European Commission

MORE4 study

Support data collection and analysis concerning mobility patterns and career paths of researchers

Survey on researchers in European Higher Education Institutions

PPMI, IDEA Consult and WIFO
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Research and Innovation

MORE4 study: Support data collection and analysis concerning mobility patterns and career paths of researchers

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EUROPEAN COMMISSION

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Directorate-General for Research and Innovation
European Research Area

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1. Introduction

1.1. Objectives of the MORE4 study

The MORE 4 study, titled "Support data collection and analysis concerning mobility patterns and career paths of researchers", is being carried out under the framework contract 30-CE-0845646/00-02 COMM/D1 - PO/2016-06/01 – Lot I –Evaluation of DG COMM". It aims to **update, improve and further develop the set of indicators** used in the MORE3 study in order to meet the need for indicators over time and to assess the impact on researchers of policy measures introduced during the implementation of the European Partnership for Researchers (EPR)[1] and to provide new indicators to meet emerging policy needs and priorities.

The main objective of the MORE4 study is defined as:

"Carrying out two major surveys and developing indicators to help monitor progress towards an open labour market for researchers"

In order to realise this overall objective, the study team will build on the previous MORE studies' results and methodologies, the annual Researchers Reports 2012-2014, the ESF work on "New Concepts of Mobility", the results of the survey managed by DG Education and Culture on "Research careers in Europe" and recent developments in EU policy. The MORE4 study will update, improve and further develop the existing monitoring system and indicator framework where needed, both methodologically and conceptually.

Four tasks are identified in this regard:

1. Carry out a survey of researchers currently working in the EU (and EFTA) in higher education institutions (HEI) regarding their mobility patterns, career paths, employment and working conditions (Task 1)
2. Carry out a survey of researchers currently working outside Europe regarding their mobility patterns, career paths and working conditions (Task 2)
3. Update the set of internationally comparable indicators on researchers (Task 3)
4. Draft a final report that provides a comparative, policy-relevant analysis of the mobility patterns, working conditions and career paths of researchers (Task 4)

This report represents Part 1 of the Second Interim Report of the MORE4 study, which is the final report of Task 1: EU higher education survey results. Part 2 of the Second Interim Report is the final report of Task 3: Indicator report on researchers and is delivered in a separate document. The underlying report thus presents the final results of Task 1, the EU HE survey of researchers working in Europe.

[1] COM(2008) 317 final: Communication from the Commission to the Council and the European Parliament of 23 May 2008 "Better careers and more mobility: a European partnership for researchers".

1.2. Guide to the reader

In the following sections, we first summarise the relevant policy context for the EU HE survey in section 2. In section 3, we resume the general conceptual framework of the MORE4 study and in section 4, a number of implications of the methodology for the interpretation of the results are considered.

Sections 5 to 9 set out the results of the EU HE survey in Task 1 of the study, structured according to the above-mentioned conceptual framework:

- Section 5: Characteristics of researchers and their career paths
- Section 6: Working conditions
- Section 7: Collaboration and mobility during the PhD stage, including:
    - International collaboration and mobility (stock, flow, motives, barriers)
    - Interdisciplinary experiences
    - Intersectoral experiences
- Section 8: Collaboration and mobility in the post-PhD stage, including:
    - International collaboration and mobility (stock, flow, motives, barriers, effects)
    - Interdisciplinary collaboration and mobility (stock, flow, motives, barriers, effects including virtual mobility)
    - Intersectoral collaboration and mobility (stock, flow, motives, barriers, effects)
- Section 9: Attractiveness of the European Research Area

Section 10 summarises the findings of these sections in relation to the policy context.

In the Annexes, further details are provided regarding the survey methodology and the questionnaire. Additional data and indicator tables are included.

2. Policy context

MORE4, as was the case for the previous MORE studies, aims to link its approach and results to the relevant policy issues and questions in order to formulate evidence-based conclusions that are useful for the European Commission for informing policy development on the European Research Area (ERA), including in relation to research institutions, researchers and optimising the research conditions in Europe. In the following section, we outline first the relevant EU policy objectives , in particular as arising from the *European Partnership for Researchers, the European Research Area (ERA) in general, specifically the ERA Priority to create an Open Labour Market for Researchers and the concepts of Open Innovation, Open Science and Open to the World*; then we briefly provide an overview of the relevant instruments and progress made so far with respect to the objectives and implementation of EU policies in this area. This provides background and context for the study and is part of the added value of the MORE studies for EU (and national) policies: MORE4 results inform policy design, contribute to monitoring of policy implementation and progress toward achieving objectives of EU policy.

2.1. Policy initiatives and objectives at the level of the EU

Knowledge is at the heart of modern societies, being both the backbone of economic success as well as being key to tackling societal challenges. The academic research sector is the key sector capable of - producing knowledge and dissemination, so that its performance is central to achieving the EU's broader goals in the framework of the EU2020 strategy, "smart, sustainable and inclusive growth". Several objectives with respect to (academic) researchers, research institutions and systems arise out of a number of EU policies and strategies.

2.1.1. European Partnership for Researchers

The European Partnership for Researchers[2] (EPR) is one of the most important European initiatives that targets the improvement of researcher careers and the stimulation of mobility. The partnership programme (supported by The Council[3] and European Parliament[4]) was designed to strengthen national ownership and aimed to achieve rapid and measurable progress (by the end of 2010), towards the following goals[5]:

- Open recruitment and portability of grants;
- Social security and supplementary pensions for mobile researchers;
- Attractive employment and working conditions;

[2] European Commission, "Better careers and more mobility: a European partnership for researchers" [COM (2008) 317 final].

[3] Council conclusions on European researchers' mobility and careers of 2 March 2010: http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/intm/113121.pdf

[4] European Parliament report on "Cross-Border Mobility of Young Researchers", October 2009: http://www.europarl.europa.eu/activities/committees/studies/download.do?language=en&file=27511

[5] Communication of from the Commission to the Council and the European Parliament of 23 May 2008 "Better access and more mobility: a European Partnership of researchers" COM2008) 317 final.

- Improving training, skills and experience.

Furthermore, the additional benefits of this partnership programme should include recognition of researchers' qualifications from other institutions and countries; greater portability of individual grants awarded by national funding agencies and EU research programmes; better career development opportunities for early-career researchers including regular evaluation and more autonomy; better training throughout their careers to improve their employability and chances of promotion and better links between academia and the non-academic labour market to improve researchers' employability and ability to turn research into innovative products and services.

Progress was made towards the achievement of the stated goals, but according to an expert group[6], it was slow and not uniform across countries. A Commission Communication (6 October 2010)[7] announced the decision to incorporate the EPR into the Innovation Union Flagship Initiative of the Europe 2020 strategy. The Innovation Union calls for a unified European Research Area (ERA); an area open to the world, in which scientific knowledge, technology and researchers circulate freely.

2.1.2. European Research Area

The objective of the ERA was supported by the March 2000 European Council and is anchored in the 2007 Lisbon Treaty. The following vision of the ERA was put forward in the 2012 ERA Communication on 'A Reinforced European Research Area Partnership for Excellence and Growth'[8]: *"a unified research area open to the world based on the Internal Market, in which researchers, scientific knowledge and technology circulate freely and through which the Union and its Member States strengthen their scientific and technological bases, their competitiveness and their capacity to collectively address grand challenges."* The creation of a European Research Area (ERA) is one of the cornerstones of EU 2020 strategy[9] (and the Innovation Union initiative in particular) and future economic competitiveness of Europe.

In 2011, the European Council urged all parties at EU, Member State and stakeholder level to address the remaining gaps and complete ERA by 2014. The 2012 ERA Communication therefore defined a number of actions for Member States detailed in five priority areas, dealing with: (1) more effective national research systems; (2) optimal transnational cooperation and competition; (3) an open labour market for researchers; (4) gender equality and gender mainstreaming in research; and (5) optimal circulation, access to and transfer of scientific knowledge. In addition, ERA also evolves around international cooperation as a sixth priority area.[10]

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[6] Excellence, Equality and Entrepreneurialism Building Sustainable Research Careers in the European Research Area. By the expert group on the Research Profession, 20 July 2012: http://ec.europa.eu/euraxess/pdf/research_policies/ExpertGrouponResearchProfession.pdf

[7] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Europe 2020 Flagship Initiative Innovation Union, SEC(2010) 1161, Brussels, 6.10.2010, COM(2010) 546 final: http://ec.europa.eu/research/innovation-union/pdf/innovation-union-communication_en.pdf#view=fit&pagemode=none .

[8] European Commission, COM(2012) 392 final, "A Reinforced European Research Area Partnership for Excellence and Growth": http://ec.europa.eu/euraxess/pdf/research_policies/era-communication_en.pdf

[9] European Commission, "Europe 2020 Flagship Initiative – Innovation Union, SEC(2010) 1161 final, Brussels, 6 October 2010.

[10] European Commission, COM(2017) 35, "ERA progress report 2016: The European Research Area: Time for implementation and monitoring progress", http://ec.europa.eu/research/era/pdf/era_progress_report2016/era_progress_report_2016_com.pdf

Moreover, the 2012 ERA Communication laid the foundation for a reinforced ERA partnership "*deeper, wider and more efficient than to date*" between the European Commission, the Member States and research stakeholder organisations. The explicit role of the latter was a new and important element in the reinforcement of the ERA Partnership.

Particularly important for the MORE studies is the ERA Priority "An Open Labour Market for Researchers", which is key to the mobility and career prospects of researchers. As the 2012 ERA Communication states, several obstacles stand in the way of an open labour market for researchers[11]:

- the lack of transparent, open and merit-based recruitment[12];
- giving non-nationals/non-residents access to national grants and making them portable across borders;
- human resources policies which result in poor career prospects for young researchers;
- inadequate gender equality practices;
- social security obstacles;
- insufficient intersectoral mobility between academia and business (and vice versa);
- obstacles to the fair recognition of academic diplomas.

2.1.3. The three O's: Open Innovation, Open Science and Open to the World

In the next 2021-2027 period, Horizon Europe will be strongly based on Open Science as its modus operandi, going beyond Horizon 2020's open access policy to require immediate open access for publications and data, and research data management plans. The EC states that "*the Programme will encourage the proliferation of FAIR data (findable, accessible, interoperable, and re-usable) and support a sustainable and innovative scholarly communications ecosystem. It will foster activities to improve researcher skills in Open Science and the reward systems that promote this. Research integrity and citizen science will play a central role, as will the development of a new generation of research assessment indicators.*"[13]

In 2015, the then Commissioner for Research, Science and Innovation, Carlos Moedas, set out the three O's as a next chapter in the ERA and Innovation Union policy[14]: Open Innovation, Open Science and Open to the World. Each of these are regarded as strategic priorities to foster research and innovation in Europe in future years to come[15], and to open up the ERA to future challenges (like digitalisation and global networks) allowing the ERA concept to evolve over time taking into account new challenges and taking advantage of opportunities.

Open Science is highly relevant in the context of researchers' mobility and career paths. The generalisation of Big Data and digital technologies is profoundly altering the way research is being done. The European Commission funded the project 'FOSTER' (e-learning platform to Facilitate Open Science Training for European Research), which defined Open Science as: *"the practice of science in such*

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[11] http://ec.europa.eu/research/era/open-labour-market-for-researchers_en.htm

[12] https://euraxess.ec.europa.eu/content/open-transparent-and-merit-based-recruitment-researchers-otm-r

[13] European Commission SWD(2018) 307 final, Impact Assessment - Horizon Europe, https://eur-lex.europa.eu/resource.html?uri=cellar:d17282ba-6a2f-11e8-9483-01aa75ed71a1.0001.03/DOC_1&format=PDF

[14] Speech of 22 June 2015. http://europa.eu/rapid/press-release_SPEECH-15-5243_en.htm

[15] Open Innovation, Open Science, Open to the World - a vision for Europe. Directorate-General for Research and Innovation. May 2016.

a way that others can collaborate and contribute, where research data, lab notes and other research processes are freely available, under terms that enable reuse, redistribution and reproduction of the research and its underlying data and methods"[16]. In other words, Open Science involves Open Access, Open Data, Open Source and Open Reproducible Data and shares with these concepts the principles of transparency, universal accessibility and the reusability of the scientific information disseminated via online tools[17]. Open Science also goes beyond results and methods - it affects each step of the scientific process. The aim is therefore to use technological improvements and cultural changes as a basis to foster collaboration and openness in research[18].

2.2. Policy instruments at EU level

The EU has a wide range of instrument types at its disposal to address its objectives with regard to ERA and also regarding the three O's. Among these are:

- Non-research specific EU rules and regulations, such as EU internal market rules in respect of freedom of movement are also crucial for researcher mobility; as well as specific regulatory frameworks for researchers:
    - the 'Scientific Visa Directive';
    - support for a new pan-European supplementary pension fund for researchers;

- Funding grants for research institutions and individual researchers, e.g.:
    - Marie Skłodowska-Curie actions (MSCA), that have also contributed to set the standards for research training, attractive employment conditions and open recruitment for all EU-researchers.
    - ERC and H2020/Horizon Europe funding programmes more generally;
    - ERC and H2020/Horizon Europe funding programmes more generally;

- Provision of in kind EU services, such as the EURAXESS platform;
- Standards, certifications and regulations to guide institutional policies, such as:
    - European Charter for Researchers and Code of Conduct for the Recruitment of Researchers and the Human Resources Strategy for Researchers (HRS4R) which helps to implement Charter and Code, or the package to implement Open, transparent and merit-based recruitment procedures (OTM-R);
    - Principles of innovative doctoral training;

- Cooperation agreements with third countries, opening up the EU's research programmes and specific funding instruments to participation by their individual researchers and/or research institutions;
- Provision of know-how to stimulate the diffusion of best practice, e.g. within the PSF (Policy Support Facility):
    - Mutual Learning Exercise (MLE) to share best practice;

[16] https://www.fosteropenscience.eu/foster-taxonomy/open-science-definition

[17] *Pontika, N., P. Knoth, M. Cancellieri, S. Pearce (2015) Fostering Open Science to Research using a Taxonomy and eLearning Portal.*

[18] Open Science. https://ec.europa.eu/digital-single-market/en/open-science

- Peer Review of national research systems.

The EU **research funding programmes** are also in particular very important for the realisation of an ERA. In 2018, the EC has adopted its proposal for the next EU long-term budget and its proposal for Horizon Europe, the successor of Horizon 2020[19]. Horizon Europe is planned to be launched on 1 January 2021. The EC has proposed a budget of €100 billion for the research and innovation programme that will succeed Horizon 2020. The new programme represents broad continuity with Horizon 2020 (in line with the concept of evolution not revolution) and focuses instead on making a few design improvements to further increase its openness and impact in comparison to its predecessor. Horizon Europe shall reinforce the European Research Area through sharing excellence, research and innovation reforms and policy.

The impact of these instruments in terms of supporting public goods with a high European added value may come from EU-wide competition for excellence, EU investments supporting the training and mobility of scientists, the creation of transnational and multidisciplinary collaboration, leverage of additional investment from the public and private sectors, building the scientific evidence necessary for effective EU policies, and structuring national R&I systems.[20] Moreover, there is a leverage effect through support for mobility on the added value of EU programmes and funds, particularly in the form of skills and career development, as well as improvements in social cohesion and cooperation between European researchers, thus increasing the productivity of this community[21].

The instruments are combined in various EU initiatives, often also together with national and regional policies. For example, the promotion of the ERA takes place through various instruments and programmes implemented at the EU level, the national level and the regional level. At the EU level, the European Commission has taken the lead by introducing new and adapting existing R&D support schemes. For example, the ERA-NETs, together with initiatives under Article 185 of the Treaty on the Functioning of the European Union (TFEU), lead towards joint coordination of regional, national and European research programmes. The Member States have agreed upon initiatives towards improved coordination of research infrastructures (European Strategy Forum on Research Infrastructures — ESFRI) and begun to address the grand challenges in cooperation with JPIs (Joint Programming Initiatives). Of course, Horizon 2020/Europe supports the functioning of ERA through both targeted and cross-cutting measures.

For the MORE studies, a particularly important aspect are the instruments which support the **creation of an open labour market of researchers.** The 2012 ERA Communication gives an overview of proposed actions to be implemented by the Reinforced ERA Partnership (by 2014) to tackle the obstacles on the way towards an open labour market for researchers (see supra). The ERA Roadmap 2015-2020[22] identified the use of open, transparent and merit-based recruitment practices with regard to research positions as the most important action in order to achieve an open labour market for researchers.

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[19] European Commission COM(2018) 436 final, Implementing Horizon Europe – the Framework Programme for Research and Innovation.

[20] https://ec.europa.eu/info/sites/info/files/swd_2018_307_f1_impact_assesment_en_v7_p1_977548.pdf

[21] https://ec.europa.eu/info/sites/info/files/swd_2018_307_f1_impact_assesment_en_v6_p2_977548.pdf

[22] Draft Council conclusions on the European Research Area Roadmap 2015- 2020
http://data.consilium.europa.eu/doc/document/ST-8975-2015-INIT/en/pdf

At the EU level, a series of policy initiatives has been implemented in order achieve an open labour market for researchers, such as:

- the development of the EURAXESS network,
- the 'Scientific Visa Directive',
- a Human Resources Strategy for Researchers based on the Charter and Code,
- the Principles of Innovative Doctoral Training,
- support for a new pan-European supplementary pension fund for researchers,
- Marie Skłodowska-Curie actions (MSCA), that have also contributed to setting the standards for research training, attractive employment conditions and open recruitment for all EU-researchers.

Instruments relevant for Open Science

In February 2016, the European Commission (Directorate-General for Research and Innovation) announced to establish a Commission Expert Group to provide advice about the development and implementation of Open Science policy in Europe. The tasks of the Open Science Policy Platform cover:

(1) advising the Commission on how to further develop and implement Open Science policy;
(2) bringing up and addressing issues of stakeholder concerns for the European science and research community;
(3) supporting policy formulation by helping to identify relevant issues and providing recommendations on required policy actions;
(4) supporting policy implementation;
(5) providing advice and recommendations on cross-cutting issues related to Open Science.

In May 2016, Commissioner Moedas nominated the members of the Open Science Policy Platform (OSPP). In a series of meetings, the OSPP developed recommendations on 8 prioritised Open Science ambitions that have been adopted on April 22nd 2018[23]:

- Rewards and Incentives;
- Research Indicators and Next-Generation Metrics;
- Future of Scholarly Communication;
- European Open Science Cloud;
- FAIR Data;
- Research Integrity;
- Skills and Education;
- Citizen Science.

[23] https://ec.europa.eu/research/openscience/index.cfm?pg=open-science-policy-platform; https://ec.europa.eu/research/openscience/pdf/integrated_advice_opspp_recommendations.pdf#view=fit&pagemode=none

From June 2016 to June 2017, a sub-group of the Steering Group Human Resources and Mobility (SGHRM) has been working on the reputation system in research[24]. This Working Group on Rewards focused on:

(1) promoting discussions with and between stakeholders regarding the current reward systems for researchers;
(2) reflecting on alternative methods to recognise contributions in the Open Science environment (including rewards and incentives), considering the diversity in experience and career paths;
(3) proposing new standards for evaluating research proposals and outcomes;
(4) identifying good practices as to how Open Science has already been taken up by researchers and research institutions.

In July 2017, the working group recommended[25]:

- to foster the engagement of the entire researcher community in the practices of Open Science by changing the overall culture of recognition and rewards;
- ERA policies, ERA roadmaps and National Action Plans should be reviewed through the lens of Open Science in order to make it compatible;
- Researcher participation in Open Science should be supported and corresponding funding should be pursued at the European level;
- During recruitment, career progression, grant evaluation etc., researchers should be assessed encompassing the full range of their achievements, in particular in terms of Open Science. The expert group therefore proposed the OS-Career Assessment Matrix as an instrument to reflect diverse career paths.

In the same timeframe, the Working Group on Skills, another sub-group of the SGHRM, focused on the introduction of Open Science education and training tailored to the four career stages (R1-R4) as well as in doctoral training programmes and in early education (i.e. master, bachelor, high school)[26]. The working group identified the skills necessary for Open Science including open access publishing; data management and open data; enabling professional research conduct; and citizen science. Based on these skills the working group proposed a European Skills and Qualifications Matrix for Open Science. In its report[27] the working group recommended to:

(1) set up an Open Science policy;
(2) to provide guidelines to implement Open Science;
(3) to raise awareness for Open Science policy initiatives as well as institutional and funding agency guidelines;

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[24] https://ec.europa.eu/research/openscience/index.cfm?pg=rewards_wg

[25] Working Group on Rewards under Open Science (2017), Evaluation of Research Careers fully acknowledging Open Science Practices; Rewards, incentives and/or recognition for researchers practicing Open Science; https://ec.europa.eu/research/openscience/pdf/os_rewards_wgreport_final.pdf#view=fit&pagemode=none

[26] https://ec.europa.eu/research/openscience/index.cfm?pg=skills_wg

[27] Working Group on Education and Skills under Open Science (2017) Providing researchers with the skills and competencies they need to practise Open Science; https://ec.europa.eu/research/openscience/pdf/os_skills_wgreport_final.pdf#view=fit&pagemode=none

(4) to provide training for researchers for Open Science ensuring career stage appropriate accredited and modularised Open Science skills training and professional development;
(5) to base recognition of Open Science in the career development as well as in funding decisions by funding agencies.

In 2017, a mutual learning exercise (MLE) was initiated for the first time focusing on Open Science addressing national policies and practices relating to: (1) alternative (non-traditional) metrics to measure quality and impact of research outcomes going beyond citation of articles and (2) incentives and rewards for researchers to engage in Open Science activities. 13 countries (incl. 3 non-EU member states) participated in this process lasting from January 2017 to January 2018.

2.3. Progress towards meeting policy objectives

Information on progress both in implementing the instruments, but also in achieving the objectives outlined above, comes from a variety of sources, e.g. the ERA progress reports (which also use the MORE studies as a primary source of information on progress) or various research performance indicators, indicators on the spread of Open Science approaches, etc.

In 2013 and 2014, progress reports[28] were published on the development of the ERA, on the basis of the 5 priority areas defined above. The ERA Progress Report 2013 presented for the first time an overview on the political context, steps taken and initial achievements in the 28 Member States, as well as in a number of Associated Countries. It provided a baseline for the 2014 progress report, which concluded that the conditions for the completion of ERA identified in the 2012 ERA Communication were in place i.e.:

(1) Member States increasingly adopt measures in support of ERA and include them in their NRPs (National Reform Programmes);
(2) Stakeholder Organisations support the ERA agenda;
(3) the EU has embedded ERA in the European Semester, provides substantial funding for ERA measures and promotes open recruitment, open access to publications and data and gender equality through Horizon 2020;
(4) a solid monitoring mechanism is in place which delivers data on all levels of progress. The data from MORE2 were one of the data sources used in the progress report.

The report concludes that reforms must now be implemented at the Member State level to make ERA work.

At the level of the Member States and Associated Countries, the progress in this specific priority was monitored through the so-called "Researchers' reports", which complemented the above-mentioned ERA progress reports. Regarding the progress made at the Member State level in terms of an open labour market for researchers, the Researchers' Report 2014[29] concluded that the progress has been uneven and that there remained substantial differences between Member States. Challenges remained

[28] ERA progress report 2013: http://ec.europa.eu/research/era/pdf/era_progress_report2013/era_progress_report2013.pdf
ERA progress report 2014: http://ec.europa.eu/research/era/pdf/era_progress_report2014/era_progress-report_150521.pdf
[29] DG Research & Innovation, 2014, Researchers' Report:
https://cdn5.euraxess.org/sites/default/files/policy_library/researchers_report_2014_final_report.pdf

in some Member States including a lack of open, transparent and performance-oriented attitudes. It was concluded that further efforts were needed by the Member States and by research and academic institutions (with support of the EC) to remove outstanding obstacles to researcher mobility, training and attractive careers.

In May 2015, the EU's Competitiveness Council adopted the ERA Roadmap 2015-2020[30], developed in consultation with the European Research Area and Innovation Committee (ERAC), the ERA Related Groups and most of the organisations which make up the ERA Stakeholder Platform. The ERA Roadmap 2015-2020 identified "*a limited number of key implementation priorities which are likely to have the biggest impact on Europe's science, research and innovation systems if all the members of the ERA Partnership get them right".*

In 2016, progress on ERA had been measured for each country on each priority on the basis of 24 indicators (ERA Monitoring Mechanism) which had been jointly defined by the Commission, the Member States and research stakeholders. By that time, 24 Member States and five Associated Countries had adopted an ERA national action plan 2015-2020. The progress report 2016[31] concluded that significant improvements had been made for the six ERA priority areas, but more efforts were needed to address specific problems and differences between countries (which is also a result of MORE3, in terms of heterogeneity between countries). National research systems had been better adapted to the ERA priorities; international scientific cooperation and coordination in addressing the grand challenges had increased; and there had been improvements in open, transparent and meritocratic attitudes with a view to creating an open labour market for researchers. Numerous initiatives have been launched to address gender issues, raising expectations for results in the coming years. At the same time, the EC recognises that the digitisation and development of global networks represent important challenges for the future development of the ERA.

The 2016 ERA progress report also stated "*that more attention is being paid to open, transparent and merit-based recruitment procedures at national level. The further promotion of the EURAXESS portal as a repository of researchers' rights is key in this regard. Potential measures to further facilitate the international mobility of researchers include equal access to national research funding programs for foreign researchers and increasing the portability of research grants. Additional measures include the further development of human resources procedures in research performing institutions. Pension right transferability and language competency for teaching requirements are evolving topics*."

These areas, identified as requiring action for promoting mobility, better working conditions, and improved careers of researchers, with special attention to those issues which are related to age and gender aspects, will all be covered in the study and will be the guiding context for the analysis and conclusions of the study. Recent developments will be taken into account (see also section 3.3 for an overview of how policy developments are addressed in MORE4):

- Strengthened HRS4R process since 2016, with guidelines and templates to implement the strengthened process[32].

[30] http://data.consilium.europa.eu/doc/document/ST-1208-2015-INIT/en/pdf

[31] European Commission, COM(2017) 35, "ERA progress report 2016: The European Research Area: Time for implementation and monitoring progress", http://ec.europa.eu/research/era/pdf/era_progress_report2016/era_progress_report_2016_com.pdf

[32] https://cdn4.euraxess.org/sites/default/files/policy_library/hrs4rguide-process16-2-2016.pdf

- New insight on open, transparent and merit-based recruitment of researchers (OTM-R) based on the study on the open, transparent and merit-based recruitment of researchers[33] and work by the Working Group of the Steering Group of Human Resources Management under the European Research Area on OTM-R[34] and a resulting check-list for institutions on OTM-R[35].
- New insights on cross-sectoral mobility based on the study on fostering industrial talents in research at European level[36].

With respect to Open Science, the MLE (mutual learning exercise) final report[37], mentioned above, concludes that only a few types of Open Science incentives and rewards are currently being implemented in participating countries and that the implementation of Open Science has to be part of the bigger picture, i.e. the role and functions of science in society. National strategies for the implementation of Open Science are essential to align Open Science policies with general STI policies.

In conclusion, the EU policy context is characterised by a multitude of objectives, instruments, and monitoring and reporting tools to assess progress. MORE4 can provide first-hand information based on a survey among researchers, which can inform the development of evidence-based policies in the academic research policy context:

(1) The results are useful to track progress toward objectives e.g. as regards the adoption of open and transparent recruitment practices, innovative doctoral training or more generally toward the attractiveness of the EU as a location for excellent academic research. Perceptions by researchers complement other sources of information, e.g. surveys among research institutions.
(2) MORE4 also sheds light on the success of policies in terms of reaching their target audience (implementation performance), e.g. whether researchers are aware of, and use the EURAXESS platform. Such a representative survey of the target population of research policies is an asset for policy design and evaluation.
(3) MORE4 results inform policy design itself, as it pinpoints crucial issues in the ERA, such as heterogeneity in the structures and performances of the research systems of the EU Member States. The MORE studies do not only feed into the development of policy reports such as the ERA progress report, but are also used analytically and for academic research purposes to research the determinants and measurement of attractiveness as they contain information as to what matters to researchers from an attractiveness perspective.

[33] Technopolis (2014) IA study on the Open, transparent and merit-based recruitment of researchers, Final Report. https://cdn5.euraxess.org/sites/default/files/policy_library/otm_final_report_0.pdf

[34] https://cdn1.euraxess.org/sites/default/files/policy_library/otm-r-finaldoc_0.pdf

[35] Report of the Working Group of the Steering Group of Human Resources Management under the European Research Area on Open, Transparent and Merit-based Recruitment of Researchers, 2015. https://cdn5.euraxess.org/sites/default/files/policy_library/otm-r-checklist.pdf

[36] CSES et al. (2018) Study on Fostering Industrial Talents in Research at European Level, Final report. https://cdn5.euraxess.org/sites/default/files/policy_library/final_report_intersectoral_mobility.pdf

[37] https://rio.jrc.ec.europa.eu/en/file/12405/download?token=Cy9bQifW

3. Conceptual framework and definitions

3.1. Conceptual framework

Within the context of these policy developments, the conceptual framework defines and structures a set of overarching concepts that are then applied consistently in the four different tasks of the MORE4 study. It is as such a tool for guidance in structuring and interpreting the findings in each of the tasks and integrating them in the final report. The conceptual framework is also strongly based on the framework in the MORE2 and MORE3 studies (2012 and 2016) for reasons of consistency and comparability[38] [39].

The definitions of the concepts of mobility further take into account the existing standards or secondary sources so that comparability with other studies and contexts is maximised. In the following sections 3.1 to 3.2, we repeat the definitions of a number of key concepts that were applied the same in MORE3, pertaining to: researchers, different fields of science, research career stages and the type of mobility of researchers. Finally, section 3.3 treats the refinements made to a number of concepts of career paths and working conditions, based on the identified evolution in the policy context since 2012 and 2016.

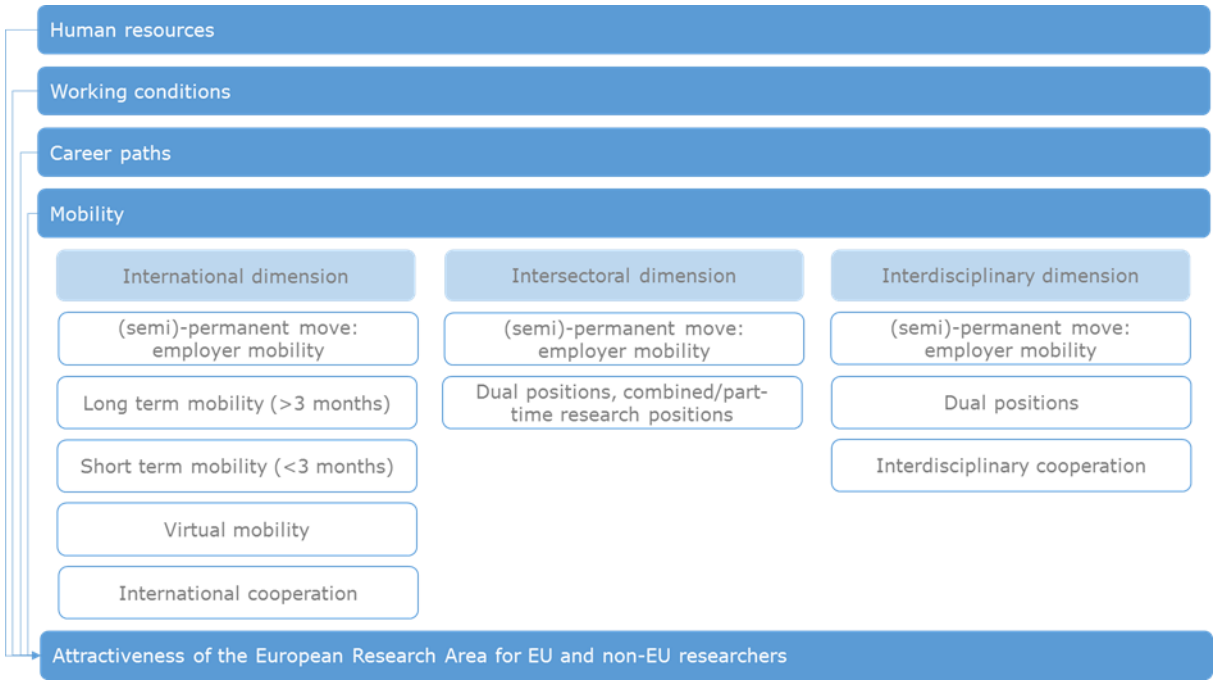
In our conceptual framework, human resources are the starting point, as the stock of human resources is basically the population of interest. The career paths of researchers can be seen as an important element of working conditions; taken together, both are important factors which influence the various forms of mobility, e.g. taking the next career step may necessarily involve international mobility to gain access to international networks, poor working conditions and differences in remuneration levels may drive researchers to seek research opportunities in other countries within the same sector (e.g. the phenomenon of brain-drain) or to other sectors within the same country. Working conditions and career paths determine to a large extent the relative attractiveness of the European Research Area for both EU and non-EU researchers, whereas different forms of mobility can *inter alia* be seen as indicators, or as monitoring tools for issues relating to the relative attractiveness of working as a researcher within the ERA in general, and in specific countries in particular.

Generally, the MORE framework brings together the variables and indicators at three different levels: human resources and working conditions relate to the system and organisation level, career paths and mobility fit in the individual researcher perspective and the attractiveness of the ERA corresponds to the system level. These correspond directly to the policy context and in particular to the overarching ERA priorities, as explained in the conclusions in section 10.

[38] IDEA Consult et al. (2013) Support for continued data collection and analysis concerning mobility patterns and career paths of researchers. FINAL REPORT (deliverable 8).

[39] IDEA Consult et al. (2017) MORE3 study: Support data collection and analysis concerning mobility patterns and career paths of researchers, FINAL REPORT, European Commission.

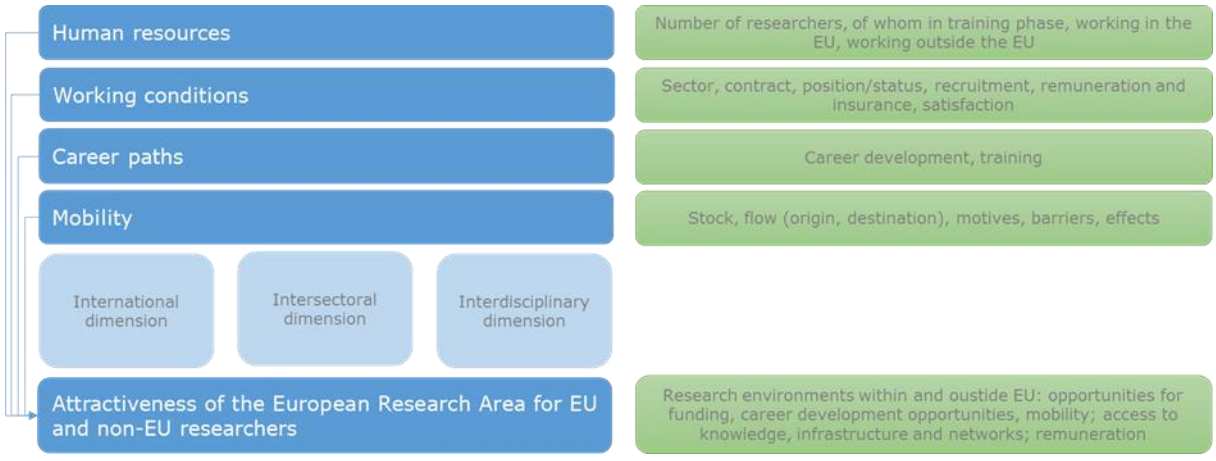
Figure 1: Conceptual framework of the MORE studies



Source: Based on previous MORE studies and literature review

For each of the concepts (in dark blue) and their different dimensions (in light blue), a number of key indicators are identified for data collection and analysis in (each of the tasks in) MORE4. The main types of indicators are given in Figure 2. Each of these are further elaborated and detailed in the analysis sections (sections 5 to 9).

Figure 2: Framework for definition of indicators in the MORE studies



Source: Based on previous MORE studies and literature review

Before turning to the analysis of the indicators, structured in sections according to this conceptual framework, we explain in the following sections the definitions of concepts used in the indicators, as well as the policy-driven developments that have an impact on the definition, scope or interpretation of the indicators.

3.2. Definitions

3.2.1. Researchers

The main definitions on researchers in use derive from the Canberra Manual, covering Human Resources devoted to Science and Technology (HRST), and from the Frascati Manual, covering Research and experimental development and R&D personnel. These definitions have also been used in the previous MORE studies[40] [41] [42].

Definition from the Canberra Manual[43]:

- HRST: people who fulfil one or other of the following conditions:
    - Successfully completed education at the third level in an S&T field of study (HRSTE).
    - Not formally qualified as above but employed in an S&T occupation where the above qualifications are normally required (HRSTO).

Definitions from the Frascati Manual[44]:

- Research and experimental development (R&D):
    - "Research and experimental development (R&D) comprise creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge."
- R&D personnel:
    - "In broad terms, R&D personnel include highly trained researchers, specialists with high levels of technical experience and training, and other supporting staff who contribute directly to carrying out R&D projects and activities. […], the scope of this concept encompasses all knowledge domains."
    - "R&D personnel in a statistical unit include all persons engaged directly in R&D, whether they are employed by the statistical unit or are external contributors fully

[40] IDEA Consult et al. (2010) Study on mobility patterns and career paths of EU researchers. FINAL REPORT (deliverable 7).

[41] IDEA Consult et al. (2013) Support for continued data collection and analysis concerning mobility patterns and career paths of researchers. FINAL REPORT (deliverable 8).

[42] IDEA Consult et al. (2017) MORE3 study: Support data collection and analysis concerning mobility patterns and career paths of researchers, FINAL REPORT, European Commission.

[43] OECD (1995), The Measurement of Scientific and Technological Activities. Manual on the Measurement of Human Resources Devoted to S&T. "Canberra Manual", OECD, Paris. (Section 3.1.1.).

[44] OECD (2015), Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/9789264239012-en.

integrated into the statistical unit's R&D activities, as well as those providing direct services for the R&D activities (such as R&D managers, administrators, technicians and clerical staff). All persons employed directly on R&D should be counted, as well as those providing direct services such as R&D managers, administrators, and clerical staff."

- Researchers:
  - "Professionals engaged in the conception or creation of new knowledge. They conduct research and improve or develop concepts, theories, models, techniques instrumentation, software or operational methods."
  - "For practical reasons, doctoral students engaged in R&D should be counted as researchers."

For this study, a researcher is defined in accordance with the Frascati manual[45] as **"professionals engaged in the conception or creation of new knowledge, conducting research and improving or developing concepts, theories, models, techniques instrumentation, software or operational methods"**.

The European Charter for Researchers and Code of Conduct for the Recruitment of Researchers[46], which are key elements in the European Union's policy to make research an attractive career, as well as the European Commission's communication on "Towards a European framework for research careers"[47], also refer to the 2002 version of this definition of researchers[48]. The definition is furthermore applied in R&D surveys which are the source for Eurostat and OECD R&D statistics.

To guarantee that respondents meet the criteria to be considered a researcher according to this definition, the questionnaire of the EU HE surveys in the MORE studies contain the following self-selection paragraph:

We specifically target "researchers" within this survey, including people:

- carrying out research OR
- supervising research OR
- improving or developing new products/processes/services OR
- supervising the improvement or development of new products/processes/services.

If you consider yourself to fall into one or more of the above categories, we kindly ask you to complete the questionnaire.

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[45] OECD (2015), Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/9789264239012-en.

[46] http://ec.europa.eu/euraxess/pdf/brochure_rights/am509774CEE_EN_E4.pdf

[47] "Towards a European Framework for Research Careers" (European Commission 2011, p. 2 http://ec.europa.eu/euraxess/pdf/research_policies/Towards_a_European_Framework_for_Research_Careers_final.pdf

[48] In Proposed Standard Practice for Surveys on Research and Experimental Development, Frascati Manual, OECD, 2002: "Professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, and in the management of the projects concerned."

3.2.2. *Fields of Science*

Fields of science (FOS) are defined according to the Fields of Research and Development (FORD) classifications proposed by the OECD in the 2015 Frascati Manual[49]:

- Field 1: Natural Sciences
- Field 2: Engineering and Technology
- Field 3: Medical and health sciences
- Field 4: Agricultural and veterinary sciences
- Field 5: Social Sciences[50]
- Field 6: Humanities and the Arts

Consistent with the previous MORE studies, three categories are derived from this for the purpose of the Task 1 survey sample stratification. The three categories are an aggregation of the six FOS as follows:

- NATURAL: Field 1 (Natural Sciences) and Field 2 (Engineering and Technology)
- HEALTH: Field 3 (Medical and health sciences) and Field 4 (Agricultural and veterinary sciences)
- SOCIAL: Field 5 (Social Sciences) and Field 6 (Humanities and the Arts)

3.2.3. *Research careers*

There is a wide but diverse range of literature on the definition and typology of research careers. An overview is given in the RISIS Research Paper on the 'Conceptual framework for the study of research careers'[51]. According to this overview, three theoretical approaches can be identified to research careers: that of the individual agency[52], of institutional and collectively produced processes[53] or in between[54]. Based on these, careers are structured in stages. Four explicit models of career stages are identified, each focusing on different defining factors such as role sets/interdependence and authority (Laudel & Gläser, 2007); competences/independence and leadership (EC); positions/independence (ESF) and positions/ranks (LERU).

The MORE4 study, as its predecessors, takes the perspective of the individual researcher, and applies the EC model for career stages[55]. As such, it is situated in this context in the individual agency perspective, defined by competences/independence and leadership. This model was defined in the

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[49] OECD (2015), Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/9789264239012-en.

[50] Including Economic Sciences.

[51] RISIS – WP24 – Task 1. Conceptual framework for the study of research careers. Research papper synthesizing the theoretical model for research careers. January 2016.

[52] The sociological model of the institutional processes that structure research careers (Gläser 2001; Laudel and Gläser 2008).

[53] Economics of sciences (Black and Stephan 2010; Fox and Stephan 2001; Sauermann and Stephan 2012; Stephan 2008).

[54] The scientific and technical human capital approach (Bozeman, Dietz, and Gaughan 2001; Bozeman and Rogers 2002).

[55] The classification describes four broad profiles that apply to all researchers, independent of where they work in the private or public sector: in companies, NGOs, research institutes, research universities or universities of applied sciences. Source: https://euraxess.ec.europa.eu/europe/career-development/training-researchers/research-profiles-descriptors.

European Commission's Communication "Towards a European Framework for Research Careers" (European Commission 2011, p. 2)[56] and is published on the EURAXESS website along with profile characteristics (desirable or necessary competences)[57]. This career stage model, with its focus on competences and leadership, best fits the purpose of the study and at the same time allows for a high degree of standardisation across different related studies.

These four career stages are:

- R1: First Stage Researcher (up to the point of PhD),
- R2: Recognised Researcher (PhD holders or equivalent who are not yet fully independent);
- R3: Established Researcher (researchers who have developed a level of independence);
- R4: Leading Researcher (researchers leading their research area or field).

According to the definitions given in the European Commission's Communication, the different stages are sector-neutral (applicable to companies, NGO's, research institutes, research universities or universities of applied sciences). The specific necessary and desired competences for each career stage are included in Annex 1.

As this classification is not known in formal data sources on researchers, the classification has been used by means of the self-selection of researchers in the surveys.

3.2.4. Mobility of researchers

Researcher 'mobility' refers to the movements researchers make during their career, which can be of varying lengths, with different goals, with different types of destinations and coming from different types of originating countries.

In the subsequent MORE studies, the definitions of mobility were improved and updated as new concepts of researcher mobility developed, and policies towards mobility and the evaluation of researchers' achievements had to be revisited[58]. However, the MORE4 definitions are consistent with the MORE3 definitions. In the following sections, we resume the main definitions of (different types of) mobility, including the in MORE3 updated approach for PhD mobility, and the introduction of a classification of mobility to distinguish cases of forced mobility (escape, expected and exchange mobility).

3.2.4.1 Overview of different types of mobility

According to the expert group on the research profession[59] at least four types of mobility can be recognised:

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[56] http://ec.europa.eu/euraxess/pdf/research_policies/Towards_a_European_Framework_for_ Research_Careers_final.pdf

[57] https://euraxess.ec.europa.eu/europe/career-development/training-researchers/research-profiles-descriptors

[58] New concepts of researcher mobility – a comprehensive approach including combined/part-time positions. Science Policy Briefing, ESF, April 2013.

[59] "Excellence, Equality and Entrepreneurialism building sustainable research careers in the European Research Area" (2012), by the Expert Group on the Research Profession.

- Geographical or international mobility;
- Intersectoral mobility;
- Virtual mobility (based on tangible cross-border research collaboration);
- Mobility related to change of topics or disciplines.

In MORE1, the analysis mainly focused on "geographical" and "sectoral mobility". By 2012, mobility could no longer be seen only in physical and geographical/international terms and "virtual mobility" was included for the first time in the MORE2 study. Mobility related to change of topics or disciplines was not explicitly included in the MORE2 study but was elaborated in MORE3 and continued in MORE4, so that this current study covers all four types of mobility. An overview of this evolution is shown in Table 1.

Table 1: Types of mobility covered in each MORE study

	MORE1	MORE2	MORE3	MORE4
International mobility				
Virtual mobility				
Intersectoral mobility				
Interdisciplinary mobility				

In Table 2, the definitions of these different types of mobility are structured along the dimensions of type of mobility, phase in which mobility takes place, duration and purpose of mobility. Each of the definitions in this table will be analysed in this report in the indicated sections.

Table 2: Definitions of mobility

<table>
<tr><td colspan="2"></td><td>PHD MOBILITY</td><td colspan="2">POST-PHD MOBILITY</td></tr>
<tr><td colspan="2"></td><td>Mobility of researchers enrolled in a PhD programme during their R1 career stage.</td><td colspan="2">Mobility in any of the following research career stages and, even though the terminology selected for simplicity suggests otherwise, regardless of whether or not the researcher has obtained a PhD.</td></tr>
<tr><td rowspan="4">Geographical or international mobility</td><td rowspan="4">Moving to another country</td><td>PhD degree mobility:
Mobility with the purpose of obtaining the PhD in another country</td><td rowspan="2">>3 month mobility:
Mobility with duration of 3 months or more</td><td>Employer mobility:
Mobility including a change of employer</td></tr>
<tr><td>>3 month mobility during PhD:
Mobility of three months or more during the PhD while still obtaining the PhD in the home country</td><td>Mobility without employer change</td></tr>
<tr><td>PhD non-mobility:
Having never been PhD degree or during PhD mobile to another country</td><td colspan="2">Non-mobility:
Having never been mobile to another country for >3 months at a time</td></tr>
<tr><td></td><td colspan="2"><3 month mobility:
Mobility with duration of less than 3 months</td></tr>
<tr><td>Intersectoral mobility</td><td colspan="4">Moving to another sector (working in non-academic sectors).</td></tr>
<tr><td>Interdisciplinary mobility</td><td colspan="4">Having switched to another (sub)field during the academic research career[60]</td></tr>
<tr><td>Virtual mobility</td><td colspan="4">The use of web-based or virtual technology to collaborate internationally or interdisciplinary - based on tangible cross-border or cross-domain research collaboration</td></tr>
</table>

[60] Which is to be distinguished from interdisciplinary research as such.

3.2.4.2 *Definition of PhD mobility*

In MORE3, the presentation of PhD mobility was simplified to improve understanding and the user-friendliness and ease of interpretation of the results[61]. MORE4 continues to use this improved definition. In practice, we make the following distinction (see Table 3 for an example):

- PhD mobility: Mobility with the purpose of obtaining the PhD in another country than the country of citizenship AND the country of Master's degree. The case where the destination country of the PhD degree is different from the country of citizenship, but equal to the destination of the Master's degree, is classified as Master's mobility.
- During PhD mobility: mobility of three months or more during the PhD while still obtaining the PhD in the home country.

Based on the graduation country for each degree, the distinction between PhD mobility, PhD return mobility and Master mobility is made. To grasp Master mobility more directly, we have also asked whether a Master's student who has not obtained/will obtain their PhD in a country other than the country where they obtained their previous degree (the degree that gave access to the PhD), already moved during/for his/her Master's degree anticipating on entering a PhD in this country. The mobility of Master's students will not be analysed as such in the MORE4 study (as it is not a form of researcher mobility, but rather of educational mobility), but it is necessary to control for it in the interpretation of PhD mobility.

Table 3: Definition of PhD mobility – example

COUNTRY OF CITIZENSHIP	COUNTRY OF MASTER DEGREE	COUNTRY OF PHD DEGREE	MOBILITY
Country A	Country A	Country A	Non-mobility for PhD
Country A	Country A	Country B	PhD mobility to country B
Country A	Country B	Country A	PhD return mobility to country A (after Master mobility to country B)
Country A	Country B	Country B	Non-mobility for PhD (after Master mobility to country B)
Country A	Country B	Country C	PhD mobility to country C (after Master mobility to country B)

[61] An important point of discussion in PhD mobility concerned the reference country. Different reference countries were tested: country of citizenship and country of Master degree. The results were presented both in terms of destination (% of researchers that moved TO the country to obtain a PhD) and in terms of origin (% of researchers that moved AWAY FROM this country to obtain a PhD; either from country of citizenship or from country of Master degree). These different presentation forms complicated the interpretation of the results. Therefore in MORE3 introduced an improved definition of PhD mobility, controlling for Master mobility, as well as a simplification of the presentation of the results.

For ease of interpretation, the analysis of PhD mobility focuses on the destination country (=country of PhD):

- **PhD mobility** (including an indication of PhD mobility after Master mobility) per country (country moved to for the PhD): *% of researchers who obtained a PhD in country X and who were mobile for this reason – of whom % after Master mobility;*
- **Non-mobility for PhD** (including an indication of non-mobility for PhD after Master mobility) per country (country stayed in for the PhD): *% of researchers who obtained a PhD in country X and who were not mobile for this – of whom % after Master's degree.*

The latter case, non-mobility for PhD after Master's degree, allows a better understanding of the reasons behind low PhD mobility to a particular country. It also enables us to test, for example, the assumption that mobility to this country takes place predominantly before the PhD stage.

3.2.4.3 Definition of escape, expected and exchange mobility

In MORE2, a number of results indicated that international mobility can be driven by push factors more than by pull factors. In some cases, the effects of mobility were even negative. To explore the explanations for these dynamics and outcomes in more detail, we introduced in MORE3 the concepts of escape mobility, expected mobility and exchange mobility. These concepts and definitions are also applied in MORE4.

- **Escape mobility** is the case where a researcher is 'pushed' away from his or her environment because of lack of funding, absence of sufficient academic positions relative to the number of researchers seeking posts, etc. This may mean that if they want to pursue a career as a researcher, they have to change countries. The hypothesis is that this kind of forced mobility may show a different pattern of effects, also including negative effects such as the loss of network at home or a deterioration of working conditions.
- As a second perspective, we will also ask about situations where mobility may be viewed as being a 'natural' step in a research career, though not required. This is referred to as '**expected mobility**' and fits in between the two concepts of escape and exchange mobility.
- Finally, **exchange mobility** refers to a situation where a researcher chooses to move (personal motivation, self-selecting) with the aim of exchanging knowledge and work in an international network, or with the aim of using international experience as a way of boosting their career. The latter is expected to have more positive effects in terms of expanding a researcher's network and improving career progression opportunities. The latter also closely relates to the concept of Open Science, where global cooperation becomes increasingly important.

3.2.5. Country groups used for the analysis

Sometimes we use country groupings for the analysis to provide additional context to the interpretation of the survey results. One country grouping is geographical (Western, Northern, Eastern and Southern European countries) and contains all EU28 Member States. It mainly reflects differences in overall economic conditions. A second country grouping of 16 EU countries is based on a classification of higher

education systems, based on Janger - Campbell - Strauss, 2019[62], who themselves draw on the comparative higher education literature cited therein, such as Enders-Musselin, 2008[63].

- The Anglo-Saxon and Nordic systems (e.g. United Kingdom, Sweden, The Netherlands) are higher education systems mostly based on collegiate department-style models, an intermediate share of tenured researchers and a high share of structured PhD training;
- The continental higher education system refers to countries such as Germany, the Czech Republic or Poland with a more hierarchical chair-based system and high shares of fixed-term researchers (the "survivor" model, see Enders-Musselin, 2008[64]);
- The Southern European system refers to systems with high shares of tenured researchers also called "protective pyramid", with an early access to a permanent position following a strict competition. Further progression is then organised in hierarchical steps, depending on job availability. As Lissoni et al., 2011[65] and Pezzoni - Sterzi - Lissoni, 2012[66], document for the highly centralised academic systems of Italy and France, criteria for academic promotion in such protective pyramids are not limited to scientific productivity but include also issues such as social and political capital, seniority, gender.

This is a stylised summary and there are significant intra-group differences, but there are also consistent between-group differences which make the analysis by country group worthwhile, not the least due to the high number of EU Member States.

3.3. Policy-driven developments in concepts of career paths and working conditions

In common with previous updates, this update in MORE4 aims to meet the need for indicators to be reviewed and amended over time to reflect the evolution in the phenomenon of researcher mobility, changes in the policy context and external factors. This will enable the impact on researchers of policy measures introduced during implementation of the EPR to be better assessed, in particular by providing new indicators to meet emerging policy needs and priorities. Building a strong evidence base over time to gather longitudinal information and data is necessary across all the areas identified as requiring action to promote mobility, better working conditions, and improved careers for researchers, with special attention to those issues which are related to age and gender aspects. As in MORE3, the MORE4 study addresses these issues as shown in Table 4.

[62] Janger, J., Campbell, D., F.J., Strauss, A., (2019), "Attractiveness of jobs in academia: a cross-country perspective", Higher Education, pp. 1-20.

[63] Enders, J., Musselin, C., (2008)"Back to the future? The academic professions in the 21st century", High. Educ. To, 2030, pp. 125–150.

[64] Ebd.

[65] Lissoni, F., Mairesse, J., Montobbio, F., Pezzoni, M., (2011), "Scientific productivity and academic promotion: a study on French and Italian physicists", Ind. Corp. Change, 20(1), pp. 253–294.

[66] Pezzoni, M., Sterzi, V., Lissoni, F., (2012) "Career progress in centralised academic systems: Social capital and institutions in France and Italy", Res. Policy, 41(4), pp. 704–719.

Table 4: Continued relevant research areas in MORE4

RELEVANT RESEARCH AREAS with respect to the promotion of mobility, better working conditions, and improved careers of researchers	HOW THESE AREAS ARE ADDRESSED IN THE MORE4 STUDY
Cross-sectoral mobility	• Mapping of intersectoral mobility (including sector, contract type, career stage), dual positions and collaboration; • Motives for intersectoral mobility; • Comparison of working conditions in and outside the HE sector; • Importance of intersectoral mobility as positive or negative factor for recruitment and career progression; • Mapping and importance of intersectoral collaboration in PhD training.
Attraction of foreign researchers and international mobility	• Mapping of international mobility (including countries, timing, duration, frequency, contract type and employer change, career stage), and collaboration; • Motives and barriers for international mobility and non-mobility; • Effects of international mobility; • Comparison of working conditions in and outside the EU; • Importance of international mobility as positive or negative factor for recruitment and career progression; • Mapping and importance of international network/collaboration in PhD training; • Impact of virtual technology on international collaboration.
Promotion of Marie Curie Actions (H2020)	• Mapping of researchers who obtained an MSCA grant • New in MORE4: Effects experienced from their MSCA grant (if it was the most recent grant the researcher received)
Promotion of HR Excellence in Research and implementation of HRS4R	• Awareness among researchers of the European Charter for Researchers and Code of Conduct for the Recruitment of Researchers; • Not new, but further elaborated in MORE4: Researchers' opinion on several aspects of the recruitment process in their home institution.
Open, transparent and merit-based recruitment procedures (OTM-R)	• Researchers' opinion on several aspects of the recruitment process in their home institution, and more specifically on open, transparent and merit-based recruitment procedures.
Program Innovative Doctorate Training and career development	• Mapping of supervision structure in PhD training; • Awareness among researchers of the 7 Innovative Doctoral Training Principles and attributed importance; • Application of the 7 Innovative Doctoral Training Principles; • Application of and barriers for training in transferable skills.
Gender/ Equal opportunity initiatives	• Gender is one of the main dimensions in the analysis, i.e. all key indicators are calculated per gender and compared; • New in MORE4: Researchers' opinion on several aspects of the recruitment process in their home institution, among which whether measures are taken to foster representation of underrepresented groups.
Support/promotion of EURAXESS	• Awareness among researchers of the services offered by EURAXESS; • Use of any of the EURAXESS services.

Recent elements that have required the development of new indicators in MORE4 are the concept of Open Science[67] and other developments identified in the impact assessment of the forthcoming framework programme Horizon Europe:

- The impact of the EU-level R&I investments in terms of supporting public goods with a high European added value: through EU-wide competition for excellence, EU investments support the training and mobility of scientists, create transnational and multidisciplinary collaboration, leverage additional investment from the public and private sectors, build the scientific evidence necessary for effective EU policies, and structure national R&I systems.[68]
- The amplifying effect of support for mobility on the added value of EU programmes and funds, particularly in the form of skills and career development, as well as improvements in social cohesion and cooperation between European researchers, thus increasing the productivity of this community[69].

Table 5: New relevant research areas in MORE4

NEW RESEARCH AREAS with respect to the promotion of mobility, better working conditions, and improved careers of researchers	HOW THESE AREAS ARE ADDRESSED IN THE MORE4 STUDY

Open Science and its impact on the activities of the HEI and therefore on researchers	• Introduction of a new question on engagement in activities of Open Science:
	  • publishing in (or sending articles for review to) open access journals,
	  • sharing research data, software or research protocols publicly,
	  • participating in public awareness activities (to increase the awareness of scientific issues among the general public).
	• Skills training and importance of skills for a research career: introduction of the categories 'innovative digital skills' and 'collaboration with citizens, government and broader society' (also in MORE3)
	• PhD training: introduction of category 'training in Open Science approaches'
	• Recruitment and career progress: introduction of a question on how 'alternative' skills and outputs are taken into account, namely[70]:
	  • having published in open access journals, having shared research data in open platforms
	  • engagement in public awareness activities
	  • project-related work experience
	  • engagement in knowledge transfer, management of research or innovation, contribution to patents or development of inventions

[67] https://ec.europa.eu/research/openscience/index.cfm?pg=open-science-policy-platform

[68] https://ec.europa.eu/info/sites/info/files/swd_2018_307_f1_impact_assesment_en_v7_p1_977548.pdf

[69] https://ec.europa.eu/info/sites/info/files/swd_2018_307_f1_impact_assesment_en_v6_p2_977548.pdf

[70] In MORE3, there was one aggregate category 'alternative forms of research output', instead of the first four categories in MORE4 (having published in open access journals, having shared research data in open platforms; engagement in public awareness activities; project-related work experience; engagement in knowledge transfer, management of research or innovation, contribution to patents or development of inventions).

NEW RESEARCH AREAS with respect to the promotion of mobility, better working conditions, and improved careers of researchers	HOW THESE AREAS ARE ADDRESSED IN THE MORE4 STUDY
	• intersectoral mobility • interdisciplinary mobility • international mobility • transferable skills • Collaboration: introduction of 'non-researchers (users or social stakeholders' in the list of potential collaboration partners) (also in MORE3) • Comparison of working conditions in and outside the EU and comparison of working conditions in and outside the HE sector: introduction of the category 'Acceptance of/commitment to Open Science approaches (e.g. publishing in open access journals, sharing research data, participating in citizen science events, etc.)' • Effects of entire mobility experience; effects current stay in Europe by non-EU researchers; effects of grants: introduction of the category 'Understanding and application of Open Science approaches (e.g. publishing in open access journals, sharing research data, participating in citizen science events, etc.)'
European value added in terms of • **training and mobility of scientists,** • **transnational and multidisciplinary collaboration,** • **additional investment from the public and private sectors,** • **scientific evidence necessary for effective EU policies, and** • **structuring the national R&I systems**	• Detailed monitoring of several aspects and effects of training, international, intersectoral and interdisciplinary mobility, grants, etc. • Heterogeneity in the EU, and potential convergence or divergence: all analyses on country differences and evolutions therein
Amplifying effect on skills and career development, improvements in social cohesion and cooperation between European researchers	

4. Interpretation of the results

The MORE4 EU HE survey was designed to produce comparable and consistent indicators with the MORE3 EU HE survey (2016) and the MORE2 EU HE survey (2012). For this reason, the sampling approach and data editing approach is the same as in MORE3 and MORE2. It is based on a two-stage stratified random sampling approach, aiming to produce estimates with a minimum degree of accuracy (5% max error -p value of 5%) at both EU28 and individual country level. The survey has been administered in 31 European countries: the 28 Member States of the European Union and Iceland, Switzerland and Norway. It was implemented through both CAWI (Computer-assisted web interviewing) and CATI (Computer-assisted telephone interviewing) techniques. One third of the responses (28.7%) was collected through CAWI and the remaining two thirds of the responses (71.3%) through CATI. The final sample consists of 9,321 complete observations.

The survey methodology of the MORE4 EU HE survey is described in detail in Annex 2 of this report. Before we present the survey results, it is however important to note a number of points regarding the advantages and the limitations of the survey, as well as the interpretation of the indicators that are presented in the following sections 5 to 9. In this section 4, we therefore first describe the implications of the sampling and survey methodology, and of the resulting sample, for the interpretation and comparability of MORE4 results with MORE3 and MORE2.

4.1. Strengths and weaknesses of using surveys to analyse researchers´ mobility patterns

There are several methods that can be implemented for the collection of information related to researchers´ mobility patterns, each with their own strengths and weaknesses. The two most frequently used methodologies in this field are surveys[71] and bibliometric analysis[72] [73]. In a survey-based approach,

[71] Apart from the MORE studies, there are other important examples of surveys used in the field of researchers´ mobility, such as:

- Franzoni, Chiara, Scellato, Giuseppe, et Stephan, Paula. International mobility of research scientists: lessons from GlobSci. In: Global mobility of research scientists. Academic Press, 2015. p. 35-65.
- Thorn, Kristian, and Lauritz B. Holm-Nielsen. "International mobility of researchers and scientists: Policy options for turning a drain into a gain." The international mobility of talent: types, causes, and development impact (2008): 145-167.

[72] Some examples of bibliometric analysis in the field are:

- Franzoni, Chiara, Scellato, Giuseppe, et Stephan, Paula. The mover's advantage: The superior performance of migrant scientists. Economics Letters, 2014, vol. 122, no 1, p. 89-93.
- Jonkers, K., & Tijssen, R. (2008). Chinese researchers returning home: Impacts of international mobility on research collaboration and scientific productivity. Scientometrics, 77(2), 309-333.

[73] There are other methods, such as the analysis of researchers´ CVs (e.g. Cañibano, C., Otamendi, F. J., & Solís, F. (2011). International temporary mobility of researchers: a cross-discipline study. Scientometrics, 89(2), 653-675.) or qualitative methods (e.g. for an example of use of semi-structured interviews, see Jöns, Heike. "Transnational academic mobility and gender." Globalisation, Societies and Education 9, no. 2 (2011): 183-209.

researchers are contacted and asked to provide information about their mobility experiences. In a bibliometrics-based approach, the analysis is based on publication databases and the countries of origin or of the academic affiliation of the authors of these publications. Compared to other methods, and most notably to bibliometric analysis, the main advantages of using surveys (as in MORE4 and the previous MORE studies) are the following:

- Surveys can be designed in such way that the final sample is **representative of the population** in terms of country, field of science, gender or other important variables of interest. Related to this is the capacity to apply probability sample and the possibility to get to findings that can be generalisable in a more accurate and stronger way[74]. In bibliometrics, considerations about the publication patterns need to be accounted for during the methodological design:
    - Fields of science: publication and co-authoring are more frequent in some fields or disciplines than in others and this has an impact on the types of information collected during the analysis.
    - Career stages: depending on the research design or the target of the research experienced researchers might be overrepresented as this group tends to have published more than early career researchers.
    - Incomplete data: the tools used to gather bibliometric data do not cover all research areas or index all publications. The results will vary depending on the tool that is used.

- Surveys can not only provide information about behaviours (e.g. mobility patterns) but also more **detailed sociodemographic information** about the researchers (which can be analysed on an anonymised basis to reflect GDPR considerations relating to the protection of personal data and privacy). This additional information allows for the findings to be interpreted in greater depth, reducing the possibility of establishing spurious relationships.
- It is probably the most often used method in those studies covering large samples and with a large geographical dispersion (e.g. covering several countries). This allows a standardized questionnaire to be developed that can be translated into several languages and applied at the same time to a large number of respondents. This entails that it is not only a less labour-intensive approach compared to other methods (e.g. interviews or focus groups), but also that the findings across countries and over time are comparable[75].
- Surveys are one of the most commonly used methodologies to collect information on people´s **attitudes and opinions**. The MORE studies are important as they complement the information collected by Eurostat or the statistical offices in the Member States on factual data (number of researchers working in the country, distribution across career stages or gender, etc). Surveys therefore allow to go beyond the merely factual data and provide valuable information to understand the motivations of respondents. In this sense, the MORE studies provide information about how researchers evaluate their own working conditions, their motives for moving abroad, and the barriers that might hinder their mobility. More

[74] Fielding, N. G., Lee, R. M., & Blank, G. (Eds.). (2008). The SAGE handbook of online research methods. Sage.

Kelley, K., Clark, B., Brown, V., & Sitzia, J. (2003). Good practice in the conduct and reporting of survey research. International Journal for Quality in health care, 15(3), 261-266.

Nardi, P. M. (2018). Doing survey research: A guide to quantitative methods. Routledge.

[75] Nardi, P. M. (2018). Doing survey research: A guide to quantitative methods. Routledge.

qualitative approaches (e.g. focus groups, interviews) are also appropriate methods to collect this information and often do so with a greater degree of detail than any survey can provide. However, the advantage of surveys is that the collection of the information is done systematically across a large group of individuals living in different contexts. This allows for a more systematic comparison of the findings across contexts: e.g. across countries, fields of science, gender, career stages, etc.

- Finally, surveys allow new developments, concepts and/or policies to be investigated in a flexible way while guaranteeing the comparability of the results over time. This is the case, for instance, for the introduction of items in the MORE4 questionnaire probing researchers on their attitudes towards Open Science approaches. Hence the MORE4 survey constitutes a unique source of information, as there are no other data sources that offer such a complete view on this topic yet at EU level.

4.2. General information on the sampling and survey strategy and implications

As mentioned above and described in more detail in Annex 2, the MORE4 Higher Education (HE) survey in Europe was designed to provide estimates on researchers in the EU28+3 HE sector with a maximum accuracy at both EU and individual country level (5% max error -p value of 0.05) and including a stratification by fields of science (FOS). In most countries the number of validated questionnaires achieved a margin of error of 5.5%; in eight countries a margin of error between 5.5% and 6.5% was achieved (Switzerland, Lithuania, Slovakia, Finland, Poland, Hungary, Malta, Slovenia) and for five countries an error between 6.5% and 8.0% was achieved (Latvia, Cyprus, Estonia, Iceland and Luxembourg). Overall, the response rates are less equally distributed across countries than in MORE3 but comparable to those obtained in MORE2.

To reach this level of accuracy, different strategies were developed and implemented: a statistical sampling strategy, a multichannel data collection approach and a data editing and calibration strategy.

Each of these steps in the approach is taken to ensure the accuracy of the final results, but each in itself has specific limitations that are to be taken into account in the interpretation of these results. Even though the methodological set-up was developed with great care and has accounted for all practical issues in the most feasible way, some aspects of the implementation are worth pointing out.

In the sampling and data collection strategy, we can mention the following aspects, all of them expected to have a very limited impact on the results or the interpretation:

- A number of additions to the frame were needed during the survey due to low response rates in specific countries. Individuals were nonetheless selected randomly, so this addition to the frame is not expected to impact the results.
- A very small seasonal effect cannot be excluded since the survey ran until early July and it is therefore possible that there is a small bias towards respondents that were still in the office in the first days of summer. This potential bias is however addressed by the non-response survey (see infra on the calibration strategy) and is thus expected to have only a very limited effect. In addition, in comparison to MORE2 and MORE3 the seasonal effects are expected to be less pronounced as the survey was open for a longer period of time (the survey was live for three months, one month longer than in MORE3).

- Compared to MORE2 and MORE3, linguistic issues were better anticipated on during MORE4 based on the lessons learnt during the implementation of the previous studies. For example, invitation and reminder emails were sent in many different languages, adapted to the specific country's national language(s).

In terms of data editing and calibration strategy, the MORE4 EU HEI survey has two characteristics that, though generally applied in survey design, are worth keeping in mind when interpreting the results of the survey:

- A data editing imputation technique known as 'donor method' has been applied to complete partial responses in such a way that they can be used in the data analysis. The donor method used in editing of partial responses is a standard solution to improve the quality and quantity of the information gathered in the final database but cannot be used widely in order to avoid arbitrary estimates. Data editing was therefore applied to only a limited number of observations (79) that completed already over a third of the questionnaire, including the key questions, and will therefore not affect the outcomes in a significant manner.
- Calibrated weights have been calculated. The aim of the calibration strategy is to reduce the non-response bias by asking the non-respondents about the three key issues of the survey and comparing this to the answers of the respondents. Data collected for this calibration comes from supplementary surveys which are in themselves not representative. However, it is important to note that in this report the results obtained with calibrated weights only affect a few indicators – intersectoral, short-term and long-term mobility - and only when calculating shares with respect to the total population.

These two processes define both the accuracy and limitations of interpreting the results. Overall, the limitations have been anticipated and addressed as far as possible, thus reducing the negative effect thereof on the accuracy of the estimators.

4.3. Potential and limitations of the resulting sample

The final average sampling error rate across countries obtained in MORE4 is equal to 5.7% and thereby slightly higher than the one obtained in MORE3 but in line with the resulting error rate in MORE2. Our methodology thus leads to accurate indicators at the European and country level. In other words, for a country with a 5% error rate, this means that if the survey was to be repeated a hundred times, in 95 cases the outcomes for that country would be deviating no more than +/-5% from the outcomes of the MORE4 survey (5% max error -p value of 0.05).

The indicators at other levels of analysis (field of science, gender, career stages, FTE) are not guaranteed to have the same degree of accuracy. Nevertheless, at EU level, the number of observations is sufficiently high to guarantee consistent and accurate results here as well. It is at lower level of subpopulations that the outcomes are to be interpreted with more care (e.g. R1 researchers' opinions in a particular country). Sample size is therefore key to obtaining accurate estimates. For this reason, we do not show subpopulation estimates in the report when the n-value of this subpopulation is below 30. Applying this threshold of 30 observations - the standard used in international reference like the OECD - avoids the publication of non-robust indicators due to low n-values. Moreover, it also ensures that the privacy of the respondents in this small subpopulation is not compromised.

One particular case are the FTE estimates, i.e. estimates at country level for FTE researchers instead of HC researchers. The data also allows us to express estimates in FTE, as the survey contains a question on whether the respondent is in full-time or part-time employment. However, these will always be less accurate than HC estimates: both incorporate the same sampling error, but FTE estimates are in addition based on a survey question and thus incorporate also the eventual errors due to codification of the information from this question. Therefore, in the indicator report, all estimates are expressed in terms of HC only and correspond to the above-mentioned accuracy level.

Similarly, caution is also needed in the interpretation of the career stage estimates. As with the FTEs, the information on career stages is based on a survey question (self-selection by the researchers). For the interpretation of the analyses referring to career stages, readers need to take into account the existence of certain biases in this factor: the data reflect higher shares of R3 researchers and lower shares of R1 researchers compared to what we can expect based on the information that is available in the literature and in Eurostat data on R1 researchers. These potential biases are minimised when applying post-stratification weights by career stage. This was tested in section 1.4 in the Annex, where we observe that differences between our main indicators and the career stage post-stratified estimates are relatively small and do not affect the conclusions of the report. Nevertheless, it is important to take this point into account when comparing MORE4 with MORE2 or MORE3 indicators, as each of the surveys show a slightly different distribution across career stages which may lead to sample-based differences in the estimates between the surveys. This will be further discussed in the next section on comparability with previous MORE studies.

4.4. Comparability with previous MORE studies

Comparability with the estimates obtained in previous MORE surveys was one of the main goals when designing the approach and developing the questionnaire in MORE4. For this reason, the sampling approach and data editing approach is the same as in MORE3 and MORE2. However, the implementation of the survey was improved based on lessons learned from these predecessor studies. This means that the methodology is the same to help ensure longitudinal comparability, but efforts have also been made to make changes to aspects of the data collection approach so as to maintain the same level of accuracy (e.g. to improve the response rate or to minimize linguistic barriers, see supra).

It is important to stress the fact that the three studies do not follow a panel design. This entails that MORE2, MORE3 and MORE4 are independent from each other in the sense that the three surveys do not include responses from the same individuals. MORE2, MORE3 and MORE4 offer solid ground for the study of the evolution of indicators at aggregate level between the points in time when the different respective MORE studies were carried out, but cannot serve to analyse the evolution of small subgroups (e.g. the abovementioned threshold of 30 observations).

Also, the questionnaire was based strongly on the MORE3 questionnaire. The evolving policy context did require a shift in focus towards, for example, the increasing importance of Open Science approaches in researchers' daily work. For this reason, a number of questions were deleted, replaced or added. Apart from this natural evolution, the key questions were not changed in any way and for questions where a change was needed, the team still took into account maximum comparability. A comparison between the questionnaires is provided as Annex to the Methodological Report complementing this report. Any changes in the questions, whether or not having an effect on its comparability or interpretation, are mentioned in the relevant sections on analysis and results.

These general principles in the development of the approach and questionnaire have resulted in strongly comparable indicators across the three MORE studies, in particular in terms of what concerns the key indicators on working conditions and the mobility of researchers in Europe. However, it is important to point out that comparability may be limited in number of cases due to the following factors:

- Changes in the question which may have led to alternative interpretation (e.g. the addition of items on Open Science in the questions on motives or effects of mobility; although we expect this effect to be very limited to zero);
- Changes in the order of the questions which may have led to another position towards the question (1 case: the question on interdisciplinary mobility, where one introductory question was deleted compared to MORE3);
- Different sample composition (e.g. slightly different distribution in career stages with more senior researchers in MORE3 and, even more in MORE4)
- The introduction of new questions; i.e. that were not included in MORE2 (e.g. on Open Science and the effects of grants).

Lastly, the same principles have been applied across the three MORE studies also in the analysis phase. In a limited number of cases, MORE3 introduced new approaches and applied them also to MORE2 data in order to again obtain comparable results. This was, for example, the case in the calculation of composite indicators, when grouping types of working conditions or motives for undertaking mobility together. In the analysis of MORE4, the same approaches as in MORE3 have been applied so that consistency across the three studies is guaranteed.

Further points of attention or limitations in the interpretation of specific indicators are explicitly mentioned in the relevant sections on analysis and results.

5. Characteristics of researchers and career paths

This chapter follows a sequential structure with respect to researchers' characteristics and careers. First, this section presents the distribution of the main sociodemographic variables that are used in the different analyses presented in this report - career stage, field of science and gender. In addition to these main variables, a set of questions included in the questionnaire provides detailed information about the sociodemographic characteristics of the individual survey respondents.

We then go on to analyse PhD studies in the EU as the main point of entry into academic research careers. Given that 92% of researchers have obtained a PhD or are currently enrolled in a PhD program, the quality and content of PhD studies is very relevant for performance indicators such as the EU's overall research performance, the attractiveness of the ERA for foreign students, and training in broader transferable skills which open up labour market options for researchers. The survey contained questions on PhD training for all R1 researchers who are currently enrolled in a PhD and for all R2 researchers (who are still close enough to the R1 stage to be able to reflect on their PhD training). PhD mobility is discussed in detail in section 0 "Mobility and collaboration during PhD stage".

The next step in a researcher's career is recruitment, the design of which determines whether those with better training and future potential are more successful in getting jobs. Questions on recruitment conditions and which factors play a role in recruitment are asked and analysed for all four career stages (i.e. all researchers).

An analysis of researcher characteristics across the four career stages is then provided and the way in which career progression takes place is described, e.g. in terms of the time it takes to reach the next career stage. The determinants of this progression form another subsection. Finally, we look at dual positions as a special form of research career. The structure of career paths is a key determinant of the attractiveness of a research system, as it conditions career perspectives and time horizons for research agendas. For example, short fixed-term contracts do not allow long-term, higher-risk research strategies to be pursued.

As these sections will show, some of these factors determine to a certain extent the ability and predisposition of researchers to be internationally, intersectorally and interdisciplinary-mobile (sections 7 and 8). Therefore, this overview allows for a better understanding and contextualisation of the findings presented in the more detailed sections of this report.

Sometimes we use country groupings for the analysis to provide additional context to the interpretation of the survey results (see section 3.2.5). One country grouping is geographical (Western, Northern, Eastern and Southern European countries) and contains all EU28 Member States. It mainly reflects differences in overall economic conditions. A second country grouping of 16 EU countries is based on a classification of higher education systems (Anglo-Saxon and Nordic, Continental and Southern European).

5.1. Sociodemographic information

CHARACTERISTICS OF THE POPULATION OF RESEARCHERS (EU28) (of all researchers)				
	EU28 total[76]	**Per (current) career stage**	**Per FOS**	**Per gender**
2012 (n=9,015)	1,239,857 HC	R1: 17.4% R2: 22.1% R3: 32.9% R4: 27.6%	MED: 24.0% NAT: 39.7% SOC: 36.3%	F: 37.8% M: 62.2%
2016 (n=9,412)	1,373,130 HC	R1: 14.3% R2: 17.9% R3: 38.8% R4: 29.0%	MED: 38.6% NAT: 25.2% SOC: 36.2%	F: 38,8% M: 61,2%
2019 (n=8,540)	1,429,763 HC	R1: 9.9% R2: 14.2% R3: 45.3% R4: 30.7%	MED: 24.2% NAT: 39.4% SOC: 36.3%	F: 39,5% M: 60,5%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Note:

- Based on question 2: "What is your gender?", question 11: "What is your main field of research in your current position?" and question 13: "In which career stage would you currently situate yourself?"

Country level: The information included in this report is always presented at the level of the 28 EU Member States. Figures for three associated countries – Switzerland, Iceland and Norway – are only included in the graphs and the tables including detailed information per country. Detailed information on the sample size and population estimates at country level is provided in Annex 2. Given the setup of the sampling strategy, weighting of the number of researchers in the sample per country yields the population numbers as available in Eurostat (2016).

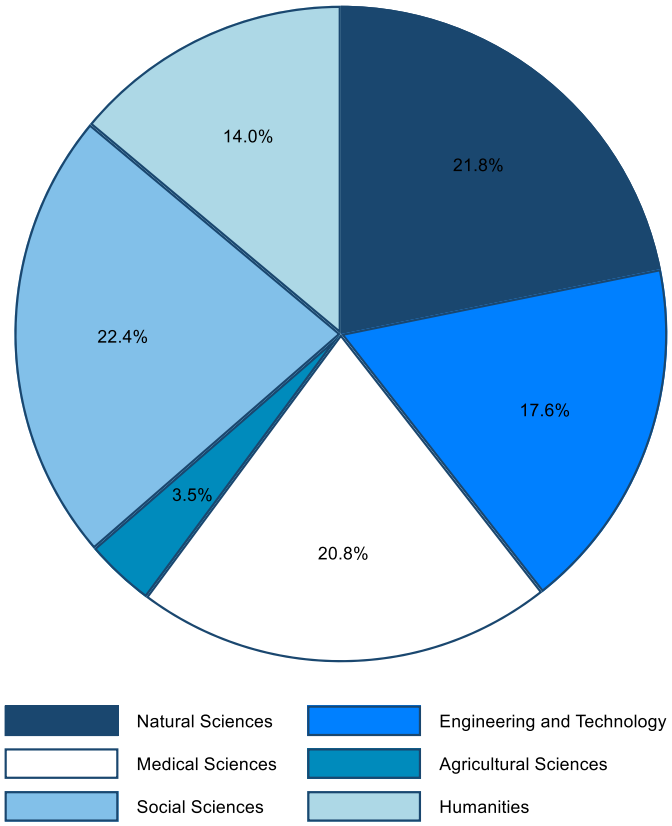
Career stage: The largest estimated shares of researchers in the EU28 are R3 (45%) and R4 researchers (31%). The percentage of R1 and R2 researchers is lower: 10% and 14% respectively[77]. Annex 2 provides further details on the composition of the sample and the post-stratification method to calculate estimates for the population of researchers taking into account career stage information. This analysis demonstrates that differences between our main indicators and the career stage post-stratified estimates are relatively small and do not affect the conclusions of the report.

[76] The EU total corresponds to the current 28 EU Member States for MORE3. At the time of the MORE2 survey in 2012, EU accession of Croatia had not yet taken place so the MORE2 EU total refer to the at that time applicable 27 Members States only.

[77] Annex 2 shows that the data reflect higher shares of R3 researchers and lower shares of R1 researchers compared to what we can expect based on the information that is available in the literature and in Eurostat data on R1 researchers. As explained in section 4 of this report, the reader need to take this into account in the interpretation of results, in particular when comparing MORE4 with MORE2 or MORE3 indicators, as each of the surveys show a slightly different distribution across career stages which may lead to sample-based differences in the estimates between the surveys. On the other hand, we point out that these potential biases are minimised when applying post-stratification weights by career stage. Even though data availability is an issue for this kind of weighting, post-stratification weights by career stage were tested in section 2.4 in Annex 2, where we observe that differences between our main indicators and the career stage post-stratified estimates are relatively small and do not affect the conclusions of the report.

Field of science: According to the self-classification of respondents in terms of field of science, 22% of the researchers in the population work in the Natural Sciences, 21% in the Medical Sciences and 22% in the Social Sciences. Fewer researchers work in the Engineering and Technological field (18%), in the Humanities (14%) and in Agricultural Sciences (3%).

Figure 3: Distribution of researchers by field of science (EU28)



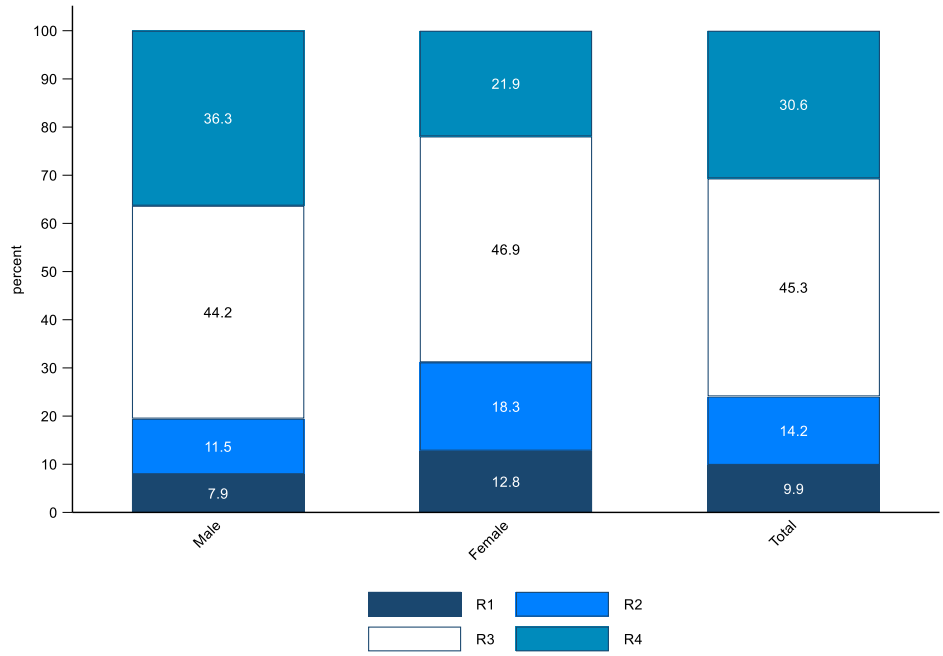
Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 11: "What is your main field of research in your current position?"
- (n=8,540)

Gender: In the EU28, an estimated 865,313 researchers (60.5%) are men and 564,450 (39.5%) are women. This indicates a stable (or only slightly improved) gender balance compared to the results of the MORE2 and MORE3 survey (2012, 2016), where women represented respectively 38% and 39% of the population of researchers.

Figure 4 shows that there are a number of differences in terms of gender composition across career stages. The share of male researchers having entered the R4 stage is much higher than the share of women (36% compared to 22%). However, among female researchers, a higher share has entered the R3 stage than among the male researchers (47% compared to 44%). As expected, the proportion of women is also more concentrated in the earlier stages (R1, R2).

