only acceptable employment I found” suggesting that some doctorate holders have chosen a non-research career as a desirable career path, while others, prefer to focus on research activities within the job post.

Figure 300. Doctorate contribution to the following aspects of the working life



Note: Only applicable to those currently employed full-time, part-time or self-employed.

Figure 311. Reasons for taking the current job





Note: Only applicable to those currently employed full-time, part-time or self-employed.

5.6. MOBILITY

This section focuses on two different types of mobility: intersectoral and geographical mobility. Related to intersectoral mobility, doctorate holders were asked about their career track including previous jobs and sectors, as well as about plans to change their career path. Geographical mobility refers to changes in the workplace in a foreign country for more than three months since the completion of the doctorate.

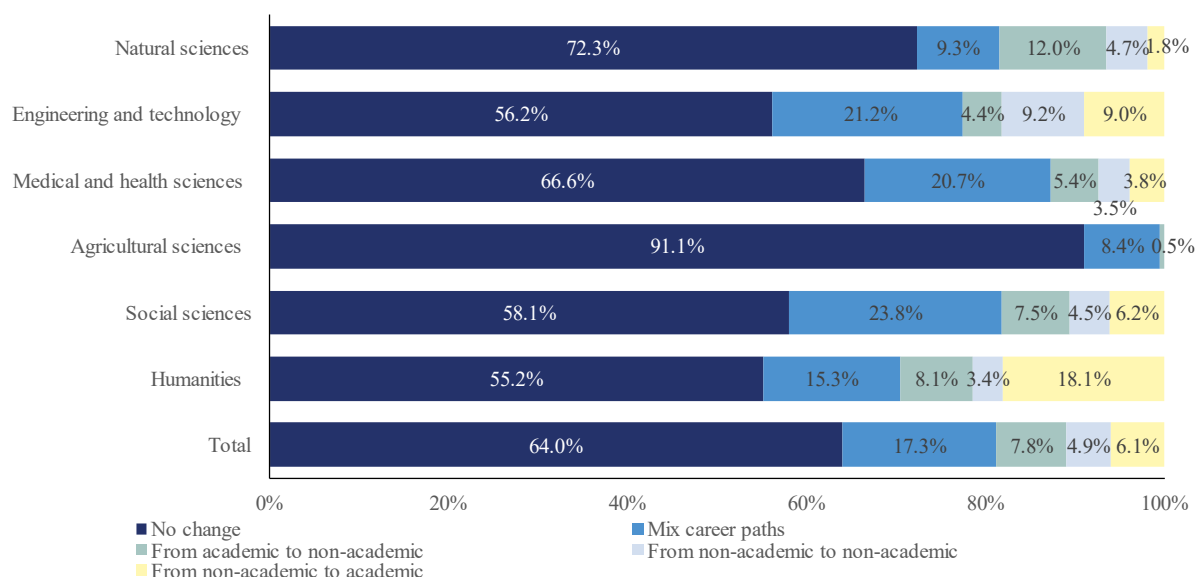
5.6.1. *Intersectoral mobility*

There is a significant proportion of doctorate holders (36%) who are considering moving to a different sector of employment (e.g., from the academic sector to a non-academic sector or vice-versa); however, the majority, i.e., 63.9%, are not considering changing the sector of current employment. Among those that want a change, 17.3% would like to combine experience in the academic and non-academic sectors.

When looking at the differences by field of research, results in Figure 31 suggest that doctorate holders do not plan to change their sector of employment or to combine it with a different path (mix career paths). That is particularly true in the case of Agricultural science where 91.1% of respondents are not considering a career change and 8.4% would like to follow a dual career path. The first type of intersectoral mobility combines academic and non-academic paths and is of particular interest in engineering and technology, medical and health sciences, and social sciences where more than 20% of the respondents have chosen this category. Natural sciences and humanities are nevertheless the fields with the highest proportion of potential intersectoral mobility: 12% of natural science doctorate graduates consider changing from an academic to a non-academic job while 18.1% of humanities doctorate holders consider to move from a non-academic to an academic sector job.



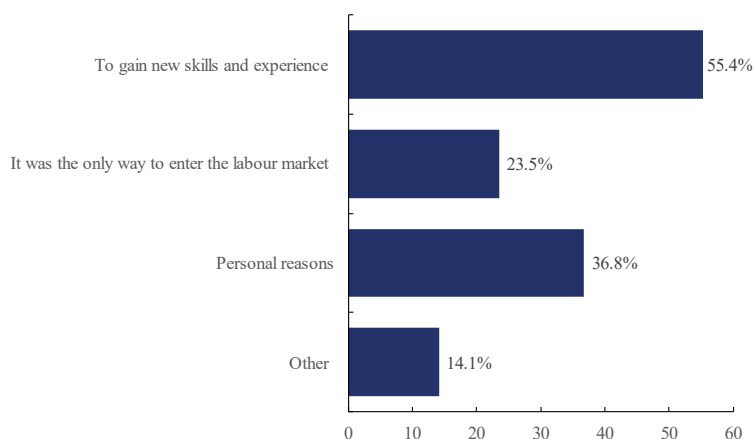
Figure 322. Intersectoral mobility expectations by field



Across sectors, some differences emerge although the main option is to remain working in the same sector. Those working at universities, government and the healthcare sector would desire to have a mixed career path while 26.5% of doctorate holders working in a RO would like to move to a non-academic sector job. Among those working in non-academic sectors they are open to changes to another non-academic job (e.g., 17.7% of those working in non-HE) but also to an academic path (e.g., 16.7% of those working on NGOs/Others).

Among the reasons for intersectoral mobility, gaining new skills and experience (55.4%) was the most widespread one, followed by personal reasons (36.8%). For 23.5% this was the only way to enter the labour market while 14.1% pointed out other reasons. This pattern is similar regardless of the type of programme followed by doctorate holders (e.g., structured or individually supervised).

Figure 333. Reasons to change sectors (n=366)



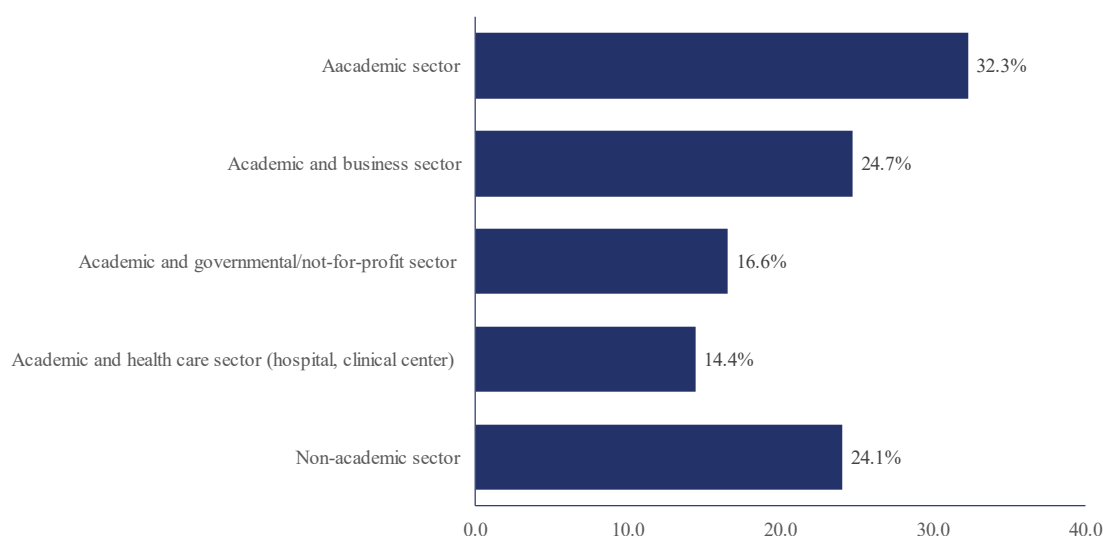
Note: Only applicable to those that have one or more employers after the completion of the doctorate and that worked previously in a different sector from current employment.

What comes after a PhD? Findings from the DocEnhance survey of doctorate holders on their employment situation, skills match, and the value of the doctorate



Another question related to intersectoral mobility refers to combined positions (i.e., several part-time positions). 30% of the respondents have combined more than one position. 32.3% of the respondents combine positions in more than one organization from the academic sector, followed by 24.7% combined positions from the academic and business sector and 24.1% worked at more than one organization from the non-academic sector.

Figure 344. Organisations where PhD holders combine positions
(n=315)



Note: Only applicable to those who have had more than one employer.

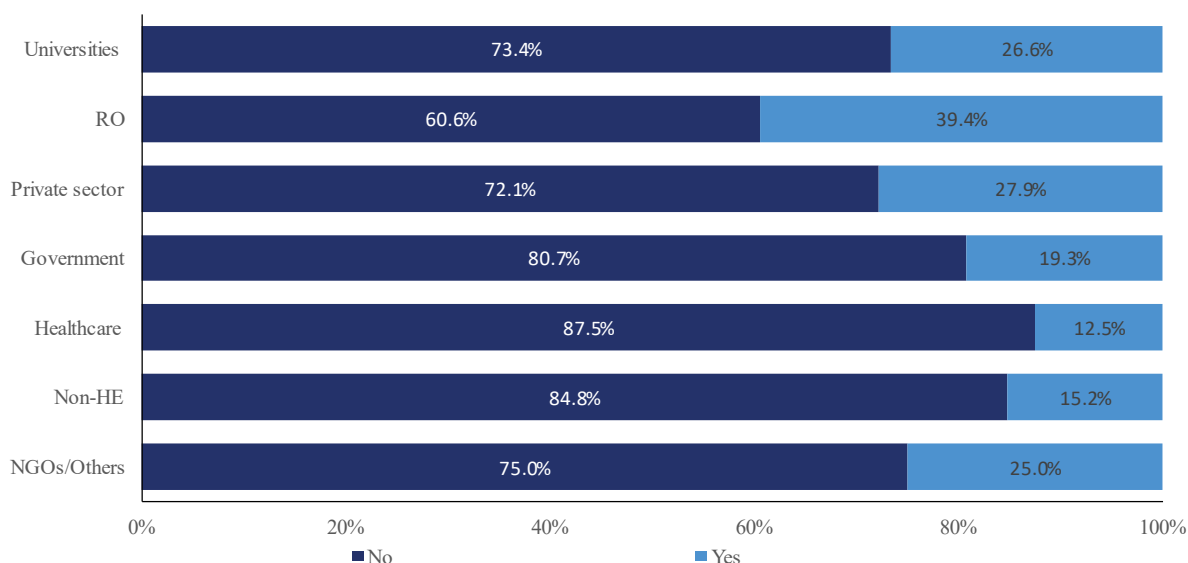
5.6.2. Geographical mobility

Looking at geographical mobility, 25.8% of the respondents have lived in a foreign country for more than three months since the completion of their doctorate. This share is higher for men than women – more than 28% of men compared to 22.7% of women. The percentage of respondents who lived abroad is the highest in the age groups of 30-34 years (32.5%) and 35-39 years (31.1%) and lower in the age group of 50 years or more (13.6%) and less than 30 years (9.8%). Those without children (28.9%) or having only one are more mobile (28.7%) compared to those having 2 or more (15% or less). Researchers were significantly more mobile (29.2%) than non-researchers (17.7%).

Looking at different employment sectors, one can note that among respondents working at the ROs, nearly 40% lived in a foreign country for more than three months after the completion of their doctorate (Figure 34). For those working in universities, the private sector or NGOs/Others, the percentage of PhD holders living abroad is between 25% and 28%. For those working in other sectors, mobility is less frequent, ranking from 12.5% for doctorate holders employed in the healthcare sector to 19.3% for those employed in the government sector.



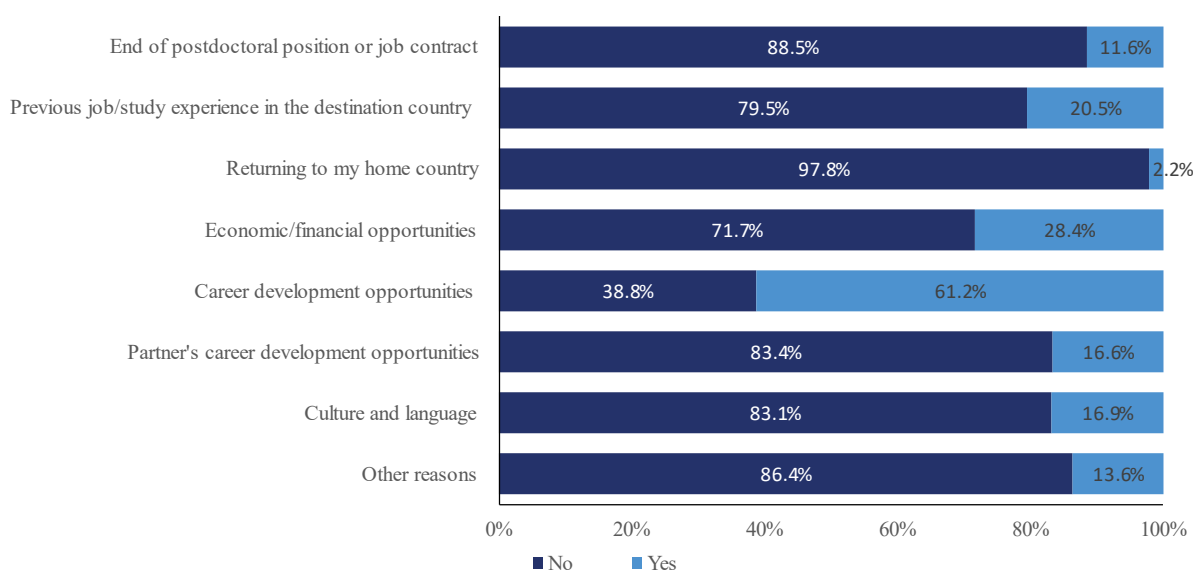
Figure 355. Geographical mobility by sector of employment



Note: Only applicable to those currently employed full-time, part-time or self-employed and have worked outside their country of citizenship after completing the doctorate more than 3 months.

Respondents were asked about the reasons to move abroad after completing their doctorate. The main reason was to have career development opportunities (61.2%), followed by economic/financial opportunities (28.4%). The option least selected is about returning home after they changed the country for study reasons (2.2%). Please note that respondents could select more than one answer, so the total sum exceeds 100 %.

Figure 366. Reasons for moving to another country (geographical mobility)



Note: Only applicable to those that have worked outside their country of citizenship after completing the doctorate more than 3 months.

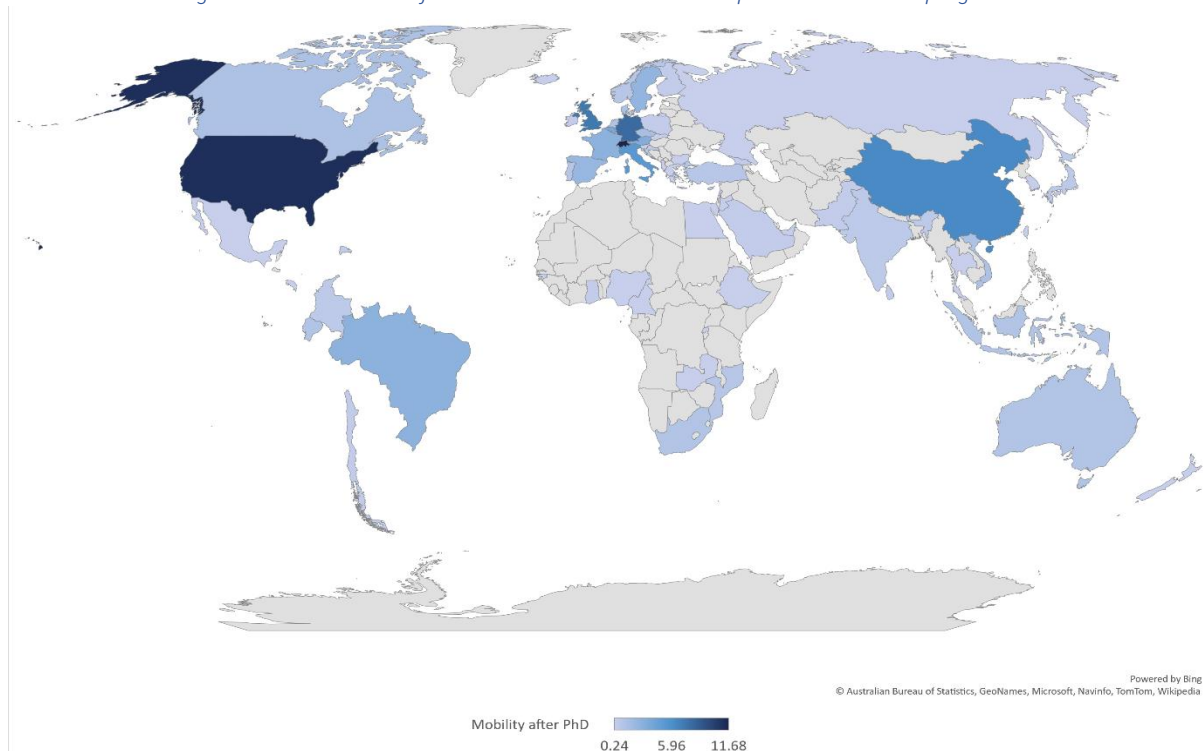
Among the destinations, the most frequent countries to move to are Switzerland (11.7%), United States (11.7%), Germany (8.0%), the UK (7.3%), China (6.3%) and Italy (5.4%). Countries that

What comes after a PhD? Findings from the DocEnhance survey of doctorate holders on their employment situation, skills match, and the value of the doctorate



only received one doctorate holder (0.2%) are represented with the lightest blue on the map and are for example Albania, Bulgaria or Costa Rica. The darker the blue, the more flow of doctorate holders to those countries.