Figure 4: Distribution of researchers by gender and career stage (EU28)

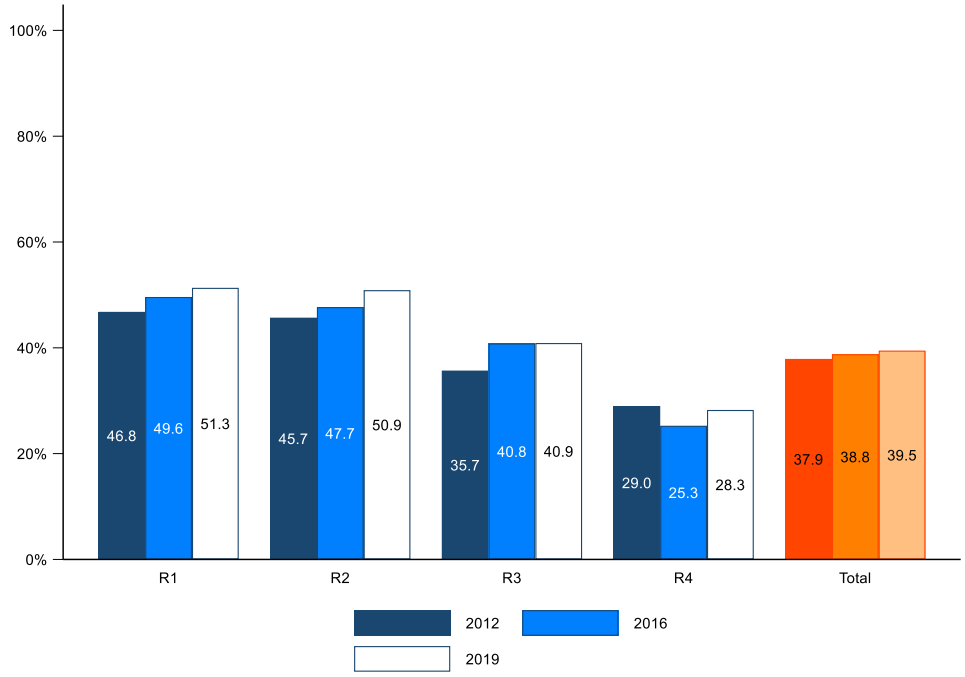


Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 2: "What is your gender?" and question 11: "What is your main field of research in your current position?"
- (2019: n=8,540; 2016: n=9,412; 2012: n=9,015)

Looking at the same information the other way around in Figure 5, it is confirmed that women are less represented in the higher career stages: while 51% of R1 and R2 researchers in EU28 countries are women, the percentage drops to 41% for R3 and even to 28% among R4 researchers. In comparison with MORE3, the share of women in EU28 countries is only slightly higher in all groups, with differences of respectively 1.7 (R1), 3.2 (R2), 0.1 (R3) and 3.0 (R4) percentage points between MORE4 and MORE3. In general, the very small but positive trend in female representation across career stages is a continuation of the evolution since MORE2. This doesn't hold for female R4 researchers, however. While the share of female R4 researchers declined comparing MORE3 to MORE2, this trend now seems to have been reversed.

Figure 5: Female representation across career stages (EU28)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Based on question 2: "What is your gender?" and question 15: "In which career stage would you currently situate yourself?"
- (2019: n=8,540; 2016: n=9,412; 2012: n=9,015)

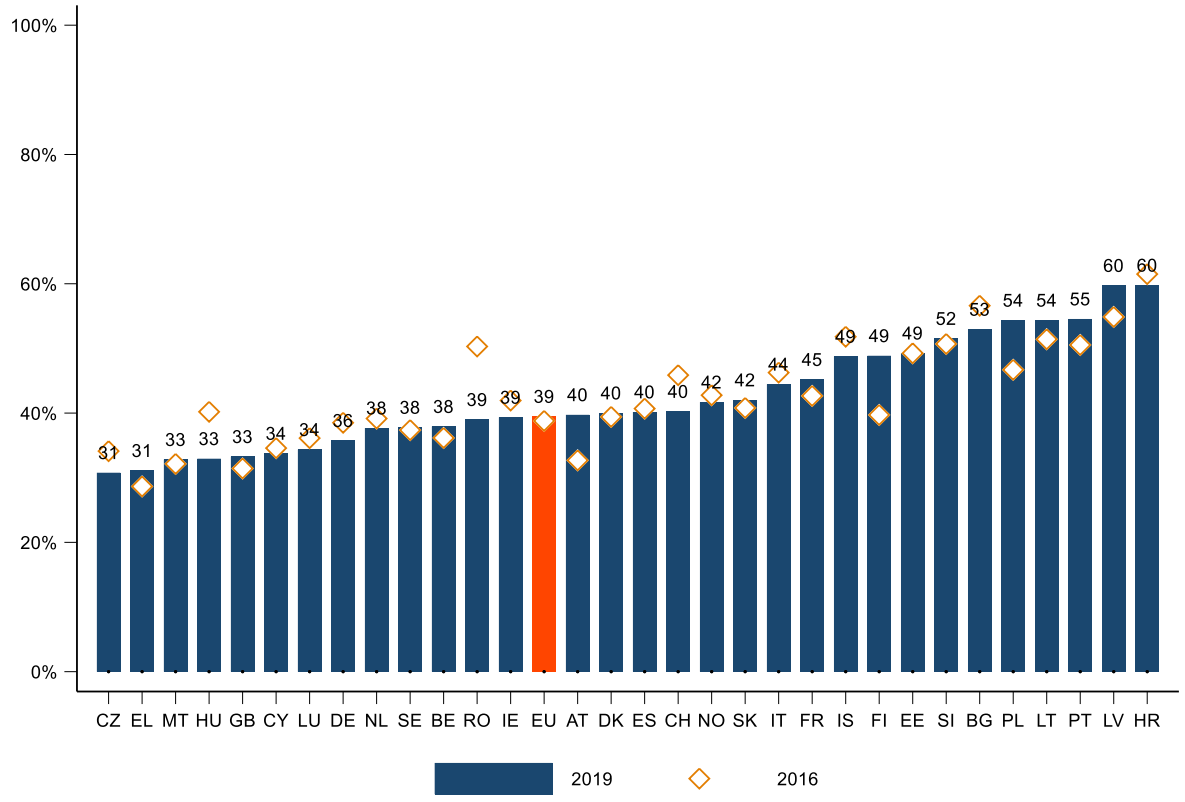
The participation of women in the research profession shows significant variation across countries (Figure 6). In general terms, data for many Eastern European countries[78] indicate higher shares of women than on average in the EU28 countries (39%). This is the case in Slovakia, Estonia, Slovenia, Bulgaria, Poland, Lithuania, Latvia and Croatia. When analysing the data for Eastern European countries across career stages we also observe that the shares of women are higher than the EU28 averages in each of the career stages: 60% in R1, 56% in R2, 49% in R3 and 42% in R4 (versus 51%, 51%, 41% and 28% respectively at EU28 level).

However, in only seven countries do women slightly outnumber men: Slovenia (52%), Bulgaria (53%), Poland (54%), Lithuania (54%), Portugal (55%), Latvia (60%) and Croatia (60%). The largest imbalances are found in Czech Republic (31%), Greece (31%), Malta (33%), Hungary (33%) and the UK (33%).

In terms of the evolution of female representation since 2016, it is important to note that in about half of the countries (52%) female representation increased. The most positive evolution has taken place in Finland (+9pp), followed by Poland (+8pp), Austria (+7pp) and Latvia (+5pp). The largest negative changes in the share of women in the research profession have occurred in Romania (-11pp), Hungary (-7pp) and Czech Republic (-6pp).

[78] The group of Eastern European countries consists of Bulgaria, Croatia, Czech Republic, Estonia, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

Figure 6: Female representation across countries



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

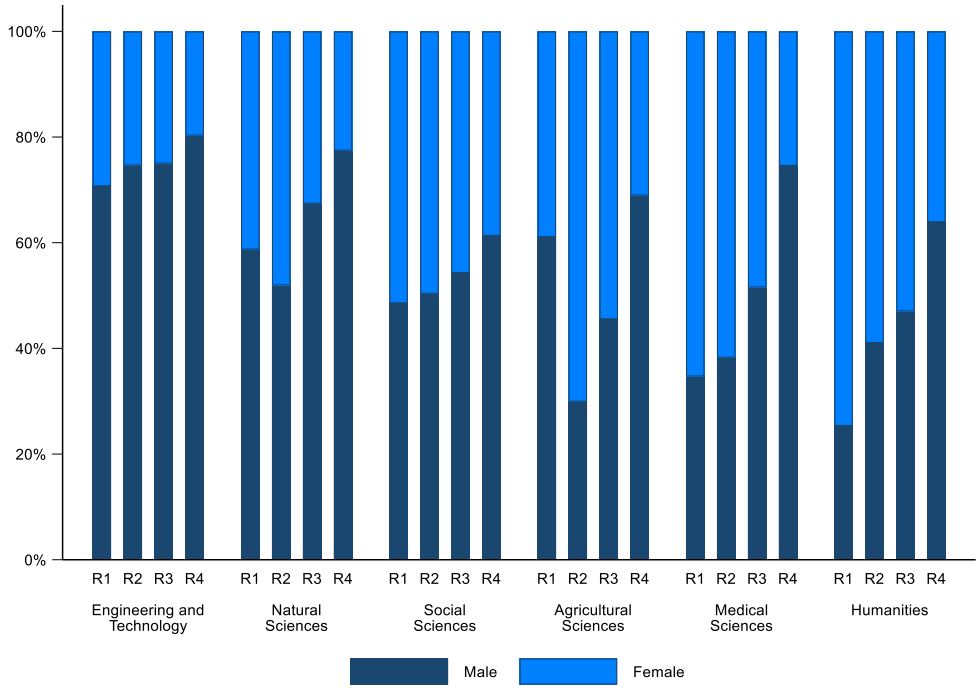
- Based on question 2: "What is your gender?"
- (2019: n=9,321; 2016: n=10,394; 2012=10,546)

Across most countries gender differences become barely deniable from career stage R3 onward (see also Figure 5). With few exceptions (mostly located in Eastern and South-eastern Europe) the share of male researchers predominates in career stage R3. Similarly, the vast majority of researchers in R4 across countries are male. The highest shares of female R4 researchers can be found in Latvia (48% female R4 researchers), Portugal (48% female R4 researchers) and Croatia (48% female R4 researchers).

Male and female researchers are not equally distributed across different fields of science. In EU28 countries, the most balanced disciplines are Humanities, Agricultural Sciences, Medical Sciences and Social Sciences, in which 51%, 47%, 45% and 45% respectively of the researchers are women. However, the opposite is found in Engineering and Technology (24%) and in the Natural Sciences (32%), where women are significantly under-represented. This distribution is very similar to the findings in the MORE3 and MORE2 studies.

Figure 7 shows the distribution of male and female researchers across career stages and fields of science. 80% of leading researchers in career stage R4 in Engineering and Technology and 77% in Natural Sciences are male. Moreover, the share of male researchers in R4 is also remarkably high in Medical Sciences (75%), while the vast majority of early stage R2 researchers in Medical Sciences is female (62%).

Figure 7: Differences in gender across career stages and fields of science (EU28)

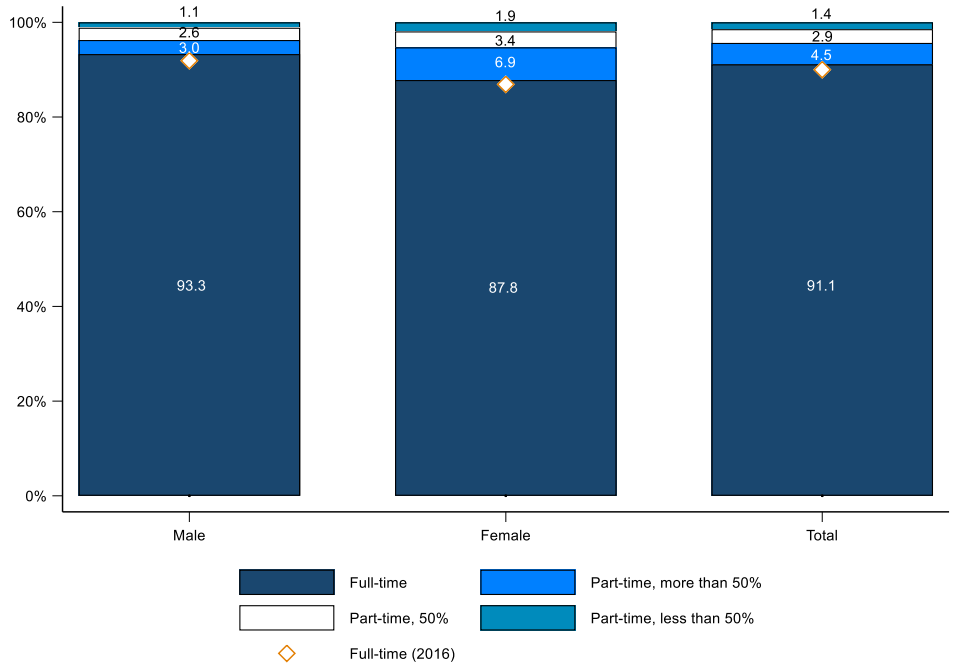


Source: MORE4 EU HE Survey (2019)
Notes:

- Based on question 2: "What is your gender?", question 13: "In which career stage would you currently situate yourself?" and question 11: "What is your main field of research in your current position?"
- (n=8540)

In terms of the type of position, there are also a number of differences between male and female researchers. While full-time positions are the most common for both groups, the percentage of women with this type of contract is lower than in the case of men (88% versus 93%). This difference is explained by the larger shares of part-time positions found among female researchers, especially with 50% or more of working time. Since MORE3, these shares remained stable.

Figure 8: Distribution of researchers by type of position and gender (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 2: "What is your gender?" and question 29: "Type of position"
- (n=8,540)

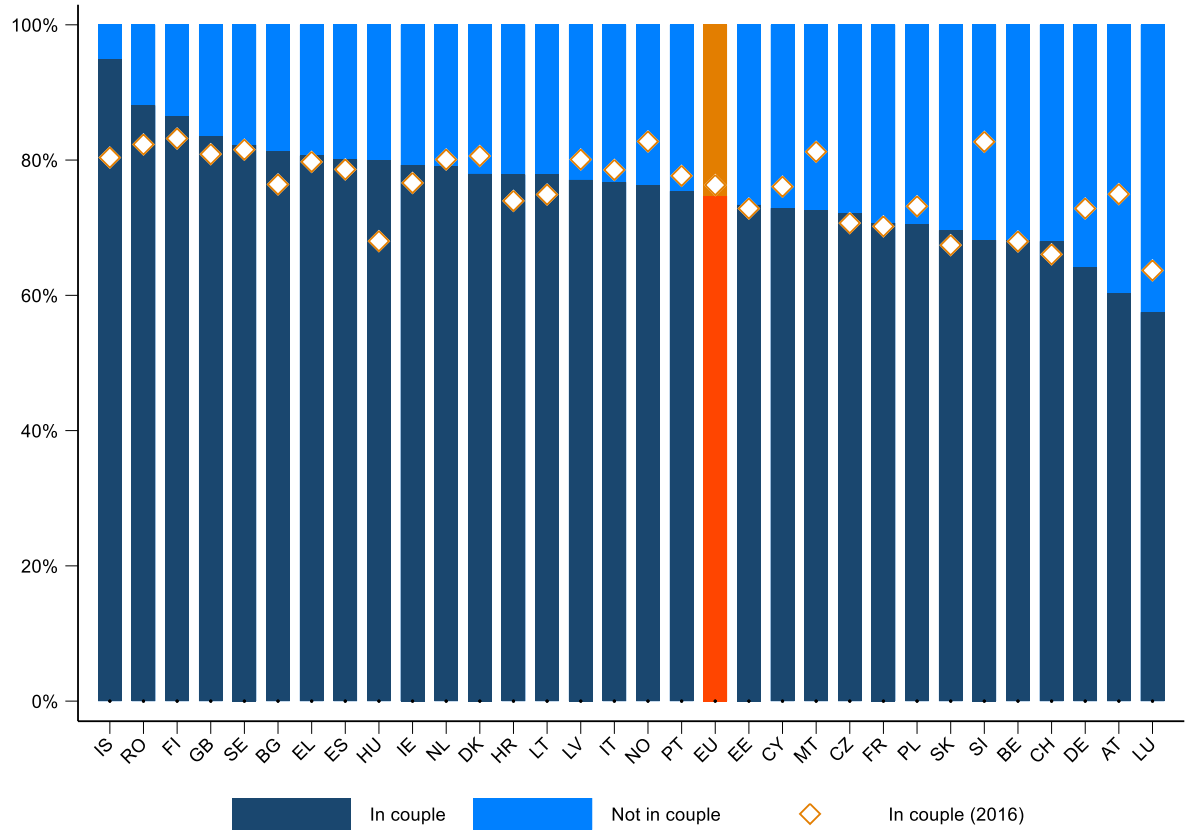
Family composition: In terms of family and personal life, it can be noted that 36% of the respondents opted not to disclose any kind of information on their marital status and whether they have children; a similar percentage refrained to give this type of information in the MORE3 and MORE2 studies. However, the available data shows that a large majority of researchers in EU28 countries live in a couple (75%) – 1pp lower than in 2016 (MORE3 study) but still 1pp higher than in 2012 (MORE2 study). Iceland, Romania and Finland are the countries with a higher proportion of researchers living as a couple (respectively 95%, 88% and 86%). Luxembourg and Austria have the lowest shares (58% and 60% respectively, see Figure 9). For Luxembourg, the differences can be explained to a large extent by the effect of age. Indeed, Luxembourg is the country where researchers have the lowest average age – 42 years -, much lower than the EU28 average (48 year). Also, in Austria the average age is lower than the EU28 (47 years).

There are important differences when analysing marital status by gender: while 78% of the male researchers live in a couple, only 70% of the female researchers do. This is possibly related to the higher representation of female researchers in the earlier career stages.

Analysing marital status across fields of science, Natural Sciences stands out as the field with the highest share of researchers living in a couple (81%). Among the other fields of science, there are no large differences. Among those, the field with the lowest share of researchers living in a couple is Natural Sciences (72%) while the field with the highest share of researchers is Social Sciences (76%).

Interestingly, the partners of one fifth of those who live in a couple in EU28 countries (20%) also work as researchers[79];[80] .

Figure 9: Share of researchers living in couple, by country



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Based on question 6: "What is your status?"
- (2019: n=5,961; 2016: n=8,306)

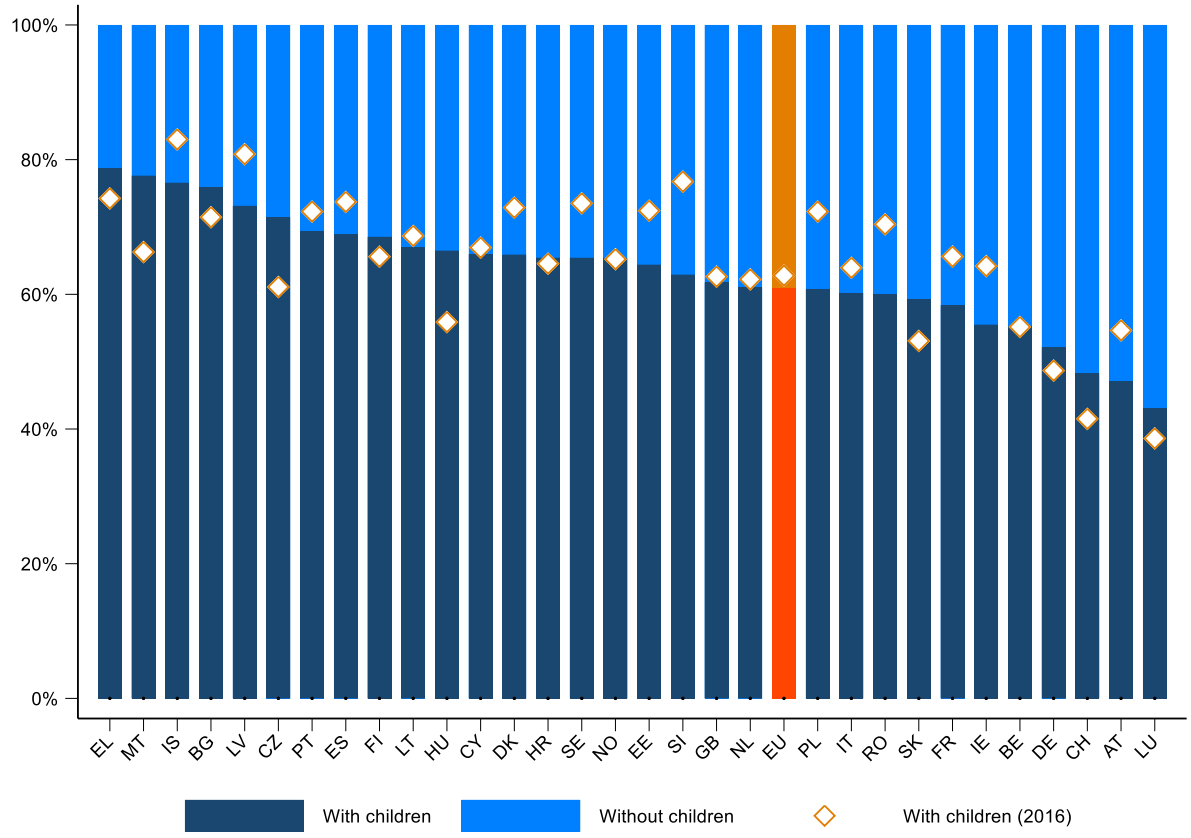
When analysing the characteristics of researchers with children it is important to note that they are very similar to those living as a couple. In the EU28 countries, 61% of the researchers have children, but there are also differences between men and women. Not only are male researchers more likely to live in a couple, they are also more likely to have children: 64% of them have children compared to 56% of their female counterparts. This gender difference was also observed in the MORE3 study but is important to

[79] This share compares to the total of all researchers living in a couple, including those who prefer not to disclose whether their partner works as a researcher.

[80] As a benchmark, we mention that the DG EAC study "Research Careers in Europe" obtained a share of 39% of researchers in the "dual-career couple" situation. However, the definition in this study was broader, including couples where both life partners pursue a career or seek jobs which are highly demanding and strongly oriented at career progression, and at least one of them is a researcher. In the MORE3 and MORE4 EU HE survey we only consider a couple where both partners are researchers. It is thus logical that the share found here is lower than the broader defined share in the DG EAC study.

note that the share of male researchers that have children declined by 4pp. In the MORE2 study the share of male researchers with children was even slightly higher at 73%, while the share of female researchers with children was 62%.

Figure 10: Share of researchers with children, by country



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Based on question 6: "What is your status?"
- (2019: n=5,961; 2016: n=8,306)

When analysing country differences, Luxembourg, Austria, Switzerland and Germany display the lowest shares of researchers with children – between 43% and 52%. Iceland (77%), Malta (78%), and Greece (79%) are the countries with a higher proportion of researchers with children.

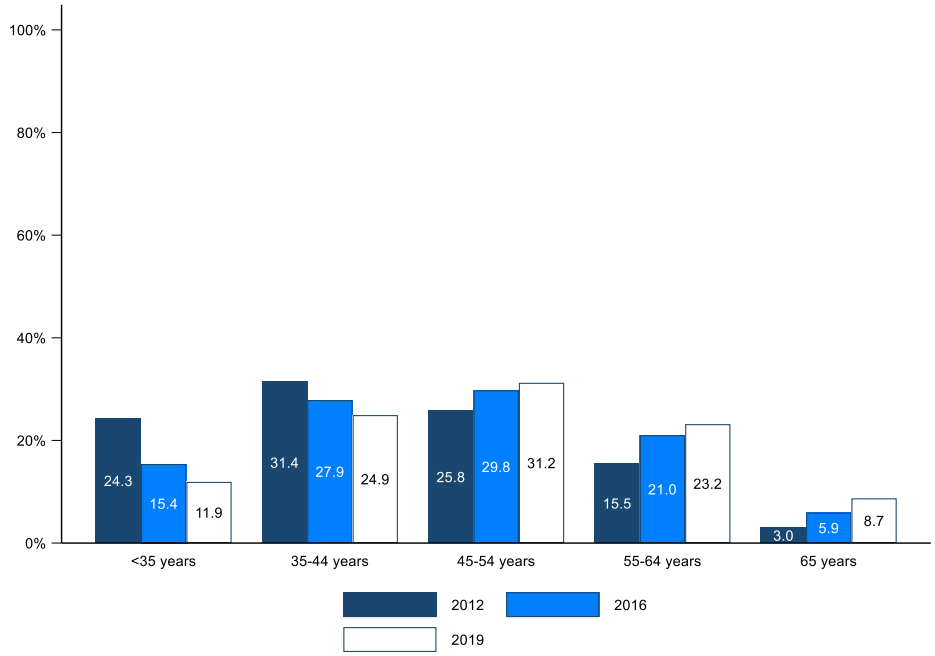
With respect to fields of science, the shares of researchers with children across fields ranges from 57% in the Natural Sciences to 68% in Engineering and Technology[81].

[81] The shares of researchers with children in the rest of the fields are the following: 60% in Humanities, 61% in Medical Sciences, 66% in Agricultural Sciences and 58% in Social Sciences.

An interesting difference relates to single parenthood. Although the overall share of single researchers with children is rather low (5%), the share of single female researchers with children nearly duplicates the share of male researchers in the same situation: 7 compared to 3%.

Age structure: Regarding age structure, the largest age group is formed by the researchers between 45 and 54 years old[82]. Comparing the age structure of MORE4 to the earlier MORE studies, we observe that over time the share of researchers that are older than 44 has risen gradually. More detailed information on the researchers' characteristics in each of the career stages are provided in Section 5.4.

Figure 11: Age structure of the researcher population (EU28)



Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- Based on question 3: "What is your year of birth?"
- (2019: n=8,540; 2016: n=9,412; 2012: n=10,546)

Education: The European research landscape is characterised by a high level of specialisation. A large majority of researchers responding to the survey hold a PhD degree: 84% in the EU28 countries, and 83% in the larger sample. These shares didn't change since MORE3. In the MORE2 study the share of researchers with a PhD was slightly higher (90%), but the results of MORE3 and MORE4 indicate that having a PhD degree continues to be paramount in developing a professional career in research. In addition, 75% of R1 researchers in the EU28 countries who have not reached this educational level are currently working on their PhD thesis (61% in MORE3).

[82] A comparison with population data on the distribution of researchers in higher education institutions by age is not possible due to insufficient data availability for the different age groups (EUROSTAT, rd_p_persage).

5.2. Education and training: PhD studies

The MORE4 EU HE survey contained questions on the researchers' PhD degree: have they already, or will they obtain a PhD in the future? For the R1 researchers who are currently enrolled in a PhD, and for the R2 researchers holding a PhD, information was also collected on their PhD supervision and training. This information is analysed in the following three sections, but first an overview of the extent to which a PhD is prevalent among researchers is provided.

In this chapter, it is important to point out that the share of R1 and R2 researchers in the MORE4 sample (24%) is significantly lower than in MORE2 and MORE3 (39% and 32% respectively). Evolutions over time for this group of early-stage researchers should be interpreted with care.

SHARE OF EARLY-STAGE RESEARCHERS CURRENTLY ENROLLED IN A PHD PROGRAM (of all R1 researchers)

	EU28 Total	Per career stage	Per FOS	Per gender
2012 (n=1,621)	86.80%	R1: 86.8%	MED: 81.4% NAT: 88.9% SOC: 87.9%	F: 84.8% M: 88.5%
2016 (n=1,339)	61.10%	R1: 61.1%	MED: 62.8% NAT: 64.1% SOC: 57.2%	F: 60.6% M: 61.6%
2019 (n=887)	74.79%	R1:74.7 %	MED: 74% NAT: 76.5% SOC: 73.6%	F: 77.5% M: 71.8%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- The discrepancies between MORE2 (2012), MORE3 (2016) and MORE4 (2019) result, inter alia, from differences in the sampling. The share of R1 researchers without a PhD and who are not currently enrolled in a PhD program (MORE2: 11.1%; MORE3: 18.9%; MORE4: 20,2% unweighted) and the share of R1 researchers with a PhD and who are not currently enrolled in a PhD program (MORE2: 2.9%; MORE3: 10.8%; MORE4: 6,1% unweighted) differ substantially between MORE2 and MORE4.
- Based on question 23: "Are you currently working on a PhD or are you enrolled in a doctoral program?"

SHARE OF RESEARCHERS CURRENTLY ENROLLED IN A PHD PROGRAM OR ALREADY HOLDING A PHD (of all researchers)

	EU28 Total	Per career stage	Per FOS	Per gender
2012 (n=9,016)	90.50%	R1: 89.7% R2: 90.4% R3. 92.0% R4: 91.1%	MED: 87.4% NAT: 91.9% SOC: 91.0%	F: 89.1% M: 91.3%
2016 (n=9,412)	91.90%	R1: 72.5% R2: 94.3% R3. 95.6% R4: 95.2%	MED: 92.9% NAT: 92.6% SOC: 90.6%	F: 90.9% M: 92.6%
2019 (n=8,420)	91.7%	R1: 80.3% R2: 92.5% R3: 92.2% R4: 94.5%	MED: 90.0% NAT: 93.4% SOC: 91.1%	F: 92.5% M: 91.3%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Note:

- Based on question 23: "Are you currently working on a PhD or are you enrolled in a doctoral program?" and question 9: "Please indicate below all higher education (=post-secondary) diplomas/degrees you have obtained so far and their details."

5.2.1. PhD degree or enrolment in PhD program

The quality and structure of PhD studies plays an important role in influencing the skill levels of researchers regarding their specific, professional skills in their field of science, but also with respect to general, transferable skills such as presentation techniques. Since in 2019 a very high share of researchers (92%[83]) in HEIs have either finished their PhD studies or are currently enrolled in a PhD program, it should be clear that the quality of the research carried out during their subsequent careers is heavily influenced by the quality of the PhD program. Policies which address the quality of PhD-studies such as the EU-funded MSCA initiative are hence very important. By comparison with MORE2 and MORE3, the share of researchers who obtained a PhD or who are currently enrolled on a PhD programme has remained stable.

Within the group of EU researchers qualified as being in the R1 career stage, 75% indicated that they were enrolled on a PhD program. Two-thirds (69%) of these researchers (i.e. R1 and R2 currently enrolled in a PhD programme[84]), indicate that their PhD is affiliated to a single institute, while one third (31%) is enrolled in a joint degree by more than one institute.

Country level: Within the surveyed countries, joint degrees are most frequent in Slovakia, where the share of joint PhD studies is almost twice as high as the EU average (23%).

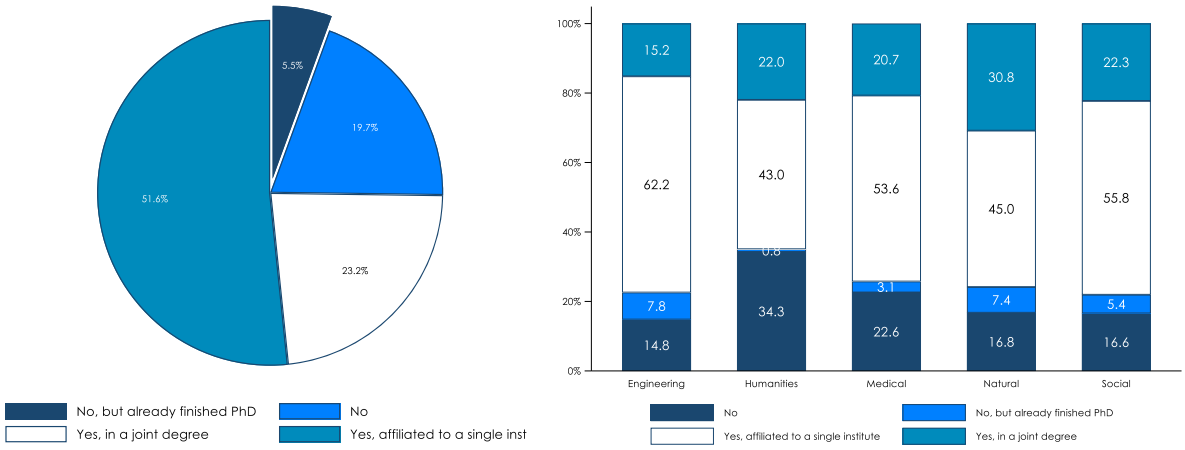
Field of science: When comparing different fields of science, joint degrees were found to be most common in Natural Sciences. In Engineering and Technology, PhD studies affiliated to more than one institute are less common (see right panel in Figure 12).

Within the remaining group of R1 researchers (25%), 6% have already finished their PhD but are still in an employment position classified as R1 (see left panel in Figure 12). Compared to MORE3, the share of researchers not working on a PhD has declined.

[83] PhD-holders who are enrolled in a second (or multiple) PhD program are included in the 92% of the researcher population with a PhD.

[84] Unless otherwise indicated, in the following PhD candidates are defined as R1 and R2 researchers currently enrolled in a PhD program.

Figure 12: Enrolment in PhD programs in r1 career stage and across fields of science (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Only R1 researchers.
- Less than 30 observations in Agriculture, therefore not displayed in graph.
- Based on question 23: "Are you currently working on a PhD or are you enrolled in a doctoral program?"
- (n=887)

5.2.2. PhD supervision

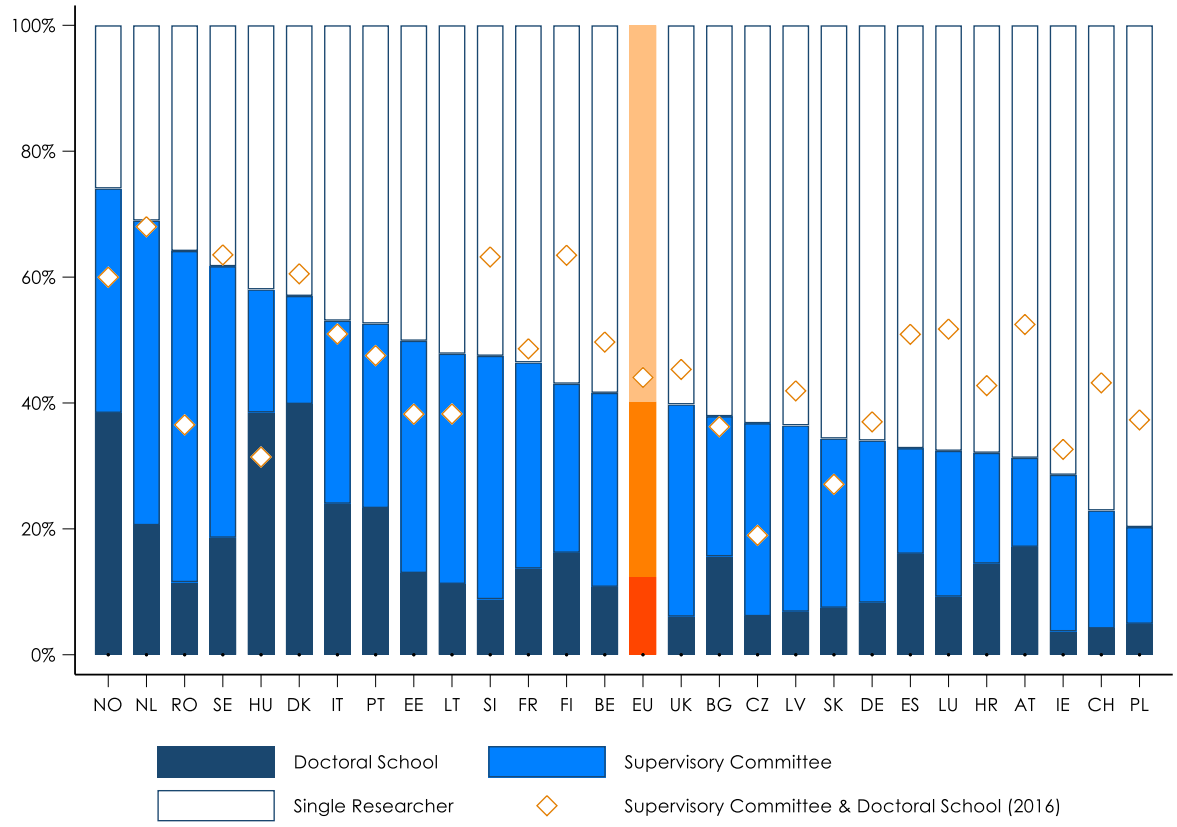
Within the EU, the supervision of doctoral training mainly lies in the hands of single researchers. 60% of PhD studies of R1 and R2 researchers in Europe are supervised by a single researcher, 28% by a supervisory committee and 12% are embedded in a doctoral school (see Figure 13). This is similar to the MORE3 results. This indicates that there is room for further professionalisation in European PhD training, or an increase in structured PhD training, such as supported by the EU's MSCA (Marie Skłodowska-Curie actions).

Gender: In terms of gender, no major differences can be observed in supervision structures, although the share of males being supervised by just one single researcher is slightly higher (62% vs. 58%).

Country level: However, EU (and associated) countries handle supervision very differently (see Figure 13). While in Poland 80% of all PhD candidates are supervised by a single researcher, this is only 26% in Norway. Supervisory committees are most common in Romania, Netherlands, Sweden, Slovenia and Estonia. More than one third of all PhD candidates is embedded in a doctoral school in Denmark (40%), Hungary (38%), Norway (38%) and one fourth in the Netherlands (21%) and Italy (24%), while doctoral schools are almost non-existent in Ireland, Switzerland and Poland. Overall, there is a trend for supervisory committees or even doctoral schools in Anglo-Saxon countries (Figure 14). While in Continental European countries only every third PhD candidate is in a doctoral school or supervised by a supervisory committee (33%), it is every second PhD candidate in Anglo-Saxon countries (47%). This trend has been slightly reinforced over time. Compared to MORE3, in most countries which already had high shares of PhD candidates in a doctoral school or supervised by a supervisory committee, large shares are also observed in 2019 (see Figure 13). In contrast, in some countries with low 2016 shares of R1 researchers in structural PhD-programmes (doctoral schools or supervisory committee), such as Austria or Switzerland, even a decline of the respective shares is observed in 2019.

Field of science: Supervision by a single researcher is slightly more common in Humanities (69%) and Natural Sciences (65%) than in other fields of science, such as Engineering and Technology (53%). In Medical Sciences (38%) supervisory committees are most often used, in contrast, only 18% of PhD candidates in Humanities report to have a supervisory committee. The highest shares of researchers embedded in doctoral schools are observed in Engineering (15%), while the lowest shares are in Agricultural Sciences (6%). Overall, the differences in the importance of supervision structures across fields of science are much less significant than across countries.

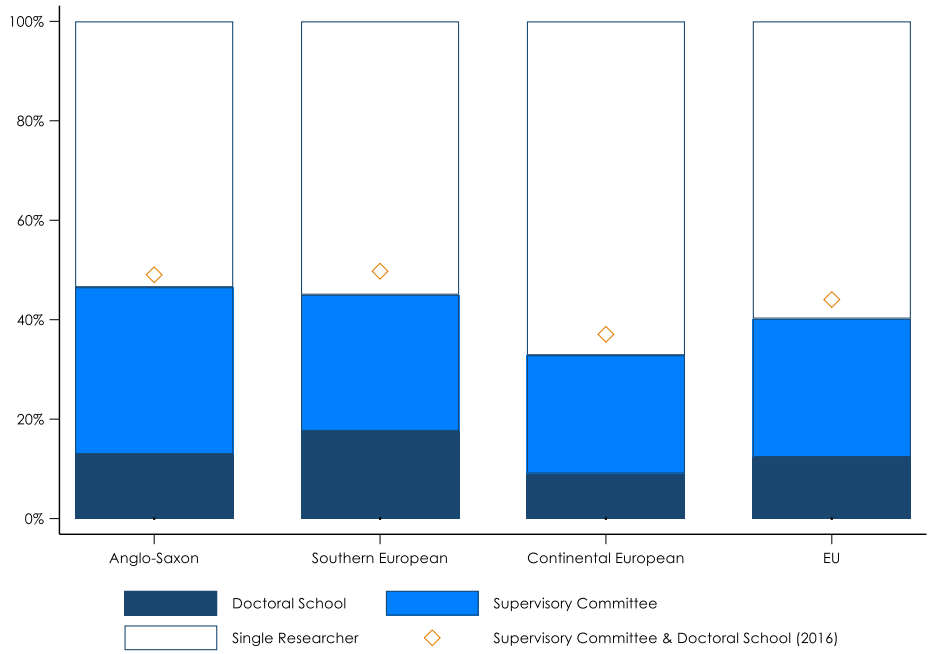
Figure 13: PhD supervision structures, by country



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Only R1 PhD candidates and R2 PhD holders.
- The answer could be either that PhD supervision was undertaken by just one senior, by a supervisory committee, embedded in a doctoral school or took another form.
- Based on question 48: "How would you describe your PhD in terms of supervision structure?"
- (2019: n=1,843; 2016: n=2,786)

Figure 14: PhD supervision structures, by higher education system



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Only R1 PhD candidates and R2 PhD holders.
- The answer could be either that PhD supervision was undertaken by just one senior, by a supervisory committee, embedded in a doctoral school or took another form.
- Based on question 48: "How would you describe your PhD in terms of supervision structure?"
- (2019: n=2,699; 2016: n=3,832)

5.2.3. PhD training

To analyse the quality and focus of PhD training in the EU, MORE3 and MORE4 include questions regarding various aspects of PhD training such as the transparency of procedures, the skills that have been acquired or opportunities that have been offered (Figure 15). PhD candidates were asked whether the institution where they obtain their PhD is attractive in terms of working conditions, research independence and career development opportunities and, on average, every second PhD candidate in the EU (53%) agreed (see category 'attractiveness of HEI' in Figure 15). This result is similar to MORE3 (2016: 54%).

In contrast, only every third PhD candidate in the EU (32%) agreed that the procedures for admission, supervision, evaluation and career development are transparent and accountable. Compared to MORE3, the share of satisfied PhD candidates has even decreased (2016: 40%).

Regarding the content, training in critical and autonomous thinking was viewed as being of crucial importance in PhD training.

- On average across the EU28, 76% of PhD candidates say that they were trained to think creatively, critically and autonomously. Compared to MORE3 this is a slight decrease by 8pp (2016: 83%).
- In contrast, only 32% of PhD candidates have obtained transferable skills in their PhD training (2016: 33%) and 35% through their work experience during their PhD (2016: 42%). In total, 46% of researchers gained transferable skills either by training and/or by work experience[85].
- 40% of PhD candidates in the EU28 have been able to gather work experience in more than one discipline during their PhD training (2016: 41%).
- Only 19% of PhD candidates received training in Open Science approaches.[86]

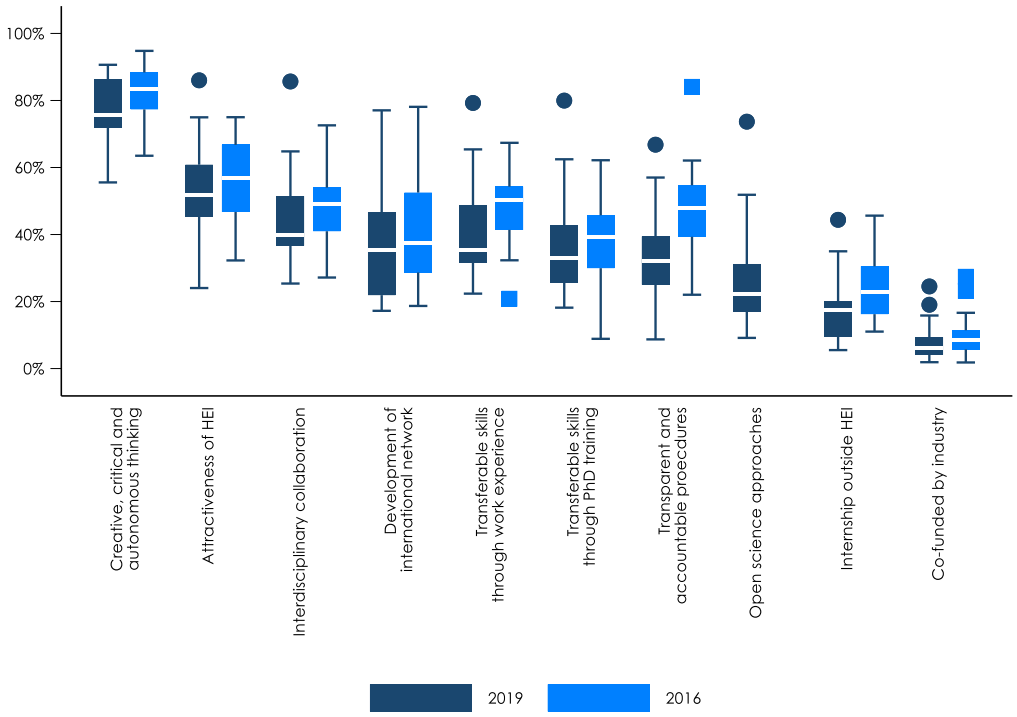
International exchanges during PhD training as well as internships outside the HEI are rather low on average.

- Not even every third PhD candidate (32%) has developed an international network during their PhD through collaborations, joint degrees etc.; this result is similar to MORE3 (34%).
- Only 14% of PhD candidates have undertook a work placement or internship outside the university or HE institute for their PhD (2016: 20%).
- 5% of PhDs are (co-)funded by industry (2016: 8%).

[85] This aggregated value is reported as key indicator in the second part of the second interim report of MORE4, namely the report of Task 3 which provides an overview of key indicators on researchers.

[86] The answering category "Training in Open Science approaches" is new in MORE4 and, thus, cannot be compared to MORE3.

Figure 15: Characteristics of PhD training – variation across countries (EU28)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Only R1 PhD candidates and R2 PhD holders.
- The figure shows box plots for different answer categories. A box plot shows the full range of variation of a data set by its minimum and maximum (top and bottom lines), its median (line within the shaded box) and the data between the first and third quartile (shaded box). Outliers are presented by dots.
- The Open Science approach item was included only in the MORE4 questionnaire.
- Based on question 50: "Which of the following statements are applicable to your PhD training?"
- (2019: n=1,546; 2016: n= 2,385)

Country level:

Table 6 shows that there exist pronounced differences across countries in Europe in terms of how PhD students and graduates perceive the characteristics of their PhD studies. Among the countries with the highest shares of students assessing their institution as attractive are Romania (86%), Denmark, the UK and Latvia. On the other hand, among the countries with the lowest shares of PhD candidates assessing their institution as attractive are mainly countries with the Southern HE system (e.g. Portugal, Spain) or the Continental system (e.g. Hungary, Poland), but also Luxembourg (lowest share of 24.0%).

Similar results are found for transparent and accountable procedures for admission, supervision, evaluation and career development. Besides Romania (which has a very high share of 67%), in the Anglo-Saxon and Nordic system, shares of researchers considering procedures to be transparent and accountable are higher than in the Southern and Continental system. The lowest shares of PhD candidates perceiving procedures as transparent and accountable can be found in Luxembourg (9%), Switzerland (20%), Germany (21%), and Slovakia (21%)

In terms of training content, the highest share of PhD candidates being trained to think creatively, critically and autonomously is found in Iceland (95%) while it is lowest in Poland (56%). When comparing different HE systems, countries with the Anglo-Saxon system score higher in shares of PhD candidates trained to think creatively on average, while the countries with the lowest shares can be found in the group of countries classified as having a continental HE system.

Interdisciplinary collaboration was found to be most common for PhD candidates studying in Romania, Denmark and Croatia, and least common in the EU and Associated Countries in the United Kingdom (25%), Lithuania and Switzerland (27%).

In Denmark and Norway, a comparatively high share of researchers have been able to develop international networks (e.g. by undertaking collaboration, a dual or joint degree, or mobility) during a PhD program, however, the highest share of PhD candidates who declare that they have developed international networks was found in Romania (77%). Only 17% of PhD candidates in the United Kingdom were able to develop an international network.

Table 6: Characteristics of PhD training – ranking of countries (0/green=best)

Country of PhD		Procedures	Attractiveness	Thinking	Inter-disciplinary	International	Transferable Skills	Experience Skills	Internships	Industry-funding	Open Science
Romania		1.00	1.00	0.84	1.00	1.00	1.00	1.00	0.37	0.37	1.00
Hungary	Continental	0.29	0.42	0.53	0.54	0.57	0.72	0.76	1.00	0.19	0.66
Denmark	Anglo-Saxon	0.62	0.82	0.95	0.65	0.69	0.55	0.67	0.74	0.39	0.36
Austria	Continental	0.53	0.59	0.96	0.35	0.49	0.43	0.55	0.34	0.41	0.28
Belgium		0.53	0.44	0.88	0.23	0.60	0.49	0.46	0.33	0.12	0.16
Ireland	Anglo-Saxon	0.23	0.67	0.53	0.43	0.61	0.23	0.21	0.12	0.23	0.18
TheNetherlands	Anglo-Saxon	0.34	0.61	0.81	0.53	0.25	0.25	0.48	0.19	1.00	0.12
Italy	Southern	0.60	0.46	1.00	0.21	0.68	0.54	0.59	0.33	0.11	0.00
Croatia		0.73	0.28	0.61	0.54	0.37	0.31	0.36	0.36	0.05	0.49
Czech Republic	Continental	0.22	0.34	0.29	0.26	0.29	0.22	0.22	0.76	0.76	0.34
Estonia		0.41	0.38	0.60	0.19	0.19	0.33	0.34	0.38	0.02	0.20
Finland		0.23	0.42	0.34	0.25	0.39	0.25	0.15	0.17	0.27	0.39
France	Southern	0.47	0.39	0.88	0.21	0.37	0.30	0.24	0.34	0.21	0.23
Germany	Continental	0.21	0.47	0.48	0.18	0.08	0.06	0.08	0.06	0.06	0.02
Bulgaria		0.39	0.37	0.58	0.24	0.04	0.05	0.00	0.26	0.18	0.29
Latvia		0.46	0.74	0.26	0.20	0.06	0.12	0.21	0.08	0.31	0.28
Lithuania		0.43	0.34	0.50	0.03	0.18	0.00	0.21	0.49	0.20	0.21
Norway		0.79	0.74	0.80	0.32	0.71	0.30	0.25	0.23	0.35	0.15
Poland	Continental	0.40	0.23	0.00	0.28	0.05	0.08	0.25	0.07	0.08	0.23
Portugal	Southern	0.34	0.22	0.57	0.22	0.05	0.13	0.23	0.10	0.03	0.15
Slovakia	Continental	0.21	0.46	0.35	0.18	0.04	0.14	0.16	0.30	0.20	0.17
Slovenia		0.49	0.49	0.94	0.49	0.10	0.09	0.21	0.00	0.12	0.12
Spain	Southern	0.28	0.31	0.22	0.39	0.39	0.10	0.23	0.68	0.00	0.04
Sweden	Anglo-Saxon	0.50	0.76	0.47	0.11	0.39	0.29	0.06	0.05	0.62	0.40
Switzerland		0.20	0.26	0.94	0.03	0.12	0.28	0.08	0.14	0.00	0.13
United Kingdom	Anglo-Saxon	0.83	0.59	0.71	0.00	0.00	0.40	0.09	0.08	0.13	0.08
Luxembourg		0.00	0.00	0.90	0.07	0.31	0.14	0.13	0.32	0.00	0.09
EU		0.40	0.46	0.57	0.23	0.24	0.22	0.23	0.22	0.17	0.15

Source: MORE4 EU HE survey (2019). Based on question 50: "Which of the following statements are applicable to your PhD training?". (n= 2,786)
Notes:

- Only R1 PhD candidates and R2 PhD holders.
- Iceland, Greece, Malta and Cyprus have I<30 observations, therefore not displayed in the table.
- Graph illustrates distance from the country with the highest share of PhD candidates answering the respective question with yes: 1 = country with highest share (green); 0 = country with lowest share (red); x = (minimum share – country share)/(maximum share – minimum share).

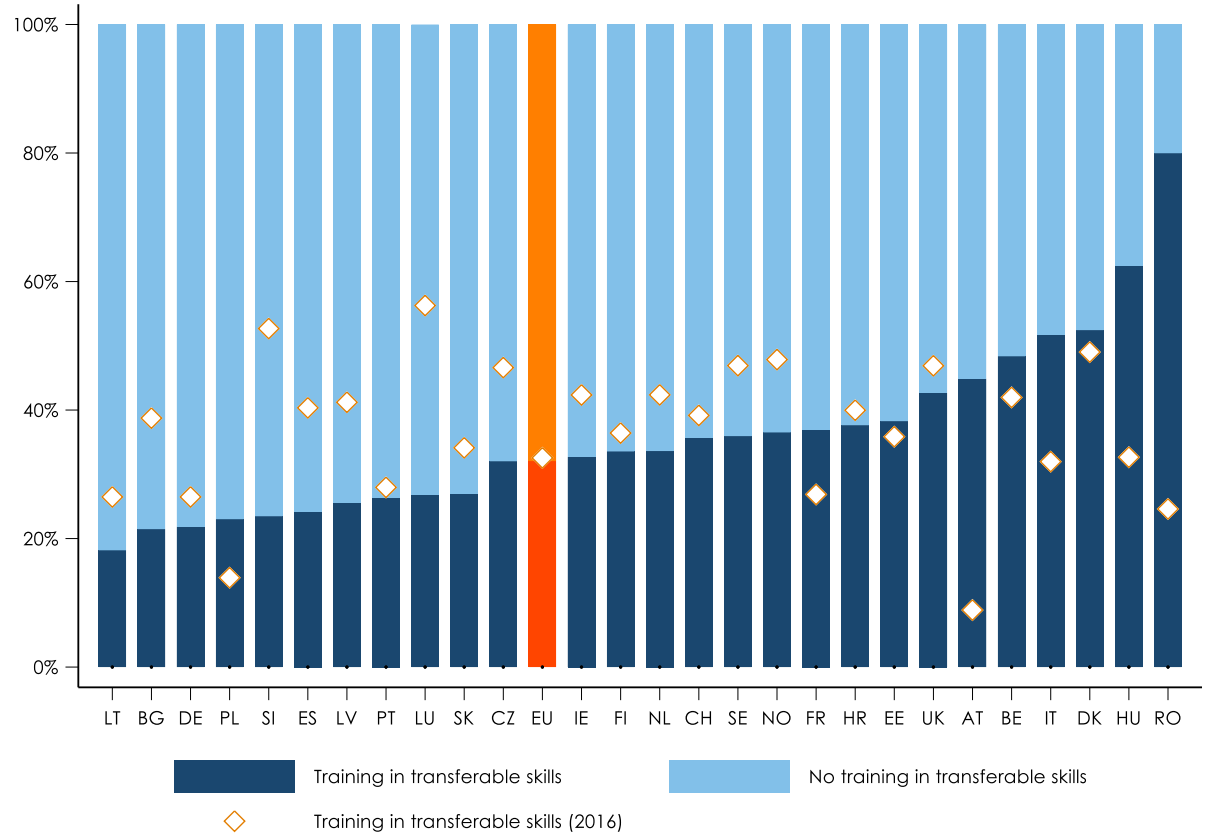
An important aspect of PhD studies is their ability to provide training for young scientists in **transferable skills** such as research skills, people and project management. This broadens the labour market options for researchers. On average, in the EU28 countries, 32% of PhD candidates indicate that they have received training in transferable skills during their PhD training (2016: 33%). When taking into account transferable skills training including knowledge gained via work experience, this share is at 46% of all researchers. This can be compared to 86% of researchers who state that these skills are a positive factor for their career progression (see Figure 36 in section 5.4.3.2 on p.101).

Within the EU, large differences occur across countries regarding the share of young researchers receiving training in such transferable skills. Countries like Lithuania, Bulgaria, Germany and Poland show low levels of PhD candidates stating that they have received training in transferable skills during their PhD (see **Error! Not a valid bookmark self-reference.**). On the other hand, in Romania, but also in Hungary, Denmark and Italy, the share of PhD candidates who state that training in transferable skills forms a part of their PhD training is relatively high.

Interestingly, countries with low shares of PhD candidates who declare that they have received structured training in transferable skills tend to also have low shares of students that think they have developed transferable skills through work experience (e.g. Bulgaria, Czech Republic, Germany, Lithuania, Luxembourg; see

Table 6).

Figure 16: Share of researchers receiving training in transferable skills during PhD, by country



Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Only R1 PhD candidates and R2 PhD holders.
- Less than 30 observations in Cyprus, Greece, Iceland, Malta, therefore not displayed in graph.
- Share of researchers receiving training in transferable skills per country of PhD (i.e. the country where one obtained a PhD or is currently enrolled in a PhD programme).
- Based on question 50: "Which of the following statements are applicable to your PhD training?"
- (2019: n=1,936; 2016: n=2,810)

Table 7 shows the shares of R1 and R2 researchers that have received different types of funding (or no funding at all) and had training in transferable skills during their PhD as well. The majority of researchers that have received an ERC Advanced or Synergy Grant or a Marie Sklodowska Curie Experienced or Early Stage Researchers Action (MCER and MCESR) also received training in transferable skills, while for other types of funding, a lack of such training was observed. For instance, among those researchers awarded with an ERC Advanced Grants only 6% have not received training in transferable skills. In contrast, among those researchers awarded with national research funding, 68% have not received training in transferable skills. A similar ratio was found for researchers that have never received funding: about 67% have not received any training in transferable skills, while the remaining 32% had received such training.

Table 7: Share of researchers with training in transferable skills, by funding (EU28)

Funding Source	2019		2016	
	Training in transferable skills: yes	Training in transferable skills: no	Training in transferable skills: yes	Training in transferable skills: no
Individual fellowship under ERC: Advanced Grant	94.3%	5.7%	30.5%	69.5%
Individual fellowship under ERC: Proof of Concept	83.2%	16.8%	22.2%	77.8%
Individual fellowship under ERC: Starting or Consolidator Grant	56.6%	43.4%	37.9%	62.1%
Individual fellowship under ERC: Synergy Grant	56.5%	43.5%	55.7%	44.3%
(Other) FP or H2020 funding	48.6%	51.4%	56.9%	43.1%
Individual fellowship under Marie Sklodowska-Curie Actions: Experience researcher	41.0%	59.0%	49.9%	50.1%
Individual fellowship under Marie Sklodowska-Curie Actions: Early stage researcher	38.6%	61.4%	43.2%	56.8%
Funding under other Marie Sklodowska-Curie Actions:	36.1%	63.9%	54.4%	45.6%
National competitive funding (based on peer review)	32.5%	67.5%	32.7%	67.3%
Funding (irrespective of the source): yes	31.9%	68.1%	35.8%	64.2%
Total (R1-R2)	31.4%	68.6%	30.3%	69.7%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Only R1 PhD candidates and R2 PhD holders.
- Researchers can receive funding from more than one of the listed sources. Therefore, the sum of the percentages per funding source exceeds the total percentage of researchers that have received funding from at least one of the sources listed.
- Based on question 50: "Which of the following statements are applicable to your PhD training?" and question 98: "Have you obtained competitive funding for basic research (based on peer review) from one or more of the following sources?"
- (2019: 1,804;2016: n=2,522,)

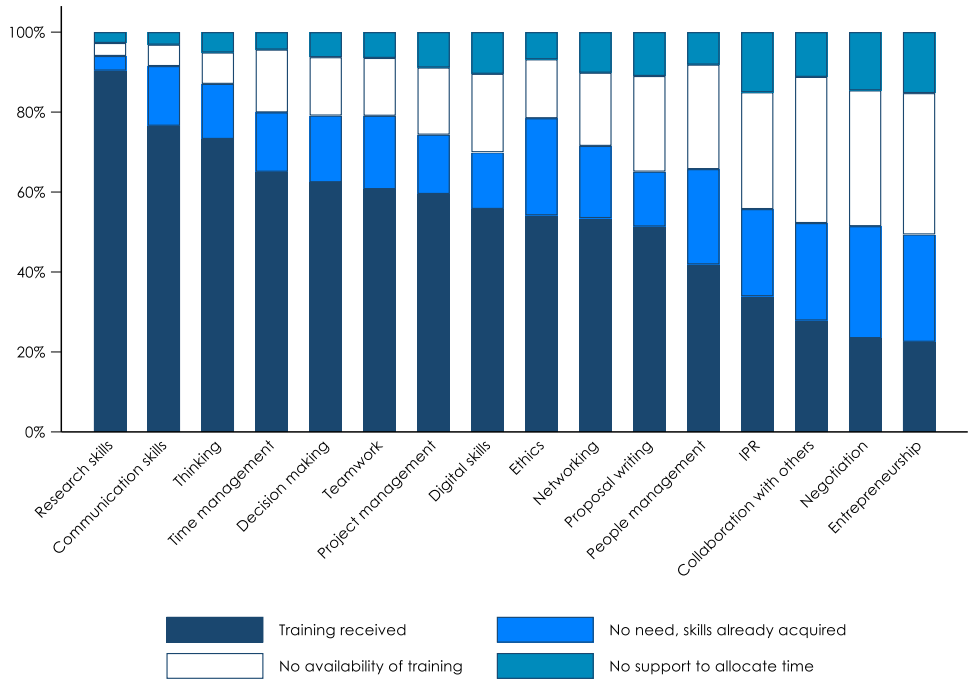
The most frequent training modules in transferable skills that have been received by PhD candidates during their doctorate – if any – refer to research skills (see Figure 17). 90% of all PhD candidates educated in the EU28 countries who declare that they have received any training in transferable skills also state that they have received training in research skills (2016: 90%). Another 5% indicate that they already acquired these skills and therefore do not need training, while 4% indicate that this kind of training is not available.

Communication and presentation skills, decision-making and problem-solving, and critical and autonomous thinking are also well-covered training modules in the transferable skills during the PhD. For these skills, more than 80% of PhD candidates indicate that they either have received specific trainings or had already acquired such skills. Compared to MORE3, both the offer of transferable skills modules and the participation in such modules have remained broadly unchanged.

Training in entrepreneurship, negotiation and collaboration with others (citizens, government and broader society) were found to be much less frequently provided, often because no training provision

is built into the PhD, or because such skills are already being acquired by the researchers in other ways (this could, for example, be the case by undertaking a short mobility period in industry).

Figure 17: Training modules in transferable skills (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Only R1 PhD candidates and R2 PhD holders who indicate that they have received any training in transferable skills during their doctorate. The illustrated shares thus refer to PhD candidates who obtained any kind of structured training - which equates to 31.3% of all PhD candidates. This calculation is based on question 50: "Which of the following statements are applicable to your PhD training?" and refers to R1 PhD candidates and R2 PhD holders.
- Reasons why researchers did not receive training on different types of transferable skills (based on question 54). The possible reasons are: No need, skills already required; No availability of this kind of training; No support to allocate time to this kind of training; Others.
- Based on question 54: "You indicated that you did not receive training on the following transferable skills during your doctorate. Why not?"
- (n= 540-626)

The most frequently received training modules overall correspond to those principles that PhD candidates highly value (see Figure 18). Moreover, the importance of all items has increased for PHD candidates compared to MORE3.

- When PhD candidates were asked about their opinion regarding the most important principles for PhD training in general, research excellence was mentioned most often. 90% of PhD candidates saw excellence as being absolutely essential, or at least as very important for their PhD studies.
- This was followed by attractive working conditions (incl. research independence and career development opportunities; 23% absolutely essential and 65% very important), and transparent and accountable procedures (27% and 57% respectively).

- International networks, the development of transferable skills through work experience or training, and interdisciplinary collaboration are perceived as being very important by about more than three quarters of these researchers.
- Only 46% of R1 and R2 researchers who are currently enrolled in or have recently finished a PhD program value industry funding as very important or absolutely essential. Whilst this is lower than the percentage of respondents stating that other factors were very important, this may reflect the fact that industrial PhDs and PhDs where there is strong industry involvement, for instance, through intersectoral mobility, remain less common that international mobility.
- Two-thirds consider intersectoral collaboration (including work placements and internships) to be an important principle for PhD training.

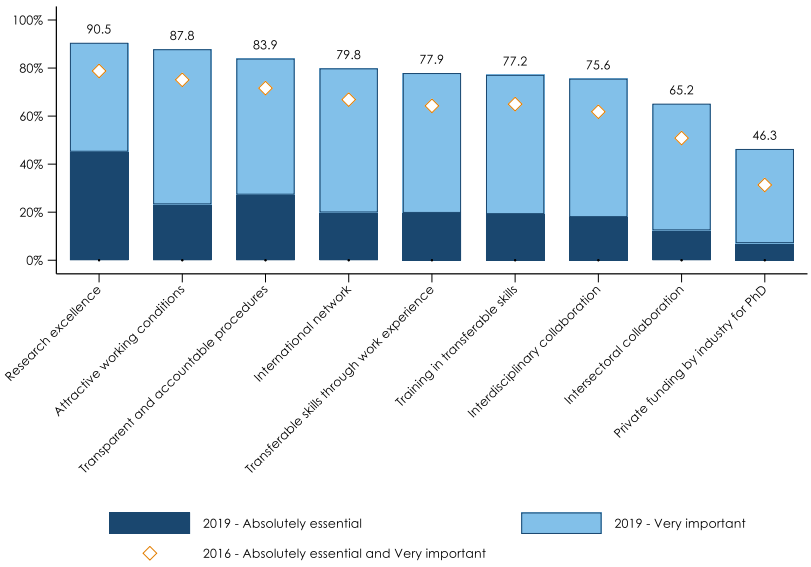
This is somewhat in contrast with the principles of innovative doctoral training, where "industry exposure", including intersectoral collaboration, figures prominently. However, only 17% of R1 (2016: 9%) researchers and 13% of R2 (2012: 11%) researchers are aware of these principles. **Country level:** The comparably low share of PhD candidates assessing private co-funding by industry as very important for their PhD is mirrored by the share of researchers receiving such funding. Within EU28 member states only 6% of PhD candidates are co-financed by industry. Across countries, the respective share ranges from 2% (Estonia) to 24% (Netherlands) (

Table 6 shows the ranking of countries).

Field of science: Across different fields of science, the highest share of co-funded PhD candidates is unsurprisingly found in Engineering (12%), where there is strong industry interest. This is followed by Agriculture (7%), while it is lowest in Social Sciences (3%).

We also see a similar pattern when examining the extent to which PhD candidates responding to the survey undertook internships and work placements during their PhD. While internships and work placements are more common in the public or government sectors (incl. research performing organisations), they are less common in the private sector. On the one hand, 11% of R1 and R2 researchers stated that they have undertaken a work placement or internship in the public sector. On the other hand, between 2-3% have done this in the three private sectors respectively: private, not-for-profit oriented organisations (e.g. research foundations or NGOs, 3%), large firms (2%) as well as SMEs and start-ups (1%). The share has remained stable in comparison with MORE3, with minor declines (3 pp) in public sector internships and SME work placements.

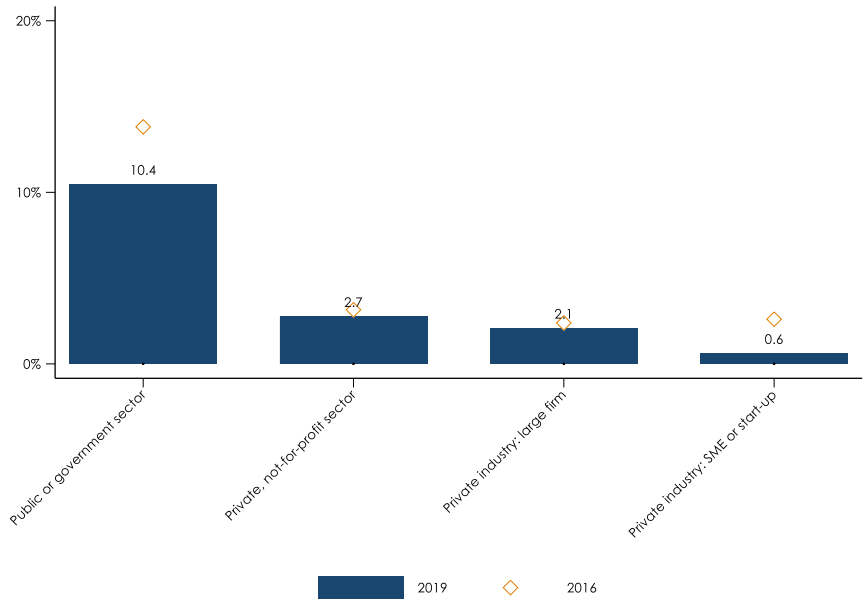
Figure 18: Importance of principles for PhD training as seen by PhD candidates (EU28)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Only R1 PhD candidates and R2 PhD holders.
- Based on question 51: "How important do you consider the following principles for PhD training in general?"
- (2019: n= 1,667-1,762; 2016: 2,437-2,485)

Figure 19: Work placements and internships (EU28)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Only R1 PhD candidates and R2 PhD holders.
- Based on question 52: "Please indicate in which sector(s) you undertook any work placements or internships (outside the university or higher education institution):"
- (2019: n=1,776; 2016: 2,516)

5.3. Recruitment

The design of recruitment policies for researchers is a major feature of research organisations, shaping career perspectives and perceptions of the attractiveness of research jobs, particularly for early stage researchers. This matters for the EU given its goal of increasing the number of researchers significantly across the ERA. Recruitment can be an important tool for universities and research organisations to attract promising newcomers, give fresh impetus to ongoing research and shape their scientific profile. MORE4 included several questions on the recruitment policies of research organisations, which were asked of all researchers across all career stages. These are analysed in the following sections. Compared to MORE3 one question regarding the process of recruitment in researchers' home institutions has been extended in order to assess more problem dimensions, such as language barriers affecting recruitment or administrative burdens.

5.3.1. *Open, transparent and merit-based recruitment*

SHARE OF RESEARCHERS WHO AGREE THAT RESEARCH JOB VACANCIES ARE SUFFICIENTLY EXTERNALLY AND PUBLICLY ADVERTISED IN THEIR HOME INSTITUTION (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2012 (n=9,016)	60.0%	R1: 56.1% R2: 58.6% R3. 60.1% R4: 63.3%	MED: - NAT: - SOC: -	F: - M: -
2016 (n=8,632)	80.3%	R1: 78.6% R2: 80.0% R3. 80.2% R4: 81.6%	MED: 79.9% NAT: 80.0% SOC: 81.0%	F: 78.0% M: 81.8%
2019 (n=7,940)	87.0%	R1: 82.3% R2: 83.4% R3: 87.6% R4: 89.1%	MED: 88.1% NAT: 87.9% SOC: 85.1%	F: 84.7% M: 88.4%
SHARE OF RESEARCHERS WHO AGREE THAT THE RECRUITMENT PROCESS IS SUFFICIENTLY TRANSPARENT IN THEIR HOME INSTITUTION (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2012 (n=9,016)	64.6%	R1: 62.3% R2: 60.6% R3. 65.0% R4: 68.8%	MED: - NAT: - SOC: -	F: - M: -
2016 (n=8,624)	74.1%	R1: 74.5% R2: 70.8% R3. 72.9% R4: 77.4%	MED: 76.4% NAT: 76.5% SOC: 69.9%	F: 70.9% M: 76.1%
2019 (n=7,907)	81.5%	R1: 81.0% R2: 78.7% R3: 80.9% R4: 83.7%	MED: 85.6% NAT: 82.7% SOC: 77.3%	F: 78.6% M: 83.3%
SHARE OF RESEARCHERS WHO AGREE THAT RECRUITMENT IS SUFFICIENTLY MERIT-BASED IN THEIR HOME INSTITUTION (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2012 (n=9,016)	65.7%	R1: 67.3% R2: 60.1% R3. 66.9% R4: 67.9%	MED: - NAT: - SOC: -	F: - M: -
2016 (n=8,317)	76.5%	R1: 78.8% R2: 76.5% R3. 74.3% R4: 78.5%	MED: 77.4% NAT: 79.8% SOC: 72.4%	F: 74.9% M: 77.6%
2019 (n=7,705)	82.9%	R1: 85.2% R2: 81.7% R3: 82.0% R4: 84.1%	MED: 85.0% NAT: 85.2% SOC: 78.9%	F: 80.7% M: 84.3%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Note:

- Based on question 37: "What is your opinion on the following issues with respect to recruitment in general in your home institution"

Comparing the data based on MORE2 and MORE3 with the answers regarding the recruitment processes in 2019, there has been a further improvement in the degree of perceived transparency and the perceived role of merit across the EU.

- Advertisement of vacancies: The degree of perceived openness deserves a special mention. In 2012 only 60% of researchers perceived that vacancies were sufficiently advertised in their home institution. Four years later, this share reached 80% and in 2019 the number has further increased by 7 percentage points. However, the respective question that was posed in MORE2 differs slightly from the question asked in 2016/2019 (see notes of Figure 20 for more details) and was placed at a different position in the questionnaire. This is unlikely, however, to have caused such a big difference. The change over time is likely to be due to developments, such as the introduction of legal requirements for research institutions to publicly advertise job openings to strengthen transparency, and changes in policies made by research institutions themselves (public advertisement of vacancies).
- Transparent recruitment: The percentage of respondents that agreed when asked about transparent recruitment processes in their home institution was 81% (EU28 average). This category increased most compared to 2016, namely by 7.4pp.
- Merit-based recruitment: The share that agree with the principle of merit-based recruitment was 83%, an increase by 6.4pp compared to 2016.

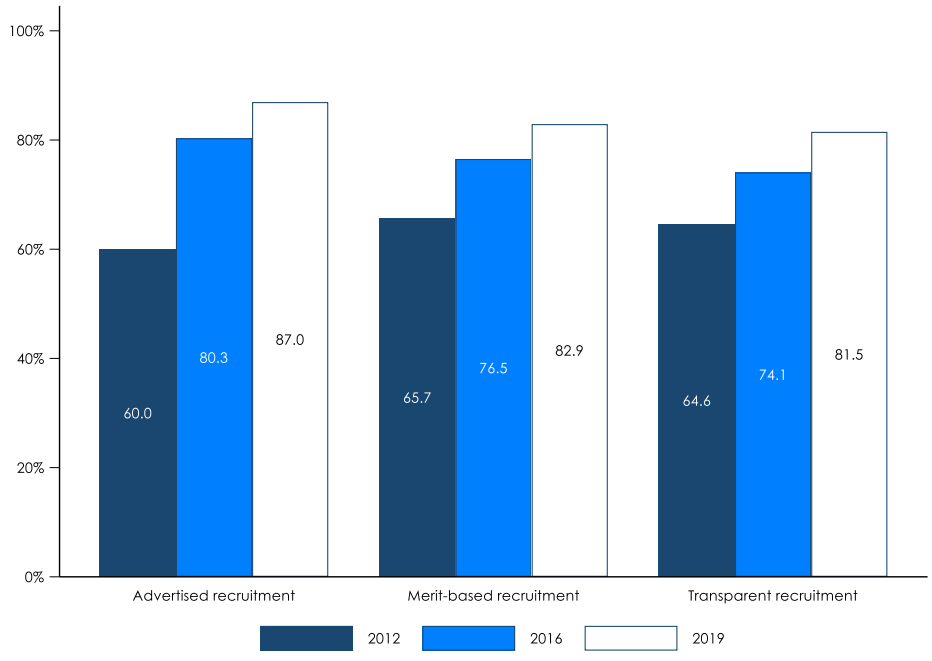
Country level: Generally, there are variations with respect to researchers' perceptions of recruitment processes in their home institutions across countries (see

Table 79 IN ANNEX). THE SHARES FOLLOW A SIMILAR PATTERN TO RESEARCHERS' PERCEPTION OF CAREER PROGRESS IN THEIR HOME INSTITUTIONS (SEE SECTION 5.4.3.1. AND

Table 81 in Annex).

- Advertisement of vacancies: 94% of researchers in the UK and 92% of researchers in Germany perceive research job vacancies to be sufficiently externally and publicly advertised and made known by their home institution, while at the other end, only 73% of researchers in Portugal and 75% of researchers in Lithuania agreed.
- Transparent recruitment: The share of researchers that agreed when asked about transparent recruitment processes in their home institution is the lowest in Hungary (65%), Luxembourg (71%), Portugal (72%) and Spain (73%). The highest shares of researchers perceiving recruitment in their home institution as being transparent are in Iceland (92%), Romania (90%) and in the Czech Republic (89%).
- Merit-based recruitment: The share of researchers who agree that recruitment is sufficiently merit-based varies across countries, all countries have shares over 70% (with only one exception, Portugal, where only 67% of researchers agree). A vast majority of researchers agree that recruitment is sufficiently merit-based in Iceland (93%), the Netherlands (91%) and Czech Republic (90%). Within the EU mostly Southern and Eastern European countries are below the EU28 average (82%).

Figure 20: Researchers' perception of recruitment processes in their home institution (EU28)



Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- Shares of researchers agreeing with the statement of the question.
- Based on question 37: "What is your opinion on the following issues with respect to recruitment in your home institution: 1) Research job vacancies are sufficiently externally and publicly advertised and made known by the institution. 2) The recruitment process is sufficiently transparent. 3) Recruitment is sufficiently merit-based.", with answer categories "I agree", "I don't agree" and "N/A".
- The difference with 2012 data needs to be interpreted with caution since the respective question in MORE2 was stated slightly differently, in particular the item on external advertising, and the question had a different position in the questionnaire. In MORE2: "What is your opinion on the following issues: 1) Are you satisfied with the extent to which job vacancies are publicly

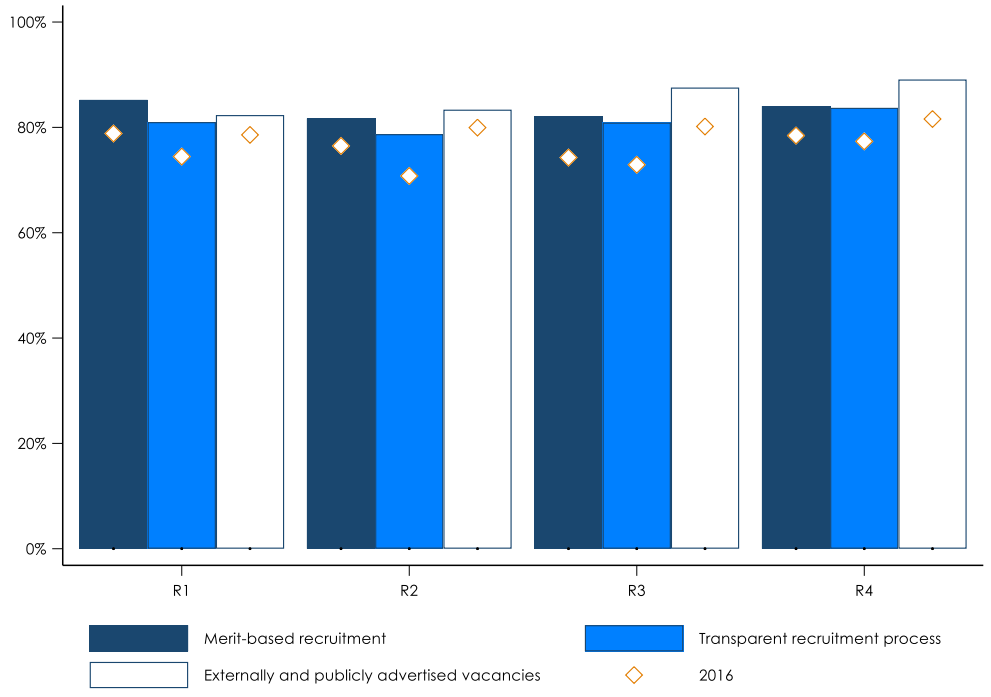
advertised and made known by your institution? 2) Do you think that the recruitment process at your home institution is sufficiently transparent? 3) Do you think that recruitment at your home institution is sufficiently merit-based?", with answer categories "yes", "no" and "N/A / no opinion".

- (2019: n=7,705-7,940; 2016: n=8,317-8,632; 2012: n=7,210-7,710)

Career stages: Figure 21 shows the shares of agreement among researchers on issues with respect to recruitment in their home institutions across career stages. For all four career stages, values of the three options have increased compared to 2016, especially in case of transparent recruitment processes (MORE3, see diamonds in Figure 21).

- Advertisement of vacancies: A slight tendency can be observed that, in comparison to early stage researchers, a higher share of later stage researchers is content with advertising practices. This might be due to their higher level of participation in staffing decisions (82% of R1 researchers, 83% of R2 researchers, 88% of R3 researchers and 89% of R4 researchers perceive that vacancies are sufficiently publicly advertised, see Figure 21).
- Transparent recruitment: The assessment of transparency levels of the recruitment process remains stable over the different career stages.
- Merit-based recruitment: With respect to the share of researchers in different career stages feeling recruitment to be merit-based, no significant differences can be observed either. On average, a majority of researchers perceive recruitment as merit-based (85% of R1, 82% of R2, 82% of R3 and 84% of R4 researchers).

Figure 21: Researchers' perception of recruitment processes in their home institution, by career stage (EU28)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Shares of researchers agreeing with the statement of the question.
- Based on question 37: "What is your opinion on the following issues with respect to recruitment in your home institution?"
- (2019: n=7,705-7,940; 2016: n=8,317-8,632)

Fields of science: Researchers in Humanities and Social Sciences are somewhat less likely to perceive transparent and merit-based related aspects of recruitment in their home institutions (see Table 8). This may be linked to different ways of publishing and assessing the quality of research output than in Natural Sciences.

- Advertisement of vacancies: For this proxy of open recruitment, the differences are rather small. The share of researchers agreeing on research job vacancies being sufficiently externally and publicly advertised is lowest in Humanities (83%) and highest in Engineering and Technology (89%).
- Transparent recruitment: 78% of researchers in Social Sciences and 75% of researchers in Humanities perceive recruitment to be transparent, versus 89% in Agricultural Sciences.
- Merit-based recruitment: 80% of researchers in Social Sciences and 78% of researchers in Humanities perceive recruitment to be sufficiently merit-based, versus 87% in Agricultural Sciences and 87 in Engineering and Technology.

Table 8: Researchers' perception of recruitment processes in their home institution, by field of science (EU28)

	2019			2016		
Field of Science	**Externally and publicly advertised**	**Transparent**	**Merit-Based**	**Externally and publicly advertised**	**Transparent**	**Merit-Based**
Natural Sciences	87.2%	81.4%	84.2%	80.3%	76.9%	80.4%
Engineering and Technology	88.9%	84.4%	86.5%	79.5%	75.8%	79.0%
Medical Sciences	88.1%	85.0%	84.8%	81.0%	77.8%	79.1%
Agricultural Sciences	88.3%	89.4%	86.7%	73.8%	68.8%	67.1%
Social Sciences	86.4%	78.5%	79.6%	79.9%	68.3%	70.1%
Humanities	83.0%	75.4%	77.9%	82.5%	72.0%	75.5%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:
- Based on question 37: "What is your opinion on the following issues with respect to recruitment in general in your home institution?"
- (2019: n=7,705-7,940;2016: n=8,317-8,632)

5.3.2. *Specific characteristics of recruitment processes*

SHARE OF RESEARCHERS AGREEING ON SPECIFIC ISSUES WITH RESPECT TO THE RECRUITMENT PROCESS IN THEIR HOME INSTITUTION (2019)

	EU28 Total	Per career stage	Per FOS	Per gender
Job advertisements include clear and detailed information (n=7,926)	86.5%	R1: 88.2% R2: 87.1% R3: 85.0% R4: 88.0%	MED: 89.7% NAT: 87.6% SOC: 83.2%	F: 83.0% M: 88.8%
Required qualifications and competencies are in line with the needs of the position (n=8,047)	90.4%	R1: 91.8% R2: 91.7% R3: 89.0% R4: 91.5%	MED: 92.0% NAT: 92.0% SOC: 87.7%	F: 88.4% M: 91.8%
Lack of knowledge of national language is not a barrier (n=7,782)	56.6%	R1: 66.5% R2: 71.4% R3: 53.9% R4: 50.5%	MED: 60.7% NAT: 59.4% SOC: 50.9%	F: 56.0% M: 57.0%
There are measures to foster representation of underrepresented groups (n=6,915)	76.3%	R1: 80.9% R2: 77.0% R3: 76.1% R4: 75.1%	MED: 81.6% NAT: 78.7% SOC: 70.2%	F: 71.5% M: 79.3%
Clear and transparent information on the selection process (n=7,859)	81.2%	R1: 76.8% R2: 78.8% R3: 79.8% R4: 85.5%	MED: 86.9% NAT: 83.1% SOC: 75.1%	F: 76.8% M: 83.9%
Administrative burden for candidates is kept to a minimum (n=7,584)	70.3%	R1: 78.6% R2: 70.8% R3: 70.2% R4: 67.9%	MED: 74.2% NAT: 72.7% SOC: 65.2%	F: 68.1% M: 71.7%
There is feedback to all candidates in the selection process (n=7,293)	66.1%	R1: 71.8% R2: 68.9% R3: 66.1% R4: 63.4%	MED: 73.4% NAT: 69.2% SOC: 58.0%	F: 62.2% M: 68.6%
There is a procedure to deal with complaints made by applicants (n=6,797)	85.5%	R1: 84.8% R2: 84.1% R3: 85.5% R4: 86.3%	MED: 89.5% NAT: 86.5% SOC: 81.6%	F: 83.9% M: 86.5%

Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 36: "What is your opinion on the recruitment process in your home institution"

Recruitment processes consist of several aspects that can affect researchers' perceptions of the transparency and fairness of recruitment. The majority of researchers think that the required qualifications and competencies are in line with the needs of the position (90%), that the job advertisements include clear and detailed information, and that there is a procedure to deal with complaints (87%).

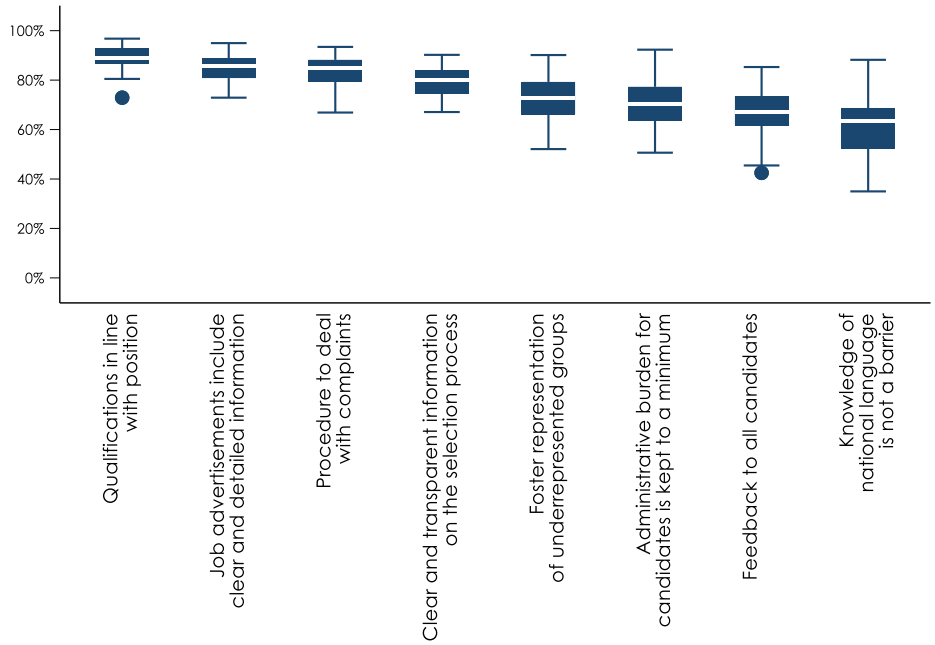
In contrast, recruitment issues due to language barriers are more serious. 43% of researchers consider the lack of national language to be a barrier to recruitment. Similarly, feedback about the selection process is not always supplied to all candidates as a standard procedure. On average, 34% of researchers in the EU28 do not agree that feedback is provided to all candidates in the selection process in their home institution.

Career Stage: The shares of researchers agreeing with the recruitment characteristics are rather equally distributed across career stages. An exception was the role of national language skills for recruitment. Knowing the national language was less important for recruitment in the case of researchers at the beginning of their careers. While 49% of leading researchers (R4) consider the lack of national language skills to be an issue for recruitment, only 33% of R1 researchers agreed. This may be linked to a higher share of teaching in R4 jobs than in R1 jobs. In contrast, only 77% of R1 researchers considered the information about the selection process transparent, while 86% of R4 researchers agreed.

Fields of science: Regarding the characteristics of recruitment processes, some differences were observed across different fields of science. In the domain of Social Sciences (Social Sciences and Humanities), all aspects are assessed less positively than in the other domains. National language skills are a larger issue for recruitment in Social Sciences than in other fields. 49% of researchers in the aggregated domain of Social Sciences (Social Sciences and Humanities) report that lacking language skills is a barrier, while the respective shares of researchers working in Natural Sciences (Natural Sciences and Engineering and Technology) or Medical Sciences (Medical Sciences and Agricultural Sciences) are 40% and 39%. Similarly, the shares of researchers in Social Sciences are lower in terms of information and feedback about the selection procedure, administrative burdens, and measures to foster representation of underrepresented groups.

Gender: No large gender differences with respect to researchers' perceptions of the different aspects of the recruitment process can be observed. The largest, but still limited, difference appears in terms of measures to foster the representation of underrepresented group. While 79% of male researchers agree that such measures are available, only 71% of female researchers did so. 84% of the male researchers think that the information about the selection process was clear and transparent, compared with 77% of female researchers.

Figure 22: Researchers' perception of specific characteristics of the recruitment process in their home institution (EU28)

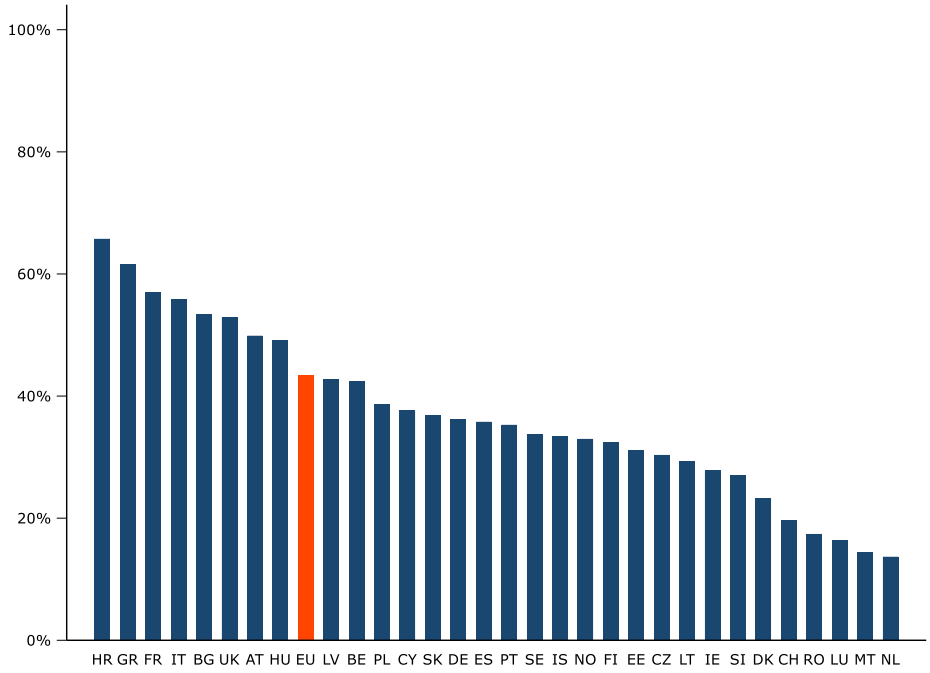


Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 36: "What is your opinion on the recruitment process in your home institution"
- (n=6,797-8,047)

Country level: Country differences can be observed especially regarding language barriers, administrative burdens, fostering representation of underrepresented groups and feedback on the selection process to all candidates (Able 74)

- Not knowing the national language was especially important as a barrier for recruitment in Greece (65% do not agree with the statement that it is not a barrier), Croatia (64%), and France (57%), least important in the Netherlands (12%), Malta (14%), Luxembourg (16%) and Romania (17%; Figure 23).
- Similarly, administrative burdens are perceived to be the smallest in the Netherlands (92% agree that administrative burden is kept to a minimum), Switzerland (85%) and Denmark (82%), and the largest in France (51%), Greece (56%) and Croatia (60%).
- The highest share of researchers thinking that there are measures to foster representation of underrepresented groups can be found in Germany (90% agree that this kind of measures are taken), the Netherlands (88%) and the Czech Republic (86%), the lowest shares in France (52%), Italy (55%) and Greece (57%).
- Regarding the availability of feedback on a selection process for all candidates, according to the respondents, this works well in Iceland (89% agreed that feedback is given to all candidates), Slovenia (85%) and the Netherlands (83%), while the smallest shares of researchers that agreed that there was sufficient information available can be found in Austria (43%), France (46%) and Lithuania (58%).

Figure 23: Share of researchers who think that the national language is a barrier in the recruitment process, by country of employer



Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 36: "What is your opinion on the recruitment process in your home institution"
- (n=7,774)

5.3.3. Factors for recruitment

MORE4 also included questions on how non-standard research outputs[87] and career experiences such as mobility to industry affect recruitment in the home institution of researchers. Four types of such factors affecting recruitment were found to be of equal importance, considering statistical margins of error:

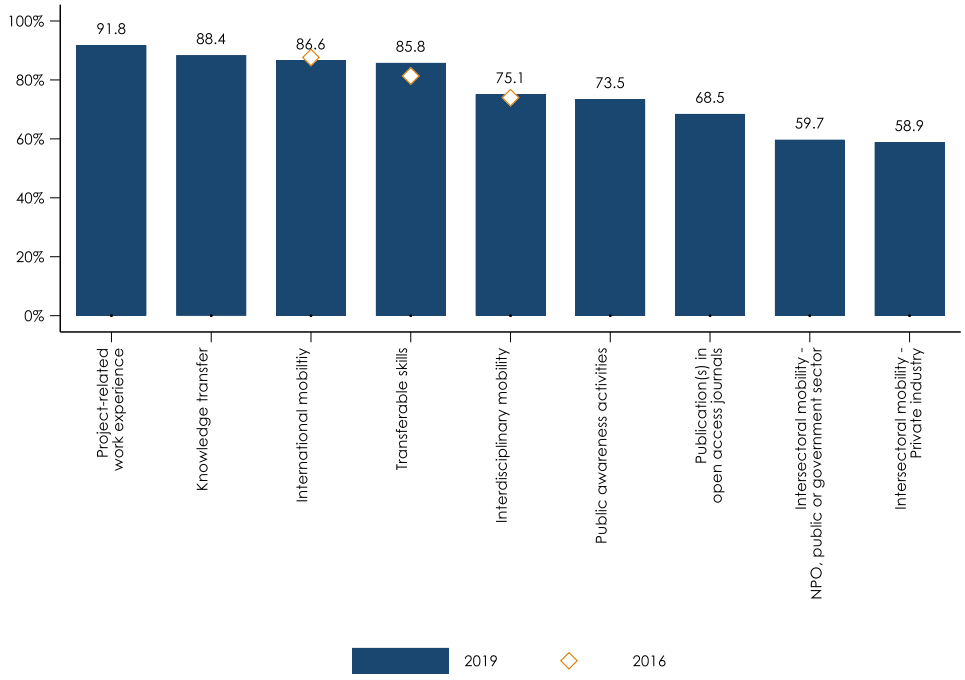
- Project-related work experience (e.g. teamwork, writing grant applications or project reports, etc.) (EU28: 92%);
- Engagement in knowledge transfer (including management of research or innovation, contribution to patents or developments of inventions) (EU28: 89%);
- International mobility experiences (EU28: 87%) and transferable skills (EU28: 86%).

[87] Non-standard or alternative research outputs contrast with scholarly research articles published in peer-reviewed journals, and include project reports, grant writing, development and maintenance of data infrastructure, organization of conferences etc.

Interdisciplinary mobility, public awareness activities and publication in open access journals play a less important role as a recruitment factor in the perception of researchers, least important is intersectoral mobility to either the public or the private sector.

As the answer categories between MORE3 and MORE4 changed, only the factors international and interdisciplinary mobility experience and transferable skills can be directly compared over time. On average, no large differences between the shares of researchers perceiving those factors as important for recruitment in 2016 and in 2019 can be observed.

Figure 24: Positive factors for recruitment (EU28)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

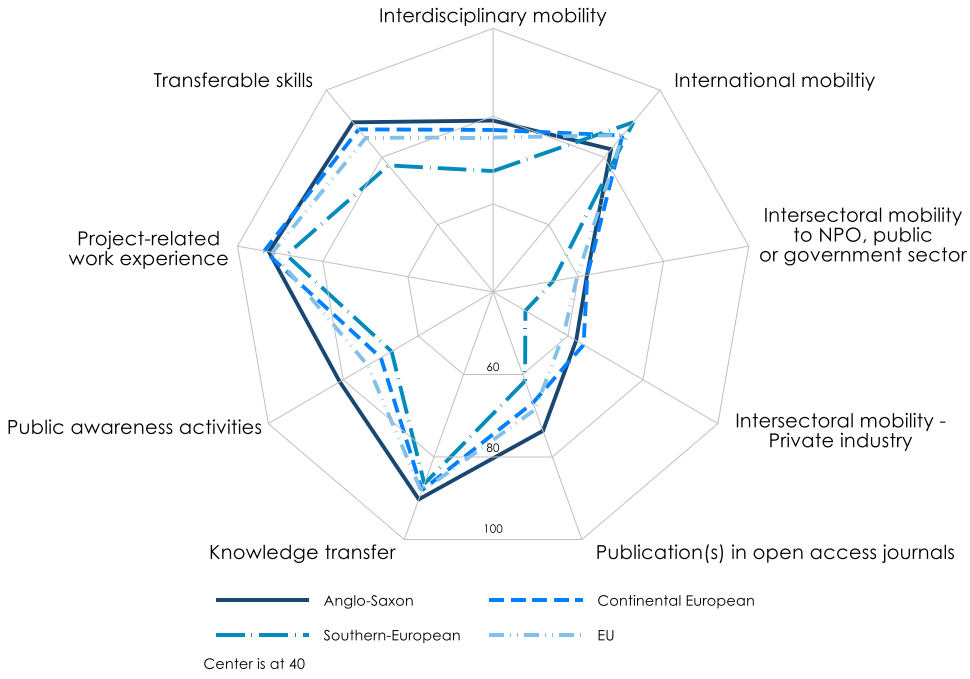
- Based on question 39: "In your experience, would you say the following factors are regarded as positive or negative factors for recruitment in your home institution?"
- (2019:7,570-8,251; 2016: n=8.483-9.013)

COUNTRY LEVEL: COUNTRY DIFFERENCES CAN BE OBSERVED ESPECIALLY REGARDING PUBLICATION IN OPEN ACCESS JOURNALS, INTERSECTORAL MOBILITY TO THE GOVERNMENTAL AND THE PRIVATE SECTOR, INTERDISCIPLINARY MOBILITY EXPERIENCE (SEE

Table 79 in Annex).

- Project-related work experience (e.g. teamwork, writing grant applications or project reports, etc.) is highly valued by most researchers across countries. 97% of researchers in Latvia, 96% in Denmark and 95% of researchers in the Netherlands would agree that project-related work experience positively affects recruitment. On the lower bound 83% of researchers in Croatia, 86% in Italy and 87% of researchers in Cyprus still perceive project-related work experience as being positive for recruitment.
- Engagement in knowledge transfer is ranked as a very important factor for recruitment. Across countries the shares of researchers considering this as a positive factor are rather high and homogeneous. The highest shares of researchers considering engagement in knowledge transfer as a positive factor for recruitment are in Iceland (94%), Switzerland (94%) and Latvia (93%), while the lowest shares are observed in Croatia (75%), Hungary (82%) and Italy (82%).
- Overall, international mobility is considered to be a very important factor for recruitment. 98% of researchers in Iceland, 96% of researchers in Latvia and Luxembourg think than international mobility is a positive factor for recruitment. At the other end of the spectrum, only 80% of researchers in the UK, 83% in Portugal and 84% in Ireland agree. In case of the UK and Ireland, this might be explained by the advantage of English-speaking countries regarding the fact that English is the global scientific language.
- In particular, researchers in Slovenia (93%), Iceland (93%) and Malta (92%) perceive that transferable skills would positively affect their potential recruitment in their home institutions. Yet only about 72% of researchers in Portugal, about 74% of researchers in Italy and about 75% of researchers in Greece think that transferable skills are a positive factor for recruitment.
- Taking part in an interdisciplinary mobility experience or following an interdisciplinary research approach was perceived as positively affecting recruitment in Latvia (88%), the Netherlands (88%) and Iceland (85%), whereas only about 59% of researchers in Italy, 60% in Croatia and 65% in Austria agreed.
- Engagement in public awareness activities was considered to be a positive factor for recruitment by 89% of researchers in the Netherlands, 88% in Malta and 87% in Iceland, while only 55% of researchers in Italy, 60% in Hungary and 63% in Spain agree.
- The highest shares of researchers considering publication in open access journals as a positive factor for recruitment are in Romania (91%), Latvia (89%) and Malta (84%), while the lowest shares are observed in Italy (49%), Austria (61%) and Hungary (62%).
- In contrast to MORE3, intersectoral mobility is now differentiated between intersectoral mobility depending to which sectors the mobility is taking place. Intersectoral mobility to the governmental sector is perceived as a positive factor for recruitment, especially by researchers in the Netherlands (78%), in Latvia (74%) and by researchers in Czech Republic (73%), while only about one out of three researchers in Italy (36%) and Greece (37%) would agree. Intersectoral mobility to the private sector is considered to be positive by 77% of researchers in Latvia, 76% in the Netherlands and 75% in the Czech Republic. At the other end of the spectrum, less than one in three researchers (29%) in Italy, 41% of researchers in Croatia and 42% in Luxembourg agreed.

Figure 25: Positive factors for recruitment across higher education systems



Source: MORE4 EU HE survey (2019)
Reading note: The figure shows the shares of researchers in the EU and in different higher education systems that perceive the various factors as positive for recruitment. The center point indicates 40 percent, the outermost circle 100 percent.
Notes:

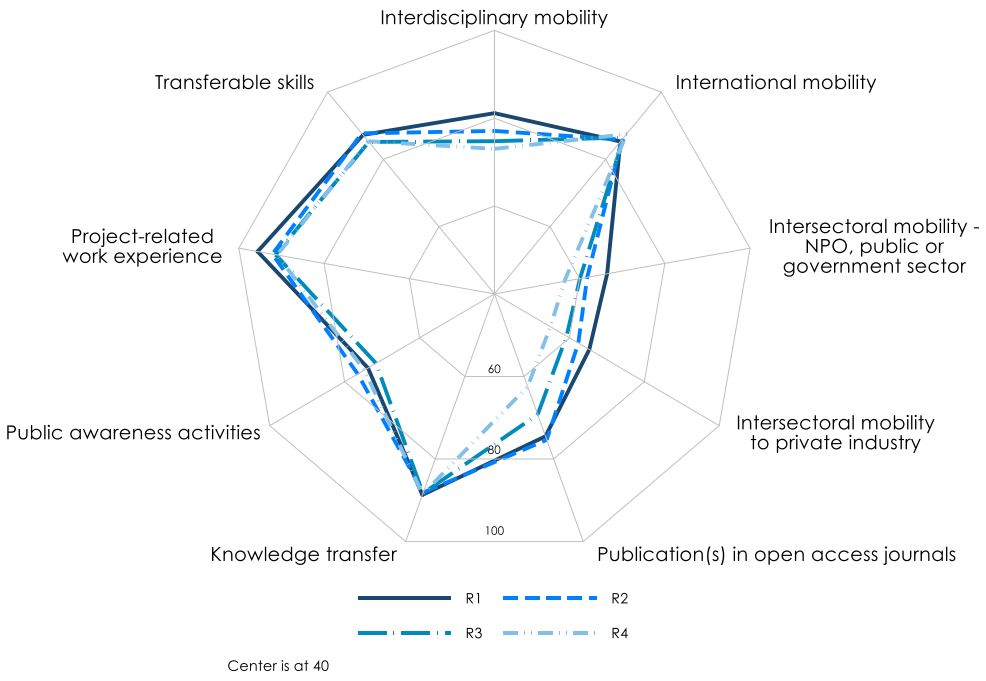
- Based on question 39: "In your experience, would you say the following factors are regarded as positive or negative factors for recruitment in your home institution?"
- (n=1,381-7,880)

Looking at the results by country groupings, in general, researchers working in Anglo-Saxon countries perceive mostly all if the options listed in the survey question as being more important for recruitment, than researchers working in Continental European or Southern European Countries. However, on average, there were a lower share of researchers from countries having the Anglo-Saxon HE system than from other country groups perceive international mobility as an important factor for recruitment (see Figure 25). This result is in accordance with the results regarding the attractiveness of different HE systems within the EU. The Anglo-Saxon system seems to be the most attractive within the EU, offering the most appealing research environment, and, thus, international experience outside the Anglo-Saxon system might be less important (see section 9).

In contrast, the shares of researchers from Southern European HE systems considering those factors as important for recruitment is most often lower than those of researchers from other systems, particularly regarding intersectoral and interdisciplinary mobility experiences, but not international mobility experiences.

Slightly more researchers in the Continental European HE systems consider intersectoral mobility to the private sector as being a positive factor for recruitment than researchers from other HE systems. International mobility, project-related work experience and knowledge transfer is an important factor for recruitment in the Continental European system as well.

Figure 26: Positive factors for recruitment by career stage (EU28)

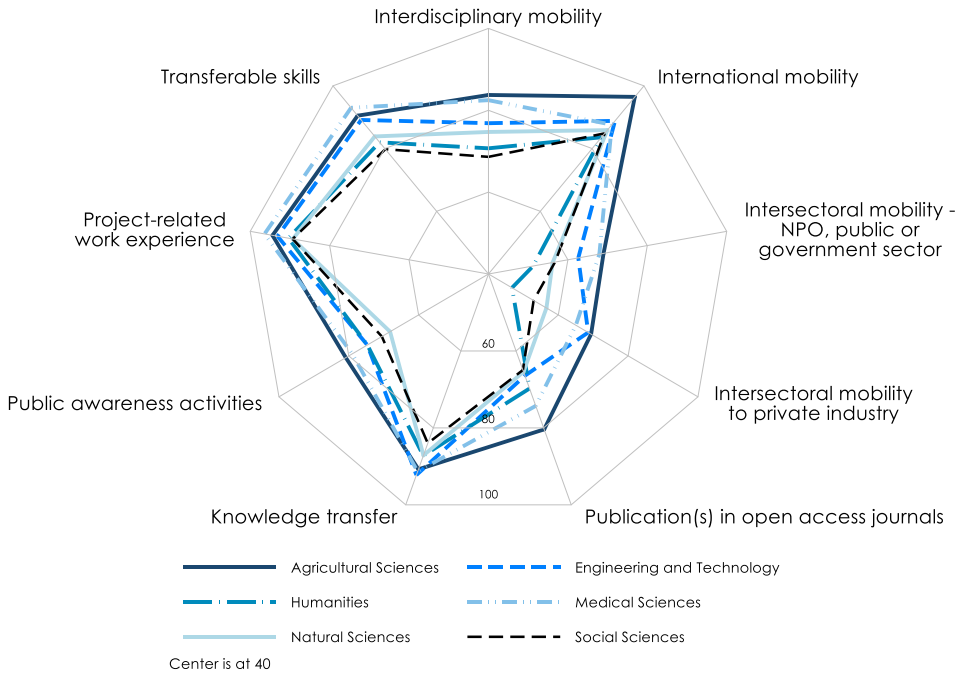


Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 39."In your experience, would you say the following factors are regarded as positive or negative factors for recruitment in your home institution?
- (n=739-2,395)

Career stages: Regarding project-related work experience, perceptions as to the relative importance did not vary widely across career stages, although the perceived importance decreased slightly along the career stages. (R1: 96%, R2: 92%, R3&R4: 91%). The same phenomena can be observed in relation to other factors influencing recruitment, which are most important for R1 and R2 researchers (interdisciplinary and intersectoral mobility experience, publications in open access journals, training in transferable skills). Across all career stages, the share of researchers considering international mobility experiences as an important factor for recruitment is very similar and relatively high (between 85% of R1 researchers and 88% of R4 researchers). The perceived importance of engaging in awareness-raising activities was also found to be homogeneous across different career stages but at a lower level (between 72% of R3 to 76% of R2 researchers).

Figure 27: Positive factors for recruitment by field of science (EU 28)



Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 39."In your experience, would you say the following factors are regarded as positive or negative factors for recruitment in your home institution?
- (n=314-1,924)

Field of science: Across different fields of science, the greatest area where there were similar views across different scientific disciplines can be found regarding project-related work experience (see Table 78). The share of researchers considering project-related work experience as a positive factor for recruitment in their home institution is above 89% in every field of science (with a maximum of 96% of researchers in Medical Sciences).

In contrast, between fields of science the largest heterogeneity can be observed with respect to positive effects of intersectoral mobility experience to the private sector. While in Humanities only 47% of researchers consider mobility between sectors as a positive factor influencing recruitment, 69% of researchers in Agricultural Sciences and Engineering and Technology would agree.

A somewhat smaller variation between sciences can be seen regarding the influence of transferable skills, interdisciplinary mobility, international mobility, intersectoral mobility to the government sector, publication in open access journals and public awareness activities. 69% of researchers in Agricultural Sciences versus 51% of researchers in Humanities think that intersectoral mobility to the governmental sector positively affects recruitment in their home institution. 71% of researchers in Humanities versus 84% of researchers in Agricultural Sciences think that interdisciplinary mobility is a positive for recruitment. Publishing in open access journals, is considered by 80% of researchers in Agricultural Sciences versus 65% of researchers in Social Sciences as a positive factor for recruitment.

5.4. Research careers

First, this subsection examines the profiles of researchers within the career stages R1 to R4. It then looks at the average length of these career stages across countries. The third subsection looks at the determinants of progression along career stages in terms of whether researchers perceive career progression to be merit-based and transparent. Finally, dual research careers are examined as a specific type of research career.

5.4.1. Career stages: profiles of researchers

In this section, we focus on career stages from the perspective of career progression. We start with an analysis of the distribution over career stages per country that points at different patterns, from flat to pyramid distributions. We then further characterise the career stages in terms of age, contract types, and teaching activities to create a profile of each career stage in terms of stability and autonomy[88].

5.4.1.1 Distribution of researchers over career stages

The distribution of researchers over career stages was discussed in the socio-demographics section (5.1). It was pointed out that the percentage of R1 and R2 researchers in the sample is relatively low, and that this should be kept in mind when interpreting the results.

Country level: Figure 28 provides an overview of the distribution of researchers in various career stages in different European countries. The share of R1 and R2 researchers in the sample is lower in most countries compared to that of the 2016 survey. Also, while in some countries the shares of researchers in different career stages are about comparable in size, in other countries some career stages are much larger than others.

By contrast, Greece, Italy and Cyprus have a particularly high share of established and leading researchers in comparison to low numbers of early-stage researchers. Only about 2% of researchers in Greece, 4% of researchers in Cyprus and Italy are in career stage R1 and respectively 5%, 11% and 7% of researchers are in R2, while respectively 41%, 56% and 58% are in career stage R3 and 52%, 29% and 31% are in R4.

The shares of R1 researchers in these countries were already below EU average in 2016[89] and 2012 have either remained stable (Italy) or have further decreased. The survey was not designed to reflect the distribution of researchers over career stages ex-ante. However, the fact that such large differences between countries are observed can point to different structures of higher education systems in terms of the size of the "pyramid". Southern European systems such as Greece and Italy feature high shares of tenured R3 and R4 researchers, leading to a lower number of R1 and R2 researchers; it may also reflect funding difficulties which limit the entry into academic careers of young researchers. However, there are also other countries with very low shares of R1 and R2 researchers that are not following the Southern European system, such as the United Kingdom (11% of researchers are in R1 and R2). Vice

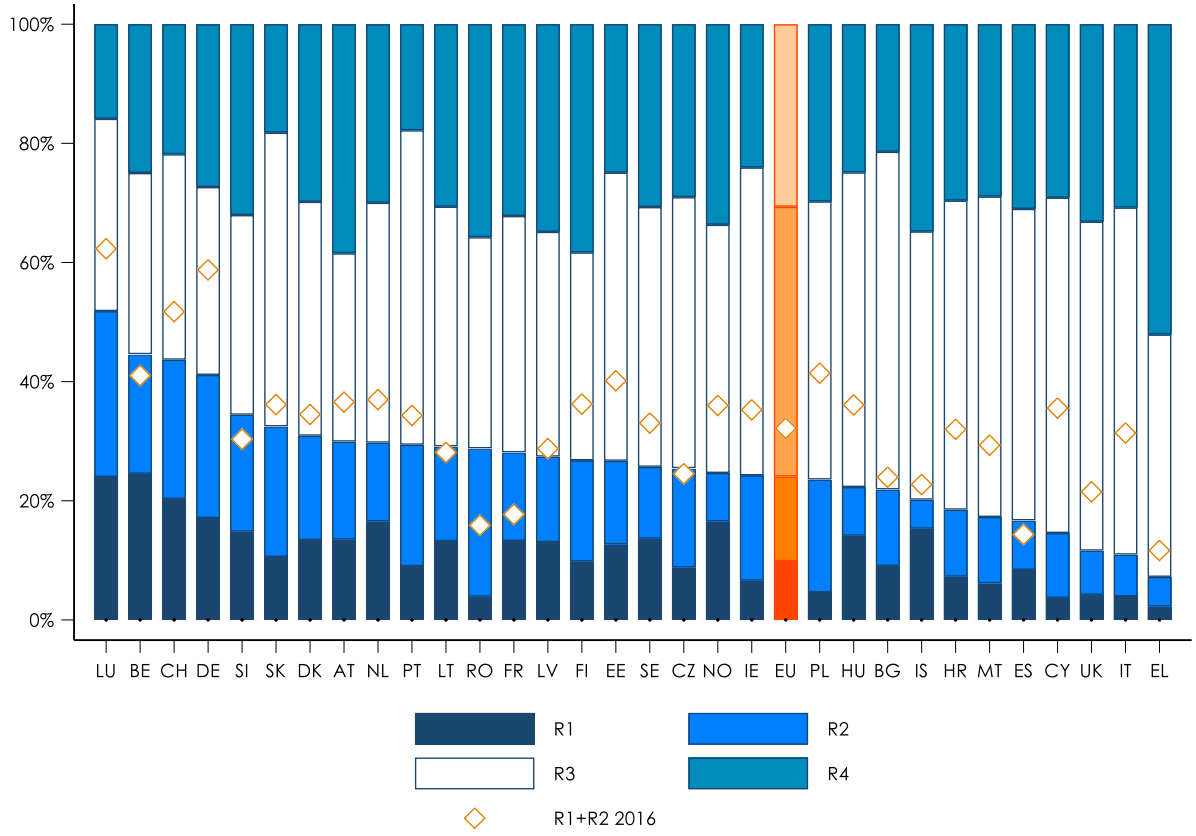
[88] Annex 2 shows that the data reflect higher shares of R3 researchers and lower shares of R1 researchers compared to what we can expect based on the information that is available in the literature and in Eurostat data on R1 researchers. As explained in section 4 of this report, the reader need to take this into account in the interpretation of results.

[89] Based on the MORE3 survey, the average share of R1 researchers in the EU28 was 14% in 2016 (18% in 2012), while the share of R1 was 5% in Greece, 4% in Italy and 12% in Cyprus.

versa, there are also exceptions within the Southern European countries that have above-average shares of R1 and R2 researchers such as France (28% in R1 and R2). As mentioned, these results should be interpreted with caution as sample sizes and researcher self-assessment in terms of career stage vary across countries.

Overall, such structural differences seem to be rather persistent. In 2012, nations featuring hierarchical chair-based systems were also among the countries with the lowest shares of R4 researchers, like Hungary (2012: 17% of R4 researchers), Czech Republic (2012: 19% of R4 researchers) and Poland (2012: 17% of R4 researchers). Southern European countries, however, could be found in the group characterised by high shares of R3 and R4 researchers. For instance, in 2012, 47% of researchers in Greece and 44% of researchers in Spain were in career stage R4 (EU27: 28% in 2012).

Figure 28: Distribution of researchers across career stages R1 to R4, by country



Source: Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Based on question 13: "In which career stage would you currently situate yourself?"
- (2019: n=9,321 2016:n= 10,394;)

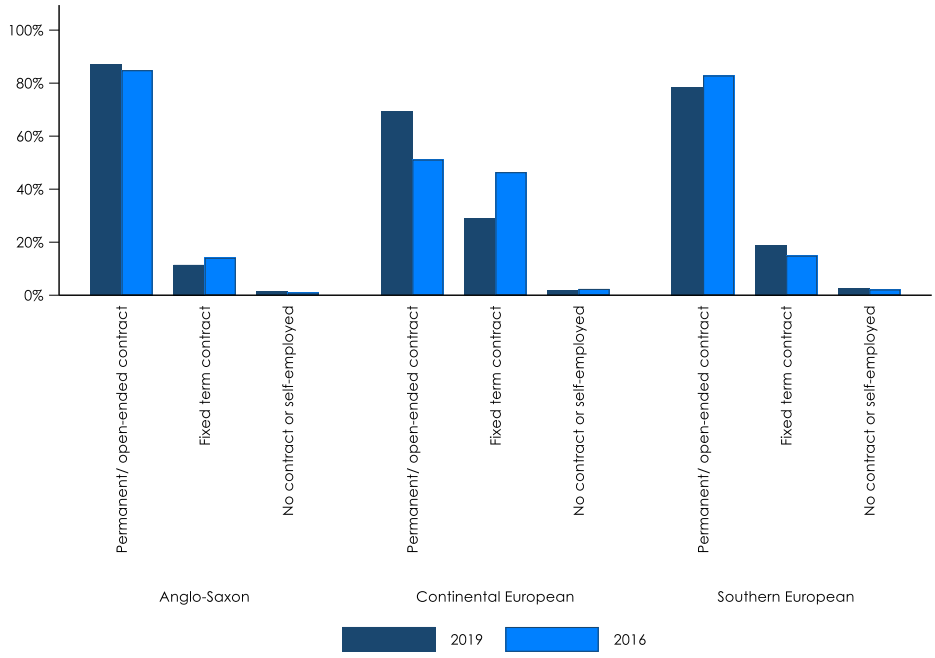
5.4.1.2 Characteristics of the different career stages

Table 9 shows an overview of different characteristics of researchers, such as gender, age and type of contract, by career stage. This confirms the findings of the MORE2 and MORE3 study in 2012 and 2016.

R1 and R2 researchers are younger and are more likely to be employed on fixed-term contracts, while R3 and R4 researchers are older and mostly on permanent contracts. **Error! Reference source not found.Country groups:** Country differences in terms of the contractual situation of researchers in different career stages are rooted in different higher education system structures (see Figure 152 and discussion at the beginning of section 5), with "tenure" systems opposed to systems with chairs leading to a low share of permanent or open-ended contracts at early stages; Kreckel 2010, as well as Figure 30)

However, compared to 2016, especially in Continental European countries but also in Anglo-Saxon countries the average share of permanent contracts has increased while the share of fixed-term contracts has been reduced. In 2019 87% of researchers in Anglo-Saxon, 69% of researchers in Continental European and 78% of researcher in Southern European countries have permanent contracts. Considering the long-term perspectives for (risky) research with uncertain outcome this is a positive development.

Figure 30: Contractual situation, by country groups



Source: MORE 4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Average shares of the following country groups are shown: Anglo-Saxon (UK, SE, DK, NL, IE), Continental European (DE, AT, PL, HU, CZ, SK) and Southern European (IT, FR; ES, PT).
- Based on question 28: "Type of contract"
- (2019: n=1,021-4,147; 2016: n= 1,570-4,162)

Career stages: While most early stage R1 researchers have fixed-term contracts (72% of R1 researchers), the respective share decreases continuously in higher career stages. Only 46% of R2 researchers, 12% of R3 researchers and only 4% of R4 researchers have fixed-term contracts. Vice versa, the shares of researchers employed with permanent contracts is the highest in the latest career stage R4 (95% of R4 researchers) and the lowest for researchers in R1 (19% of R1 researchers). Compared to 2016, the share of fixed-term contracts has increased especially in case of early stage R1 researchers (2016: 65% of R1

researchers), the other career stages show similar shares of researchers employed with fixed-term contracts as in 2016.

confirms that the contractual situation per career stage and country group is relatively stable since 2016. R4 researchers are still much more likely to be male (72% of R4 researchers) than female (28% of R4 researchers) (see also section 5.1). Figure 29 further shows that R3 researchers experience the higher teaching load. Also, the shares of teaching load per career stage and country group are stable between 2016 and 2019. In the following paragraphs, we discuss the analysis of the characteristics per career stage in more detail.

Table 9: Characteristics of researchers, by career stage (EU28)

	R1	R2	R3	R4
Type of Contract				
No contract (regarded as a student)	8.6%	1.0%	0.6%	0.3%
Fixed term <= 1 years	16.4%	6.6%	1.2%	0.9%
Fixed term >1-2 years	13.9%	10.7%	1.7%	0.6%
Fixed term >2-4 years	28.2%	14.0%	5.2%	0.6%
Fixed term > 4 years	13.0%	14.6%	3.9%	2.2%
Permanent contract / open-ended contract	18.6%	52.1%	86.8%	95.1%
Self-employed	1.2%	1.0%	0.6%	0.3%
	R1	**R2**	**R3**	**R4**
Gender				
Male	48.7%	49.1%	59.1%	71.7%
Female	51.3%	50.9%	40.9%	28.3%
	R1	**R2**	**R3**	**R4**
Age Category				
<35	68.8%	22.8%	3.8%	0.6%
35-44	18.4%	45.7%	31.4%	7.8%
45-54	8.3%	18.2%	37.5%	35.4%
55-64	3.8%	10.4%	21.6%	37.7%
65+	0.6%	3.0%	5.7%	18.4%

Source: MORE4 EU HE Survey (2019)
Notes:

- Based on question 68: "What was the type of contract?", question 2: "What is your gender?" and question 3: "What is your year of birth?"
- (n=9,321)

R1: About 69% of all R1 researchers are under 35. In total, only 19% of researchers in R1 have a permanent contract. The majority of R1 researchers are doing a PhD (75% of R1 researchers). These researchers are either affiliated to a single institute (52% of all R1 researchers) or enrolled in a joint PhD program (23% of R1 researchers). 25% of R1 researchers are currently not working on a PhD and are not enrolled in a doctoral program. Of those R1 researchers currently not working on a PhD, 23% already have a PhD, and 32% (MORE3: 41%) have a permanent or open-ended contract.

R2: Most of the researchers in career stage R2 are in their early 30s to early 40s. They are engaged in research as well as in teaching activities, although differences across countries are observable, which might be due to differences in the underlying higher education system (see Figure 29). Generally, their teaching load is much lower than of researchers in later career stages, however, within Eastern European countries, the teaching load for R2 researchers is significantly higher than in the rest of Europe

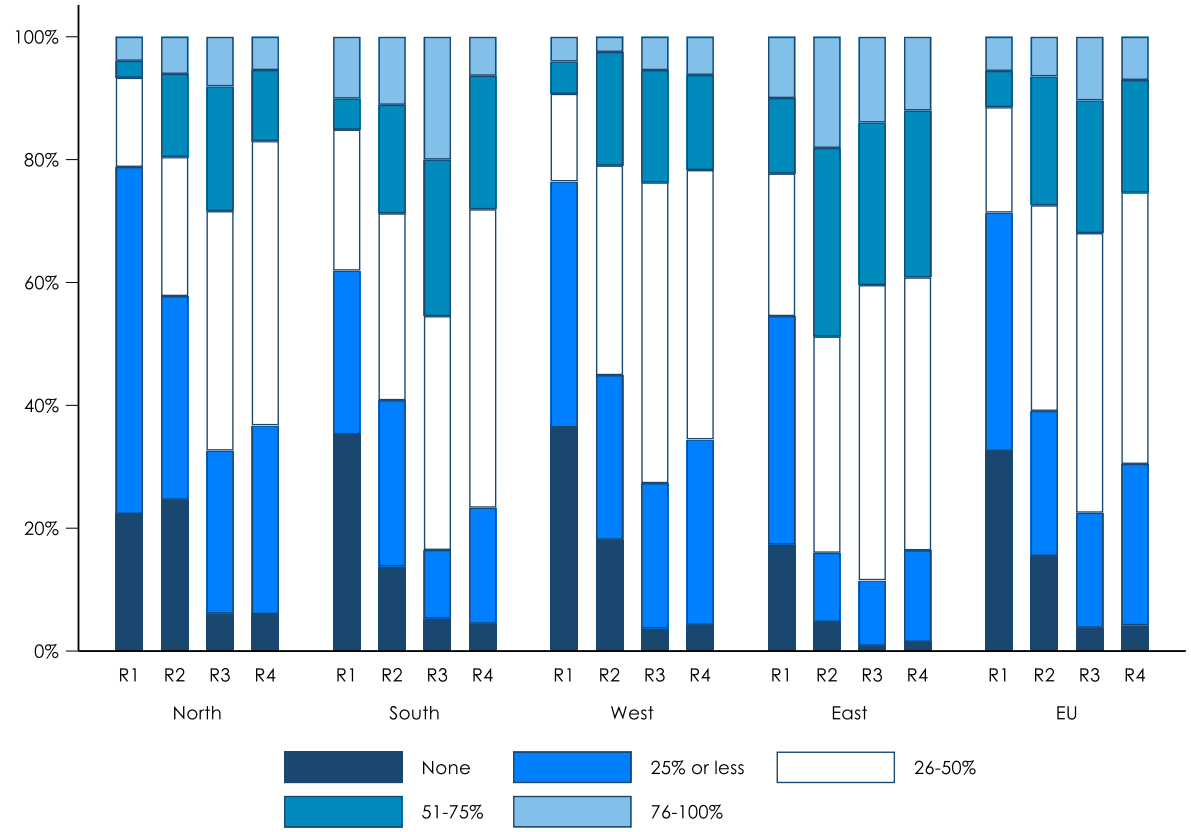
(see Figure 29). In contrast to R1 researchers, more than 50% of recognised researchers in R2 have a permanent or open-ended contract.

R3: A majority of R3 researchers is equipped with permanent or open-ended contracts (86%). Most established researchers are either in their late 30s/early 40s (31%) or in their late 40s/early 50s (38%). In general, their teaching load is significantly higher than in R2, but this is also connected to a better contractual status as well as being strongly dependent on their geographical position (see **Error! Reference source not found.**).

R4: More than 90% of R4 researchers are over 45 and the vast majority has a permanent contract (95 %). The teaching load is high and comparable to R3 researchers. However, differences in the teaching load of researchers in later career stages (R3 and R4) between geographical regions within Europe were observed. The teaching load in Eastern and South Europe was found to be significantly higher for established and leading researchers than in Western and Northern Europe (see Figure 29). Likewise, in R4 the degree of research autonomy is further improved, which again might be a consequence of permanent contracts, as opposed to project-based related fixed-term contracts.

In 2019, on average, the highest share of researchers (41%) across the EU spend between 26% and 50% of their time with teaching activities. A somewhat lower share spends less (32%) or more time (27%) with teaching. Although the share of researchers spending between 26% and 50% of their time on teaching has remained stable compared to 2016 (2016: 42%), a shift toward higher teaching loads can be observed: the share of researchers spending 25% or less on teaching decreased by 6pp from 33% in 2016. In contrast, the share of researchers spending more than 50% of their time with teaching has increased from 26% in 2016 by 6pp.

Figure 29: Teaching activities, by geographical region and career stage



	2019					2016				
Teaching activities	**EU**	**East**	**North**	**South**	**West**	**EU**	**East**	**North**	**South**	**West**
None	8.4%	3.0%	10.7%	7.8%	9.9%	8.5%	3.7%	12.5%	3.6%	11.7%
25% or less	23.7%	14.1%	32.8%	16.1%	28.0%	24.4%	15.3%	35.2%	16.4%	28.1%
26-50%	40.6%	42.8%	35.9%	39.6%	41.1%	41.6%	39.6%	33.6%	45.7%	41.1%
51-75%	19.0%	26.3%	14.2%	22.2%	15.9%	17.3%	27.2%	12.9%	21.4%	13.8%
76-100%	8.3%	13.8%	6.4%	14.2%	5.0%	8.3%	14.3%	5.9%	12.9%	5.2%

Source: MORE 4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers per career stage and per region that indicate they spend a certain share of their time on teaching
- Average shares of the following country groups are shown: East (CZ, EE, HU, LV, LT, PL, SI, SK, BG, RO, HR), North (NO, SE, FI, DK, IS), South (PT, ES, IT, EL, MT, CY) and West (BE, FR, DE, NL, LU, AT, UK, IE, CH).
- Based on question 31: "Teaching activities (as % of your overall working time)"
- (n=1,021-4,147)

5.4.1.3 Contractual situation

Share of researchers with a fixed term contract (of all researchers)				
	EU Total	**Per career stage**	**Per FOS**	**Per gender**
2012 (n = 8,986)	34.30%	R1: 70.6% R2: 55.6%	MED: 36.3% NAT: 38.4%	F: 38.5% M: 31.8%

		R3. 23.8% R4: 7.7%	SOC: 28.5%	
2016 (n = 9,213)	26.10%	R1: 65.0% R2: 50.0% R3. 15.9% R4: 6.1%	MED: 22.9% NAT: 27.8% SOC: 26.6%	F: 31.3% M: 22.9%
2019 (n= 8,540)	20.2%	R1: 71.5% R2: 45.9% R3: 12.0% R4: 4.3%	MED: 20.3% NAT: 19.4% SOC: 20.9%	F: 24.7% M: 17.2%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Note:

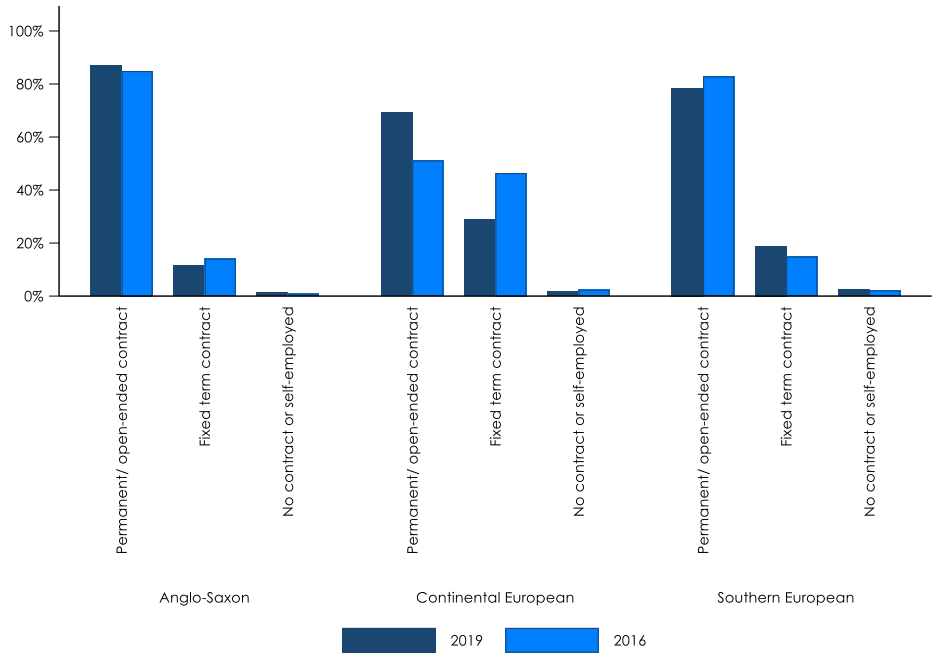
- Based on question 28: "Type of contract"

Country groups: Country differences in terms of the contractual situation of researchers in different career stages are rooted in different higher education system structures (see Figure 152 and discussion at the beginning of section 5), with "tenure" systems opposed to systems with chairs leading to a low share of permanent or open-ended contracts at early stages; Kreckel 2010[90], as well as Figure 30)

However, compared to 2016, especially in Continental European countries but also in Anglo-Saxon countries the average share of permanent contracts has increased while the share of fixed-term contracts has been reduced. In 2019 87% of researchers in Anglo-Saxon, 69% of researchers in Continental European and 78% of researcher in Southern European countries have permanent contracts. Considering the long-term perspectives for (risky) research with uncertain outcome this is a positive development.

[90] Kreckel, R., (2010) "Karrieremodelle an Universitäten im internationalen Vergleich", 7, pp. 33–44.

Figure 30: Contractual situation, by country groups



Source: MORE 4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
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Gender: Some gender differences are observed when looking at the contractual types. While 17% of male researchers have a fixed term contract in 2019, the respective share of female researchers is 8 percentage points higher (25%). Compared to 2016, both the shares of male and female researchers having a fixed-term contract have decreased (2016: 31% for female researchers vs. 23% for male researchers), however, the gender gap has remained rather stable.

Linked to the contractual situation, is the average duration of current employment. Overall, and mirroring the decrease in the average share of fixed-term contracts in the EU28 compared to MORE3, the average duration of the current employment for researchers across career stages has slightly gone up in comparison with MORE3. Overall, this is a positive development as fixed-term contracts negatively impact on knowledge creation because having a contract of fixed duration does not allow

scope for a long-term approach to research. This serves as a barrier to the implementation of riskier-research, and leads to a focus on incremental, less risky research projects of short time horizon only[91].

Average duration of current employment (in years)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2012 (n = 9,016)	10.7	R1: 4.2 R2: 7.2 R3. 11.2 R4: 16.9	MED: 11.1 NAT: 10.5 SOC: 10.7	F: 9.6 M: 11.4
2016 (n = 9,412)	12.4	R1: 5.7 R2: 8.6 R3. 12.3 R4: 18.2	MED: 12.8 NAT: 12.5 SOC: 12.0	F: 11.4 M: 13.0
2019 (n = 8,540)	13.5	R1: 5.7 R2: 9.2 R3: 13.3 R4: 18.5	MED: 13.9 NAT: 13.8 SOC: 12.8	F: 12.4 M: 14.2

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Note:

- Based on question 26: "Employed since"

5.4.2. Career stages: length

Although researcher career paths do not always progress in a linear manner from stage R1 to R4, a closer look at the length of time that researchers remain in the same career stage might deliver valuable insights regarding structural differences between career phases and countries. In comparison to later career stages, early career stages (R1 and R2) are characterised by reduced research autonomy, higher shares of fixed-term contracts and lower salaries, etc. (see above). Thus, the shorter the length of early career stages, the higher the attraction of research careers in general.

The first stage of a researcher's career R1 takes on average 5.0 years in the EU28 countries (2016: 4.7 years). The average retention period in R2 is similar to R1: 5.3 years (2016: 5.0 years). In the EU28 researchers spend on average 7.7 years in the third career stage R3, roughly comparable in length compared to 2016 (7.4 years).

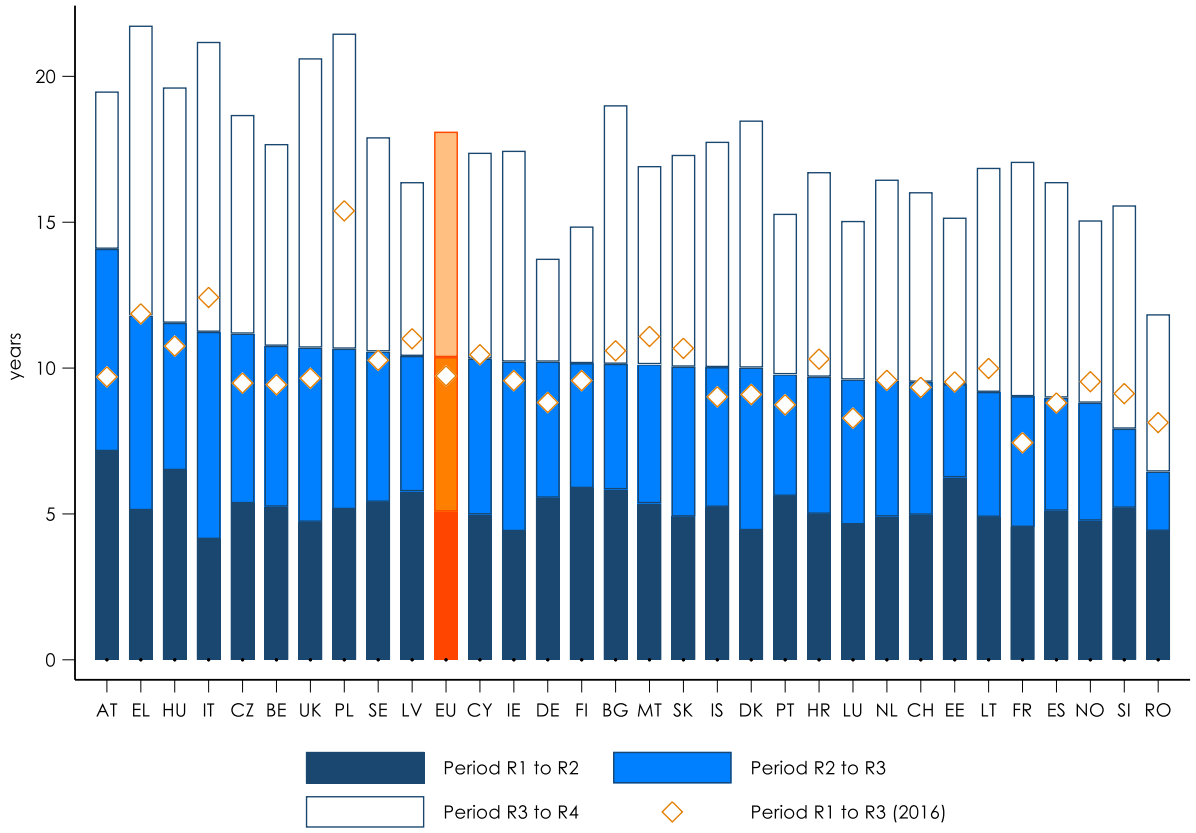
Country level: Figure 31 shows variations in the average length of time it takes to switch from one career stage to another across countries. On average, within the EU28 it takes about 18 years from stage R1 to reach career stage R4. However, there is substantial variation for reaching R4 from R1 across countries, ranging from 11 years (Romania) to 22 years (Greece).

As the higher education systems differ mostly in the early career stages, Figure 31 has been ordered according to the average length of time it takes to finish the first two career stages (R1 and R2). It takes researchers in Austria the longest time to move from R1 (R2) to R3 (i.e. 14 (7) years) and researchers in Romania the shortest amount of time (i.e. 6 (2) years). The length of career stages R1 and R2 is rather heterogeneous between countries. While the time it takes to accomplish the first career stage R1 ranges from 4 years (Italy) to 7 years (Austria), it takes another 2 to 7 years (Romania and Italy respectively) to

[91] Petersen, Alexander M., Massimo Riccaboni, H. Eugene Stanley, and Fabio Pammolli. 'Persistence and Uncertainty in the Academic Career'. Proceedings of the National Academy of Sciences 109, no. 14 (4 March 2012): 5213–18. doi:10.1073/pnas.1121429109.

accomplish career stage R2. Nevertheless, the time it takes for researchers to complete the first career stage R1 shows a lower variation across EU member states than the variation of time to finish the other career stages - which rises with every higher career step (see Figure 32).

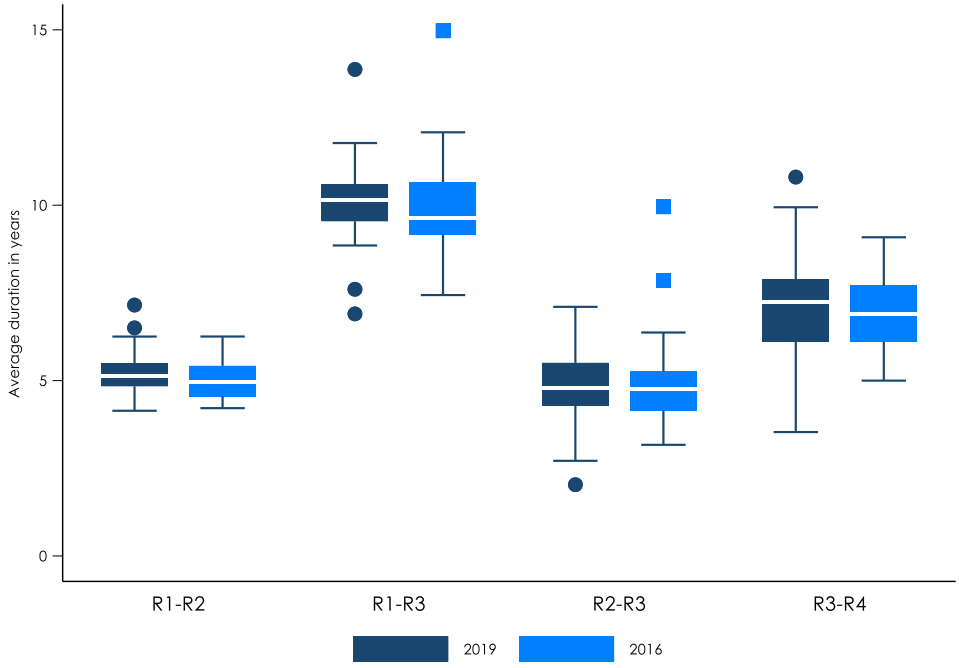
Figure 31: Average length of career stages by countries, ordered by the length of time to reach R3 from R1



Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Based on questions 14-22: "Please indicate the starting year in which you first entered the subsequent career stages"
- (2019: 8,300; 2016: 8,824)

Figure 32: Characteristics of career stage length – variation across countries



Source: MORE4 EU HE Survey (2019)
Notes:

- Based on questions 14-22: "Please indicate the starting year in which you first entered the subsequent career stages"
- (2019: 8,300; 2016: 8,824)

Field of science: Small differences regarding the field of science can be observed (see Table 87 in Annex). On average, the R1 phase in Humanities (5.4 years) takes longer than in Natural Sciences (4.9 years). Moreover, country differences can be substantial. While Austrian researchers of Social Sciences stay nearly 7.1 years in R1, Italian researchers in this field finish R1 three years earlier (4.1 years).

In comparison to early stage researchers the structural differences with respect to different fields of sciences are reversed, i.e. the second career stage in Humanities takes less time than in Natural Sciences (5.1 and 5.8 years respectively). Again, the data indicate wide variations between countries. For instance, the mean duration of R2 in Natural Sciences is 7.4 years in Italy, while on average Romanian researchers in this field stay only about 2.0 years in the second career stage.

Independent of the field of science researchers are engaged in, the time they stay in R3 tends to be higher than in the previous stages.

5.4.3. Progression along career stages

In MORE3 and MORE4, respondents were asked several questions as to how their career paths, are perceived across different countries and how non-standard research outputs and mobility experiences influence progression along the career path (similar to the questions for recruitment, analysed in sections 5.3.1 and 5.3.3). We first examine perceptions regarding transparent and merit-based career progression and then identify the multiple factors that collectively determine the degree and speed of career progression in researcher's careers. Finally, the extent of confidence of researchers in their future career is analysed.

5.4.3.1 Transparent and merit-based career progression

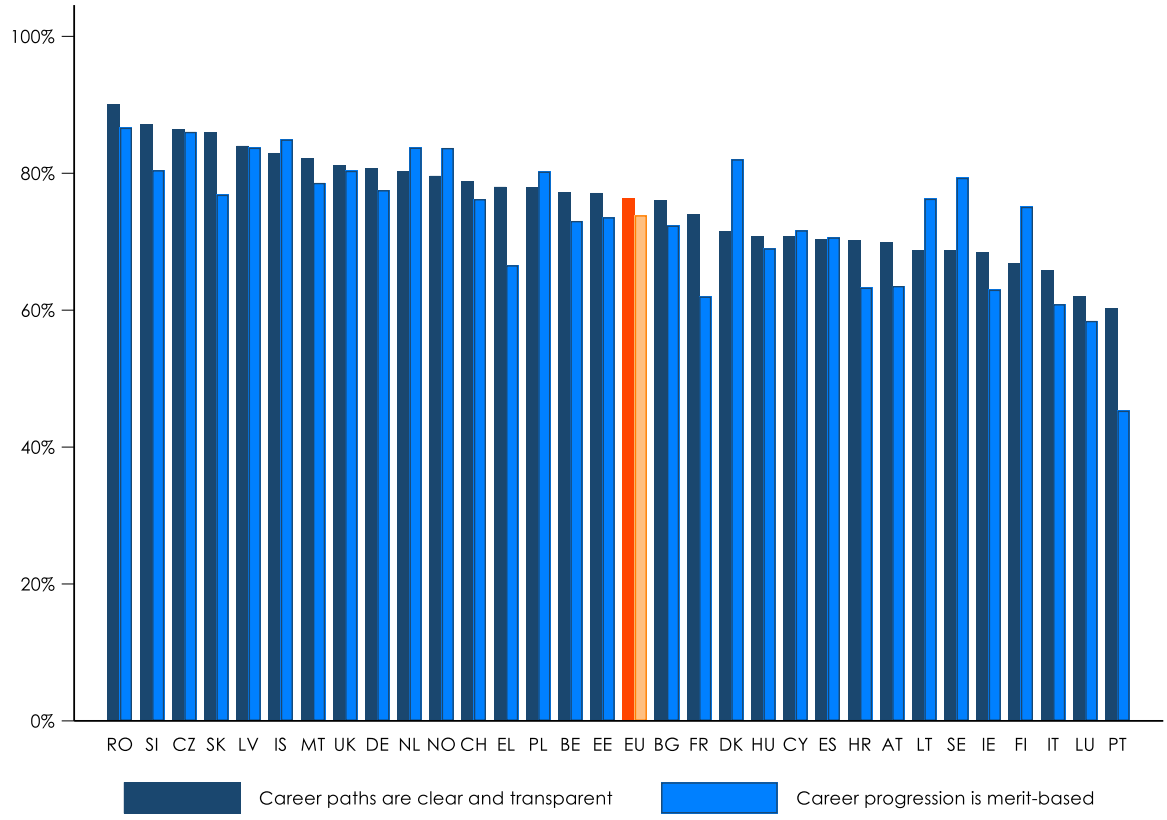
SHARE OF RESEARCHERS WHO AGREE THAT THE DIFFERENT TYPES OF CAREER PATHS ARE CLEAR AND TRANSPARENT AT THEIR HOME INSTITUTION (of all EU28 researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2016 (n=8,711)	70.6%	R1: 70.2% R2: 69.7% R3. 68.9% R4: 73.7%	MED: 68.9% NAT: 74.4% SOC: 67.8%	F: 66.9% M: 73.0%
2019 (n=7,999)	76.3%	R1: 74.6% R2: 72.8% R3: 75.2% R4: 80.2%	MED: 82.0% NAT: 78.3% SOC: 70.4%	F: 72.2% M: 79.1%
SHARE OF RESEARCHERS WHO AGREE THAT CAREER PROGRESSION IS SUFFICIENTLY MERIT-BASED IN THEIR HOME INSTITUTION (of all EU28 researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2016 (n=8,475)	65.10%	R1: 64.4% R2: 64.3% R3. 63.4% R4: 68.1%	MED: 66.3% NAT: 70.0% SOC: 59.0%	F: 61.0% M: 67.6%
2019 (n=7,797)	73.9%	R1: 75.7% R2: 72.4% R3: 71.4% R4: 77.7%	MED: 78.9% NAT: 75.8% SOC: 68.4%	F: 70.0% M: 76.3%
SHARE OF RESEARCHERS WHO AGREE THAT OBTAINING A TENURED CONTRACT BASED ON MERIT ONLY IS COMMON PRACTICE AT THEIR HOME INSTITUTION (of all EU28 researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2016 (n=7,980)	64.20%	R1: 64.2% R2: 64.6% R3. 61.6% R4: 67.4%	MED: 67.8% NAT: 67.4% SOC: 58.3%	F: 58.4% M: 67.7%
2019 (n=7,333)	73.3%	R1: 70.0% R2: 72.1% R3: 72.1% R4: 76.5%	MED: 79.6% NAT: 74.6% SOC: 67.4%	F: 68.9% M: 76.0%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Note:

- Based on question 38: "What is your opinion on the following issues with respect to career progression in your home institution?"

In the EU28, the average share of researchers agreeing that the different types of career paths are clear and transparent at their home institution is 76%. The average share of researchers perceiving their career progression has been sufficiently merit-based is comparable at 74%. 73% of researchers in the EU28 agree that obtaining a tenured contract based on merit only is common practice at their home institution. In all three categories, an increase compared to MORE3 can be observed (similar to the observations on open, transparent and merit-based recruitment in section 5.3.1).

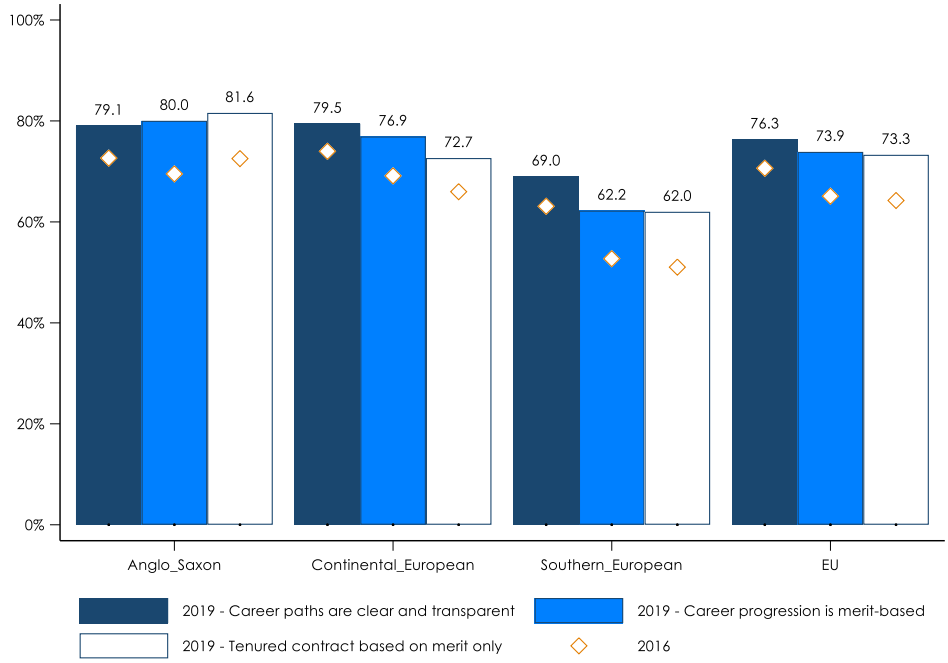
Figure 33: Perception of transparent and merit-based career progression in the home institution, by country



Source: MORE4 EU HE survey (2019)
Notes:

- Share of researchers agreeing on these issues with respect to career progression in their home institution.
- Based on question 38: "What is your opinion on the following issues with respect to career progression in your home institution"
- (n= 8,033-8,743)

Figure 34: Perception of career progression in the home institution, by higher education system



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Share of researchers agreeing on these issues with respect to career progression in their home institution.
- Based on question 38: "What is your opinion on the following issues with respect to career progression in your home institution"
- (2019: n=1,381-7,999; 2016: 1,338-8,711)

Country level: As with recruitment, there are country variations as to differences in the perceptions of whether career paths are clear and transparent for researchers (see Figure 33). The lower bound of the share of researchers who agree that the career paths at their home institution are transparent is about 60% in Portugal. 90% of researchers in Romania perceive career paths to be transparent. Compared to MORE3, almost all countries that have above-average shares of researchers perceiving career progression in their home institution as clear and transparent in 2019 also had respective shares above the EU average in 2016. The only exceptions are Austria, Cyprus and Sweden.

The same range of shares across countries can be observed when researchers were asked whether career progression is sufficiently merit-based. Only about 45% of researchers in Portugal agreed that career progression is sufficiently merit-based, while about 87% of researchers in Romania were satisfied with merit-based career progression at their home institution. Compared to MORE3, all countries that have above-average shares of researchers perceiving career progression in their home institution as merit-based in 2019 also had respective shares above the EU average in 2016.

Generally, the perceived lack of merit-based career progression was considerable in some Southern European countries, e.g. Portugal and Italy, as well as in France, while the highest shares aside from Romania have Anglo-Saxon countries, i.e. the Netherlands, Denmark, United Kingdom and Sweden. Figure 34 summarizes the differences between Anglo-Saxon and Southern European countries in terms of merit-based and transparent career progression. However, compared to 2016 all country groups

managed to increase their share of researchers considering career progression as transparent and merit-based on average.

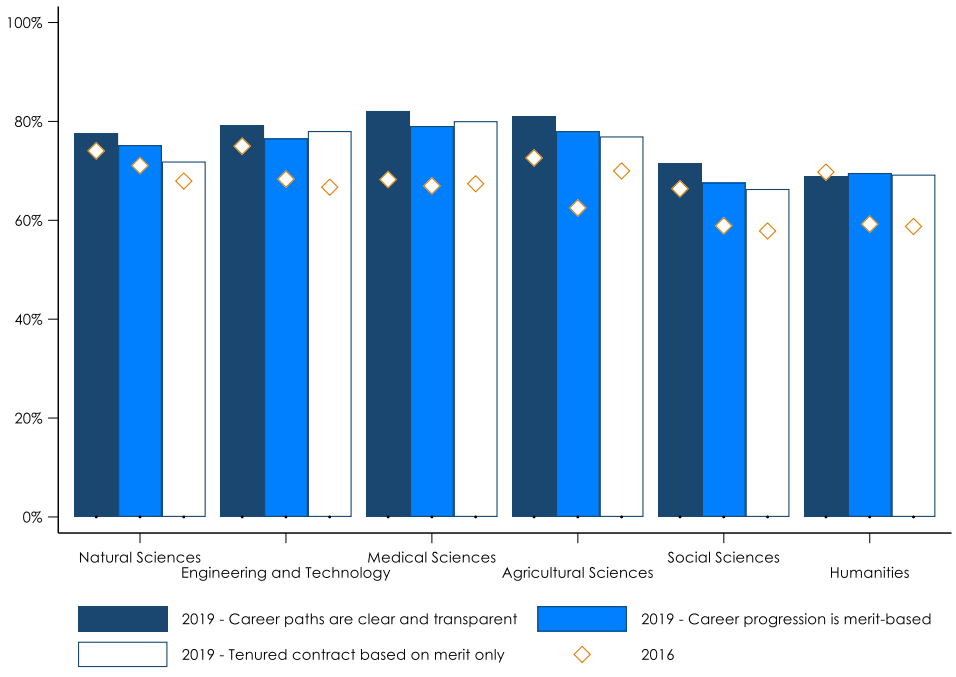
Obtaining a tenured contract based on merit only was perceived as common practice particularly in Romania (88%), Czech Republic (86%), Iceland and the Netherlands (both 84%). By comparison, about 45% of researchers in Portugal and about 54% of researchers in Austria agreed.

In general terms, positive responses towards those factors related to career progression and recruitment are very much interrelated. Those countries where researchers perceive recruitment to be more transparent tend to be the countries where researchers consider it common that tenured contracts are merit-based. These countries are also those where merit appears to play the most important factor determining career progression. In this sense, Southern European countries, such as Italy and Portugal appear to do worse than the EU28 average in these two dimensions (see Table 79 and

Table 81 in Annex). The United Kingdom and the Netherlands, but also Germany, Switzerland and Eastern European countries such as Romania and the Czech Republic, on the contrary, consistently obtain better-than-average results in each of these dimensions.

Field of science: Comparing different fields of science, the shares of researchers that perceive career progression as being merit-based and transparent is the highest in Medical Sciences for all three categories. In Medical Sciences, career paths are perceived to be transparent (82% of researchers in Medical Sciences), merit-based (79%) and tenure positions are also commonly assigned related to research performance (80%) (see Figure 35). In contrast, the shares of researchers considering career progression as merit-based and tenure contracts as commonly connected to research performance are the lowest in Social Sciences (68% and 66% of researchers in the Social Sciences respectively). Career progression is considered to be transparent only by 69% of researchers in the Humanities. However, with the exception of the share of researchers in Humanities considering career progression as transparent, which remained rather stable since MORE3, in all categories, the shares of researchers considering the career progression in their institutions as transparent and merit-based has increased in all fields of sciences since 2016.

Figure 35: Perception of transparent and merit-based career progression in the home institution, by field of science (EU28)



Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

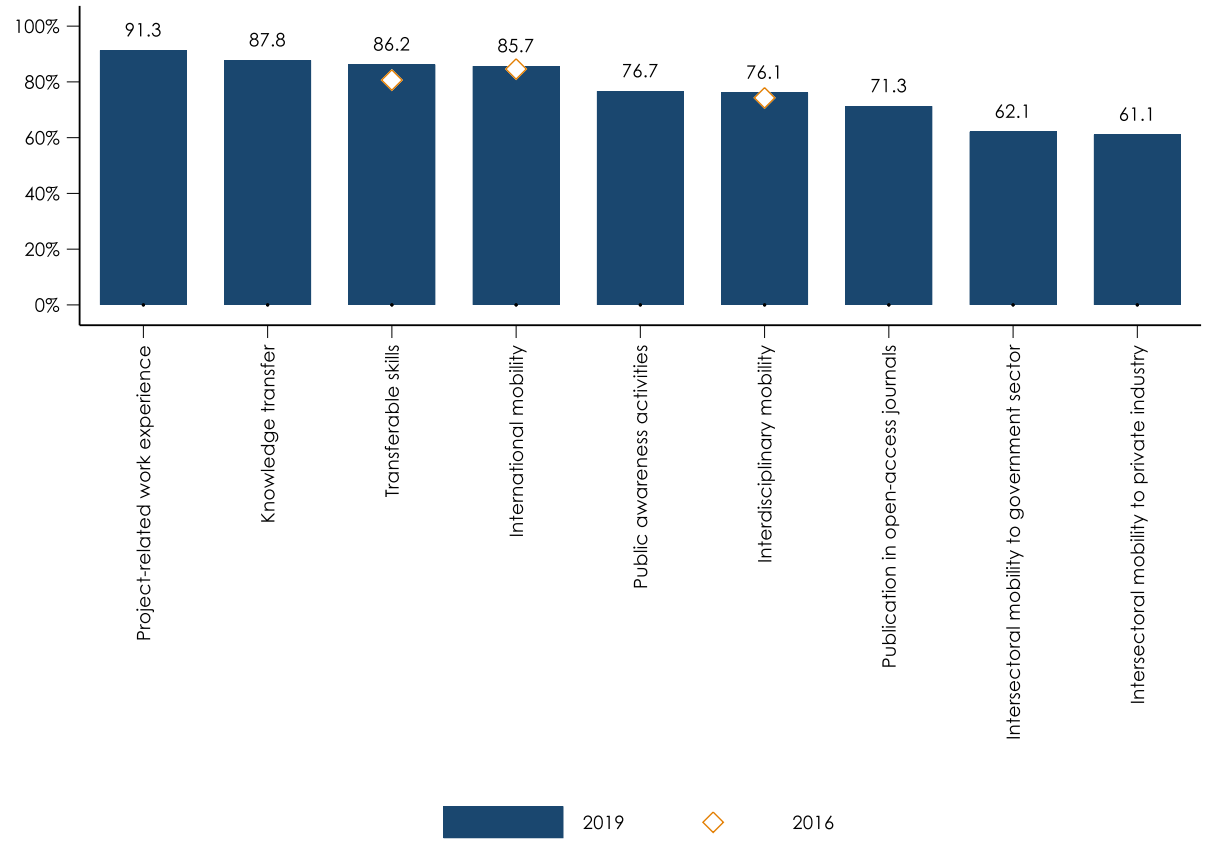
- Share of researchers agreeing on these issues with respect to career progression in their home institution.
- Based on question 38: "What is your opinion on the following issues with respect to career progression in your home institution"
- (2019:n= 351-2078; 2016: 331-2,431)

5.4.3.2 Factors for career progression

In comparison to MORE3, new factors for career progression, both positive and negative, in the home institution were considered. The factors that were considered to be among the most significant determinants for career progression mirror those that are said to impact primarily recruitment processes. Project-related work experience was the factor identified as determining career progression the most (91% of the researchers), followed by engagement in knowledge transfer, including the management of research or innovation, the contribution to patents or developments of inventions, (88%), transferable skills (86%), international mobility (86%), public awareness activities (76%) and publication in open access journals (71%). Interestingly, the perceived impact of intersectoral mobility both to private industry and government sector (61% and 62%) lags well behind international mobility and other factors (see Figure 36). These results are in line with the results from MORE3 and, for those categories that have already been available in the survey 2016, remained rather stable.

Moreover, intersectoral mobility to the private sector is the factor with the highest share of researchers, saying that it might even negatively influence their career progression (6% of researchers), due to the lack of recognition for mobility periods spent in other sectors in some countries' career appraisal systems, both at national level and in individual academic and research institutions. The same risk of having their career negatively impacted was feared by 5% of researchers with respect to intersectoral mobility to the governmental sector. Another 4% of researchers in Europe suspect that mobility between disciplines negatively influences occupational advancement. This finding supports the conclusions of Youtie et al. (2013) that European researchers' career progression tends to be more intra-disciplinary than in the US. However, the share of researchers fearing negative effects of interdisciplinary research on their career progression has decreased slightly compared to MORE3 (2016: 7%).

Figure 36: Perception of positive factors for career progression (EU28)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Share of researchers agreeing that these factors are positive for career progression (EU28 average).
- Based on question 40: "In your experience, would you say the following factors are regarded as positive or negative factors for career progression in your home institution?"
- (2019: n=8,540; 2016: n=9,421)

COUNTRY LEVEL: INTERSECTORAL MOBILITY TO THE PRIVATE AND GOVERNMENTAL SECTOR, PUBLISHING IN OPEN ACCESS JOURNALS AND ENGAGEMENT IN PUBLIC AWARENESS CORRESPOND TO THE LARGEST DIFFERENCES ACROSS COUNTRY GROUPS, WHILE THE LOWEST VARIATION IS FOUND FOR THE VALUE OF PROJECT-RELATED WORK, INTERNATIONAL EXPERIENCE, AND KNOWLEDGE TRANSFER FOR CAREER PROGRESSION BETWEEN DIFFERENT REGIONS WITHIN EUROPE (FOR FIGURES PER COUNTRY, SEE

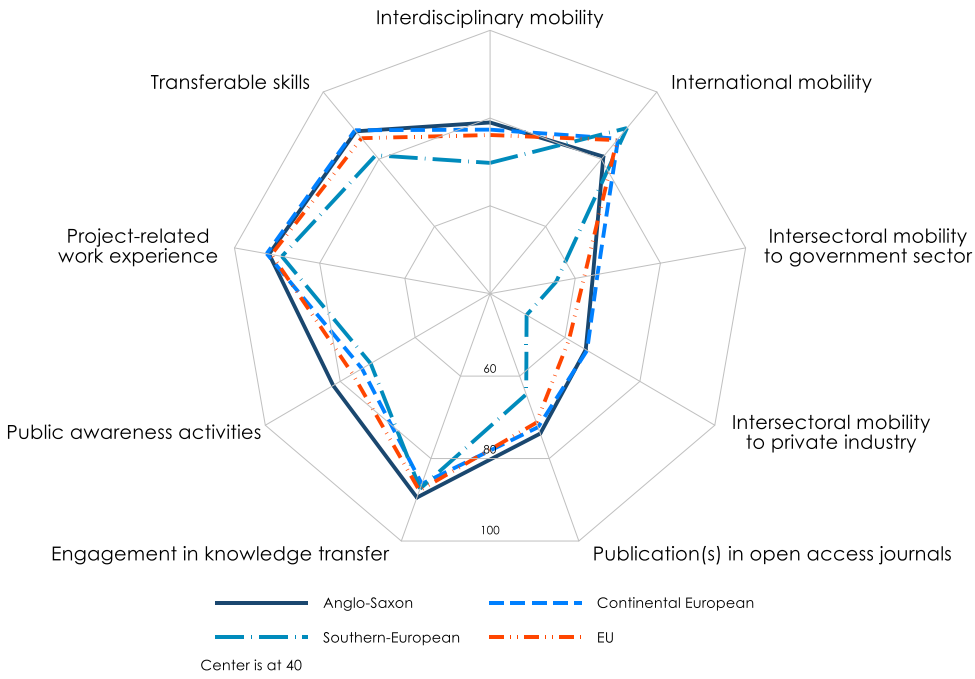
Table 81 in Annex).

Intersectoral mobility experiences, publishing in open access journals and public awareness activities are on average less valued by researchers in Southern Europe, like Italy or Portugal, and more appreciated in Continental European countries, such as the Netherlands.

- Regarding intersectoral mobility to the private sector or to the governmental sector, the share of researchers perceiving it to be positive for career progression ranges respectively from 36% (private sector) and 28% (government sector) of researchers in Italy to 77% and 78% of researchers in the Netherlands and Latvia.
- With respect to publication in open access journals, on the lower bound are Italy (50%) and Croatia (65%), while Romania (92%) and Malta (90%) are on the upper range.
- 59% of researchers in Italy and 69% of researchers in Spain perceive engagement in public awareness as a positive factor for career progression. However, 90% of researches in the Netherlands and 89% of researchers in Belgium would agree.
- The wide variance between different countries suggests that cultural-specific factors influence how researchers view the value added of taking part in intersectoral mobility, and how far this will impact their labour market prospects. This in turn depends not only on the researchers' perceptions, but the attitude of potential employers, both in industry and in academia and research institutions. The extent to which at national level and institutionally within academia, the career appraisal systems of researchers at different career levels from R1 to R4 recognise and value periods of intersectoral mobility, are among the factors that influence how favourably intersectoral mobility is viewed from a researchers' career progression perspective.

The data shows a structural difference between different higher educational systems as the Southern European countries generally seem to evaluate impact factors to support career progression less favourably. This pattern might reflect the lower average share of researchers in Southern European countries compared to other country groups that perceive their recruitment to be transparent and merit-based. In the absence of transparent and merit-based recruitment measures, factors affecting recruitment may also be perceived as less decisive – i.e. the factors relating to merit we surveyed may be perceived as less important because recruitment is less merit-based. Similar to the analysis of factors positively affecting recruitment, international mobility is the exception, as it is valued slightly less by the Anglo-Saxon country group. This result can be seen for example in the rather low share of researchers from the United Kingdom who consider international experience to be a positive factor for career progression compared with some other countries (78% of researchers from the UK).

Figure 37: Perception of positive factors for career progression, by higher education system



Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers agreeing that these factors are positive for career progression.
- Average shares of the following country groups are shown: Anglo-Saxon (UK, SE, DK, NL, IE), Continental European (DE, AT, PL, HU, CZ, SK), Southern European (IT, FR; ES, PT) and EU28.
- Based on question40: "In your experience, would you say the following factors are regarded as positive or negative factors for career progression in your home institution?"
- (2019: 1,307-8,262)

Career stage: A comparison between perceptions of leading researchers and those in their early career stage might provide meaningful insights regarding evolutions or even potential misperceptions of the young researchers that are currently planning their career. The greatest difference between leading (R4) and early stage R1 researchers can be seen in regard of publishing in open access journals. While 79% of R1 researchers consider publications in open access journals as a positive factor for career progression, only 67% of leading researchers agree. Apart from that, according to the data no significant structural differences between the various career stages can be found.

Field of science: The largest differences between different fields of science can be found with respect to intersectoral mobility from academia to the private industry and governmental sector. For instance, only 50% of researchers in Humanities but 69% of researchers in Agricultural Sciences think that intersectoral mobility to the private industry is a positive factor for career progression (see Table 82 in Annex).

Similarly, the perceived role of publications in open access journals, interdisciplinary mobility, engagement in public awareness activities, international mobility and engagement in knowledge transfer differs across different fields of science (between 16 and 12 percentage points).

Regarding the impact of engagement in knowledge transfer and project-related work experience, only smaller differences across fields of sciences are observable. The shares of researchers considering knowledge transfer as a positive factor for career progression ranges from 83% (Social Sciences) to 93% (Agricultural Sciences). The shares of researchers considering project-related work experience as a positive factor for career progression ranges from 89% (Social Sciences) to 97% (Agricultural Sciences).

A question included in MORE4 allows to compare the perception regarding Open Science practices as positive factors for recruitment and career progression with activities researchers have already been engaged in.

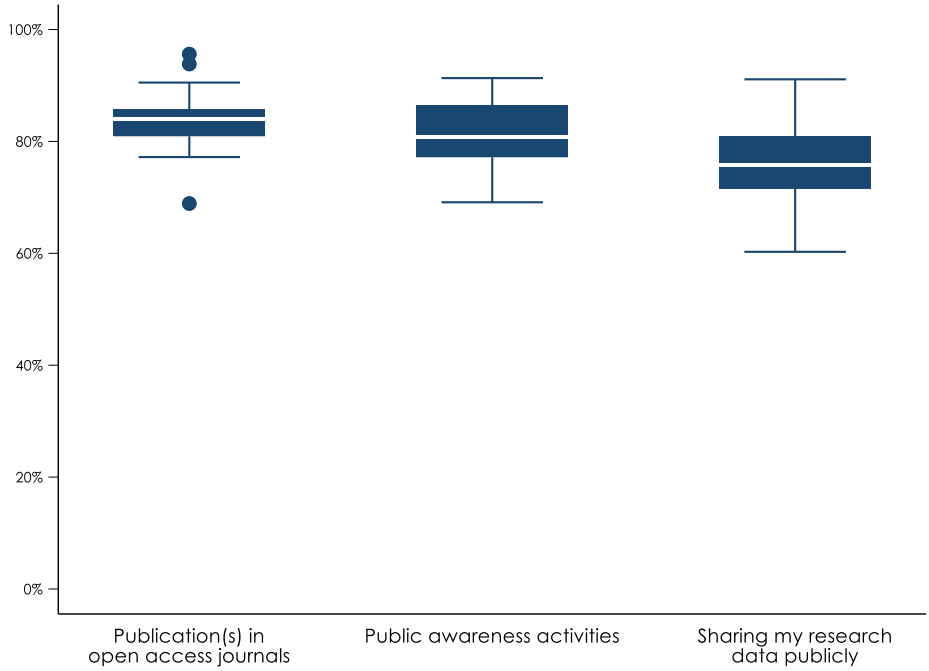
- For instance, although publication in Open Access journals is not among the top factors that affect recruitment and career progression positively (69% of researchers consider it positive for recruitment, 71% for career progression), 83% of researchers have already published in Open Access journals.
- Similarly, 81% have participated in public awareness activities (these activities are considered to be positive for recruitment/career progression by 74%/77% of researchers).
- Moreover, most researchers are willing to share research data, software and codes publicly. Already in 2019, 75% of the researchers have at some point shared this kind of information. Time will show whether this trend is persistent.