Figure 377. Destination of the doctorate holders once completed the doctoral programme



Note: colours in the map represents the flow of intake doctorate holders. The stronger the blue is, the higher the percentage of doctorate holders moved to that country and the lighter, the least proportion.

5.7. RELEVANCE OF THE DOCTORAL TRAINING PROGRAMME AND THE INTERNATIONAL EXPERIENCE

This section also presents bilateral analyses of some combinations of variables where we are particularly interested in the understanding of the efficiency of the doctoral training programme or the international experience. To do that, we tested the significant differences that could emerge across the groups based on a T-test. The T-test is a test that compares the average on each group to be able to infer results to the general population. Significant results in a T-test mean that the differences between groups are not a particularity of the sample selected and we can conclude that these differences are part of the general population of doctorate holders.

5.7.1. Differences between the training received

Table 12 represents different approaches towards the impact of the doctoral programme by asking how prepared doctorate holders felt for their first job. As a general finding, the doctorate holders who received specific transferable training during the doctoral training have significantly higher outputs compared to those that did not. Those who for instance followed a training in [What comes after a PhD? Findings from the DocEnhance survey of doctorate holders on their employment situation, skills match, and the value of the doctorate](#)



research skills, other academic competencies, personal skills, professional skills, and communication skills feel more prepared for the first job, can better progress towards their desired career and have a clearer idea about the opportunities they could aspire to after the doctorate. There are almost no differences in how doctorate holders perceive their transition to the job market or how this affects their career path.

Table 13 shows how the doctoral programme has contributed to different aspects of the current position. Doctorate holders that received training on professional and communication skills scored more positively the contribution of the programme in the current job in almost all areas - a higher salary, more interesting and demanding job, better status at workplace, better position on the labour market, etc). Professional skills and management skills training also correlate with the improvement of skills and competencies, a higher salary, increasing the interest in and more demanding job assignments.



This project has received funding from the European Union's Horizon 2020 Science with and for Society programme under grant agreement no. 872483



Table 12. Contribution of the doctoral training program to the feeling of preparation for the first job

	Research skills			Other academic competences			Personal skills			Professional skills			Communication skills			Management skills			Other		
	No	Yes	T-test	No	Yes	T-test	No	Yes	T-test	No	Yes	T-test	No	Yes	T-test	No	Yes	T-test	No	Yes	T-test
My doctorate properly prepared me for my first job	3.4	3.5	***	3.3	3.7	***	3.5	3.8	**	3.5	3.7	***	3.4	3.6	***	3.5	3.7	***	3.5	3.4	n.s.
My doctorate enabled me to progress towards my desired career	3.7	3.9	***	3.7	3.9	***	3.8	3.5	***	3.7	4.1	***	3.8	3.9	***	3.8	4.0	**	3.9	3.4	n.s.
It was clear to me what career opportunities I could aspire to after my doctorate	3.4	3.6	**	3.4	3.6	***	3.5	2.3	n.s.	3.4	3.8	***	3.5	3.6	n.s.	3.5	3.7	n.s.	3.5	3.2	n.s.
The transition to my first job after doctorate was difficult	2.3	2.3	n.s.	2.3	2.3	n.s.	2.3	2.3	n.s.	2.3	2.3	n.s.	2.3	2.3	*	2.3	2.3	n.s.	2.3	2.2	n.s.
Having a doctorate made no difference to my career path	2.3	2.3	n.s.	2.4	2.2	n.s.	2.3	0.0	n.s.	2.3	2.3	n.s.	2.5	2.1	***	2.3	2.3	n.s.	2.3	2.6	n.s.

Note: Significant levels: ***p-value<0.01; **p-value<0.05; *p-value<0.1; n.s.=non-significant.

Table 13. Contribution of the doctoral training program to the current position

	Research skills			Other academic competences			Personal skills			Professional skills			Communication skills			Management skills			Other		
	No	Yes	T-test	No	Yes	T-test	No	Yes	T-test	No	Yes	T-test	No	Yes	T-test	No	Yes	T-test	No	Yes	T-test
Improved my skills and competencies	4.1	4.5	***	4.3	4.5	***	4.3	4.6	***	4.3	4.6	***	4.3	4.5	***	4.4	4.5	n.s.	4.4	4.6	n.s.
A higher salary	3.1	3.0	n.s.	3.1	3.0	n.s.	3.0	3.1	*	2.9	3.3	***	2.9	3.1	***	3.0	3.3	**	3.0	2.7	n.s.
More interesting job assignments	3.6	3.7	n.s.	3.5	3.7	*	3.5	3.8	*	3.5	4.0	***	3.5	3.8	***	3.6	3.9	n.s.	3.6	3.7	n.s.
More demanding job assignments	3.5	3.6	n.s.	3.4	3.7	*	3.5	3.7	*	3.5	3.8	***	3.5	3.7	***	3.5	3.8	***	3.6	4.1	n.s.
Better status at my place of work	3.2	3.4	***	3.3	3.4	n.s.	3.3	3.6	**	3.2	3.7	n.s.	3.2	3.5	***	3.3	3.7	**	3.4	3.1	n.s.
A job with a new employer	2.9	3.0	n.s.	2.9	3.0	*	2.9	3.0	n.s.	2.9	3.0	***	2.9	3.0	n.s.	2.9	3.1	n.s.	2.9	3.0	n.s.
A better position on the labour market	3.2	3.3	**	3.2	3.3	n.s.	3.2	3.4	***	3.2	3.5	n.s.	3.2	3.3	***	3.1	3.6	***	3.3	3.0	n.s.
Starting my own business	1.7	1.9	*	1.9	1.8	n.s.	1.8	2.0	*	1.8	2.0	n.s.	1.9	1.8	n.s.	1.7	2.1	***	1.8	1.6	n.s.

Note: Significant levels: ***p-value<0.01; **p-value<0.05; *p-value<0.1; n.s.=non-significant.

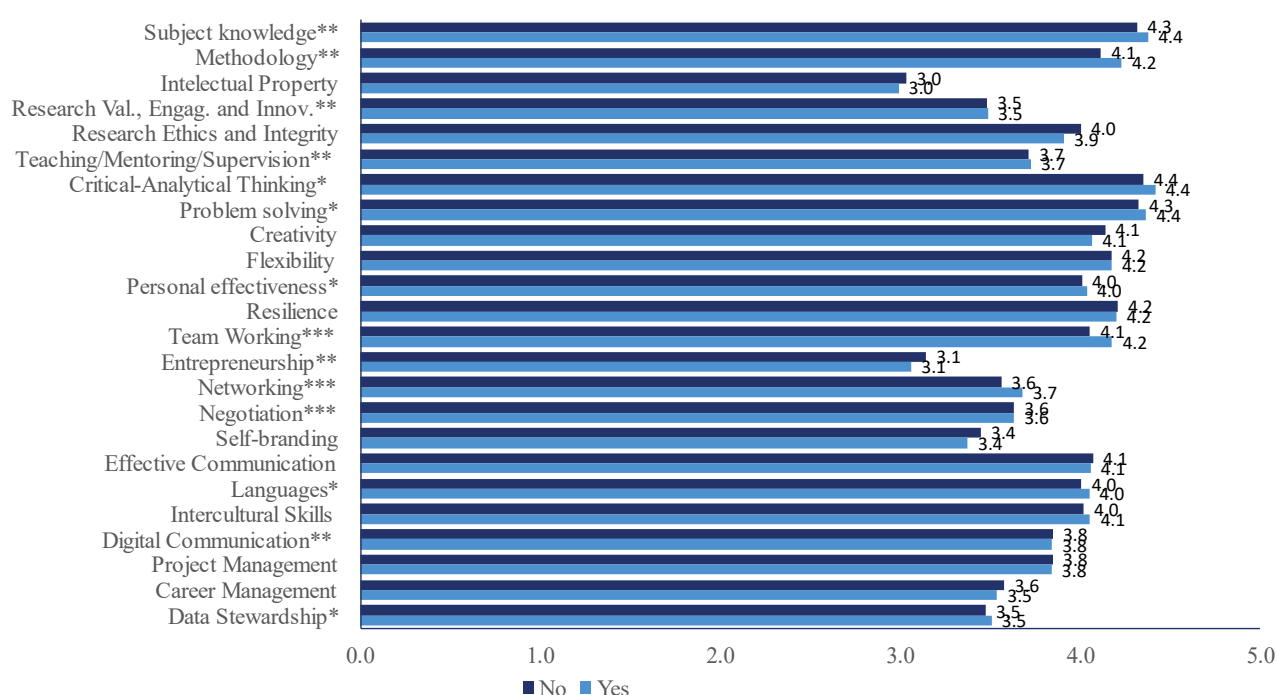


Research skills and other academic competencies do not present significant differences among those that followed or didn't follow the training.

5.7.2. Skills

In this section, we focus on the differences in the skills set of the doctorate holders. First, we explore whether collaboration with an external organisation (e.g. a private firm, another organisation, etc.) is associated with better acquired skills at doctorate completion. Although differences in the value reported are not very high, having an external collaborator during the doctorate improves the perception of the acquisition of subject knowledge, methodology, research valorisation, engagement and innovation, teaching experience, team working, entrepreneurship, networking and negotiation (level of significance: 1-5%).

Figure 388. Skills acquired after doctorate completion by collaboration with an external partner during doctorate.



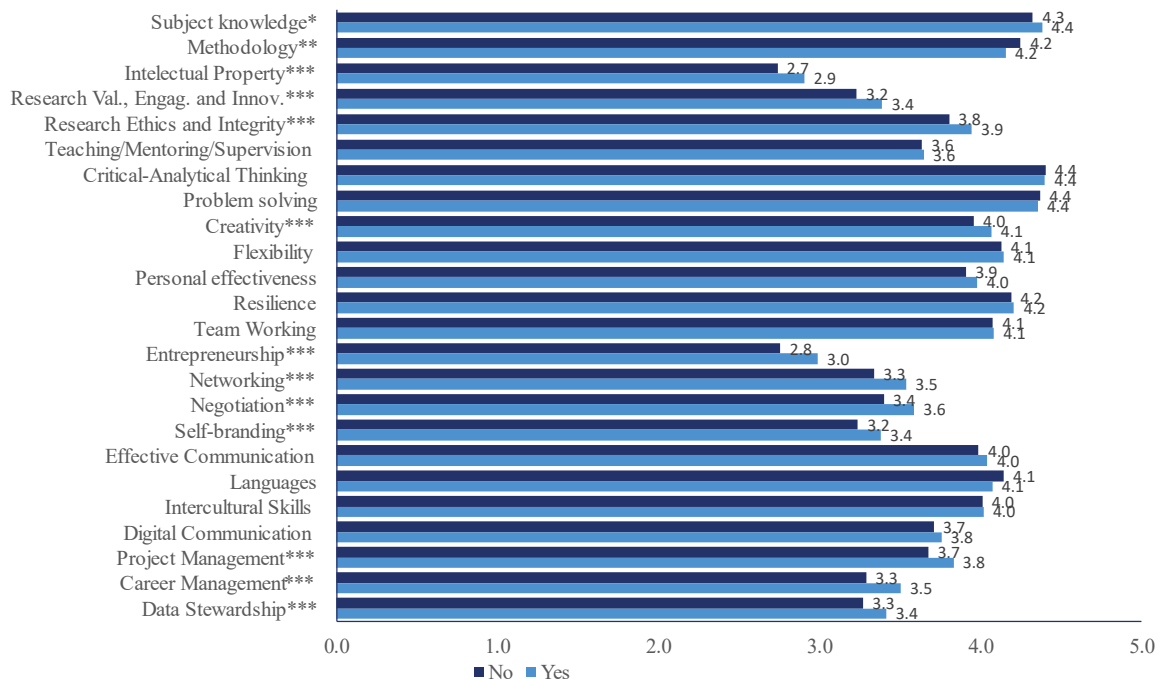
Note: Significant levels: ***p-value<0.01; **p-value<0.05; *p-value<0.1.

Second, we compare the skills acquired at doctorate completion and those important in the current job for those doctorate holders who followed transferable skills trainings at their university and those who were not. Results are provided in Table 14. Receiving formal training significantly increases the self-reported level of skills acquired during the doctoral program for almost all the skills, except for subject knowledge, creativity, resilience and languages. Fewer differences appear when looking at skills needed in the current job. In this case, significant higher values are observed for skills related to intellectual property (0.2 points), research ethics, teaching/ mentoring and self-branding (0.3 points), and entrepreneurship (0.5) when the candidates have received formal training.



Figure 38 represents the difference in the scores allocated to different types of skills when we distinguish between those doctorate holders that have any paid job before or during your doctorate and those who did not. For most of the skills, the doctorate holders with prior job experience give higher scores to most of the skills. Significant differences appear for academic skills – e.g. intellectual property, research valorisation, research ethics and integrity (except teaching/mentoring/supervision), professional skills – entrepreneurship, networking, negotiation, and self-branding (except for team working) and all management skills – project management, career management and data stewardship. In the group of communication and personal skills, there are no significant differences except creativity.

Figure 399. Skills acquired after doctorate completion by those that have/haven't a paid job before or during the doctorate



Note: Significant levels: ***p-value<0.01; **p-value<0.05; *p-value<0.1.



Table 14. Self-reported level of skills at the time of the doctorate completion and their importance in the current job by training received.

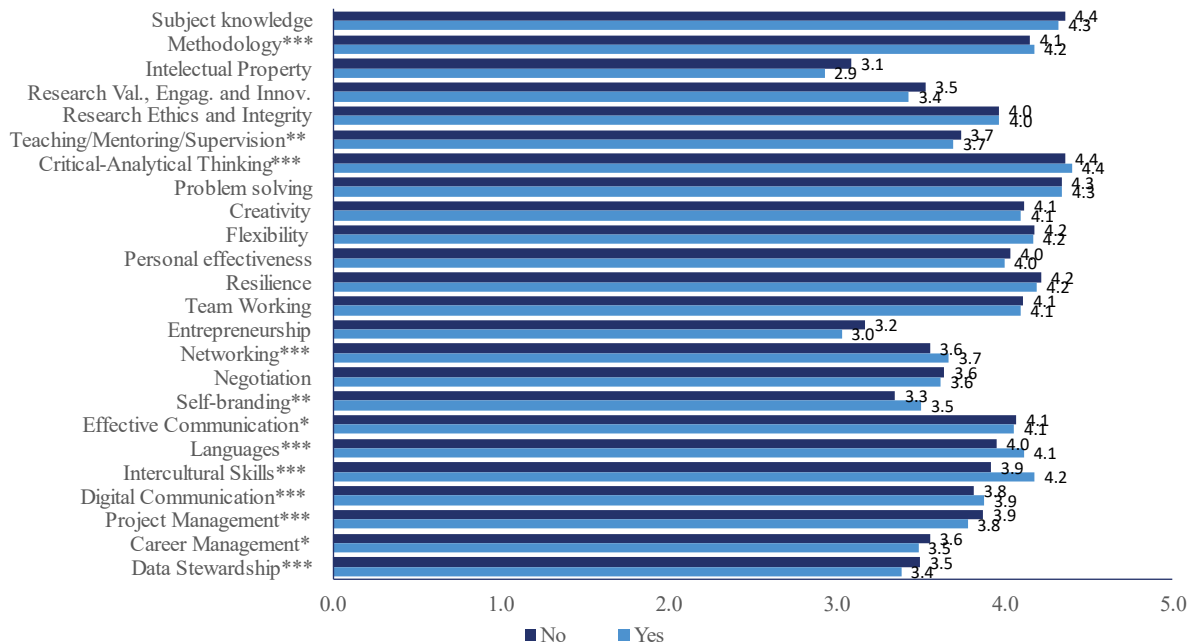
	At doctorate completion			At current job		
	Not received formal training	Received formal training	T-test	Not received formal training	Received formal training	T-test
Subject knowledge	4.2	4.4	n.s.	4.1	4.1	n.s.
Methodology	4.0	4.2	***	4.0	4.0	n.s.
Intellectual Property	2.7	3.1	***	2.9	3.1	***
Research Val., Engag. and Innov.	3.2	3.6	***	3.4	3.5	***
Research Ethics and Integrity	3.9	4.1	***	3.5	3.8	***
Teaching/Mentoring/Supervision	3.5	3.8	**	3.3	3.6	***
Critical-Analytical Thinking	4.3	4.4	**	4.5	4.4	n.s.
Problem-solving	4.3	4.5	**	4.5	4.4	n.s.
Creativity	4.1	4.2	n.s.	4.2	4.1	*
Flexibility	4.1	4.3	***	4.4	4.3	n.s.
Personal effectiveness	3.9	4.1	***	4.4	4.2	n.s.
Resilience	4.2	4.2	n.s.	4.4	4.2	**
Team Working	4.0	4.4	***	4.3	4.4	n.s.
Entrepreneurship	2.9	3.3	***	2.8	3.3	***
Networking	3.4	3.9	***	3.9	4.0	**
Negotiation	3.5	3.9	***	3.8	4.0	*
Self-branding	3.2	3.7	***	3.5	3.8	***
Effective Communication	3.9	4.2	***	4.4	4.3	n.s.
Languages	4.0	4.1	n.s.	3.9	4.0	n.s.
Intercultural Skills	3.9	4.1	***	3.7	3.6	n.s.
Digital Communication	3.8	3.9	*	4.0	3.9	n.s.
Project Management	3.7	4.1	***	4.1	4.2	***
Career Management	3.5	3.9	***	3.6	3.8	**
Data Stewardship	3.4	3.7	***	3.5	3.7	n.s.