SHARE OF RESEARCHERS THAT HAVE ENGAGED IN ACTIVITIES OF OPEN SCIENCE (EU28)

	EU28 Total	Per career stage	Per FOS	Per gender
Publishing in open access journals (n= 8,540)	83.1%	R1: 64.6% R2: 84.3% R3: 82.8% R4: 88.9%	MED: 88.9% NAT: 83.3% SOC: 79.0%	F: 80.5% M: 84.8%
Sharing research data, software or research protocols publicly (n= 8,540)	75.2%	R1: 60.0% R2: 74.1% R3: 75.7% R4: 79.9%	MED: 82.0% NAT: 76.3% SOC: 69.5%	F: 71.4% M: 77.7%
Participating in public awareness activities (n= 8,540)	80.8%	R1: 62.2% R2: 77.1% R3: 82.1% R4: 86.6%	MED: 85.2% NAT: 79.3% SOC: 79.5%	F: 82.1% M: 80.0%

Source: Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 43: "Could you please indicate whether you have engaged in the following activities?"

Figure 38: Engagement in activities of open science (EU28)



Source: Source: MORE4 EU HE survey (2019)
Notes:

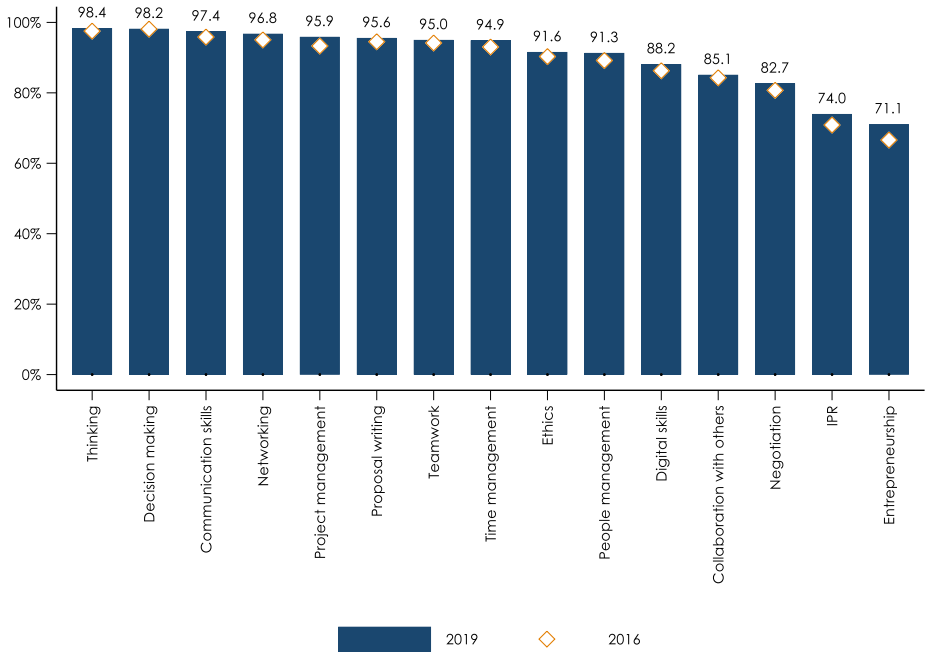
- Based on question 43: "Could you please indicate whether you have engaged in the following activities?"
- (n=8,540)

Fields of Science: While Open Science-related activities are very common in the domain of Medical Sciences (Medical Sciences and Agricultural Sciences), the share is lower for researchers working in the domain of Social Sciences (Social Sciences and Humanities). Especially in terms of sharing data and code publicly, the share of researchers in SSH (70%) is lower than in Medical Sciences and Agricultural Sciences (82%).

Country level: While there is little variation between countries in terms of publications in Open Access journals and participation in public awareness activities, the variation in terms of sharing data and software codes publicly is larger. While high shares of researchers sharing that kind of information publicly were observed in Slovenia (91%), Romania (89%) and Poland (83%), the lowest shares were found in Spain (60%), Denmark (61%) and Norway (63%). Overall, more researchers in Eastern European countries than in Northern European countries willingly share data, software and code willingly with others.

5.4.3.3 Skills for future career progression

Figure 39: Skills for future career progression (EU28)



Source: MORE4 EU HE Survey (2019)
Notes:

- Based on questions 42 "Which skills do you consider important for your future research career (in or outside academia)?"
- (2019:n=7,742-8,40; 2016:n=8,617-9,291)

Regarding their future career, the vast majority of researchers in the EU28 agree that skills for critical and autonomous thinking (98%), decision-making and problem-solving (98%), communication and presentation (97%), networking (97%) and grant and/or proposal writing (96%) are essential for a prosperous future research career (see Table 83 in Annex). By contrast, only 71% of researchers regard entrepreneurial skills as important and 74% of researchers agree with respect to intellectual property rights (IPR). Besides, a high share of researchers in the EU28 agree that project management (96%), teamwork (95%), time management (95%), ethics (92%), people management (91%), innovative digital skills (88%), collaboration with citizens, government and broader society (85%) and skills on negotiation (83%) are important skills that will help to determine their future career prospects. These results are stable compared to MORE3.

Country level: Across different countries heterogeneity regarding some of the potentially important skills that might influence career development can be observed, particularly for those that have on average a lower appreciation among EU researchers (see Table 79 in Annex):

- While 88% of researchers in Romania think that entrepreneurship is important for their future research careers, only 57% of researchers in Norway would agree.
- Innovative digital skills are regarded to be important by 96% of researchers in Slovenia and only by 82% of researchers in Italy.

- Intellectual property rights are perceived as important by 90% of researchers in Malta, while in Sweden 61% of researchers agree.

In contrast, the differences across countries are much smaller for those skills that show the highest shares of researchers regarding them as important: critical and autonomous thinking and decision making or problem-solving skills.

- The vast majority of researchers in all countries (between 95% and 100%) think that critical and autonomous thinking as well as decision-making skills are important for their future research career.

Field of science: Also, across fields of science considerable differences are observed for those skills that are ranked low on average (see Table 84 in Annex):

- While 83% of researchers engaged in Agricultural Sciences are convinced that entrepreneurship is important for their future career, only 60% of researchers in Humanities agree.
- Similarly, while 86% of researchers in Social Sciences consider innovative digital skills essential for their future careers, 92% of researchers in Agricultural Sciences and in Engineering and Technology think that digital skills are important for their future careers.

In contrast, the higher ranked skills like critical thinking and decision-making skills also show the lowest variation regarding the shares of researchers considering them as being positive for a prosperous future career across all disciplines. These skills are thus generally accepted across Europe and across fields as being essential to developing a research career.

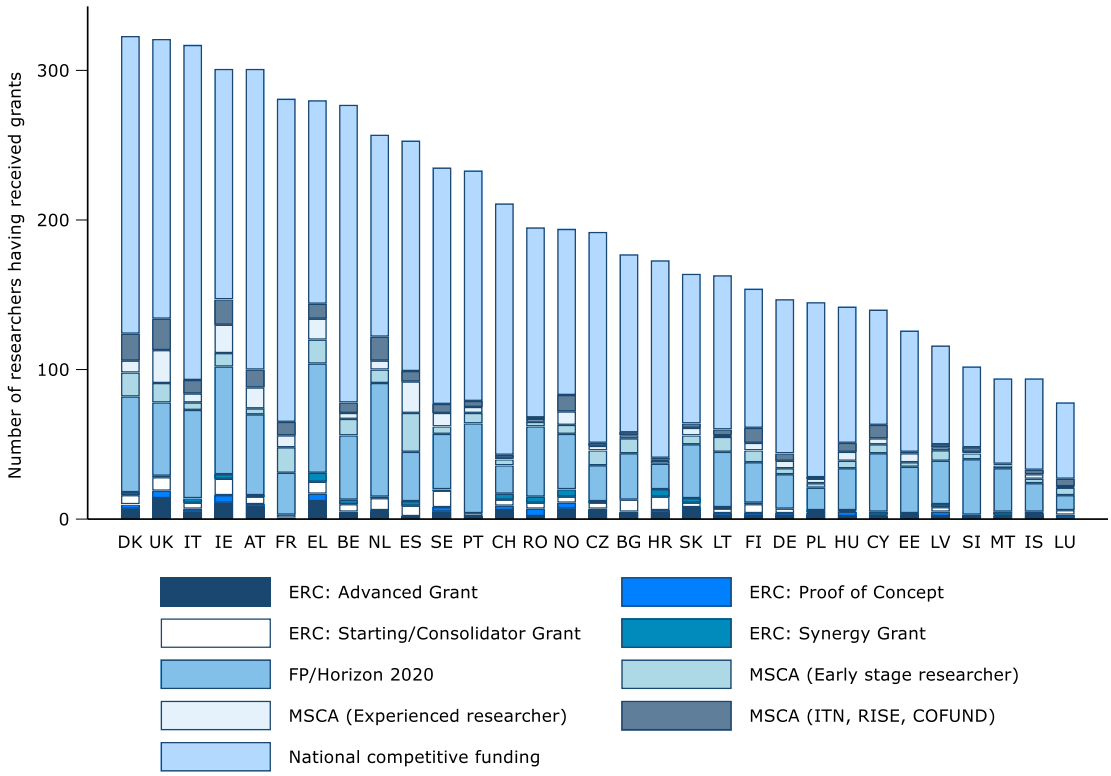
5.4.3.4 Grants and their effects

Figure 40 presents the total number of researchers that have been awarded grants per country. A researcher is counted once for each type of grant that he/she has obtained (regardless of how many grants of this type they have obtained). Accordingly, in the figure, the total of each country bar may count researchers several times if they have received more than one grant. Denmark, the United Kingdom and Italy rank highest.

Of course, national grants account for a good share of grants awarded to the respondents in the sample[92]. Moreover, the number of researchers per type of grants does not provide information about the granted volumes in terms of budgets.

[92] 44% of EU researchers have received a national grant at least once.

Figure 40: Number of researchers who received a grant, by country



Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 98: "Have you obtained competitive funding for basic research (based on peer review) from one or more of the following sources??"
- (n=9,321)

In MORE4, researchers have been asked for the first time about the effects of their most recently obtained grant, i.e. comparison with the MORE3 survey is not possible. On average, researchers perceive grants to strongly affect their recognition in the research community, their volume of research output, the number of co-authored publications and their national research contacts and networks (see table below):

- Overall, 93% of researchers agree the grants that have been given to them influence their recognition in the research community.
- 91% of researchers agree that grants resulted in a higher number of research outputs (e.g. number of publications or patents).
- In terms of co-publications and improved national contacts 90% of researchers agree.
- 88% of researchers agree that grants have a positive effect on advanced research skills and quality of researcher output (e.g. measured by citations).
- In line with these results, 87% of researchers perceive grants positively affecting their overall career progression.

- Also, the ability to obtain (other) competitive research funding for basic research is positively affected by grants (85%) as well as the job options in academia (72%). Non-academic job options are perceived as being less often affected by grants (51%).
- Respectively 85% and 88% agree that grants affect the collaboration with other (sub-)fields of research and international research networks. 70% of researchers think that grants affect their understanding and applying of Open Science approaches.
- Only 58% and 59% experienced an effect on salary and financial condition and quality of life.

Share of researchers agreeing on these issues with respect to the effects they experienced from the grant they most recently obtained (2019)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
Quantity of output (n=4,239)	91.0%	R1: 85.4% R2: 93.1% R3: 89.3% R4: 92.8%	MED: 92.8% NAT: 90.5% SOC: 90.3%	F: 90.5% M: 91.2%
Number of co-authored publications (n=4,166)	90.1%	R1: 79.3% R2: 91.1% R3: 88.9% R4: 92.1%	MED: 92.1% NAT: 91.4% SOC: 86.8%	F: 90.3% M: 90.0%
Quality of output (n=4,127)	87.9%	R1: 86.1% R2: 88.8% R3: 86.0% R4: 90.0%	MED: 90.4% NAT: 87.3% SOC: 86.8%	F: 86.9% M: 88.4%
Advanced research skills (n=4,223)	87.5%	R1: 80.5% R2: 88.1% R3: 87.4% R4: 87.9%	MED: 88.7% NAT: 86.7% SOC: 87.6%	F: 88.0% M: 87.1%
Understanding and application of Open Science approaches (n=3,882)	70.4%	R1: 71.2% R2: 74.8% R3: 71.2% R4: 68.3%	MED: 75.2% NAT: 68.8% SOC: 69.0%	F: 70.5% M: 70.4%
Collaboration with other (sub)fields of research (n=4,222)	85.1%	R1: 77.4% R2: 84.9% R3: 83.3% R4: 87.8%	MED: 87.8% NAT: 82.8% SOC: 86.2%	F: 84.1% M: 85.7%
International contacts/network (n=4,240)	88.1%	R1: 81.7% R2: 89.4% R3: 86.0% R4: 90.7%	MED: 89.4% NAT: 87.2% SOC: 88.5%	F: 87.2% M: 88.7%
National contacts/network (n=4,277)	90.0%	R1: 75.7% R2: 88.9% R3: 90.9% R4: 90.4%	MED: 91.8% NAT: 89.2% SOC: 89.8%	F: 89.7% M: 90.2%
Ability to obtain (other) competitive research funding for basic research (n=4,153)	85.1%	R1: 79.5% R2: 86.0% R3: 82.9% R4: 87.8%	MED: 88.2% NAT: 86.4% SOC: 80.9%	F: 84.8% M: 85.2%
Job options in academia (n=3,898)	71.8%	R1: 70.3% R2: 77.8% R3: 71.1% R4: 71.1%	MED: 75.5% NAT: 70.3% SOC: 71.0%	F: 69.3% M: 73.2%
Job options outside of academia (n=3,673)	50.7%	R1: 57.4% R2: 60.5% R3: 51.0% R4: 47.4%	MED: 58.0% NAT: 46.2% SOC: 51.3%	F: 47.3% M: 52.6%
Overall career progression (n=4,180)	86.5%	R1: 88.4% R2: 90.2% R3: 85.2% R4: 86.8%	MED: 89.2% NAT: 85.1% SOC: 86.4%	F: 83.5% M: 88.2%
Recognition in the research community (n=4,244)	92.9%	R1: 83.6% R2: 92.8% R3: 91.6% R4: 95.0%	MED: 93.0% NAT: 93.2% SOC: 92.2%	F: 91.7% M: 93.5%
	57.7%	R1: 59.4%	MED: 60.6%	F: 54.1%

Share of researchers agreeing on these issues with respect to the effects they experienced from the grant they most recently obtained (2019)				
Progression in salary and financial conditions (n=4,081)		R2: 75.4% R3: 55.0% R4: 56.3%	NAT: 57.2% SOC: 56.3%	M: 59.8%
Quality of life (n=3,680)	59.0%	R1: 74.2% R2: 74.0% R3: 55.9% R4: 57.4%	MED: 57.1% NAT: 59.9% SOC: 59.1%	F: 56.8% M: 60.2%

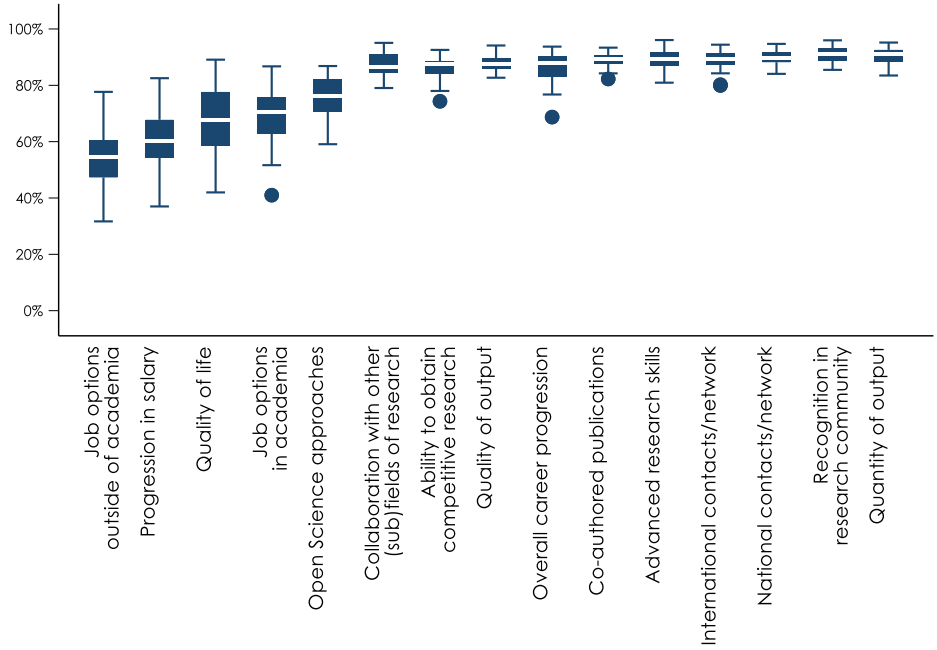
Source: MORE4 EU HE survey (2019)
Note:

- Based on question 100: "Which effects did you experience from this (most recently obtained) grant?"

Country level: For some of the effects of grants a rather high country variation can be observed; for other effects there was a strong consensus among respondents irrespective as to which country they are situated in (Figure 41). Variation is the highest with respect to effects on job options inside and outside academia, on salary and financial conditions and on the quality of life. For instance, while 89% of researchers in Romania agreed that grants affect their quality of life, only 42% of researchers in Poland agree. Similarly, 78% of researchers in the Netherlands expressed the view that grants affect job options outside academia, while this only held for 32% of researchers in Austria.

In general, there is a tendency that the effects that are recognised by the highest shares of researchers, coincide with those showing the lowest level of country variation (Figure 41). For instance, the difference between the country with the highest share of researchers agreeing on the effect of grants on recognition in the research community (UK: 96%) and the lowest share (Slovakia: 86%) is only 10pp. The same holds for the shares of researchers thinking that grants affect their national research network (Belgium 95% versus Cyprus 84%).

Figure 41: Effects of grants (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 100: "Which effects did you experience from this grant?"
- (n=4,473)

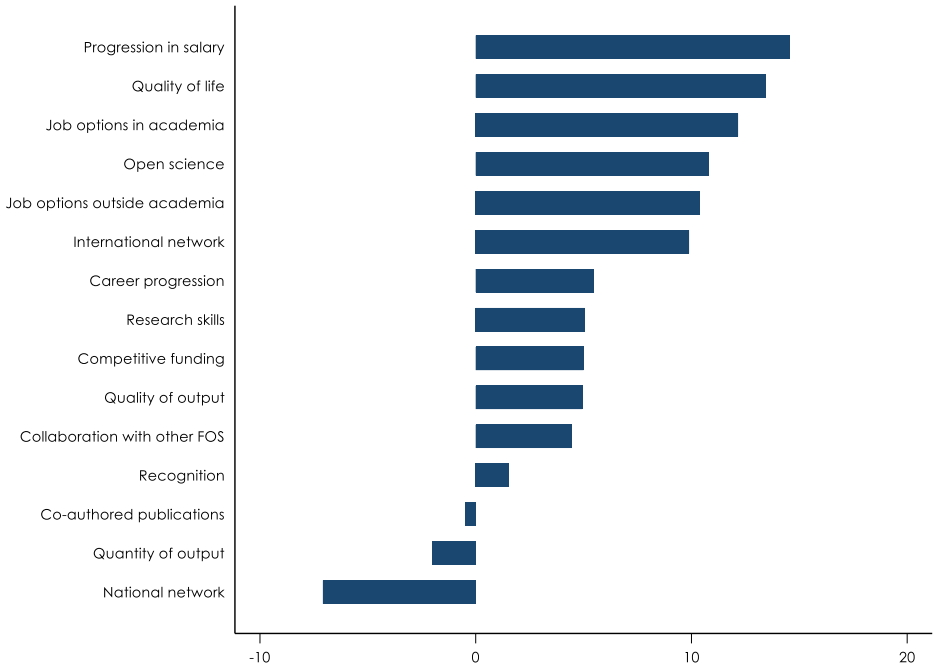
Career stages: No significant effects between career stages can be observed. The largest difference can be found in terms of quality of life. While in earlier career stages the effect of grants on quality of life is felt more strongly (74% of R1 and R2 researchers), fewer researchers in later career stages agree (56% of R3 and 57% of R4 researchers). Of course, this result is likely to be related to more precarious working conditions in terms of fixed-term contracts.

Gender: No large gender differences can be observed, they are generally within the statistical margin of error.

Fields of Science: No large differences in terms of fields of science can be observed. There is a tendency that researchers in the group of Medical Science perceive more often effects of grants than researchers in the group of Social Sciences.

By type of grant, EU grants (all types taken together) are associated more often than national grants with effects such as progression in salary, quality of life, job options in- and outside academia as well as international network and Open Science (see Figure 42). This may be linked to more international mobility as a result of EU grants. In particular ERC and MSCA grants are perceived to have effects on quality of output, career progression and job options by a significantly larger share of researchers than national grants, pointing to a considerable impact of these grants (see Figure 43). The collaborative EU grants are more similar in terms of effects to national grants, with the exception in particular of the effect on a larger international network (see Figure 43).

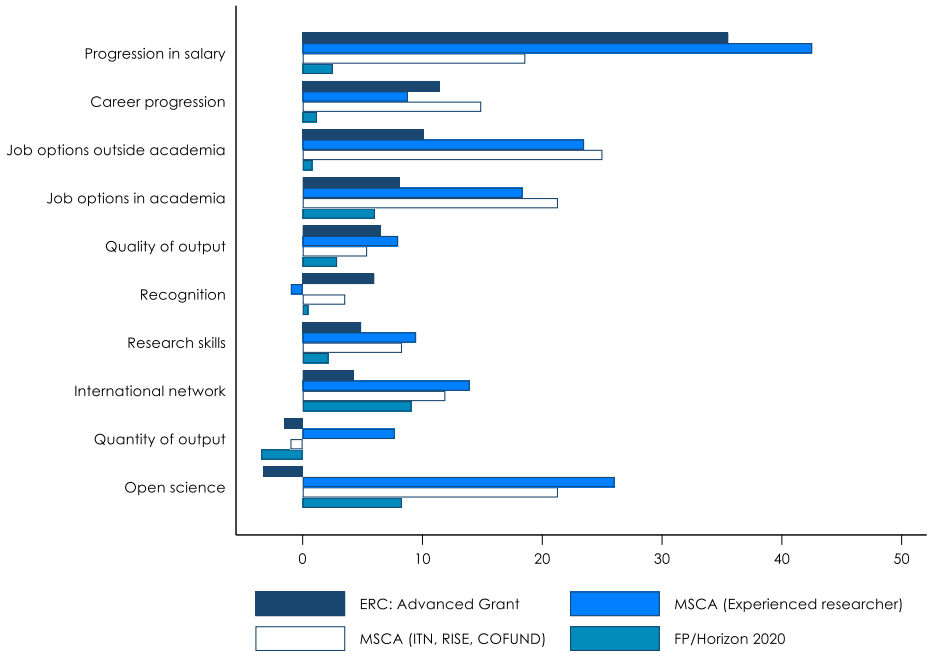
Figure 42: Difference in effects of EU grants relative to national grants (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 99: "Which of these did you obtain the most recently?"
- (n=477-507)

FIGURE 43: Difference in effects of specific EU grants vs. national grants (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 99: "Which of these did you obtain the most recently?" and question 100 "Which effects did you experience from this grant?"
- (n=507)

5.4.3.5 Confidence in future career prospects

SHARE OF RESEARCHERS WHO ARE VERY OR SOMEWHAT CONFIDENT ABOUT THEIR FUTURE CAREER (of all researchers)

	EU28 Total	Per career stage	Per FOS	Per gender
2012 (n=9,016)	77.7%	R1: 77.6% R2: 70.2% R3. 77.7% R4: 83.7%	MED: 77.2% NAT: 78.1% SOC: 77.5%	F: 77.1% M: 81.1%
2016 (n=9,412)	75.6%	R1: 68.4% R2: 68.0% R3. 77.1% R4: 82.0%	MED: 76.5% NAT: 78.0% SOC: 72.4%	F: 69.0% M: 79.9%
2019 (n= 8,540)	82.7%	R1: 78.0% R2: 73.4% R3: 82.0% R4: 89.7%	MED: 87.6% NAT: 83.0% SOC: 79.2%	F: 77.4% M: 86.3%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Note:

- Based on question 47: "Overall, how confident do you feel about the future prospects for your research career?"

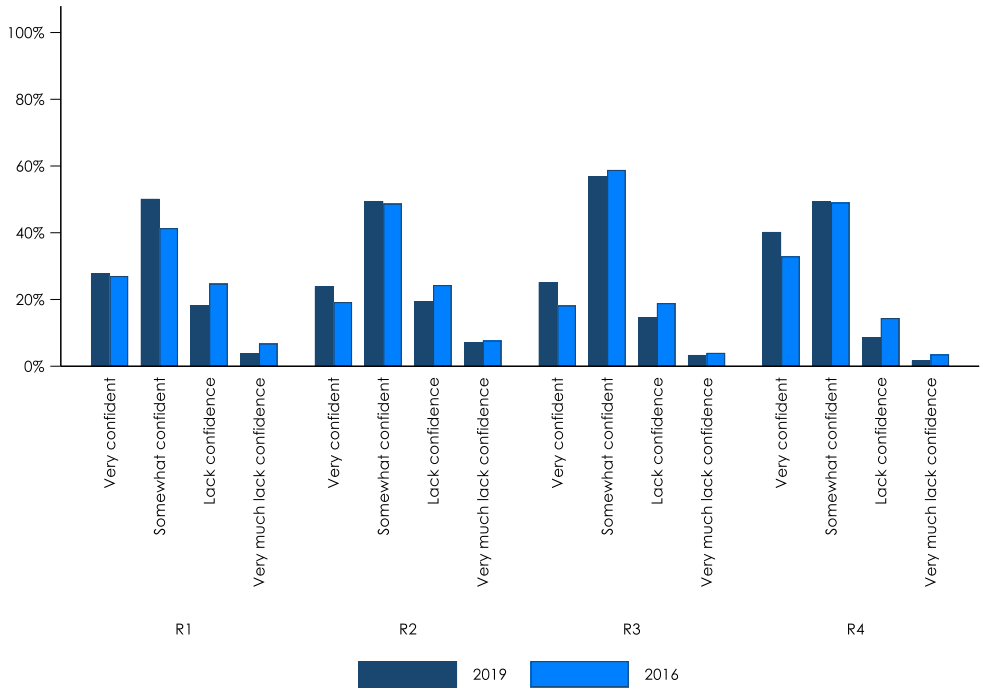
Researchers were asked how confident they feel about future prospects for their research career. On average, within the EU28, about 83% of researchers feel very or somewhat confident about their future

prospects for their research careers, i.e. an increase of confident researchers in the EU28 by 7pp since 2016; this may also be linked to better funding (see section 6 on working conditions).

Country level: Across countries, however, large differences are observable and, aside from Malta (93% of researchers), particularly in Northern Europe the group of optimistic researchers clearly dominates. The highest shares of researchers that feel very or somewhat confident about their future careers, however, are found in Iceland (96%), Austria (93%) and Slovenia (93%), as well as in Norway (92%). In contrast, in Southern European countries, particularly in Italy (63%), and Portugal (68%), the lowest share of researchers feel confident about their professional future (see Table 85 and Table 86 in Annex).

Career stage: The level of confidence in future research careers is not surprisingly related to researchers' career stages. This was the case in 2012 (MORE2) and 2016 (MORE3) and has been confirmed in 2019: leading or established researchers (R4 and R3) showed higher levels of optimism about their future than their colleagues at earlier career stages (Figure 44), linked to their contractual status (fixed-term contracts versus permanent contracts, see Figure 45). While 90% of R4 researchers had positive feelings about their future career, researchers in the early stages are more pessimistic. Only 78% of R1 researchers and 73% of R2 researchers were (very) confident about their future career prospects as a researcher.

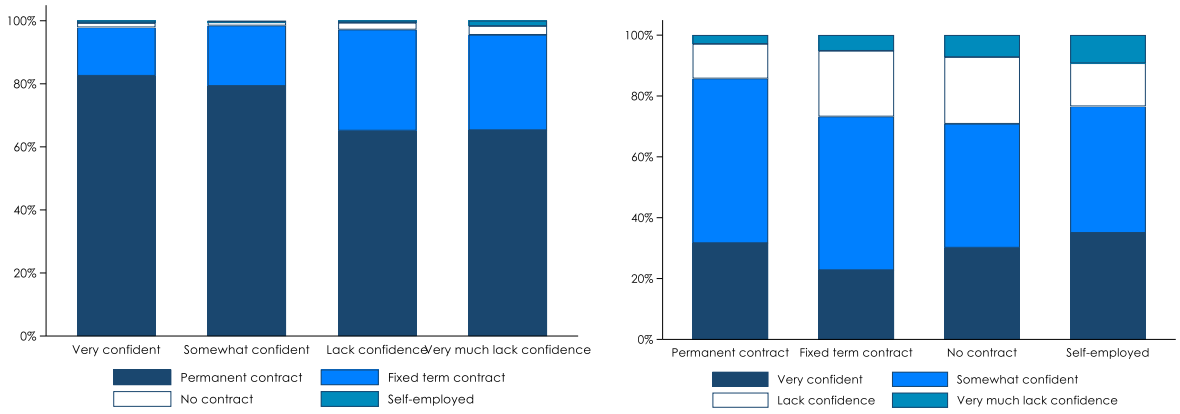
Figure 44: Confidence in future career prospects, by current career stage (EU28)



Source: MORE4 EU HE Survey (2019)
Notes:

- Researchers feeling very confident, somewhat confident, lack confidence and very much lack confidence about the future prospects for their research career.
- Based on question 47: "Overall, how confident do you feel about the future prospects for your research career?"
- (n=8,540)

Figure 45: Confidence in future career prospects, by contract type (EU28)

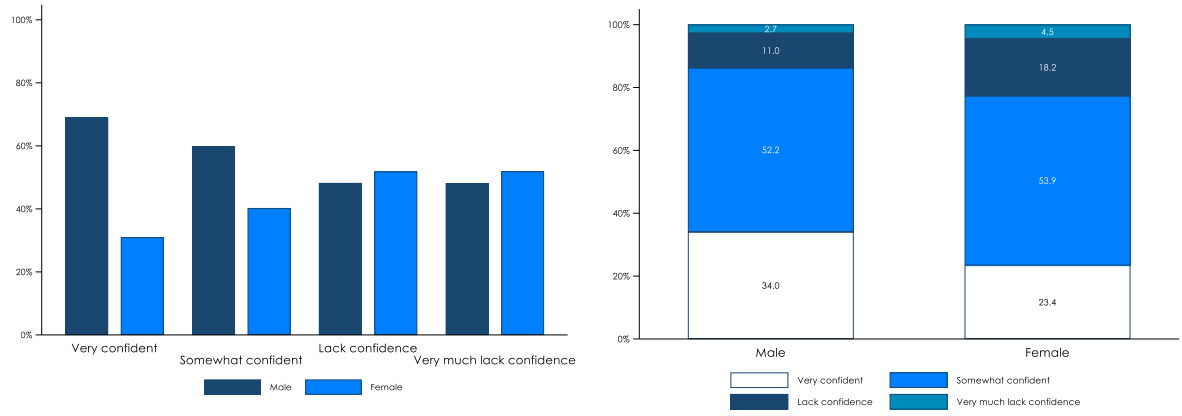


Source: MORE4 EU HE Survey (2019)
Notes:

- Researchers feeling very confident, somewhat confident, lack confidence and very much lack confidence about the future prospects for their research career.
- Based on question 47: "Overall, how confident do you feel about the future prospects for your research career?"
- (n=8,540)

Gender: In general, female researchers are more pessimistic than their male colleagues (Figure 46), which is in line with the results from MORE3. Among female researchers, only 23% (2016: 18%) feel very confident about their future career prospects (see right hand side of Figure 46). The majority, 54% (2016: 51%) of female researchers, feel somewhat confident about their future careers. In comparison, 34% (2016: 28%) of male researchers feel very confident and another 52% (2016: 52%) feel somewhat confident about their future career prospects. Regarding the proportion expressing a lack of confidence, 4% of female and 3% of male researchers lacked confidence very much about their future prospects for their research career (2016: 7% and 4%) and 18% female and 11% male researchers lacked confidence (2016: 24% and 16%).

Figure 46: Confidence in future career prospects, by gender (EU28)



Source: MORE4 EU HE Survey (2019)
Notes:

- Shares of male and female researchers feeling very confident, somewhat confident, lack confidence and very much lack confidence about the future prospects for their research career.
- Based on question 47: "Overall, how confident do you feel about the future prospects for your research career?"
- (female researchers: n=3,534; male researchers: n=5,006)

5.4.4. Dual positions

According to the literature, university-industry knowledge transfers, independent of the specific channel, as well as knowledge spillovers within HEIs can contribute to economic well-being and knowledge gains (Cañibano - Otamendi - Andújar, 2008; O'Shea - Chugh - Allen, 2008; Perkmann et al., 2013[93]). Economic development and competitiveness are strongly connected to an industry's capability to assimilate, process and apply new knowledge in order to translate this knowledge into more efficient production processes or new products and services. The role of commercialisation is also reflected by positive effects of university-industry cooperation on patenting and licensing (Lin - Bozeman, 2006; Motohashi - Muramatsu, 2012; Ponomariov, 2013[94]). Therefore, MORE2, MORE3 and MORE4 included survey questions on several intersectoral links: mobility, collaboration and dual positions of researchers, defined as being employed in more than one institution/organisation at the same time. This section discusses the situation of researchers currently in a dual position within their research career. The other types of intersectoral links are addressed in the respective sections on intersectoral mobility and collaboration (section 0 and subsections).

Having a dual position is still a marginal situation on average in Europe; in total only 11% (2016: 10%) of researchers in R2-R4 are employed by several institutions, either inside or outside the higher education sector.

[93] Perkmann, M., Tartari, V., McKelvey, M., Autio, E., Broström, A., D'Este, P., Fini, R., Geuna, A., Grimaldi, R., Hughes, A., (2013) "Academic engagement and commercialisation: A review of the literature on university–industry relations", Res. Policy, 42(2), pp. 423–442.

[94] Ponomariov, B., (2013) "Government-sponsored university-industry collaboration and the production of nanotechnology patents in US universities", J. Technol. Transf., 38(6), pp. 749–767.

Career stage: Comparing the shares of researchers combining a position in the HE-sector with another position inside or outside the HE-sector across career stages reveals that it is slightly more common for leading researchers to have a dual position (14% of R4 researchers compared to 11% of R2 and 9% of R3 researchers).

Gender: No major gender differences can be observed in terms of researchers combining a position in the HE-sector with another position inside or outside the HE-sector.

SHARE OF RESEARCHERS WITH A DUAL POSITION IN CURRENT EMPLOYMENT (of R2-3-4 researchers)

	EU28 Total	Per career stage	Per FOS	Per gender
2016 (n=8,073)	9.70%	R1: - R2: 9.0% R3. 9.2% R4: 10.8%	MED: 10.1% NAT: 8.5% SOC: 10.8%	F: 9.4% M: 9.9%
2019 (n=7,653)	10.9%	R1: - R2: 10.5% R3: 8.9% R4: 14.1%	MED: 14.4% NAT: 8.2% SOC: 11.6%	F: 11.6% M: 10.5%

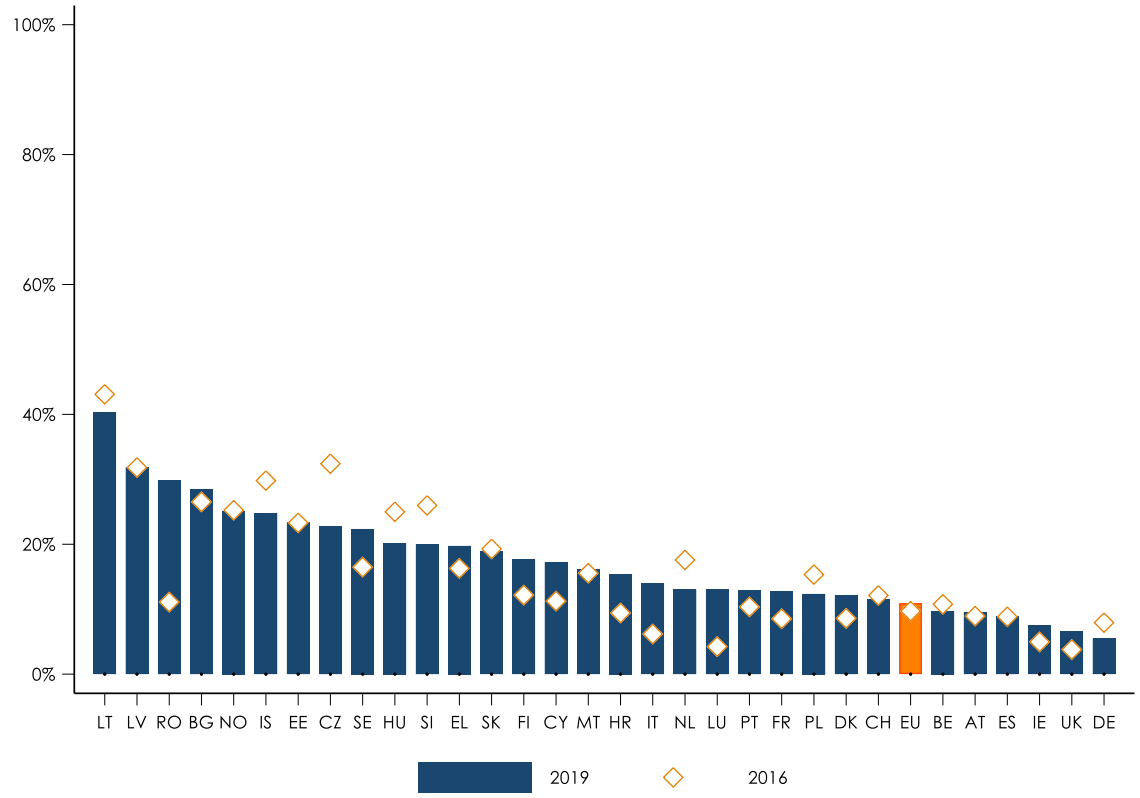
Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- In MORE3 a "dual position" is defined as being employed in more than one institution/organisation at the same time (either combined positions in more than one HEI or combined position in a HEI and in another sector). This is a broader definition of "dual position" than in MORE2 and, thus cannot be compared with MORE2 values. In MORE2 it was only asked if researchers combine employment in the HE sector with a position outside the HE sector.
- Based on question 25: "Are you currently in a so-called "dual position", whereby you are employed in more than one institution/organisation at the same time?"

Country level: Figure 47 illustrates the distribution of researchers that are employed by a HEI and by another organisation/institution, either within the HE sector or outside, at the same time. Across countries, large variations in the frequency of dual positions (outside the HE sector) can be observed, with some countries reaching shares of up to 40% of all researchers employed at several institutions/organisations at the same time (e.g. Lithuania). In general, dual positions (not only those combining a position in a HEI with another outside the HE sector) are much more common in Eastern and South-Eastern Europe than in other European countries. However, the share of researchers with dual positions is also above 20% in Norway and Sweden.

The largest difference between the MORE3 data in 2016 and the MORE4 data in 2019 can be seen for Romania, where the share increased by nearly 19pp (2016: 11%). The smallest changes in comparison with MORE3 can be found in Latvia (2016: 32%, 2019: 32%) and Estonia (2016: 23%, 2019: 23%). A large decrease is observed in Czech Republic (2016: 32%, 2019: 23%).

Figure 47: Share of researchers currently in a dual position, by country



Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Only R2, R3 and R4 researchers.
- Based on question 25: "Are you currently in a so-called "dual position", whereby you are employed in more than one institution/organisation at the same time?"
- (2019: 8,300; 2016: n=8,824)

MORE2 data on dual positions is only comprised of researchers combining a position inside the higher education sector with at least one other position outside any higher education institution. In contrast, MORE3 and MORE4 allow to differentiate between dual positions inside and outside the HE-sector and within the HE-sector (i.e. combined positions in more the one HE-institution).

In 2019, 5% of researchers combine their position in a HEI with another position outside the HE sector, i.e. in the private or governmental sector. Compared to MORE3, no large differences can be observed (2016: 3%). In 2012, according to MORE2, nearly 13% of researchers were employed by a HEI as well as institutions/organisations outside the HE sector at the same time in 2012. However, as the questions has changed since MORE3, a direct comparison with MORE2 data is limited[95].

[95] The questions regarding dual positions are slightly different in MORE2 and MORE3 (see notes below the overview tables). Moreover, in MORE2 the question was answered by researchers at all stages (including R1 researchers), while in MORE3 only R2-R4 researchers answered the question.

Career stage: Similar to the result above (including all dual positions inside and outside the HE-sector), R4 researchers seem slightly more inclined to engage in a dual position outside the HE sector (7% compared to 5% in both R3 and R2).

Gender: The share of female and male researchers combining a position in the HE-sector with another position outside is similar in size.

FOS: Similar to the results in MORE3 and MORE2 and the analysis for all dual positions in and outside the HE-sector, researchers working in the domain of Medical Sciences (including Medical Sciences and Agricultural Sciences) more often combine their position in the HE-sector with one in a sector outside the HE-sector compared to other fields of sciences (7% versus 4% in the domain of Natural Sciences and Engineering and Technology and 5% in the domain of Social Sciences and Humanities).

SHARE OF RESEARCHERS WITH A DUAL POSITION COMBINING A HE AND NON-HE POSITION IN CURRENT EMPLOYMENT
(of R2-3-4 researchers)

	EU28 Total	Per career stage	Per FOS	Per gender
2012 (n=8,046)	12.60%	R1: - R2: 14.1% R3. 11.0% R4: 13.3%	MED: 19.9% NAT: 10.9% SOC: 9.7%	F: 10.4% M: 13.8%
2016 (n=8,073)	3.30%	R1: - R2: 2.8% R3. 2.9% R4: 4.0%	MED: 5.1% NAT: 2.6% SOC: 2.8%	F: 3.2% M: 3.3%
2019 (n=8,540)	4.8%	R1: .% R2: 4.9% R3: 4.7% R4: 6.5%	MED: 7.1% NAT: 3.7% SOC: 4.5%	F: 5.6% M: 4.3%

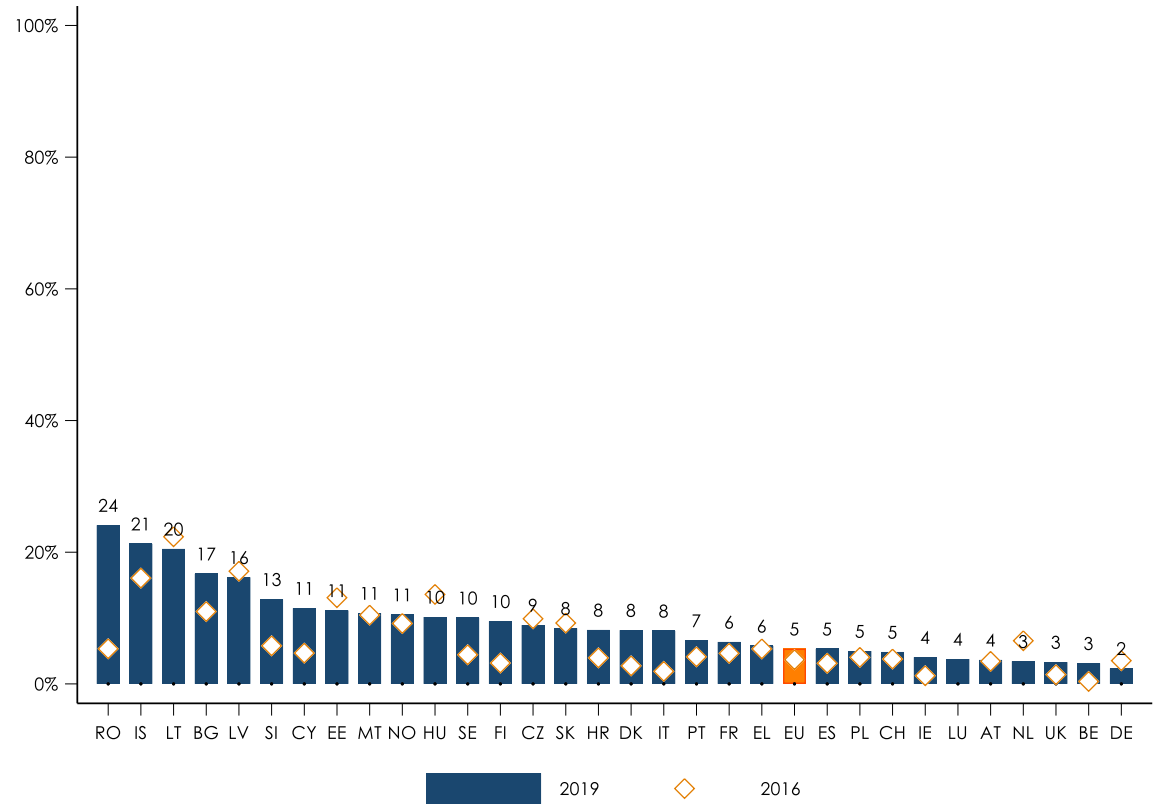
Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- In MORE2 it was only asked if researchers combine employment in the HE sector with a position in another sector (outside the HE sector). Therefore, to be able to compare with MORE2 values, the MORE3 values for dual positions in this table are restricted to combined positions in the HE sector with positions in another sector (outside the HE sector).
- Based on question 25: "Are you currently in a so-called "dual position", whereby you are employed in more than one institution/organisation at the same time?"

Country level: Supporting the results of MORE3 and the total analysis of dual position in and outside academia, Figure 48 indicates that dual positions combining a position in a HEI with one outside the HE-sector are much more common in Eastern and South-Eastern Europe than in other European countries.

In comparison with the MORE3 data, the inequality regarding the share of dual positions across countries tends to have decreased. The geographic structural trend, however, can still be observed. This is probably due to better working conditions in Western and Northern European countries, where the satisfaction with salaries and social security is generally higher than in Eastern and South-Eastern Europe (see section 5 on working conditions). In addition, research institutes might have made it their goal to fill their (decision-making) positions with researchers who also hold a university position, such as the Max-Planck-Gesellschaft or Fraunhofer-Gesellschaft in Germany. The largest difference between MORE3 and MORE4 is found in Romania (+19pp), Slovenia (+7pp) and Cyprus (+7pp).

Figure 48: Share of researchers currently in a dual position combining a HE and non-HE position, by country

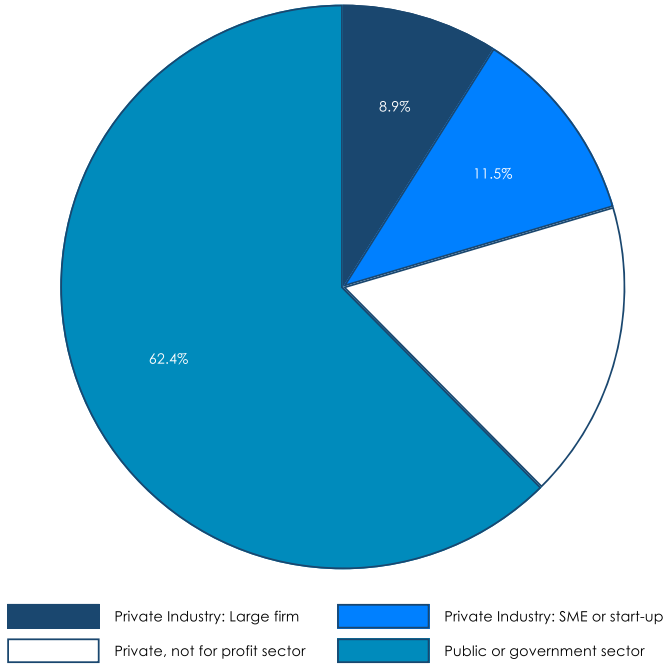


Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- Only R2, R3 and R4 researchers.
- In MORE2 it was only asked if researchers combine employment in the HE sector with a position in another sector (outside the HE sector). Therefore, to be able to compare with MORE2 values, the MORE3 values for dual positions in this figure are restricted to combined positions in the HE sector with positions in another sector (outside the HE sector).
- In 2016 the share of researchers with dual positions combining a HE and non-HE position in Belgium and in Luxemburg is zero (MORE3).
- Based on question 25: "Are you currently in a so-called "dual position", whereby you are employed in more than one institution/organisation at the same time?"
- (2019: 8,300; 2016: n=8,824)

Sectoral level: 6% of R2-R4 researchers with dual positions combine positions in several HEIs and, as reported, 5% of R2-R4 researchers are employed in a HEI as well as in another sector at the same time. Out of this 5% more than half of the researchers combine their HE-position with a position in the governmental sector (62%, 2016: 56%). Another 17% (2016: 20%) of researchers have a dual position combining the HE-sector with the private, not-for-profit sector. 12% (2016: 16%) of R2-R4 researchers with dual positions outside HEIs are either employed at or run start-ups and small and medium-sized enterprises. Only 9% (2016: 8%) of researchers employed in a HEI as well as in another sector at the same time are employed at large companies.

Figure 49: Distribution of researchers currently in a dual position combining a HE and non-HE position over non-he sectors (EU28)



Source: MORE4 EU HE Survey (2019)
Notes:

- Only R2, R3 and R4 researchers that combine a position in an HE institution with a position outside the HE sector.
- At the basis of this graph are the 624 researchers or 4,8% of all researchers in the EU28 who combine a position in the HE sector with another position in another sector.
- Based on question 25: "Are you currently in a so-called "dual position", whereby you are employed in more than one institution/organisation at the same time?"
- (n=624)

SHARE OF RESEARCHERS WITH A DUAL POSITION COMBINING A HE POSITION WITH A POSITION IN PRIVATE INDUSTRY IN CURRENT EMPLOYMENT (of R2-R3 researchers)

	EU28 Total	Per career stage	Per FOS	Per gender
2012 (n=8,046)	3.10%	R1: - R2: 3.4% R3. 3.0% R4: 2.9%	MED: 3.4% NAT: 3.6% SOC: 2.4%	F: 2.2% M: 3.6%
2016 (n=8,703)	0.80%	R1: - R2: 0.9% R3. 0.7% R4: 0.9%	MED: 0.8% NAT: 1.0% SOC: 0.5%	F: 0.6% M: 0.9%
2019 (n=8,540)	1.0%	R1: R2: 1.7% R3: 0.9% R4: 1.2%	MED: 0.8% NAT: 1.0% SOC: 1.1%	F: 0.9% M: 1.1%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- The private industry includes large private firms as well as private small and medium-sized enterprises.
- Based on question 25: "Are you currently in a so-called "dual position", whereby you are employed in more than one institution/organisation at the same time?"

SHARE OF RESEARCHERS WITH A DUAL POSITION COMBINING A HE POSITION WITH A POSITION IN PUBLIC OR GOVERNMENT IN CURRENT EMPLOYMENT
(of R2-3-4 researchers)

	EU28 Total	Per career stage	Per FOS	Per gender
2012 (n=9,016)	8.00%	R1: - R2: 9.3% R3. 6.7% R4: 8.5%	MED: 14.7% NAT: 6.1% SOC: 5.7%	F: 6.5% M: 8.9%
2016 (n=9,412)	1.80%	R1: - R2: 1.1% R3. 1.5% R4: 2.7%	MED: 2.9% NAT: 1.3% SOC: 1.5%	F: 1.8% M: 1.8%
2019 (n=8,540)	3.0%	R1: - R2: 2.9% R3: 3.0% R4: 4.0%	MED: 5.7% NAT: 2.0% SOC: 2.3%	F: 4.1% M: 2.3%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Note:

- Based on question 25: "Are you currently in a so-called "dual position", whereby you are employed in more than one institution/organisation at the same time?"

Compared to MORE3, the share of R2-R4 researchers combining a position in the HE-sector with a position in the private industry (large firms, SMEs or start-ups, not-for-profit organisations) is rather stable at 1% (2016: 0.8%). No large differences between career stages, gender or fields of science can be observed.

The share of R2-R4 researchers combining a position in the HE-sector with another position in the governmental sector has increased by more than 1pp since 2016 (from 2% to 3%). Especially leading researchers (4%) combine their HE-position with a position in public or government. In common with the findings in MORE2 and MORE3, as well as the previous analyses in this section, researchers from Medical Sciences or Agricultural Sciences have a higher probability to choose this combination of positions than researchers from other sciences. Contrary to MORE3 (where we observed no gender differences), nearly twice as many female (4%) as male R2-R4 researchers (2%) having a dual position combining the HE-sector with the governmental sector.

6. Working conditions in the current HEI position

Researchers, particularly academic researchers, experience a highly competitive working environment. The "up-or-out" nature of research results in a high proportion of researchers dropping out of research careers. While the specific "the winner-takes-it-all" aspect of (academic) research might lead to undesired dropouts of highly talented researchers, serious competition among researchers can enhance scientific productivity and lead to pioneering new insights. However, this holds only true if the selection criteria are largely merit-based and leaving the academic labour market is not due to bad working conditions or other individual characteristics like gender or ethnic minority (Geuna - Shibayama, 2015[96]).

Research careers are terminated not only because of low levels of productivity. Donowitz et al., 2007[97], show that, despite high labour demand, the number of young American physician-scientists is stagnating due to more attractive working conditions and secure career paths outside academia. The availability of stable funding and research grants, as a measure to ensure continuation of career paths and reduce insecurity, is found to be not only productivity enhancing (Dasgupta - David, 1994) but also to reduce chances of researchers leaving the profession (Geuna - Shibayama, 2015[98]). Aside from financial support, there are several other factors (e.g. collaboration possibilities, teaching and social recognition) influencing both research quality, scientific productivity and the transition and diffusion of knowledge as well as the well-being and satisfaction of researchers.

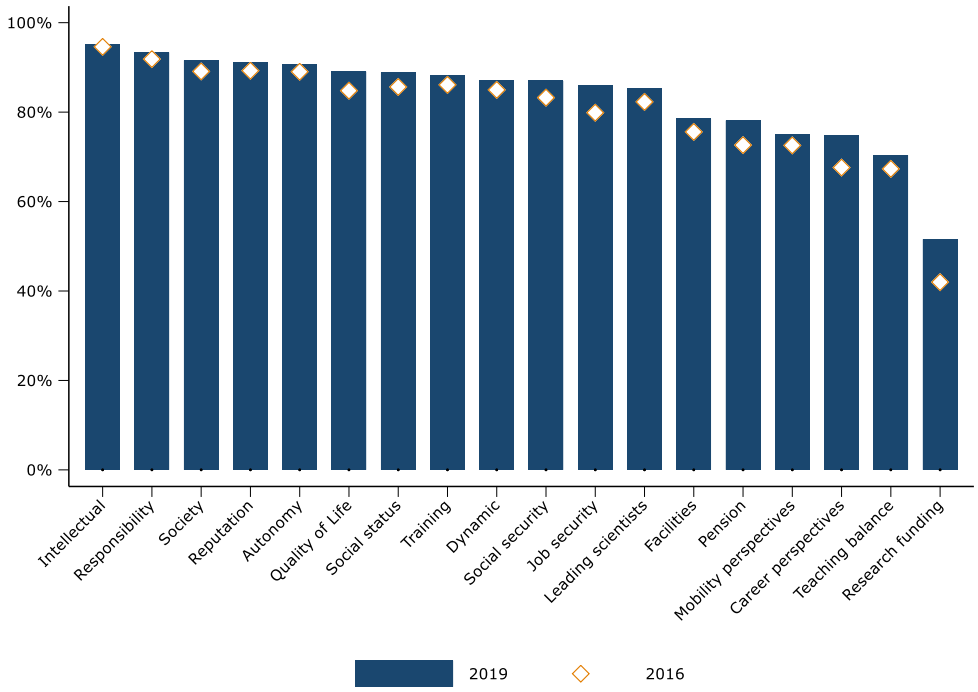
In the MORE4 EU HE survey, questions are asked of all researchers on the characteristics of their current employment and on their satisfaction with different conditions in their current employment. In this section, we describe the outcomes thereof. As in section 5, we sometimes group countries by their higher education system when country differences are likely to be linked to structural differences in higher education systems, and sometimes by geographic area when country differences are likely to be linked to differences in economic development. In order to provide a summary, the following figure illustrates researchers' level of satisfaction with each of the different working conditions listed in the survey. At the bottom end are research funding, remuneration, career perspectives and the balance between teaching and research, at the top end, the level of intellectual challenge and responsibility associated with researchers' current position. In comparison with 2016, the shares of satisfied researchers have somewhat increased across the board, with the most significant improvements for research funding (+10pp) and career perspectives (+7pp).

[96] Geuna, A., Shibayama, S., (2015) "Moving Out Of Academic Research: Why Scientists Stop Doing Research?", in Geuna, A. (Ed.), Glob. Mobil. Res. Sci. Econ. Who Goes Why, Elsevier, pp. 271–303.

[97] Donowitz, M., Germino, G., Cominelli, F., Anderson, J. M., (2007) "The attrition of young physician-scientists: problems and potential solutions", Gastroenterology, 132(2), pp. 477–480.

[98] Geuna, A., Shibayama, S., (2015) "Moving Out Of Academic Research: Why Scientists Stop Doing Research?", in Geuna, A. (Ed.), Glob. Mobil. Res. Sci. Econ. Who Goes Why, Elsevier, pp. 271–303.

Figure 50: Individual satisfaction with working conditions (EU28)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=7,603-8,414;2016: n=8,382-9,303)

The following tables show the evolution of perceived satisfaction with working conditions between 2012 and 2019. The working conditions are clustered into aspects related to academic life (intellectual challenges, the reputation of the employer, degree of research autonomy and the level of responsibility), employment conditions (job location/quality of life, job security, pension plan, remuneration package), personal aspects (contribution to society, social status, dynamic work environment) and career aspects (career and mobility perspectives). Compared to MORE2 and MORE3, there is a clear upward trend. The tables show values of these indicators for 2012, 2016 and 2019. However, the figures for 2012 are not fully comparable to those of 2016 and 2019 because MORE3 (and consistently also MORE4) included a larger number of working conditions in this question than MORE2 (notably with respect to conditions for scientific knowledge production such as working with leading scientists).

SATISFACTION IN CURRENT ACADEMIC POSITION WITH ACADEMIC ASPECTS (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2012 (n = 9,106)	89.30%	R1: 90.8% R2: 86.3% R3: 88.4% R4: 91.7%	MED: 90.8% NAT: 89.9% SOC: 87.6%	F: 87.8% M: 90.2%
2016 (n = 9,303)	91.20%	R1: 91.1% R2: 89.6% R3. 90.2% R4: 93.5%	MED: 92.0% NAT: 92.0% SOC: 89.8%	F: 90.2% M: 91.8%
2019 (n = 8,414)	92.6%	R1: 94.0% R2: 92.5% R3: 90.9% R4: 94.6%	NAT: 93.5% MED: 94.5% SOC: 90.3%	F: 90.2% M: 94.1%
SATISFACTION IN CURRENT ACADEMIC POSITION WITH EMPLOYMENT ASPECTS (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2012 (n = 9,016)	59.60%	R1: 58.6% R2: 53.7% R3: 59.5% R4: 65.2%	MED: 59.9% NAT: 60.6% SOC: 58.3%	F: 57.0% M: 61.2%
2016 (n = 9,412)	77.50%	R1: 73.1% R2: 71.6% R3. 77.9% R4: 82.7%	MED: 80.9% NAT: 78.0% SOC: 74.6%	F: 74.0% M: 79.7%
2019 (n = 8,540)	82.1%	R1: 78.8% R2: 77.2% R3: 82.0% R4: 85.4%	NAT: 84.0% MED: 85.9% SOC: 77.4%	F: 78.3% M: 84.5%
SATISFACTION IN CURRENT ACADEMIC POSITION WITH PERSONAL ASPECTS (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2012 (n = 9,016)	83.60%	R1: 81.3% R2: 80.1% R3: 83.9% R4: 87.2%	MED: 86.8% NAT: 83.9% SOC: 81.1%	F: 82.3% M: 84.4%
2016 (n = 9,206)	86.60%	R1: 85.5% R2: 86.2% R3. 85.0% R4: 89.4%	MED: 90.0% NAT: 87.4% SOC: 83.3%	F: 84.2% M: 88.0%
2019 (n = 8,337)	89.2%	R1: 89.7% R2: 89.1% R3: 88.0% R4: 90.9%	NAT: 90.8% MED: 93.3% SOC: 84.7%	F: 86.8% M: 90.8%

SATISFACTION IN CURRENT ACADEMIC POSITION WITH CAREER-RELATED ASPECTS (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2012 (n = 9,016)	63.00%	R1: 68.3% R2: 60.1% R3: 59.2% R4: 66.6%	MED: 62.6% NAT: 65.5% SOC: 60.5%	F: 58.9% M: 65.5%
2016 (n = 8,827)	70.10%	R1: 67.8% R2: 66.0% R3. 67.2% R4: 78.1%	MED: 74.1% NAT: 70.4% SOC: 66.9%	F: 64.0% M: 74.0%
2019 (n = 7,969)	74.9%	R1: 73.1% R2: 71.6% R3: 72.9% R4: 80.3%	NAT: 77.6% MED: 81.4% SOC: 67.6%	F: 68.2% M: 79.3%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- The MORE3 questionnaire included a larger number of items for this question compared to the MORE2 questionnaire. Therefore, differences between MORE2 and MORE3 should be interpreted with caution since the indicators are not based on exactly the same items in MORE2 and in MORE3 (see details below).
- Academic aspects include intellectual challenge, level of responsibility, reputation of employer, degree of independence (MORE2); and intellectual challenge, level of responsibility, reputation of employer, research autonomy (MORE3/MORE4), respectively.
- Employment aspects include job security, benefits, salary (MORE2); and quality of life, job security, social security, pension plan, remuneration package (MORE3/MORE4), respectively.
- Personal aspects include contribution to society, dynamism, social status (MORE2); and contribution to society, dynamic work environment, social status (MORE3/MORE4), respectively.
- Career-related aspects include mobility perspectives, opportunities for advancement (MORE2); and mobility perspectives, career perspectives (MORE3/MORE4), respectively.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"

This myriad of perceived working conditions potentially relevant for working as a researcher makes it difficult to single out the principal working conditions. MORE2 used a stated choice approach to identify the most relevant working conditions[99]. Based on the analysis of these data by Janger & Nowotny (2016), in MORE3 and MORE4 we have conceptualised the main relevant working conditions as falling into one of three categories, namely:

- **Working conditions not directly affecting scientific knowledge production**, such as conditions relevant for extrinsic pecuniary motivations to engage in a research career (e.g. salary and pension entitlements), and working conditions affecting social and content-specific motivations of a research career,
- **Working conditions affecting the production of scientific knowledge**, such as research funding, working with stimulating peers or the career-path determined time horizon available for implementing one's research agenda.
- **Working conditions relevant for both knowledge production, financial and career development motivations**, such as the prospects for mobility

[99] IDEA Consult et al, 2013. MORE2 - Support for continued data collection and analysis concerning mobility patterns and career paths of researchers, Final Report. European Commission, DG Research and Innovation. And Janger, J., Nowotny, K., (2016) "Job choice in academia", Research Policy, 45(8), pp. 1672–1683.

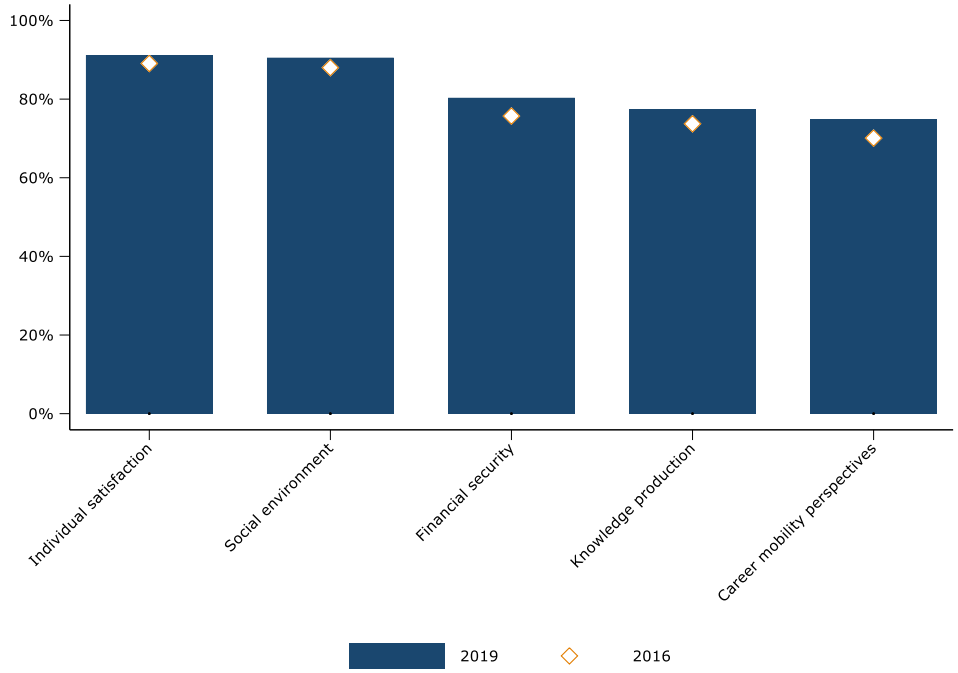
Figure 51 shows the EU averages for working conditions based on this structure:

- **Financial security**: Perceived working conditions affecting extrinsic pecuniary motivations are shown by items contained in financial security (average of remuneration, job security, pension plan and social security);
- **Social environment and recognition**: Social and content-specific working conditions are shown by items contained in social environment and recognition (social status, reputation of employer, contribution to society);
- **Individual satisfaction at work**: Degree of intellectual challenge, working in a dynamic work environment, the level of responsibility and quality of life;
- **Perceived working conditions affecting scientific knowledge production**: average of satisfaction with research funding and access to facilities (financial support for research), working with leading scientists and the perceived quality of education and training (intellectual support), satisfaction with researchers' time for research vs teaching as well as with research autonomy (own research time);
- **Career and mobility perspectives**: these both affect knowledge production and financial security, so that they are shown as a separate bar.

While the share of researchers who indicate that they are satisfied with their current job with individual aspects (intellectual challenge, dynamic work environment, level of responsibility and quality of life) is very high (91%), the share of researchers that are satisfied with career and mobility perspectives (driven by career perspectives) are at the lower end (75%). This illustrates the conundrum of embarking on a career in research. Whilst there are positive motivators, such as the degree of intellectual challenge and satisfaction with job-specific research activities and research projects, there are also less positive aspects regarding career and job uncertainties.

The share of researchers satisfied with social factors is also at a high level (91%). However, the averages mask heterogeneity within the groups, which is analysed in detail below. Regarding financial security, a rather low percentage of researchers perceived remuneration to be satisfying and high shares are content with social security. Within the category of conditions for knowledge production, some aspects also are considered very positively by a high percentage of researchers (e.g., research autonomy) while others show a lower percentage of satisfied researchers (e.g. research funding).

Figure 51: Systematisation of working conditions (EU28)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=7,969-8,540, 2016: n=8,827-9,412)

In the following sections, the findings on working conditions based on MORE4 data will be presented along with the systematisation of working conditions. The first section 6.1 will group all working conditions relevant for motivation in relation to financial remuneration and benefits less relevant for scientific knowledge production, the second (6.2) deals with working conditions relevant for scientific knowledge production, the third section with the cross-cutting issues of career and mobility perspectives.

6.1. Remuneration and other non-science related working conditions

This subsection first looks at financial security (including remuneration and job and social security), then at the social environment and recognition and finally at the individual, content-specific satisfaction at work.

6.1.1. Financial security[100]

6.1.1.1 Remuneration

SHARE OF RESEARCHERS THAT CONSIDER THEMSELVES WELL PAID OR PAID A REASONABLE SALARY (of all researchers)

	EU28 Total	Per career stage	Per FOS	Per gender
2016 (n=9,412)	67.0%	R1: 69.1% R2: 63.2% R3. 65.7% R4: 70.2%	MED: 65.9% NAT: 69.1% SOC: 65.7%	F: 63.9% M: 69.1%
2019 (n=8,540)	70.4%	R1: 66.1% R2: 71.8% R3: 67.6% R4: 75.2%	MED: 70.9% NAT: 72.2% SOC: 68.1%	F: 67.4% M: 72.4%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Note:

- Based on question 33: "How do you feel about your remuneration package (if you do not take into account a second income or, if applicable, the income of your partner)?"

[100] The overview tables do not show 2012, as in 2016 and 2019 a more detailed question was asked about salary. In 2012, on average in the EU27, 53% of researchers were satisfied with their salary, so that the figure in 2016 can be considered an improvement compared to 2012.

SHARE OF RESEARCHERS THAT CONSIDER THE REMUNERATION PACKAGE IN THEIR CURRENT ACADEMIC POSITION BETTER/WORSE THAN THAT OF PEOPLE WITH COMPARABLE SKILLS AND EXPERIENCE OUTSIDE ACADEMIA
(of all researchers)

	EU28 Total	Per career stage	Per FOS	Per gender
Better 2016	9.8%	R1: 14.9% R2: 9.7% R3. 9.0% R4: 8.3%	MED: 10.5% NAT: 9.2% SOC: 9.9%	F: 11.5% M: 8.7%
Better 2019	10.1%	R1: 10.4% R2: 7.4% R3: 11.3% R4: 9.3%	MED: 11.4% NAT: 10.0% SOC: 9.3%	F: 9.7% M: 10.3%
Worse 2016	59.5%	R1: 46,9% R2: 52,7% R3. 63,9% R4: 64,1%	MED: 56,5% NAT: 61,1% SOC: 59,7%	F: 60,1% M: 59,1%
Worse 2019	55.9%	R1: 55.6% R2: 50.4% R3: 57.2% R4: 56.4%	MED: 50.0% NAT: 57.1% SOC: 58.5%	F: 57.9% M: 54.6%

Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:
- Based on question 35: "How would you compare your remuneration package to that of people with comparable skills and experience outside academia?"
- (2019: n=7,592, 2016: n=9,412)

Overall, about 2 out of 3 EU researchers feel well (22%) or reasonably paid (48%), while 20% feel paid sufficiently to only make ends meet and the remaining 8% indicated that they struggle to make ends meet given the inadequate salary (Figure 52).[101]

Career stage: This pattern does not strongly differ across career stages. The largest differences with the overall distribution are found for R1 and R4 researchers. More R4 researchers feel well or reasonably paid than R1 researchers (75% to 66%). This is different from MORE3, where R1 researchers had a similar share as R4 researchers, and the smallest share was found for R2 researchers. However, among researchers that considered themselves to be badly paid no structural differences between career stages could be observed (between 7 and 10% of researchers feel badly paid).

Country level: There were larger differences, however, across countries (see Figure 52). While 92% of researchers in Luxembourg and Germany, and 90% of researchers in the Netherlands feel well or at least reasonably paid, this share is low in Greece (23%) and Slovakia (39%). Hence, in these countries the share of researchers struggling with their income is comparably high.

There were found to be some differences across countries concerning which career stages are most heavily affected by low salaries, or – more precisely – in the researchers' perception of being badly paid. While for instance, researchers in Belgium or Portugal showed similar shares of dissatisfaction with their remuneration in all career stages, in other countries, the share of researchers unsatisfied with their remuneration decreased significantly for the higher career stages. This holds for instance for Czech Republic, Spain and Lithuania, but also for countries where researchers perceived themselves to be

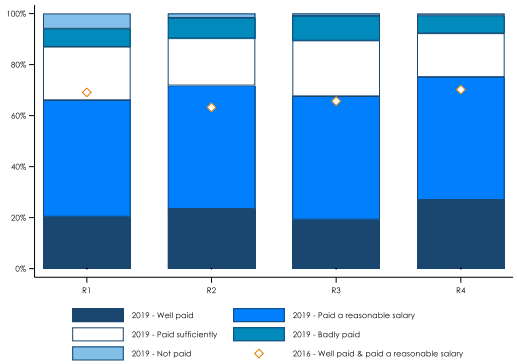
[101] 1% of researchers stated that they were not paid.

better paid overall (e.g., Switzerland or Germany). This could reflect a dominance of general economic conditions or the higher education system features in certain countries, while in other countries, more career-stage related characteristics prevail.

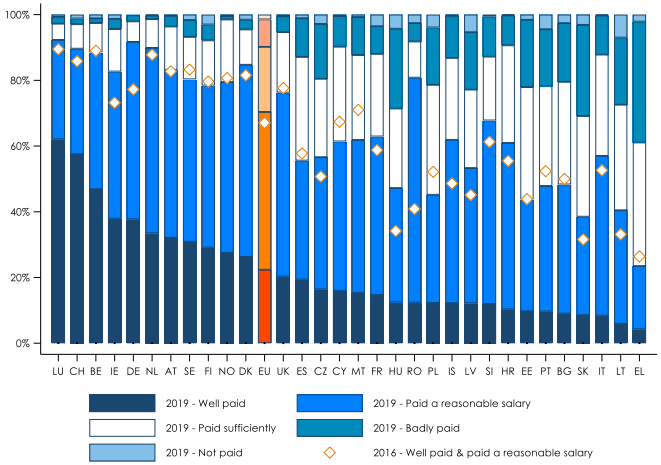
Field of Science: No large differences between fields of science can be observed.

Figure 52: Perception of remuneration, by career stage (EU28) and by country

By career stage (EU28)



By Country



By career stage and country

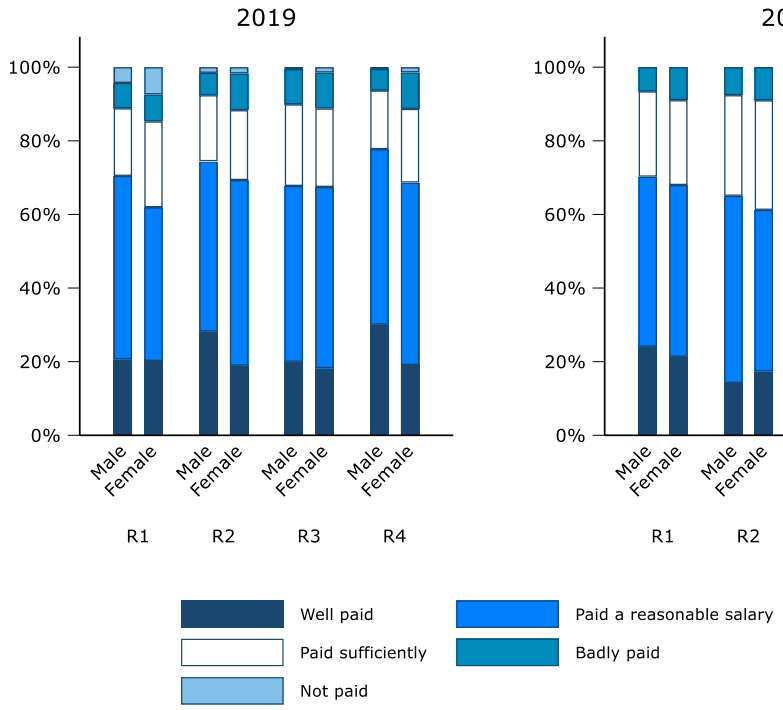
	R1	R2	R3	R4
Austria	27%	20%	17%	12%
Belgium	11%	10%	9%	16%
Bulgaria	NA	48%	51%	49%
Croatia	NA	57%	38%	31%
Cyprus	NA	NA	39%	34%
Czech Republic	74%	50%	42%	33%
Denmark	19%	12%	19%	10%
Estonia	NA	NA	63%	36%
Finland	NA	15%	20%	15%
France	41%	23%	43%	35%
Germany	14%	12%	4%	6%
Greece	NA	NA	79%	78%
Hungary	73%	NA	52%	43%
Iceland	NA	NA	53%	15%
Ireland	NA	29%	15%	8%
Italy	NA	NA	41%	43%
Latvia	68%	NA	45%	47%
Lithuania	73%	59%	64%	48%
Luxembourg	18%	7%	4%	0%
Malta	NA	NA	41%	27%
Norway	40%	21%	19%	12%
Poland	NA	55%	62%	39%
Portugal	NA	55%	52%	52%
Romania	NA	21%	19%	12%
Slovakia	36%	62%	72%	46%
Slovenia	43%	21%	37%	29%
Spain	78%	57%	45%	31%
Sweden	23%	25%	19%	17%
Switzerland	15%	12%	10%	5%
The Netherlands	18%	10%	10%	6%
United Kingdom	NA	NA	26%	17%
EU	**34%**	**28%**	**32%**	**25%**

Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)

Notes:
- Based on question 33: "How do you feel about your remuneration package (if you do not take into account a second income or, if applicable, the income of your partner)?
- The right table per country and career stage is based on the shares of researchers feeling only sufficiently paid, badly paid or are not paid at all. Red shades indicate high shares of researchers feeling only sufficiently paid, badly paid or are not paid at all, while green shades indicate low shares.
- (2019: n=9,299; 2016: n=10,394)

Gender: Compared to MORE3, a small but persistent gender wage gap was identified from the perspective of researchers' perceptions. Overall, the share of female researchers (33%) feeling badly paid or paid sufficiently to only make ends meet is higher than the respective share of male researchers (28%). Across career stages, the share of female researchers assessing themselves as well-paid is equal (R1) or up to 11pp (R4) lower than the respective share of male researchers (see Figure 53). Compared to MORE3 this pattern seems to be quite robust. However, the results by Janger and Nowotny (2016)[102] show that female researchers attach a lower importance to salary compared with other aspects of researcher jobs, so that at the same salary level self-reported satisfaction with salary would be higher for women than men. Also, the shares of subgroups indicating either well or reasonably paid researchers is always higher for male researchers, while the opposite is true for badly paid and not paid researchers, or those struggling to make ends meet given the bad salary (Figure 53).

Figure 53: Perception of remuneration, by gender (EU28)



Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers considering themselves well paid, paid a reasonable salary, paid sufficiently to only make ends meet, badly paid and struggling to make ends meet or not paid.
- The category "not paid" doesn't exist in MORE3 (2016).
- Based on question 33: "How do you feel about your remuneration package (if you do not take into account a second income or, if applicable, the income of your partner)?"
- (2019: n=8,540; 2016: n= 9,412)

Dual positions: Dual positions seem to go hand in hand with the perception that salaries are less attractive (see left panel in Figure 54). Researchers who are only employed in one institution are more often satisfied with their salaries. While 72% of these researchers feel well (23%) or reasonably (49%)

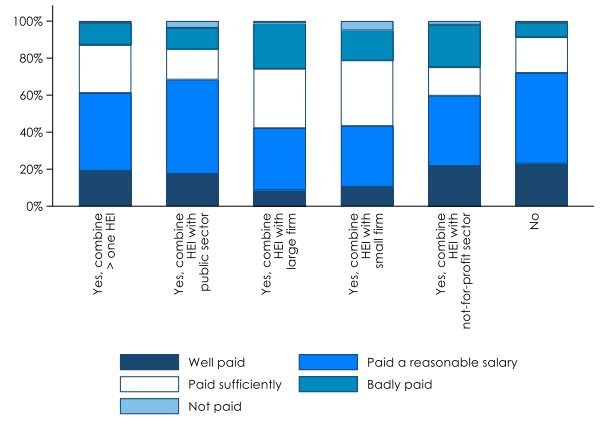
[102] Janger, J., Nowotny, K., (2016) "Job choice in academia", Research Policy, 45(8), pp. 1672–1683.

paid in their single position in their HEI, only 8% indicate that they are struggling making ends meet. In contrast, only 42% of the researchers being employed in a HEI as well as in a large firm in the private sector feel well (9%) or reasonably (33%) paid.

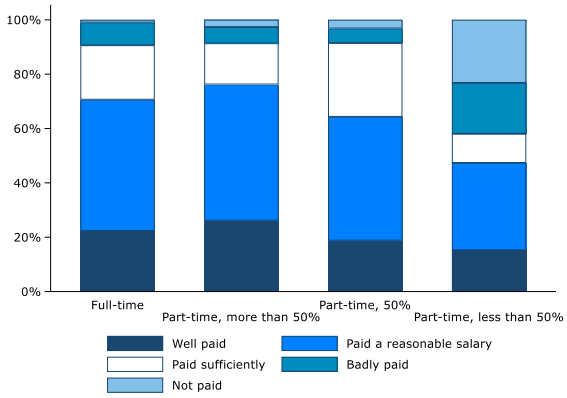
Furthermore, there are also variations between different types of dual positions. While 60-70% of researchers combining a position in the HEI with one in the public or not-for-profit sector consider themselves to be well or reasonably paid, only slightly more than 40% of those combining a HEI position with one in the private industry are satisfied. This difference might result from researchers' higher average wages in the private sector relative to other sectors. Having the direct comparison with full-time working researchers in the private sector might lead to lower satisfaction levels of those that work part-time in the HEI sector as well.

Figure 54: Perception of remuneration, by dual position and by type of position (EU28)

Dual position, only R2-R4



Type of position, R1-R4



Source: MORE4 EU HE Survey (2019)
Notes:

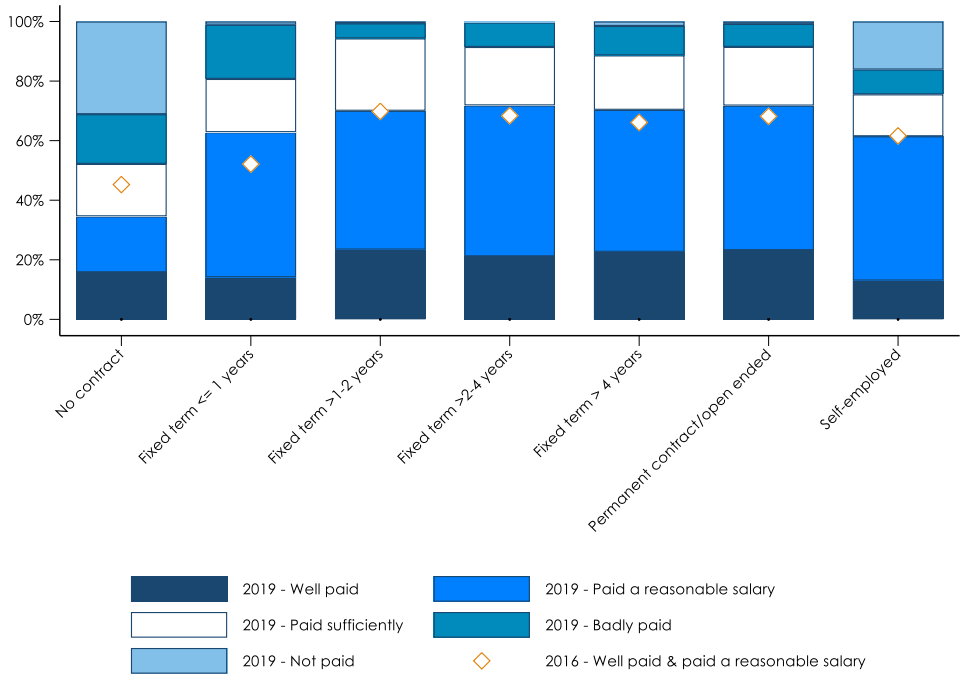
- Share of researchers considering themselves well paid, paid a reasonably salary, paid sufficiently to only make ends meet, badly paid and struggling to make ends meet or not paid.
- Based on question 25: "Are you currently in a so-called "dual position", whereby you are employed in more than one institution/organisation at the same time?", question 29: "Type of position" and question 33: "How do you feel about your remuneration package (if you do not take into account a second income or, if applicable, the income of your partner)?"
- (left: n=7,653, and right: n=8,073)

As observed, researchers having dual position are overall less satisfied with their remuneration than researchers that are employed by only one HEI. However, given the available data it is not clear whether these differences might be explained by the fact that remuneration for part-time positions[103] is less attractive or whether potentially less attractive remuneration in academia tends to force researchers to take up a second job (outside academia).

[103] Researchers were explicitly asked to exclude other income (e.g. of their partner) in evaluating their remuneration at the HEI.

In terms of the type of position (see right panel in Figure 54), researchers evaluate their remuneration to be less attractive if they are working part-time, working hours less than 50% of a full-time position. The share of researchers feeling well-paid (15%) or paid a reasonable salary (32%) drops to nearly half. They also have the highest share of researchers feeling badly paid (19%). Interestingly, differences are quite low between full-time employed and part-time employed with more than 50% of working hours. The group of employees working part-time with working hours more than 50% of a full-time position even consider themselves to be slightly better paid (sum of well and reasonably paid: 76% vs. 71%.

Figure 55: Perception of remuneration, by type of contract (EU28)



Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers considering themselves well paid, paid a reasonable salary, paid sufficiently to only make ends meet, badly paid and struggling to make ends meet, or not paid.
- Based on question 28: "Type of contract" and question 33: "How do you feel about your remuneration package (if you do not take into account a second income or, if applicable, the income of your partner)?"
- (2019: n=8,540, 2016: n= 9,412)

Type of contract: When looking at satisfaction levels with remuneration across different types of contract, the share of researchers feeling badly paid or only sufficiently paid to make ends meet was highest unsurprisingly among those regarded as still being PhD candidates and who therefore have no formal contract (see Figure 55). The differences among the remaining durations of fixed-term contracts but also permanent contracts are remarkably low. The largest difference can be found between the group of researchers with fixed-term contracts lasting less than a year and all other fixed-term contracts. 14% of those researchers feel well paid and another 49% feel reasonably paid. In the other groups of researchers having fixed-term contracts the share of researchers feeling well or reasonably well paid is slightly higher at 70-72%. Moreover, the share of researchers felling badly paid is the highest in the group of fixed-term contracts of less than a year (18%). The shortest fixed-term contracts are therefore

more related to student status conditions while the longer fixed-term contracts have similar remuneration conditions as in a permanent position.

Table 10: Perception of remuneration in academia compared to outside academia (EU28)

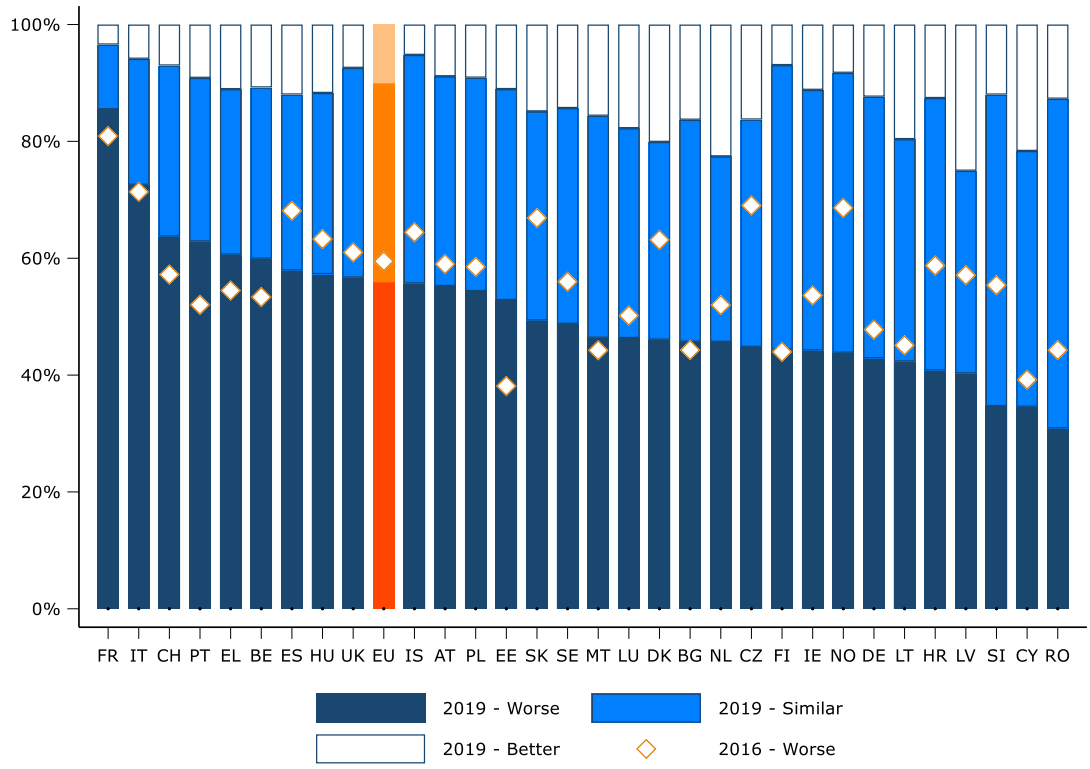
	WORSE	SIMILAR	BETTER
EU 2016	59%	31%	10%
EU 2019	56%	34%	10%

Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers comparing their remuneration to that of people with comparable skills and experiences outside academia and assessing it to be worse, similar or better.
- Based on question 35: "How would you compare your remuneration package to that of people with comparable skills and experience outside academia?"
- (2019: n= 7,592, 2016: n=8,212)

Compared to people outside academia with comparable skills and experience, 56% of EU researchers feel worse paid in academia. 34% feel there is little difference and only 10% of EU researchers perceive themselves as better paid in academia than their non-academic counterparts. Compared to the MORE3 survey in 2016 there are no large differences on average for the EU28. However, there exist large differences between countries and within countries over time (see Figure 56).

Figure 56: Perception of remuneration in academia compared to outside academia, by country



Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers comparing their remuneration to that of people with comparable skills and experiences outside academia and assessing it to be worse, similar or better.
- Based on question 35: "How would you compare your remuneration package to that of people with comparable skills and experience outside academia?"
- (2019: n=8,283, 2016: n= 9,115)

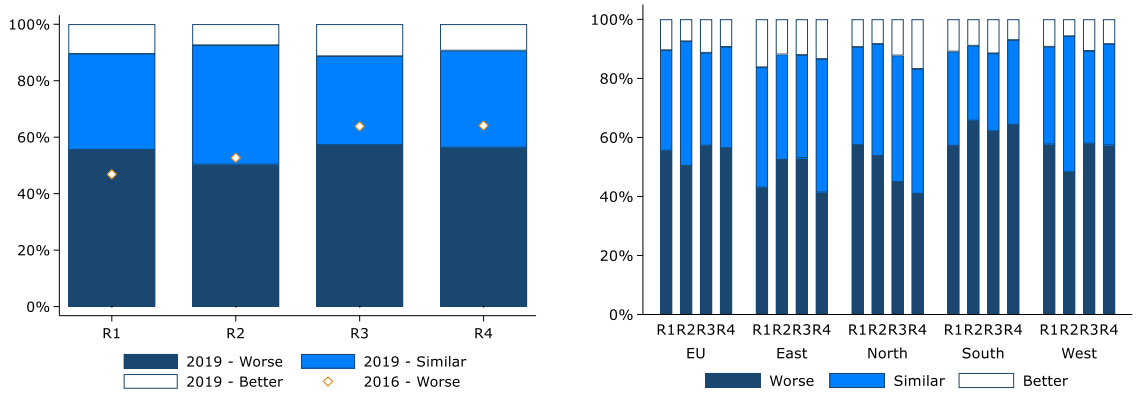
Country level: The largest share of researchers feeling worse paid in academia is found in France (85%) followed by Italy (73%), and Switzerland (64%) (see Figure 46). In Romania (31%), Cyprus (35%) and Slovenia (35%) the lowest share of researchers feels worse paid. In comparison to 2016 the biggest differences can be found in Norway (-25pp), the Czech Republic (-24pp) and Slovenia (-21pp). Overall, the shares of researchers feeling paid worse than outside academia have decreased in most of the countries since 2016.

The share of researchers feeling better paid in academia than outside academia is the highest in Latvia (25%), the Netherlands (23%) and Cyprus (22%), while the lowest shares can be found in France (3%), Iceland (5%) and Italy (6%). Interestingly, among EU Member States which joined the European Union after 2004, only Poland (9%) is below the EU average, while the three of the top 5 countries with the highest shares of researchers feeling better paid stem from this group (Latvia, Cyprus and Lithuania)[104]. This observation points at structural differences in the HE but also in the economic system of these

[104] Moreover, among the top 10 countries another 4 countries (Bulgaria, ranked 7th, Czech Republic, 8th, Malta, 9th and Slovakia, 10th) are from this group. Only the Netherlands (2nd), Denmark (4th) and Luxembourg (6th) rupture this picture.

countries, where fewer opportunities outside academia appear to be available. Moreover, these results are rather robust in comparison with the MORE3 survey data.

Figure 57: Perception of remuneration compared to outside academia, by career stage and by country group and career stage (EU28)



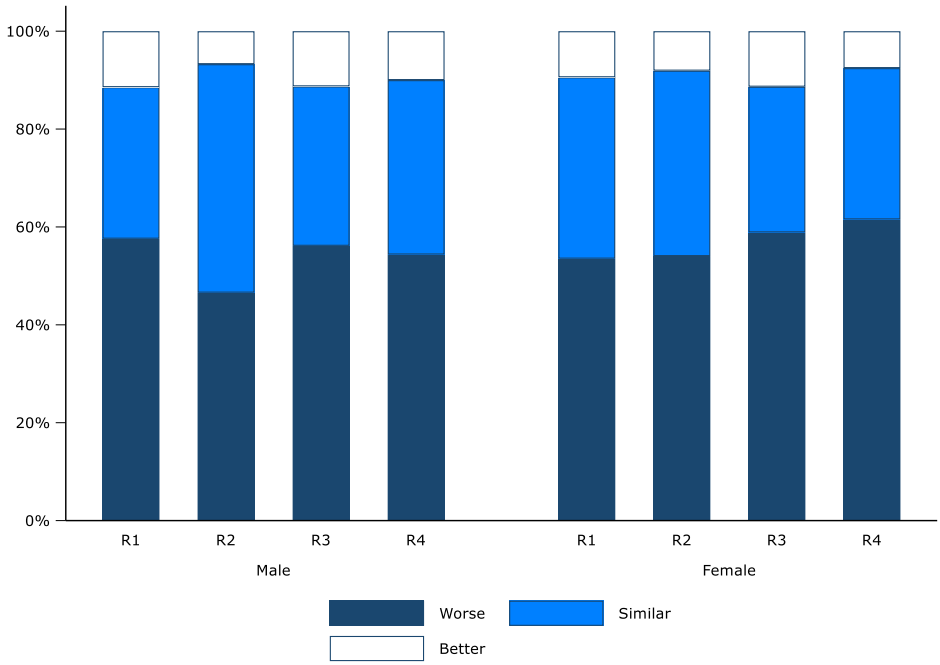
Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers comparing their remuneration to that of people with comparable skills and experiences outside academia and assessing it worse, similar or better.
- Average shares of the following country groups are shown: East (CZ, EE, HU, LV, LT, PL, SI, SK, BG, RO, HR), North (NO, SE, FI, DK, IS), South (PT, ES, IT, EL, MT, CY), West (BE, FR, DE, NL, LU, AT, UK, IE, CH) and EU28.
- Based on question 35: "How would you compare your remuneration package to that of people with comparable skills and experience outside academia?"
- (2019: n=7,592, 2016: n=8,212)

Career stage: Regarding the shares of EU researchers feeling paid worse in academia than their non-academic counterparts, no large differences across career stages can be observed. 57% of R3 researchers feel worse paid and the respective share for R1 researchers is only 7pp lower (see left panel in Figure 47). The average share of researchers feeling better paid ranks from 7% in R2 to 11% in R3. However, differences are observed between country groups (see right panel in Figure 47). In Northern European countries, the share of (perceptions of) more badly paid researchers in academia compared to outside academia decreases from more than half of the researchers in the early career stages (57% in R1 and 54% in R2) to about 41% in the in R4. Vice versa, the share of 'better paid in academia' increases from 9% in R1 to 17% in R4. Such pattern, however, is not found in other country groups.

Compared to MORE3, overall the shares of researchers feeling worse paid than their non-academic colleagues have slightly decreased in all career stages except R1, while the shares of researchers perceiving their remuneration to be similar to those outside academia have slightly increased in these career stages R2-R4. This change is mostly due to changes in the Northern European countries. The largest differences to 2016 are observed in the group of researchers in later career stages in Northern European countries. While in Northern Europe in 2016 the share of researchers feeling worse paid than their non-academic counterparts in later career stages was rather high (R4: 59% and R3: 58%), it has dropped in 2019 by 18pp (R4) and 14pp (R3). At the same time the shares of R3 and R4 researchers in Northern Europe that consider their remuneration as similar to their colleagues outside academia have increased by more than 10pp. It remains to be seen whether this difference indicates an emerging trend towards an appreciation of academic senior researchers in terms of remuneration in Northern Europe or whether it is an outlier in the MORE4 survey data.

Figure 58: Perception of remuneration compared to outside academia, by gender and career stage (EU28)



Source: MORE4 EU HE Survey (2019)
Notes:

- Share of researchers comparing their remuneration to that of people with comparable skills and experiences outside academia and assessing it worse, similar or better.
- Based on question 35: "How would you compare your remuneration package to that of people with comparable skills and experience outside academia?"
- (n=7,592)

Gender: No large differences by gender are found for the group of researchers perceiving their remuneration in academia to be better compared to non-academia. On average in the EU, 10% of all female researchers feel better paid in academia, as well as 10% of all male researchers. Similarly, 58% of all female and 55% of all male researchers feel worse paid in academia than their non-academic colleagues. Similar to the results in MORE3, this holds in particular for R2 researchers (54% for females vs. 47% of males) and R4 researchers (62% for females vs. 54% of males).

6.1.1.2 Job and social security

Next to remuneration, the satisfaction of researchers with these other aspects of financial security are surveyed: job security, pension plan and social security.

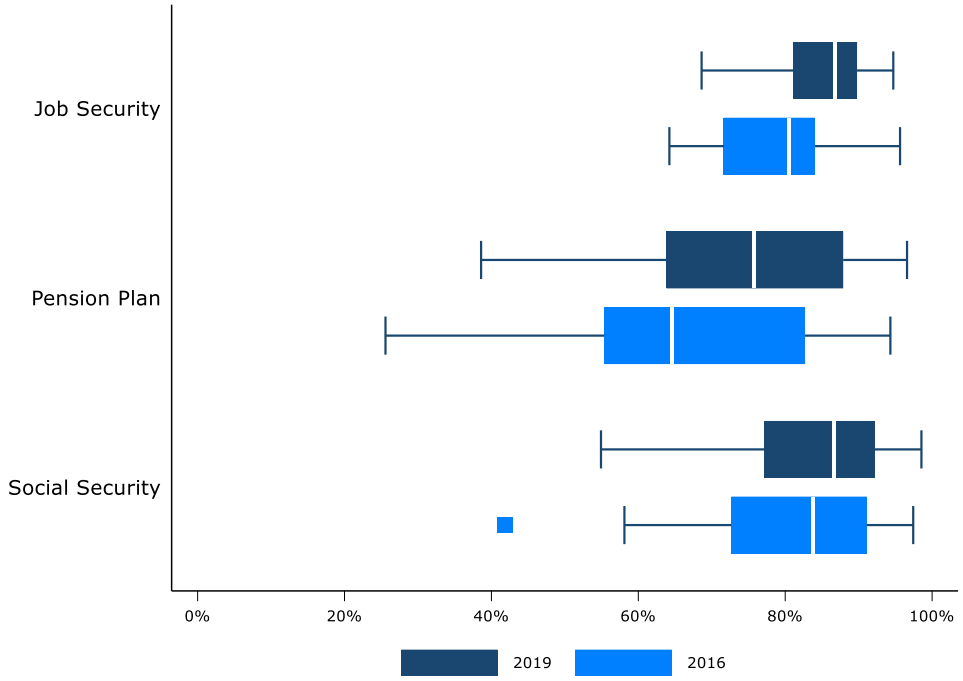
SATISFACTION WITH JOB SECURITY (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2016 (n=9,061)	79.9%	R1: 66.0% R2: 64.3% R3: 83.3% R4: 91.7%	MED: 83.5% NAT: 79.0% SOC: 78.2%	F: 76.1% M: 82.3%
2019 (n=8,172)	85.9%	R1: 77.2% R2: 72.1% R3: 87.1% R4: 92.9%	MED: 88.9% NAT: 88.8% SOC: 80.6%	F: 82.4% M: 88.2%
SATISFACTION WITH PENSION PLAN (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2016 (n=8,382)	72.6%	R1: 69.4% R2: 68.4% R3: 72.2% R4: 77.3%	MED: 79.3% NAT: 72.6% SOC: 68.0%	F: 68.2% M: 75.4%
2019 (n=7,603)	78.1%	R1: 79.2% R2: 74.9% R3: 78.7% R4: 78.4%	MED: 84.9% NAT: 79.8% SOC: 71.9%	F: 72.7% M: 81.5%
SATISFACTION WITH SOCIAL SECURITY (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2016 (n=9,086)	83.2%	R1: 78.5% R2: 79.5% R3: 83.6% R4: 87.3%	MED: 88.2% NAT: 83.1% SOC: 80.0%	F: 80.8% M: 84.8%
2019 (n=8,244)	87.0%	R1: 82.3% R2: 82.1% R3: 87.8% R4: 89.4%	MED: 90.6% NAT: 89.1% SOC: 82.2%	F: 83.9% M: 89.0%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Shares of researchers satisfied with their job security, pension plans and social security and other benefits.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n= 8,330-9,001, 2016: n=9,282-10,048)

On average, researchers' satisfaction with social security systems (87%), pension plans (78%) and job security (86%) is rather high in the EU. Compared to 2016 the shares of satisfied researchers have increased in all three aspects. For instance, in terms of satisfaction with job security the average share of satisfied researchers increased by 6pp.

Figure 59: Variation in individual satisfaction with job and social security attributes across countries (mean=EU28)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Shares of researchers satisfied with their job security, pension plans and social security and other benefits.
- The figure shows box plots for different answer categories. A box plot shows the full range of variation of a data set by its minimum and maximum (top and bottom lines), its median (line within the shaded box) and the data between the first and third quartile (shaded box). Outliers are presented by dots.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n= 8,330-9,001, 2016: n=9,282-10,048)

Table 11: Individual satisfaction with job and social security attributes, by country

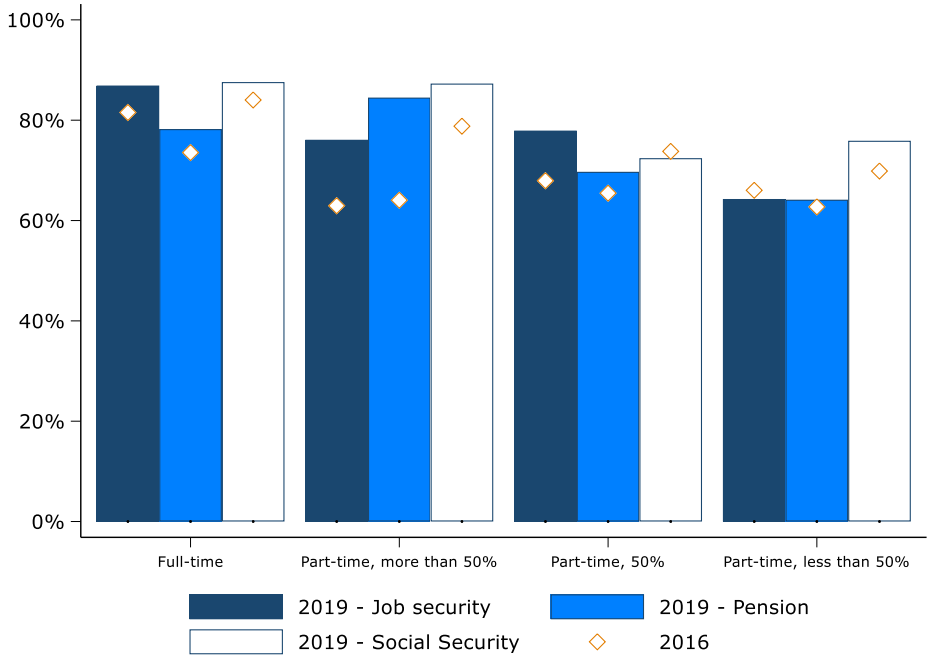
		Job security	Pension plan	Social security
Iceland	Northern European	96.7%	94.0%	96.3%
Romania	Eastern European	94.7%	80.4%	88.0%
Malta	Southern European	94.5%	63.6%	75.8%
The Netherlands	Western European	93.3%	96.6%	96.2%
Slovenia	Eastern European	93.2%	82.5%	91.0%
Czech Republic	Eastern European	92.0%	80.0%	87.3%
France	Western European	90.5%	77.0%	91.0%
Croatia	Eastern European	89.9%	56.2%	86.1%
Spain	Southern European	89.7%	76.1%	91.8%
Switzerland	Western European	89.7%	91.5%	91.8%
Germany	Western European	89.3%	91.4%	90.4%
Italy	Southern European	88.6%	65.5%	84.0%
Norway	Northern European	87.8%	94.8%	95.7%
Luxembourg	Western European	87.7%	93.1%	98.5%
Sweden	Northern European	87.6%	89.6%	94.9%
Austria	Western European	87.3%	89.5%	95.3%
Ireland	Western European	86.9%	86.3%	91.0%
Finland	Northern European	86.5%	91.7%	94.2%
Belgium	Western European	86.3%	82.7%	92.5%
Greece	Southern European	83.3%	38.6%	54.9%
Poland	Eastern European	82.6%	70.4%	80.9%
Bulgaria	Eastern European	82.3%	64.1%	78.4%
United Kingdom	Western European	81.9%	75.3%	85.3%
Latvia	Eastern European	81.3%	66.1%	73.8%
Portugal	Southern European	80.9%	59.6%	82.8%
Denmark	Northern European	78.2%	94.9%	93.5%
Cyprus	Southern European	78.2%	61.6%	73.3%
Hungary	Eastern European	77.8%	64.5%	71.0%
Slovakia	Eastern European	77.6%	65.8%	74.7%
Estonia	Eastern European	76.7%	58.1%	82.4%
Lithuania	Eastern European	68.6%	55.1%	73.1%
EU 2016		**79.9%**	**72.6%**	**83.2%**
EU 2019		**85.9%**	**78.1%**	**87.0%**

Source: MORE4 EU HE Survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Share of researchers satisfied with their job security, pension plans and social security and other benefits.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n= 8,330 – 9,001, 2016: n=8,382-9,086)

Country level: The satisfaction with financial security attributes strongly varies across European countries (Figure 59 and Table 11). This holds in particular for the satisfaction with the pension plan in place. While in all Western and in particular in the Nordic EU Member States at least 3 out of 4 researchers are satisfied with their pension plan – the Netherlands are leading with 97% – it is only 39% in Greece. However, the share of satisfied researchers in Greece is not only outstandingly low for the pension plan - the same also holds for social security overall. Researchers' satisfaction with social security and the pension system is highly correlated.[105] Only 55% of Greek researchers indicate that they are satisfied with their social security. Other Southern and Eastern European countries have much higher shares of satisfied researchers in both attributes, although they do not have equally high shares as the Nordic countries or the Western European Member States. In terms of job security, the pattern is less clear. Among the five countries with the highest shares of researchers satisfied with their job security[106] are Iceland (leading with 97%), Romania (95%) and Malta (94%). On the contrary, Denmark (with the second highest share in pension plan satisfaction) only has a mediocre share in job security satisfaction of 78%. Lithuania (69%), Estonia (77%) and Slovakia (78%) have the lowest shares of researchers satisfied with job security.

Figure 60: Individual satisfaction with job and social security attributes, by type of position



Source: MORE4 EU HE Survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Share of researchers satisfied with their job security, pension plans, social security and other benefits.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=7,603-8,244, 2016: n=8,382 - 9,086)

[105] The correlation coefficient is 0.9. Researchers' satisfaction with job security is more independent from their perception of the social system and their pensions. Both correlation coefficients are about 0.5.

[106] The other two countries are the Netherlands (93%) and Slovenia (93%).

Table 12: Individual satisfaction with job and social security attributes, by type of position

	Job security		Pension		Social security	
	Full time	Part time	Full time	Part time	Full time	Part time
North	86%	81%	93%	90%	95%	88%
South	88%	59%	66%	48%	84%	72%
West	88%	77%	83%	83%	90%	82%
East	84%	77%	70%	68%	81%	75%
EU	**86.9%**	**74.9%**	**78.2%**	**76.9%**	**87.6%**	**80.6%**

Source: MORE4 EU HE Survey (2019)
Notes:

- Share of researchers satisfied with their job security, pension plans, social security and other benefits.
- Average shares of the following country groups are shown: East (CZ, EE, HU, LV, LT, PL, SI, SK, BG, RO, HR), North (NO, SE, FI, DK, IS), South (PT, ES, IT, EL, MT, CY), West (BE, FR, DE, NL, LU, AT, UK, IE, CH) and EU28.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=7,603-8,244)

Type of position: By type of position, full-timers are more often satisfied with their financial security attributes than part-timers (see Figure 60). This holds especially in case of researchers' perception of job security. While 87% of full-timers are satisfied with job security, this is only between 64%-78% of part-timers. With respect to pension plan, 78% of full-timer is satisfied compared to a similar 77% of (all) part-timers. With respect to social security, the difference is 7pp: 88% of full-timers and 81% of part-timers are satisfied with social security.

Across the different categories of part-timers some differences are observed. The share of satisfied researchers with pension plans increases with the number of working hours in part-time positions. For all three attributes, the share of satisfied researchers is lower among the part-timers with less than 50% of a full-time position than for those with more than 50%.

To put this in context, the overall share of researchers in part-time positions in the EU is low (9% versus 91% in full-time positions) and this has barely changed since MORE2, as is shown in the table below.

SHARE OF RESEARCHERS IN FULL-TIME EMPLOYMENT (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2012 (n=8,985)	89.6%	R1: 73.2% R2: 91.7% R3. 93.5% R4: 93.3%	MED: 89.3% NAT: 91.4% SOC: 87.7%	F: 86.4% M: 91.5%
2016 (n=9,412)	90.0%	R1: 65.7% R2: 89.1% R3. 94.2% R4: 96.8%	MED: 88.2% NAT: 92.8% SOC: 88.2%	F: 86.9% M: 91.9%
2019 (n=8,540)	91.1%	R1: 69.8% R2: 85.1% R3: 95.4% R4: 94.5%	MED: 90.0% NAT: 92.7% SOC: 90.3%	F: 87.8% M: 93.3%

Source: MORE4 EU HE Survey (2019), MORE3 EU HE Survey (2016) and MORE2 EU HE survey (2012)
Note:

- Based on question 29: "Type of position"

However, there exist differences across regions in EU28 (see right panel in Figure 60). While in the Northern European countries the difference in shares of full-time and part-time researchers satisfied with their financial security attributes is (significantly) less than 10 percentage points for all 3 categories

(5pp for job security, 3ppt for pension plan, and 7ppt for social security), it is significantly higher in the Southern European countries. In the case of job security, the difference is even 29pp. While 88% of Southern European full-time researchers are satisfied with their job security, it is only 59% of the part-timers. In the Western European and Eastern European Member States the differences in shares of satisfied researchers between full-timers and part-timers varies slightly around the EU28 average. Northern Europe has the highest shares of satisfied researchers in almost all categories, independent of the group of full-time or part-time working.

6.1.2. Social environment and recognition

In this section, we look into satisfaction with aspects of social environment and recognition, as part of the non-science related working conditions. They include contribution to society, social status and reputation of the current employer. Overall, 91% of EU28 researchers are satisfied with these kinds of conditions. Compared to MORE3 the share of satisfied researchers is slightly higher than in 2016.

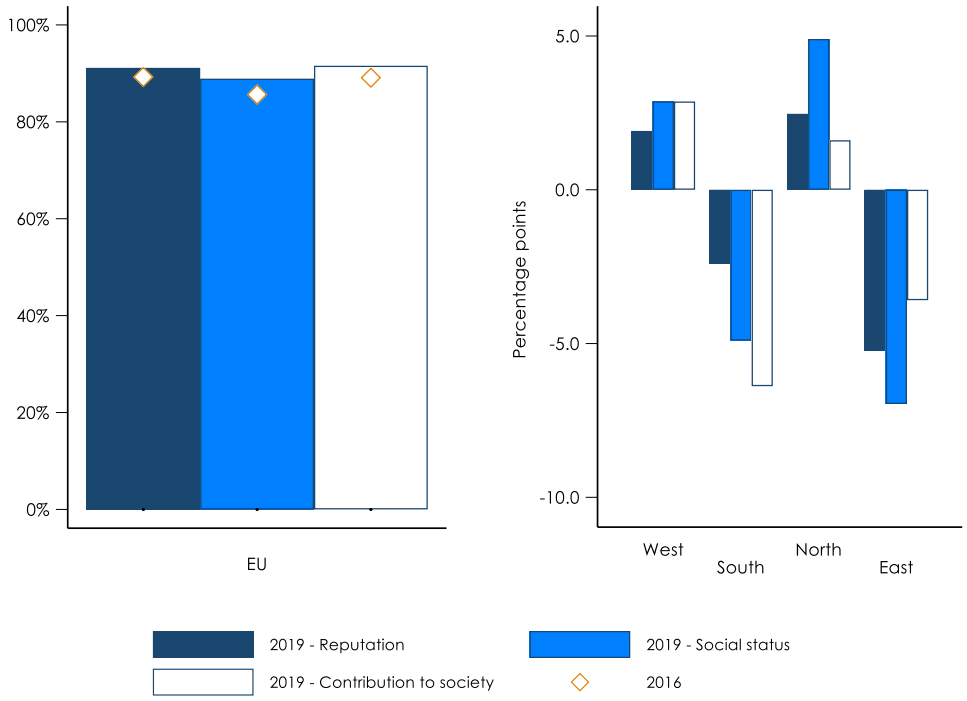
SATISFACTION WITH SOCIAL ENVIRONMENT AND RECOGNITION (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2016 (n = 9,084)	88.00%	R1: 87.1% R2: 87.3% R3. 86.6% R4: 90.8%	MED: 92.0% NAT: 88.3% SOC: 84.8%	F: 86.2% M: 89.1%
2019 (n = 8,246)	90.5%	R1: 89.9% R2: 90.1% R3: 89.6% R4: 92.3%	NAT: 91.8% MED: 94.3% SOC: 86.5%	F: 88.3% M: 92.0%

Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:
- Share of researchers satisfied with the reputation of their employer, social status and their contribution to society.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"

The left panel in Figure 61 shows in more detail that 92% (2016: 89%) of all EU researchers are satisfied with their contribution to society, 89% (2016: 86%) with their social status and 91% (2016: 89%) with the reputation of their current employer. However, across European countries, differences are observed (see right panel in Figure 61).

Country level: Western and Northern European countries have on average higher shares of researchers who are satisfied with their social environment and recognition. In particular, the share of researchers satisfied with their social status is 5pp higher in Northern European countries than on average. On the contrary, researchers in Eastern European EU Member States were less often satisfied (7pp below EU-average). In Southern European countries the share of satisfied researchers with respect to their contribution to society is 6pp lower than on average.

Figure 61: Individual satisfaction with social environment and recognition, by country groups

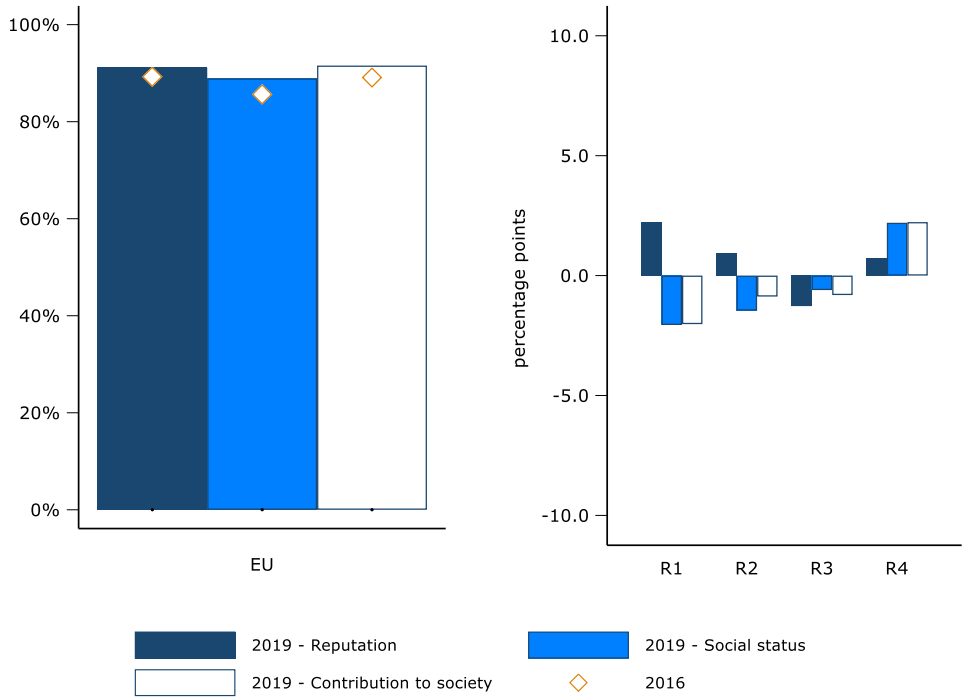


Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers satisfied with the reputation of their employer, social status and their contribution to society (left-hand panel) and differences in percentage points by country group.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=8,197-8,246, 2016: n=8,999-9,084)

Field of science: Across fields of science, researchers working in Medical Sciences are most often satisfied with their social environment and recognition. In contrast, Humanities and Social Sciences have the lowest levels of satisfied researchers for all three aspects of social environment and recognition. The differences of satisfied researchers between Medical sciences and Social Sciences/Humanities range between 10pp and 13pp.

Figure 62: Individual satisfaction with social environment and recognition, by career stage (EU28)



Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers satisfied with the reputation of their employer, social status and their contribution to society and differences in percentage points.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=8,197-8,246, 2016: n=8,999-9,084)

Career stage: Differences between career stages are almost not existent. Unsurprisingly, R4 researchers tend to be more often satisfied with their social status (the share of satisfied R4 researchers is 2pp higher than the EU28 average; see right panel in Figure 62), while early stage researchers (R1) are more often satisfied with the reputation of their employer. Finally, the later the career stage, the more often researchers are satisfied with their contribution to society.

6.1.3. Individual satisfaction at work

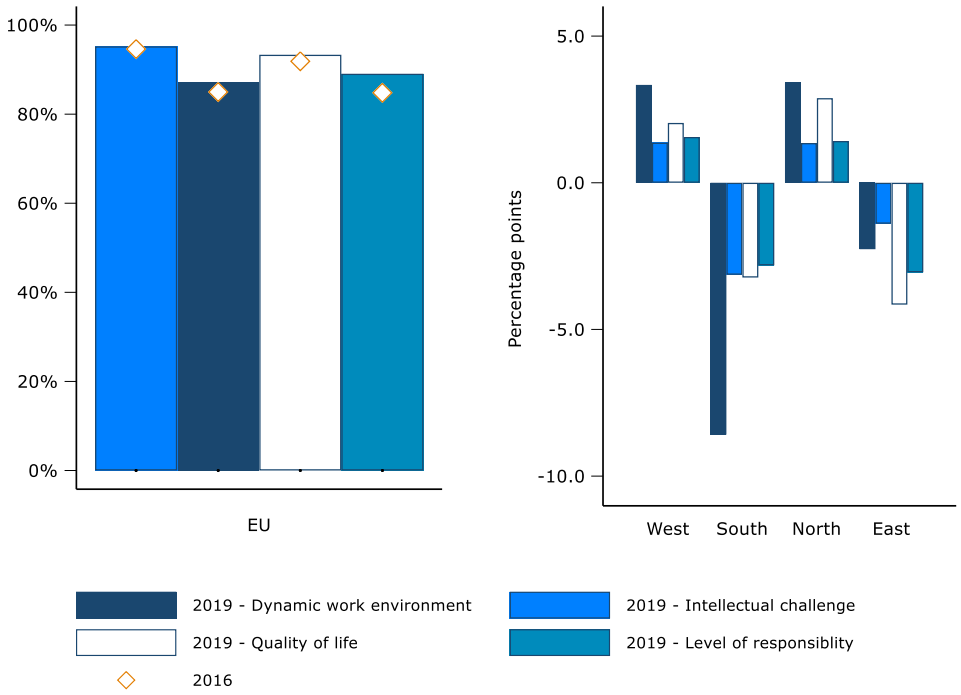
As part of the non-science working conditions to follow social environment and recognition, the satisfaction with intellectual challenge, dynamic work environment, level of responsibility or quality of life are analysed as 'individual satisfaction at work'. Overall, 91% of EU researchers are satisfied with these aspects. In more detail: 95% of researchers in the EU28 are satisfied with the intellectual challenge in their current position, 93% with the level of responsibility, 87% with the dynamic work environment, and 89% with the quality of life (see left panel in Figure 53). Compared to MORE3 no large differences are observed.

INDIVIDUAL SATISFACTION AT WORK (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2016 (n = 9,303)	89.10%	R1: 88.3% R2: 88.1% R3. 88.2% R4: 91.1%	MED: 91.0% NAT: 90.3% SOC: 86.4%	F: 87.0% M: 90.3%
2019 (n = 8,414)	91.2%	R1: 93.4% R2: 90.3% R3: 90.0% R4: 92.6%	NAT: 92.3% MED: 94.7% SOC: 87.6%	F: 88.6% M: 92.9%

Source MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers satisfied with intellectual challenge, dynamic work environment, level of responsibility and quality of life.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"

Figure 63: Individual satisfaction at work, by country groups



Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

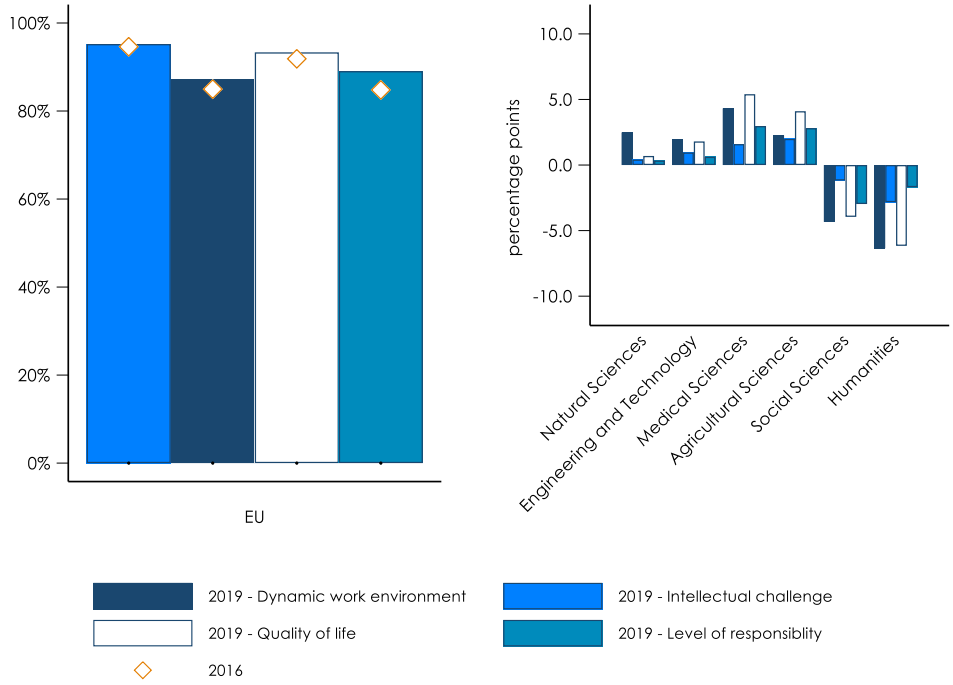
- Share of researchers satisfied with their dynamic work environment, intellectual challenge, quality of life and their level of responsibility and differences in percentage points.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=8,314-8,337, 2016: n=9,167-9,303)

Country level: Across countries, researchers in Northern and Western European countries tend to be slightly more satisfied with all aspects of individual satisfaction at work than researchers from other European regions. The share of satisfied researchers is between 1 and 3pp above the EU28 average. On the other hand, researchers from Southern and Eastern European countries are slightly less satisfied than the EU average. For instance, researchers from the Southern European countries less often satisfied

with the dynamic work environment, pointing at the traditionally more hierarchical and strongly structured working relations. The respective share of satisfied researchers is 9pp lower than in the EU overall.

Career stage: No large differences between career stages can be observed in any aspect of individual satisfaction with work. The largest difference appears in terms of satisfaction with quality of life. While 85% of R2 researchers are satisfied with their quality of life, the respective share of R4 researchers is higher by 6pp (91% of R4 researchers).

Figure 64: Individual satisfaction at work, by field of science (EU28)



Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers satisfied with their dynamic work environment, intellectual challenge, quality of life and their level of responsibility and differences in percentage points.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (left: 2019: n=8,314-8,337, 2016: n=9,167-9,303; right: n=343-2,051)

Field of science: Similar to the described pattern in the previous section, researchers working in Social Sciences and Humanities are below the EU average in shares of satisfied researchers regarding individual job-related satisfaction (see right panel in Figure 54). In contrast, researchers working in Medical Sciences and Agricultural Sciences tend to be more satisfied than the EU average. For instance, in Humanities (83%) and in Social Sciences (85%) the share of researchers satisfied with their quality of life is almost 12pp and 10pp lower than the share of satisfied researchers in Medical Sciences.

All in all, relatively high levels of social (security, environment and recognition) and individual (job content) satisfaction – on average in the EU – can be seen to compensate dissatisfaction with pay when

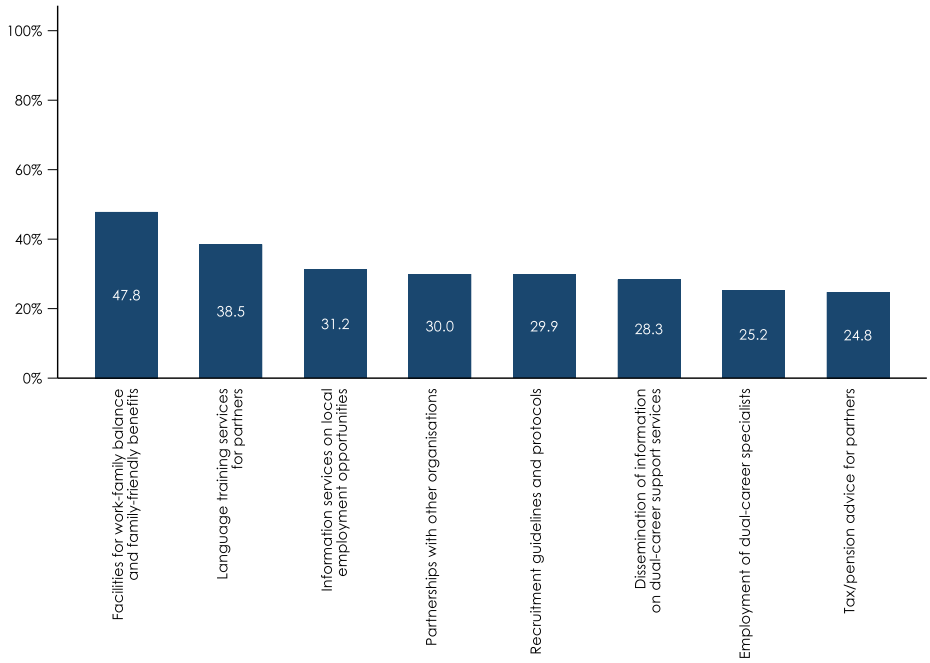
compared with outside academia, making research careers attractive. Researchers are willing to trade-off salary against other job features, as previous studies show (Janger and Nowotny, 2016[107]).

6.1.4. Measures supporting partners working as researchers

The MORE4 survey introduced a new question to ask about support services for partners of researchers, who also work as a researcher, at their current home institution (so-called 'dual careers'). About half of researchers with a partner who also works as a researcher (48%) agree that their home institutions successfully implement facilities for work-family balance and family-friendly benefits for researchers and their partners. Another 39% of researchers consider language training services for partners of researchers successfully implemented. Nearly one third of researchers report that they are satisfied with their home institutions' information services on local employment opportunities for partners (31%), partnerships with other organisations to coordinate job opportunities for the partners (30%), recruitment guidelines and protocols sensitive to dual-career issues among researchers (30%), and the dissemination of information on dual-career support services on institution's website(s), social media, leaflets (28%). Employment of dual-career specialists and tax/pension advice for partners of researchers, are less often mentioned (both 25%).

[107] Janger, J., Nowotny, K., (2016) "Job choice in academia", Research Policy, 45(8), pp. 1672–1683.

Figure 65: Support measures for partners working as researchers (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 41: "You have indicated that your partner also works as a researcher. What is your opinion on the following issues with respect to support of dual careers in your home institution. My home institution successfully implements…"
- (n=610-676)

Country Level: Since researcher couples are not the general rule, the number of observations is low due to the nature of the question itself. Therefore, many countries drop out of the country-level analysis[108]. Nevertheless, looking at the countries that do have a reliable number of observations, a large heterogeneity can be found. The largest gap between countries can be found concerning information services on local employment opportunities, where 74% of researchers in Denmark but only 11% of researchers in Italy believe that this was successfully implemented in their home institution (see Table 13). In Denmark 63% of researchers state that their home institutions offer facilities such as child-care services, in contrast to 13% of institutions in Portugal. 67% of researchers in Spain believe that language training services are implemented successfully at their home institutions but only 22% of researchers in Italy agree.

Career stage: For nearly all items, agreement is strongest in the R1 career stage and tends to drop afterwards. Differences between career stages are rather small for some items (e.g. language training services or employment of dual-career specialists) but large variation can be found for others, such as tax/pension advice for partners, where 44% of R1 researchers agree that these services are implemented successfully at their home institution but only 19% of R2 researchers agree. 51% of R1 researchers state that they believe their home institution successfully implements information services on local employment opportunities, but only 24% of R2 researchers agree to the same question. Concerning partnerships with other organisations, only 23% of R4 researchers believe that this is successfully

[108] In case of less than 30 observations, countries' researcher shares are not shown or analysed to avoid small sample biases.

implemented at their home institution, in contrast to 56% of R1 researchers. 48% of R1 researchers think that recruitment guidelines and protocols sensitive to dual-career issues among researchers are sufficiently available at their home institution, but only 21% of R4 researchers agree.

Gender: Female researchers' agreement is slightly lower in all characteristics, but the largest gender difference can be observed concerning the successful implementation of facilities for work-family balance and family-friendly benefits, where 56% of males but only 39% of females agree. In other categories no major gender differences can be observed.

Field of Science: Researchers working in Humanities have significantly lower agreement rates in all items. In case of facilities for work-family balance only 34% of researchers in Humanities consider them successfully implemented at their home institution, while 65% of researchers in Medical Sciences agree. The gap is even larger concerning the dissemination of information on dual-career support services, where only 6% of researchers working in Humanities but 41% of researchers in Medical Sciences state that their home institution has successfully spread this information.

Table 13: Support measures for partners, per country

	Bulgaria	Denmark	Spain	France	Italy	Portugal	Sweden	EU
Dissemination of information on dual-career support services	31.4%	44.2%	51.7%	16.7%	8.9%	12.3%	34.7%	28.3%
Information services on local employment opportunities	29.9%	73.6%	54.3%	20.7%	10.7%	16.3%	27.7%	31.2%
Recruitment guidelines and protocols	22.9%	41.3%	50.1%	14.9%	7.9%	12.3%	31.5%	29.9%
Language training services for partners	47.4%	59.3%	67.1%	29.0%	22.3%	32.9%	33.2%	38.5%
Partnerships with other organisations	28.7%	45.6%	50.1%	25.3%	14.6%	24.6%	27.1%	30.0%
Employment of dual-career specialists	27.6%	49.4%	50.3%	14.6%	6.0%	16.9%	28.8%	25.2%
Tax/pension advice for partners	25.0%	59.3%	52.0%	15.9%	16.3%	9.6%	33.6%	24.8%
Facilities for work-family balance and family-friendly benefits	26.1%	63.3%	49.8%	40.0%	30.8%	13.0%	44.9%	47.8%

Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 41: "You have indicated that your partner also works as a researcher. What is your opinion on the following issues with respect to support of dual careers in your home institution. My home institution successfully implements…"
- (n=673-701)

6.2. Working conditions for scientific knowledge production

Further factors determining scientific knowledge production comprise financial support (research funding and infrastructure), intellectual support provided to researchers (working with leading scientists and quality of training and education), the balance of time between teaching and research as well as research autonomy. Finally, career path elements also influence scientific knowledge production as career-determined time horizons for research agendas change the content of research (Petersen et al., 2012[109]). This will be discussed in section 6.3.

[109] Petersen, A. M., Riccaboni, M., Stanley, H. E., Pammolli, F., (2012) "Persistence and uncertainty in the academic career", Proc. Natl. Acad. Sci., 109(14), pp. 5213–5218.

SATISFACTION WITH ENVIRONMENT FOR SCIENTIFIC KNOWLEDGE PRODUCTION (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2016 (n=9,223)	73.7%	R1: 79.1% R2: 76.3% R3: 69.9% R4: 74.9%	MED: 75.8% NAT: 75.7% SOC: 70.2%	F: 70.2% M: 75.9%
2019 (n=8,378)	77.5%	R1: 82.4% R2: 80.0% R3: 73.8% R4: 80.2%	NAT: 79.5% MED: 81.0% SOC: 72.9%	F: 72.9% M: 80.4%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers satisfied with research funding, access to research facilities and equipment, working with leading scientists, quality of training and education, balance between teaching and research, and research autonomy.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"

6.2.1. Financial support

Of course, the availability of research funds as well as access to research facilities and proper equipment are clearly factors positively affecting achievement of new knowledge and innovations. They are among the working conditions that researchers look out for when deciding between jobs (Janger and Nowotny, 2016). In the following subsections on financial support, we first discuss research funding and then satisfaction with research equipment and facilities.

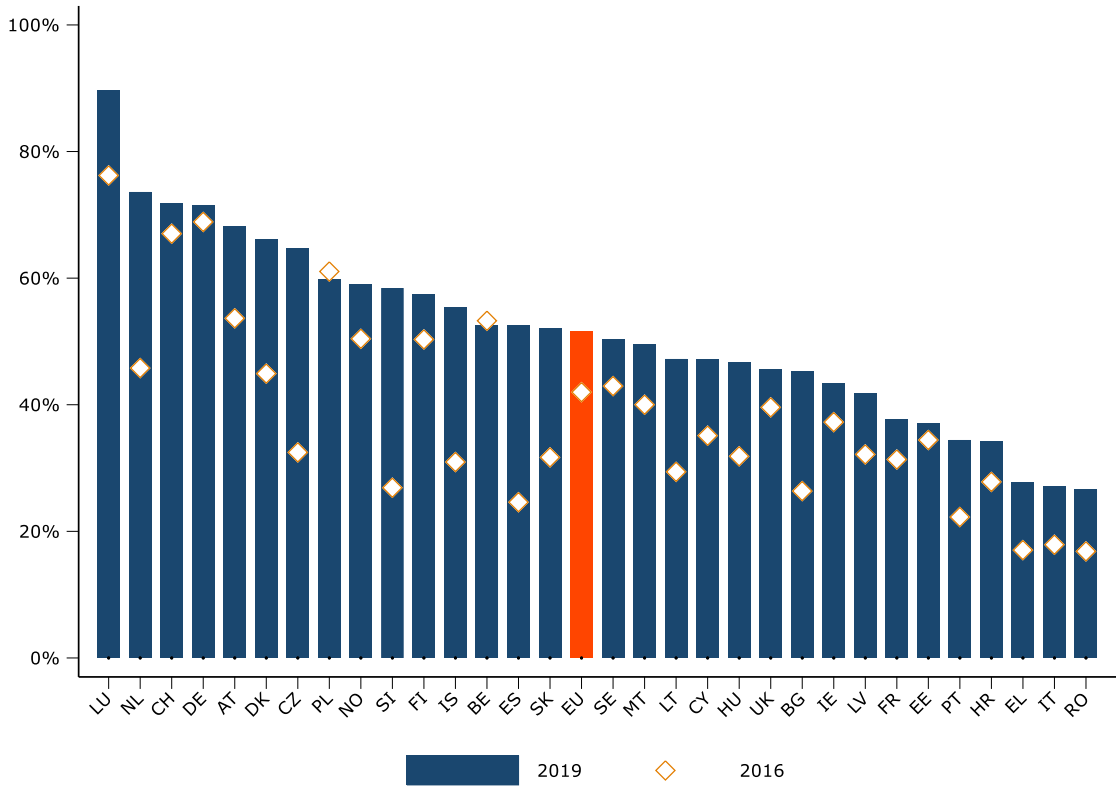
SATISFACTION WITH RESEARCH FUNDING (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2016 (n=9,125)	42.0%	R1: 62.1% R2: 54.4% R3: 32.2% R4: 37.9%	MED: 42.6% NAT: 44.3% SOC: 39.2%	F: 38.4% M: 44.2%
2019 (n=8,258)	51.6%	R1: 72.9% R2: 59.0% R3: 45.7% R4: 50.1%	MED: 55.7% NAT: 54.5% SOC: 45.6%	F: 46.6% M: 54.8%
SATISFACTION WITH RESEARCH FACILITIES (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2016 (n=9,117)	75.6%	R1: 83.8% R2: 77.3% R3: 72.9% R4: 74.1%	MED: 76.6% NAT: 77.5% SOC: 72.8%	F: 70.8% M: 78.6%
2019 (n=8,253)	78.5%	R1: 84.7% R2: 81.9% R3: 75.4% R4: 79.5%	MED: 81.4% NAT: 80.7% SOC: 74.1%	F: 74.0% M: 81.4%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers satisfied with the availability of research funding and the availability of research facilities .
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"

6.2.1.1 Research funding

Figure 66: Individual satisfaction with research funding, by country



Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers satisfied with the availability of research funding.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=9,019, 2016: n=10,075)

In total, about 52% of researchers in the EU28 consider themselves satisfied with the availability of research funding. This is a 10pp increase compared to MORE3.

Country level: The data reveal a high degree of heterogeneity across countries (see Figure 66). On the one hand, only 27% of researchers in Romania as well as in Italy and 28% of researchers in Greece are satisfied with the availability of research funding. More generally, a pattern is visible with Eastern European countries (except for Poland, Czech Republic and Slovenia) and in particular Southern European countries hit by the crisis and fiscal consolidation are at the lower end of the spectrum. On the other hand, 90% of researchers in Luxemburg, 74% of researchers in the Netherlands and 72% of researchers both in Switzerland and Germany are satisfied with the availability of research funding. Scandinavian countries are also all above EU average. By comparison with 2016, all countries except for Belgium and Poland improve, likely reflecting the economic upswing in the recent years with rising budgets for research.

Career stage and country groups: Table 14 shows the distribution of researchers considering themselves as satisfied with research funding and the availability of research facilities across geographical regions as well as the EU28 average per career stage. Remarkably, in the EU28 the share of researchers who are content with research funding is decreasing between R1 and R3 and increasing slightly again in R4. The shares range from about 73% of satisfied researchers in R1 to only about 46% in R3 and 50% in R4.

The geographical distribution of perceived satisfaction of researchers with research funding presents an unambiguous picture. Generally, Western and Northern European researchers are more satisfied with their access to research funding than their colleagues in Southern and Eastern Europe. Only in R3 and R4 career stage, the shares in Eastern Europe are among the highest.

Looking at the distribution between different career stages one finds that researchers at the beginning of their career (e.g. 51% of R1 researchers in Southern and 80% of R1 researchers in Western Europe) as well as recognised researchers (e.g. 36% of R2 researchers in Southern and 68% of R2 researchers in Western Europe) are more satisfied with the available research funding than researchers at the last stage of their career within the same geographical region (e.g. 35% of R4 researchers in Southern and 53% of R4 researchers in Western Europe). The only exception is the share of satisfied R4 researchers in Eastern Europe which is the highest within the EU.

Table 14: Individual satisfaction with research funding, by country group and career stage

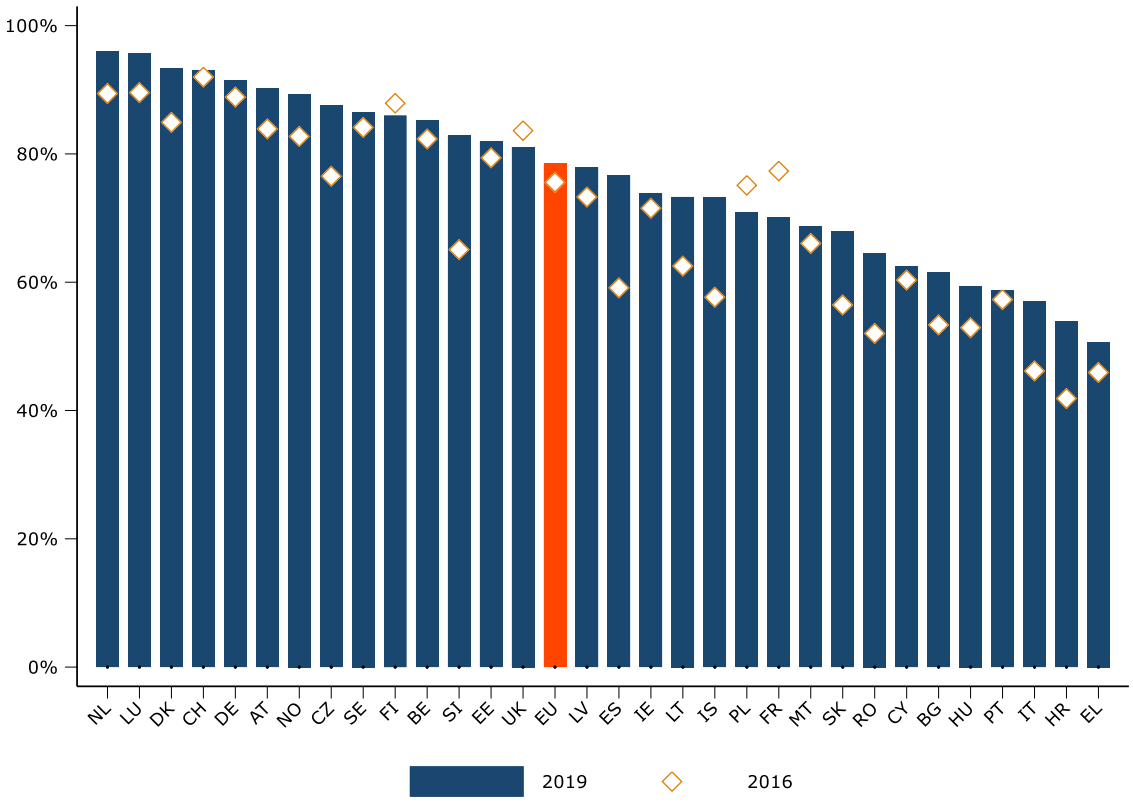
RESEARCH FUNDING	R1	R2	R3	R4	Total
North	72.6%	62.6%	49.9%	57.8%	**57.1%**
South	50.9%	36.0%	41.1%	35.1%	**39.4%**
West	79.7%	68.4%	47.3%	52.5%	**55.9%**
East	62.9%	42.3%	49.5%	60.7%	**52.5%**
EU28	**72.9%**	**59.0%**	**45.7%**	**50.1%**	**51.6%**

Source: MORE4 EU HE survey (2019)
Notes:

- Share of researchers satisfied with research funding.
- Average shares of the following country groups are shown: East (CZ, EE, HU, LV, LT, PL, SI, SK, BG, RO, HR), North (NO, SE, FI, DK, IS), South (PT, ES, IT, EL, MT, CY), and West (BE, FR, DE, NL, LU, AT, UK, IE, CH) and EU28.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (n=9,017/9,019)

6.2.1.2 Research facilities and equipment

Figure 67: Individual satisfaction with research facilities and equipment, by country



Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers satisfied with their access to research facilities and equipment.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=9,019, 2016: n=10,075)

In total, about 79% of all researchers in the EU28 are satisfied with their access to research facilities and equipment. Compared to MORE3 this is a slight increase by 3pp (2016: 76%).

Country level: Although less emphasised than with respect to availability of research funding, the heterogeneity across countries regarding perceived satisfaction with access to research facilities and equipment is rather high (see Figure 67) 51% of researchers in Greece, 54% of researchers in Croatia are satisfied with their access to research facilities and equipment. On the upper bound 92% of researchers in Switzerland, 96% of researchers in the Netherlands and Luxembourg and 93% of researchers in Denmark and Switzerland are satisfied with their access to research facilities. Again, Scandinavian countries are on the higher end and Southern European countries on the lower end of the range. By comparison with 2016, researchers in most countries feel more satisfied with access to research facilities, except for France, Poland, the UK and Finland.

Career stage and country groups: Table 15 shows the share of researchers considering themselves as satisfied with the availability of research facilities and equipment across geographical regions for

different career stages. The share of researchers perceiving themselves as satisfied is always above the EU28 average in Northern and Western European countries. Compared to funding availabilities, a similar though less pronounced pattern can be observed. Researchers at later career stages show a slightly lower satisfaction with the research facilities provided than researchers at early career stages (although often lower in R3 than in R4). For instance, while about 78% of R1 researchers in Southern Europe are satisfied with their access to research facilities, only about 64% of R4 researchers in Southern Europe are satisfied. The only exception are researchers in Eastern European countries: while 70% of R1 researchers are satisfied with the availability of research facilities, the respective share of satisfied R4 researchers increases by 11pp to 81%. Overall, in comparison with the access to financial funding, researchers seem to consider themselves rather satisfied with their access to research facilities.

Table 15: Individual satisfaction with access to research facilities, by country group and career stage

RESEARCH FACILITIES	R1	R2	R3	R4	Total
North	92.2%	87.4%	87.4%	88.0%	**88.3%**
South	78.3%	62.8%	64.5%	63.8%	**65.0%**
West	88.2%	91.2%	81.1%	84.0%	**84.4%**
East	70.2%	62.8%	67.4%	81.3%	**70.8%**
EU28	**84.7%**	**81.9%**	**75.4%**	**79.5%**	**78.5%**

Source: MORE4 EU HE survey (2019)
Notes:

- Share of researchers satisfied with access to research facilities.
- Average shares of the following country groups are shown: East (CZ, EE, HU, LV, LT, PL, SI, SK, BG, RO, HR), North (NO, SE, FI, DK, IS), South (PT, ES, IT, EL, MT, CY), and West (BE, FR, DE, NL, LU, AT, UK, IE, CH) and EU28.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (n=9,017/9,019)

To check whether researchers' perceptions correspond to statistics, we correlated the answers to the questions on satisfaction with research funding and facilities as well as remuneration with GDP per capita and R&D expenditure in the higher education sector (HERD). The resulting correlations are all highly significant, in particular so for R&D expenditure.

Table 16: Correlation of answers to more4 survey with GDP and GERD

	RESEARCH FUNDING	RESEARCH FACILITIES	REMUNERATION
GDP, market price, euro per capita	0.586 (0.001)	0.662 (0.000)	0.644 (0.000)
GERD, HE sector, million Euro per researchers FTE	0.644 (0.000)	0.725 (0.000)	0.744 (0.000)

Source: MORE4 EU HE survey (2019), EUROSTAT
Notes:

- Share of researchers satisfied with access to research funding, research facilities or with the remuneration (researchers who indicated that they are "well paid" or "paid a reasonably salary". Numbers in brackets indicate level of statistical significance, with everything <0.01 highly statistically significant.

6.2.2. Intellectual support

Intellectual support covers both collaboration with leading researchers and the quality of training and education available.

6.2.2.1 Collaboration with leading researchers

SATISFACTION WITH COLLABORATION WITH LEADING SCIENTISTS (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2016 (n=8,965)	82.3%	R1: 78.7% R2: 80.8% R3: 79.9% R4: 88.2%	MED: 86.2% NAT: 85.3% SOC: 76.1%	F: 78.3% M: 84.8%
2019 (n=8,126)	85.4%	R1: 81.3% R2: 83.6% R3: 82.8% R4: 91.2%	MED: 89.8% NAT: 86.3% SOC: 81.2%	F: 80.8% M: 88.4%

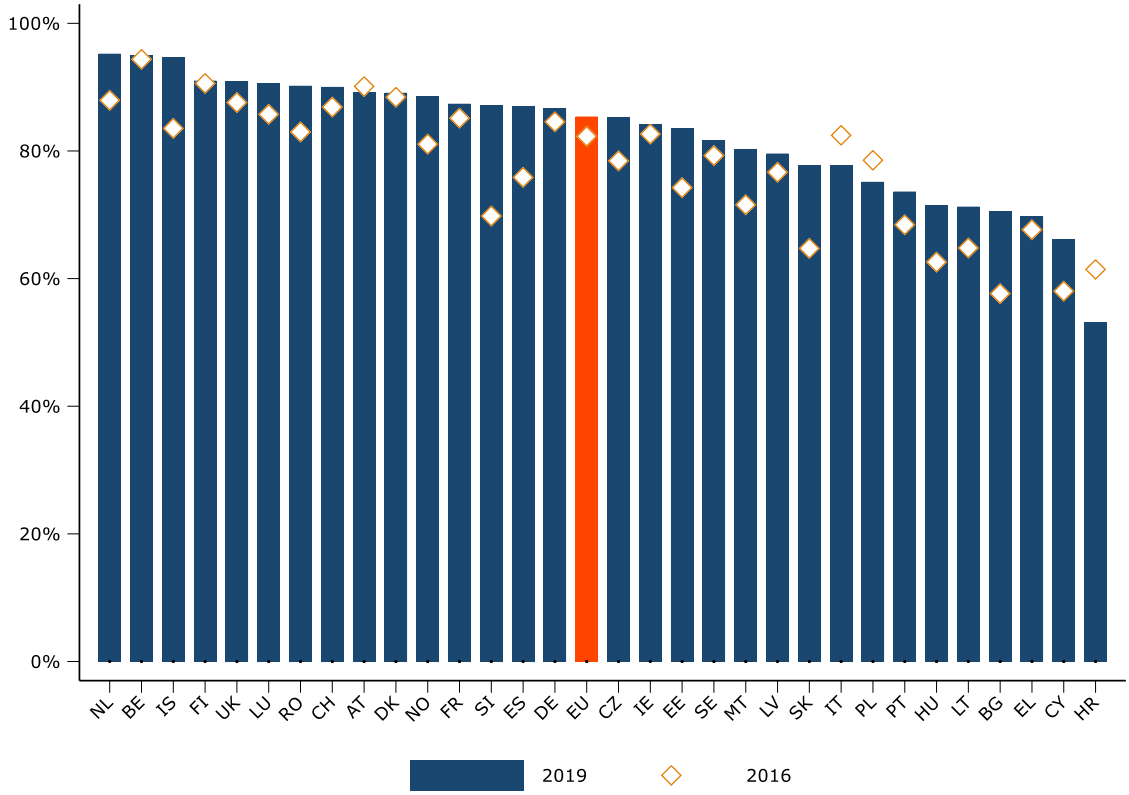
Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers satisfied with working with leading scientist.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"

On average, about 85% of researchers in the EU28 are satisfied with their opportunities to work with leading scientists. This is only slightly higher than in MORE3 (83%).

Country level: A comparison between countries shows that the shares of researchers considering themselves as satisfied are particularly high in Belgium, the Netherlands and Iceland (95% of researchers), opposing the rather low shares of satisfied researchers in Croatia (53%), Cyprus (66%) and Greece (70%) (see Figure 68). There is more satisfaction in most countries when compared with 2016, except for Croatia, Poland, Italy and Austria.

Figure 68: Individual satisfaction with collaboration with leading researchers, by country



Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers satisfied with working with leading scientist.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=8,869, 2016: n=9,900)

Career stage and country groups: It should be noted that a slightly higher share of researchers working in Anglo-Saxon and Nordic higher education systems[110], like the Netherlands or the United Kingdom, consider themselves, on average, satisfied with their possibilities to work with leading scientists (90%

[110] This country grouping of 16 EU countries, already introduced in section 5 of this report, is based on a classification of higher education systems, based on Janger - Campbell - Strauss, 2019, who themselves draw on the comparative higher education literature cited therein, such as Enders-Musselin, 2008:

- The Anglo-Saxon and Nordic systems (e.g. United Kingdom, Sweden, The Netherlands) are higher education systems mostly based on collegiate department-style models, an intermediate share of tenured researchers and a high share of structured PhD training;
- The continental higher education system refers to countries such as Germany, the Czech Republic or Poland with a more hierarchical chair-based system and high shares of fixed-term researchers (the "survivor" model, see Enders-Musselin, 2008);
- The Southern European system refers to systems with high shares of tenured researchers also called "protective pyramid", with an early access to a permanent position following a strict competition; the way further up is then organised in hierarchical steps, depending on job availability. As Lissoni et al., 2011 and Pezzoni - Sterzi - Lissoni, 2012 , document for the highly centralised academic systems of Italy and France, criteria for academic promotion in such protective pyramids are not limited to scientific productivity, but include also issues such as social and political capital, seniority, gender.

of researchers) than researchers in Continental (84% of researchers) or Southern European (83% of researchers) higher education systems (see Table 17). This corresponds with the rankings of these countries/regions in research excellence indicators (e.g., the share of articles among the top 10% cited in each field, as used in the European Innovation Scoreboard).

Differentiating between career stages reveals that the shares of researchers that are satisfied in terms of working with leading scientists in their current position are highest among R4 researchers in all higher education systems (between 89% of R4 researchers in Southern European countries and 95% of R4 researchers in Anglo-Saxon countries) (see Table 17). Compared to MORE3 data, the average satisfaction has slightly increased in all career stages in the EU (about + 3pp).

Table 17: Individual satisfaction with collaboration with leading scientists, by career stage

WORKING WITH LEADING SCIENTISTS	R1	R2	R3	R4	Total
Anglo-Saxon	**83.4%**	**89.2%**	**87.6%**	**95.0%**	**86.7%**
Continental European	**78.7%**	**82.5%**	**80.1%**	**92.2%**	**79.9%**
Southern European	**83.4%**	**81.1%**	**80.5%**	**88.7%**	**89.2%**
EU	**81.3%**	**83.6%**	**82.8%**	**91.2%**	**76.6%**

Source: MORE4 EU HE survey (2019)
Notes:

- Share of researchers satisfied with working with leading scientists.
- Average shares of the following country groups are shown: Anglo-Saxon (UK, SE, DK, NL, IE), Continental European (DE, AT, PL, HU, CZ, SK), Southern European (IT, FR; ES, PT) and EU28.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (n=8,050/8,126)

Gender: A gender differences in terms of satisfaction with collaboration with leading scientist can be observed. Overall, more male researchers (88%) than female researchers (81%) are satisfied with their possibilities to work with leading scientists. Compared to MORE3 this gender gap has remained stable.

6.2.2.2 Training and education

SATISFACTION WITH QUALITY OF TRAINING (of all researchers)	EU28 Total	Per career stage	Per FOS	Per gender
2016 (n=9,023)	86.1%	R1: 83.4% R2: 84.7% R3: 85.8% R4: 88.7%	MED: 88.9% NAT: 86.4% SOC: 83.8%	F: 83.9% M: 87.5%
2019 (n=8,050)	88.2%	R1: 85.6% R2: 85.0% R3: 87.9% R4: 91.2%	MED: 93.8% NAT: 89.2% SOC: 83.4%	F: 85.0% M: 90.3%

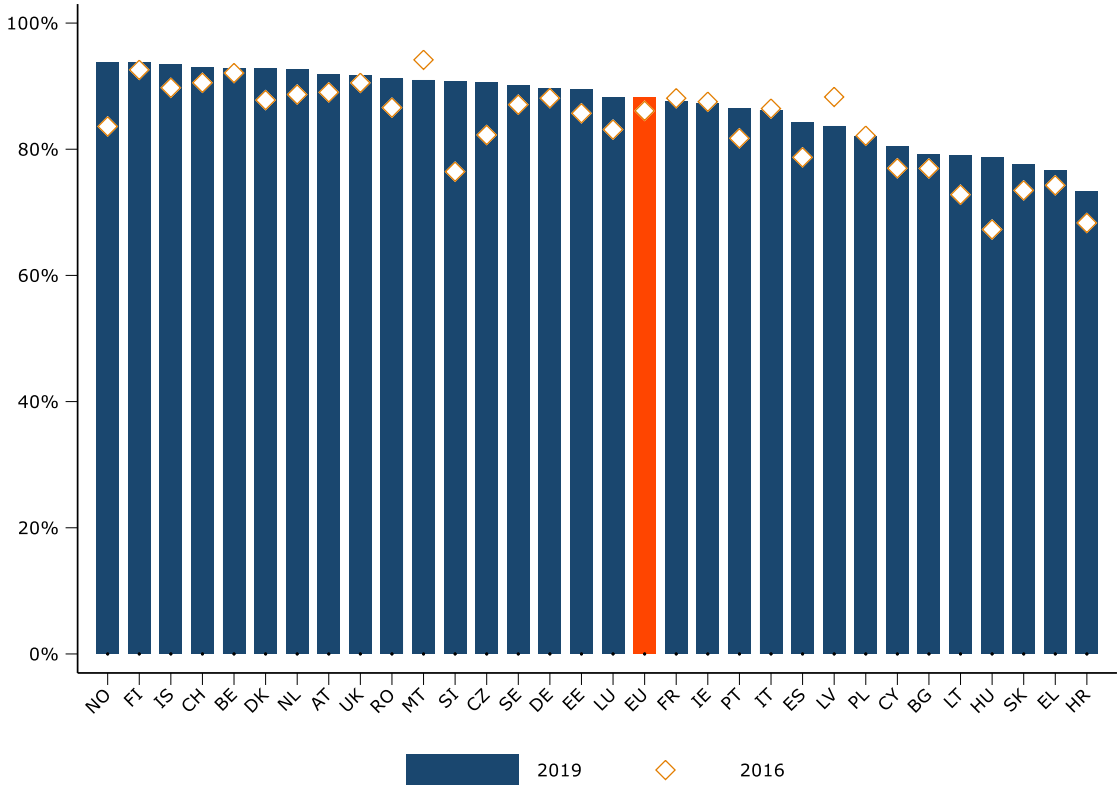
Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers satisfied with working with the quality of training and education.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"

In total, about 88% of researchers (2016: 86%) in the EU28 consider themselves as satisfied with their quality of education and training.

Country level: A comparison between countries shows that a particularly high share of researchers in Finland and Norway (94% of researchers), Belgium, Denmark, Iceland, Switzerland and the Netherlands (93%) perceive themselves as satisfied with their education and training, while a lower share of researchers from Croatia (73%), Greece (77%) and Slovakia (78%) agree (see Figure 69).

Figure 69: Individual satisfaction with the quality of training and education, by country



Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers satisfied with working with the quality of training and education.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=8,795, 2016: n=9,961)

Career stage and country groups: Again, the share of researchers considering themselves satisfied with training and education is the highest among leading R4 researchers (91% of R4 researchers compared to 86% in R1). Researchers from Southern higher education systems are slightly below EU28 average independent of their career stage. The largest difference, although still limited, is observed for early-stage researchers: 81% of R1 researchers in Southern European education systems versus 86% of R1 researchers on average in the EU.

Table 18: Individual satisfaction with the quality of education and training, by career stage

QUALITY OF TRAINING	R1	R2	R3	R4	Total
Anglo-Saxon	91.8%	88.6%	91.2%	92.9%	**92.2%**
Continental European	84.7%	83.2%	86.2%	94.2%	**84.2%**
Southern European	81.3%	84.8%	86.0%	87.7%	**90.6%**
EU	**85.6%**	**85.0%**	**87.9%**	**91.2%**	**82.8%**

Source: MORE4 EU HE survey (2019)
Notes:

- Share of researchers satisfied with the quality of training and education.
- Average shares of the following country groups are shown: Anglo-Saxon (UK, SE, DK, NL, IE), Continental European (DE, AT, PL, HU, CZ, SK), Southern European (IT, FR; ES, PT) and EU28.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (n=8,050/8,126)

6.2.3. Balance between time for research and teaching, as well as time for own research (research autonomy)

Scientific knowledge production is shaped by the time balance between research, teaching and other activities such as administrative tasks, and within time available for research, by the degree of autonomy granted to early stage researchers to follow individual lines of research. Indeed, in many interviews with young, talented researchers who moved to top institutions in the US, the main reason which emerges alongside clear tenure opportunities is the significant degree of independence they enjoy from an early career stage onwards (R2, assistant professor)[111] [112].

6.2.3.1 Balance between time for teaching and research

The teaching load of EU researchers has increased continuously since 2012, however, according to the MORE4 data, more than two out of three researchers (70%) in the EU28 are satisfied with their balance between teaching and research time (2016: 67%). The data reveal a significant negative correlation between researchers' teaching load and their satisfaction.[113]

[111] Janger, J., Nowotny, K., (2016) "Job choice in academia", Research Policy, 45(8), pp. 1672–1683.

[112] See Janger and Nowotny, 2016, for a brief review of the literature and a quasi-experiment which puts numbers on the influence of these working conditions on job choice in academia, using MORE2 data.

[113] Spearman correlation coefficients are significant at a 1% level and range between -0.3 (based on single observations) and -0.5 (based on country aggregates).

AVERAGE CATERGORY OF TEACHING LOAD (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2012 (n=8.985)	1.7	R1: 1.10 R2: 1.66 R3: 1.95 R4: 1.88	MED: 1.49 NAT: 1.60 SOC: 2.00	F: 1.76 M: 1.70
2016 (n=9.412)	1.92	R1: 1.37 R2: 1.71 R3: 2.19 R4: 1.98	MED: 1.49 NAT: 1.86 SOC: 2.10	F: 1.94 M: 1.91
2019 (n = 8,540)	2.07	R1: 1.30 R2: 1.91 R3: 2.24 R4: 2.15	MED: 2.04 NAT: 1.99 SOC: 2.19	F: 2.11 M: 2.04

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- With 0 = no teaching; 1 = 0-25% of time teaching; 2 = 25-50% of time teaching; 3 = 50-75% of time teaching and 4 = 75-100% of time teaching. Based on this scale the EU averages are calculated. Higher numbers indicate high teaching loads.
- Based on question 31: "Teaching activities"

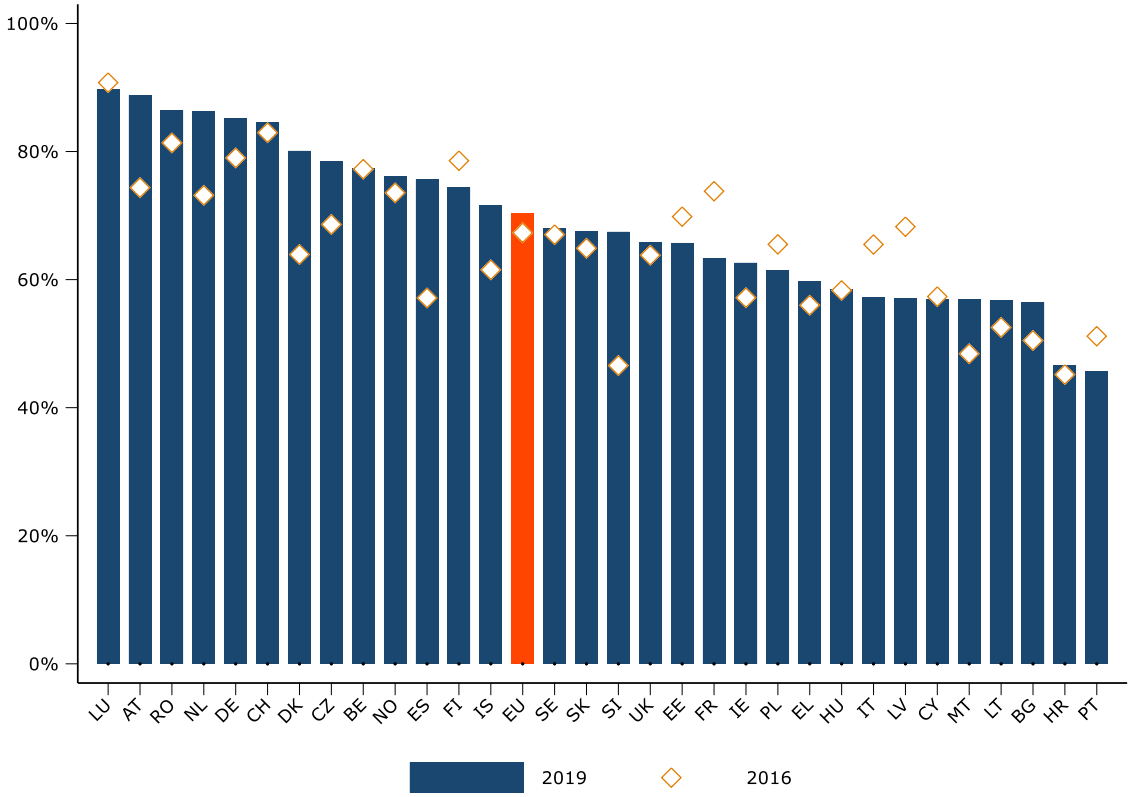
AVERAGE SATISFACTION WITH TEACHING LOAD (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2016 (n=8,844)	67.3%	R1: 77.7% R2: 75.0% R3: 60.3% R4: 67.7%	MED: 74.9% NAT: 70.5% SOC: 58.9%	F: 62.1% M: 70.5%
2019 (n=8,105)	70.4%	R1: 78.8% R2: 80.2% R3: 63.2% R4: 74.3%	MED: 74.7% NAT: 74.4% SOC: 63.3%	F: 63.7% M: 74.8%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Share of researchers satisfied with the teaching load.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"

Country level: A comparison between countries shows that the shares of researchers that perceive themselves as satisfied with their balance between teaching and research activities are particularly higher in Luxembourg (90% of researchers), Austria (89%) and Romania and the Netherlands (86%), while Portugal (46%), Croatia (47%) and Bulgaria (56%) show lower shares of researchers considering themselves as satisfied with this aspect (see Figure 78). With some exception such as Latvia (-11pp), France (-11pp) or Italy (-8pp), there is more satisfaction in most countries when compared with 2016.

Figure 70: Individual satisfaction with the balance between teaching and research, by country



Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers satisfied with their balance between teaching and research time.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=8,860, 2016: n=9,742)

Career stage and country level: On average, there is some variation between career stages with only 63% of R3 researchers but 80% of R2 researchers being satisfied with the balance they have between teaching and research (see Table 19). Particularly researchers working in Continental European higher education systems are satisfied with their teaching load (see Table 19). In this country group the share of researchers perceiving themselves as satisfied is above the EU28 average in every career stage. In the geographical classification, the Northern and Western European country groups have generally higher shares than the Southern and Eastern European country groups.

Table 19: Individual satisfaction with the balance between teaching and research, by country groups

BALANCE BETWEEN TEACHING AND RESEARCH	R1	R2	R3	R4
Anglo-Saxon	71.1%	85.4%	58.7%	78.1%
Continental European	87.6%	84.1%	73.0%	80.2%
Southern European	71.3%	68.4%	61.3%	64.1%
North	80.7%	74.5%	67.6%	78.4%
South	70.6%	57.3%	62.6%	64.9%
West	82.7%	90.9%	65.4%	76.6%
East	69.2%	61.6%	58.8%	75.1%
EU28	**78.8%**	**80.2%**	**63.2%**	**74.3%**

Source: MORE4 EU HE survey (2019)
Notes:

- Share of researchers satisfied with their balance between teaching and research time.
  Average shares of the following country groups are shown: Average shares of the following country groups are shown: Anglo-Saxon (UK, SE, DK, NL, IE), Continental European (DE, AT, PL, HU, CZ, SK), Southern European (IT, FR; ES, PT), East (CZ, EE, HU, LV, LT, PL, SI, SK, BG, RO, HR), North (NO, SE, FI, DK, IS), South (PT, ES, IT, EL, MT, CY), West (BE, FR, DE, NL, LU, AT, UK, IE, CH) and EU28.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (n=8,105/8,378)

Gender: Gender differences are observed regarding researchers' satisfaction with their teaching load. While only 64% of female researchers are satisfied with their teaching load, 75% of male researchers agreed. Compared to 2016, the shares of satisfied researchers have increased both in case of females and male researchers (2016: 62% vs. 71%). However, the gender gap has remained stable (+2pp).

6.2.3.2 Research autonomy

SATISFACTION WITH RESEARCH AUTONOMY (of all researchers)	EU28 Total	Per career stage	Per FOS	Per gender
2016 (n=9,223)	89.0%	R1: 89.0% R2: 85.6% R3: 88.0% R4: 92.5%	MED: 85.7% NAT: 90.1% SOC: 90.2%	F: 87.8% M: 89.8%
2019 (n=8,378)	90.7%	R1: 91.1% R2: 90.1% R3: 87.8% R4: 95.1%	MED: 90.6% NAT: 91.7% SOC: 89.6%	F: 87.5% M: 92.8%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers satisfied with the research autonomy.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"

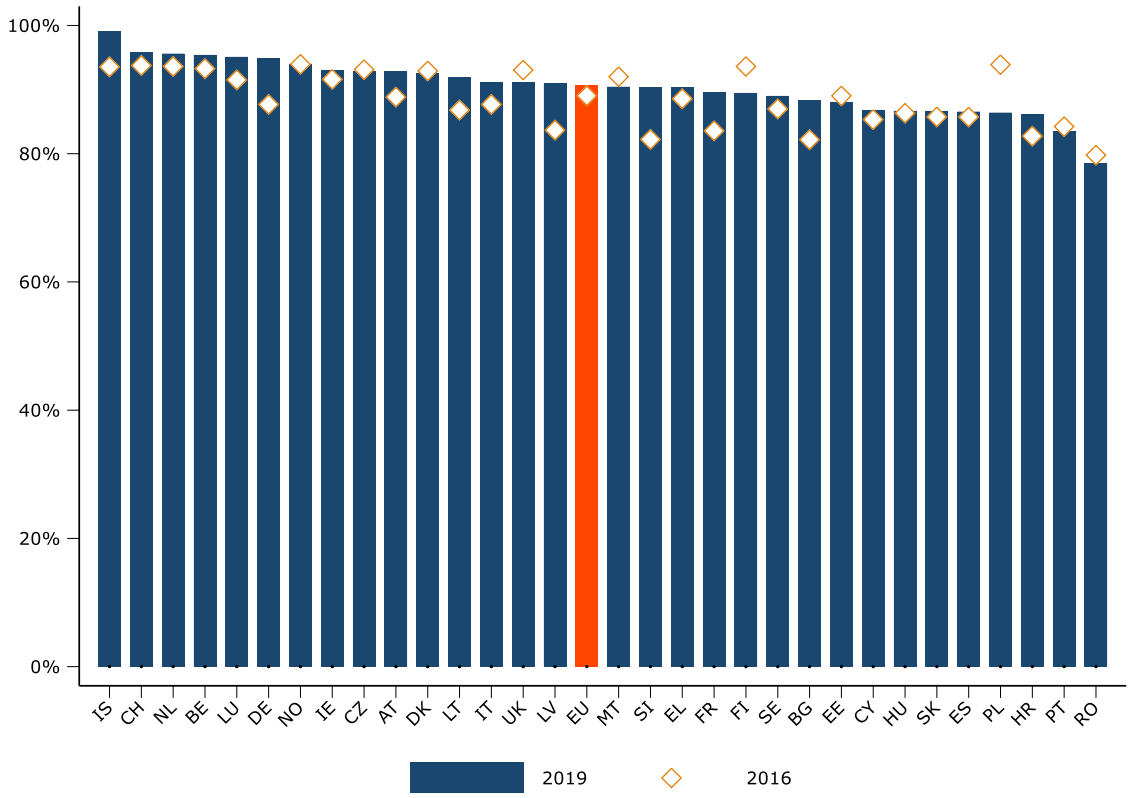
It is well known in the literature that higher levels of autonomy are correlated with stronger personal commitments and higher internal motivation to accomplish tasks excellently (Brock, 2003; Hackman - Oldham, 1976[114]). In particular, high-level research requires strong internal motivation and patience to specialise and stay tuned into one particular research question. Thus, autonomy should be especially

[114] Hackman, J. R., Oldham, G. R., (1976) "Motivation through the design of work: Test of a theory", Organ. Behav. Hum. Perform., 16(2), pp. 250–279.

high in research jobs, and as outlined above, it is one of the key drivers of mobility of young talented researchers. In the analysis by Janger and Nowotny (2016)[115], researchers are willing to trade a substantial amount of salary for an increased level of research autonomy.