Note: Significant levels: ***p-value<0.01; **p-value<0.05; *p-value<0.1; n.s.=non-significant.

Finally, we compare the skills levels taking into consideration international mobility or experience during the doctorate (e.g., short research visits abroad, etc.). Research stays abroad during the doctorate were associated with better skills upon doctorate completion, with statistically significantly higher self-reported competences in 6 of 24 skills. As to be expected, the greatest gain was in intercultural skills (0.3 on a scale of 1 to 5). Language skills were also enhanced (0.1), as well as networking (0.1) and digital communication (0.1), along with less obviously related skills such as self-branding (0.2) and research methodology (0.1).



Figure 400. Skills acquired after doctorate completion of those with an international experience during doctorate



Note: Significant levels: ***p-value<0.01; **p-value<0.05; *p-value<0.1.

5.8. EXPLORING DIFFERENT PHD HOLDERS' PROFILES

Based on the respondents' experience, we have identified three main career paths for doctorate holders. To build career paths³¹ we take into consideration the following information:

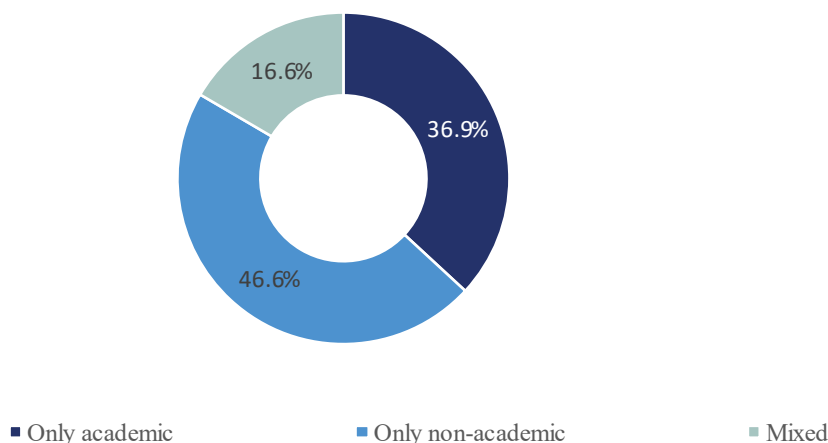
- For those with at least one job before the current employment and after obtaining the doctorate, we compare the current sector with the previous sector and classify as "Only academic" if the doctorate holder moved only between universities and research organizations; "Only non-academic" for those who moved between non-academic positions and "Mixed" for those that have had jobs in different academic and non-academic sectors.

³¹ To build this variable we combine the information provided in the following questions: a) Sector of employment; b) How many other employers did you have before your current employment and after obtaining your doctorate (including postdoctoral positions with other employers)?; c) Before your current employment and after obtaining your doctorate, did you work in (a) different sector(s) from that of your current employment?; and d) Before your current employment and after obtaining your doctorate, in which sector(s) have you worked?



- For those whose current job is the first experience within the labour market, we used current employment to distinguish between “only academic” (universities and ROs) and “only non-academic” (all other categories).

Figure 411. Career paths based on the sector of employment
(n=1685)



Note: Only applicable to those currently employed full-time, part-time or self-employed

The most frequent path is the only non-academic route where 46.6% of the doctorate holders are currently working in non-academic sector positions and any other previous job(s) is(are) also part of this group of sectors. 36.9% of the respondents have been continuously working in the academic sector and 16.6% combined both academic and non-academic positions.

We can describe the characteristics of each career path based on gender, age, research field and involvement or not in research in their current job.

For those following a purely academic path, there are slightly more women (51.8%) than men (48.2%) and young researchers in their thirties (42.5% between 30-34 years old and 25.5% between 35-39 years old). The predominant research field is natural sciences (40.5%) and social sciences (19.6%). Finally, as expected, 94.6% of these doctorate holders are involved in research in their current job and work at universities and research organizations in positions such as postdoctoral researchers (38.5% in universities and 54.5% in research organizations), research fellow/researcher (21.2% in research organizations and 12.7% in the university) and 17.5% as assistant/junior professor.



Figure 422. Characteristics of doctorate holders by academic path: gender

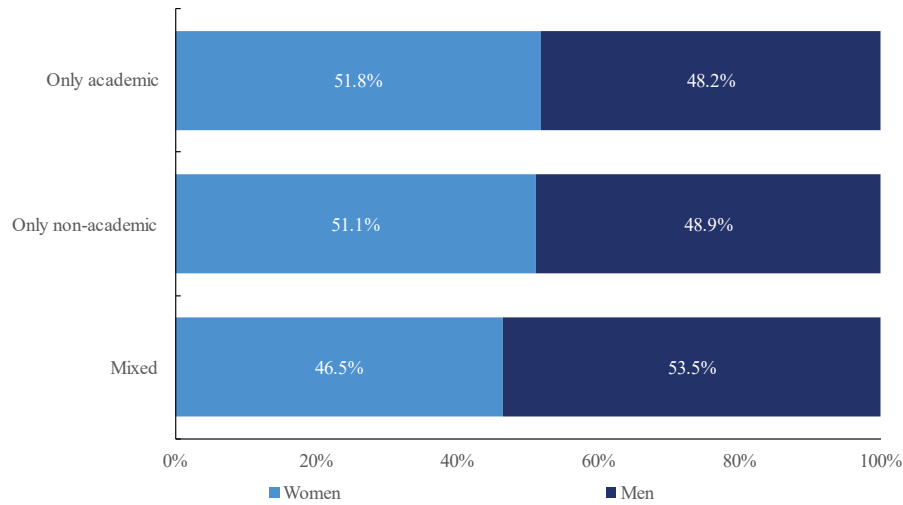
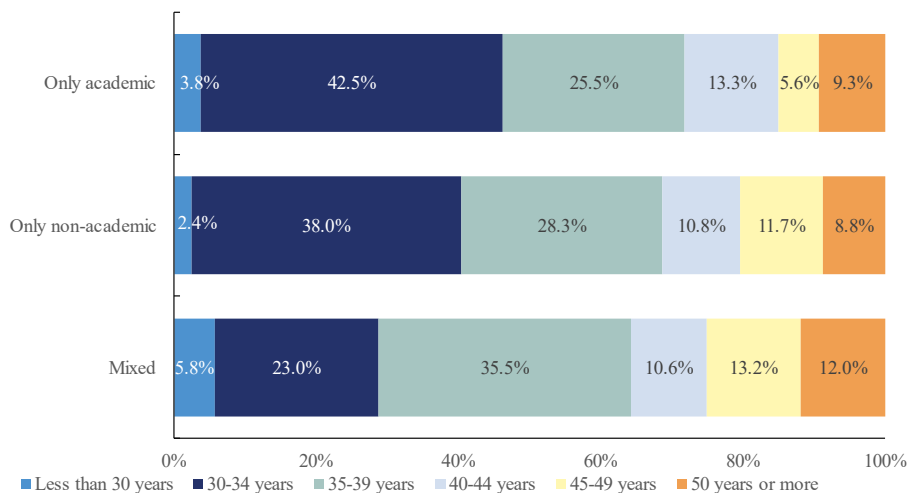


Figure 433. Characteristics of doctorate holders by academic path: age



For those following a purely non-academic path, there are slightly more women (51.1%) than men (48.9%), young researchers in their thirties (38% between 30-34 years old and 28.3% between 35-39 years old). These doctorate holders are quite evenly spread across natural sciences (23.7%), engineering and technology (23.2%), medical and health science (21.3%) and social sciences (20.5%). Only 46.2% of the respondents are involved in research in their current job; they work across all range of sectors (including an important proportion of the respondents in the non-HE sector) and in “other” positions like analyst, specialist, engineer, project manager and other unspecified positions.



Figure 444. Characteristics of PhD holders by academic path: field

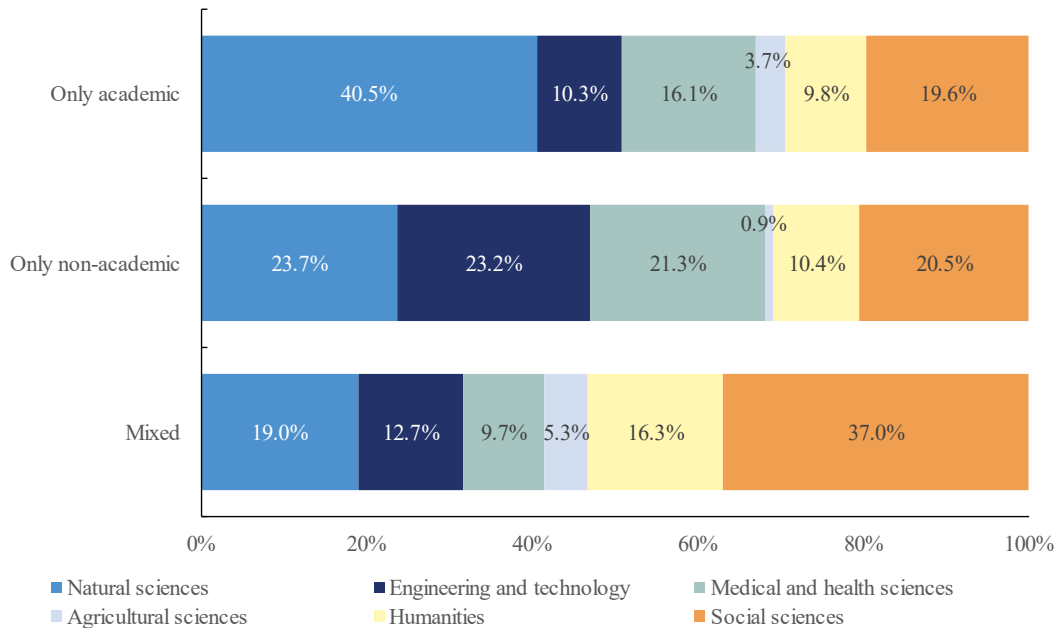
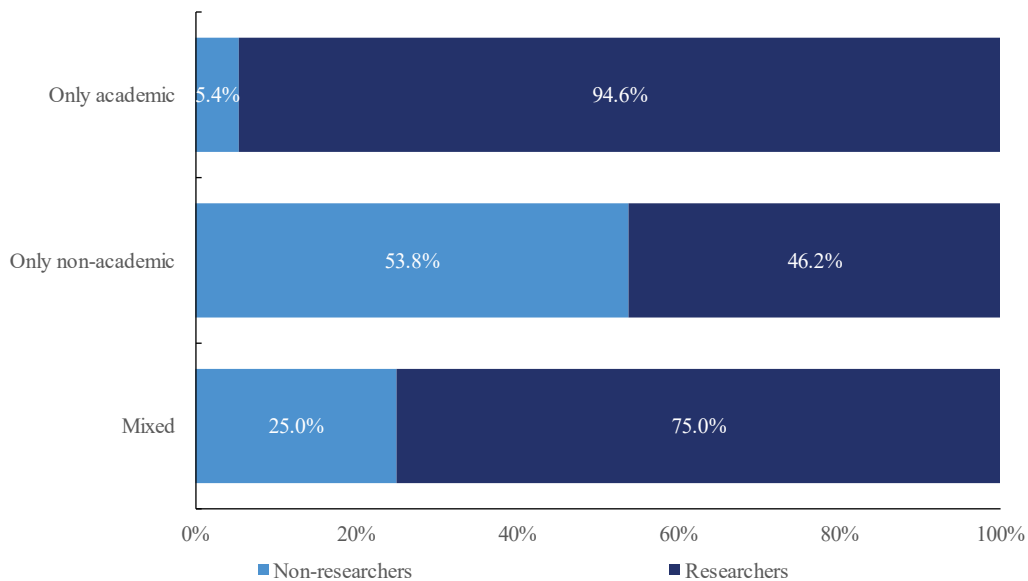


Figure 455. Characteristics of PhD holders by academic path: engagement in research

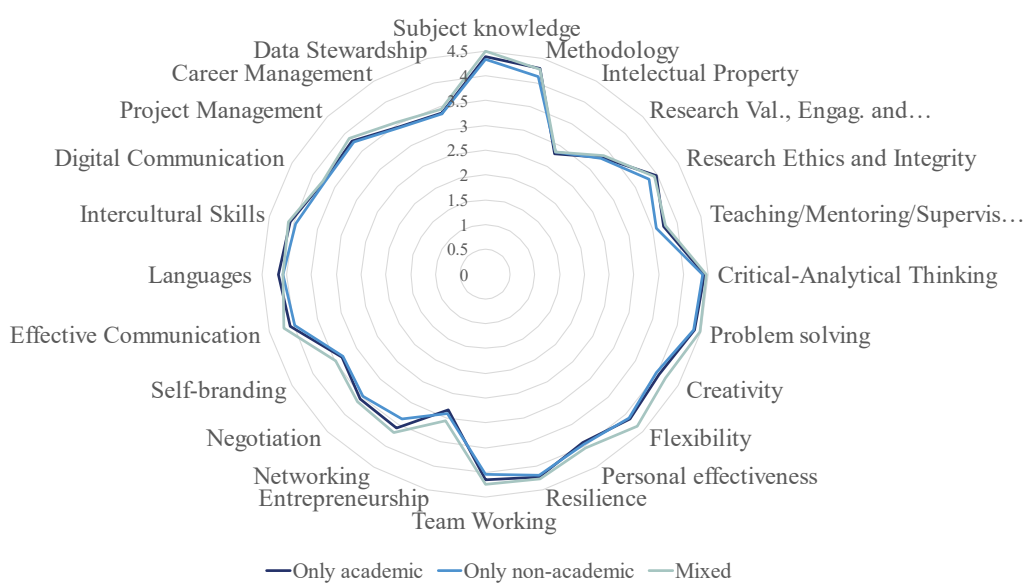


For those following a mixed career path, there are slightly more men (53.5%) than women (46.5%), in their late thirties (35.5%), and many are from the social sciences (37.0%) and natural sciences (19.0%). A significant share of those doctorate holders (75%) is involved in research activities. The most frequent positions occupied depend on the sector. For example, those working in universities or research organizations are employed mainly as postdocs or other research positions, while those in the private sector, government or the healthcare area are mainly analysts and specialists.



Comparing the skills acquired at doctorate completion across the three career paths the differences are almost insignificant. In general, those following a mixed career path have slightly higher scores on all the skills, except for research ethics and integrity, resilience and languages where those under the academic path seem to feel better prepared (Figure 45).

Figure 466. Skills at doctoral completion by employment path



With regards to vertical (mis)-match, results in Table 15 suggest that the majority of doctorate holders following an academic path (80.7%) are qualified, contrasted with 84.3% of those following a non-academic path who are overeducated. In the mixed career path, 52.2% are classified as qualified while 47.8% are overeducated. The field in which the doctorate holders work is closely related to the thematic field of the doctorate for 66.1% of respondents in the academic path and 45.8% in the mixed career path. For those following a non-academic path, 43.4% work in an area partially related to the field during the PhD while 23.6% work in a non-related area.

Table 15. Vertical and horizontal (mis)-match by career path

		Only academic	Only non-academic	Mixed
Vertical (mis)-match	Qualified	80.7%	15.7%	52.2%
	Overeducated	19.3%	84.3%	47.8%
	Total (count)	1629		
Horizontal (mis)-match	Closely related	66.1%	33.0%	45.8%
	Partly related	28.0%	43.4%	43.5%
	Not related	5.9%	23.6%	10.7%
	Total (count)	1626		



6. DISCUSSION

6.1. CHARACTERISTICS OF THE SURVEY RESPONDENTS

There was mostly reasonable diversity among the survey respondents, although almost half had graduated from one specific institution

On standard demographic measures and other similar characteristics, there was good diversity among the doctorate holders who responded to our survey. Slightly over half (51%) were women, 48% were men and 2% were something other or preferred not to say. A little over half (56%) had no children, 40% had one or two children and 4% had three or more. The fields of study undertaken by respondents were also relatively evenly split, with 27% studying natural sciences, 23% studying social sciences, 19% studying medical and health sciences, 16% studying engineering and technology, 12% studying humanities and 3% studying agricultural sciences.

The majority (65%) of respondents were aged 30–39, which is to be expected of recent PhD graduates but many were 40–49 (21%) or 50 and above (10%) and 4% were under 30. Reflecting the location of the universities involved in the survey, most (81%) respondents were of EU nationality, but 9% were from elsewhere in Europe, 5% were from Asia, 4% were from America and 2% were from Africa (according to the respondents' primary reported citizenship).

The breakdown of our survey respondents by institution was, however, not evenly split. Slightly over half (51%) of respondents undertook their doctorate studies at the Technical University of Munich. In contrast, just 1% of respondents graduated from the Aristotle University of Thessaloniki, which was the university with the smallest cohort of respondents to our survey (due to the lack of centralised contact information of the PhD graduates). These figures mostly reflected the size of the institutions rather than the willingness of graduates to participate, with response rates varying only between 18% and 31% across eight of the nine universities involved in the survey (the response rate from University of Alcalá (11%) was lower). We compensate for these differences applying weights in the analyses described to give the same importance to all universities regardless the sample obtained.

The sample shares similar characteristics with other studies in the field

While this survey has collected data representative of doctorate graduates at the level of each partner university, it must be kept in mind the overall sample may or may not be representative of doctorate holders at wider European level. In this section we compare the characteristics of our overall sample with available data on other studies in the field.



Among those studying for PhDs in the EU in 2016, 48% were women and 52% were men (no other categories were recorded).³² However, our survey tends to be slightly more women-oriented compared to the average PhD candidate. With regards to the time taken to complete the doctorate programme, 48% of our respondents took four years or less compared to 51% of doctorate students in Europe in 2018, as reported by a survey of European higher education institutions.³³ No direct comparison for financial support could be found, but similar proportions of respondents to our survey reported using funding from a public sector source (26%), private sector organisation (5%) or their own funding (11% to 18%) as proportions of European higher institutions that said that these financial sources were always used by their doctorate students or were used to a great extent (48%, 3% and 11% respectively).³⁴

In addition to providing a relatively even spread of disciplines, the distribution of the fields studied by respondents to our survey closely matches the fields studied by all doctorate holders across the OECD countries.³⁵ Job satisfaction among our survey respondents was also compared with reported job satisfaction for doctorate holders across the OECD countries. A smaller proportion of respondents to our survey said that they were “somewhat satisfied” with their job compared to those in the OECD dataset, but this might largely be accounted for by the proportion responding “neither satisfied nor dissatisfied”, which was not an option in the OECD surveys.

Doctorate holders undertook their programmes with a mixture of career aspirations, but these were not the main motivation

Career-oriented motivations for pursuing a doctorate programme were common but not overwhelming. Almost half of respondents (48%) had been motivated to pursue their doctorate by the desire to work as a researcher in academia (which was among the higher scored options for all fields of research), but less specific goals were also common with 41% wanting to work as a highly skilled expert (especially for doctorate holders in natural sciences and engineering and technology) and 35% seeking to diversify career opportunities. Working as a researcher outside academia was among the two least popular motivation factors, along with social recognition. Only one in five (19%) even explicitly stated that they had pursued a doctorate to work as a non-academic researcher. This combined with the finding that the

³² European Commission, *She Figures 2018* (Luxembourg: Publications Office of the European Union, 2019), 19.

³³ European University Association, *Doctoral education in Europe today: approaches and institutional structures* (Geneva: EUA-CDE, 2019), 22.

³⁴ European University Association, *Doctoral education in Europe today: approaches and institutional structures* (Cambridge: EUA-CDE, 2019), 20.

³⁵ OECD, *OECD work on careers of doctorate holders* (Paris: OECD Publishing, 2019). Available at: <https://www.oecd.org/innovation/inno/careers-of-doctorate-holders.htm#latest-data>.

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majority of the respondents are not working in the academia after PhD completion indicates that there is an alternative employment path working outside academia.

These career-oriented motivations were by no means the only reasons cited for pursuing doctorate studies. Indeed, the most common motivation was the interest in the research topic for doctorate holders in most research fields, with over 99% and 80% of doctorate holders in engineering and technology and natural sciences having selected this motivation factor. Across the whole sample, interest in research topic had motivated just over half of all respondents (51%). Another non-career-oriented motivation – personal accomplishment – was also very common (46%), while social recognition of the qualification also motivated a significant minority (12%).

These results demonstrate that doctorate holders may not be solely – or even principally – pursuing doctorates to pursue specific careers. Furthermore, fewer respondents had undertaken their doctorate to start a career in academia than had not explicitly aimed for this. This adds more evidence to the growing argument that doctoral programmes should prepare graduates for a wider range of careers rather than acting only as a first step on an academic career path. Doctoral programmes must not be one-size-fit-all but should offer the possibility for the doctoral researchers to adapt their training plan, including transferable skills training, based on the career profiles and aspirations. The fact that many pursue doctoral study for personal accomplishment or pure interest in the research topic also helps to frame discussions of the value of doctorate, which perhaps should not focus exclusively on professional outcomes.

6.2. VALUE OF DOCTORATE PROGRAMMES

Doctorate graduates are mostly satisfied with their programmes

If making the decision again, 64% of doctorate graduates surveyed would do the same doctoral training programme at the same institution. Just 7% would decide not to do any doctoral training programme, which is a strong indicator of the perceived value of the doctorate. In general, our respondents were satisfied with the doctoral training and especially such aspects of their programmes as quality of research training, transferable skills training, and the supervision provided by the supervisor. Lower levels of satisfaction were shown to the support to pursue a particular career provided by the university – both academic and especially a non-academic path. When looking for the first or next job, doctorate holders were mainly relying on web search, social and professional networks, and peers, whereas university career centres were among the least used resources or means of finding employment. These findings were similar in the previous ESF Career Tracking Survey, and a study of PhD careers conducted by



the FNRS Observatory of Research Careers³⁶. We consulted the DocEnhance partner universities, and six provided confirmation that they did have a career centre operating during 2016-2020. Out of those, in one university, the career centre did not operate during the full period of 2016 - 2020, and in another university the existing career centre mainly targeted Master's and Bachelor level students. The low scores therefore may be partly due to the fact that in some universities career centres did not exist or were not targeting PhD researchers, and partly because PhD researchers did not use these services where those existed (this however is clearer at the level of the individual universities). It remains to be explored what more can be done at the university level to support PhD career orientation, especially when it comes to providing information on employment prospects outside the academia.

There appeared to be a slight preference for structured doctorate programmes (compared to supervisor-led doctorate studies), with those who followed structured programmes reporting marginally higher satisfaction with quality of transferable skills training (+0.1), support to pursue an academic career (+0.2) and services for doctoral students (+0.3).

Doctorate holders overall see doctoral training as a positive experience and the doctorate as an added value for their career, with many indicating that the doctorate helped them to progress to their desired career goals. However, doctorate holders working outside the academia, are less positive about the added value of the doctorate, and the transition to the first job after PhD. When asked about the added value of the doctorate in their current job, many agreed that the doctorate improved their skills and competences, allowed them to have more interesting and demanding work assignments, and improved their status at the workplace. The doctorate appears to have contributed less to finding a job with a new employer, to start a business or a higher salary.

The perceived impact and added value of the doctorate on careers was overall positive, but less so for those in non-HE, healthcare and government sectors

Survey respondents were asked a series of questions exploring different aspects of the impact they thought their doctorate had had on their career. Almost two thirds of respondents (65%) agree that their programme had made a difference to their career path smoothing the transition to the first job after the doctorate, regardless of the career path chosen. A substantial majority (83%) thought that their doctorate programme had contributed either "greatly" or "a lot" to improving skills and competencies relevant to their career. In contrast, however, the aspects of doctorate programmes related to careers tended to be associated with the least satisfaction of doctorate holders. Only 54% were satisfied with the preparation provided by

³⁶ European Science Foundation, [2017 Career Tracking Survey of Doctorate Holders](#) (Strasbourg: ESF, 2017), 70; Observatory of Research and Scientific Careers, [Employment status of PhD holders in the Federation Wallonia-Brussels](#) (Brussels: F.R.S-FNRS, 2019), 13.

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the doctorate programme to pursue an academic career and just 34% were satisfied with the preparation to pursue a non-academic career.

Ranking the contribution of the doctorate programme from 1 (no contribution) to 5 (great contribution), respondents reported positive contributions to improved skills and competencies (4.3) while there are other areas where the impact has not been so significant, like securing an improved position on the labour market (average ranking of 3.1), jobs with a new employer (2.8), increased salary (3.0) and better status at the workplace (3.3).

There are however differences between those who are engaged in research in their current job and those who are not, as well as across the various sectors of employment. Those in research jobs and those working in the academic and private sector were clearly more positive about the impact of the doctorate on their career and about the added value of the doctorate (e.g., for the nature of tasks, salary, a better position in the labour market). Those in non-research positions, as well as those especially in the non-HE - and to a lesser extent healthcare and government sectors - were more negative about the added value and impact of the doctorate. The rather negative scores in the non-HE sector should get special attention – this sector mainly employs 21% of all Humanities graduates as well as 6 % of Social Sciences graduates in our sample. Previous ESF-SC career tracking survey reported unemployment levels for the doctorate holder in humanities twice as high as those in other fields³⁷. This calls for more investigation and more targeted career support for doctorate holders in humanities.

Doctorate holders appear to find employment fast, yet temporary contracts are common in academia

Across the nine universities involved in our survey, the average time to find a job after completing the doctorate was very short, with 72% finding employment in less than 1 month after completion, with 15% of those needing between 1 and 3 months. This may be largely since a vast majority (76%) already had a paid job before and during the doctorate and may have continued after completing their doctoral degree. Just 4% reported waiting more than one year to find their first job after their doctorate.

At the time of taking the survey, 91% of respondents were employed and 3% of respondents were unemployed (compared to 7% across the entire active population of the European Union).³⁸ These high levels of employment match previous surveys from the OECD and US National Science Foundation, which found that doctorate holders have the highest employment

³⁷ European Science Foundation, [2017 Career Tracking Survey of Doctorate Holders](#) (Strasbourg: ESF, 2017), 38.

³⁸ Eurostat, [Unemployment by sex and age – monthly data](#) (2021), accessed 5 July 2021.

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rates of all educational attainment levels.³⁹ The level of unemployment in this survey is very close to the one reported in the FNRS study located at 3.8%⁴⁰ and in the previous ESF career tracking study in 2017 located at 4%.⁴¹

Despite relatively high rates of employment, previous studies have reported that recent doctorate graduates are often employed on temporary contracts.⁴² Our survey found that 64% of employed respondents were in permanent (full-time or part-time) employment while 20% were in temporary (full-time or part-time) employment. This proportion of temporary contracts in our sample is indeed higher than the proportion of the overall European Union workforce in temporary employment (11% in 2020),⁴³ although it is lower than the rates of temporary contracts reported from similar surveys of recent doctorate graduates in the UK (28%), Belgium (30% to 37%) and Italy (49%).⁴⁴ The share of temporary contracts is also lower than in the ESF's 2017 survey (27%).⁴⁵

The share of temporary contracts is highest among those working in Research Organisations (35%) and universities (33%). These employ nearly half of the doctorate holders (49%), of which many are engaged in postdoc positions (48% and 38% respectively). The overall lower share of temporary contracts in our study compared to those reported in other studies may be partly explained by the relatively lower numbers of the PhD graduates in our sample working in the academic sector (e.g., 37% employed in universities, compared e.g., to 44.4% in Wallonia

³⁹ OECD, [Education at a Glance 2019](#) (Paris: OECD Publishing, 2019), 252 and US National Science Foundation, [National Survey of College Graduates 2019](#) (2019)

⁴⁰ Observatory of Research and Scientific Careers, [Employment status of PhD holders in the Federation Wallonia-Brussels](#) (Brussels: F.R.S-FNRS, 2019), 16.

⁴¹ European Science Foundation, [2017 Career Tracking Survey of Doctorate Holders](#) (Strasbourg: ESF, 2017), 36.

⁴² For example, see: Observatory of Research and Scientific Careers, [Employment status of PhD holders in the Federation Wallonia-Brussels](#) (Brussels: F.R.S-FNRS, 2019), 22–25; Centre for Research and Development Monitoring [ECOOM Brief 30: PhD holders and job contracts: is one better off in the non-academic sector?](#) (Ghent: ECOOM, 2020), 4; Vitae, [Do researchers' early careers have to be precarious?](#) (Cambridge: The Careers Research and Advisory Center, 2019), 3; University of Turin, [Career Tracking of PhD Holders. University of Turin. Project Report](#) (Turin: Università degli Studi di Torino, 2018), 16.

⁴³ Statista, [Temporary employees as percentage of the total number of employees in the European Union \(EU27\) from 2005 to 2020](#) (2021).

⁴⁴ Observatory of Research and Scientific Careers, [Employment status of PhD holders in the Federation Wallonia-Brussels](#) (Brussels: F.R.S-FNRS, 2019), 22–25; Centre for Research and Development Monitoring [ECOOM Brief 30: PhD holders and job contracts: is one better off in the non-academic sector?](#) (Ghent: ECOOM, 2020), 4; Vitae, [Do researchers' early careers have to be precarious?](#) (Cambridge: The Careers Research and Advisory Center, 2019), 3; University of Turin, [Career Tracking of PhD Holders. University of Turin. Project Report](#) (Turin: Università degli Studi di Torino, 2018), 16.

⁴⁵ European Science Foundation, [2017 Career Tracking Survey of Doctorate Holders](#) (Strasbourg: ESF, 2017), 36.



and 47% in the previous ESF career-tracking study⁴⁶). While the differences can be explained by the different national and institutional contexts and policies, our findings indicate that researchers in research organisation and universities, of which many in postdoctoral positions, often find themselves in precarious employment contracts. The share of doctorate holders working in academia is lower among respondents who graduated 5 years ago, compared to those with 1-2 years since graduation.

Slightly more than half of the doctorate graduates are employed in non-academic sectors, where permanent contracts prevail

Over half of the employed doctorate holders (52%) are working outside academia: one in five (22%) were working in the private sector, with the next most popular sectors being healthcare (10%), government and the public sector (8%), non-higher education (6%) and the non-governmental sector (3%). Most common positions are analyst/specialist and engineer in the private and government, medical positions in the healthcare sector, and teachers in the non-HE sectors. The proportion of respondents with permanent contracts was much higher for those employed in the private sector (87%), healthcare sector (80%), non-higher education sector (77%) and government sector (70%) than in universities (56%) or research performing organisations (57%). The OECD has recently highlighted the increasing precarity of academic research careers and the problems this causes, as well as policy recommendations to address these issues.⁴⁷ The results from our survey demonstrate the importance of this issue, which should be incorporated into discussions on how doctoral programmes can be tailored to provide most value to graduates and society in general.

Higher shares of women in temporary contracts and lower rank positions compared to men, although differences may be also explained by variation across sectors of employment

When looking at the gender differences we also see that female doctorate holders are at a disadvantage when it comes to employment contracts, which is in line with previous surveys of doctorate holders as well as measures of the overall labour market in Europe⁴⁸. Women are less likely than men to be in a permanent position (57% for women versus 70% for men including both full time and part-time positions). This could partly be explained because there

⁴⁶ Observatory of Research and Scientific Careers, [Employment status of PhD holders in the Federation Wallonia-Brussels](#) (Brussels: F.R.S-FNRS, 2019), 17; European Science Foundation, [2017 Career Tracking Survey of Doctorate Holders](#) (Strasbourg: ESF, 2017), 66.

⁴⁷ OECD, [Reducing the Precarity of Academic Research Careers](#) (Paris: OECD Publishing, 2021).

⁴⁸ For example, see: Centre for Research and Development Monitoring [ECOOM Brief 30: PhD holders and job contracts: is one better off in the non-academic sector?](#) (Ghent: ECOOM, 2020), 4; Observatory of Research and Scientific Careers, [Employment status of PhD holders in the Federation Wallonia-Brussels](#) (Brussels: F.R.S-FNRS, 2019), 15; Eurostat, [Part-time employment and temporary contracts - quarterly data](#) (2021), accessed 12 July 2021

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is a higher proportion of men employed in the private sector (28% compared to 14%) and as we have seen the private sector tends to be a safe bet for permanent jobs. Looking at the field of the doctorate, men are overrepresented in engineering and technology and natural sciences, while women are more concentrated in agricultural sciences, humanities, medical sciences, and social sciences. It is also important to note that there is a higher proportion of women taking career breaks (37%) compared to 23% of men.