In comparison to the teaching-research balance, researchers are rather happy with their level of research autonomy in European institutions. About 91% (MORE3: 89%) of all researchers in the EU28 perceive themselves as satisfied with their level of research autonomy.

Figure 71: Individual satisfaction with research autonomy, by country



Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers satisfied with the research autonomy.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=9,146; 2016: n=10,192)

Country level: Regarding research autonomy the heterogeneity across countries is rather low compared to other aspects of researcher satisfaction. On the lower bound, 78% of researchers in Romania, 84% in Portugal and 86% in Croatia and Poland perceive themselves as satisfied with their degree of research autonomy (see Figure 71). On the higher bound, in Iceland, Switzerland, the Netherlands, Belgium,

[115] Janger, J., Nowotny, K., (2016) "Job choice in academia", Research Policy, 45(8), pp. 1672–1683.

Luxembourg and Germany the share of researchers considering themselves as satisfied with their amount of research autonomy is over 95%.

Career stage and country level: Overall, no large differences between career stages are found. R4 researchers are the most satisfied with their research autonomy (95%), while the share of satisfied R3 researchers is the lowest (88%). Across all country groups a high share of researchers perceive themselves as satisfied with their research autonomy, this is especially true in case of leading researchers (see Table 19). The share of satisfied R4 researchers ranges from about 97% in Western Europe to 91% in Southern European countries. Within the groups of R2 researchers the variation is slightly higher. About 94% of R2 researchers in Western European countries and 81% of R2 researchers in Southern Europe perceive themselves as satisfied with their level of research autonomy.

In the Southern and Eastern European country groups, the shares of researchers satisfied with their research autonomy is lower than EU average all career stages. In the Northern and Western country group, the shares are each time higher than EU average (except for R1 in the Northern countries). The differences are relatively small though.

Table 20: Individual satisfaction with research autonomy, by country groups and career stage

RESEARCH AUTONOMY	R1	R2	R3	R4
Anglo-Saxon	94.6%	90.5%	87.5%	97.0%
Continental European	89.2%	93.9%	89.9%	96.4%
Southern European	91.1%	83.6%	85.9%	92.3%
North	89.7%	90.7%	89.8%	93.7%
South	88.0%	81.4%	86.7%	91.3%
West	93.8%	93.8%	88.9%	97.1%
East	85.2%	83.1%	86.0%	92.4%
EU28	**91.1%**	**90.1%**	**87.8%**	**95.1%**

Source: MORE4 EU HE survey (2019)
Notes:

- Share of researchers satisfied with their research autonomy.
  Average shares of the following country groups are shown: Average shares of the following country groups are shown: Anglo-Saxon (UK, SE, DK, NL, IE), Continental European (DE, AT, PL, HU, CZ, SK), Southern European (IT, FR; ES, PT), East (CZ, EE, HU, LV, LT, PL, SI, SK, BG, RO, HR), North (NO, SE, FI, DK, IS), South (PT, ES, IT, EL, MT, CY), West (BE, FR, DE, NL, LU, AT, UK, IE, CH) and EU28.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (n=8,105/8,378)

6.3. Career and mobility perspectives as working conditions

SATISFACTION WITH MOBILITY PERSPECTIVES (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2016 (n=8,737)	72.6%	R1: 72.9% R2: 71.2% R3: 70.1% R4: 76.8%	MED: 76.1% NAT: 73.5% SOC: 69.1%	F: 66.9% M: 76.2%
2019 (n=7,897)	75.1%	R1: 76.0% R2: 75.8% R3: 73.3% R4: 77.0%	MED: 80.8% NAT: 78.8% SOC: 67.2%	F: 69.7% M: 78.6%
SATISFACTION WITH CAREER PERSPECTIVES (of all researchers)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2016 (n=8,827)	67.6%	R1: 62.7% R2: 60.8% R3: 64.3% R4: 79.4%	MED: 72.2% NAT: 67.3% SOC: 64.7%	F: 61.2% M: 71.8%
2019 (n=7,969)	74.8%	R1: 70.3% R2: 67.5% R3: 72.4% R4: 83.7%	MED: 82.1% NAT: 76.5% SOC: 68.0%	F: 66.8% M: 80.1%

Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers satisfied with their career and mobility perspectives and differences in percentage points.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"

As outlined, career perspectives also matter for scientific knowledge production. But they also matter of course for perspectives of job security and financial security. We therefore treat this aspect as a cross-cutting issue relevant for both remuneration and scientific knowledge production. Mobility perspectives shape collaboration patterns (see section 8.1.3.2), so that they also influence scientific knowledge production. Team size and average number of co-authors is on the rise, so that mobility perspectives become more important overall (see e.g. Walsh and Lee, 2015, or Pavlidis et al., 2014).

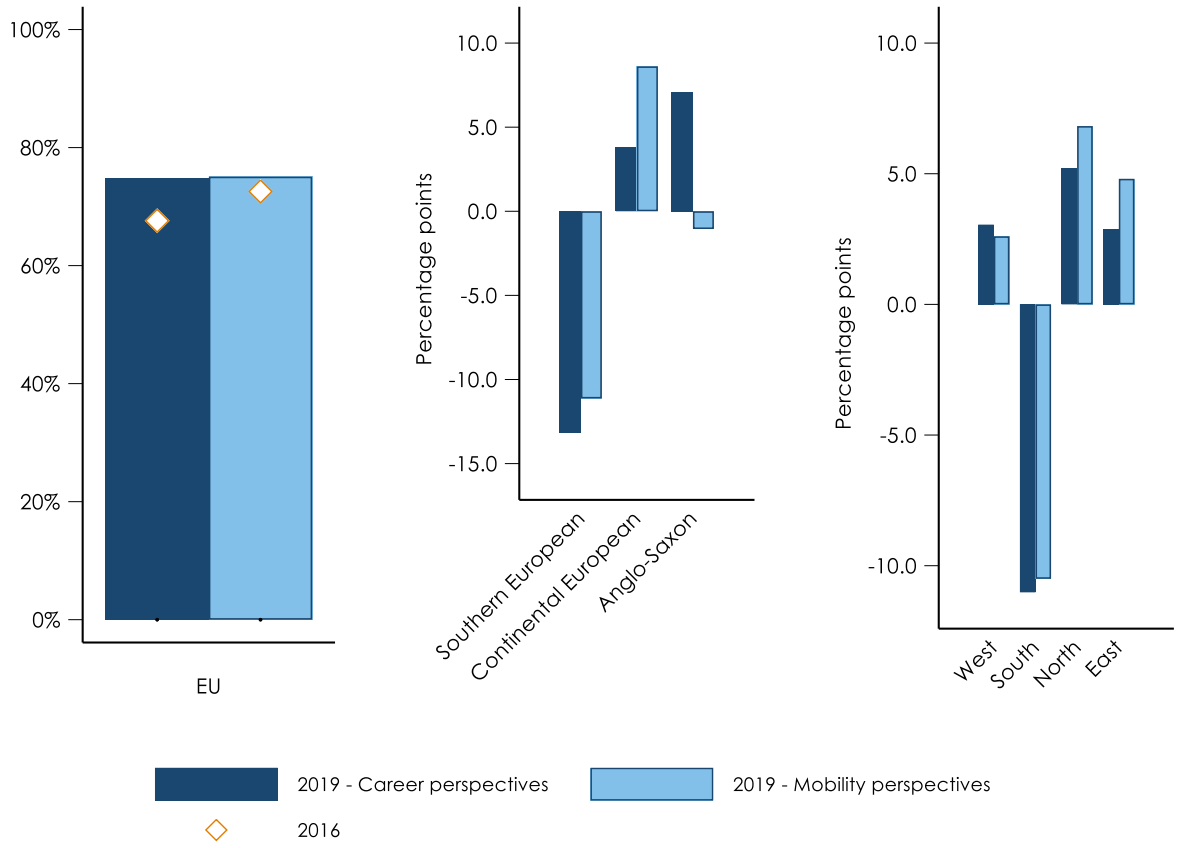
For both career perspectives and mobility perspectives, more than 3 out of 4 researchers in the EU28 perceive themselves as satisfied in their current position (75% respectively, see left panel in Figure 72).

Country group level: However, when looking at countries following the Southern European higher education system only, the share drops with over 10pp to 62% for career perspectives (see Figure 72, upper panel). On the other hand, slightly more than 4 out of 5 researchers in the Anglo-Saxon higher education system countries (82%) think positively about their future career, followed by the Continental European HE system countries (79%).

A similar pattern is observed for the perception of mobility perspectives. Again, the share drops to 64% in Southern Europe but is now highest in Continental Europe (84%), and even slightly below EU average for the Anglo-Saxon systems.

Differentiating between geographic regions shows a similar picture; while the shares of researchers thinking positive about their future career is below EU average in Southern Europe, it is above-average in the other three regions and especially in Northern Europe (see Figure 72, lower panel).

Figure 72: Individual satisfaction with career and mobility perspectives, by country groups



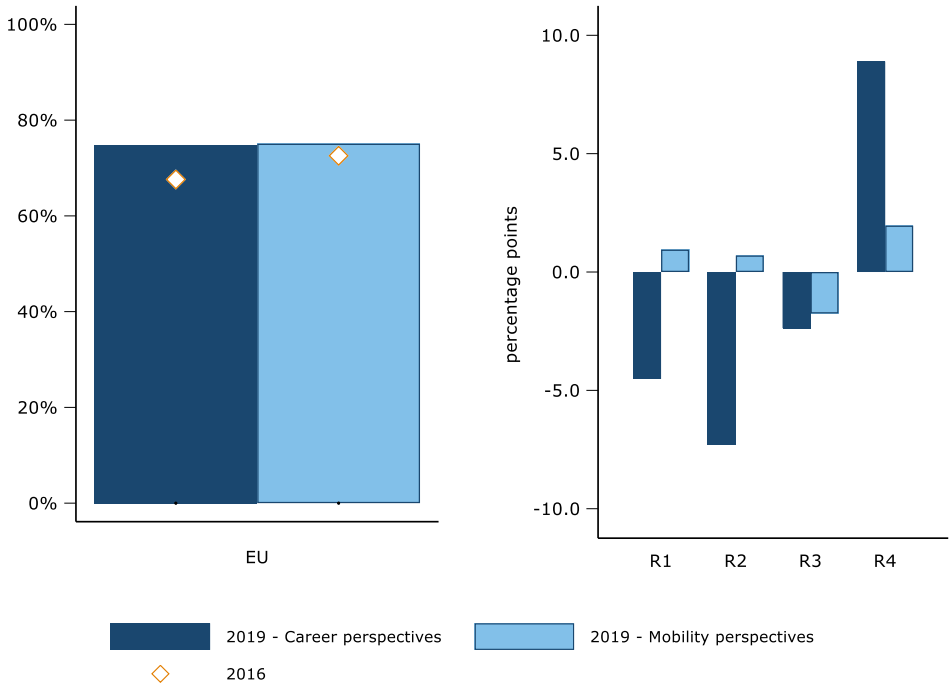
Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers satisfied with their career and mobility perspectives and differences in percentage points.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n= 7,969/7,897, 2016: n=8,827/8,737)

Gender: Rather large gender differences can be observed, especially in terms of satisfaction with career perspectives. While 80% of male researchers are satisfied with their career perspectives, only 67% of females agree. Compared to 2016 the gender gap has slightly increased by 4 percentage points. Similarly, but less pronounced is the difference in the shares of satisfied male and female researchers with their mobility perspectives. 79% of male researchers feel satisfied with their mobility perspectives while the share of female researchers is 9pp lower (70%). Compared to MORE3 the gender gap has remained rather stable.

Career stage: The share of researchers who consider themselves as satisfied with their career perspectives is significantly highest in R4 (see right panel in Figure 81). The respective share (84%) is 10pp above the EU average. It is lowest for R2 researchers (67%) followed by R1 (70%) and R3 (72%). This is plausible, as R4 researchers have made it to the top of the career path and hence enjoy their current position; uncertainty about the feasibility of a research career is highest at the R2 stage, when career progression often depends on the assessment of research performance by others. In terms of satisfaction with mobility perspectives no large differences between career stages can be observed (range between 73% of R3 and 77% of R4).

Figure 73: Individual satisfaction with career and mobility perspectives, by career stages (EU28)



Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers satisfied with their career and mobility perspectives and differences in percentage points.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n= 7,969/7,897, 2016: n=8,827/8,737)

Career stage and country group: Taking together the perspectives by country groups and by career stage, researchers tend to consider themselves most often satisfied with their career perspectives in R4 in the Eastern European countries (90%) while least often in R2 (42%) in Southern Europe (see Table 21). Overall, the shares of satisfied researchers are highest in Northern and Western European countries and increasing in career stages. A very similar picture can also be drawn for mobility perspectives. However, in the case of mobility perspectives of researchers in later career stages, the share of satisfied researchers is also high in the group of Eastern European countries.

Table 21: Individual satisfaction with career and mobility perspectives, by career stages and country groups

	CAREER PERSPECTIVES					MOBILITY PERSPECTIVES				
	R1	R2	R3	R4	Total	R1	R2	R3	R4	Total
North	73.4%	70.6%	78.6%	88.5%	**80.0%**	77.8%	78.8%	80.5%	86.6%	**81.9%**
South	58.6%	41.6%	62.8%	74.4%	**63.8%**	74.8%	52.2%	64.2%	67.1%	**64.6%**
West	74.4%	72.1%	75.9%	85.2%	**77.8%**	77.5%	82.2%	76.1%	77.7%	**77.7%**
East	68.7%	68.4%	75.7%	89.8%	**77.7%**	79.3%	71.9%	78.8%	87.0%	**79.9%**
EU	**70.3%**	**67.5%**	**72.4%**	**83.7%**	**74.8%**	**76.0%**	**75.8%**	**73.3%**	**77.0%**	**75.1%**

Source: MORE4 EU HE Survey (2019)
Notes:

- Share of researchers satisfied with their career and mobility perspectives
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (n= 7,969/7,897)

Field of science: Across fields of science, researchers in the Medical Sciences have the most optimistic view on their future careers. 82% consider themselves as satisfied with their career perspectives. Regarding the mobility perspectives, 82% researchers in Agricultural Sciences are satisfied, very closely followed by researchers in Medical Sciences (81%). The shares of satisfied researchers concerning both career and mobility perspectives are lowest in Humanities (67% and 63%, respectively) and Social Sciences (69% and 70%, respectively).

All in all, when returning to overall perceived satisfaction with working conditions relevant for scientific knowledge production, we find lowest shares of perceived satisfaction for research funding, the balance between time for teaching and time for research as well as career perspectives. Satisfaction with research funding has however markedly increased since 2016, probably reflecting rising budgets for R&D in the wake of the economic upswing. Still, perceived satisfaction is higher in countries which did not experience significant fiscal consolidation after the crisis (e.g. Northern European countries). It shows moreover the importance of EU policies for both research funding (such as through the ERC or the Horizon2020 programme) and career perspectives (such as the MSCA initiative).

7. Mobility and collaboration during PhD stage

In this section of the report, the findings on mobility and collaboration in PhD stage are presented. The section is divided in three main parts, based on the three main dimensions of mobility:

- International mobility (section 7.1);
- Interdisciplinary experiences (section 7.2);
- Intersectoral experiences (section 7.3).

All R1 researchers who have obtained a PhD or are currently enrolled in a PhD programme, as well as all R2 researchers were asked about mobility and collaboration during PhD stage. This is thus the target group on which the analysis in the following sections focusses.

7.1. International mobility and collaboration during PhD stage

In what follows, we first discuss the stock of PhD mobile researchers according to the definitions described in section 3.2.4.2, and summarised as follows:

- PhD degree mobility: Mobility with the purpose of obtaining the PhD in another country than the country of citizenship AND the country of Master's degree.
- During PhD mobility: Mobility of three months or more during the PhD while still obtaining the PhD in the country where the researcher has started his/her PhD.

We also investigate combinations of both types of PhD mobility and into the opinions of the non-mobile. In what follows, we further explore the flows, motives and barriers of international PhD mobility.

7.1.1. Stock

SHARE OF RESEARCHERS WITH INTERNATIONAL "PHD DEGREE MOBILITY"
(of all R2 researchers, or R1 researchers that are enrolled in a doctoral programme)

	EU28 Total	Per career stage	Per FOS	Per gender
2012 (n= 3,449)	15.3%	R1: 19.4% R2: 12.3%	MED: 16.4% NAT: 14.5% SOC: 15.5%	F:12.6% M:17.5%
2016 (n=2,469)	16.4%	R1: 20.0% R2: 14.6%	MED: 17.1% NAT: 16.7% SOC: 15.7%	F:15.9% M:16.9%
2019 (n=1,776)	15.5%	R1: 17.5 % R2: 14.1%	MED: 10.9% NAT: 14.6% SOC: 19.4%	F:15.1% M:16.0%

SHARE OF RESEARCHERS WITH INTERNATIONAL "DURING PHD MOBILITY" (of all R2 researchers, or R1 researchers that are enrolled in a doctoral programme)				
	EU28 Total	**Per career stage**	**Per FOS**	**Per gender**
2012 (n=3,449)	18.3%	R1: 13.9% R2: 21.5%	MED: 16.6% NAT: 16.2% SOC: 21.9%	F: 17.6% M: 18.9%
2016 (n=2,469)	18.2%	R1: 12.9% R2: 21.0%	MED: 17.1% NAT: 16.5% SOC: 21.0%	F: 18.8% M: 17.7%
2019 (n=1,776)	23.5%	R1: 18.0% R2: 26.7%	MED: 15.4% NAT: 21.1% SOC: 31.8%	F: 23.0% M: 24.0 %

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- "PhD degree mobility" is based on question 55: "Did/will you obtain your PhD in a country other than the one where you obtained your previous degree (the degree that gave access to the PhD)?"
- The answer option "No" in MORE2 EU HE survey (2012) was adjusted in MORE3 HE survey (2016) to "No, because I moved during/for my Master's degree anticipating undertaking a PhD in this country and "No". These two answer options are aggregated in the table above, which makes the results comparable between MORE2, MORE3 and MORE4.
- "During PhD mobility" is based on question 57: "During your PhD, did you move for 3 months or more to a country other than the country where you did/will obtain your PhD?"

The tables above give an overview of the shares of researchers that undertook one or another form of PhD mobility, and the differences across the main dimensions of analysis. PhD degree mobility is less common than during PhD mobility (16% versus 24%). These differences were less outspoken in the previous MORE surveys (for instance 16% versus 18% in MORE3). Moreover, current R1 researchers – researchers currently enrolled in a doctoral programme - are more inclined towards PhD degree mobility than the current R2 researchers were at the time of their PhD. For during PhD mobility, we see an opposite effect. This effect is consistent across all MORE surveys.

7.1.1.1 PhD degree mobility

In this section on PhD degree mobility, we analyse the direct question on whether or not researchers did or will obtain their PhD in a country (EU or non-EU) other than the one where they obtained their previous degree. This question was only asked of the R1 researchers currently enrolled in a doctoral programme and to the R2 researchers.

Of the current R1 PhD candidates and R2 PhD holders, 16% indicate that they have moved from the country where they obtained a previous degree with the purpose of obtaining a PhD in the destination country (see Table 22). 2% of the R1-R2 researchers indicate that they already moved during/for their Master's degree anticipating undertaking a PhD in this same country afterwards. These percentages are stable compared to MORE3.

Table 22: PhD degree mobility (EU28)

PhD degree mobility	15.5%
Non-mobility for PhD, but already moved during/for Master's degree with the objective of obtaining a PhD in that destination country	2.2%
Non-mobility for PhD, and no move during/for Master's degree with the objective of obtaining a PhD in that destination country	82.2%
Total	100%

Source: MORE4 EU HE survey (2019)
Notes:

- Only R1 PhD candidates and R2 PhD holders.
- With 'PhD degree mobility' defined as obtaining or having obtained a PhD in another county than the one where one obtained his/her previous degree.
- Based on question 55: "Did/will you obtain your PhD in a country other than the one where you obtained your previous degree (the degree that gave access to the PhD)?"
- (n=1,776)

Field of science: Researchers in Humanities (25%), Natural Sciences (17%) and Social Sciences (17%) are more inclined towards PhD degree mobility than researchers in other fields of sciences. This is in contrast with MORE3 where Researchers in Engineering and Technologies (22%) and Agricultural Sciences (22%) were slightly more inclined towards PhD degree mobility and where the differences between fields of sciences were less pronounced. At an aggregated level, these differences are still substantial (Medical: 11%, Natural 15% and Social Sciences 20%). This is in sharp contrast to MORE3 and MORE2, where no real differences could be observed.

Career stage: As indicated earlier, the R1 researchers are more inclined towards PhD degree mobility than their R2 colleagues were at the time of their PhD (18% versus 14%). These differences were more outspoken in MORE3 (20% versus 15%) and MORE2 (19% versus 12%). Furthermore, compared to the 2016 data, both R1 and R2 shares have decreased slightly.

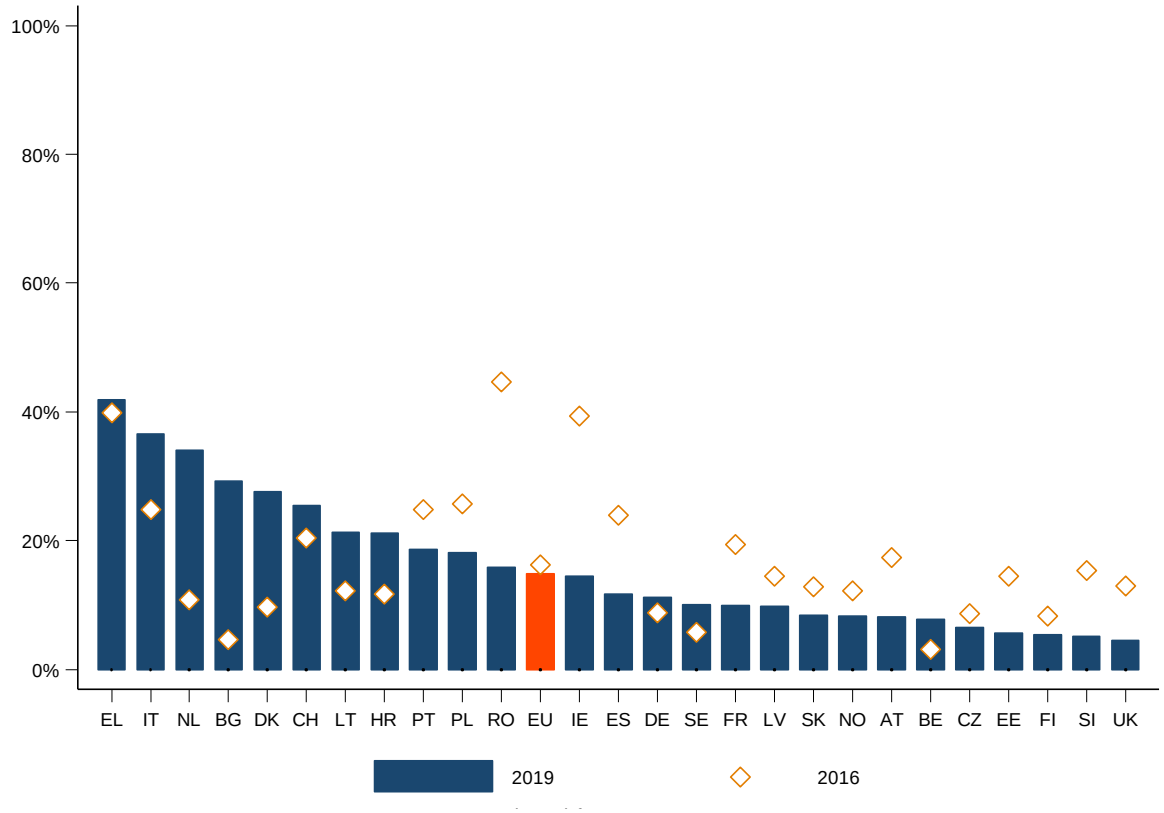
Gender: Compared to the 2012 and 2016 data, PhD degree mobility seems to have further converged for male and female researchers. In MORE4, the share for male researchers is only 0.9pp higher than the share for female researchers. In MORE2, this difference was still 4.9pp.

Family status: R1-R2 researchers with children engage/have engaged less in PhD degree mobility (13%) than those without children (18%). In MORE3, these shares are similar (12% and 19%). Surprisingly, R1-R2 researchers who are single engage less in PhD degree mobility (14%) then the ones in couple (17%), though differences are small. In MORE3, these shares behaved in the opposite direction (20% versus 14%). Of the researchers who are in couple, PhD degree mobility is substantially higher for the ones who have a partner who is also a researcher (23% versus 15%). In MORE3, these differences, were less outspoken (18% versus 12%).

Country of departure: To analyse PhD degree mobility from the point of view of the departure country, the share of researchers who indicate in the direct question that they are PhD degree mobile is calculated by country of citizenship (see Figure 74). One does have to take into account that it concerns R1 and R2 researchers who are currently working in the EU and associated countries. Citizens from Greece, Italy, Bulgaria, the Netherlands and Denmark are most PhD degree mobile (25% or more). Researchers in

Finland, Slovenia and the United Kingdom are least PhD degree mobile (below 6%). When comparing to 2016 data, some remarkable differences can be observed. In MORE3, Romania and Ireland were among the top 3 of countries with the highest shares of international PhD degree mobility, while in MORE4, they are very close to the EU28 average (13% and 16% respectively). Another notable difference is Bulgaria. In 2019, 29% of Bulgarian citizens indicated that they are PhD degree mobile, while this percentage amounted to only 5% in MORE3.

Figure 74: International PhD degree mobility, by country of citizenship (departure)



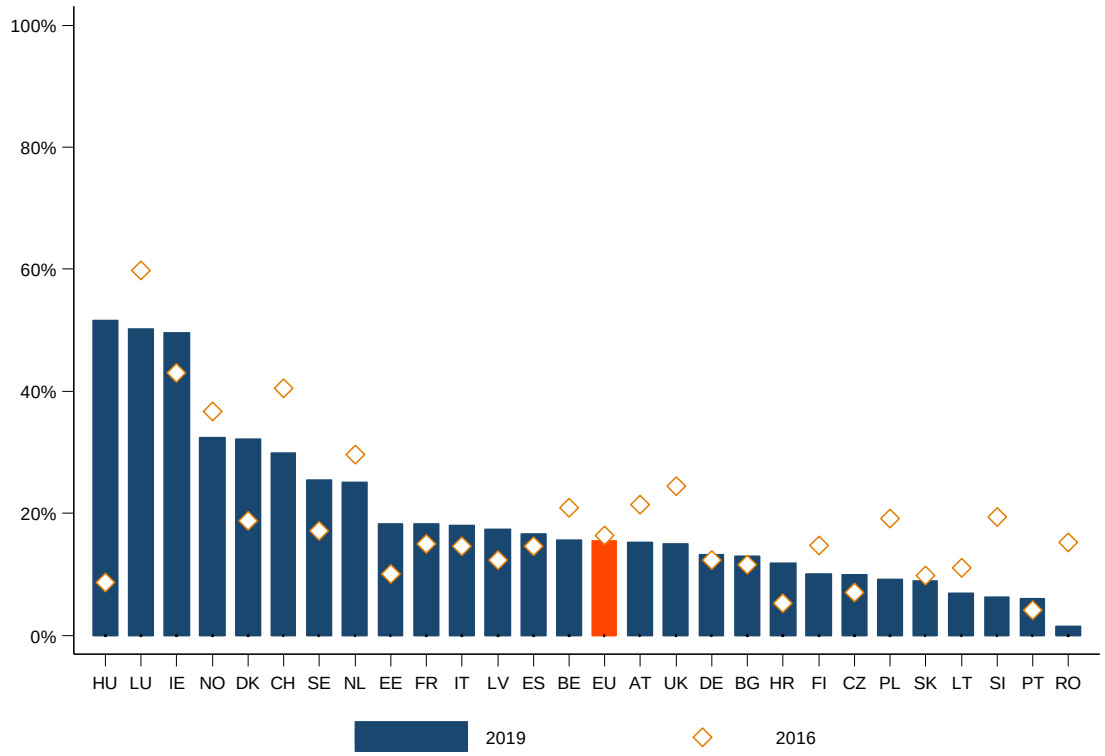
Source: MORE4 EU HE survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of R1 PhD candidates and R2 PhD holders that were PhD degree mobile per country of citizenship.
- With 'PhD degree mobility' defined as obtaining or having obtained a PhD in another county than the one where one obtained his/her previous degree.
- Countries with less than 30 observation are omitted: Cyprus, Iceland, Hungary, Luxembourg, Malta.
- Based on question 57: "Did/will you obtain your PhD in a country other than the one where you obtained your previous degree (the degree that gave access to the PhD)?" and question 5: "What is your country of citizenship?"
- (2019: n=1,781; 2016: 2,587)

Country of destination: The country of PhD is taken as a basis to analyse PhD degree mobility from the point of view of the destination country. The study estimates what proportion of researchers did or will obtain their PhD in a specific country while being citizens of another country. It is as such a measure of the proportion of foreign researchers among the PhD candidates in that country. Figure 75 shows that Hungary, Luxembourg and Ireland have the highest shares of foreign citizens among their PhD candidates. In MORE3, the highest shares could be observed for Iceland, Luxembourg and Greece. In general, small and open countries are also relatively more receiving countries (besides Luxembourg and

Ireland, also Norway, Denmark, Switzerland and the Netherlands). At the other end of the spectrum are countries such as Romania, Portugal, Slovenia, Lithuania and Slovakia which attract low numbers of PhD degree mobile researchers compared to their total number of PhD candidates. This is in line with 2016 data, where Portugal attracted the lowest number of PhD degree mobile researchers compared to the total number of PhD candidates (4%).

Figure 75: International PhD degree mobility, by country of PhD (destination)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Share of R1 PhD candidates and R2 PhD holders that were PhD degree mobile per country of PhD.
- With 'PhD degree mobility' defined as obtaining or having obtained a PhD in another county than the one where one obtained his/her previous degree.
- Countries with less than 30 observation are omitted: Cyprus, Iceland, Greece, Malta
- Based on question 55: "Did/will you obtain your PhD in a country other than the one where you obtained your previous degree (the degree that gave access to the PhD)?"
- (2019: n=1,881; 2016: 2,716)

7.1.1.2 During PhD mobility

Aside from PhD degree mobility, we have also defined during PhD mobility: >3 months mobility to a country other than the country where the researcher did/will obtain his or her PhD. According to a direct question in the 2019 survey, 24% of the current R1-R2 researchers have undertaken this kind of during PhD mobility. This is a considerable increase compared to the 2016 survey, where only 18% of the current R1-R2 indicated they were mobile during their PhD.

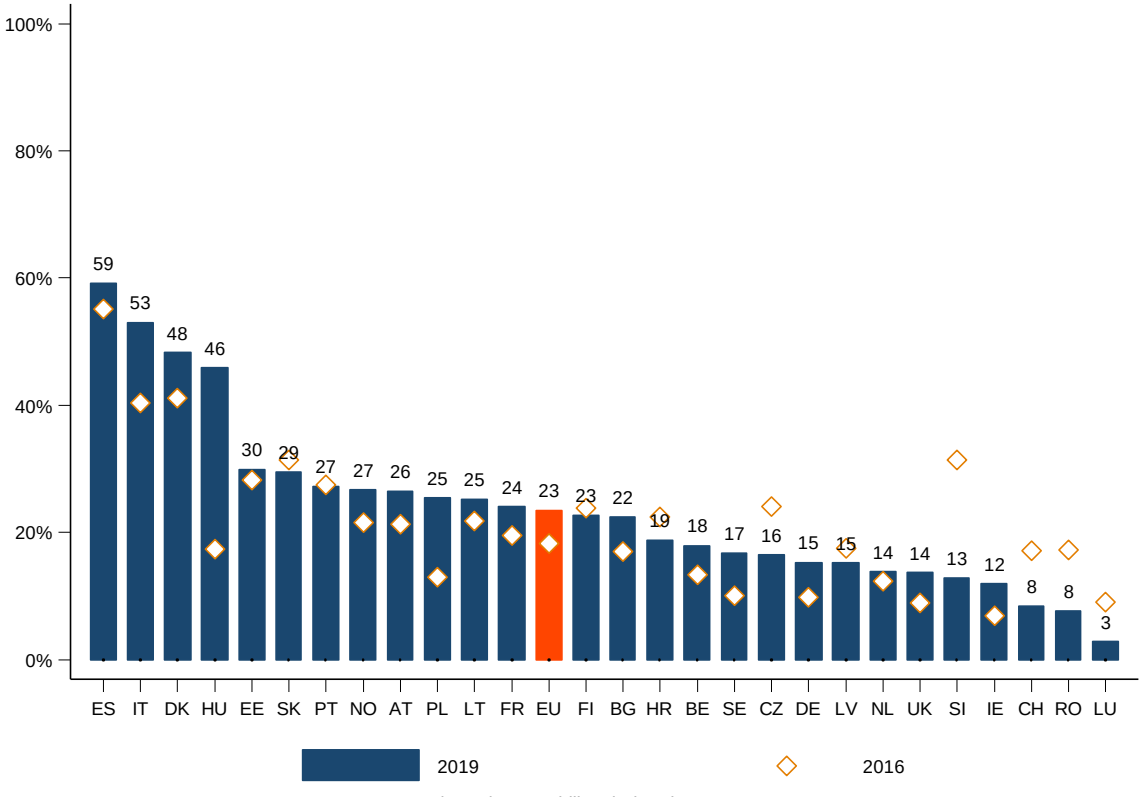
Departure country: Figure 76 provides an overview of the during PhD mobility per country of PhD (i.e. the country where the PhD is or will be obtained, in this case the departure and return country). The

shares for researchers who will/did obtain a PhD in Spain, Italy, Denmark and Hungary are considerably higher than the EU average (between 46% and 59% compared to 23.5%). These researchers are thus on average more mobile during their PhD. Already in 2016, the top 3 of countries with the highest during PhD mobility shares contained Spain, Denmark and Italy (55%, 41% and 40%). However, at that time Hungary reported a share of 17%, which was below EU average (18%). As such, Hungary experienced a remarkable increase over time.

Other countries that score high in MORE4 are Estonia, Slovakia, Portugal and Norway, with values over 25%. Researchers who obtain(ed) their PhD in Switzerland, Romania and Luxembourg are less frequently engaged in during PhD mobility (10% or below). For Luxembourg and Switzerland, this could be in part due to other types of mobility being more prevalent in these countries, such as the PhD degree mobility or Master mobility.

In MORE3, we already observed a decrease for researchers from Italy and Romania. In Romania, the European Social Fund and the Sectoral Operational Programme Human resources development 2007-2013 supported heavily mobility of researchers. This programme ended in 2015 though and could be a reason why mobility has dropped more recently. In MORE4, we can notice that this share of during PhD mobility dropped further in Romania (from 17% to 8%), while we can observe an increase in Italy (from 40% to 48%). We can also observe a striking decrease for Slovenia, where this share dropped from 31% to 13%.

Figure 76: >3 month international mobility during PhD, by country of PhD (departure)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Share of R1 PhD candidates and R2 PhD holders that were >3 month mobile during their PhD per country of PhD.
- With '>3 month mobility during PhD' defined as moving for 3 months or more to a country than the one in which they obtained or will obtain their PhD.
- Countries with less than 30 observations are omitted: Cyprus, Greece, Iceland, Malta.
- Based on question 57: "During your PhD, did you move for 3 months or more to a country other than the country where you did/will obtain your PhD?"
- (2019: n= 1,917; 2016: 2,764)

Career stage: As indicated before, R2 researchers are more frequently engaged in during PhD mobility (27%) than R1 researchers currently working on their PhD (18%). In MORE3 and MORE2, we can observe the same phenomenon, although these percentages are lower (in MORE3: 21% and 13%, while in MORE2, this was 22% and 14%).

Field of science: Compared to 2016 and 2012 data, we can observe that the differences between aggregated fields of science are becoming increasingly larger, especially the share of researchers with international during PhD mobility active in Social Sciences and Humanities has increased substantially to 32% in MORE4 (21% in MORE3). At a more detailed level, we can observe that indeed Social Sciences and Humanities have higher shares of R1 and R2 researchers who moved for a fixed period during their PhD to another country (30% and 35% respectively). This is expected from existing literature and these resulted were also found in the 2016 and 2012 data.

Gender: No large gender differences have been found, with 24% of the male researchers versus 23% of the female researchers having engaged in during PhD mobility. In 2016 and 2012, these shares varied between 17% and 19%.

Family situation: R1-R2 researchers without children are somewhat more inclined to engage in during PhD mobility (26%) compared to those without children (24%), but not surprisingly the difference is smaller than for PhD degree mobility (2.8pp versus 4.7pp difference). On the other hand, researchers in a couple (27%) are more inclined to engage in during PhD mobility compared to single researchers (23%). This difference is also larger than for PhD degree mobility (3.5pp versus 4.7pp). Mobility during PhD also increases substantially among researchers with partners working in research (43% versus 23% without partner).

7.1.1.3 PhD degree and during PhD mobility

When combining the information from both questions, we find that 6% of the R1-R2 researchers combined the two forms of PhD mobility, while 64% did not engage in either of them ('non-PhD mobile researchers', see next section). In the previous MORE3 survey these figures were respectively 4% and 70%. We can also notice that:

- 18% undertook a move during their PhD but did not engage in PhD degree mobility (compared to a total of 24% with during PhD mobility). These numbers are an increase compared to the previous MORE3 survey where these percentages amounted to 14% and 18%;
- 10% undertook mobility with the purpose of obtaining their PhD in the destination country (12% in MORE3) but did not combine this with another move during the PhD (compared to a total of 16% with PhD degree mobility; also 16% in MORE3).

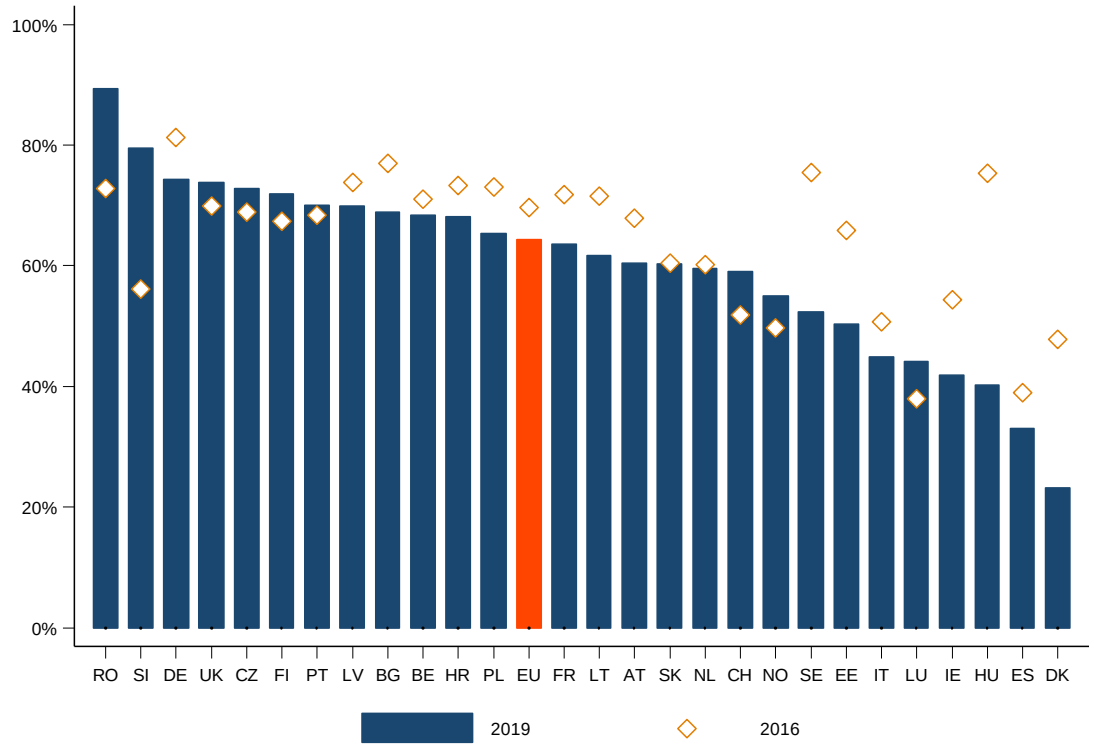
In MORE3, we observed that the rate of during PhD mobility was considerably higher among researchers who were not mobile for their PhD degree, because they already moved during their Master's degree: 37% versus 18% in total. It was argued that Master mobility could be considered an early indication of their international orientation. However, in MORE4, we can notice that these percentages are no longer significantly different form each other (23% versus 24% in total).

7.1.1.4 Non-mobility for PhD

Non-mobility for PhD is defined as the experience of a researcher who has undertaken neither PhD degree mobility nor >3 month mobility during PhD. This is the subgroup of researchers which was further questioned on their non-mobility in the survey.

The bars in Figure 77 represent those researchers who obtained/will obtain their PhD in the country but who were never mobile for or during the PhD phase. At the EU level, 64% of the R1-R2 researchers were as such non-mobile for the PhD (70% in MORE3).

Figure 77: Non-mobile researchers for PhD degree or during PhD, by country of PhD



Source: MORE4 Eu HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Share of R1 PhD candidates and R2 PhD holders that were never PhD degree mobile nor mobile during their PhD per country of PhD.
- With 'PhD degree mobility' defined as obtaining or having obtained a PhD in another county than the one where one obtained his/her previous degree.
- With '>3 month mobility during PhD' defined as moving for 3 months or more to another country than the country where he/she did or will obtain their PhD.
- Countries with less than 30 observations are omitted: Cyprus, Malta, Greece, Iceland.
- Based on question 55: "Did/will you obtain your PhD in a country other than the one where you obtained your previous degree (the degree that gave access to the PhD)?" and question 57: "During your PhD, did you move for 3 months or more to a country other than the country where you did/will obtain your PhD?".
- (2019: n=1,917; 2016: 2,763).

Country level: Many countries are close to the EU average. Countries with the most non-mobile researchers are Romania (89%), Slovenia (80%), Germany (74%), the United Kingdom (74%) and Czech Republic (73%). At the lower end of the spectrum (lowest share of non-mobile researchers in PhD) are Denmark (23%), Spain (33%) and Hungary (40%). In these countries, researchers are thus more inclined to undertake at least one type of PhD mobility than on average in the EU. Countries that are renowned as 'open' countries in terms of outgoing mobility, such as Luxembourg (44%), Norway (55%), Ireland (42%) and Switzerland (59%) are also at the right-hand side of the graph (this was already the case in MORE3). Compared to 2016 data, we can observe that most of the countries (of PhD) experienced a decrease in the share of non-mobile researcher. This decrease is the most pronounced in Hungary (decrease of 35pp: from 75% to 40%), Denmark (decrease of 25pp: from 48% to 23%) and Sweden (decrease of 23pp: from 75% to 52%). Substantial increases in the share of non-mobile researchers can however be observed in Slovenia (+34pp) and Romania (+16pp).

Career stage: Differences in terms of career stages are not significant, with a value of 65% for R1 and 63% for current R2. For both R1 and R2 researchers, these shares have decreased compared to 2016 data (71% and 69%).

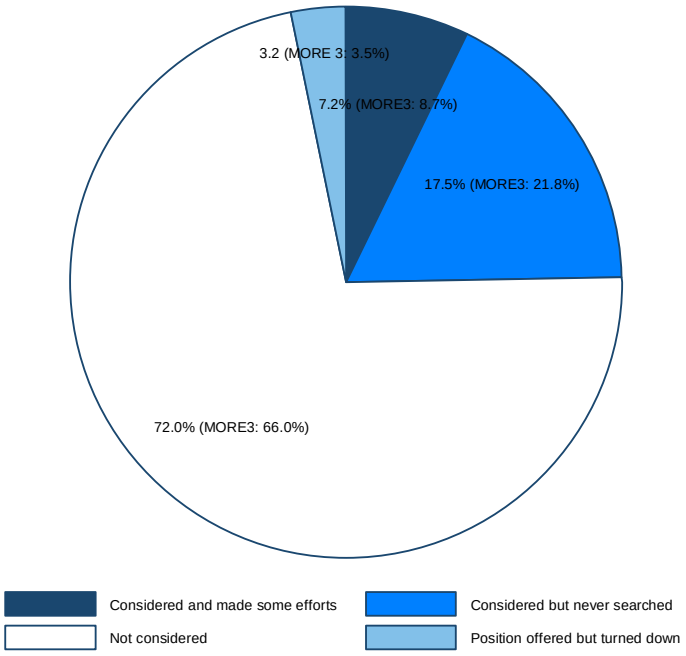
Field of science: Differences between fields are increasing over time, as indicated before. The highest non-mobility occurs in the aggregated domains of Health (Medical Sciences and Agricultural Sciences; 75%) and Natural Sciences (including Engineering and Technology; 66%). In Social Sciences and Humanities, the share of non-mobile researchers equals 55%.

Gender: There are no substantial differences between male and female researchers in terms of non-mobility for PhD (61% versus 67%).

About 28% of the non-mobile researchers in PhD have ever considered to take part or all of their PhD in a country other than that in which they obtained their previous degree (see Figure 78): 18% has considered it but never searched for concrete opportunities (MORE3: 22%), 7% considered it and did undertake some efforts to become mobile (MORE3: 9%) and finally, 3% considered it and was even offered a position in another country, but turned it down (MORE3: 3%). 72% of all non-mobile researchers indicated that they not even have considered to take part or all of their PhD in a country other than that in which they obtained their previous degree. This is an increase of 6pp compared to the 2016 data.

Country differences are relatively large, as shown in Figure 79, and not necessarily related to the degree of (non-)mobility in the country. In MORE3 these differences were also relatively large, and we can notice from the figure below that the category of researchers that never considered PhD mobility since 2016 has decreased in most of the countries.

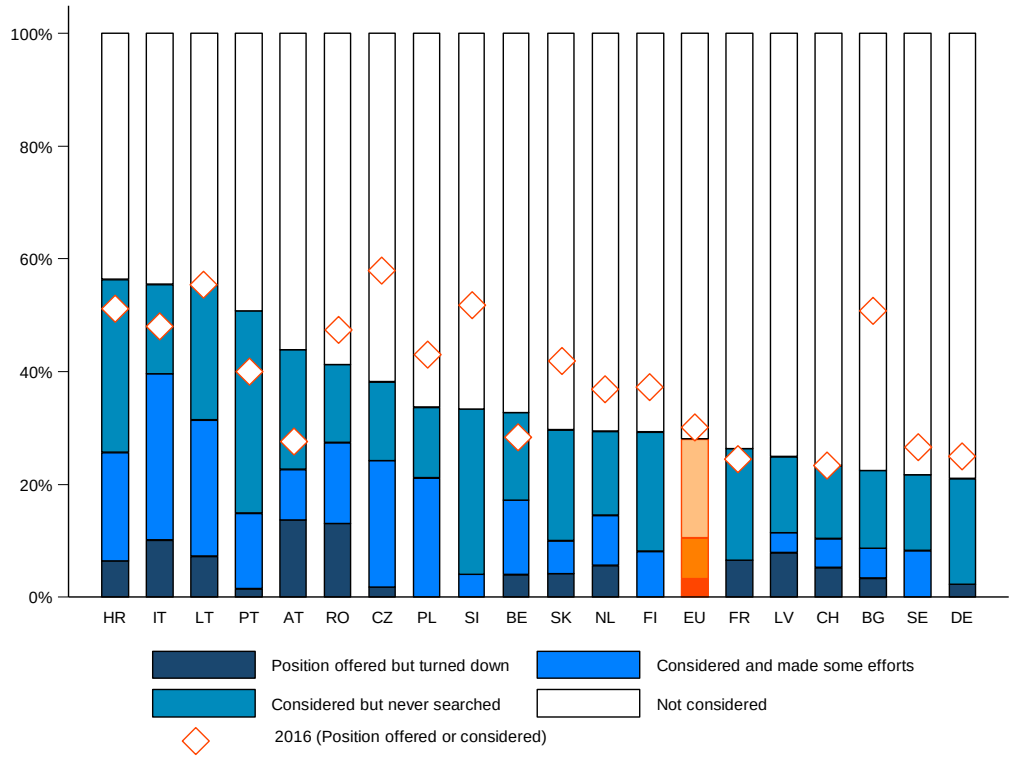
Figure 78: Degree of consideration of PhD mobility among the non-mobile



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Distribution of R1 PhD candidates and R2 PhD holders that were non-PhD mobile (i.e. not PhD degree mobile nor mobile during their PhD) over levels of consideration of PhD mobility.
- With 'PhD degree mobility' defined as obtaining or having obtained a PhD in another county than the one where one obtained his/her previous degree.
- With '>3 month mobility during PhD' defined as moving for 3 months or more to another country than the country where he/she did or will obtain their PhD.
- Based on question 60: "Did you ever consider undertaking part or all of your PhD in a country other than the one in which you obtained your previous degree?"
- (2019: n=1,073; 2016: 1,512)

Figure 79: Degree of consideration of PhD mobility among the non-mobile, by country of PhD



Source: MORE4 EU HE survey (2019) and MORE4 EU HE survey (2016)
Notes:

- Distribution of R1 PhD candidates and R2 PhD holders that were non-PhD mobile (i.e. not PhD degree mobile nor mobile during their PhD) over levels of consideration of PhD mobility by country of PhD.
- With 'PhD degree mobility' defined as obtaining or having obtained a PhD in another county than the one where one obtained his/her previous degree.
- With '>3 month mobility during PhD' defined as moving for 3 months or more to another country than the country where he/she did or will obtain their PhD.
- Countries with less than 30 observations are excluded: Cyprus, Estonia, Greece, Hungary, Ireland, Norway, Spain, Iceland, Luxembourg, Malta and United Kingdom.
- Based on question 60: "Did you ever consider undertaking part or all of your PhD in a country other than the one in which you obtained your previous degree?"
- (2019: n=1,149; 2016: 1,500)

7.1.2. Flows

The R1-R2 researchers indicated between 1 and 5 different countries for their >3 month mobility during their PhD (in MORE3 this was 3). 85% indicated one country (82% in MORE3), 11% two countries (15% in MORE3), 2% three countries (4% in MORE3), 1% four countries, and 2% five countries.

The MORE surveys provide information of the destination countries of mobile researchers. It is important to note that the analysis of the flows only reflects the information provided by the respondents to the survey. This entails that the analysis does not take into account the general flow of workers to and from these countries. With this caveat in mind, it can be observed that the main destination countries for >3 month mobility during PhD are the United States (13%), Germany (12%) and the United Kingdom (10%). In MORE3 and MORE2, these countries were also among the top 3, but in a different order (Germany surpassed the United Kingdom in the most recent MORE survey). In

MORE3, the percentages of these countries amounted to 12%, 12% and 11% respectively for the US, the UK and Germany. When comparing the top 10 of destination countries in MORE4, with the top 10 in MORE3, it can be noticed that Austria (3%) and Denmark (3%), have taken their place in this top 10 at the expense of Switzerland (2%, rank 14) and Canada (1%, rank 16).

Of the R1 and R2 researchers who moved for >3 months during their PhD towards the United States, 12% were Italian, 12% Danish and 12% German. We can also observe from the table, that most of the R1 and R2 researchers who moved to this top 10 of destination countries, come from neighbouring countries (apart from the United States and the United Kingdom). From Table 23 we discern that the top 10 destination countries for during PhD mobility are often visited by R1 and R2 researchers from the largest mainland EU-countries (Germany, Italy, Spain, Denmark). In MORE3, this list was dominated by Southern European countries (Italy, Spain, Greece, Portugal).

Table 23: Main destination countries for >3 month mobility during PhD (EU28 departing countries)

DESTINATION	SHARE (%)	CUMULATIVE SHARE (%)	ORIGIN 1 (CITIZENSHIP)	ORIGIN 2 (CITIZENSHIP)	ORIGIN 3 (CITIZENSHIP)
United States	12.7%	12.7%	Italy (11.6%)	Denmark (11.6%)	Germany (11.6%)
Germany	12.2%	24.9%	Spain (9.4%)	Slovenia (9.4%)	Austria/Bulgaria (6.3%)
United Kingdom	10.2%	35.1%	Spain (11.5%)	Italy (9.6%)	Denmark (9.6%)
France	7.3%	42.4%	Spain (16.2%)	Italy (13.5%)	Romania/Portugal (10.8%)
Spain	4.5%	46.9%	Portugal (16%)	Bulgaria (12%)	Slovenia (12%)
Italy	3.9%	50.8%	Germany (13.6%)	Lithuania (13.6%)	France (9.1%)
Sweden	3.5%	54.3%	Germany (16.7%)	Italy (16.7%)	Denmark, Lithuania, Sweden (11.1%)
Belgium	3.5%	57.8%	Germany (11.1%)	France (11.1%)	Denmark (11.1%)
Austria	3.3%	61.2%	Slovenia (17.6%)	Belgium, Slovakia (11.8%)	
Denmark	2.7%	63.9%	Spain (14.3%)	Finland, Portugal, Slovenia, and others (7.1%)	

Source: MORE4 EU HE survey (2019)
Reading note: Of the total number of researchers currently working in the EU but who were mobile for more than three months during their PhD to the United States, 11.6% were Italian, both also 11.6% Danish and 11.6% Spanish.
Notes:
- Share of R1 PhD candidates and R2 PhD holders currently working in the EU which were mobile for more than three months during their PhD to a specific destination country.
- Destination countries with less than 14 observations are not included in the table (Denmark has 14 observations).
- Based on question 58: "To which country(ies) was this?"
- (n=510)

7.1.3. Motives

This section discusses the motives of R1 and R2 researchers to engage in an international move for or during their PhD. A list of 15 factors were presented for each type of mobility (plus the 'other' category). Motives are analysed individually and across categories of motives. These categories follow a similar rationale to those presented in Section 6 on researchers' satisfaction with working conditions. We can

differentiate between 1) motives related to remuneration and other non-science related factors, 2) motives related to scientific knowledge production, and 3) motives related to career progression.

The first set encompasses to two main categories: Financial security and satisfaction at work.

- Financial security includes remuneration, job security, social security and other benefits and pension plan.
- Individual satisfaction at work encompasses those motives that refer to non-work-related reasons such as culture, personal or family reasons and other non-specified factors.

The second main group of motives –related to conditions to create scientific knowledge - is formed by financial support, intellectual support, and time constraints.

- Financial support includes availability of research funding and of suitable positions, and access to research facilities and equipment.
- Intellectual support refers to working with leading scientists, the quality of education and training, and international networking.
- Time balance and research autonomy includes research autonomy and balance between teaching and research time.

Finally, the last group makes reference to those factors related to career progression.

7.1.3.1 Motives for PhD degree mobility

In this section, we address the factors which were important in the decision of the researchers to engage in PhD degree mobility. This question was asked to all R1 PhD candidates and R2 PhD holders who will obtain/obtained their PhD in a country other than the one where they obtained their previous degree (the degree that gave access to the PhD). An overview of the motives for PhD degree mobility in 2012, 2016 and 2019 is provided in Table 24.

In 2016 nearly all the motives included in the survey experienced an increase with respect to 2012. However, in 2019 we observe that the shares have decreased – hence getting closer again to the results obtained in 2012. The availability of research funding is the most frequently mentioned motive in 2019 (80%) - a very similar percentage to the one obtained in 2016 in this item. Working with leading scientists was the most often cited motive in 2016 (88%). In 2019 it still an important motive but it is mentioned by 74% of the researchers (73% in 2012).

The following three motives have been included among the five most often cited motives over time (2012-2016-2019): Availability of suitable PhD positions, international networking and working with leading scientists (and international networking since 2016). There is thus a relatively stable pattern in the motives why researchers engage in PhD degree mobility. On the other hand, quality of education and training and career progression have lost some of their relative importance in 2019 compared to 2016 and 2012. Among the least frequently mentioned motives we find job security, personal /family reasons and pension plan constitute a motive for mobility for less than 50% of the researchers.

In Table 25, the main motives for PhD mobility in 2016 are summarised into the categories defined above. Motives of intellectual support (73%) and financial support (75%) are the main ones for PhD degree mobility, as well as career progression (68%).

Table 24: Importance of motives for international PhD degree mobility (2012-2016, EU)

SHARE OF RESPONDENTS THAT INDICATE THIS MOTIVE AS ONE OF THE MOTIVES FOR INTERNATIONAL PHD DEGREE MOBILITY (of all R2 researchers, or R1 researchers that are enrolled in a doctoral programme and that were PhD degree mobile)			
	2012 (n=653)	**2016 (n=491)**	**2019 (n=305)**
Availability of research funding	72.6%	79.2%	80.2%
Availability of suitable PhD positions	83.9%	84.5%	78.3%
International networking	/	81.8%	74.8%
Working with leading scientists	73.2%	87.8%	74.3%
Research autonomy	64.6%	77.9%	73.3%
Quality of training and education	76.4%	86.9%	71.1%
Career progression	74.5%	84.5%	68.0%
Access to research facilities and equipment's	69.5%	79.0%	65.7%
Remuneration	50.8%	70.9%	57.1%
Balance between teaching and research time	/	64.7%	55.5%
Social security and other benefits	35.3%	63.6%	51.1%
Culture and / or language	58.9%	62.5%	50.1%
Job security	44.5%	62.1%	48.4%
Personal /family reasons	31.5%	60.3%	48.3%
Pension plan	(together with social security benefits in 2012 survey)	49.2%	38.5%
Working conditions	62.6%	/	/

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- With 'PhD degree mobility' defined as obtaining or having obtained a PhD in another county than the one where one obtained his/her previous degree.
- Only including researchers having obtaining or having obtained a PhD in a EU country.
- Based on question 56:" Which of the following factors were important in your decision to obtain your PhD in another country?" The answer options between MORE2 and MORE3 differ slightly.

Table 25: Importance of categories of motives for international PhD degree mobility (EU28)

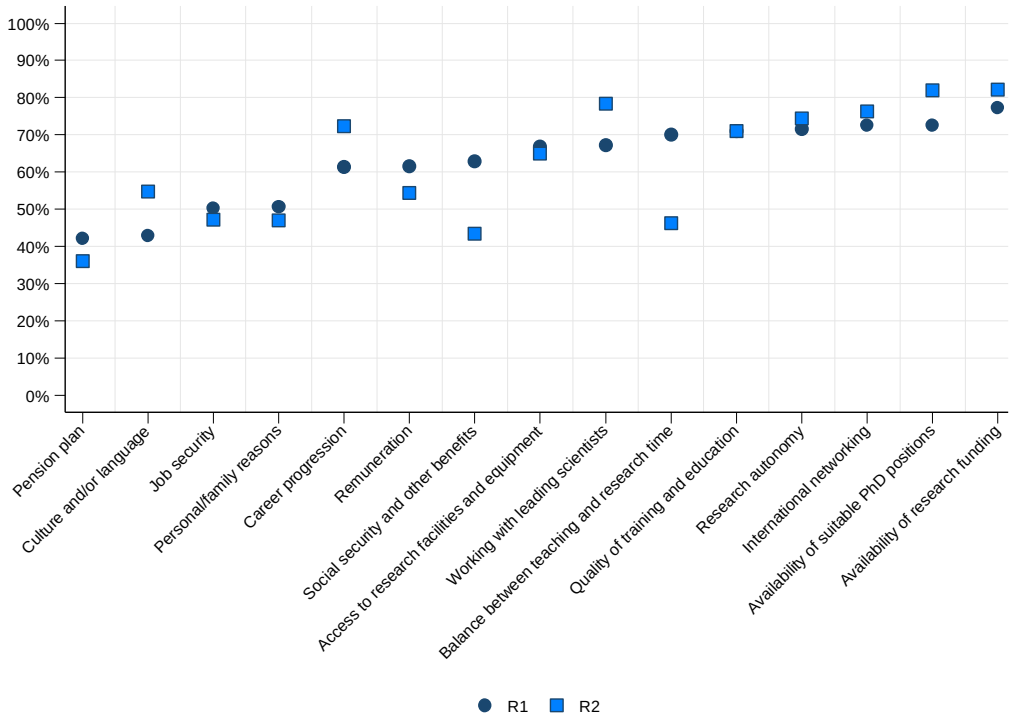
AVERAGE SHARE OF RESPONDENTS THAT INDICATE THE MOTIVES IN THIS CATEGORY AS ONE OF THE MOTIVES FOR INTERNATIONAL PHD DEGREE MOBILITY (of all R2 researchers, or R1 researchers that are enrolled in a doctoral programme that were PhD degree mobile)					
	Year	**EU total**	**Per career stage**	**Per FOS**	**Per gender**
Financial security	**2016**	61.5%	R1: 58.8% R2: 63.4%	MED: 65.2% NAT: 39.2% SOC: 49.3%	F: 61.1% M: 61.9%
	2019	48.8%	R1: 54.2% R2: 45.3%	MED: 75.1% NAT: 59.4% SOC: 30.1%	F: 50.6% M: 46.9%
Satisfaction at work	**2016**	61.4%	R1: 66.0% R2: 58.2%	MED: 59.3% NAT: 69.2% SOC: 56.1%	F: 58.8% M: 63.9%
	2019	66.1%	R1: 64.5% R2: 67.2%	MED: 92.2% NAT: 85.1% SOC: 59.6%	F: 64.7% M: 67.7%
Financial support	**2016**	80.9%	R1: 75.4% R2: 84.9%	MED: 85.1% NAT: 86.7% SOC: 70.7%	F: 78.4% M: 83.0%
	2019	74.8%	R1: 72.2% R2: 76.4%	MED: 91.6% NAT: 86.0% SOC: 56.6%	F: 83.1% M: 66.3%
Intellectual support	**2016**	85.5%	R1: 79.3% R2: 90.2%	MED: 87.7% NAT: 88.3% SOC: 80.2%	F: 85.1% M: 85.9%
	2019	73.4%	R1: 70.2% R2: 75.2%	MED: 79.2% NAT: 63.9% SOC: 59.6%	F: 79.0% M: 67.6%
Time balance	**2016**	71.3%	R1: 64.4% R2: 76.3%	MED: 66.7% NAT: 79.4% SOC: 69.8%	F: 70.3% M: 72.5%
	2019	64.4%	R1: 70.8% R2: 60.4%	MED: 79.2% NAT: 63.9% SOC: 59.6%	F: 61.1% M: 67.9%
Career progression	**2016**	84.5%	R1: 83.8% R2: 85.1%	MED: 85.4% NAT: 93.4% SOC: 75.0%	F: 85.3% M: 83.8%
	2019	68.0%	R1: 61.3% R2: 72.3%	MED: 91.8% NAT: 78.3% SOC: 51.3%	F: 78.1% M: 57.6%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016)
Notes:

- With 'PhD degree mobility' defined as obtaining or having obtained a PhD in another county than the one where one obtained his/her previous degree.
- Financial security includes remuneration, job security, social security and other benefits and pension plan.
- Satisfaction at work refers to culture, and personal or family reasons.

- Financial support includes availability of research funding and of suitable positions, and access to research facilities and equipment.
- Intellectual support refers to working with leading scientists, the quality of education and training, and international networking.
- Time balance includes research autonomy and balance between teaching and research time.
- Based on question 56:"Which of the following factors were important in your decision to obtain your PhD in another country?"
- (2019: n= 305; 2016: n=491)

Figure 80: Importance of motives for international PhD degree mobility, by (current) career stage (EU28)



	R1	R2	TOTAL
Pension plan	42.2%	36.1%	38.5%
Culture and/or language	42.8%	54.7%	50.1%
Job security	50.3%	47.2%	48.4%
Personal/family reasons	50.6%	47.0%	48.3%
Career progression	61.3%	72.3%	68.0%
Remuneration	61.5%	54.3%	57.1%
Social security and other benefits	62.8%	43.4%	51.1%
Access to research facilities and equipment	66.8%	65.1%	65.7%
Working with leading scientists	67.2%	78.4%	74.3%
Balance between teaching and research time	70.1%	46.3%	55.5%
Quality of training and education	71.1%	71.1%	71.1%
Research autonomy	71.5%	74.4%	73.3%
International networking	72.5%	76.2%	74.8%
Availability of suitable PhD positions	72.5%	82.0%	78.3%
Availability of research funding	77.2%	82.1%	80.2%

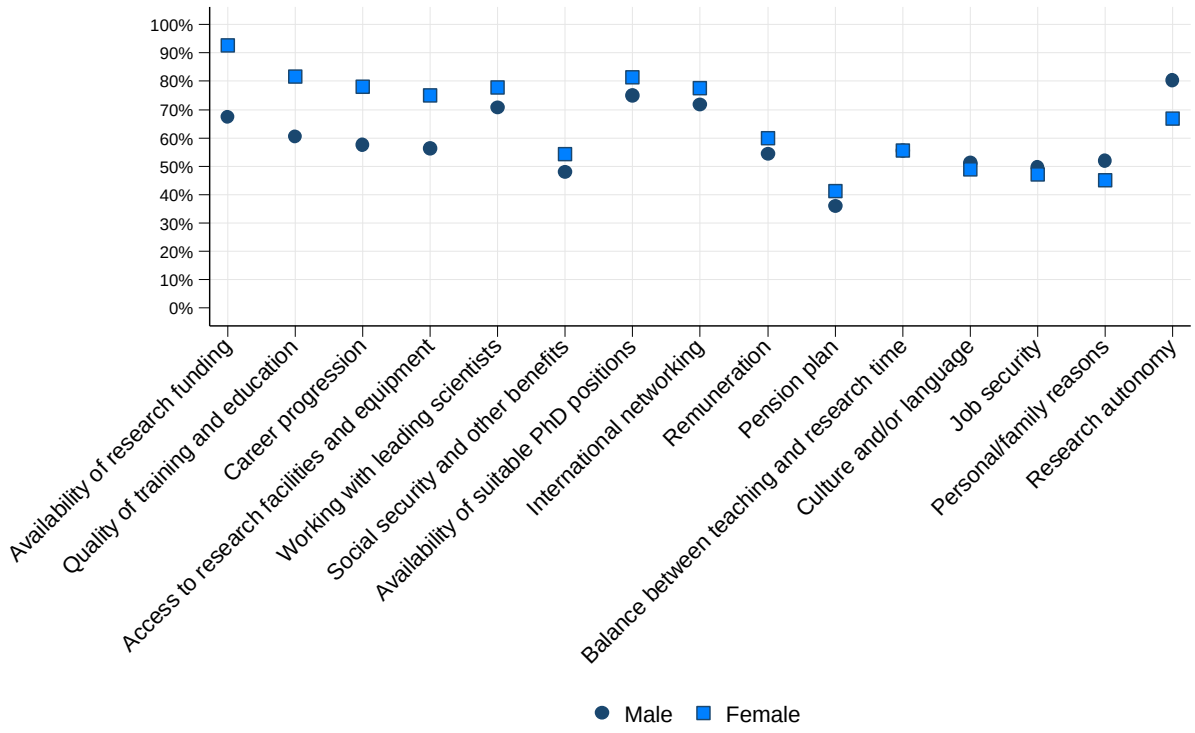
Source: MORE4 EU HE survey (2019)
Notes:

- Only R1 PhD candidates and R2 PhD holders that were PhD degree mobile.
- Difference between percentage of PhD degree mobile researchers that find the motive important (versus no important) for their PhD degree mobility per career stage and the total share of PhD degree mobile researchers that find it important.
- With 'PhD degree mobility' defined as obtaining or having obtained a PhD in another county than the one where one obtained his/her previous degree.
- Based on question 56:"Which of the following factors were important in your decision to obtain your PhD in another country?"
- (n=305)

Career stage: R1 and R2 do not differ much when it comes to the reasons why they move to another country to do their PhD. When the items are analysed separately we observe that the largest differences are found in the items referring to the balance between research and teaching time and the item on social security and other benefits: both items are more frequently mentioned by R1 researchers (with 24pp and 20pp difference respectively). On the opposite, culture and language, career progression and working with other scientists are motives that have been indicated by a higher share of R2 researchers (with more than 10pp difference each).

Gender: In MORE3, there were no large gender differences across the different set of motives, the exception being that male researchers consider satisfaction at work more important than their female counterparts. The MORE4 survey indicates a different picture: the gender differences are larger this time. When analysing each of the items individually, we observe that, compared to men, women tend to be more driven by the availability of research funding, the quality of training and education, career progression and access to research facilities and equipment (between 19 and 26pp difference).

Figure 81: Importance of motives for international PhD degree mobility, by gender (EU28)



	MALE	FEMALE	TOTAL
Availability of research funding	67.4%	92.7%	80.2%
Quality of training and education	60.3%	81.6%	71.1%
Career progression	57.6%	78.1%	68.0%
Access to research facilities and equipment	56.4%	75.1%	65.7%
Working with leading scientists	70.6%	77.7%	74.3%
Social security and other benefits	47.8%	54.4%	51.1%
Availability of suitable PhD positions	75.0%	81.5%	78.3%
International networking	71.8%	77.7%	74.8%
Remuneration	54.3%	60.0%	57.1%
Pension plan	35.9%	41.2%	38.5%
Balance between teaching and research time	55.5%	55.5%	55.5%
Culture and/or language	51.3%	48.9%	50.1%
Job security	49.7%	47.1%	48.4%
Personal/family reasons	52.0%	45.1%	48.3%
Research autonomy	80.3%	66.7%	73.3%

Source: MORE4EU HE survey (2019)
Notes:

- Only R1 PhD candidates and R2 PhD holders that were PhD degree mobile.
- Difference between percentage of PhD degree mobile researchers that find the motive important (versus not important) for their PhD degree mobility per gender and the total share of PhD degree mobile researchers that find it important.
- With 'PhD degree mobility' defined as obtaining or having obtained a PhD in another county than the one where one obtained his/her previous degree.
- Based on question 56: "Which of the following factors were important in your decision to obtain your PhD in another country?"
- (n=305)

7.1.3.2 Motives for >3 month mobility during PhD

In this section, we address the factors which were important in the decision of the researchers to engage in >3 month international mobility during their PhD. Current R1 and R2 researchers who were not PhD degree mobile but did engage in >3 month mobility to a country other than the country where they did/will obtain their PhD, were asked for motives for their during PhD mobility.

An overview of the motives for during PhD mobility is provided in Table 26. Opposite to what we found for PhD degree mobility, the shares of researchers confirming the motives for during PhD mobility have generally increased compared to 2016. International networking (92%), working with leading scientists (90%), career progression (86%) and the quality of training and education (84%) are again among the most important motives. Research autonomy has lost some of its relative importance in 2019 compared to 2016, where this aspect was ranked third (versus sixth in 2019). Availability of suitable PhD positions is, as can be expected, less important than for PhD degree mobility (59%).

The 2019 results are further summarised in Table 27 according to the categories defined above. Like for PhD degree mobility, intellectual support (88%) and financial support (71%) are the main motive categories, but now career progression (86%) is more important. The largest change between 2016 and 2019 has taken place in the items referring to financial security which were indicated by 22% of the respondents in 2016 and have now been selected by 47% of the researchers. The evolution of the item referring to career progression is also worth mentioning it has grown from 71% in 2016 to 86% in 2019.

Table 26: Importance of motives for >3 month mobility during PhD (EU28)

SHARE OF RESPONDENTS THAT INDICATE THIS MOTIVE AS ONE OF THE MOTIVES FOR INTERNATIONAL DURING PHD MOBILITY (>3 MONTHS)			
Of all R2 researchers, or R1 researchers that are enrolled in a doctoral programme and that were >3 month mobile during PhD			
	2012 (n=552)	**2016 (n=420)**	**2019 (n=333)**
International networking	/	86.1%	92.0%
Working with leading scientists	82.1%	88.5%	89.5%
Career progression	83.3%	70.6%	86.4%
Quality of training and education	62.4%	71.0%	83.9%
Access to research facilities and equipment	78.3%	74.7%	80.7%
Research autonomy	75.0%	75.4%	79.8%
Culture and/or language	68.2%	68.2%	74.6%
Availability of research funding	63%	67.3%	72.8%
Availability of suitable PhD positions	41.6%	56.7%	58.6%
Balance between teaching and research time	/	47%	56.0%
Remuneration	26.2%	34.1%	53.7%
Personal/family reasons	52.3%	29.8%	52.1%
Job security	22.6%	22.7%	46.4%
Social security and other benefits	13.2%	19.7%	46.4%
Pension plan	(together with social security benefits in 2012 survey)	12.2%	40.3%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- With '>3 month mobility during PhD' defined as moving for 3 months or more to another country than the country where he/she did or will obtain their PhD.
- Based on question 59:"Which of the following factors were important in your decision to move to another country?" The answer options between MORE2 and MORE3 differ slightly.

Table 27: Importance of categories of motives for >3 month mobility during PhD (EU28)

AVERAGE SHARE OF RESPONDENTS THAT INDICATE THE MOTIVES IN THIS CATEGORY AS ONE OF THE MOTIVES FOR >3 MONTH MOBILITY DURING PHD

(of all R2 researchers or R1 researchers that are enrolled in a doctoral programme that were >3 MONTH MOBILE DURING PHD)

		EU total	Per career stage	Per FOS	Per gender
Financial security	**2016**	22.2%	R1: 22.2% R2: 22.2%	MED: 29.9% NAT: 16.9% SOC: 18.8%	F: 22.0% M: 22.3%
	2019	46.7%	R1: 46.5% R2: 46.8%	MED: 57.4% NAT: 46.3% SOC: 42.8%	F: 43.4% M:49.4%
Satisfaction at work	**2016**	49.0%	R1: 58.7% R2: 46.0%	MED: 46.9% NAT: 41.1% SOC: 56.0%	F: 53.7% M: 44.3%
	2019	42.3%	R1: 47.1% R2: 40.9%	MED: 50.3% NAT: 40.7% SOC: 40.1%	F: 38.8% M: 45.1%
Financial support	**2016**	66.3%	R1: 62.4% R2: 67.2%	MED: 63.5% NAT: 76.8% SOC: 61.3%	F: 65.2% M: 67.2%
	2019	70.7%	R1: 71.0% R2: 70.6%	MED: 75.8% NAT: 67.8% SOC: 70.5%	F: 69.9% M: 71.5%
Intellectual support	**2016**	81.9%	R1: 85.6% R2: 80.7%	MED: 84.6% NAT: 83.1% SOC: 78.1%	F: 83.2% M: 80.6%
	2019	88.5%	R1: 91.3% R2: 87.6%	MED: 96.2% NAT: 86.9% SOC: 86.5%	F: 86.0% M: 90.7%
Time balance	**2016**	61.2%	R1: 66.8% R2: 59.5%	MED: 60.1% NAT: 60.1% SOC: 62.7%	F: 56.7% M: 65.5%
	2019	67.9%	R1: 63.3% R2: 69.1%	MED: 74.6% NAT: 60.4% SOC: 70.6%	F: 67.1% M: 68.5%
Career progression	**2016**	70.6%	R1: 81.5% R2: 67.6%	MED: 69.9% NAT: 63.0% SOC: 76.6%	F: 64.3% M: 76.6%
	2019	86.4%	R1: 87.1% R2: 86.2%	MED: 88.1% NAT: 83.4% SOC: 87.8%	F: 85.1% M: 87.6%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016)

Notes:

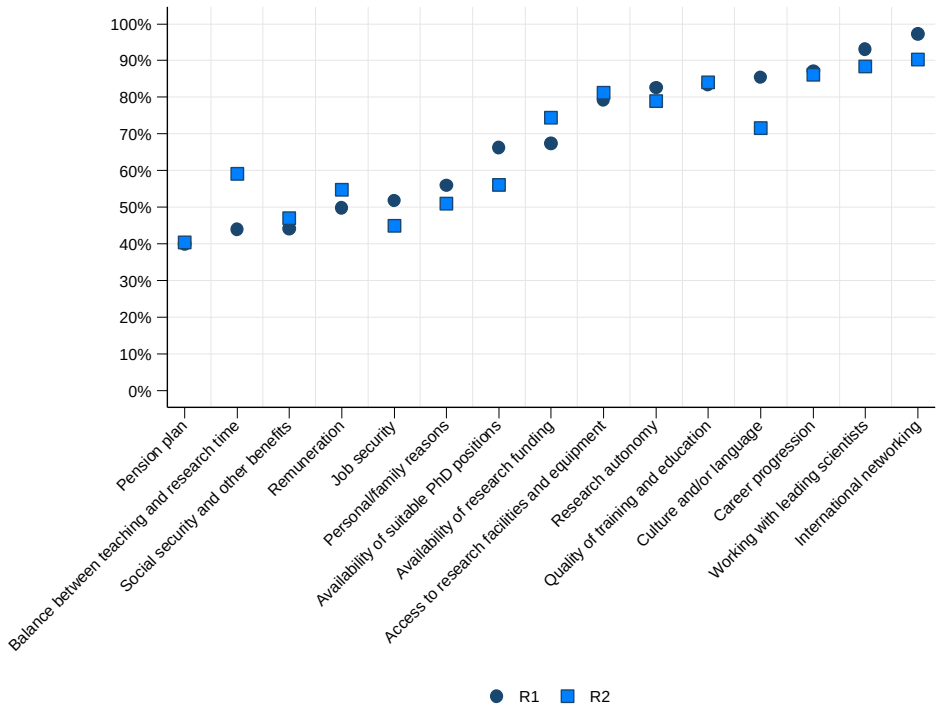
- With '>3 month mobility during PhD' defined as moving for 3 months or more to another country than the country where he/she did or will obtain their PhD.
- Financial security includes remuneration, job security, social security and other benefits and pension plan.
- Satisfaction at work refers to culture, and personal or family reasons.

- Financial support includes availability of research funding and of suitable positions, and access to research facilities and equipment.
- Intellectual support refers to working with leading scientists, the quality of education and training, and international networking.
- Time balance includes research autonomy and balance between teaching and research time.
- Based on question 59:"Which of the following factors were important in your decision to move to another country?"
- (2019: n=333; 2016: n=420)

Career stage: Compared to PhD degree mobility, the motives for mobility carried out during PhD present smaller differences across career stages (see Figure 82). The largest differences are found in the balance between teaching and research time (44% of R1 researchers versus 59% of R2 researchers), followed by culture and/or language (85% of R1 researchers compared to 72% of R2).

Gender: Figure 83 shows the difference between male and female researchers in terms of importance of motives for them during PhD mobility. The only items in which we find relevant differences between men and women are related to the quality of training and education (7pp); balance between teaching and research time (8pp), culture and/or language (9pp), personal/family reasons (10pp) and pension plan (13pp). All these items were more frequently indicated by men than by women.

FIGURE 82: Importance of motives for >3 month mobility during PhD, by (current) career stages (EU28)

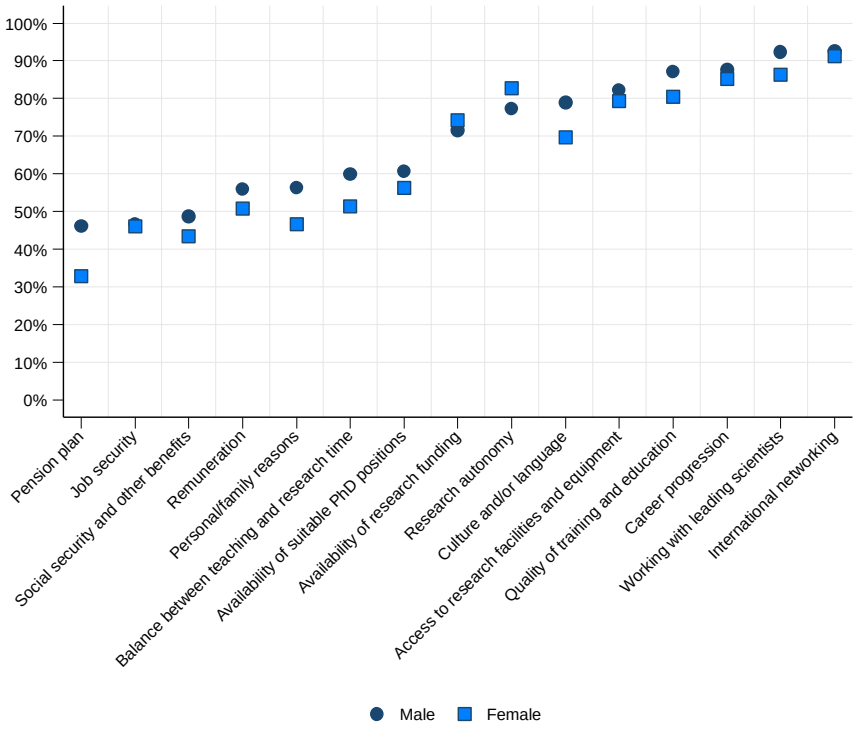


MOTIVE	R1	R2	TOTAL
International networking	97.3%	90.3%	92.0%
Working with leading scientists	93.1%	88.4%	89.5%
Career progression	87.1%	86.2%	86.4%
Quality of training and education	83.5%	84.0%	83.9%
Access to research facilities and equipment	79.4%	81.2%	80.7%
Research autonomy	82.6%	79.0%	79.8%
Culture and/or language	85.3%	71.6%	74.6%
Availability of research funding	67.3%	74.3%	72.8%
Availability of suitable PhD positions	66.2%	56.2%	58.6%
Balance between teaching and research time	44.1%	59.2%	56.0%
Remuneration	49.8%	54.7%	53.7%
Personal/family reasons	55.9%	51.0%	52.1%
Social security and other benefits	44.3%	47.0%	46.4%
Job security	51.7%	44.9%	46.4%
Pension plan	40.0%	40.4%	40.3%

Source: MORE4EU HE survey (2019)
Notes:

- Only R1 PhD candidates and R2 PhD holders that were >3 month mobile during PhD.
- Difference between percentage of researchers who have been mobile during their PhD that find the motive important (versus not important) for their >3 month mobility during PhD per career stage and the total share of researchers that have been mobile during their PhD and who find that find it important.
- With '>3 month mobility during PhD' defined as moving to another country than the country of PhD for three months or more.
- Based on question 59:"Which of the following factors were important in your decision to move to another country?"
- (n=333)

Figure 83: Importance of motives for >3 month international mobility during PhD mobility, by gender (EU28)



MOTIVE	MALE	FEMALE	TOTAL
International networking	92.6%	91.3%	92.0%
Working with leading scientists	92.4%	86.3%	89.5%
Career progression	87.6%	85.1%	86.4%
Quality of training and education	87.1%	80.4%	83.9%
Access to research facilities and equipment	82.1%	79.2%	80.7%
Research autonomy	77.3%	82.7%	79.8%
Culture and/or language	78.9%	69.6%	74.6%
Availability of research funding	71.7%	74.2%	72.8%
Availability of suitable PhD positions	60.7%	56.2%	58.6%
Balance between teaching and research time	59.8%	51.4%	56.0%
Remuneration	56.0%	50.9%	53.7%
Personal/family reasons	56.4%	46.6%	52.1%
Social security and other benefits	48.8%	43.5%	46.4%
Job security	46.7%	46.0%	46.4%
Pension plan	46.0%	32.9%	40.3%

Source: MORE4 EU HE survey (2019)
Notes:

- Only R1 PhD candidates and R2 PhD holders that were >3 month mobile during PhD.
- Difference between share of researchers who have been mobile during their PhD that find the motive important (versus not important) for their >3 month mobility during PhD per gender and the total share of researchers that have been mobile during their PhD and who find this important.
- With '>3 month mobility during PhD' defined as moving to another country than the country of PhD for three months or more.
- Based on question 59:"Which of the following factors were important in your decision to move to another country?"
- (n=333)

7.1.4. Barriers

As described in the section on non-mobility for PhD (section 7.1.1.4), 28% of the current R1-R2 researchers who have not been for or during PhD mobile, did consider to take part or all of their PhD in a country other than the one in which they obtained their previous degree. The share of researchers in the same situation in 2016 was of 34%.

The main factors which finally prevented them from undertaking a move are summarised and presented together with the 2012 and 2016 results in Table 28. In 2019 the main barrier for PhD mobility is personal or family related (77%), followed by the ability to obtain funding for mobility (60%) or for research (58%) and logistics (54%). An analysis of the respondents to this question indicates that these barriers (personal reasons and those related to funding) are independent from each other. In 2016 and 2012 the ranking of the main barriers was very similar but the shares have increased in all the items since then, especially for the personal and family reasons that have experienced an increase of 20pp over time, confirming the key role of this factor in mobility decisions. Also, logistics has become a more important barrier for PhD mobility (54%), compared to 2016 (29%).