Gender differences also appear when looking at current positions of doctorate holders: there are higher shares of men in high academic rank positions, e.g., Senior Researcher or Full Professor and leadership positions outside academia e.g., Director/Head of Unit, while women are more present in the lower rank positions such as postdoctoral researchers or early career researchers. Similarly, among the doctorate holders occupied in research positions (69% of the total sample), most men respondents consider themselves established researchers (49%) while most women respondents consider themselves as recognized researchers (54%), according to the European Framework for Research Careers. While these differences may partly be due to different answering tendencies between men and women (e.g., women answering in a more "humble manner"), all in all, our results point to a more precarious employment situation for women doctorate holders.

Similarly, regarding the transition to first employment after the doctorate, women feel somewhat less prepared for the first job than men, have less clear career prospects and tend to agree a bit more than men that the transition to the first or next job after the doctorate was difficult.

While most doctorate holders work in jobs related to the thematic field of their PhD, most of those outside the academia are 'overeducated' for their position

We further explore how doctorate holders fit their jobs, looking at the vertical and horizontal (mis-)match. Most respondents (85%) work in jobs that are closely or partly related to thematic field of their doctorate (horizontal match). Looking at differences by sectors, most of those working in universities and ROs, have their jobs "closely related", while most respondents working in non-academic sectors have their jobs "partly related" to the thematic field of their doctorate. We note also that 28% of respondents in industry, 26% in government and 39% in NGO/other sectors do not have jobs thematically related with their doctorate, compared to only 6% of respondents in the university, 5% in ROs and 9% in healthcare. Working in a field not thematically related to the doctorate, alone, may not necessarily be considered in negative terms, as doctorate holders may choose to work in a different thematic field, and still use their skills and research experience.

More than half (54%) of all respondents is "overeducated" (vertical (mis)-match), that is the minimum educational requirement for the position they are currently employed in is a Master's degree or lower. Having a PhD as the minimum entry standard was markedly different for those engaged in research for their work (62%) compared to those that were not (11%). Correspondingly, higher proportions of those working in the government sector (94%), non-higher education sector (97%) and for non-governmental organisations (92%) are



overeducated and did not need a PhD compared to those working in universities (19%) or research performing organisations (29%). The proportion for the private sector led in between these extremes, with 79% categorized as overeducated.

The level of vertical (mis-)match could be a sign that a 'surplus' of doctorate graduates is being produced as indicated by a number of media and academic articles⁴⁹. However, it may be the case that while not required, PhD may be a "desired" degree and that doctorate holders have more interesting or demanding jobs and perform better in their jobs than those with lower qualifications would do. Evidence for this includes the high employment and short gaps between graduation and employment for doctorate holders (see above) as well as the significant proportion (69%) of respondents agreeing that their doctorate had enabled them to progress towards their desired career. It would be important to explore in future research whether employers outside academia are aware of the added value of the doctorate holders and whether they are actively looking to hire those.

Over two thirds of employed doctorate holders were engaged in research, although more would like to be

Over two thirds of doctorate holders (69%) are engaged in research in their current jobs (including most of respondents in the academic sector (98% in ROs and 96% in the university), and between 45% and 63% in other sectors, e.g., healthcare (64%), government (51%), the private sector (42%) and NGOs (45%). Of those working in non-HE sector only 31% were engaged in research. By doctorate field, those most likely to be engaged in research were those who had studied agricultural sciences (85%) or natural sciences (78%) while those who had studied humanities (54%), or engineering and technology (60%) were least likely to be engaged in research.

Looking at differences between doctorate holders, those engaged in research in, and outside academia appear more satisfied overall with the various aspects of their job (e.g., autonomy and responsibility, prestige of the organisation, skills development, intellectual challenge associated with the job, etc.) than those not engaged in research activities. When asked what motivated them to pursue a non-research job, doctorate holders' responses clearly indicate it was a "second best" choice, and similar conclusion was made in the report from the survey of PhD holders in Wallonia⁵⁰. For some, there were 'positive' reasons, with 32% saying that interest in non-research careers had been a "very important" or "extremely important" factor in their decision to move away from research, and 44% saying the same of the variety of career

⁴⁹ "[Education: The PhD factory](#)", by Cyranoski, D., Gilbert, N., Ledford, H., Nayar, A., Yahia, M., 2011, *Nature* Volume 472, p. 276-279; "[The PhD bubble: when production outstrips demand](#)", 2014, *ParisTech Review*.

⁵⁰ Observatory of Research and Scientific Careers, [Education-job match among the PhD holders in the Federation Wallonia-Brussels](#) (Brussels: F.R.S-FNRS, 2019), 8.
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paths available for non-researchers. For others, practical issues had been an important factor, with 34% listing personal or family reasons and 53% listing salary as very or extremely important. However, the most common reasons were more explicitly 'negative'. Over half (59%) said that the unavailability of a suitable research position had been a "very important" or "extremely important" factor in their decision and the most common factor (which was very or extremely important to 65% of those not engaged in research) was the difficulty in securing a permanent research position.

That many of these highly trained individuals end up in jobs where they do not engage in research and where PhD is not a requirement is something to take into consideration, especially since this career choice is clearly driven by external constraints (e.g., lack of permanent contracts) rather than personal choice and career goals. This also partly explains why doctorate holders not engaged in research and those in non-academic sectors felt less prepared for the transition to the first employment after the PhD.

It is encouraging to note, however, that slightly over one quarter of all those not involved in research in their current job (most of whom work outside academia), are working in what can be called "leadership" positions or positions with responsibility (e.g. coordinator, director/head of unit, project manager). It would be interesting to do further research to explore, whether, even if hired for jobs not requiring a PhD or research experience in jobs outside academia, doctorate holders are promoted to jobs with more responsibilities faster than other colleagues, as their analytical and other skills are recognised by the employers. In the next section we discuss the skills (mis-)match to explore whether doctorate holders utilise their knowledge and skills to the fullest in their workplace.

6.3. SKILLS TRAINING AND SKILLS (MIS-)MATCH)

Most doctoral programmes offer transferable skills training, although these tend to focus on academic skills

Historically, doctoral programmes have focused heavily on the completion of an original academic research project under the supervision of a senior academic, to develop future academic researchers.⁵¹ Commentators have described this focus broadening slightly, however, as doctorate holders have pursued a variety of careers and hence require a greater set of skills extending beyond academic research, and as institutions have taken a greater role in managing the content and structure of the courses they offer to PhD candidates.⁵² Approximately half (52%) of respondents to our survey said that their doctorate had mainly

⁵¹ [New Variant PhD: The changing nature of the doctorate in the UK](#), by Park, C., 2005, *Journal of Higher Education Policy and Management*, Volume 27, p. 189-207.

⁵² European University Association, [Doctoral education in Europe today: approaches and institutional structures](#) (Geneva: EUA-CDE, 2019), 6-7.

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been achieved through individually supervised research with the rest undertaking structured training programmes. Three quarters (76%) were offered transferable skills training (e.g. communication, management, research ethics and integrity, etc.) during their doctorate, although where this was optional (30.5%) over a third (34%) declined it. It would be interesting to explore further (e.g., in interviews) what were the reasons for not taking any courses where these were offered: whether it was due to the lack of time and the pressure to focus on thesis and academic publications, the influence of PhD supervisors, or a perceived lack of usefulness of such trainings.

For 24% of respondents, there were no training transferable skills offered at their university (or perhaps the doctorate graduates were not aware of there being any). Five out of nine partner universities confirmed offering transferable skills courses to PhD candidates (e.g. leadership skills and communication, academic entrepreneurship, career management, networking, time management, effective collaboration, personal skills, communication skills, etc.), and one partner university confirmed there being no transferable skills trainings on offer. In some universities, there are specific transferable skills courses for doctoral researchers, in others these are offered to other students and other members of the faculty as well. In one university, there is no doctoral school and therefore skills courses vary across the faculties, with most offering training in academic skills, rather than transferable skills.

Despite the perception that transferable skills training is increasingly being delivered to broaden doctorate holders' career prospects, the skills training PhD holders received focused mostly on research and other academic skills (84% and 62% of those receiving skills training respectively). Training in skills relevant to a wider variety of employment sectors were less common – 56% of those receiving transferable skills training were trained in communication skills, 34% in personal skills such as problem solving or resilience, 31% in professional skills and 27% in management skills. These findings echo similar results collected through the EUA-CDE survey of HEIs conducted in 2018-2019, which showed that the focus of doctoral training activities was very much on research competences, followed at a distance by other non-academic transferable skills trainings (teamwork, knowledge valorisation, management or teaching competences)⁵³.

Overall, in our sample, personal competencies such as critical-analytical thinking and problem-solving were rated highest among the most important competences acquired at doctorate completion and needed in the current job. Outside this group of skills/competences, doctorate holders rated their subject knowledge and methodology among the strongest skills at doctorate completion, and effective communication, team working and project management as most needed ones in the current job. Entrepreneurship and Intellectual Property related skills

⁵³ European University Association, [*Doctoral education in Europe today: approaches and institutional structures*](#) (Geneva: EUA-CDE, 2019), 15.

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were by far least acquired and least needed at current job out of all the skills listed. As far as entrepreneurship skills concerned, this may be related to the fact that only 6.8 % of respondents were self-employed at the time of the survey.

Skills match was best for those working in universities and research organisations, yet for those in jobs outside academia research skills and broader academic competences are less needed

The doctorate holders responding to our survey overall reported a reasonably good match between the skill levels they had developed by the end of their doctoral programme and the skills that were important in their current jobs. Rating these skills from 1 (“very poor” / “not at all important”) to 5 (“very good” / “extremely important”), the average (mis-)match across all 24 skills included in the survey and across all respondents was just 0.15⁵⁴. This masks some variability between different sub-groups of respondents, which is explored below.

As expected, the average skills mis-match between graduation and employment was smaller for those working in universities or research performing organisations, where the average mis-match was 0.12. In contrast, skills mis-matches were greater for those working in non-higher education sector (0.33), the government sector (0.28), NGOs (0.19), the healthcare sector (0.10), and the private sector (0.05).

No single skill was associated with a great miss-match across all employment sectors. Instead, different skill gaps were prominent for different sectors, which demands further exploration of the skills’ needs across the various employment sectors. In the private sector, the greatest skill gap was in project management followed by negotiation, communication and flexibility. In the non-governmental and healthcare sectors the greatest skill deficiency was in networking, while in non-higher education it was unsurprisingly teaching. No significant skills deficiencies were reported by those working in the government sector (the skills (mis-)matches in this sector almost exclusively consisted of doctorate graduates having greater skills than required).

The variety in skills needs across different sectors suggests that universities seeking to improve the transferable skills training delivered in their doctoral programmes should aim to target a broader set of skills. As discussed above, most transferable skills training delivered as part of existing programmes focuses on academic skills. However, it was only those working in universities and research organisations that reported needing greater competence in these areas than had already been delivered by their doctoral programme. In all non-academic sectors (the private, governmental, healthcare and especially non-HE sector), there was a clear ‘over-skilling’ when it comes to subject knowledge and other academic competences (e.g.,

⁵⁴ Difference in the reported score for each skill at current job compared to at doctorate completion.



research ethics and integrity, research valorisation, intellectual property, or teaching/mentoring). Exceptions were intellectual property competences for the private sector where the need converged with the level of skills acquired at doctorate completion, and teaching/mentoring skills in the non-HE sector, where doctorate graduates reported being under-skilled.

The 'over-skilling' of those working in non-academic sectors may be a more troubling issue than the overeducation of doctorate holders in their jobs. Whereas employees with higher qualifications than required may perform their role better than those who just meet the qualification requirements, employees reporting greater skills than required in their job may suggest that these skills are being underutilised.

Transferable skills training associated with significantly better skills attainment levels and better doctorate added value in the workplace

Transferable skills of doctoral researchers can be developed in several ways: for instance, through performing doctoral research and writing the thesis (e.g., critical-analytical thinking, problem-solving, project management), through dedicated additional training modules offered by the university, or on-the-job training (e.g. through internships and jobs with and collaborations with the non-academic sector organisations) or through informal training and collaboration. In this study, we explored correlations between self-reported skills attainment levels on the one hand, and on the other, 1) receiving formal skills training at the university, 2) collaborating with (non-)academic partners during PhD research and 3) having previous job experience.

Doctorate holders who had received transferable skills training reported statistically significantly greater competence in 20 of 24 skills upon completion of their course than those who had not received such training. The greatest differences were in professional skills – team working, entrepreneurship, networking, negotiation and self-branding – where respondents' self-reported skills were between 0.4 and 0.5 points greater on a scale of 1 to 5, and management skills – project management, career management and data stewardship, where skills were between 0.3 and 0.4 points better for those taking part in the skills training.

The impact of transferable skills training also appeared to have a positive impact upon career progression, although this was less clear cut. Recipients of all forms of transferable skills training agreed more strongly that their doctorate programmes had prepared them properly for their first job, and recipients of all forms of transferable skills training other than personal skills (such as problem solving and resilience) agreed more strongly that their doctorate had enabled them to progress towards their desired career path.

Focusing on non-academic transferable skills, respondents who have received training in professional, communication and management skills scored the contribution of the doctorate to the various aspects of their current job more positively, e.g., contributed to a higher salary, more demanding and more interesting job assignments, as well as a better position on the labour market or a job with a new employer. In contrast, few statistically significant differences were found between those who had received transferable skills training and those who had



not for job satisfaction, the transition to a first job after graduation (duration or perceived difficulty) or self-reported impact of the doctorate programme on career path. Interestingly, receiving research and academic skills trainings (e.g., subject knowledge, methodology, research ethics or integrity) did not correlate with a higher salary, better labour market position or more demanding work assignments in the way that was apparent for trainings in non-academic transferable skills. This, together with the findings on skills (mis-)match, showing that the demand for the research and academic skills appears to be lower than the offer in most non-academic sectors, again calls for developing the training offer for broader non-academic transferable skills and persuading PhD supervisors that this is an important and worthwhile activity.

Collaboration with external organisations, mobility during PhD and having previous job experience are also positively related to self-reported skills' attainment levels

Most (60%) doctorate holders did not conduct their doctorate in collaboration with an external organisation. Of those that did, most (29% of the overall sample) collaborated with another university or research performing organisation. Very few (3%) collaborated with the private sector, predominantly doctorate holders in engineering and technology. Collaboration with the private sector appeared, however, to have a very strong correlation with subsequent employment in the private sector where 81% of those who collaborated with a private sector organisation during their PhD were working in the private sector at the time of the survey. Collaboration with non-academic partners during PhD improves employment perspectives and helps to acquire relevant skills, and our study demonstrates there may be some margin for improvement regarding fostering and encouraging such collaborations with the non-academic sector organisations.

Doctorate holders who had collaborated with an external organisation during their doctorate reported statistically significantly greater competences at doctorate completion in 5 of 24 skills upon completion of their course than those who had not collaborated. These skills were subject knowledge, research methodology, team working and networking which were better on a scale of 1 ("very poor") to 5 ("very good") between 0.1 and 0.2 points of differences. This suggests that collaboration with an external organisation had a positive relationship with skills development.

Having previous job experience (e.g., either before or during PhD) also appears to have a positive relationship with reported levels for most of the skills. Significant differences, with differences in value between 0.1 and 0.2 are found in academic skills – intellectual property, research valorisation, research ethics and integrity; professional skills – entrepreneurship, networking, negotiation, and self-branding; and all management skills – project management, career management and data stewardship.

Research stays abroad during the doctorate were associated with better skills upon doctorate completion, with statistically significantly higher self-reported competences in 6 of 24 skills. As to be expected, the greatest gain was in intercultural skills (0.3 on a scale of 1 to 5). Language skills were also enhanced (0.1), as well as networking (0.1) and digital communication (0.1),



along with less obviously related skills such as self-branding (0.2) and research methodology (0.1).

Our survey indicates that skills development may be achieved through different routes, both through formal training at the university as well as collaborative doctoral education, mobility or training on-the-job. The training for formal transferable skills has had more impact on both research and academic skills and professional and management skills development. Having had a previous job has a positive relationship with the same groups of skills, although differences in values are not as big. Collaborating with (non-)academic organisations seems to correlate positively with a more limited set of skills development, namely those related to research and academic skills, as well as teamwork and networking skills.

Personal skills and communication skills development do not appear to have been impacted in a significant way by collaborations during the PhD or previous work experience; however formal transferable skills training does have a positive relationship with skills such as effective communication and intercultural skills, as well as flexibility, personal effectiveness and problem solving.

6.4. DOCTORATE HOLDERS' CAREER PROFILES AND INTERSECTORAL MOBILITY

The respondents to our survey had graduated from their PhD between January 2016 and December 2020, so were in their first to sixth year after graduation. As we previously noted, however, that 76% of respondents had held a job prior to or during their doctorate, and that 31% were over the age of 40. It would therefore not be correct to characterise the survey population as exclusively early career professionals.