Table 28: Importance of barriers for PhD mobility among the non-mobile (EU28)

AVERAGE SHARE OF RESPONDENTS THAT INDICATE THIS BARRIER AS ONE OF THE FACTORS KEEPING THEM FROM INTERNATIONAL PHD MOBILITY (of all non-mobile R2 researchers, or non-mobile R1 researchers that are enrolled in a doctoral programme)			
	2012 (n=825)	**2016 (n=595)**	**2019 (n=401)**
Other personal/family reason	54.0%	58.0%	77.6%
Obtaining funding for mobility	(together with funding for research in 2012 survey)	44.1%	60.4%
Obtaining funding for research	63.8%	43.5%	58.3%
Logistics	44.0%	28.8%	54.5%
Finding a suitable position	54.5%	41.9%	52.8%
Maintaining level of remuneration	NA	21.6%	46.5%
Transferring social security entitlements	NA	12.9%	35.0%
Transferring research funding to another country	34.0%	14.6%	34.7%
Loss of contact with professional network	25.8%	22.0%	34.0%
Quality of training and education	25.5%	10.1%	29.3%
Language of teaching	(together with culture and language for PhD programme in 2012 survey)	12.8%	27.2%
Access to research facilities and equipment for research	25.7%	15.4%	26.5%
Language for PhD programme	22.1%	10.3%	22.4%
Obtaining a visa or work permit	NA	6.0%	21.1%
Culture	(together with language for teaching and language for PhD programme in 2012 survey)	4.1%	15.8%

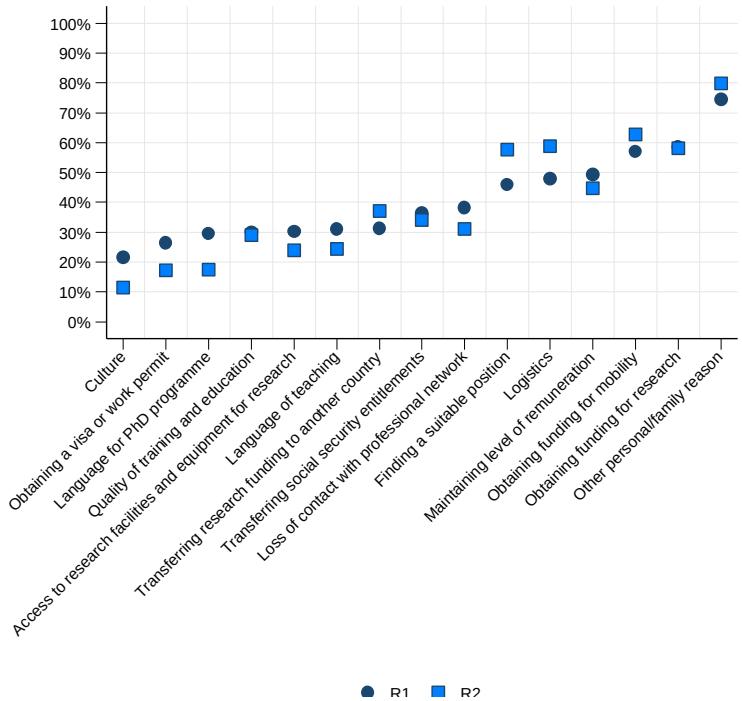
Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016), and MORE2 EU HE survey (2012)
Notes:

- Share of non-mobile R1 PhD candidates and R2 PhD holders with some consideration of PhD mobility that indicate the barrier as important for non-PhD mobility.
- With 'non-PhD mobile' defined as never having been PhD degree mobile nor mobile during PhD.
- With 'some consideration of PhD mobility' defined as not having indicated to have never considered it (thus having considered it but made no effort; have considered it and searched and having turned down a concrete offer).
- Based on question 61: "Which of the following factors prevented you from taking part or all of your PhD in another country"? The answer options in MORE2 where slightly different compared to MORE3 and MORE4.

Career stage: As shown in Figure 84, the ranking of the barriers for mobility that are more frequently mentioned by the non-mobile researchers is the same for R1 and R2 researchers and the differences between these two groups tend to be limited. As in MORE3, R1 researchers seem to observe slightly more barriers to PhD mobility than R2 researchers. Compared to R2 researchers, R1 researchers indicate more often to face the following barriers: the language for PhD programme (12pp), culture (10pp) and obtaining a visa or work permit (9pp). On the contrary, R2 researchers face more often other types of barriers, such as finding a suitable position (12pp) or logistics (11pp). It is important to note that the main barrier, personal and family reasons, is equally important to both groups (75% for R1 and 80% for R2).

Gender: Figure 85 shows the difference between the non-mobile male and female researchers in terms of importance of barriers for PhD mobility. In 2016, female researchers tended to indicate more barriers as reasons for not having been mobile. They were particularly more hindered by problems with obtaining funding for mobility (19pp difference with male researchers) or for research (18pp) and finding a suitable position (16pp). In 2019 we observe that the two groups tend to converge and that even men tend to indicate more often than women some of the barriers. This is most notably the case for barriers related to access to research facilities and equipment for research (16pp), transferring social security entitlements (15pp), culture (14pp), and the quality of training and education (11pp). Interestingly, personal and family reasons and obtaining funding for mobility are more important barriers to female researchers. Obtaining funding for mobility is mentioned by similar shares of men and women (61 versus 60% respectively).

Figure 84: Importance of barriers for PhD mobility among the non-mobile, by (current) career stage (EU28)

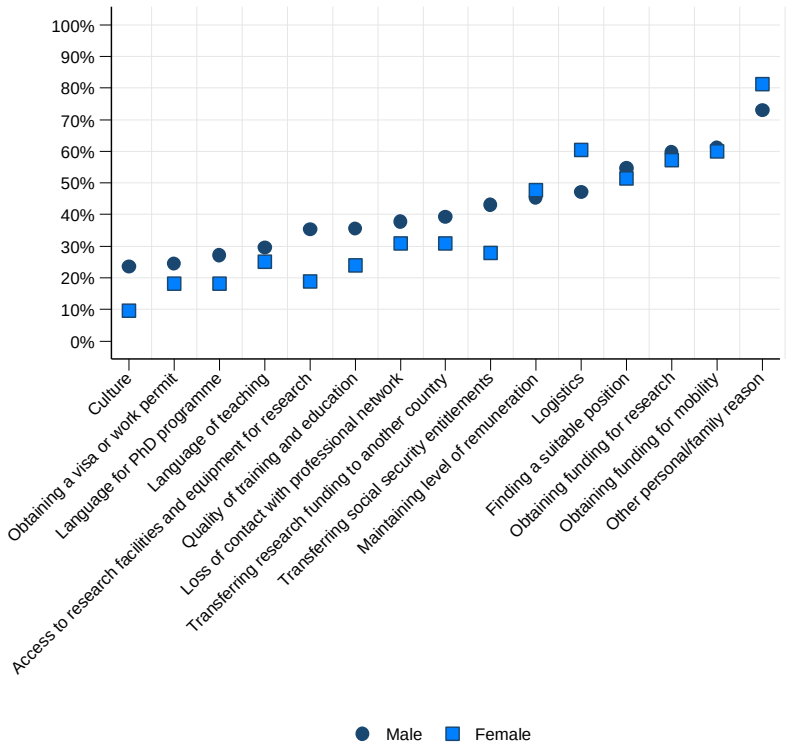


	R1	R2	TOTAL
Other personal/family reason	74.5%	79.7%	77.6%
Obtaining funding for mobility	57.1%	62.7%	60.4%
Obtaining funding for research	58.5%	58.1%	58.3%
Logistics	47.9%	58.9%	54.5%
Finding a suitable position	45.8%	57.6%	52.8%
Maintaining level of remuneration	49.3%	44.8%	46.5%
Transferring social security entitlements	36.4%	34.0%	35.0%
Transferring research funding to another country	31.3%	37.0%	34.7%
Loss of contact with professional network	38.4%	31.2%	34.0%
Quality of training and education	29.9%	28.9%	29.3%
Language of teaching	31.1%	24.4%	27.2%
Access to research facilities and equipment for research	30.1%	23.9%	26.5%
Language for PhD programme	29.5%	17.4%	22.4%
Obtaining a visa or work permit	26.4%	17.2%	21.1%
Culture	21.7%	11.6%	15.8%

Source: MORE4 EU HE survey (2019)
Notes:

- Only R1 PhD candidates and R2 PhD holders that were non-PhD mobile.
- Difference between the share of non-PhD mobile researchers with some consideration of PhD mobility that indicate the barrier as important for non-PhD mobility per current career stage and the total share.
- With 'non-PhD mobile' defined as never having been PhD degree mobile nor mobile during their PhD.
- With 'some consideration of PhD mobility' defined as not having indicated to have never considered it (thus having considered it but made no effort; having considered it and searched and having turned down a concrete offer).
- Based on question 61 MORE3: "Which of the following factors prevented you from taking part or all of your PhD in another country"?
- (n=401)

Figure 85: Importance of barriers for PhD mobility among the non-mobile, by gender (EU28)



	MALE	FEMALE	TOTAL
Other personal/family reason	72.9%	81.3%	77.6%
Obtaining funding for mobility	61.1%	59.9%	60.4%
Obtaining funding for research	59.7%	57.1%	58.3%
Logistics	47.0%	60.4%	54.5%
Finding a suitable position	54.6%	51.3%	52.8%
Maintaining level of remuneration	45.1%	47.7%	46.5%
Transferring social security entitlements	43.2%	27.9%	35.0%
Transferring research funding to another country	39.3%	30.9%	34.7%
Loss of contact with professional network	37.8%	30.8%	34.0%
Quality of training and education	35.4%	24.0%	29.3%
Language of teaching	29.5%	25.2%	27.2%
Access to research facilities and equipment for research	35.3%	18.8%	26.5%
Language for PhD programme	27.2%	18.2%	22.4%
Obtaining a visa or work permit	24.3%	18.3%	21.1%
Culture	23.4%	9.5%	15.8%

Source: MORE4 EU HE survey (2019)
Notes:

- Only R1 PhD candidates and R2 PhD holders that were non-PhD mobile.
- With 'non-PhD mobile' defined as never having been PhD degree mobile nor mobile during their PhD.
- With 'some consideration of PhD mobility' defined as not having indicated to have never considered it (thus having considered it but made no effort; having considered it and searched and having turned down a concrete offer).
- Based on question 61 in MORE4: "Which of the following factors prevented you from taking part or all of your PhD in another country"?
- (n=401)

7.2. Interdisciplinary experiences during PhD stage

This section is a summary of findings described in more detail in other sections of this report, combined to provide insights from the specific perspective of interdisciplinary experiences during PhD stage. It concerns information on PhD training and the importance and implementation of the Innovative Doctoral Training Principles, as well as information from the mobility and collaboration questions as discussed in the general sections on interdisciplinary mobility and collaboration (see section 8.2and subsections).

Importance: With respect to PhD training, interdisciplinarity is less valued as a principle by PhD candidates. 18% consider it absolutely essential (MORE3: 15%), another 57% (MORE3: 48%) find it very important. However, this still adds up to a total of 75% of PhD candidates who appreciate interdisciplinary collaboration. This is a substantial increase compared to 2016 data, where this total amounted to 63%.

Implementation during PhD training: In terms of implementation, we found that 40% of all R1 and R2 researchers in EU28 have collaborated with or worked in more than one discipline for their PhD (this is stable compared to MORE3). When comparing R1 and R2 researchers, we see that this share is slightly higher for R1 researchers where this share amounts to 43%, compared to 37% for R2 researchers. It is most common for PhD candidates studying in Romania (86%), Denmark (65%) and Croatia (58%). Least common in the EU and associated countries is interdisciplinary work in the United Kingdom (25%), Switzerland (27%) and Lithuania (27%).

Mobility: 15% of the R1 researchers indicate they have actually switched to another (sub)field during their academic career, compared to 19% in total. Like for all career stages, these shares are significantly lower compared to MORE3 (30% for R1 compared to 34% in total).

Collaboration in current position: 74% of the R1 researchers indicate that they collaborate with, or work in more than one field in their current position. This represents an increase of 8% compared to MORE3 but remains below the average total share of 80% for all researchers. 60% work with researchers in the same institute, 49% with researchers in other universities or research institutes and 17% with researchers in the non-academic sector (compared to 2016 data, this is an increase of 6pp). The difference compared to the total is largest for interdisciplinary collaboration with other universities/research institutes (-14pp).

Virtual mobility: R1 researchers see the least influence of (virtual) technology in interdisciplinary collaboration compared to researchers in other career stages. This may be due to a better acquaintance of the younger generation with digital technologies, thus seeing it as part of daily (work) life and less so as a replacement for mobility.

7.3. Intersectoral experiences during PhD stage

This section briefly pinpoints the findings described in more detail in other sections of this report, combined to provide insight from the specific perspective of intersectoral experiences during PhD stage. It concerns information on PhD training and the importance and implementation of the Innovative Doctoral Training Principles, as well as information from the mobility and collaboration questions as discussed in the general sections on intersectoral collaboration (see section 8.3 and subsections).

Importance: Intersectoral collaboration and industry funding are considered the least important among the Innovative Doctoral Training Principles. 12% of current R1 and R2 researchers find intersectoral mobility essential (MORE3: 12%), 52% find it very important (MORE3: 41%). 37% value industry funding as very important, this is an increase of 6pp compared to 2016 data (31%), another 7% of current R1 and R2 researchers see this industry funding as crucial.

Implementation during PhD training: The comparably low share of PhD candidates assessing private co-funding by industry as very important for their PhD is mirrored in the share of researchers receiving such funding (5%; 8% in MORE3). Across fields of science, the highest share of co-funded PhD candidates is unsurprisingly found in Engineering (18%), followed by Natural Sciences (12%) and Medical Sciences (11%), while it is lowest in Agricultural Sciences (2%). We also see a similar pattern when looking at internships and work placements during PhD. On the one hand, 11% of R1 and R2 researchers state that they have undertaken a work placement or internship in the public sector. On the other hand, between 2-3% have done this in the three private sectors respectively: private, not-for-profit oriented organisations (e.g. research foundations or NGOs, 3%), large firms (2%) as well as SMEs and start-ups (1%). As indicated before, these shares remained stable in comparison with MORE3, with minor declines in public sector internships (-3pp; 14% in MORE3) and SME work placements (-2pp; 3% in MORE3).

Collaboration in current position: 20% of the R1 researchers collaborate with partners from outside the academic sector. This share is 5pp lower compared to 2016 data. In MORE4, this type of collaboration is however more common among R1 researchers compared to R2 researchers (20% versus 18%). It is however remarkably more common among the other career stages. The EU average amounts to 32% (36% in MORE3).

8. Mobility and collaboration in post-PhD stage

This chapter presents the main findings regarding mobility and collaboration in post-PhD stage. This refers to the mobility experienced by researchers in the following career stages: R2 (post-doctoral), R3 (established) and R4 (leading) researchers, regardless of whether they obtained a PhD degree[116]. The mobility and collaboration during PhD were described above in section 7.

The section is divided in three main parts, based on the three main dimensions of mobility:

- International mobility (section 8.1);
- Interdisciplinary mobility (section 8.2);
- Intersectoral mobility (section 8.3).

8.1. International mobility and collaboration in post-PhD stage

This section presents the findings on international mobility related to the post-PhD stage. The section presents the following types of international mobility and collaboration:

- International long term (>3 months) mobility (section 8.1.1);
- International short term (<3 months) mobility (section 8.1.2);
- International collaboration (section 8.1.3);
- International virtual mobility (section 8.1.4);
- Short travel for conferences, meetings and visits (section 8.1.5).

8.1.1. International long-term mobility of >3 months

8.1.1.1 Mobility (stock)

SHARE OF RESEARCHERS WITH >3 MONTH INTERNATIONAL MOBILITY EXPERIENCE (OF all R2, R3 and R4 researchers)

	Less than ten years ago	(Only) more than ten years ago	Never
2012 EU27 (n=7,131)	31.0%	17.4%	51.6%
2016 EU28 (n=8,073)	27.4%	18.1%	54.5%
2019 EU28 (n=7,653)	26.5%	24.0%	49.4%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Note:

- Based on question 62: "After gaining your highest educational qualification (PhD or other), how would you typify your international mobility experience?"

[116] The large majority have a PhD: 92.5% of R2, R3 and R4 EU28 researchers.

SHARE OF RESEARCHERS WITH >3 MONTH INTERNATIONAL MOBILITY EXPERIENCE IN THE LAST TEN YEARS

(of all R2, R3 and R4 researchers)

	EU total	Per career stage	Per FOS	Per gender
2012 (n=7,131)	31.0%	R2: 30.1% R3: 31.5% R4: 31.1%	MED: 26.3% NAT: 34.4% SOC: 30.5%	F: 25.2% M: 34.2%
2016 (n=8,073)	27.4%	R2: 30.2% R3: 27.5% R4: 25.5%	MED: 19.5% NAT: 28.2% SOC: 30.3%	F: 25.1% M: 28.7%
2019 (n=7,653)	26.5%	R2: 36.3% R3: 23.6% R4: 26.3%	MED: 21.6% NAT: 25.9% SOC: 30.3%	F: 24.8% M: 27.5%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Note:

- Based on question 62: "After gaining your highest educational qualification (PhD or other), how would you typify your international mobility experience?"

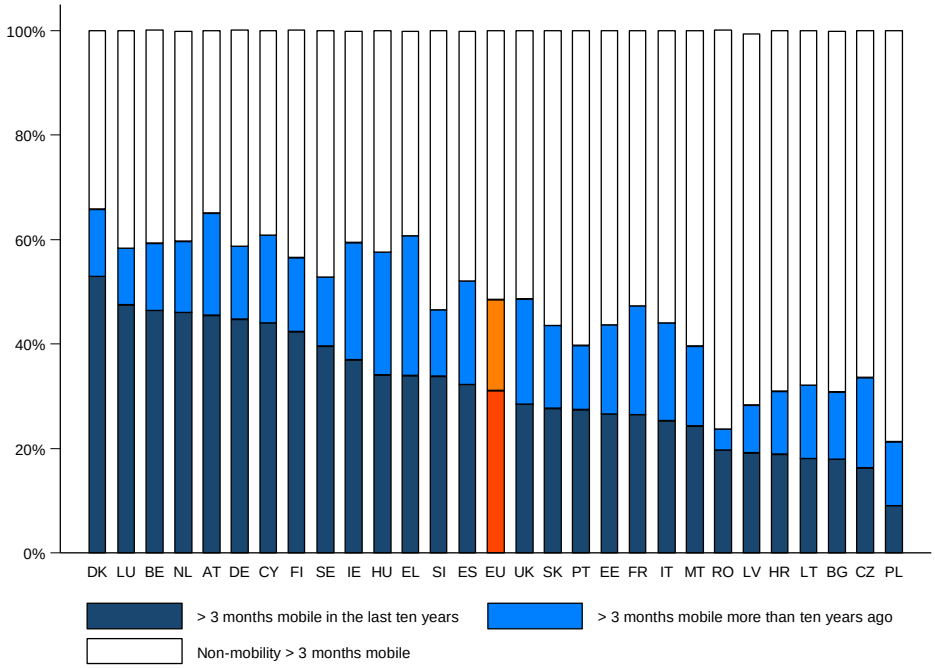
27% of post-PhD researchers in the EU28 have worked abroad as researchers for more than 3 months at least once in the last ten years. This indicator shows a remarkable stability with respect to MORE3 (27%). 24% of the post-PhD researchers in the EU28 have been >3 month mobile over ten years ago, an increase of 6 percentage points compared to 2016. Approximately half of the researchers indicate that they have been mobile at some point after having obtained their PhD (51%) while 49% of the post-PhD researchers have never been mobile for longer than 3 months.

Country level: Figure 86 shows the patterns of mobility in the different EU countries in 2012, 2016 and 2019[117]. In general terms, a certain stability can be observed across the three MORE studies: countries such as Luxembourg, Switzerland, Belgium and Austria have had higher shares of long-term mobile researchers in the last ten years than the EU-average, at all three time points. On the other side of the scale, a number of Eastern and Southern European countries (such as Poland, Malta, Czech Republic, Latvia and Portugal) show persistently low shares of mobile researchers.

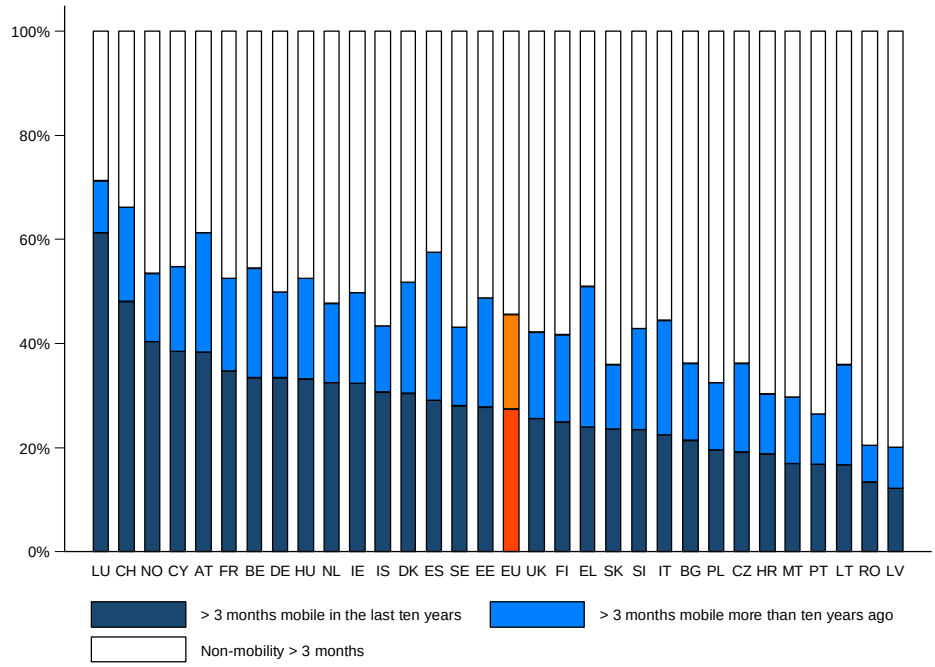
[117] The figures for the three years are provided in tables in Annex 3.3.

Figure 86: >3 month international mobility in post-PhD career stages, by country (2019, 2016 and 2012)

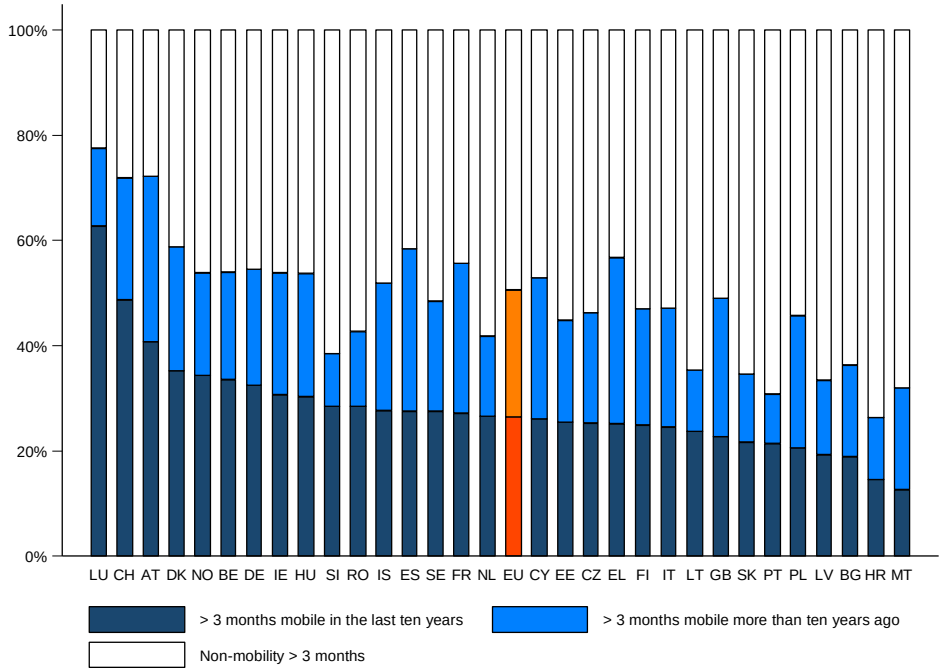
2012:



2016:



2019:

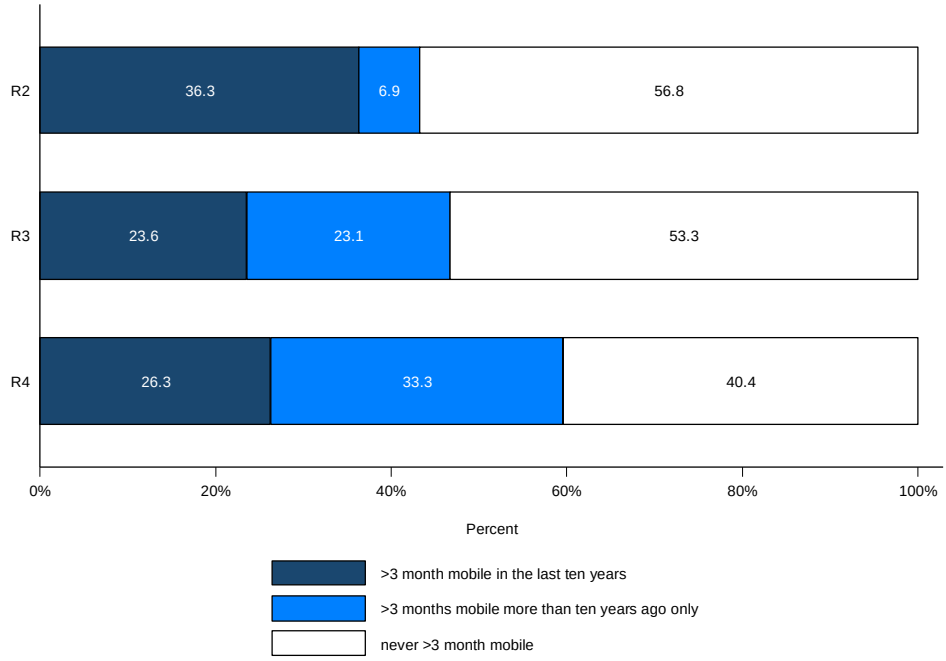


Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- Only R2, R3 and R4 researchers.
- Based on question 62: "After gaining your highest educational qualification (PhD or other), how would you typify your international mobility experience?"
- (2019: n=8,300; 2016: n=8,824; 2012: n=8,357)

Career stage: R2 researchers are more likely to have been mobile than more experienced researchers (36% versus 23% among R3 and 26% among R4 researchers, see Table 87)The latter are, on the other hand, more likely to have been mobile more than ten years ago This finding is rather logical as post-doctoral researchers are less likely to have ten years of experience, while leading researchers (R4) might have been mobile in the past but have now obtained a tenured position, and hence are not as interested in long-term mobility. This pattern is very similar to the 2012 and 2016 results.

Figure 87: >3 month international mobility in post-PhD career stages, by (current) career stage (EU28)

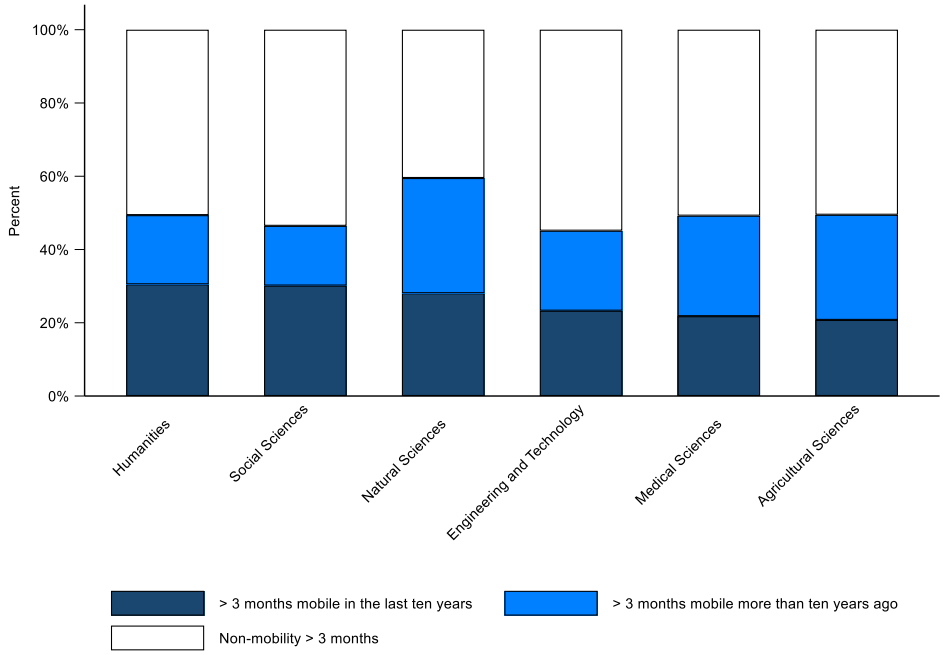


Source: MORE4 EU HE survey (2019)
Notes:

- Percentage of R2, R3 and R4 researchers who have worked abroad for 3 months or more at least once per mobility profile.
- Based on question 64: "After gaining your highest educational qualification (PhD or other), how would you typify your international mobility experience?"
- (n=7,653)

Field of Science: Researchers in Social Sciences are those that indicate more frequently to have been mobile in the last ten years (30%) followed by those in Natural Sciences (26%) and Medical Sciences (22%). It is important to note, however, that when the experiences of mobility more than ten years ago are taken into account, the researchers in the Natural Sciences show higher levels of mobility than the rest of the fields. These results are consistent with the ones obtained in MORE3.

Figure 88: >3 month international mobility in post-PhD career stages, in the last ten years, by field of science (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Percentage of R2, R3 and R4 researchers who have worked abroad for 3 months or more at least once in the last ten years per field of science.
- Based on question 64: "After gaining your highest educational qualification (PhD or other), how would you typify your international mobility experience?"
- (n=7,653)

Gender: The difference between men and women with respect to the propensity to be long-term mobile has drastically reduced since MORE2.While in 2012 men were 9 percentage points more likely to be mobile than their female counterparts, in MORE3 this difference was only 3.6pp and 2.7pp in MORE4.

There are however important differences in this gender gap across countries. The results of the MORE4 survey indicate that the countries with the largest gender gap remain the same as observed in MORE3 (2016). This is the case for Slovakia, Ireland and Slovenia. Other countries present large differences too, for example in Lithuania, Denmark, Czech Republic, Iceland and Belgium the difference between the share of mobile women and men is higher than 5 percentage points. On the opposite side, the Netherlands, Norway, Switzerland and Luxembourg have a higher share of mobile women than men (and this difference is also larger than 5pp).

Figure 89: >3 month international mobility in post-PhDcareer stages, in the last ten years, by gender and country

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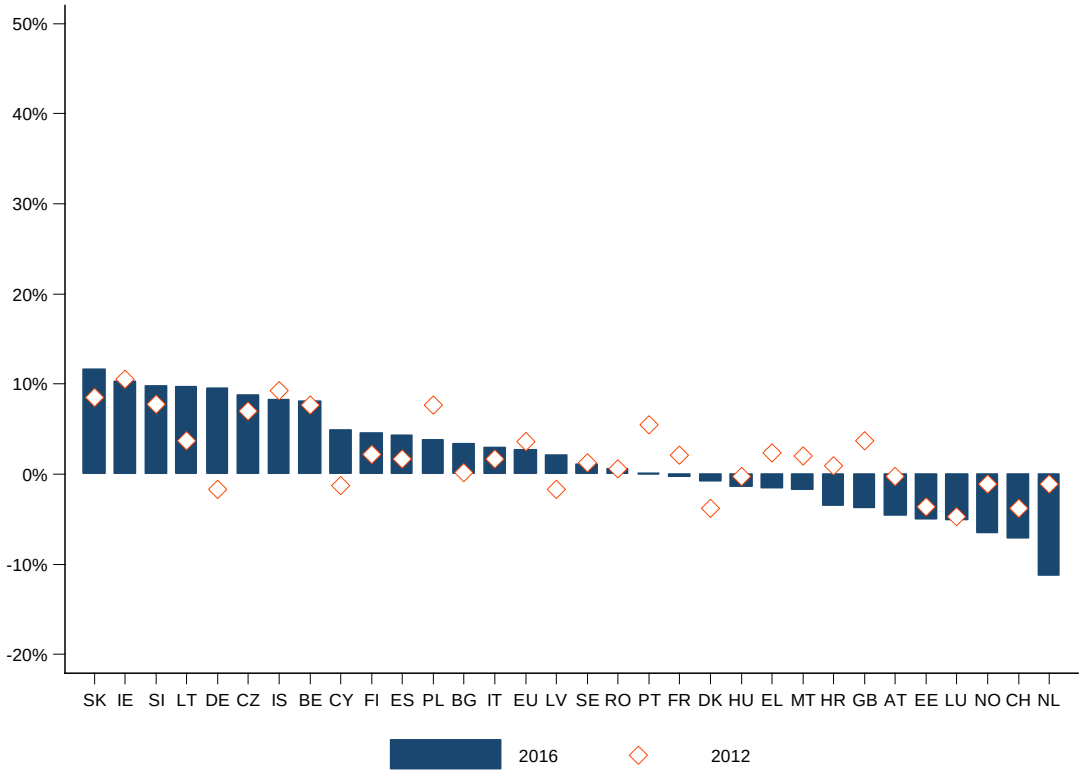


Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Difference between percentage of male and female researchers in R2, R3 and R4 researchers who have worked abroad for 3 months or more at least once in the last ten years.
- Based on question 62: "After gaining your highest educational qualification (PhD or other), how would you typify your international mobility experience?"
- (2019: n=7,653) (2016: n=8,824)

Family situation: In 2016, long-term mobility in the last ten years was more frequent among single researchers (33% versus 29% couple) and researchers without children (38% versus 26% with children). Three years later, the results of the MORE4 survey show that the patterns remain unchanged: this type of mobility is still more common among single researchers (34%) and those without children (37%) than among those in a couple (29%) or with children (26%). Researchers whose partner also works in research are also more likely to be long-term mobile than others (37% versus 26%). These percentages are stable compared to 2016.

Employer mobility: 8% of the researchers have worked abroad for a new employer (for 3 months or more at least once in the last ten years). There seems to be a slight downward trend over time since this percentage reached 12% in 2012 and 11% in 2016. This trend becomes clearer when analysing the percentage over the total of mobile researchers: while in 2016 the share of mobile researchers that had changed employer reached 39% (40% in 2012), in 2019 this percentage drops to 29%.

We observe the same downward trend when the data are analysed at country level: only in a few countries can a higher share of researchers be observed having changed employer in 2019 in at least one of their international long-term moves of more than three months. The differences are however very small. These countries are Denmark (+4.2 percentage points difference between 2016 and 2019), Czech Republic (2.8 pp), Italy (2.3 pp), Bulgaria (2 pp) and Spain and Romania (1pp each).

8.1.1.2 Non-mobility (stock)

SHARE OF RESEARCHERS WITHOUT >3 MONTH INTERNATIONAL MOBILITY EXPERIENCE OF ALL R2, R3 AND R4 RESEARCHERS

	EU total	Per career stage	Per FOS	Per gender
2012 (n=7,131)	51.6%	R2: 64.6% R3: 52.6% R4: 39.9%	MED: 51.0% NAT: 46.3% SOC: 57.4%	F: 60.8% M: 46.5%
2016 (n=8,073)	54.5%	R2: 63.7% R3: 56.7% R4: 45.8%	MED: 61.9% NAT: 50.6% SOC: 56.6%	F: 61.3% M: 50.8%
2019 (n=7,653)	49.4%	R2: 56.8% R3: 53.3% R4: 40.4%	MED: 50.7% NAT: 46.8% SOC: 52.4%	F: 55.7% M: 45.7%

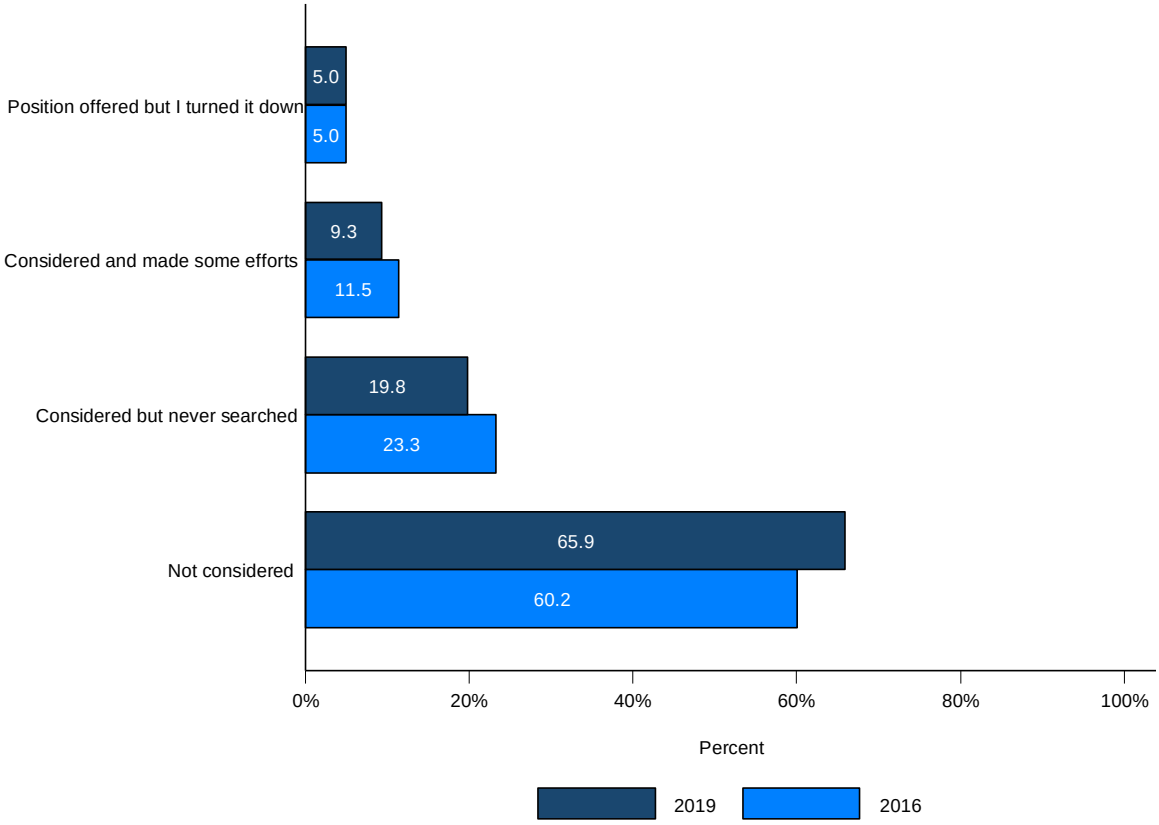
Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Note:

- Based on question 62: "After gaining your highest educational qualification (PhD or other), how would you typify your international mobility experience?"

Non-mobility is defined in the MORE studies as not having undertaken international mobility of more than three months during post-PhD career stages, either in the last ten years or before. At the beginning of the section on international long-term mobility, it was indicated that 49% of the researchers in 2019 have never been mobile (54% in 2016 and 52% in 2012).

Approximately two out of three researchers that have never worked abroad as a researcher for 3 months or more since completing their highest educational degree, have considered engaging in this type of mobility at some point (Figure 90). 9% have undertaken some efforts to become mobile (12% in 2016) and 5% have been offered a position in another country but turned it down (the same percentage as in 2012). The remaining 20% have never searched for concrete opportunities to become long-term mobile (23% in 2016).

Figure 90: Level of consideration of international post-PhD >3 months mobility among the non-mobile researchers (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers.
- Distribution of non-mobile researchers in post-PhD career over levels of consideration of mobility in post-PhD career.
- With 'non-mobility in post-PhD career stages' defined as not having undertaken international mobility of more than three months during post-PhD career stages, either in the last ten years or before.
- Based on question 79: "You have never worked abroad as a researcher for 3 months or more since completing your higher education (PhD or other). However, did you ever take this into consideration?"
- (2019: n=4,247; 2016: n=4,728)

Country level: Table 29 shows the distribution across countries in terms of levels of consideration of mobility of more than 3 months for R2, R3 and R4 researchers. Within the group of non-mobile researchers, the largest shares of those that have never considered being mobile are found in Malta (83%), the Netherlands (82%) and Luxembourg (81%). On the other side, Denmark, Bulgaria and Finland are the countries where it is more common for non-mobile researchers to have at least considered the possibility to be mobile.

Table 29: Level of consideration of international post-PhD >3 months mobility among the non-mobile researchers, by country

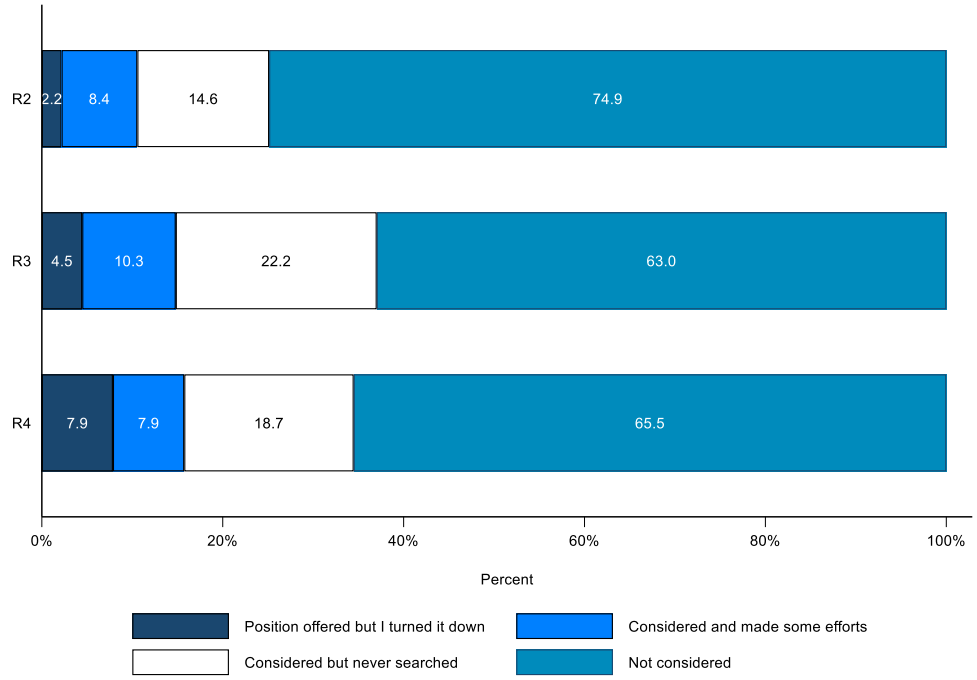
	POSITION OFFERED BUT TURNED DOWN	CONSIDERED AND MADE SOME EFFORT	CONSIDERED BUT NEVER SEARCHED	NOT CONSIDERED
Austria	9.3%	13.8%	21.3%	55.7%
Belgium	5.7%	5.5%	15.5%	73.3%
Bulgaria	2.8%	19.5%	25.5%	52.3%
Cyprus	7.0%	11.8%	21.4%	59.8%
Czech Republic	2.6%	6.0%	22.7%	68.7%
Germany	4.9%	2.2%	19.1%	73.8%
Denmark	3.8%	16.0%	28.0%	52.2%
Estonia	2.2%	11.2%	10.4%	76.2%
Greece	4.8%	10.2%	24.6%	60.5%
Spain	9.0%	12.2%	16.0%	62.8%
Finland	10.6%	10.7%	26.3%	52.4%
France	4.6%	6.3%	27.9%	61.2%
United Kingdom	2.7%	12.6%	15.1%	69.6%
Croatia	9.1%	11.5%	23.2%	56.1%
Hungary	2.8%	8.4%	23.1%	65.7%
Ireland	4.4%	12.0%	19.8%	63.8%
Italy	7.1%	6.8%	27.7%	58.3%
Lithuania	5.6%	16.1%	25.0%	53.3%
Luxembourg	0.0%	6.2%	12.4%	81.4%
Latvia	3.5%	3.9%	20.3%	72.3%
Malta	2.6%	1.5%	12.8%	83.1%
The Netherlands	7.6%	3.1%	7.0%	82.4%
Poland	1.3%	10.0%	24.7%	64.1%
Portugal	7.2%	12.5%	23.7%	56.6%
Romania	16.9%	14.3%	15.6%	53.2%
Sweden	8.2%	12.0%	16.8%	62.9%
Slovenia	5.0%	4.1%	15.0%	76.0%
Slovakia	4.3%	8.5%	25.2%	62.0%
Total (EU28)	5%	9.3%	19.8%	62.9%

Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers.
- Distribution of non-mobile researchers in post-PhD career over levels of consideration of mobility in post-PhD career.
- With 'non-mobility in post-PhD career stages' defined as not having undertaken international mobility of more than three months during post-PhD career stages, either in the last ten years or before.
- Based on question 80: "You have never worked abroad as a researcher for 3 months or more since completing your higher education (PhD or other). However, did you ever take this into consideration?"
- (n=4,247)

Career stage: When examining the extent to which non-mobile researchers have considered becoming mobile across career stages, we observe very similar results to the MORE3 survey (2012). Non-mobile R3 and R4 researchers show very similar patterns: six out of ten researchers have never considered being mobile, while approximately two out of ten have considered it but have never actively searched for concrete opportunities. 75% of the non-mobile R2 researchers have never considered becoming mobile, a significantly higher share than among R3 and R4 researchers.

Figure 91: Share of non-mobile researchers in post-PhD career, by career stage

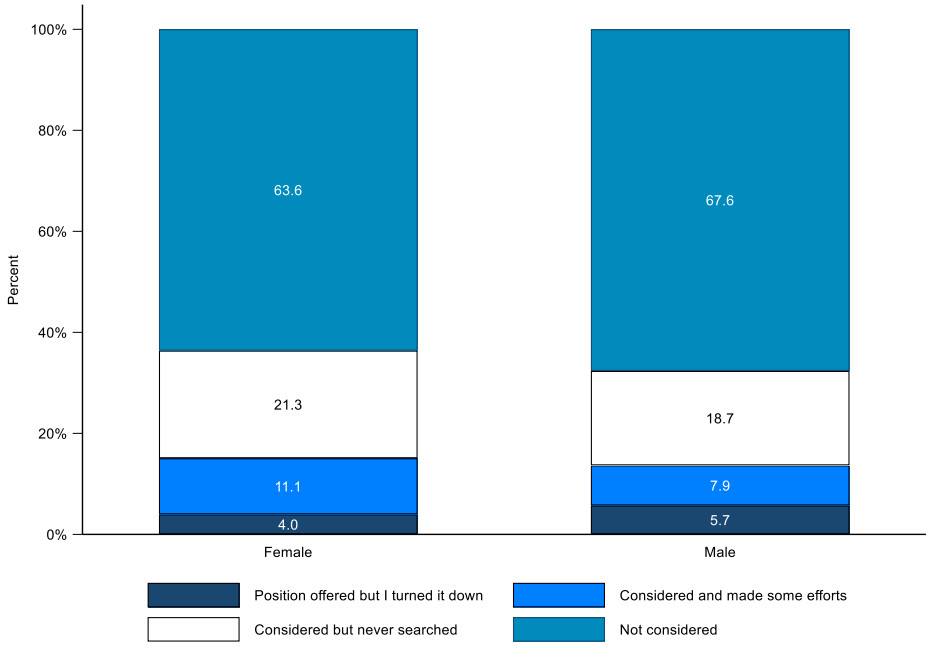


Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers.
- Distribution of non-mobile researchers in post-PhD career over levels of consideration of mobility in post-PhD career per current career stage.
- With 'non-mobility in post-PhD career stages' defined as not having undertaken international mobility of more than three months during post-PhD career stages, either in the last ten years or before.
- Based on question 80: "You have never worked abroad as a researcher for 3 months or more since completing your higher education (PhD or other). However, did you ever take this into consideration?"
- (n=4,247)

Gender: The share of non-mobile researchers that have considered becoming mobile at some point is lower than in 2016 and this is also visible when looking into gender differences. However, more women researchers than men seem to have considered mobility in 2019 compared to 2012. 32% of the male researchers (41% in 2012) have considered mobility versus 36% female researchers (38% in 2012). A slightly higher share of male researchers considered it to the extent that they were offered a position but turned it down (6% versus 4%).

Figure 92: Share of non-mobile researchers in post-PhD career, by gender



Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers.
- Distribution of non-mobile researchers in post-PhD career over levels of consideration of mobility in post-PhD career per current career stage.
- With 'non-mobility in post-PhD career stages' defined as not having undertaken international mobility of more than three months during post-PhD career stages, either in the last ten years or before.
- Based on question 80: "You have never worked abroad as a researcher for 3 months or more since completing your higher education (PhD or other). However, did you ever take this into consideration?"
- (n=4,758)

The previous paragraphs have provided an overview of the stock of mobile and non-mobile researchers. The following sections focus only on the researchers that have been long-term mobile in the last ten years, and more specifically, on the flows, motives, barriers and effects of this type of mobility.

8.1.1.3 Flows and moves

8.1.1.3.1 Destination countries

1,770 researchers currently working in the EU indicated in the survey a total of 3,120 moves (figures that are similar to MORE3, where 1,986 researchers indicated 3,249 moves). The main destination of EU28 researchers (by citizenship) who have been mobile in the last ten years of their post-doctoral career are the United States (16%) followed by Germany (10%) and the United Kingdom (19%) (see Table 30).

Table 30: The main destination countries for >3 month post-PhD mobility (EU28 citizens)

DESTINATION	2019 SHARE (%) (2016 SHARE)	CUM. SHARE (%)	MORE4 (2019) MAIN CITIZENSHIPS OF ORIGIN	MORE3 (2016) MAIN CITIZENSHIPS OF ORIGIN
United States	16% (16%)	16%	Italy (11%) Germany (10%) Greece (9%)	Greece (9.6%) Germany (9.1%) Italy (8.9%)
Germany	10% (11%)	26%	Italy (10%) Austria (8%) Croatia (6%) Slovakia (6%)	Spain (7.6%) Italy (7.3%) Poland (6.3%)
United Kingdom	9% (11%)	35%	Italy (16%) Greece (10%) Spain (10%) Germany (6%)	Greece (14.8%) Germany (10.3%) Italy (6.1%)
France	6% (7%)	41%	Italy (17%) Spain (11%) Romania (9%)	Italy (13.4%) Germany (7.5%)
Italy	6% (5%)	47%	Romania (15%) Greece (12%) France (6%) Croatia (6%)	Spain (12.8%) Italy (11.3%) Greece (10.6%)
Sweden	3% (3%)	50%	Italy (14%) Finland (11%) Germany (10%)	Finland (19.5%) Estonia (12.6%) Germany (10.3%)
Austria	3% (3%)	53%	Germany (15%) Italy (15%) Slovenia (10%) Slovakia (7%)	Germany (21.5%) Italy (17.7%) Austria (7.6%) Hungary (7.6%)
Spain	3% (3%)	56%	Italy (14%) Portugal (12%) Romania (11%)	Italy (16.7%) Portugal (11.1%) Greece (8.9%) Belgium (8.9%)

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016)

Reading note: Of the total number of moves of researchers who currently work in the EU but who were mobile to the US for more than three months during post-doctoral career stages, 11% were made by Italian citizens, 10% by German citizens and 9% by Greek citizens. When the move is made to the same country as the country of citizenship it is not reflected in the table (e.g. moves to France made by French citizens).

Notes:

- Only R2, R3 and R4 researchers.
- Based on question 64: "Please indicate the 3 most recent international steps/moves in the last ten years of your research career after your PhD up to (but excluding) your current position in which you are employed."
- (2019: n=3,120; 2016: n=3,249)

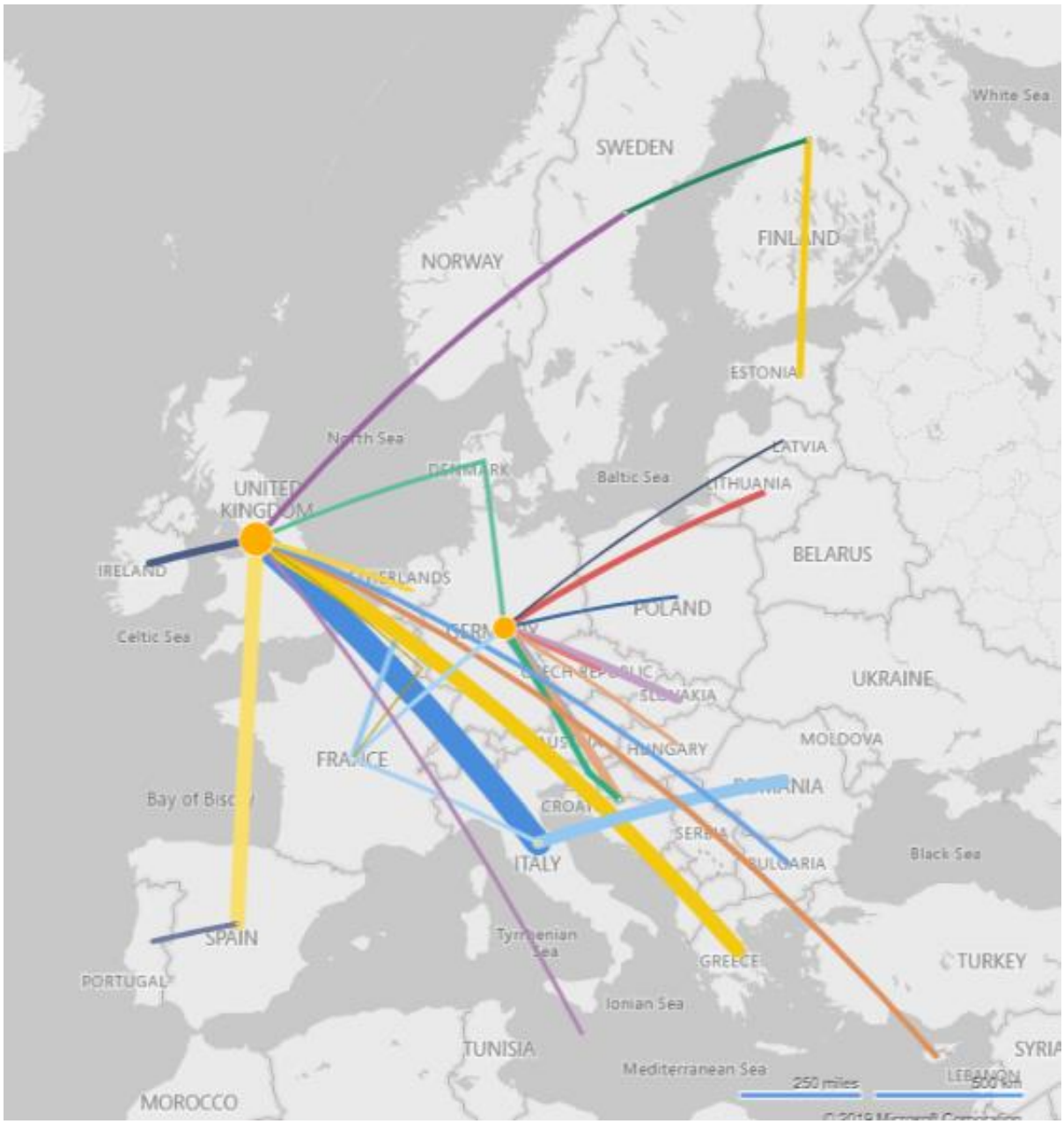
Table 30 shows that Greek, German and Italian citizens constitute the largest group of incoming researchers (among EU citizenships) for most of these top destinations. These were also the largest groups in 2016.

This finding is also confirmed by the mapping of flows in Figure 93. This map presents the flows from a certain nationality to a certain destination country. The destination countries are represented by dots,

the flows by lines. The thickness of the lines represents the number of moves to each destination. Only the most common destination country for each nationality is depicted. For instance, in Figure 93 the thick lines starting in Italy, Greece, and Spain and going to the United Kingdom, confirm that the United Kingdom is the most common destination for researchers from these countries. In other words, of all moves indicated for Italian researchers, most went to the United Kingdom.

From a global perspective, Figure 94 indicates that North America (mainly the USA) is the most frequent destination for EU researchers (55%), followed by Asia (23%), Oceania (9%) and South America (7%). The top 5 destination countries are the same as in MORE2 (2012) and in MORE3 (2016).

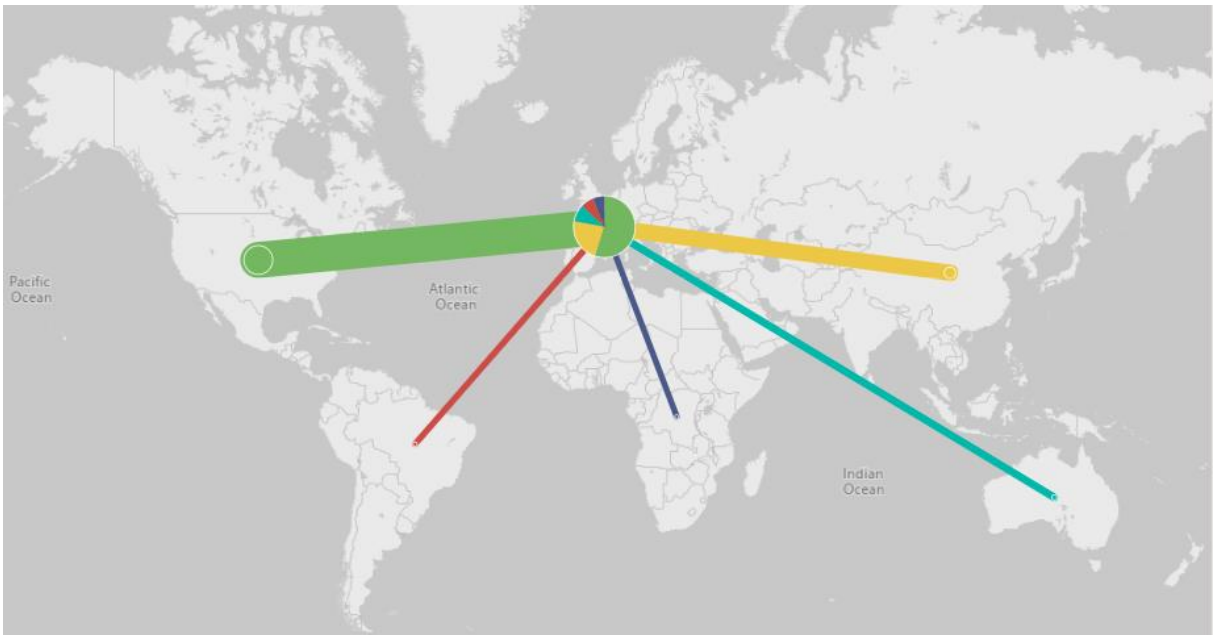
Figure 93: Map of >3 month international mobility flows in post-PhD career stages within the EU28+3 (for each nationality, only the flow to the most common destination is shown)



Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers currently working in EU28+3 and only flows of 10 moves or more are shown.
- The dots represent the destination countries. The size of the dots represent the size of the moves to each country (i.e. the large dots in the UK and Germany indicate that these are the destinations that receive a larger number of researchers).The lines represent the count of moves between countries in the EU28+3.
- With moves defined as moves of three months or more in the last ten years to another country than the country of citizenship of the researchers.
- With country of departure equal to country of citizenship.
- Based on question 64: "Please indicate the 3 most recent international steps/moves in the last ten years of your research career after your PhD up to (but excluding) your current position in which you are employed."
- (n=1,849)

Figure 94: Map of >3 month international mobility flows in post-PhD career stages from the EU to other continents



Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers currently working in EU28+3 and only flows of 10 moves or more (aggregated per continent) are shown.
- Count of moves from the EU8+3 to other continents.
- With moves defined as moves of three months or more in the last ten years to another country than the country of citizenship of the researcher.
- With country of departure equal to country of citizenship.
- Based on question 64: "Please indicate the 3 most recent international steps/moves in the last ten years of your research career after your PhD up to (but excluding) your current position in which you are employed."
- (n=1,032)

8.1.1.3.2 Mobility frequency

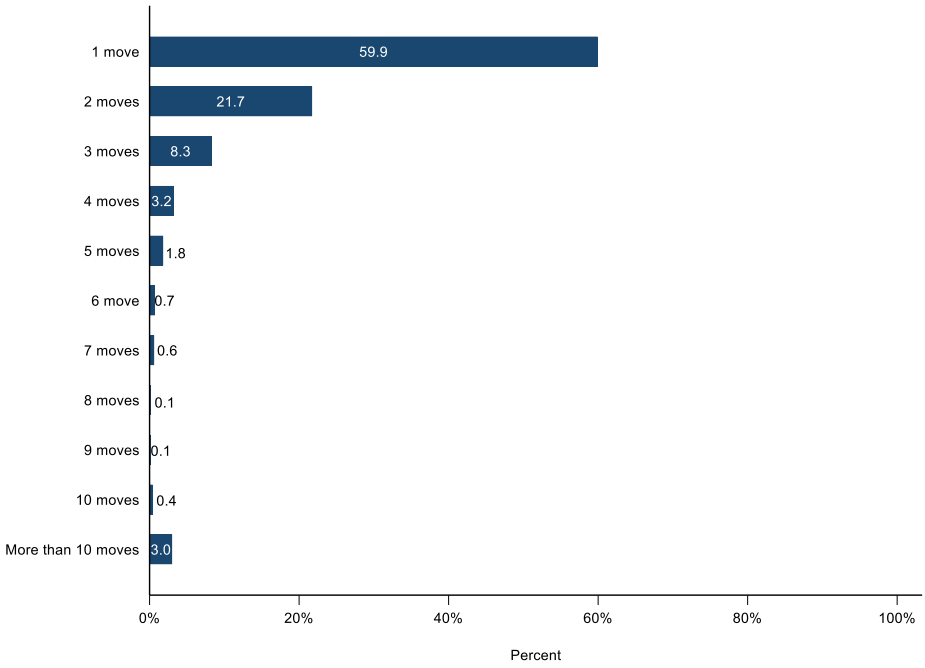
Figure 95 presents the number of moves researchers have made in the last ten years. The figures show a remarkable stability with respect to MORE3 results: 60% of the mobile researchers have moved only once (56% in 2016). The average number of moves in the last ten years per mobile researchers is 2.2 (2.2 in 2016)[118].

- Gender: Although male researchers tend to be more mobile than their female counterparts (28% versus 25% respectively), women that are mobile tend to be more frequently mobile – i.e. they show on average a slightly higher number of moves: men have moved on average 2.1 times (2.2 in 2016), while women have done so 2.3 times (2.1 in 2016).

[118] The average is based on a question asking about the number of moves. The response options included from "0" to "more than 10". The average is calculated assuming that 10+1 is the maximum number of moves. Although this is not fully accurate – researchers might have more than ten mobility experiences – the average is a useful indicator of the overall evolution over time of the intensity of researchers´ mobility.

- Career stage: There is little difference in terms of number of moves between researchers in different career stages: R4 researchers present only a slightly higher average number of moves (2.3) than R3 (2.1) and R2 researchers (2.1)[119].
- Field of science: As in the MORE3 study, the results of the survey do not show large differences across the different fields of science. The highest average number of moves is found in Agricultural Sciences (2.4) and the lowest in Engineering and Technology (2.1).
- Researchers whose partner also works as a researcher present a slightly higher average number of moves (2.3) than researchers whose partner does not work in research (2.1). This finding goes in line with the MORE3 study but the difference between the two groups has decreased with time - the shares in MORE3 were 2.5 and 2.1 respectively.

Figure 95: Frequency of >3 month international mobility in post-PhD career stages, in the last ten years (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Distribution of R2, R3 or R4 researchers who have worked abroad for 3 months or more at least once in the last ten years over the number of moves per researcher in the last ten years (2006-2016).
- Based on question 63: "How many times did you work abroad for more than 3 months in the last ten years (2006-2016)?"
- (n=1,682)

[119] The averages found in 2016 were very similar: 2.5 for R4, and 2.0 for R2 and R3 researchers.

8.1.1.3.3 Mobility duration[120] [121]

SHARE OF MOVES THAT FALL WITHIN THE SPECIFIC DURATION RANGE (of all moves by R2, R3 and R4 researchers with >3 month international mobility experience in the last ten years)					
	3 months to 6 months	6 months to 1 year	1 year to 2 years	2 years to 3 years	More than 3 years
2012 (n=2,654)	44.5%	16.1%	8.0%	8.6%	17.7%
2016 (n=2,804)	53.4%	17.5%	10%	6%	13.2%
2019 (n=1,572)	58.7%	15.4%	8.7%	5.1%	12.1%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Note:

- Based on question 66: "What was the duration of each step?"

Most of the moves of more than three months have a relatively limited duration: 59% of the moves have lasted for 3 to 6 months. This is nearly 5 percentage points higher than in 2016. The share of moves that last for more than three years shows a steady decline since 2012: the share of researchers indicating this type of move has decreased from 18% on 2012 to 12% in 2019.

In general terms, the duration tends to be longer when the move entails a change of employer (see Table 31).

Table 31: Duration per move for >3 month international post-PhD mobility with and without employer change, in the last ten years (EU28)

	NO EMPLOYER CHANGE		EMPLOYER CHANGE		TOTAL	
	2016	2019	2016	2019	2016	2019
3-6 months	69.5%	70.4%	21.1%	26.7%	53.4%	58.7%
+6 months to 1 year	17.2%	15%	18.1	16.2%	17.5%	15.4%
+1 to 2 years	5.5%	5.5%	18.9%	17.6%	10.0%	8.7%
+2 to 3 years	2.8%	2.9%	12.3%	11.1%	6.0%	5.1%
Over 3 years	5.0%	6.1%	29.6%	28.3%	13.2%	12.1%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Share of moves per duration category, for moves without and with an employer change and in total.
- With moves being defined as international steps in the last ten years of R2, R3 and R4 researchers to work abroad for 3 months or more.
- Based on question 66: "Did you change employer?"
- (2019: n=2,782; n=745 for employer change, and 2016: n=2,804; n=935 for employer change)

[120] An important difference in the question between MORE2 and MORE3/4 is the number of moves a researcher could indicate: in MORE2 this was 8 and in MORE3 and MORE4 this was 3. MORE3 and MORE4 thus focus on the most recent mobility experiences. In MORE2, however, only 5.4% of the respondents indicated that they had 4 moves or more, limiting the difference with the following MORE studies. The same remark is applicable to the subsequent sections on contract, destination sector and career progression.

[121] For analysis at the level of the move, the sample is not weighted because no information on the total number of moves in the population is available for FOS or country. Furthermore, weighting might create a larger imbalance in the information on moves than looking at the sample shares only.

8.1.1.3.4 Mobility conditions: contract

SHARE OF MOVES WITH A SPECIFIC CONTRACT TYPE
(of all moves by R2, R3 and R4 researchers with >3 month international mobility experience in the last ten years)

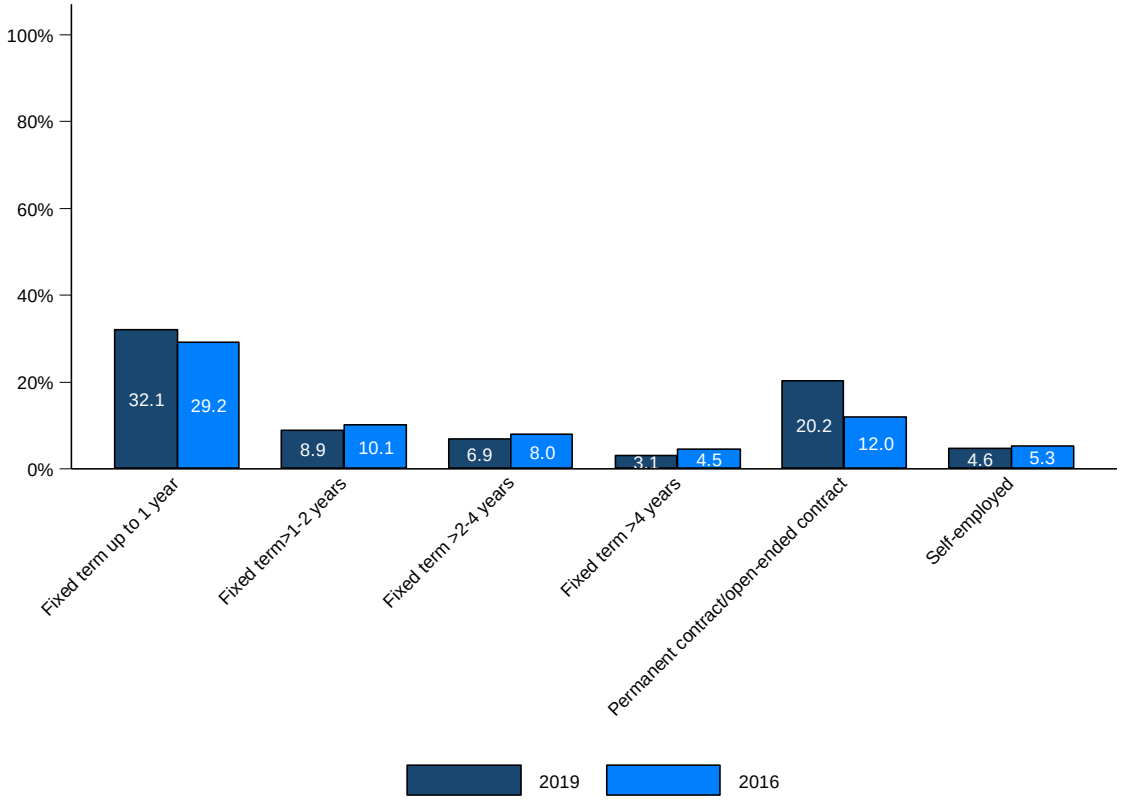
	Fixed term contract	Permanent or open-ended contract	Self-employed	Other
2012 (n=2,705)	58%	14.5%	2.7%	24.0%
2016 (n=2,804)	51.8%	12%	5.3%	30.9%
2019 (n=2,785)	51%	20.2%	4.6%	24.2%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Note:

- Based on question 68: "What was the type of contract?"

The analysis of the types of contracts that researchers have when moving to other countries reflects that the situation has been rather stable since MORE2 (2012). The most remarkable difference is found in the increasing share of researchers that have a permanent contract (from 12% in 2016 to 20% in 2019). Figure 96 shows the duration of the contracts. Fixed-term contracts with a maximum duration of one year are most common (29% in 2016 and 32% in 2019), followed by permanent contracts (12% in 2016 and 20% in 2019). The increase in the share of permanent contracts since 2016 needs to be interpreted with caution as it could be due to the smaller share of R1 researchers included in 2019 sample compared to 2016 as earlier stage researchers are less likely to have this type of contract.

Figure 96: Contract type per move for >3 month international post-PhD mobility, in the last ten years (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Distribution of moves indicated by R2, R3 or R4 researchers who have worked abroad for 3 months or more at least once in the last ten years over contract types.
- Based on question 68: "What was the type of contract?"
- (n=2,785)

8.1.1.3.5 Mobility conditions: destination sector

SHARE OF MOVES TO A SPECIFIC DESTINATION SECTOR
(of all moves by R2, R3 and R4 researchers with >3 month international mobility experience in the last ten years)

	University or HEI	Public/ government	Private, not-for-profit	Large companies	SMEs, start-ups	Self-employed	Other
2012 (n=2,705)	82.7%	9.3%	4.4%	2.6%		0.3%	0.8%
2016 (n=2,804)	84.5%	8%	2.3%	1.7%	1%	0.5%	2%
2019 (n=2,785)	86.9%	5.7%	2.4%	1.3%	0.8%	1%	1.9%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- Based on question 69: "What was the destination sector?". The questionnaire in 2012 did not differentiate between large and small companies.
- (*) The MORE2 questionnaire did not differentiate between large companies and SMEs. Therefore, these two categories in MORE3 and MORE4 need to be summed up when comparing them with MORE2.

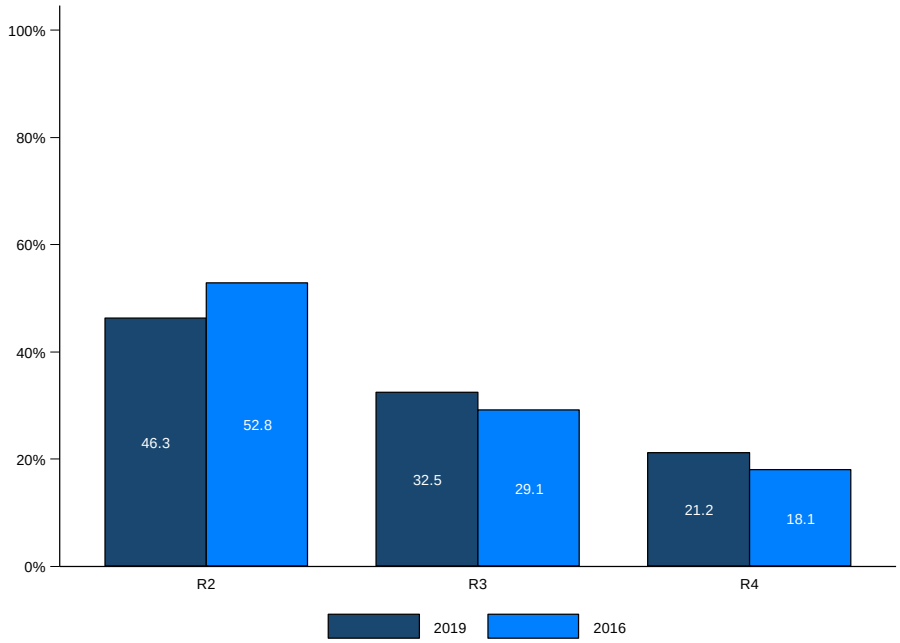
Most of the international moves that involve a change of employer are undertaken within the academic sector (87%), a slight increase compared to MORE3 (85%) and MORE2 (83%). The second most popular

sector of destination is the public sector (6%), but there seems to be a decrease in this category since 2012. However, it should be noted that the number of moves included in most of the categories is low and, therefore the findings need to be interpreted with caution. Only future studies will be able to confirm the existence of this trend. The number of moves to the private non-profit sector decreased from 2012 to 2016 but it has remained stable since then.

8.1.1.3.6 Mobility conditions: career stage

The results of the MORE4 survey indicate that the distribution of moves tends to concentrate in lower career stages (see Figure 97). For instance, 46% of the moves reported by the respondents was completed while the researchers worked as R2, 32% as R3 and 21% as R4.

Figure 97: Career stage at the beginning of each move for >3 month international post-PhD mobility, in the last ten years (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Distribution of moves indicated by R2, R3 or R4 researchers who have worked abroad for 3 months or more at least once in the last ten years over destination sector.
- Based on question 70: "What was your career stage at the start of each move?"
- (2019: n=2,785; 2016: n=2,804)

8.1.1.4 Motives

This section discusses the motives of researchers in their decision to become internationally mobile. These analyses refer to those researchers that have been internationally mobile for more than 3 months during their post-PhD career stages in the last ten years. First, this section presents the motives related to escape, expected and exchange mobility. Second, it analyses the importance of motives for the last move made to an EU country. The last sections are devoted to the analysis of the main motive for each of the individual moves and of the main motives for employment change.

For the analysis of motives per move, a list of 15 factors were presented (plus the 'other' category). In a similar way as was undertaken in section 6 on researchers´ satisfaction with working conditions and in section 7 on mobility and collaboration during PhD stage, several categories of factors are analysed. We can differentiate between 1) motives related to remuneration and other non-science related factors, 2) motives related to scientific knowledge production, and 3) motives related to career progression.

The first set encompasses to two main categories: Financial security and satisfaction at work.

- Financial security includes remuneration, job security, social security and other benefits and pension plan.
- Satisfaction at work encompasses those motives that refer to non-work-related reasons such as culture, personal or family reasons and other non-specified factors.

The second main group of motives – related to conditions to create scientific knowledge - is formed by financial support for research, intellectual support, and time constraints.

- Financial support for research includes availability of research funding and of suitable positions, and access to research facilities and equipment.
- Intellectual support refers to working with leading scientists, the quality of education and training, and international networking.
- Time balance and research autonomy includes research autonomy and balance between teaching and research time.

Finally, the last group refers to those factors related to career progression.

8.1.1.4.1 Escape, expected and exchange mobility

As explained in section 3.2.4.3, a number of results in the MORE2 study raised questions about the extent to which mobility can be forced and, therefore, whether it could entail negative effects instead of positive effects. With the objective of providing empirical evidence to address this question, the MORE3 and MORE4 EU HE surveys directly asked mobile researchers about the degree of freedom they had in their decision to become mobile. We distinguish between escape, expected and exchange mobility as defined in section 3.2.4.

Escape mobility occurs when a researcher is 'pushed' away from his or her environment because of lack of funding, of positions, etc. Escape mobility entails that researchers are mobile because they need to be if they want to pursue a career as a researcher. In this sense, it is worth highlighting that 6% of the researchers who have been mobile for more than 3 months in the last ten years indicated that they felt forced to move because there were no options for a research career in their home country, and that this is a decline of 3 percentage points compared to MORE3 (see Table 32). Another 6% felt forced because international mobility is a requirement for career progression in their home country (similar to the share of 7% observed in 2016).

The term **expected mobility** is used for those cases where mobility is perceived as a 'natural' step in a research career, but where researchers do not feel obliged to move. The results of the survey indicate that 18% (17% in 2016) of researchers who have been mobile for more than 3 months made this decision because of the expected benefits of the move in terms of career progression when returning to their home country, even though it was not required. Similarly, 16% of the long-term mobile researchers chose to be mobile in order to improve their working conditions compared to their home country (15% in 2016).

Finally, **exchange mobility** refers to those situations in which a researcher chooses to move (positive motivation, self-chosen) with the aim of exchanging knowledge and work in an international network, or with the aim to use international experience as a way to boost his or her career. This group is the largest: 47% (44% in 2016) of the researchers indicated that they decided to move because of the opportunities derived from international mobility in terms of networking and knowledge exchange.

EU versus non-EU moves: Table 32 shows that 45% of the non-EU moves were undertaken for reasons related to knowledge exchange and networking, compared to 48% of the EU moves. This is different from 2016, where the non-EU moves had a (much) higher share of exchange mobility than the EU moves (51% versus 38%). We observe a decline in escape mobility in both EU and non-EU moves: whereas the former represented 19% of the cases of EU moves in 2016, in 2019 the researchers selecting this option in the survey constitute 15%. In the case of non-EU moves the shares have declined from 12% in 2016 to 9% in 2019.

Table 32: Escape, expected and exchange mobility (EU28)

		EU MOVES		NON-EU MOVES		TOTAL	
		2016	2019	2016	2019	2016	2019
Escape	Forced: No options for research	12.5%	8.9%	4.4%	2.2%	9.1%	6.0%
	Forced: Required for career progression	6.4%	6.2%	7.9%	6.7%	7.0%	6.4%
Expected	Chosen: Improve working conditions	17.6%	13.9%	12.2%	17.8%	15.3%	15.6%
	Chosen: Appreciated in career and working conditions	15.5%	15.6%	18.6%	20.9%	16.8%	17.8%
Exchange	Chosen: Networking and knowledge exchange	38.5%	48.1%	51.0%	44.9%	43.7%	46.8%
Other		9.5%	7.4%	5.9%	7.5%	8.0%	7.5%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Only R2, R3 and R4 researchers who were >3 month mobile in the last ten years.
- Distribution of >3 month mobile researchers in post-PhD career over applicable situation for their last instance of mobility, for EU and non-EU moves.
- Based on question 72: "Which of the following situations would you say is most applicable to your last instance of mobility?" and question 62: "Please indicate the 3 most recent international steps/moves in the last ten years of your research career after your PhD up to (but excluding) your current position in which you are employed."
- (n=1,572)

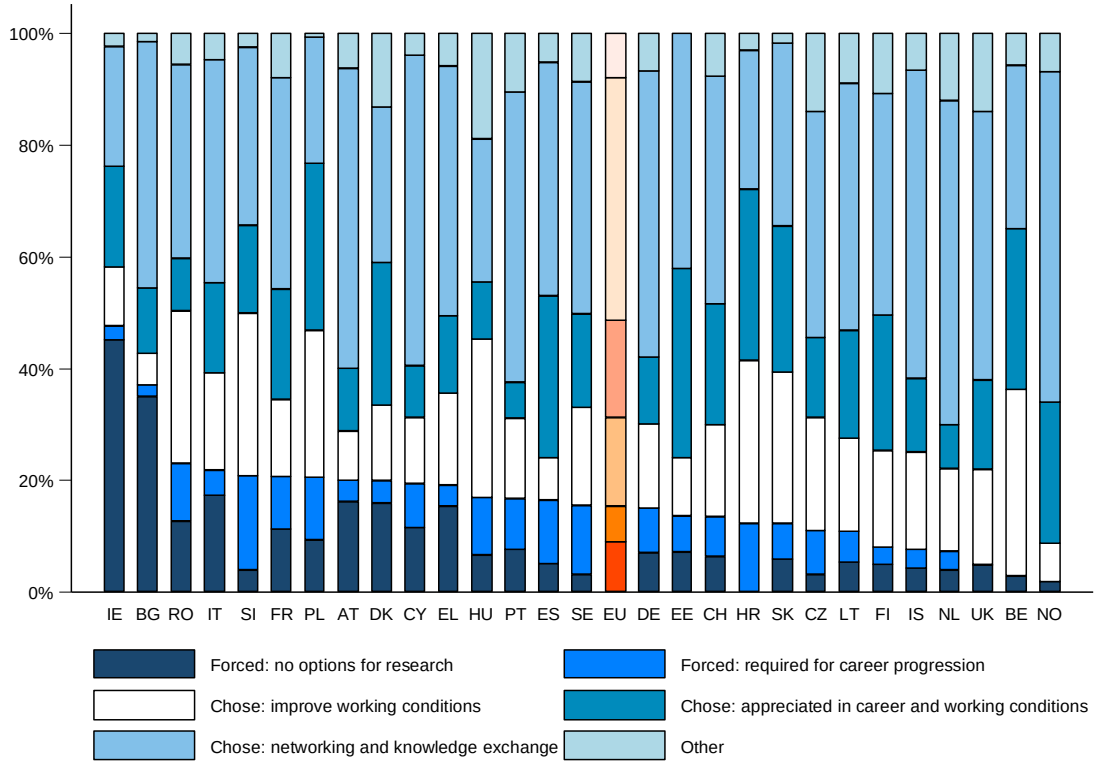
Country of citizenship: Figure 98 shows the levels of forced and chosen mobility in each country in 2016 and in 2019. While in 2016, the highest shares of forced mobility among researchers who have been mobile for more than 3 months were found among citizens from Ireland and Bulgaria, with shares significantly above the EU average (48% and 37% respectively), the situation is different in 2019: the levels of forced mobility are higher in Slovenia, Luxembourg, Estonia and Latvia. However, it should be noted that the levels of forced mobility differ a lot across these countries: for instance, most of the researchers that have faced a situation of forced mobility in Latvia indicate that this is because of an absence of other options for a research career in their country and only a minority indicate that it was a requirement for career progression. The opposite picture was found in Estonia: most of the researchers "forced to be mobile" indicate that this was a requirement for career progression in their country.

Although the situation has changed in the past years, some aspects of forced mobility remain unchanged: On the one hand, Italy is still one if the countries with a higher level of forced mobility

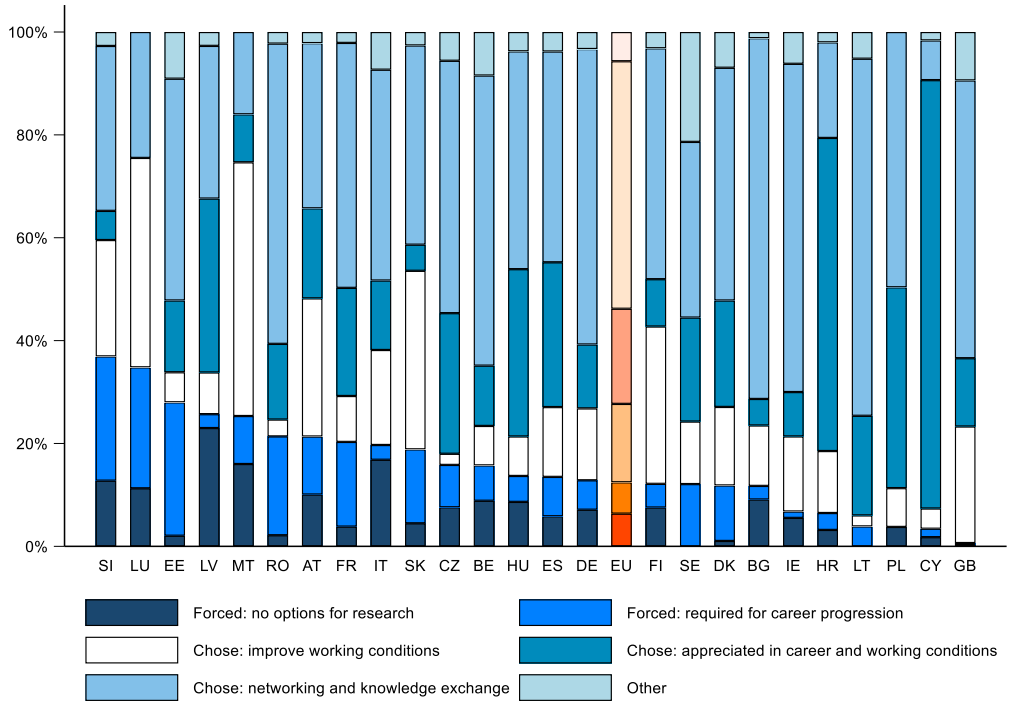
linked to the absence of other options to develop a career in academia. On the other hand, the level of forced mobility in the United Kingdom continues to be negligible.