In our sample, more than half researchers were employed in non-academic sectors at the time of the survey, with 22% working in the private sector. The share of researchers in the private sector is often associated with higher innovation level and better competitiveness. Based on the Eurostat data, as reported by the MORE4 study, around 50% of EU researchers worked in the private sector (outside non-for-profit organisations), and this share varied significantly across countries (e.g., 72% in Sweden and 19% in Latvia)⁵⁵. The relatively low share of the doctorate holders in our sample employed in the private sector therefore can be related to specific country context as well as related to the profiles of participating universities.

The reported levels of intersectoral mobility in the MORE4 study are rather low among the researchers working in European HEIs, and this concerns both the levels of attractiveness of

⁵⁵ PPMI, IDEA Consult and WIFO, More4 study: Support data collection and analysis concerning mobility patterns and career paths of researchers (Luxembourg: Publications Office of the European Union, 2021), p.166

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dual positions and industry exposure during PhD⁵⁶. The reported picture is however incomplete, as MORE study surveys cover researchers employed in Higher Education Institutions, and not those employed in research jobs outside the academia.

Our survey covers researchers and non-researchers working across all sectors and reports similarly low levers of post-PhD intersectoral mobility. Where 17 % of HEI researchers at R2 level and 23% of researchers of R3 level have had intersectoral employment experience in the MORE4 survey, 17% of respondents in our sample have moved across the academic and non-academic sectors after completing their PhD. The reported levels of intersectoral mobility are higher for R4 researchers in the MORE4 survey, meaning that the level of intersectoral mobility increases as careers progress.

Our survey shows that a significant minority is combining jobs between the academic and non-academic sectors (e.g., several part-time jobs), in addition to moving sequentially between academic and non-academic sectors.

Three career paths are identified – academic, non-academic and mixed career paths

Building on previous survey findings reported by the Centre for Research and Development Monitoring in Belgium,⁵⁷ we identified three different career path profiles among the survey respondents. These were: “academic” path – those who have worked exclusively in universities or research institutes since graduating from their doctorate; “non-academic” path – those who have worked exclusively outside of universities or research institutes since graduating; and “mixed” career path – those who have had at least one job in universities or research institutes and at least one outside⁵⁸. The largest group among our survey respondents (47%) were those on the non-academic path, followed by those on the academic path doctorate holders (37%) and those following a mixed career path (17%). Thus, when looking at the respondents’ current sector of employment, nearly half of them work in the academic sectors, while if we consider previous jobs, the share of those in only academic path is significantly lower. We would expect the academic path group to diminish proportionally as respondents’ careers continue, and the other two groups to increase.

Out of the three career profiles, the mixed career profile was composed of older doctorate holders compared to the other two profiles, an unsurprising result as it takes time to move around different job positions to build professional experience. In the mixed career group,

⁵⁶ PPMI, IDEA Consult and WIFO, More4 study: Support data collection and analysis concerning mobility patterns and career paths of researchers (Luxembourg: Publications Office of the European Union, 2021), p.8

⁵⁷ Centre for Research and Development Monitoring [ECOOM Brief 25: You have a PhD! What's next? The career paths of PhD holders](#) (Ghent: ECOOM, 2020), 4.

⁵⁸ In the “mixed” career group we do not include those who combine several part-time jobs across the various sectors; only those who sequentially moved across different employment sectors.

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there were also more men (54%) than in the other two career profile groups (52% in the academic profile and 51% in the non-academic profile groups). The academic career group was predominantly composed of doctorate holders in natural and social sciences, the mixed career group – social sciences and natural sciences, while the non-academic career path attracted a balanced proportion of doctorate holders from the various fields of research.

These three groups exhibited very different levels of engagement in research in their current job. Unsurprisingly, 95% of academics reported being currently engaged in research compared to under half (46%) of those on a non-academic path. In the mixed career group, this rose to three quarters (75%). This may indicate that many mixers are using an initial job at a university or research institute after their PhD to transition to a job in a different sector afterwards that is still engaged in research. Those in the academic path also exhibited a good vertical match with 81% needing a PhD or postdoctoral experience for their current job, followed by a reasonable match for those on a mixed career path (52%), and a strong vertical mis-match for those on the non-academic career path where the vast majority did not require a PhD for their current job (84%).

A similar pattern is observed with the horizontal (mis-)match, where 66% of academics and 46% of respondents following mixed career paths work in jobs closely related to the field of their doctorate. For those on the non-academic path, 43% work in a partially related area, while 24% work on a non-related area (the highest proportion across the three profiles).

Intriguingly, the mixed career group reported the highest satisfaction with their doctorate programme, with an average rating of 3.8 on a scale of 1 (“very dissatisfied”) to 5 (“very satisfied”), compared to 3.7 for switchers and 3.6 for academics. These differences were small, but consistent across each aspect of the doctorate programme included in the survey.

Based on doctorate holders' intentions, there was no net flow of employees from universities and research institutes to other sectors in the period after graduation

Although a significant proportion of doctorate holders are considering moving to a different sector of employment (36%), the majority do not plan to change their sector of employment. Roughly even numbers were considering moving from universities or research institutes to other sectors and in the opposite direction (8% and 6%), indicating that there was not an overall flow out of academia into other sectors in the early career stage after graduation – at least in terms of doctorate holders' intentions. Some differences by field of doctorate can be mentioned, where 18% of the doctorate holders in humanities consider changing from a non-academic sector to an academic sector job, while 12% of natural sciences doctorate holders are interested in the opposite move.

For those who had already changed sectors, only 24% said that they had changed sectors because it had been the only way for them to enter the labour market. The most common reason was to gain new skills and experience (55%), followed by “personal reasons” (37%), suggesting that people changed sectors by choice rather than necessity.



Combining jobs in universities or research institutes and jobs outside simultaneously was a popular and feasible option

While most respondents were not considering changing employment sector, a significant minority (17%) said that they were looking to have some intersectoral mobility to be able to mix working in academic and non-academic sectors at the same time. This appeared to be a reasonably popular and feasible option: with 56% of those who had had combined more than one employer at the same time (n=506) saying that they had combined positions inside universities or research institutes with positions outside across the business, government/not-for-profit, and healthcare sectors at the same time. Combining academic and non-academic paths is most popular amongst the engineering and technology, medical and health sciences (e.g. combining work as a practitioner and as an academic researcher) and social sciences graduates. Again, the most common reason for doing this (53%) had been to gain new skills and experience.

6.5. INTERNATIONAL MOBILITY

A key aim of the European Higher Education Area, as well as of individual European states, is to increase the international mobility of graduate and post-graduate students, including doctoral students.⁵⁹

Few doctorate holders live abroad for an extended period after graduation

The post-PhD mobility of the doctorate holders in our sample is similar the one reported by the MORE4 EU HE survey (27% in 2019)⁶⁰ - a quarter (26%) of respondents had lived outside of their country of citizenship after graduating from their PhD compared to 44% that did a research stay abroad while doing the doctorate. Furthermore, the vast majority (92%) of these had lived abroad for less than one year. Most of those (77%) who had lived abroad after their PhD had done so by continuing to live in the same country in which they completed their PhD (being different from their country of citizenship).

Those who were engaged in research were almost twice as likely (29% compared to 18%) to have lived abroad since graduation, although this was still a minority. There was only slight variation in international mobility following the doctorate among fields of study, with natural sciences being associated with the greatest mobility (36%) and medical and health sciences

⁵⁹ For example, see: European Commission, [The European Higher Education Area in 2020: Bologna Progress Implementation Report](#) (Luxembourg: Publications Office of the European Union, 2020), 123-156; Austrian Federal Ministry of Education, Science and Research, [National Mobility and Internationalisation Strategy for Higher Education 2020-2030](#) (Vienna, Austrian Federal Ministry of Education, Science and Research, 2020).

⁶⁰ PPMI, IDEA Consult and WIFO, [More4 study: Support data collection and analysis concerning mobility patterns and career paths of researchers](#) (Luxembourg: Publications Office of the European Union, 2021), 126-127.

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with the least (18%) - presumably due to the complication of having qualifications recognized by foreign healthcare systems.

When looking at the different employment sectors, respondents working in Research Organizations are most mobile, with nearly 40% having lived abroad for more than 3 months after completing their doctorate. This is probably explained by the high share of doctorate holders employed in postdoctoral positions, which are often temporary positions requiring international mobility. Top three most attractive destination countries were Switzerland, United States and Germany. Among those who had lived abroad since their doctorate for at least three months, the most common reason for doing so was career development (61%) followed by economic or financial opportunities (28%).

6.6. RECOMMENDATIONS FOR DOCTORAL TRAINING INSTITUTIONS

Below we provide some possible recommendations for institutions in charge of doctoral training stemming from this survey.

Provide transferable skills trainings covering more than just research and academic skills and work with supervisors on promoting these

More than half of doctorate graduates are employed outside the academia, where a broader set of skills is required. Yet, most of our respondents followed trainings focused on research and academic skills (subject knowledge, research methods, research ethics and integrity, research valorisation, etc.). The skills gaps for those working outside academia concerned mainly broader non-academic transferable skill groups (e.g., professional or management skills), indicating that universities should diversify training offer to include these categories of skills training courses. Formal trainings in transferable skills offered by the universities correlate positively with better skills attainment levels, possibly indicating a positive impact on skills development, and potentially also on career progression and various aspects at workplace.

Encourage skills development through different routes - formal skills training, collaboration and mobility during PhD as well as on-the-job training

Our survey demonstrates positive relationships between all these various routes of skills development and self-reported levels of skills attainment at doctorate completion. It is therefore important to support various forms of skills development (not just through e.g., courses), as these may prove to be complementary to help develop various sets of skills. As one quarter of respondents did not have a possibility to take any transferable skills training (or were not aware of these), it is important that institutions are able to offer such trainings to all doctoral researchers as well as raise awareness of the courses available and their importance for subsequent careers (e.g., including these in individual training plans). Only a minor share of respondents collaborated with an external organisation outside academia (e.g. private sector) – an area where some improvement may also be desired (see below).



Collect information on doctorate graduates career destinations and skills utilisation through career-tracking surveys

Universities should invest in sustainable tools and methodologies to track their graduates (not just one-off surveys) and collect valuable information in their career destinations and skills usage, especially where no such data is collected at a national (or supra-national) level. The DocEnhance career tracking survey has been helpful to start collecting such data for several DocEnhance partner universities in a coordinated fashion and provides a template questionnaire that can be adapted by other institutions' career tracking initiatives. The "Good practice recommendations for implementation of career-tracking surveys" (to be published on the [DocEnhance](#) website in 2022), prepared in the frame of the DocEnhance project can be helpful to institutions interested in setting-up a career-tracking tool to follow up their alumni.

Collect information on the skills valued and needed in the various employment sectors and in various types of jobs

Our survey clearly showed that skills deficiencies varied across the various non-academic sectors of employment. Therefore, it would be advisable for universities to collect information on the skills needs of the various relevant employment sectors and types of jobs (e.g., available studies and surveys of employers, university networks with non-academic employers of doctorate graduates, joint events and meetings with local and regional employers, etc.). The DocEnhance online consultation of employers, that complemented our PhD graduates' survey as well as stakeholder workshops with various organisations employing doctorate holders, is likely to provide some data in this regard. PhD candidates could be offered more guidance for possible career paths and while developing their training plans – which should be adapted to the field of study, career goals, and future potential sector of employment. Collaborative doctoral education is also helpful in learning what skills are needed for specific sectors or jobs outside the academia.

Provide informed career advice early in the doctoral training, with more targeted approach for some groups

The findings from this report indicate that those heading for non-academic careers feel overall less prepared for the job transition than those who remain in academia and are also less positive about the added value of the doctorate to their career. It is important that university career centers offer professional and personalised advice targeted at PhD researchers (e.g. using career advisors with relevant science background and experience outside academia), at the start of their training, to help them develop a good understanding of the possible career paths and prepare relevant training plans. Using available information on potential career destinations, university career centers (or similar) could for instance also map out several main career paths for the various fields and disciplines, and associated skills sets required. This can be done in collaboration with local and regional stakeholders and potential employers.

Dedicated career advice for the doctoral researchers in the various fields of research might be needed. In our sample, for example, the doctorate holders working in non-HE appear to have

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experienced the most difficult transition. Many of the doctorate holders in this sector have done their PhD in humanities and many thought PhD did not significantly improve their position on the labour market, their salary, or the nature of their work assignments.

Promote transferable skills strategically depending on the desired career path and help doctoral researchers build their skills portfolios

Offering transferable skills trainings depending on their career plans should also be accompanied with support for building skills portfolios of the doctoral candidates that may help them to make their skill-sets visible and understandable to potential employers outside the academia, who may not always be aware of the content of the doctoral training or doctorate added value. PhD researchers should also be trained in how to explain their research to the public and employers.

Encourage collaborations with non-academic partners during PhD to develop skills and increase employability prospects

Collaborations with other organisations, academic or non-academic, may strongly determine or impact future career destinations. In our survey, this is particularly true for collaborations with the private sector, whereby the vast majority of those who collaborated with a private sector organisation during their PhD ended up working in the private sector. However, collaborations with the non-academic sector are still much less common than those with universities or research organisations (e.g., only 3% of respondents in our sample collaborated with a private sector organisation during their PhD). Therefore, further support and promoting collaborative education and exposure to industry and other non-academic organisations should remain high on the agenda of HEIs.



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8. ANNEX I: SUMMARY STATISTICS OF THE SURVEY QUESTIONS

8.1. DOCTORATE EDUCATION

Q2 - Years from formal admission, derived from question: In which year did you start your doctoral training programme (formal admission)?

	Freq.	Percent
5 years or less	323	15.6
6-8 years	1029	49.6
9-10 years	429	20.7
More than 10 years	296	14.2
Total	2076	100.0

Q3 - Years from thesis defence, derived from question: In which year did you defend your doctorate thesis?

	Freq.	Percent
1-2 years	913	44.0
3-4 years	807	38.9
5 years	354	17.1
Total	2075	100

Q4 - In which country was your doctorate awarded?

	Freq.	Percent
Germany	241	11.6
Netherlands	239	11.5
Czech Republic	238	11.5
Norway	238	11.5
Portugal	238	11.5
Italy	224	10.8
Slovakia	219	10.5
Spain	218	10.5
Greece	200	9.6
Chile	6	0.3
Colombia	3	0.1
Azerbaijan	2	0.1
Bhutan	2	0.1
Lebanon	2	0.1
Angola	2	0.1
Brazil	2	0.1
Belgium	1	0.1
Sri Lanka	1	0.1
Mozambique	1	0.0
France	0	0.0
Total	2077	100



Q5 - Please select the field that best corresponds to your doctorate.

	Freq.	Percent
Natural sciences	565	27.3
Social sciences	480	23.2
Medical and health sciences	385	18.6
Engineering and technology	330	15.9
Humanities	240	11.6
Agricultural sciences	71	3.4
Total	2071	100

Q6 - Which of the following were your financial sources during your doctoral training period?

	No (%)	Yes (%)
Fellowship from your university	74.5	25.5
Contracted employment with your university	79.7	20.3
Fellowship from government or public research fund	74.1	25.9
Fellowship from private sector, or a private not-for-profit organisation	94.7	5.3
Fellowship from international institutions	97.4	2.6
University position/teaching and/or research assistantship	88.2	11.8
Job not related to the doctorate	82.1	17.9
Non-funded	88.9	11.1
Other	93.2	6.8
Total (Count)	2217	

Q7 - Did your doctorate take place in collaboration with any other organization?

	Freq.	Percent
No	1219	60.1
Yes, with a non-university research institution	240	11.8
Yes, with a private sector company (e.g. industrial doctorate)	64	3.1
Yes, with a third sector organisation (e.g. NGO, charity, not-for-profit)	26	1.3
Yes, with a university of applied sciences	58	2.9
Yes, with another organisation (please specify)	127	6.3
Yes, with another university (joint doctorate, cotutelle, etc.)	295	14.6
Total	2030	100

Q8 - Was your doctorate mainly achieved through structured training programme or individually supervised research?

	Freq.	Percent
Individually supervised research	1050	51.9
Structured training programme	973	48.1
Total	2023	100



Q9 – What motivated you to pursue a doctorate?

	No (%)	Yes (%)
To work as a researcher in academia	52.1	47.9
To work as a researcher outside academia	81.2	18.8
To work as a highly skilled expert	59.1	40.9
To diversify career opportunities	65.1	34.9
Personal accomplishment	54.4	45.6
Interest in the research topic	49.1	50.9
Social recognition	88.0	12.1
Other	96.8	3.2
Total (Count)	2217	

Q10 – How satisfied are you with the following aspects of your training while doing your doctorate?

	Very dissatisfied (%)	Somewhat dissatisfied (%)	Neither satisfied nor dissatisfied (%)	Somewhat satisfied (%)	Very satisfied (%)	Total (Count)	Mean	Std. Dev.
Quality of research training	4.7	10.1	8.5	32.4	44.3	1923	4.01	1.16
Quality of transferable skills training	4.3	12.4	13.8	32.7	36.8	1903	3.85	1.17
Services for doctoral candidates at your university	5.8	15.6	17.6	29.6	31.3	1920	3.65	1.23
Supervision provided by the supervisor(s)	9.2	8.1	7.4	21.3	54.0	1931	4.03	1.33
Support to pursue an academic career	9.5	17.3	19.7	29.8	23.8	1852	3.41	1.28
Support to pursue a non-academic career	15.2	19.0	31.9	21.1	12.9	1795	2.97	1.23

Q11 – If you could make the decision about doing your doctorate again, which of the following would you most likely choose?

	Freq.	Percent
The same doctoral training programme at the same institution	1250	63.6
The same doctoral training programme at another institution	246	12.5
A different doctoral training programme at the same institution	155	7.9
A different doctoral training programme at another institution	174	8.9
Not to do a doctorate at all	140	7.1
Total	1965	100



Q12 – Have you done any research stay(s) abroad while doing your doctorate?

	Freq.	Percent
No	1095	55.7
Yes	873	44.4
Total	1968	100



8.2. SKILLS AND COMPETENCIES

Q13 – Did you receive training in transferable skills at your university?

	Freq.	Percent
Yes, trainings were mandatory	572	29.1
Yes, trainings were optional	599	30.5
No, trainings were optional	314	16.0
No, no trainings were available	480	24.4
Total	1964	100

Q14 – Which training(s) did you receive at your university during your doctorate?

	No (%)	Yes (%)
Research skills	16.2	83.8
Other academic competences	37.7	62.3
Personal skills	65.8	34.2
Professional skills	68.7	31.3
Communication skills	44.4	55.6
Management skills	73.0	27.1
Other	98.1	1.9
Total (Count)	1336	

Note: Only applicable to those receiving training in transferable skills.

Q15 – How would you rate your research skills and other academic competences at the time you completed your doctorate?

	Very poor (%)	Poor (%)	Fair (%)	Good (%)	Very good (%)	Total (Count)	Mean	Std. Dev.
SUBJECT KNOWLEDGE	0.1	1.0	8.6	45.0	45.3	1927	4.3	0.7
METHODOLOGY	0.2	2.3	14.5	47.3	35.7	1925	4.2	0.8
INTELLECTUAL PROPERTY	11.3	24.3	26.9	26.3	11.1	1921	3.0	1.2
RESEARCH VALORISATION, ENGAGEMENT AND INNOVATION	3.4	13.0	30.3	38.7	14.7	1916	3.5	1.0
RESEARCH ETHICS AND INTEGRITY	0.8	5.8	19.2	44.6	29.7	1920	4.0	0.9
TEACHING/MENTORING/SUPERVISION	2.5	9.0	26.1	38.9	23.5	1923	3.7	1.0

Q16 – How would you rate your personal skills at the time you completed your doctorate?

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	Very poor (%)	Poor (%)	Fair (%)	Good (%)	Very good (%)	Total (Count)	Mean	Std. Dev.
CRITICAL-ANALYTICAL THINKING	0.1	0.8	8.8	41.8	48.6	1908	4.4	0.7
PROBLEM SOLVING	0.0	1.2	8.6	45.0	45.2	1906	4.3	0.7
CREATIVITY	0.3	3.4	17.0	43.8	35.5	1905	4.1	0.8
FLEXIBILITY	0.5	2.1	15.1	44.5	37.9	1905	4.2	0.8
PERSONAL EFFECTIVENESS	0.2	4.6	20.4	43.0	31.9	1901	4.0	0.9
RESILIENCE	0.4	2.7	12.8	43.8	40.2	1906	4.2	0.8

Q17 – How would you rate your professional skills at the time you completed your doctorate?

	Very poor (%)	Poor (%)	Fair (%)	Good (%)	Very good (%)	Total (Count)	Mean	Std. Dev.
TEAM WORKING	1.2	3.4	12.8	49.0	33.7	1894	4.1	0.8
ENTREPRENEURSHIP	9.8	21.2	29.6	27.1	12.2	1893	3.1	1.2
NETWORKING	1.6	13.0	29.3	35.6	20.6	1887	3.6	1.0
NEGOTIATION	2.2	8.4	29.5	43.8	16.1	1892	3.6	0.9
SELF-BRANDING	4.4	12.8	33.0	36.3	13.5	1895	3.4	1.0

Q18 – How would you rate your communication skills at the time you completed your doctorate?

	Very poor (%)	Poor (%)	Fair (%)	Good (%)	Very good (%)	Total (Count)	Mean	Std. Dev.
EFFECTIVE COMMUNICATION	0.5	2.3	16.6	51.5	29.1	1880	4.1	0.8
LANGUAGES	1.4	5.7	18.1	38.6	36.2	1878	4.0	0.9
INTERCULTURAL SKILLS	0.8	4.6	18.3	43.0	33.3	1875	4.0	0.9
DIGITAL COMMUNICATION	1.4	6.4	41.4	41.4	26.1	1876	3.8	0.9

Q19 – How would you rate your management skills at the time you completed your doctorate?

	Very poor (%)	Poor (%)	Fair (%)	Good (%)	Very good (%)	Total (Count)	Mean	Std. Dev.
PROJECT MANAGEMENT	1.4	7.2	22.1	44.4	24.9	1868	3.8	0.9
CAREER MANAGEMENT	2.5	11.1	30.2	40.2	16.1	1872	3.6	1.0
DATA STEWARDSHIP	2.4	13.2	30.5	41.3	12.7	1859	3.5	1.0



8.3. TRANSITION FROM DOCTORATE TO THE FIRST OR NEXT EMPLOYMENT

Q20 – Did you have a paid job before or during your doctorate?

	Freq.	Percent
No	451	24.1
Yes	1421	75.9
Total	1872	100

Q21 – Did you have a paid job at any time after completing your doctorate (including postdoctoral positions)?

	Freq.	Percent
No	165	8.8
Yes	1709	91.2
Total	1874	100

Q22 – Approximately how many months passed between the time you completed your doctorate and your first or next paid job?

	Freq.	Percent
0 months	1253	71.6
1-3 months	254	14.5
4-6 months	106	6
7-12 months	70	4
1-2 years	69	3.9
More than 2 years	0	0.0
Total	1751	100

Note: Only applicable to those having a job after completing their doctorate

Q23 – How important were the following resources when looking for your first or next job after finishing your doctorate?

	Not at all important (%)	Slightly important (%)	Moderately important (%)	Very important (%)	Extremely important (%)	Total (Count)	Mean	Std. Dev.
Academic Advisor/Supervisor	36.4	9.2	16.3	20.2	17.9	530	2.7	1.5
University Career Centre	60.4	11.4	14.0	10.7	3.5	529	1.9	1.2
Job advertisements in Department/University	52.2	12.6	17.3	12.0	5.9	525	2.1	1.3
Peers (e.g. colleagues, alumni, labour unions, associations)	29.7	10.1	22.1	24.6	13.6	530	2.8	1.4

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Web search/online job portal	21.1	8.5	9.6	27.4	33.4	528	3.4	1.5
Job/career fairs	49.7	17.4	17.1	9.8	5.9	520	2.0	1.3
Previous job, work placement or internship	33.7	12.5	17.9	20.7	15.3	525	2.7	1.5
Social and professional networks	18.5	10.2	17.7	28.0	25.6	525	3.3	1.4

Note: Only applicable to those having a job after completing their doctorate

Q24 – Did you take one or more postdoctoral positions at a university or a research performing organisation after obtaining your doctorate?

	Freq.	Percent
No	1067	61.2
Yes	678	38.9
Total	1745	100

Note: Only applicable to those having a job after completing their doctorate

Q25 – How many postdoctoral positions did you take?

	Freq.	Percent
1	496	78.2
2	113	17.8
3 or more	26	4.0
Total	635	100

Note: Only applicable to those having a post-doctoral job after completing their doctorate

Q26 – To what extent do you agree or disagree with the following statements?

	Strongly disagree (%)	Disagree (%)	Neither agree, nor disagree (%)	Agree (%)	Strongly agree (%)	Total (Count)	Mean	Std. Dev.
My doctorate properly prepared me for my first job	8.5	14.0	27.9	29.7	19.9	1729	3.4	1.2
My doctorate enabled me to progress towards my desired career	3.4	8.9	18.2	41.1	28.3	1726	3.8	1.0
It was clear to me what career opportunities I could aspire to after my doctorate	5.5	14.8	24.5	36.5	18.8	1733	3.5	1.1
The transition to my first job after doctorate was difficult	30.5	32.1	22.2	10.4	5.0	1729	2.3	1.1
Having a doctorate made no difference to my career path	31.5	33.7	14.2	12.3	8.3	1732	2.3	1.3

Note: Only applicable to those having a job after completing their doctorate

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8.4. EMPLOYMENT AND CAREER RELATED EXPERIENCE

Q27 – Which of the following best describes your current main employment status? Please note that the term 'employed' includes postdoctoral positions.

	Freq.	Percent
Permanent Full-time Employed (30 hours per week or more)	1135	61.2
Permanent Part-time Employed (less than 30 hours per week)	49	2.6
Temporary Full-time Employed (30 hours per week or more)	307	16.5
Temporary Part-time Employed (less than 30 hours per week)	70	3.8
Self Employed	125	6.8
Retired	8	0.4
Unemployed	55	3.0
Full-time study	5	0.3
Internship	4	0.2
Career break (including childcare, elderly people care)	50	2.7
Other	46	2.5
Total	1855	100

Q28 – Please indicate the sector which best describes your current main employment

	Freq.	Percent
University	627	36.7
Research organisations (e.g. research institutes)	208	12.2
Business sector: industry	230	13.5
Business sector: services and other	142	8.3
Government or another public sector	144	8.4
Healthcare sector (e.g. hospital, clinical centre)	173	10.1
Non-higher education (e.g. secondary education)	98	5.8
Private not-for-profit sector	46	2.7
Other	41	2.4
Total	1709	100

Note: Only applicable to those currently employed full-time, part-time or self-employed.

Q29 – Please indicate your main position

	Freq.	Percent
Postdoctoral position/early career researcher	360	21.2
Other (please specify)	333	19.6
Research Fellow/Researcher	157	9.2
Analyst, Specialist	146	8.6
Assistant Professor/Junior Professor	128	7.5

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Director, Head of Unit	97	5.7
Engineer	91	5.3
Senior Researcher	83	4.9
Project Manager	82	4.8
Associate Professor/Reader	63	3.7
Lecturer	60	3.6
Technician	37	2.2
Coordinator	33	1.9
Full Professor	32	1.9
Total	1703	100

Note: Only applicable to those currently employed full-time, part-time or self-employed.

Q30 – What was the minimum education or experience level requirement for your current main job?

	Freq.	Percent
Bachelor or lower	180	10.5
Master	654	38.4
Doctorate	669	39.2
Postdoctoral level	120	7.0
Other	82	4.8
Total	1705	100

Note: Only applicable to those currently employed full-time, part-time or self-employed.

Q31 – To what extent is the content of your work in your current main job related to the thematic field of your doctorate degree?

	Freq.	Percent
Closely related	807	47.4
Partly related	637	37.4
Not related	257	15.1
Total	1702	100

Note: Only applicable to those currently employed full-time, part-time or self-employed.

Q32 – In your current main job are you engaged in research?

	Freq.	Percent
No	521	30.6
Yes	1181	69.4
Total	1702	100

Note: Only applicable to those currently employed full-time, part-time or self-employed.



Q33 – Please rate the importance of the following reasons for not working as a researcher

	Not at all important (%)	Slightly important (%)	Moderately important (%)	Very important (%)	Extremely important (%)	Total (Count)	Mean	Std. Dev.
Availability of job positions/offers not focused on research	13.1	10.6	24.2	33.3	18.8	575	3.3	1.3
Interest in a non-research career	18.8	16.2	32.8	20.6	11.6	574	2.9	1.3
Unavailability of a suitable research post or position	11.9	7.9	21.4	28.6	30.2	564	3.6	1.3
Difficulty securing a tenured/permanent research post or position	12.3	6.7	16.0	31.0	34.1	570	3.7	1.3
Bigger variety of career paths	18.9	12.3	25.2	31.4	12.2	572	3.1	1.3
Better income	16.4	12.2	18.8	26.7	25.9	570	3.3	1.4
Personal/family reasons	31.0	13.4	21.2	19.9	14.5	566	2.7	1.4

Note: Only applicable to those currently employed full-time, part-time or self-employed.

Q34 – At which level do you work (as per European Framework for Research Careers)?

	Freq.	Percent
R2 Recognised Researcher	524	47.8
R3 Established Researcher	491	44.76
R4 Leading Researcher	81	7.44
Total	1096	100

Note: Only applicable to those currently employed full-time, part-time or self-employed.

Q35 – Which of the following activities do you perform as part of your main job?

	No (%)	Yes (%)
Research performing activities (including publications)	14.6	85.4
Teaching/mentoring/supervision activities	30.6	69.4
Administrative activities	50.4	49.6
Staff management responsibilities	74.3	25.7
Budget management responsibilities	76.4	23.7
International partnerships	73.5	26.5
Entrepreneurship, start-up activities	92.3	7.8
Communication or scientific journalism	78.1	21.9
Artistic creation	95.4	4.6
Other	94.8	5.2
Total (Count)	1121	



Note: Only applicable to those currently employed full-time, part-time or self-employed.

Q36 – To what extent are the following research skills and other academic competences important in your current main job?

	Not at all important (%)	Slightly important (%)	Moderately important (%)	Very important (%)	Extremely important (%)	Total (Count)	Mean	Std. Dev.
SUBJECT KNOWLEDGE	6.0	3.8	11.4	41.4	37.5	1676	4.0	1.1
METHODOLOGY	6.0	5.9	12.8	40.8	34.5	1670	3.9	1.1
INTELLECTUAL PROPERTY	17.3	19.0	26.2	24.9	12.6	1670	3.0	1.1
RESEARCH VALORISATION, ENGAGEMENT AND INNOVATION	10.7	11.6	24.3	34.1	19.3	1667	3.4	1.1
RESEARCH ETHICS AND INTEGRITY	9.2	9.6	18.6	35.6	27.1	1670	3.6	1.1
TEACHING/MENTORING/SUPERVISION	8.5	12.8	19.2	34.7	24.8	1668	3.5	1.1

Note: Only applicable to those currently employed full-time, part-time or self-employed.

Q37 – To what extent are the following personal skills important in your current main job?

	Not at all important (%)	Slightly important (%)	Moderately important (%)	Very important (%)	Extremely important (%)	Total (Count)	Mean	Std. Dev.
CRITICAL-ANALYTICAL THINKING	1.1	1.9	6.3	38.3	52.4	1668	4.4	0.8
PROBLEM SOLVING	0.8	1.1	7.1	34.8	56.2	1667	4.4	0.7
CREATIVITY	1.1	4.5	13.8	41.3	39.3	1667	4.1	0.9
FLEXIBILITY	0.6	1.9	11.4	41.5	44.7	1663	4.3	0.8
PERSONAL EFFECTIVENESS	0.6	1.7	10.5	44.4	42.9	1662	4.3	0.8
RESILIENCE	0.4	2.0	13.3	41.5	42.9	1661	4.2	0.8

Note: Only applicable to those currently employed full-time, part-time or self-employed.

Q38 – To what extent are the following professional skills important in your current main job?

	Not at all important (%)	Slightly important (%)	Moderately important (%)	Very important (%)	Extremely important (%)	Total (Count)	Mean	Std. Dev.
TEAM WORKING	1.5	2.9	10.2	43.9	41.5	1658	4.2	0.9
ENTREPRENEURSHIP	18.2	20.0	23.7	24.0	14.1	1660	3.0	1.3
NETWORKING	2.9	7.3	21.8	40.2	27.8	1657	3.8	1.0
NEGOTIATION	3.6	5.9	21.4	42.8	26.3	1659	3.8	1.0
SELF-BRANDING	5.4	10.8	26.9	35.5	21.4	1660	3.6	1.1

Note: Only applicable to those currently employed full-time, part-time or self-employed.



Q39 – To what extent are the following communication skills important in your current main job?

	Not at all important (%)	Slightly important (%)	Moderately important (%)	Very important (%)	Extremely important (%)	Total (Count)	Mean	Std. Dev.
EFFECTIVE COMMUNICATION	0.6	1.4	11.5	42.4	44.1	1656	4.3	0.8
LANGUAGES	3.3	9.0	14.1	35.0	38.6	1655	4.0	1.1
INTERCULTURAL SKILLS	5.4	12.0	22.3	34.0	26.4	1655	3.6	1.1
DIGITAL COMMUNICATION	3.1	5.6	22.1	38.6	30.6	1652	3.9	1.0

Note: Only applicable to those currently employed full-time, part-time or self-employed.

Q40 – To what extent are the following management skills important in your current main job?

	Not at all important (%)	Slightly important (%)	Moderately important (%)	Very important (%)	Extremely important (%)	Total (Count)	Mean	Std. Dev.
PROJECT MANAGEMENT	2.1	4.9	15.5	41.3	36.3	1650	4.0	0.9
CAREER MANAGEMENT	6.1	9.4	24.8	38.2	21.6	1653	3.6	1.1
DATA STEWARDSHIP	7.7	11.7	25.2	39.0	16.4	1650	3.4	1.1

Note: Only applicable to those currently employed full-time, part-time or self-employed.

Q41 – How satisfied are you with the following aspects of your main current working environment?

	Very dissatisfied (%)	Somewhat dissatisfied (%)	Neither satisfied, nor dissatisfied (%)	Somewhat satisfied (%)	Very satisfied (%)	Total (Count)	Mean	Mean
Skills development	3.1	6.62	8.13	33.06	49.08	1627	4.2	1.0
Career growth opportunities	8.06	11.17	14.71	30.34	35.73	1614	3.7	1.3
Intellectual challenge	3.51	7.78	8.08	28.29	52.34	1614	4.2	1.1
Autonomy and responsibility	2.06	4.57	7.26	24.05	62.06	1598	4.4	1.0
Reputation of organisation	2.86	5.1	11.12	27.34	53.58	1603	4.2	1.0
Organisational culture	5.79	11.87	17.12	31.06	34.16	1608	3.8	1.2
Job security/stability	9.94	10.82	12.28	20.71	46.25	1593	3.8	1.4
Salary	8.13	12.92	15.69	34.74	28.52	1610	3.6	1.2
Mentoring and training	5.68	15.04	19.34	33.79	26.15	1591	3.6	1.2
Work/life balance	5.15	14.78	14.86	28.2	37.01	1618	3.8	1.2

Note: Only applicable to those currently employed full-time, part-time or self-employed.



Q42 – What is your annual gross income (before deductions)?

	Freq.	Percent
Under €5,000	49	3.0
€5,001 - €10,000	70	4.2
€10,000 - €15,000	152	9.2
€15,001 - €20,000	177	10.7
€20,001 - €25,000	124	7.5
€25,001 - €30,000	98	5.9
€30,001 - €40,000	185	11.2
€40,001 - €60,000	300	18.2
€60,001 - €85,000	238	14.4
€85,001 - €100,000	59	3.6
€100,001 - €150,000	50	3.0
€150,001 - €200,000	28	1.7
Over €200,000	9	0.5
Prefer not to say	116	7.0
Total	1655	100

Note: Only applicable to those currently employed full-time, part-time or self-employed.

Q43 – How important were the following reasons for taking your current main position?

	Not at all important (%)	Slightly important (%)	Moderately important (%)	Very important (%)	Extremely important (%)	Total (Count)	Mean	Std. Dev.
To take the next step in my desirable career path	7.6	8.3	18.7	42.1	23.3	1634	3.7	1.1
To improve/gain new skills	5.0	6.9	21.7	46.2	20.2	1630	3.7	1.0
To work with a specific person, organisation or company	18.3	14.4	27.3	27.1	12.9	1629	3.0	1.3
It was the only acceptable employment I could find at the time	40.5	16.5	16.9	16.0	10.2	1626	2.4	1.4
Intellectual challenge	5.3	9.5	22.6	46.1	16.6	1630	3.6	1.0
Autonomy and responsibility	4.8	6.6	20.1	47.7	20.8	1630	3.7	1.0
Salary	7.7	14.3	38.1	28.1	11.8	1631	3.2	1.1
Job security/stability	8.5	10.5	23.0	38.3	19.7	1628	3.5	1.2
Work/life balance	7.0	11.0	26.7	36.8	18.5	1630	3.5	1.1
Reputation of organisation	11.8	10.8	28.3	36.3	12.9	1630	3.3	1.2
Family/personal reasons	22.1	11.0	20.4	29.5	17.1	1622	3.1	1.4

Note: Only applicable to those currently employed full-time, part-time or self-employed.



Q44 – To what extent would you say that your doctorate contributed to the following in your working life?

	Not at all (%)	A little (%)	Moderately (%)	A lot (%)	Greatly (%)	Total (Count)	Mean	Std. Dev.
Improved my skills and competencies	2.7	3.5	10.7	25.1	58.1	1624	4.3	1.0
A higher salary	24.4	12.6	25.6	16.5	20.9	1596	3.0	1.5
More interesting job assignments	12.9	10.0	23.6	23.2	30.2	1591	3.5	1.4
More demanding job assignments	14.0	9.8	23.1	28.2	24.9	1594	3.4	1.3
Better status at my place of work	16.1	13.6	19.7	21.7	29.0	1581	3.3	1.4
A job with a new employer	32.2	11.1	19.5	16.4	20.8	1433	2.8	1.5
A better position on the labour market	18.5	15.0	23.6	20.8	22.1	1553	3.1	1.4
Starting my own business	66.8	10.3	9.5	4.8	8.6	1108	1.8	1.3

Note: Only applicable to those currently employed full-time, part-time or self-employed.

Q45 – Did you take a career break (e.g. maternity/paternity leave, sickness) or have any time without a job (e.g. unemployment) since the completion of your doctorate? Please consider both intentional and unintentional career breaks.

	Freq.	Percent
No	1222	74.2
Yes	424	25.8
Total	1646	100

Note: Only applicable to those currently employed full-time, part-time or self-employed.

Q46 – What was the total duration of your longest career break after completing your doctorate?

	Freq.	Percent
Less than 3 months	146	26.9
Between 3 and less than 6 months	155	28.6
Between 6 and less than 12 months	120	22.1
12 months or more	121	22.4
Total	541	100

Note: Only applicable to those currently employed full-time, part-time or self-employed that had a career break or those currently on career break.

Q47 – What was your main reason for taking a career break?

	Freq.	Percent
Maternity/paternity leave and childcare commitments	243	44.9
Other family reasons (e.g. related to partner or elderly parents)	13	2.5
Sickness (personal health problems)	19	3.5
Travelling	25	4.6
Unemployment	180	33.1



COVID-19 pandemic	21	3.9
Other	40	7.5
Total	542	100

Note: Only applicable to those currently employed full-time, part-time or self-employed that had a career break or those currently on career break.



8.5. INTERSECTORAL MOBILITY

Q48 – Are you considering changing the sector of your current employment?

	Freq.	Percent
Yes, I work in the academic sector and I want to move to the non-academic sector	131	7.8
Yes, I work in the non-academic sector, and I want to move to the academic sector	102	6.1
Yes, I work in the non-academic sector, and I want to move to another non-academic sector	84	5.0
Yes, I want to mix the work in the academic and non-academic sectors at the same time	290	17.3
No, I am not considering changing the sector of my current employment	1076	63.9
Total (Count)	1683	

Q49 – How many other employers did you have before your current employment and after obtaining your doctorate (including postdoctoral positions with other employers)?

	Freq.	Percent
0	700	41.5
1	488	28.9
2	217	12.8
3	144	8.5
4 or more	139	8.2
Total	1688	100

Q50 – Before your current employment and after obtaining your doctorate, were you engaged in research?

	Freq.	Percent
No	313	35.8
Yes	561	64.2
Total	874	100

Note: Only applicable to those that have one or more employers after the completion of the doctorate.

Q51 – Before your current employment and after obtaining your doctorate, did you work in (a) different sector(s) from that of your current employment?

	Freq.	Percent
No	474	54.2
Yes	400	45.8
Total	874	100

Note: Only applicable to those that have one or more employers after the completion of the doctorate.



Q52 – Before your current employment and after obtaining your doctorate, in which sector(s) have you worked?

	No (%)	Yes (%)
Academic sector	55.3	44.7
Business sector: industry	79.0	21.0
Business sector: services and other	73.8	26.2
Government or another public sector	77.1	22.9
Healthcare sector (e.g. hospital, clinical centre)	91.8	8.2
Non-higher education (e.g. secondary school)	87.0	13.0
Private not-for-profit sector	86.5	13.5
Other	95.4	4.6
Total (Count)	366	

Note: Only applicable to those that have one or more employers after the completion of the doctorate and that worked previously in a different sector from current employment.

Q53 – Which were the reasons to change sectors?

	No (%)	Yes (%)
To gain new skills and experience	44.6	55.4
It was the only way to enter the labour market	76.5	23.5
Personal reasons	63.2	36.8
Other	85.9	14.1
Total (Count)	366	

Note: Only applicable to those that have one or more employers after the completion of the doctorate and that worked previously in a different sector from current employment.

Q54 – After obtaining your doctorate, have you ever had more than one employer (including your current employment), e.g. several part-time jobs?

	Freq.	Percent
No	1180	70.0
Yes	506	30.0
Total	1686	100

Q55 – In which organisations have you ever combined positions at the same time?

	No (%)	Yes (%)
Positions in more than one organisation from academic sector	67.7	32.3
Positions in organisations from both academic and business sector	75.3	24.7
Positions in organisations from both academic and governmental/not-for-profit sector	83.4	16.6
Positions in organisations from both academic and health care sector (hospital, clinical center)	85.6	14.4
Positions in more than one organisation from non-academic sector	75.9	24.1
Total (Count)	315	

Note: Only applicable to those have had more than one employer.



Q56 – Which were the reasons to combine positions in different sectors at the same time?

	No (%)	Yes (%)
To gain new skills and experience	46.7	53.3
No full-time job available	74.2	25.8
Personal reasons	63.9	36.1
Other (please specify)	81.0	19.0
Total (Count)	315	

Note: Only applicable to those have had more than one employer.



8.6. GEOGRAPHICAL MOBILITY

Q57 – Have you lived and worked outside your country of citizenship, after completing your doctorate?

	Freq.	Percent
No	1318	74.2
Yes	458	25.8
Total	1776	100

Q58 – After completing your doctorate, what was the duration of your longest stay outside your country of citizenship?

	Freq.	Percent
Less than 3 months	40	7.9
Between 3 and less than 6 months	48	9.4
Between 6 and less than 12 months	351	69.2
12 months or more	40	7.9
Total	507	100

Note: Only applicable to those that have worked outside its country of citizenship after completing the doctorate.

Q59 – What were the reason(s) for living abroad for three months or more after completing your doctorate?

	No (%)	Yes (%)
End of postdoctoral position or job contract	88.5	11.6
Previous job/study experience in the destination country	79.5	20.5
Returning to my home country	97.8	2.2
Economic/financial opportunities	71.7	28.4
Career development opportunities	38.8	61.2
Partner's career development opportunities	83.4	16.6
Culture and language	83.1	16.9
Other reasons	86.4	13.6
Total (Count)	460	

Note: Only applicable to those that have worked outside its country of citizenship after completing the doctorate more than 3 months.



8.7. DEMOGRAPHICAL DETAILS

Q60 – In which country do you currently live?

	Freq.	Percent
Germany	218	12.4
Czech Republic	186	10.6
Portugal	172	9.8
Spain	164	9.3
Slovakia	161	9.1
Italy	158	9.0
Norway	146	8.3
Greece	143	8.1
Netherlands	128	7.3
United States	36	2.0
Belgium	28	1.6
United Kingdom	26	1.5
Switzerland	25	1.4
Sweden	14	0.8
France	13	0.8
Austria	13	0.7
Cyprus	10	0.5
Brazil	9	0.5
Vietnam	9	0.5
Ecuador	8	0.4
China	7	0.4
Lebanon	7	0.4
Colombia	6	0.3
Denmark	5	0.3
South Africa	5	0.3
Dominican Republic	5	0.3
Poland	4	0.2
Croatia	4	0.2
Canada	3	0.2
Georgia	3	0.2
Ghana	3	0.2
Mozambique	3	0.2
Australia	3	0.2
Bulgaria	3	0.2
Slovenia	3	0.2
Japan	3	0.2



Turkey	3	0.2
Singapore	2	0.1
Cameroon	2	0.1
Iceland	2	0.1
Jordan	2	0.1
Russian Federation	2	0.1
India	2	0.1
Indonesia	2	0.1
Finland	2	0.1
Ireland Republic	2	0.1
Sri Lanka	2	0.1
Luxembourg	1	0.1
Nigeria	1	0.1
Pakistan	1	0.1
Guinea-Bissau	1	0.1
United Arab Emirates	1	0.1
Chile	0	0.0
Saudi Arabia	0	0.0
Albania	0	0.0
Costa Rica	0	0.0
Egypt	0	0.0
Ethiopia	0	0.0
Korea South	0	0.0
Mexico	0	0.0
New Zealand	0	0.0
Rwanda	0	0.0
Taiwan	0	0.0
Thailand	0	0.0
Zambia	0	0.0
Total	1763	100

Q61 –Citizenship Country

	First		Second		Third	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
Argentina	0	0.0				
Australia	1	0.1	1	0.8		
Austria	7	0.5	2	1.0	2	4.3
Barbados			0	0.1		
Bangladesh	3	0.2				
Belarus	0	0.0				
Belgium	8	0.5	3	1.5	2	4.4
Benin					0	0.3

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Bosnia Herzegovina			1	0.7		
Brazil	14	0.9	3	1.8		
Bulgaria	4	0.2				
Cameroon	2	0.1				
Canada	0	0.0	0	0.3		
Cape Verde			1	0.5		
Chile	2	0.1	1	0.5		
China	14	0.9				
Colombia	8	0.5				
Costa Rica	0	0.0				
Croatia	5	0.3	4	2.3		
Czech Republic	143	8.8	14	7.9	3	5.4
Denmark	2	0.1				
Dominican Republic	3	0.2				
Ecuador	8	0.5				
Egypt	1	0.0				
Ethiopia	0	0.0				
El Salvador					0	0.3
Finland	3	0.2	1	0.7		
France	18	1.1	10	5.8		
Gambia	1	0.1				
Georgia	3	0.2				
Germany	202	12.5	10	5.6	2	4.3
Ghana	6	0.3				
Greece	146	9.0	19	10.8	12	23.7
Guatemala	0	0.0				
Hungary	2	0.1				
Iceland	2	0.1				
India	14	0.9				
Indonesia	2	0.1	1	0.5	1	1.1
Iran	4	0.2	0	0.1		
Ireland Republic	3	0.2	1	0.7		
Italy	168	10.4	14	8.0	9	17.5
Japan	0	0.0	2	1.1		
Jordan	2	0.1				
Kenya	0	0.0				
Latvia	0	0.0				
Lebanon	11	0.7	2	1.3	1	2.8
Lithuania	2	0.1				
Luxembourg	0	0.0	0	0.1		
Macedonia	0	0.0				
Malaysia	2	0.1				



Mexico	8	0.5				
Morocco	1	0.1	0	0.1		
Mozambique	1	0.1	1	0.5		
Nepal	3	0.2				
Netherlands	95	5.8	7	4.2		
New Zealand			0	0.1		
Nigeria	3	0.2	1	0.5		
Norway	86	5.3	20	11.3	3	5.4
Pakistan	3	0.2				
Peru	1	0.1				
Philippines	1	0.1				
Poland	8	0.5	1	0.8		
Portugal	173	10.6	17	9.3	6	10.7
Romania	5	0.3	0	0.3		
Russian Federation	16	1.0	1	0.4	1	2.7
Rwanda	0	0.0				
Saudi Arabia	0	0.0				
Serbia	12	0.8				
Singapore	0	0.0	1	0.7		
Slovakia	165	10.2	14	7.6		
Slovenia	1	0.1			4	7.2
South Africa	6	0.4	2	1.4	1	1.7
Spain	149	9.2	8	4.6	2	4.0
Sri Lanka	2	0.1				
Swaziland	1	0.1				
Sweden	5	0.3	1	0.7		
Switzerland	6	0.4	0	0.1	0	0.3
Taiwan	3	0.2				
Thailand	0	0.0				
Togo	0	0.0				
Tunisia	1	0.1				
Turkey	4	0.2	0	0.1		
Ukraine	4	0.3				
United Kingdom	8	0.5	3	1.6		
United States	15	1.0	6	3.2	2	3.7
Uruguay	0	0.0				
Venezuela	3	0.2				
Vietnam	11	0.7	0	0.1	0	0.3
Zimbabwe			1	0.5		
Zambia	0	0.0				
Total	1622	100	179	100	52	100



Citizen of the institution country, derived from the citizenship and country of partner Organization

	Freq.	Percent
No	380	23.4
Yes	1242	76.6
Total	1622	100

Q62 – Age, derived from question: What is your year of birth?

	Freq.	Percent
Less than 30 years	68	3.9
30-34 years	626	35.9
35-39 years	506	29.0
40-44 years	201	11.6
45-49 years	166	9.5
50 years or more	176	10.1
Total	1743	100

Q63 – What is your gender?

	Freq.	Percent
Female	901	50.8
Male	842	47.5
Other	3	0.2
Prefer not to say	25	1.4
Total	1772	100

Q64 – How many children do you have?

	Freq.	Percent
0	994	56.1
1	400	22.6
2	299	16.9
3	57	3.2
4 or more	21	1.2
Total	1772	100