Figure 98: Escape, expected and exchange mobility, by country of citizenship (EU28)

2016:



2019:



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

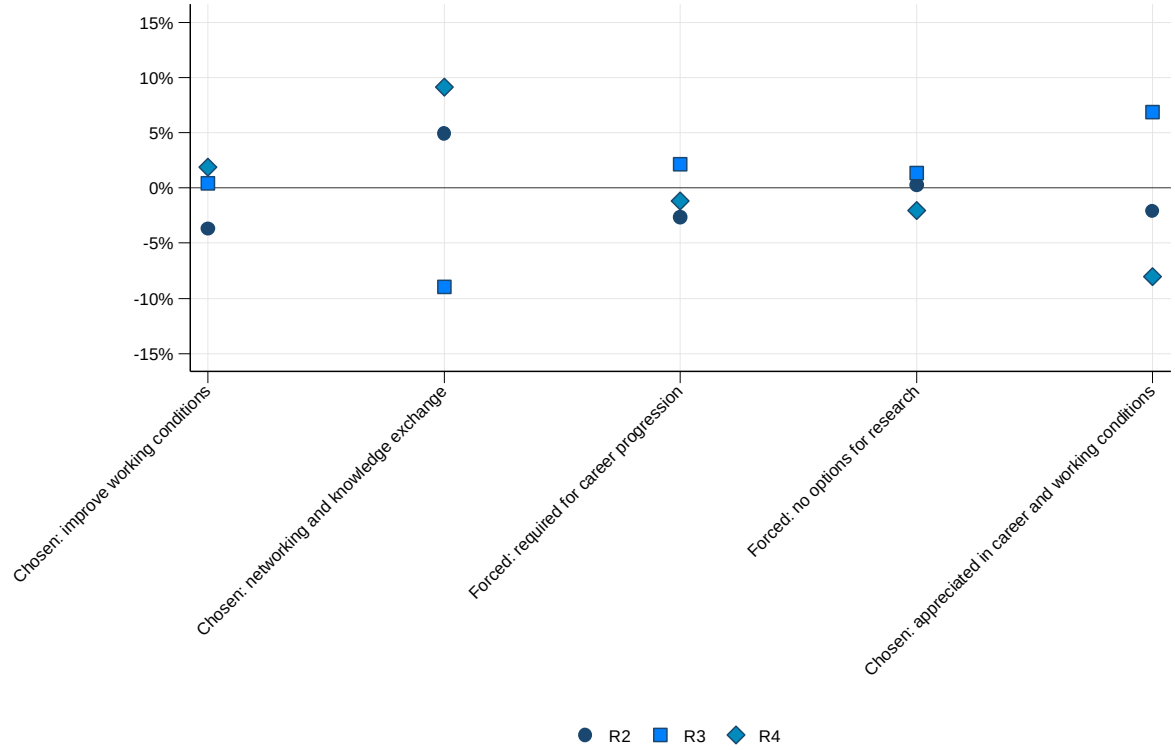
- Only R2, R3 and R4 researchers who were >3 month mobile in the last ten years.
- Share of researchers who have been >3 month mobile in post-PhD career and that experienced a specific degree of freedom in their decision to become mobile.
- Countries with <30 observations are excluded: this is the case for Malta, and Latvia in MORE4.
- Based on question 72: "Which of the following situations would you say is most applicable to your last instance of mobility?"
- (2019: n=1,573; 2016: n=1,989)

Career stage: In general, there is a remarkable homogeneity across career stages: the difference between career stages is lower than 5pp in 3 out of 5 items, among which the items referring to forced mobility (see Figure 99).

Whereas the effects of the economic crisis in some countries were very visible in the results of MORE3 in 2016, the results of the MORE4 survey indicate that the situation is now better for researchers in almost all career stages. Forced mobility has been reduced across all career stages since 2016, even among R2 researchers, which were the group most affected by forced mobility in 2016. Only among R3 researchers did forced mobility as a requirement for career progression increase.

As in MORE3, R4 researchers continue to be the group that displays a higher tendency to move because of the desire to improve their networking and to exchange knowledge but the difference with other career stages is now smaller.

Figure 99: Escape, expected and exchange mobility, by (current) career stage (EU28)



		R2		R3		R4		TOTAL	
		2016	2019	2016	2019	2016	2019	2016	2019
Escape	**Forced: no options for a research career in home country**	11.9%	6.3%	10.4%	7.4%	5.3%	4.0%	9.1%	6.0%
	Forced: requirement for career progression in home country	10.7%	3.7%	4.9%	8.5%	7.7%	5.2%	7.0%	6.4%
Expected	**Chosen: improve my working conditions compared to home country**	11.6%	11.9%	18.5%	16.0%	13.2%	17.4%	15.3%	15.6%
	Chosen: appreciated in career and working conditions in home country	14.5%	15.7%	20.4%	24.7%	12.9%	9.8%	16.8%	17.8%
Exchange	**Chosen: networking and knowledge exchange**	42.7%	51.7%	37.8%	37.8%	53.4%	55.9%	43.7%	46.8%

Source: MORE3 EU HE survey (2016) and MORE4 EI HE survey (2019)
Notes:

- The figure shows the difference between each career stage and the total for each of the items. The table presents the shares of researchers in each category.
- Only R2, R3 and R4 researchers who were >3 month mobile in the last ten years.
- Difference between share of researchers who have been >3 month mobile in post-PhD career per current career stage about their mobility situation and the total share of researchers that have been >3 month mobile.
- Based on question 72: "Which of the following situations would you say is most applicable to your last instance of mobility?" and question 13: "In which career stage would you currently situation yourself?"
- For ease of clarity the table does not include the option "Other".
- (2019: n=1,572: 2016: n=1,704)

Gender: The degree of forced mobility seems more or less equal between female and male researchers. Being forced to be mobile because there are no options in research, is slightly higher among male researchers (7% versus 5% among female researchers). There are larger differences, however, when it

comes to the reasons for "chosen mobility": male researchers are more likely to search for networking and knowledge exchange opportunities than their female counterparts (51% compared to 39%). Women, however, are more inclined to move because they believe that having been mobile will have a positive effect on their career and working conditions in their home country: 23% versus 13% among male researchers.

8.1.1.4.2 Motives for >3 month post-PhD mobility: Motives last EU move

In this section, the importance of researchers´ motives for their last move of more than three months within the EU is analysed. Table 33**Error! Reference source not found.** shows the shares of researchers who identify each motive as being important for their last move to the EU. The most frequently indicated motive is international networking (important to 87% of mobile researchers), followed by research autonomy (85%), working with leading scientists (83%) and career progression (81%). Results follow a similar pattern as the findings obtained in MORE3 and in MORE2[122].

The share of researchers declaring that they were driven by research autonomy has continued to increase since 2012 (from 47% in 2012 to 76% in 2016 and 85% in 2019). The share of researchers indicating that remuneration is a motive for their last move to the EU has also increased (from 41% in 2012 to 53% in 2016 and 58% in 2019, see Table 33). As in MORE3, social security and other benefits (44%) are more frequently indicated as a motive for the last EU move than pension plans (38%).

[122] International networking was not included in MORE2.

Table 33: Importance of motives for >3 month international mobility in post-PhD career stages, last EU move (EU28)

	2012 (n=1002)	2016 (n=1,097)	2019 (n=994)
International networking	/	83.3%	86.5%
Research autonomy	46.7%	76.4%	85.0%
Working with leading scientists	74.7%	78.8%	83.0%
Career progression	83.1%	80%	80.8%
Access to research facilities and equipment	69.3%	74.7%	74.3%
Availability of research funding	70.3%	68.2%	71.4%
Quality of training and education	59%	67.9%	70.8%
Availability of suitable positions	68.7%	65.1%	68.7%
Culture and/or language	58.1%	57.4%	66.7%
Balance between teaching and research time	/	55.7%	65.7%
Remuneration	40.6%	53.3%	57.8%
Personal/family reasons	46.7%	45.5%	49.1%
Social security and other benefits	21.6%*	41.4%	47.1%
Pension plan		32.1%	37.7%
Job security	30.1%	39.4%	44.1%
Working conditions	56%	/	/

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- Only R2, R3 and R4 researchers who were >3 month mobile in the last ten years.
- Share of respondents that indicate this motive as one of the motives for their last EU move
- * The options "Social security and other benefits" and "Pension plan" were presented as one combined option in MORE2, and as two different options in MORE3 and MORE4.
- Based on question 71: "Please consider your last instance of mobility. Which of the following factors were important motives to make this move?"

In Table 34 the motives are grouped according to the categories defined above. Career progression (on average 81% of the mobile researchers find the options in this category important) and the search for intellectual support (80%) continue to be the most frequently cited categories. As in MORE3, researchers are driven least by financial security (47%) and satisfaction at work (58%).

Country level: Table 35 shows the average scores per country of citizenship (as a proxy for origin) for each category of motives. In Lithuania, Latvia, Luxembourg and Spain, the share of researchers considering these motives important are higher than the EU28 average for all or most of the categories. On the contrary, in Romania, Sweden, Slovakia and Belgium, the average shares of researchers for most of these factors are lower than the EU28 average. In general terms, motives related to financial security receive the lowest scores across categories in most countries. Latvia and Lithuania stand out as being the countries where researchers mention more frequently these types of motives (81% and 74% respectively). On the opposite side, career progression is the most commonly cited motive in most countries, followed by intellectual support.

Career stage: R2 researchers tend to give more importance to factors related to career progression (84%) than other career stages (81% in R3 and 78% in R4). A similar pattern is found for the category of motives related to intellectual support, which is considered important by 88% of R2, 77% of R3 and 71% of R4 researchers. For R3 researchers other factors seem to play a more relevant role compared to researchers in other career stages, namely the availability of suitable positions, remuneration, research autonomy, job security, culture and/or language, and personal and family reasons.

Gender: With respect to gender, there are no large differences across categories of motives. However, we find that, compared to men, women indicate more often that personal or family reasons (+8pp), and career progression (+6pp) are more important motives. On the contrary, the balance between teaching and research time (-12pp), pension (-7pp) and working with leading scientists (-7pp) are less important motives for female researchers than for men.

Table 34: Importance of categories of motives for >3 month international mobility in post-PhD career stages, last EU move (EU28)

AVERAGE SHARE OF RESPONDENTS THAT INDICATE THE MOTIVES IN THIS CATEGORY AS ONE OF THE MOTIVES FOR THEIR LAST EU MOVE (of mobile R2, R3 and R4 researchers)					
	Year	**EU28 total**	**Per career stage**	**Per FOS**	**Per gender**
Financial security	**2016**	41.5%	R2: 42.1% R3: 43.9% R4: 36.6%	MED: 40.0% NAT: 43.1% SOC: 42.6%	F: 41.8% M: 41.4%
	2019	46.7%	R2: 51.9% R3: 47.1% R4: 39.9%	MED: 51.6% NAT: 47.2% SOC: 39.5%	F: 45.3% M: 46.5%
Satisfaction at work	**2016**	51.4%	R2: 41.6% R3: 55.9% R4: 51.5%	MED: 46.5% NAT: 56.2% SOC: 54.6%	F: 52.8% M: 50.6 %
	2019	57.9%	R2: 61.9% R3: 56.2% R4: 57.1%	MED: 55.4% NAT: 61.8% SOC: 58.6%	F: 63.4% M: 54.4%
Financial support	**2016**	69.3%	R2: 71.0% R3: 73.0% R4: 61.1%	MED: 71.2% NAT: 73.3% SOC: 66.1%	F: 71.1% M: 68.3%
	2019	71.5%	R2: 74.7% R3: 72.1% R4: 68.4%	MED: 76.9% NAT: 72.8% SOC: 65.7%	F: 71.1% M: 71.8%
Intellectual support	**2016**	76.7%	R2: 80.3% R3: 77.4% R4: 72.1%	MED: 73.5% NAT: 80.3% SOC: 78.5%	F: 71.1% M: 68.3%
	2019	80.1%	R2: 87.1% R3: 77.1% R4: 81.4%	MED: 82.3% NAT: 88.6% SOC: 75.5%	F: 81.5% M: 80.1%
Time balance	**2016**	66.0%	R2: 61.6% R3: 68.1% R4: 65.8%	MED: 63.5% NAT: 57.7% SOC: 71.8%	F: 64.6% M: 66.9%
	2019	75.4%	R2: 75.7% R3: 76.1% R4: 74.9%	MED: 77.3% NAT: 76.3% SOC: 73.7%	F: 72.6% M: 77.4%
Career progression	**2016**	80.0%	R2: 92.8% R3: 83.6% R4: 61.8%	MED: 81.7% NAT: 82.5% SOC: 77.5%	F: 79.3% M: 80.5%
	2019	80.8%	R2: 84.0%	MED: 86.4%	F: 85.3%

AVERAGE SHARE OF RESPONDENTS THAT INDICATE THE MOTIVES IN THIS CATEGORY AS ONE OF THE MOTIVES FOR THEIR LAST EU MOVE (of mobile R2, R3 and R4 researchers)					
			R3: 81.2% R4: 77.7%	NAT: 83.8% SOC: 73.7%	M: 78.2%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016)
Notes:

- Only R2, R3 and R4 researchers who were >3 month mobile in the last ten years.
- Share of researchers who were >3 months international mobile in post-PhD career stages that find the motive important (versus not important) for their most recent EU move.
- Financial security includes remuneration, job security, social security and other benefits and pension plan.
- Satisfaction at work refers to culture, and personal or family reasons.
- Financial support includes availability of research funding and of suitable positions, and access to research facilities and equipment.
- Intellectual support refers to working with leading scientists, the quality of education and training, and international networking.
- Time balance includes research autonomy and balance between teaching and research time.
- Based on question 71: "Please consider your last instance of mobility. Which of the following factors were important motives to make this move?"
- (2019: n=994; 2016: n=1,097)

Table 35: Importance of categories of motives for >3 month international mobility in post-PhD career stages, last EU move, by country of citizenship (EU28)

	Financial Security	Satisfaction at work	Financial support	Intellectual support	Time balance	Career progression
Austria	53.7%	47.6%	76.2%	88.2%	73.1%	92.0%
Belgium	23.1%	35.3%	71.7%	62.8%	70.4%	60.1%
Bulgaria	45.1%	44.0%	74.7%	89.4%	71.9%	81.8%
Croatia	23.4%	56.4%	92.3%	96.8%	33.2%	96.0%
Cyprus	8.2%	10.9%	93.6%	10.4%	95.6%	98.3%
Czech Republic	63.0%	62.8%	83.7%	85.6%	72.6%	95.2%
Denmark	39.0%	49.6%	56.9%	80.2%	79.6%	60.3%
Estonia	48.1%	58.4%	80.1%	74.9%	60.1%	95.6%
Finland	62.1%	60.7%	69.2%	68.0%	78.4%	87.3%
France	37.5%	56.2%	67.4%	86.0%	65.3%	75.3%
Germany	53.8%	55.3%	76.4%	85.2%	79.6%	83.4%
Greece	37.8%	49.5%	73.2%	76.4%	77.6%	75.4%
Hungary	45.6%	30.0%	66.3%	71.3%	58.4%	79.3%
Ireland	63.8%	71.2%	75.8%	86.0%	80.1%	85.4%
Italy	45.0%	56.2%	69.2%	74.1%	69.7%	80.0%
Latvia	80.8%	83.5%	85.1%	89.1%	73.5%	86.5%
Lithuania	74.0%	78.8%	98.9%	97.7%	100.0%	100.0%
Luxembourg	50.7%	90.5%	92.3%	93.7%	90.6%	100.0%
Malta	39.7%	50.4%	77.1%	74.6%	72.4%	100.0%
Poland	54.2%	62.3%	74.9%	94.1%	73.6%	80.8%
Portugal	59.1%	73.5%	76.1%	93.7%	81.8%	81.9%
Romania	21.3%	45.8%	50.1%	61.0%	73.5%	81.8%
Slovakia	46.2%	52.5%	67.2%	74.2%	63.5%	58.2%
Slovenia	46.9%	56.5%	64.6%	76.9%	74.6%	88.6%
Spain	54.0%	77.1%	78.7%	87.1%	83.5%	87.3%
Sweden	9.7%	41.9%	40.5%	46.8%	36.5%	47.9%
The Netherlands	49.3%	64.7%	74.3%	83.8%	78.4%	100.0%
United Kingdom	36.5%	57.5%	63.0%	83.5%	85.9%	77.2%
EU28	**46.7%**	**57.9%**	**71.5%**	**80.1%**	**75.4%**	**80.8%**

Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers who were >3 month mobile in the last ten years.
- Share of researchers who were >3 months international mobile in post-PhD career stages that find the motive important (versus not important) for their most recent EU move
- Financial security includes remuneration, job security, social security and other benefits and pension plan.
- Satisfaction at work refers to culture, and personal or family reasons.
- Financial support includes availability of research funding and of suitable positions, and access to research facilities and equipment.
- Intellectual support refers to working with leading scientists, the quality of education and training, and international networking.
- Time balance includes research autonomy and balance between teaching and research time.
- Results in this table should be interpreted with caution as the number of respondents per country is sometimes limited, especially in smaller countries.
- Based on question 71: "Please consider your last instance of mobility. Which of the following factors were important motives to make this move?" and question 5: "What is your country of citizenship?"
- (n=994)

8.1.1.4.3 Motives for >3 month post-PhD mobility: Main motives per move

Next to the question to indicate all motives for the last EU move, the MORE survey also contained a question for researchers to indicate the one main motive for each of their international >3 month moves in post-PhD stage. **Error! Reference source not found.** does not present the share of respondents, but the share of moves for which the motive was mentioned as being the most important. We find that for 24% of these moves, the main motive is career progression, 20% is driven by working with leading scientists and 16% by research autonomy. Very similar findings were obtained in MORE3. This confirms that factors related to scientific knowledge production factors are among the most important motives to be mobile. Career progression and working with leading scientists were also indicated in MORE2 as the main motives for concrete moves.

Table 37 summarises the information by aggregating these items in each of the pertinent categories defined above. The most frequently mentioned category of motives is intellectual support (31%), followed by career progression (24%) and time balance (18%). Coherently with the results obtained in MORE2 and MORE3, financial and job security are only mentioned as primary reasons in a minority of the moves.

Country level: In Figure 100, the motives per citizenship of the researchers (as a proxy for origin) are analysed. Researchers from Eastern and Southern European countries are more driven by intellectual support. As in MORE3 (2016), researchers from Western European countries tend to be more driven by factors related to career progression and financial support. Figure 101 analyses the motives per country of destination and shows a similar country distribution across motives: researchers moving to Eastern and Southern European countries tend to be more driven by motives related to intellectual support than those moving to Western European countries, where motives related to career progression are more frequently cited.

Table 36: Importance of motives for >3 month international mobility in post-PhD career stages, main motive per move (EU28)

	2012 (n= 2,703)	2016 (n=2,804)	2019 (n=2,782)
Career progression	16.5%	22.9%	24.2%
Working with leading scientists	10.9%	19.6%	19.9%
Research autonomy	1.6%	16.8%	16.1%
International networking	/	6.3%	7.7%
Availability of suitable positions	7.7%	5.5%	5.1%
Availability of research funding	7.9%	5.2%	4.8%
Personal/family reasons	3.2%	4.5%	3.2%
Quality of training and education	1.1%	3.8%	3.2%
Access to research facilities and equipment	3.2%	2.9%	4.3%
Balance between teaching and research time	/	2.1%	1.6%
Remuneration	1.2%	1.6%	0.9%
Culture and/or language	0.7%	1.0%	1.6%
Job security	0.6%	0.7%	0.4%
Social security and other benefits	0.3%*	0.1%	0.0%
Pension plan		0.0%	0.0%
Working conditions	0.9%	/	/

Source: MORE4 EU HE survey (2019) , MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- Only R2, R3 and R4 researchers.
- Share of moves for which the motive was indicated as the main one
- An important difference in the question between MORE2 and the following studies (MORE3 and MORE4) is the number of moves a researcher can register: in MORE2 this was 8 and in MORE3 and MORE4 this was 3. MORE3 and 4 thus focus on the most recent mobility only. In MORE2 however, only 5.4% of the respondents indicated that they had 4 moves or more, limiting the difference between MORE2 and the following studies. The same remark is applicable to the subsequent sections on contract, destination sector and career progression.
- * The options "Social security and other benefits" and "Pension plan" were presented as one combined option in MORE2, and as two different options in MORE3 and MORE4.
- Based on question 67: "And what was your main motive to move to each of these countries?"

Table 37: Importance of categories of motives for >3 month international mobility in post-PhD career stages, main motive per move (EU28)

		EU28 TOTAL	PER CAREER STAGE	PER FOS	PER GENDER
Financial security	**2016**	2.4%	R2: 3.2% R3: 2.2% R4: 2.2%	MED: 2.5% NAT: 0.9% SOC: 2.9%	F: 2.9% M: 2.1%
	2019	1.4%	R2: 0.7% R3:1.7% R4: 1.4%	MED: 0.6% NAT: 1.7% SOC: 1.4%	F: 1.4% M: 1.4%
Satisfaction at work	**2016**	5.6%	R2: 10.2% R3: 4.8% R4: 3.8%	MED: 4.0% NAT: 9.5% SOC: 5.4%	F: 5.3% M: 6.1%
	2019	4.8%	R2: 4.1% R3: 6.2% R4: 3.4%	MED: 3.9% NAT: 5.9% SOC: 4.1%	F: 4.0% M: 5.2%
Financial support	**2016**	13.6%	R2: 11.8% R3: 14.3% R4: 13.6%	MED: 14.0% NAT: 8.2% SOC: 15.4%	F: 12.0% M: 14.3%
	2019	14.2%	R2: 12.4% R3: 14.8% R4: 14.5%	MED: 8.9% NAT: 13.9% SOC: 16.4%	F: 16.6% M: 12.8%
Intellectual support	**2016**	29.6%	R2: 27.3% R3: 24.1% R4: 38.7%	MED: 34.0% NAT: 27.9% SOC: 26.1%	F: 29.0% M: 29.9%
	2019	30.8%	R2: 30.7 R3: 30.6% R4: 31.2%	MED: 29.7% NAT: 31.0% SOC: 31.0%	F: 34.5% M: 28.7%
Time balance	**2016**	18.9%	R2: 16.7% R3: 18.6% R4: 20.6%	MED: 15.5% NAT: 15.8% SOC: 23.4%	F: 17.0% M: 19.8%
	2019	17.7%	R2: 12.2% R3: 16.8% R4: 22.4%	MED: 17.1% NAT: 19.3% SOC: 16.5%	F: 14.1% M: 19.8%
Career progression	**2016**	22.9%	R2: 26.2% R3: 27.4% R4: 14.5%	MED: 26.0% NAT: 23.6% SOC: 19.5%	F: 26.2% M: 21.2%
	2019	24.2%	R2: 31.5% R3: 23.5% R4: 20.4%	MED: 34.0% NAT: 21.3% SOC: 23.1%	F: 21.6% M: 25.7%

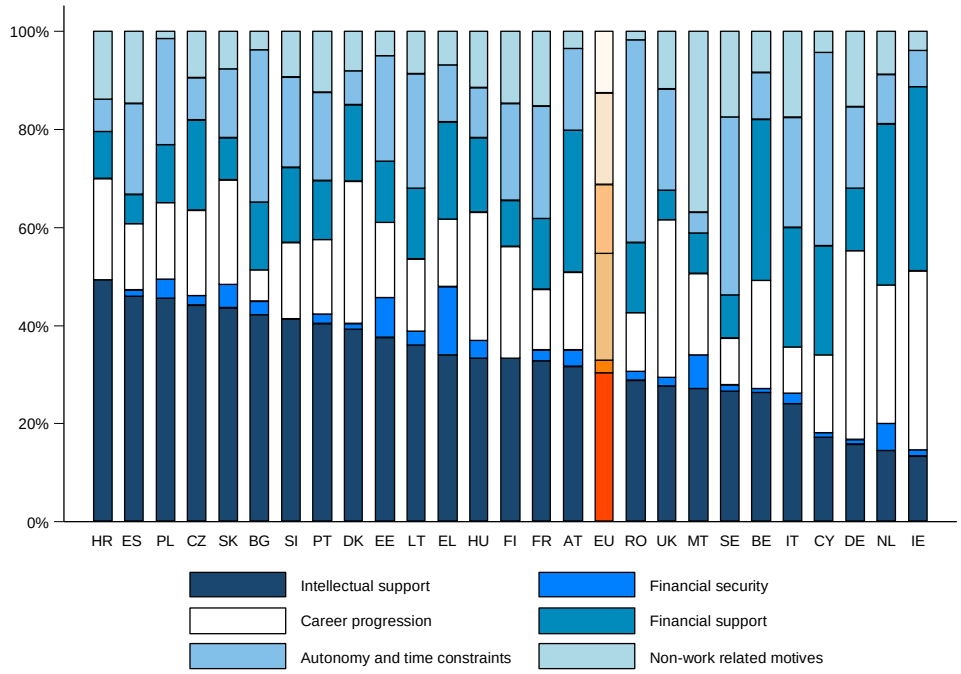
Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016)
Notes:

- Only R2, R3 and R4 researchers who were >3 month mobile in the last ten years.
- Share of individual post-PhD career mobility moves for which the motive is indicated as main motive.
- Financial security includes remuneration, job security, social security and other benefits and pension plan.
- Satisfaction at work refers to culture, and personal or family reasons.
- Financial support includes availability of research funding and of suitable positions, and access to research facilities and equipment.

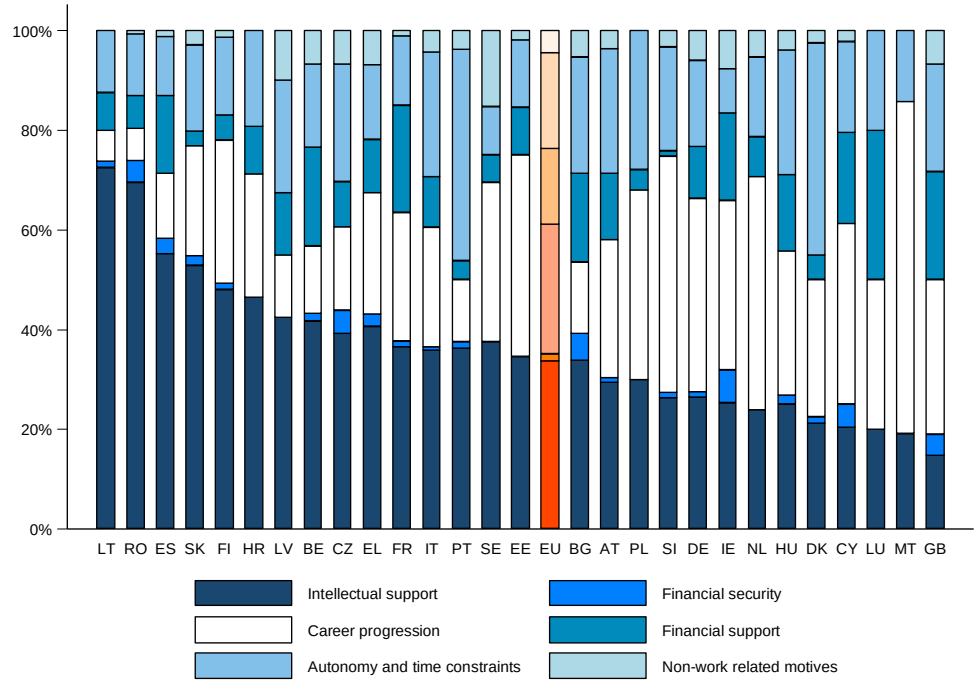
- Intellectual support refers to working with leading scientists, the quality of education and training, and international networking.
- Time balance includes research autonomy and balance between teaching and research time.
- Based on question 67: "And what was your main motive to move to each of these countries?"
- (n=2,782)

Figure 100: importance of categories of motives for >3 month international mobility in post-PhD career stages, main motive per move, by country of citizenship (EU28)

2016:

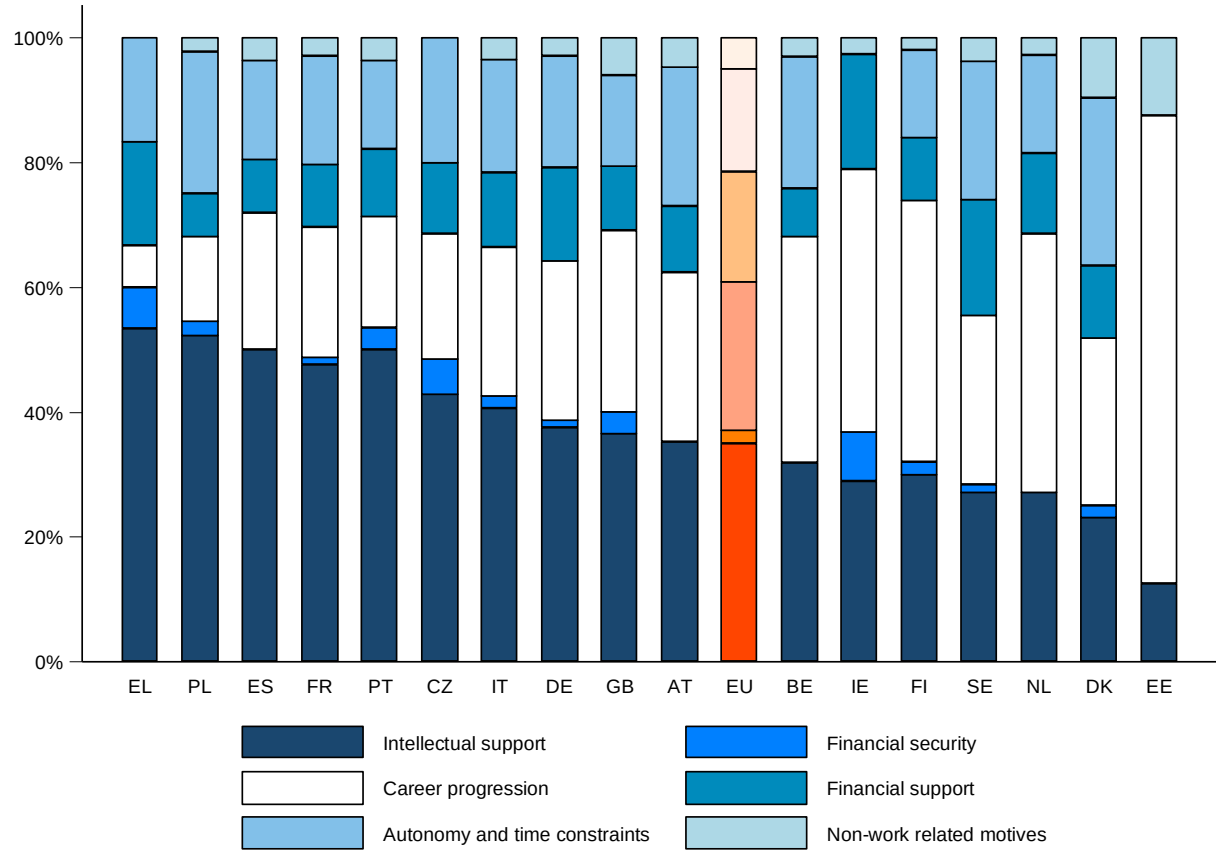


2019:



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes: Only R2, R3 and R4 researchers.
Share of individual post-PhD career mobility moves for which the motive is indicated as main motive per country of citizenship.
Countries with less than 30 observations are omitted: Switzerland, Luxembourg, Latvia, Iceland and Norway.
Based on question 67: "And what was your main motive to move to each of these countries?"
(2019: n=2,782; 2016: n= 2,653)

Figure 101: Importance of categories of motives for >3 month international mobility in post-PhD career stages, main motive per move, by destination country (EU28)

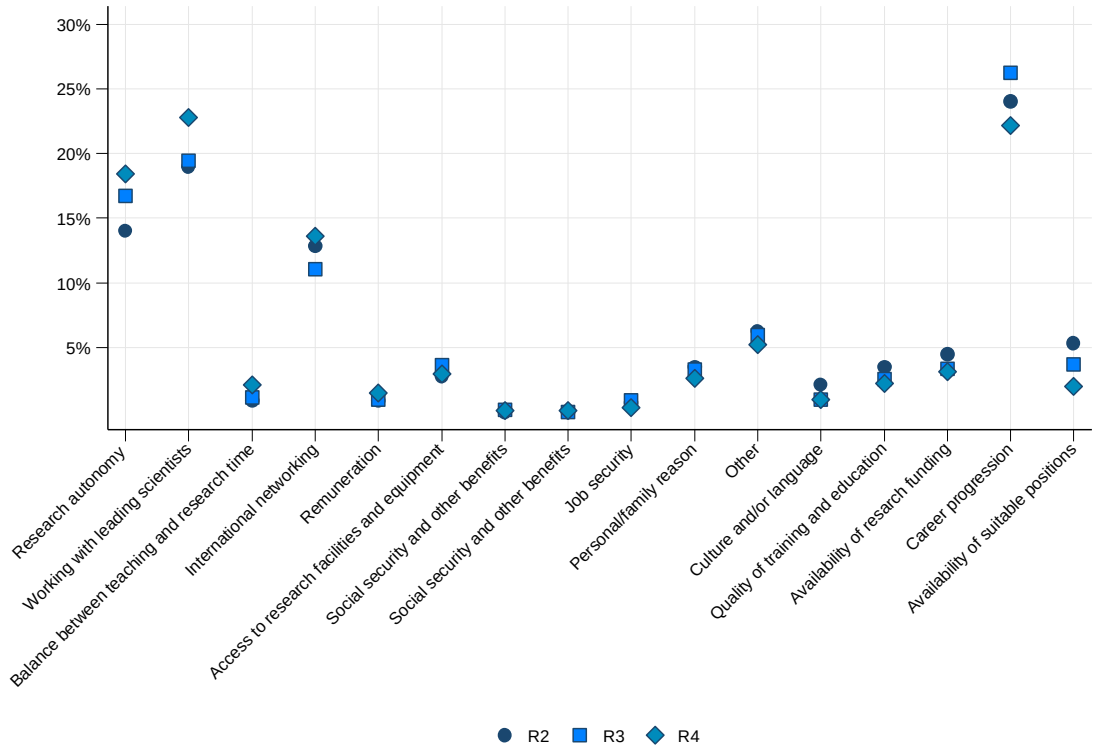


Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers.
- Share of individual post-PhD career mobility steps for which the motive is indicated as main motive per destination.
- Countries with less than 30 respondents are omitted.
- Based on question 67: "And what was your main motive to move to each of these countries?" and question 66: "Please indicate the 3 most recent international steps/moves in the last ten years of your researcher career after your PhD up to (but excluding) your current position in which you are employed."
- (n=2,782)

Career stage: There are no large differences across career stages. R4 researchers more often indicate motives related to research autonomy, working with leading scientists and international networking than researchers in earlier career stages. R2, and to a lesser extent R3, researchers are more often driven by motives related to the availability of positions and research funding, quality of training and education or culture and language.

Figure 102: Importance of motives for >3 month international mobility in post-PhD career stages, main motive per move, by career stage (EU28)



MOTIVE	R2	R3	R4	TOTAL
Career progression	24.0%	26.2%	22.2%	24.2%
Working with leading scientists	19.0%	19.4%	22.8%	19.9%
Research autonomy	14.0%	16.7%	18.4%	16.1%
International networking	12.8%	11.1%	13.6%	7.7%
Other	6.2%	5.9%	5.2%	6.9%
Availability of suitable positions	5.4%	3.7%	2.0%	5.1%
Availability of research funding	4.5%	3.4%	3.1%	4.8%
Access to research facilities and equipment	2.8	3.6%	2.9%	4.3%
Personal/family reason	3.5%	3.3%	2.6%	3.2%
Quality of training and education	3.5%	2.6%	2.2%	3.2%
Balance between teaching and research time	0.9%	1.1%	2.1%	1.6%
Culture and/or language	2.1%	1.0%	0.9%	1.6%
Remuneration	0.9%	1.0%	1.5%	0.9%
Job security	0.7%	0.9%	0.3%	0.4%
Social security and other benefits	0.0%	0.0%	0.1%	0.0%
Pension plan	0.0%	0.2%	0.1%	0.0%

Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers.
- With '>3 month international mobility' defined as moves to work abroad in at least ten years for three months or more.
- Based on question 67: "And what was your main motive to move to each of these countries?" and question 15: "In which career stage would you currently situation yourself?"
- (n=2,782)

Fields of science: The differences across fields of science regarding the motives for mobility are limited. Looking into the most often cited motives, it can be observed that the Health domain (Medical Sciences and Agricultural Sciences) has a higher score in career progression (30%) than the other two main fields of science: the Natural domain, that includes Natural Sciences and Engineering and Technology; and the Social domain, which covers Social Sciences and Humanities. The Health domain together with the Social domain seem to be less driven by the opportunity of working with leading scientists (15% compared to 24% in the Natural domain). Researchers working in the Social domain place less value on research autonomy than the other two main groups. Social security, pension plan and job security are only mentioned by a very small share of researchers across the three main domains.

Table 38: Importance of motives for >3 month international mobility: main motive per move, by field of science (EU28)

	NATURAL	HEALTH	SOCIAL	TOTAL
Career progression	26.9%	29.7%	21.7%	24.2%
Working with leading scientists	23.7%	15.0%	15.2%	19.9%
Research autonomy	16.9%	20.5%	12.2%	16.1%
International networking	9.4%	13.7%	13.8%	7.7%
Other	6.3%	2.7%	7.2%	6.9%
Availability of suitable positions	3.9%	2.0%	5.6%	5.1%
Availability of research funding	2.8%	3.1%	5.3%	4.8%
Access to research facilities and equipment	2.5%	3.4%	4.5%	4.3%
Personal/family reason	2.7%	3.4%	4.2%	3.2%
Quality of training and education	2.0%	3.1%	3.9%	3.2%
Balance between teaching and research time	0.8%	0.7%	1.6%	1.6%
Culture and/or language	1.1%	1.4%	1.6%	1.6%
Remuneration	0.3%	0.7%	1.9%	0.9%
Job security	0.7%	0.3%	1.3%	0.4%
Pension plan	0.0%	0.3%	0.2%	0.0%
Social security and other benefits	0.0%	0.0%	0.0%	0.0%

Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers.
- With '>3 month international mobility' defined as moves to work abroad in at least ten years for three months or more.
- Based on question 67: "And what was your main motive to move to each of these countries?" and question 15: "In which career stage would you currently situation yourself?"
- (n=2,782)

Gender: Interestingly, the main motives for the last move do not vary significantly between male and female researchers. While in MORE3 it was observed that the difference was slightly larger only for career progression - women attributed a larger importance to career progression than men (5pp difference), in MORE4 the difference is negligible. When analysing individual items, it is observed that research autonomy is more frequently cited as a motive for specific moves among male researchers, a finding that is coherent with the results found in MORE3.

8.1.1.4.4 Motives for >3 month post-PhD employer mobility: Main motives per move

'Employer mobility' refers to moves that include a change of employer. Reasons for this type of change can be expected to be different from more temporary changes, namely more related to the position and

financial security. Availability of suitable positions has indeed become more important: 11% of the moves with an employer change are inspired mainly by this, which is more than double the total share for all moves (see Table 39 compared to Table 40). Career progression is still the most important motive, reaching 24% - the same share as the one found for mobility overall but significantly lower than the 2016 value for international moves with employer change.

Table 39: Importance of motives for >3 month international employer mobility in post-PhD career stages, main motive per move (EU28)

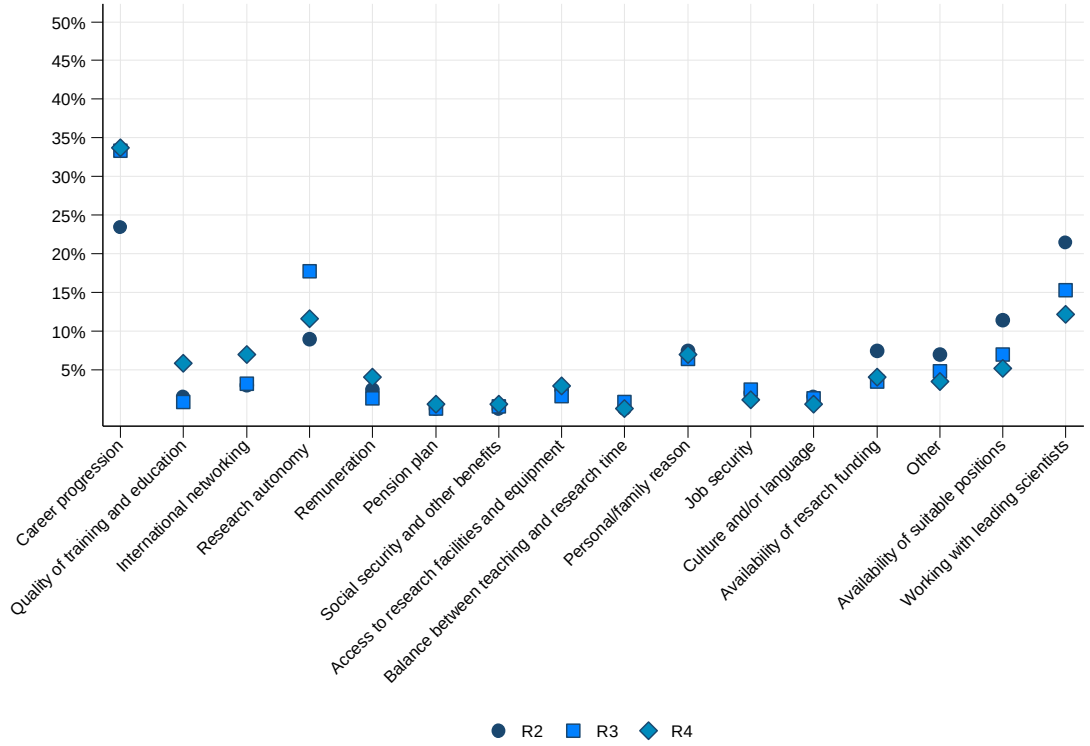
	2012 (n=1,193)	2016 (n=935)	2019 (n=745)
Career progression	23.5%	38.0%	24.3%
Availability of suitable positions	15.3%	12.0%	10.9%
Research autonomy	1.5%	10.3%	14.2%
Working with leading scientists	6.3%	8.6%	20.9%
Personal/family reasons	5.9%	6.8%	7.5%
Availability of research funding	8.1%	4.5%	3.6%
International networking	/	3.1%	1.9%
Quality of training and education	1.3%	3.0%	3.2%
Remuneration	1.3%	2.9%	2.5%
Job security	<1%	1.5%	1.3%
Balance between teaching and research time	/	1.2%	0.6%
Culture and/or language	<1%	0.9%	1.6%
Access to research facilities and equipment	1.6%	0.7%	2.1%
Social security and other benefits	<1%	0.1%	0.1%
Pension plan		0.1%	0.0%
Working conditions	<1%	/	/

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:
- Only R2, R3 and R4 researchers who were >3 month mobile in the last ten years.
- Based on question 67: "And what was your main motive to move to each of these countries?"

Career stage: As in MORE3, R2 researchers consider that the availability of a suitable position is a less relevant motive for employer mobility than R3 and R4 researchers (see Figure 103). Compared to other career stages, R2 are more driven by the availability of research funding and suitable positions, and by working with leading scientists. This is similar to the observation for the motives for all moves (with or without employer mobility). R3 researchers stand out by being comparatively more driven by research autonomy.

Gender: There are no important gender differences. Research autonomy is slightly more important in an employer move for male than female researchers (+7pp), as it is in general for all moves.

Figure 103: Importance of categories of motives for >3 month international employer mobility in post-PhD career stages, main motive per move, by career stage (EU28)



MOTIVES	R2	R3	R4	TOTAL
Career progression	23.4%	33.3%	33.7%	24.3%
Working with leading scientists	21.4%	15.3%	12.2%	20.9%
Research autonomy	9.0%	17.7%	11.6%	14.2%
Availability of suitable positions	11.4%	7.0%	5.2%	10.9%
Personal/family reason	7.5%	6.5%	7.0%	7.5%
Other	7.0%	4.8%	3.5%	5.1%
Availability of research funding	7.5%	3.5%	4.1%	3.6%
Quality of training and education	1.5%	0.8%	5.8%	3.2%
Remuneration	2.5%	1.3%	4.1%	2.5%
Access to research facilities and equipment	2.5%	1.6%	2.9%	2.1%
International networking	3.0%	3.2%	7.0%	1.9%
Culture and/or language	1.5%	1.3%	0.6%	1.6%
Job security	2.0%	2.4%	1.2%	1.3%
Balance between teaching and research time	0.0%	0.8%	0.0%	0.6%
Social security and other benefits	0.0%	0.0%	0.6%	0.1%
Social security and other benefits	0.0%	0.3%	0.6%	0.0%

Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers.
- With '>3 month international mobility' defined as moves to work abroad in at least ten years for three months or more.
- Based on question 67: "And what was your main motive to move to each of these countries?"
- (n=745)

8.1.1.5 Barriers

The MORE2 study had a section specifically devoted to the analysis of the barriers to mobility. In order to track possible changes in researchers´ perceptions of the difficulties when moving or not to another country, the MORE3 and MORE4 surveys also explicitly asked about the barriers to EU mobility, among mobile and non-mobile. Respondents were presented with a list of items which can be summarised under the following main categories:

- Professional factors: obtaining funding for the (return) mobility/research; potential loss of contact with the professional network; finding a suitable (research) position; quality of training and education; access to facilities and equipment for research; obtaining funding for return mobility; level of remuneration.
- Practical factors: logistical problems (finding adequate accommodation, child-care or schooling for children).
- Personal factors: personal and family reasons; language for teaching and for contacting or collaborating with colleagues; culture; finding a job for their partner.
- Administrative or formal/legal factors: obtaining a visa or work permit; transferring research funding to another country; transferring pension or social security rights.

We analyse these barriers from three angles:

- First, we present the main barriers experienced by non-EU researchers currently working in the EU when they moved to the EU.
- Second, we analyse the barriers experienced as important to overcome by researchers – EU and non-EU nationals - in their last EU move.
- Third, we show the main barriers that prevent researchers from being internationally mobile.

8.1.1.5.1 Barriers for non-EU researchers moving to EU

Table 40 shows the percentage of non-EU28 researchers currently working in one of the 28 EU countries for which the specific factor was a difficulty in his/her move to Europe. These shares would include, for instance, a Chinese researcher currently working in France, or a Norwegian researcher (or from any other associated country) working in Germany.

In general terms the results in terms of ranking of barriers seem stable over time. In 2019, about 25% of the researchers identify obtaining a visa or work permit as being the most difficult factor in a move to Europe. This is a decrease compared to 2016 (-5pp) and to 2012 (-9pp), hence suggesting a positive trend. In 2012, language was the most frequent barrier (38%) but the shares of researchers indicating this as an important difficulty have decreased since then: language as a barrier for teaching is indicated by 19% (27% in 2016) and language as a barrier for contact or for collaboration with colleagues by 20% (23% in 2016).

On a less positive note, the importance of barriers for obtaining funding for return mobility has increased from 4% in 2016 to 13% in 2019 (similar to the 2012 level of 13%), and that of barriers for obtaining funding for mobility has grown from 12% to 20%. Also, finding a job for one's partner has become a more important barrier, with a share of 22% in 2019 versus 15% in 2016.

Table 40: Importance of barriers for non-EU researchers moving to EU

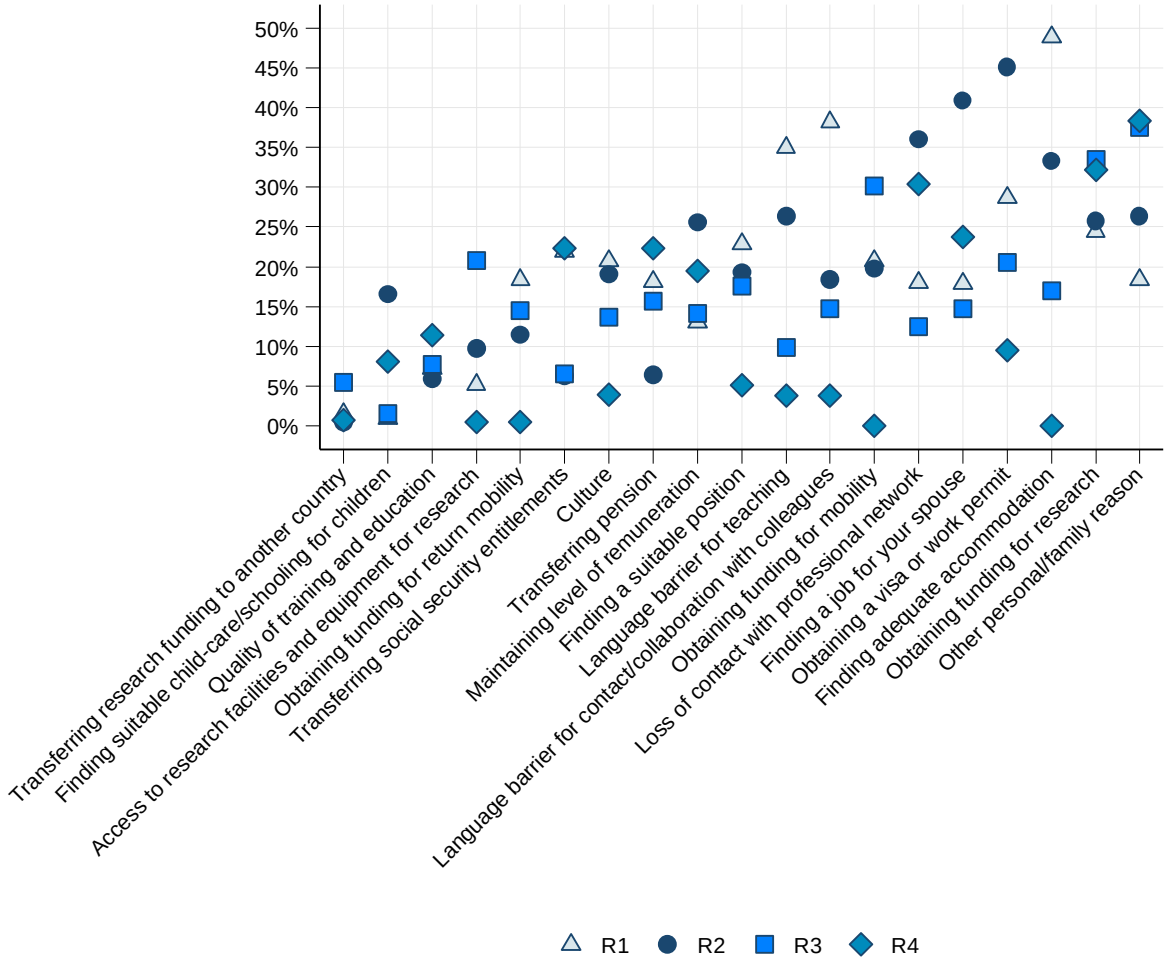
	2012 (n=481)	2016 (n=340)	2019 (n=278)
Other personal/family reason	/	20.9%	30,3%
Obtaining funding for research	27.6%	25.4%	29,3%
Finding adequate accommodation	28.1%	23.9%	25,8%
Obtaining a visa or work permit	34.4%	30.1%	25,2%
Finding a job for your spouse	18.6%	14.6%	21,9%
Loss of contact with professional network	/	17.5%	21,4%
Obtaining funding for mobility	/	11.7%	20,2%
Language barrier for contact/collaboration with colleagues	/	23.1%	20,1%
Language barrier for teaching	38.4%	27.3%	18,8%
Finding a suitable position	21.6%	18.2%	17,1%
Maintaining level of remuneration	21.5%	15.4%	16,8%
Transferring pension	/	13.6%	15,9%
Culture	/	21.8%	14,9%
Transferring social security entitlements	13.9%	9.5%	13,7%
Obtaining funding for return mobility	13.2%	4.5%	12,5%
Access to research facilities and equipment for research	8.4%	9.3%	10,8%
Quality of training and education	/	5.6%	7,9%
Finding suitable child-care/schooling for children	10.4%	11.8%	5,2%
Transferring research funding to another country	9.5%	6.6%	2,6%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- Share of non-EU28 researchers (citizenship) currently working in the EU28 or candidate countries for who the specific factor was a difficulty in their move to the EU.
- Multiple barriers per respondent are possible.
- Based on question 45: "Which difficulties have you faced in your move to Europe?"
- These shares include researchers in all career stages (R1, R2, R3 and R4).

Career stage: Figure 104 shows the differences found in the perception of barriers across career stages. The largest variation is found for finding adequate accommodation. The earlier in the career, the stronger this barrier is for a non-EU national moving to the EU. We make a similar observation for language used for teaching and for communicating with colleagues. R2 researchers also indicate more often that they faced difficulties with respect to finding a job for their partner, the loss of contact with their professional network or obtaining a visa or work permit. The greater importance of these barriers for this group of researchers might be related to a greater propensity to move among earlier career stages due to factors related to career progression. More experienced researchers (R4) tend to put greater importance on barriers related to maintaining the status quo for their current position. Compared to other career stages, this group seems to be more concerned by the difficulties to transfer pension and social security benefits.

Figure 104: Importance of barriers for non-EU researchers moving to EU28+3, by career stage



	R1	R2	R3	R4	TOTAL
Other personal/family reason	18.4%	26.4%	37.5%	38.3%	30.3%
Obtaining funding for research	24.5%	25.7%	33.5%	32.1%	29.3%
Finding adequate accommodation	48.8%	33.2%	17.0%	0.0%	25.8%
Obtaining a visa or work permit	28.7%	45.1%	20.6%	9.5%	25.2%
Finding a job for your spouse	17.9%	40.9%	14.8%	23.8%	21.9%
Loss of contact with professional network	18.1%	35.9%	12.5%	30.4%	21.4%
Obtaining funding for mobility	20.8%	19.7%	30.1%	0.0%	20.2%
Language barrier for contact/collaboration with colleagues	38.2%	18.4%	14.8%	3.8%	20.1%
Language barrier for teaching	35.0%	26.4%	9.9%	3.8%	18.8%
Finding a suitable position	22.9%	19.3%	17.6%	5.1%	17.1%
Maintaining level of remuneration	13.1%	25.5%	14.2%	19.5%	16.8%
Transferring pension	18.1%	6.5%	15.6%	22.4%	15.9%
Culture	20.8%	19.0%	13.7%	3.9%	14.9%
Transferring social security entitlements	22.0%	6.3%	6.6%	22.4%	13.7%
Obtaining funding for return mobility	18.4%	11.4%	14.4%	0.5%	12.5%
Access to research facilities and equipment for research	5.2%	9.8%	20.8%	0.5%	10.8%
Quality of training and education	7.3%	5.8%	7.8%	11.4%	7.9%

	R1	R2	R3	R4	TOTAL
Finding suitable child-care/schooling for children	1.0%	16.5%	1.6%	8.1%	5.2%
Transferring research funding to another country	1.6%	0.4%	5.5%	0.7%	2.6%

Source: MORE4 EU HE survey (2019)
Notes:

- Share of non-EU28 researchers (citizenship) currently working in the EU28 and candidate countries for which the specific factor was a difficulty in their move to the EU.
- Multiple responses are possible.
- Based on question 46: "Which difficulties have you faced in your move to Europe?"
- (n=278)

Gender: Male researchers tend to be more concerned about the loss of contact with their professional network (11pp), obtaining funding for research (8pp), finding a job for their partner or language as a barrier for teaching (both 7pp). Women indicate more often other types of barriers: finding a suitable position (14pp), transferring pension (10pp), access to research facilities and equipment (8pp) and language as a barrier for contact and collaboration with colleagues (7pp).

8.1.1.5.2 Barriers to >3 month post-PhD mobility: Barriers last EU move

In this section, we consider the population of researchers working currently in the EU, regardless of their nationality: they can be EU or non-EU nationals. The perceived importance of barriers to mobility for internationally mobile researchers during the post-PhD career stages (concerning their last >3 month move) who have worked abroad for more than three months at least once in the last ten years is included in Table 41.

Interestingly, most of the barriers included in the survey have experienced an important increase compared to MORE3: the share of researchers is sometimes even double the figure obtained in the MORE3 survey. The most frequently indicated barriers to the last move in 2019 are obtaining funding for mobility (57%), obtaining funding for research (55%), and finding a suitable position (53%). These were also the three most important barriers indicated in MORE3 and were among the most important barriers also in MORE2. In MORE3, the items that were less frequently mentioned were the ones referring to transferring social security and pension, being indicated by only 20% and 17% of the >3 month mobile researchers. In 2019, the share of researchers indicating these elements as barriers for mobility is also higher (37% in both items), but this seems to be more due to the general trend (i.e. all shares are higher) than to an actual increase of the barrier.

Table 41: Importance of barriers for >3 month international mobility in post-PhD career stages, last EU move

OF MOBILE R2, R3 AND R4 RESEARCHERS	2012 (n=1,660)	2016 (n=1,704)	2019 (n=1,572)
Obtaining funding for mobility	/	36.3%	56.9%
Obtaining funding for research	43.4%	37.6%	54.6%
Finding a suitable position	34.8%	38.3%	52.8%
Maintaining level of remuneration	/	26.2%	49.3%
Other personal/family reason	26.5%	28.3%	49.6%
Logistical problems	36.3%	33.3%	50.1%
Access to research facilities and equipment for research	27.9%	32.5%	47.6%
Quality of training and education	21.1%	28.1%	44.4%
Transferring research funding to another country	16.3%	23.5%	40.8%
Obtaining a visa or work permit	/	22.8%	41.1%
Transferring social security entitlements	/	19.6%	37.4%
Transferring pension	/	16.8%	37.4%
Culture	23.8%	23.7%	40.1%
Loss of contact with professional network	25.1%	28.0%	38.5%
Language barrier for contact/collaboration with colleagues		22.7%	36.7%
Language barrier for teaching		20.8%	35.2%

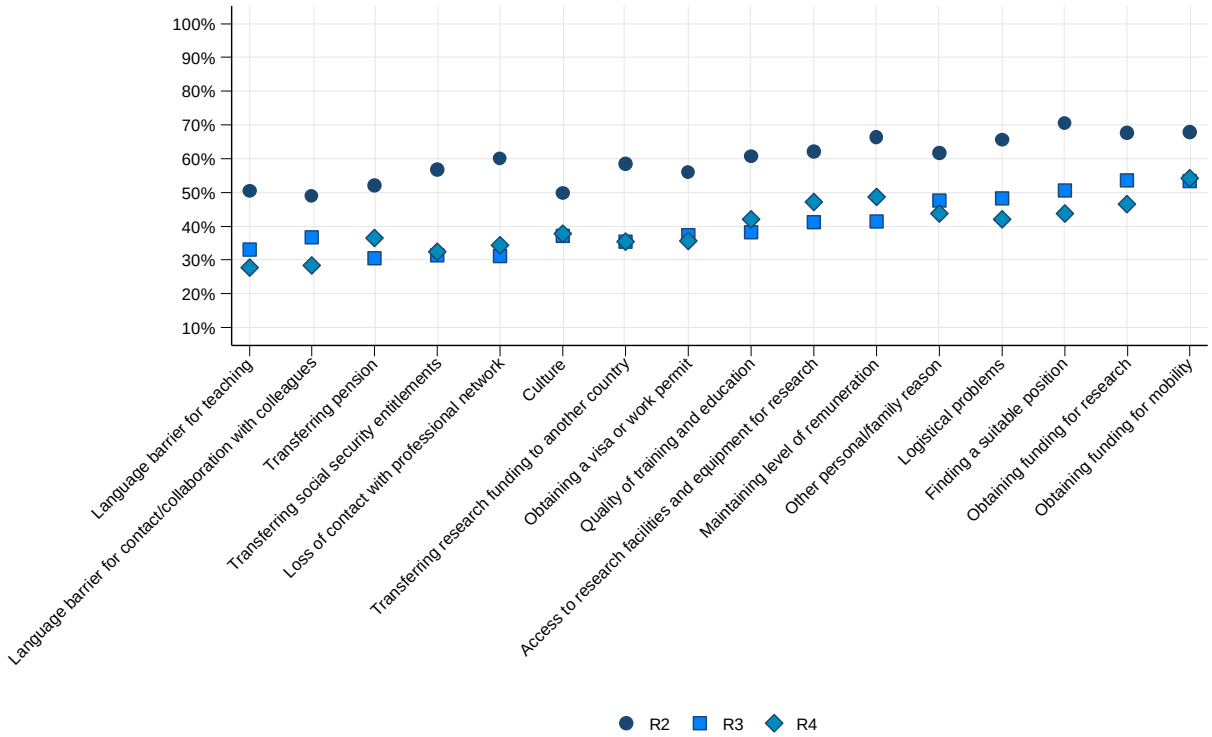
Source: MORE4 EU HE survey (2019) MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- Only R2, R3 and R4 researchers.
- Share of mobile researchers who indicate the specific barrier as being important to their last EU move.
- With 'mobility' defined as having worked abroad for more than three months at least once in the last ten years.
- Based on question 73: "Please consider again your last instance of mobility. Which of the following barriers were important to overcome in making this move?"

Career stage: As in MORE3, the career stage analysis shows a very consistent pattern (see Figure 105): R2 researchers declare that they have encountered more barriers than R3 and R4 researchers in their last move. The share of R2 researchers that have experienced some of these barriers sometimes is almost twice as high as the share of R3 or R4 researchers in the same situation. This is the case, for instance, of the quality of training and education, which is mentioned by 61% of R2 researchers but only by 38% and 42% of R3 and R4 respectively. R2 researchers are also more concerned about the loss of contact with professional network: 60% of R2 researchers have experienced this as a barrier, compared to only 31% of R3 and R4 researchers.

Gender: There are no significant differences between male and female researchers with regards to the barriers they have experienced in their last move. The largest difference is found in the item relating to the access to research facilities and equipment for research: 46% of men have indicated this barrier compared to 51% of women.

Figure 105: Importance of barriers to >3 month international mobility in post-phd career stages, last eu move, by career stage (EU28)



	⚜	⚜⚜	⚜⚜⚜	⚜⚜⚜⚜⚜
Obtaining funding for mobility	67.9%	53.3%	54.2%	56.9%
Obtaining funding for research	67.7%	53.6%	46.6%	54.6%
Finding a suitable position	70.4%	50.6%	43.7%	52.8%
Logistical problems	65.4%	48.1%	42.1%	50.1%
Other personal/family reason	61.6%	47.6%	43.8%	49.6%
Maintaining level of remuneration	66.3%	41.4%	48.7%	49.3%
Access to research facilities and equipment for research	62.2%	41.1%	47.1%	47.6%
Quality of training and education	60.7%	38.3%	42.0%	44.4%
Obtaining a visa or work permit	56.0%	37.3%	35.7%	41.1%
Transferring research funding to another country	58.5%	35.5%	35.5%	40.8%
Culture	49.8%	37.1%	37.8%	40.1%
Loss of contact with professional network	60.0%	31.1%	34.3%	38.5%
Transferring social security entitlements	56.8%	31.3%	32.4%	37.4%
Transferring pension	52.1%	30.6%	36.5%	37.4%
Language barrier for contact/collaboration with colleagues	49.0%	36.8%	28.4%	36.7%
Language barrier for teaching	50.3%	33.2%	27.8%	35.2%

Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers who were >3 month mobile in the last ten years.
- Based on question 73: "Please consider again your last instance of mobility. Which of the following barriers were important to overcome in making this move?"
- (n=1,572)

8.1.1.5.3 Barriers to >3 month post-PhD mobility: Non-mobile

A considerable number of researchers (49% in 2019, 54% in 2016) have never been mobile for more than three months. This section disentangles the main reasons behind this decision not to move to another country for this group of non-mobile researchers.

The results of the survey show a remarkable stability compared to MORE3 findings: personal and family reasons are still ranked as the most important barrier when asking for the explicit reasons for non-mobility (79%, see Table 42). This indicator experienced an increase from MORE2 to MORE3 (77% in MORE3 compared to 67% in MORE2), but it has remained stable since then. It is however important to note that this 2012-2016 evolution should be interpreted with caution since the question in MORE2 asked about fewer items.

In addition to personal reasons, logistical problems and obtaining funding for research and mobility are the most important reasons for non-mobility. As indicated in the previous section, these three factors are also important among the most relevant barriers to mobility among mobile researchers (see Table 42**Error! Reference source not found.**).

Table 42: Importance of barriers to >3 month international mobility in post-PhD career stages, for the non-mobile

	2012 (n=2,303)	2016 (n=1,403)	2019 (n=1,084)
Other personal/family reason	67.4%	77.1%	79.3%
Logistical problems	52.0%	44.4%	60.9%
Obtaining funding for research	55.9%	48.6%	60.9%
Finding a suitable position	49.9%	49.4%	59.2%
Obtaining funding for mobility		49.7%	58.8%
Maintaining level of remuneration	/	33.0%	49.1%
Transferring social security entitlements	/	31.9%	39.2%
Transferring pension	/	29.5%	38.3%
Transferring research funding to another country	26.4%	28.9%	35.9%
Access to research facilities and equipment for research	21.4%	25.7%	34.5%
Loss of contact with professional network	28.0%	27.6%	30.9%
Quality of training and education	21.7%	25.8%	27.8%
Language barrier for teaching	24.9%	27.2%	25.9%
Obtaining a visa or work permit	11.7%	15.8%	23.5%
Language barrier for contact/collaboration with colleagues	24.9%	23.2%	22.0%
Culture	24.9%	12.6%	15.7%

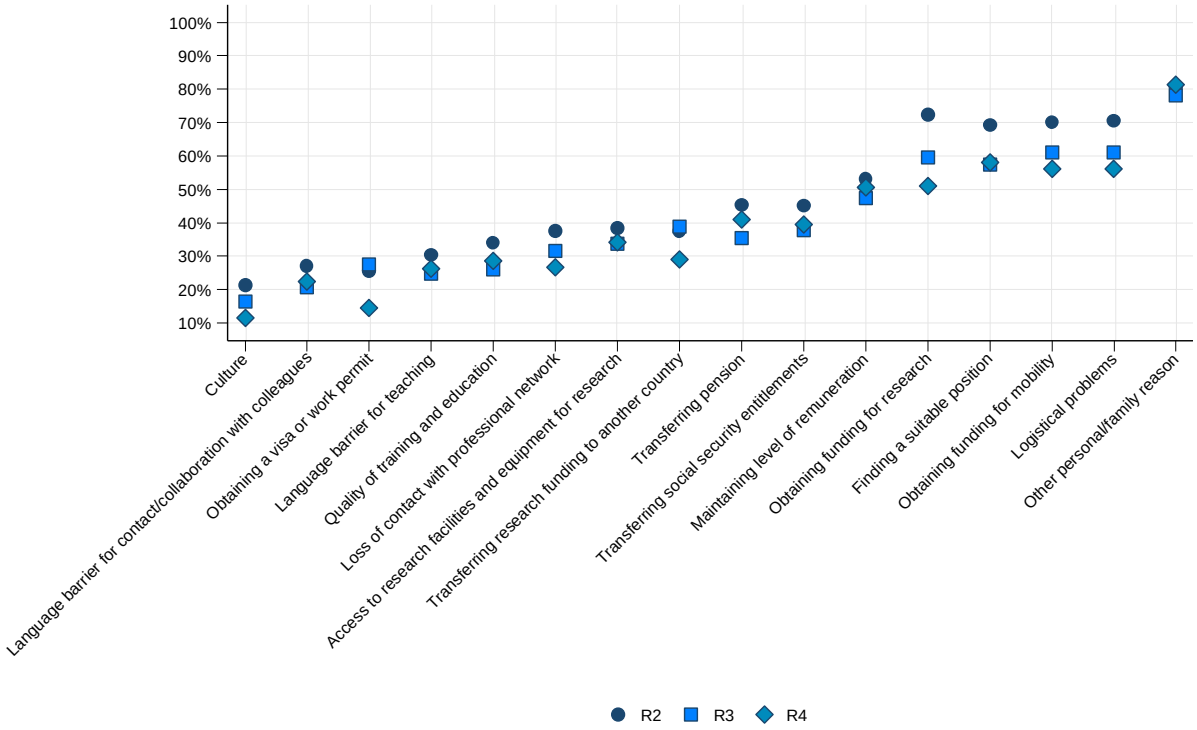
Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- Only R2, R3 and R4 researchers who have considered working abroad as a researchers for more than 3 months since completing their higher education (PhD or other) but never were mobile.
- Share of non-mobile researchers who indicate that the specific barrier is important in discouraging them from becoming internationally mobile and pursuing this path further.
- With 'non-mobility in post-PhD career stages' defined as not having undertaken international mobility of more than three months during post-PhD career stages, either in the last ten years or before.
- Based on question 80: "Which of the following factors were important in ultimately discouraging you from becoming internationally mobile and pursuing this path further?

Career stage: Figure 106 shows the results of the analysis by career stage when considering the barriers for mobility for the non-mobile researchers. Consistent with the findings on the barriers for mobile researchers, we observe that, when compared to other career stages, R4 researchers are the group that seem to be less affected by most of the barriers for mobility. R2, on the contrary, and to a lesser extent, R3, seem to be more affected by these barriers in their decision not to move. The only factor for which this pattern is reversed refers to personal and family reasons, which is a more important factor for R4 than for R2. However, the difference across career stages in this item is negligible.

Gender: In general, the differences between non-mobile male and female researchers with regards to the barriers to be mobile are small. The largest differences are found with respect to the three most often cited barriers. Female researchers mention more often the following barriers: obtaining funding for mobility, funding for research and finding a suitable position (respectively 67%, 65% and 64%, compared to 56%, 54% and 55% for male researchers).

Figure 106: Importance of barriers to >3 month international mobility in post-PhD career stages, for the non-mobile, by career stage (EU28)



	R2	R3	R4	TOTAL
Other personal/family reason	80.6%	78.1%	81.4%	79.3%
Logistical problems	70.5%	61.0%	56.2%	60.9%
Obtaining funding for mobility	69.9%	61.1%	56.1%	60.9%
Finding a suitable position	69.2%	57.4%	58.0%	59.2%
Obtaining funding for research	72.4%	59.5%	51.1%	58.8%
Maintaining level of remuneration	53.2%	47.4%	50.7%	49.1%
Transferring social security entitlements	45.0%	37.8%	39.5%	39.2%
Transferring pension	45.2%	35.4%	41.1%	38.3%
Transferring research funding to another country	37.5%	38.9%	29.0%	35.9%
Access to research facilities and equipment for research	38.5%	33.8%	34.1%	34.5%
Loss of contact with professional network	37.5%	31.5%	26.7%	30.9%
Quality of training and education	34.0%	26.0%	28.6%	27.8%
Language barrier for teaching	30.4%	24.7%	26.2%	25.9%
Obtaining a visa or work permit	25.4%	27.5%	14.6%	23.5%
Language barrier for contact/collaboration with colleagues	27.2%	20.7%	22.3%	22.0%
Culture	21.4%	16.5%	11.6%	15.7%

Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers who have considered working abroad as a researchers for more than 3 months since completing their higher education (PhD or other) but never were mobile.
- With 'non-mobility in post-PhD career stages' defined as not having undertaken international mobility of more than three months during post-PhD career stages, either in the last ten years or before.
- Based on question 80: "Which of the following factors were important in ultimately discouraging you from becoming internationally mobile and pursuing this path further?"
- (n=1,084)

8.1.1.6 Effects

In order to analyse the effects of mobility, a list of 14 items was included in the questionnaire. Respondents could indicate the extent to which they had experienced these effects using a five-point scale. The items can be divided broadly in 5 main groups:

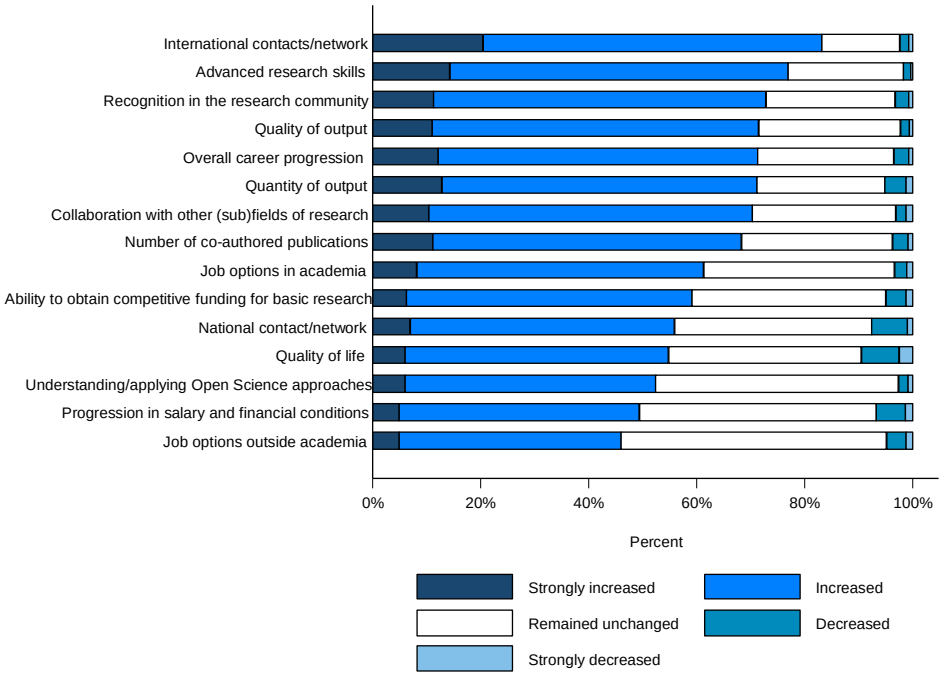
- Output effects. These refer to the quantity and quality of output, the number of co-authored publications, and research skills.
- Career-related effects. In this category we can find those effects related to career progression, job options in academia and job options outside of academia.
- Financial effects. Aspects, such as progression in salary and financial conditions; ability to obtain competitive research funding for basic research are considered in this group of effects.
- Network effects. This category encompasses different aspects related to collaboration with other (sub)fields of research, national and international contacts, and recognition in the research community.
- Personal effects. This last category includes those effects that are related to the quality of life.

8.1.1.6.1 Effects of >3 month post-PhD mobility

Figure 107 presents the R2, R3 and R4 researchers' perceptions regarding the effects of their mobility experience. These statistics refer to researchers who have worked abroad for more than three months during the last ten years. On the one hand, mobility is perceived as having a strong impact on researchers´ international contacts and network, as well as on the acquisition of advanced research skills and researchers´ recognition in the research community. On the other hand, job options outside academia, the salary and financial conditions, quality of life and the degree to which researchers apply Open Science approaches receive lower scores. The MORE3 survey produced very similar results to those displayed here (except for the item on Open Science that was only included for the first time in MORE4).

Figure 108 shows a comparison between 2016 and 2019 results with regards to the respondents that indicated that their mobility had a positive effect on each of the items (i.e. selected the options "Increased" or "Strongly increased"). It can be seen that, in general, respondents tend to have a more positive position in 2019: the shares of researchers having indicated that their mobility experience had a positive effect are larger in 2019 than in 2016, with the exception of the items on international and national contacts, collaboration with other fields, and job options outside academia.

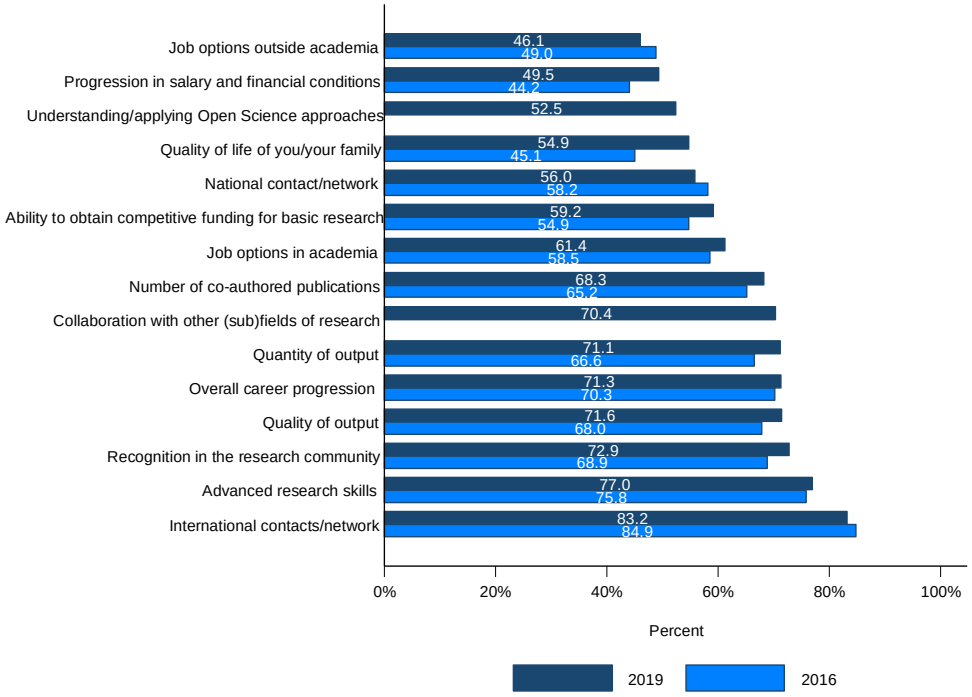
Figure 107: Effects of entire mobility experience on the research career (EU28)



Source: MORE4EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers who were >3 month mobile in the last ten years.
- Share of mobile researchers who indicated the effect of the entire mobility experience on a specific aspect of their career to be a (strong) increase, (strong) decrease or unchanged.
- Based on question 75: "Please indicate below the effects, if any, of your entire mobility experience on your career to date?"
- (n=1,512)

Figure 108: Increased and strongly increased effects of entire mobility experience on the research career (EU28)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Shares of researchers having indicated that they have experienced an increased or strongly increased effect due to their mobility experience.
- Only R2, R3 and R4 researchers who were >3 month mobile in the last ten years.
- Share of mobile researchers who indicated the effect of the entire mobility experience on a specific aspect of their career to be a (strong) increase, (strong) decrease or unchanged.
- Based on question 75: "Please indicate below the effects, if any, of your entire mobility experience on your career to date?"
- (2019: n=1,512; 2016: n=1,704)

Country level: There is a large variation across countries on the overall perception of the effects of mobility (see Table 43). Mobile researchers tend to have a more positive perspective about the mobility effects in some countries, such as Poland, Greece and Bulgaria. On the contrary, researchers from other countries tend to have a less optimistic vision of the effects of their mobility experiences. This is most notably the case for Slovakia, Lithuania and Estonia.

Over time we observe large variations in some countries: researchers in Spain and Denmark had in 2016 some of the more negative views on the effects of mobility. In 2019, however, the scores in these countries have improved and are now close to the EU average. On the opposite side, Luxembourg and Romania, which had very positive opinions on the effects of mobility in 2016, have a much more negative view.

When comparing the country averages of each individual country, output and networking effects are important in most of the countries, whereas personal effects are below average in most countries. These are the main findings from a cross-country comparison:

- The output effects are highest in Poland, Greece and Italy. The lowest scores are found in Estonia, Slovakia and Lithuania. Compared to MORE3 we observe that Estonian researchers keep on being one of the nationalities with one of the most negative opinions of the output effects of their mobility experiences. Poland stands out as the country where researchers´ opinions have changed more from 2016, having passed from a score that was close to the EU average to one of the highest scores in 2019.
- The career-related effects are perceived as being more important in Greece, the Czech Republic and Bulgaria, while they are lowest in Lithuania, Slovakia and Croatia. The largest changes since 2016 have taken place in the Czech Republic, Bulgaria and Spain: in these cases, researchers are on average much more optimistic about the career-related effects of their mobility experiences.
- The highest financial effects are found in Austria, Romania and France, and the lowest are observed in Slovakia, Lithuania and Poland. The most remarkable differences with 2016 are found in Luxembourg and Spain: in 2019 in Luxembourg researchers are on average less optimistic while in the latter researchers tend to be have more positive views on the financial effects of their international moves.
- The networking effects are considered to be less important in Slovakia, Lithuania and Germany and more in Greece, Bulgaria and Poland. Regarding the most important changes with respect to 2016 results, we observe that Polish and Spanish researchers have a much more positive view in 2019. On the opposite side, Lithuanian and Slovakian researchers are on average less optimistic with respect to this type of effect in 2019 compared to 2016.
- Romania and Poland display the highest values regarding personal effects, and Slovenia, Luxembourg, Slovakia and Estonia show the lowest values for these items. In general terms the scores for this type of effect have slightly increased over time. However, it is interesting to note that, on the one hand, there is a group of countries in which the scores are much more positive in 2019 than in 2016: Poland, Spain, Croatia and Finland. On the other hand, Luxembourg has moved from having a score that was much higher than the EU average in 2016 to being one of the countries with a lower score in 2019.

Table 43: Effects of entire mobility experience on the research career, by country: a cross-country comparison (EU28)

	OUTPUT		CAREER-RELATED		FINANCIAL		NETWORK		PERSONAL		AVERAGE	
	2016	2019	2016	2019	2016	2019	2016	2019	2016	2019	2016	2019
Austria	0.83	0.74	0.77	0.61	0.67	0.68	0.82	0.80	0.52	0.58	0.72	0.68
Belgium	0.86	0.76	0.74	0.73	0.55	0.60	0.90	0.86	0.42	0.66	0.69	0.72
Bulgaria	1.03	0.73	0.50	0.97	0.50	0.52	0.91	1.08	0.48	0.66	0.68	0.79
Croatia	1.10	0.81	0.60	0.40	0.44	0.51	0.91	0.64	0.22	0.70	0.65	0.61
Cyprus	0.71	0.77	0.56	0.78	0.39	0.59	0.77	0.72	0.50	0.51	0.59	0.68
Czech Republic	0.82	0.81	0.46	0.90	0.40	0.65	0.75	0.96	0.42	0.59	0.57	0.78
Denmark	0.67	0.88	0.43	0.70	0.24	0.52	0.58	0.71	0.39	0.37	0.46	0.63
Estonia	0.66	0.25	0.53	0.55	0.62	0.50	0.78	0.66	0.60	0.36	0.64	0.47
Finland	0.92	0.91	0.69	0.66	0.46	0.64	0.82	0.71	0.23	0.67	0.62	0.72
France	0.79	1.02	0.64	0.72	0.45	0.67	0.82	0.87	0.23	0.58	0.58	0.77
Germany	0.66	0.61	0.62	0.62	0.61	0.47	0.74	0.59	0.49	0.42	0.62	0.54
Greece	0.97	1.09	0.79	0.89	0.55	0.63	1.03	1.00	0.58	0.47	0.78	0.82
Hungary	0.99	0.99	0.62	0.78	0.54	0.52	0.90	0.82	0.81	0.75	0.77	0.77
Ireland	0.76	0.98	0.60	0.67	0.48	0.52	0.83	0.85	0.47	0.47	0.62	0.70
Italy	0.81	1.06	0.39	0.52	0.33	0.51	0.90	0.92	0.24	0.39	0.53	0.68
Lithuania	0.89	0.47	0.52	0.34	0.43	0.31	0.85	0.47	0.55	0.56	0.65	0.43
Luxembourg	1.04	0.93	0.77	0.66	0.93	0.58	0.99	0.77	0.85	0.29	0.92	0.65
Poland	0.77	1.42	0.53	0.82	0.40	0.32	0.76	1.21	0.42	1.12	0.58	0.98
Portugal	0.85	0.81	0.52	0.62	0.51	0.45	1.01	0.88	0.31	0.61	0.64	0.68
Romania	1.04	0.76	0.78	0.72	0.74	0.67	1.15	0.91	0.87	0.80	0.92	0.77
Slovakia	0.85	0.41	0.47	0.34	0.32	0.23	0.77	0.42	0.16	0.32	0.52	0.34
Slovenia	0.95	0.78	0.59	0.54	0.46	0.51	0.86	0.60	0.30	0.18	0.63	0.52
Spain	0.52	0.76	0.20	0.68	0.15	0.58	0.53	0.82	0.00	0.55	0.28	0.68
Sweden	0.80	0.91	0.63	0.75	0.47	0.55	0.80	0.95	0.36	0.63	0.61	0.76
The Netherlands	0.74	0.65	0.65	0.49	0.54	0.49	0.80	0.68	0.39	0.66	0.62	0.59
United Kingdom	0.71	0.99	0.64	0.63	0.52	0.54	0.78	0.77	0.38	0.47	0.60	0.68
EU	**0.73**	**0.80**	**0.58**	**0.63**	**0.47**	**0.53**	**0.77**	**0.78**	**0.35**	**0.49**	**0.58**	**0.65**

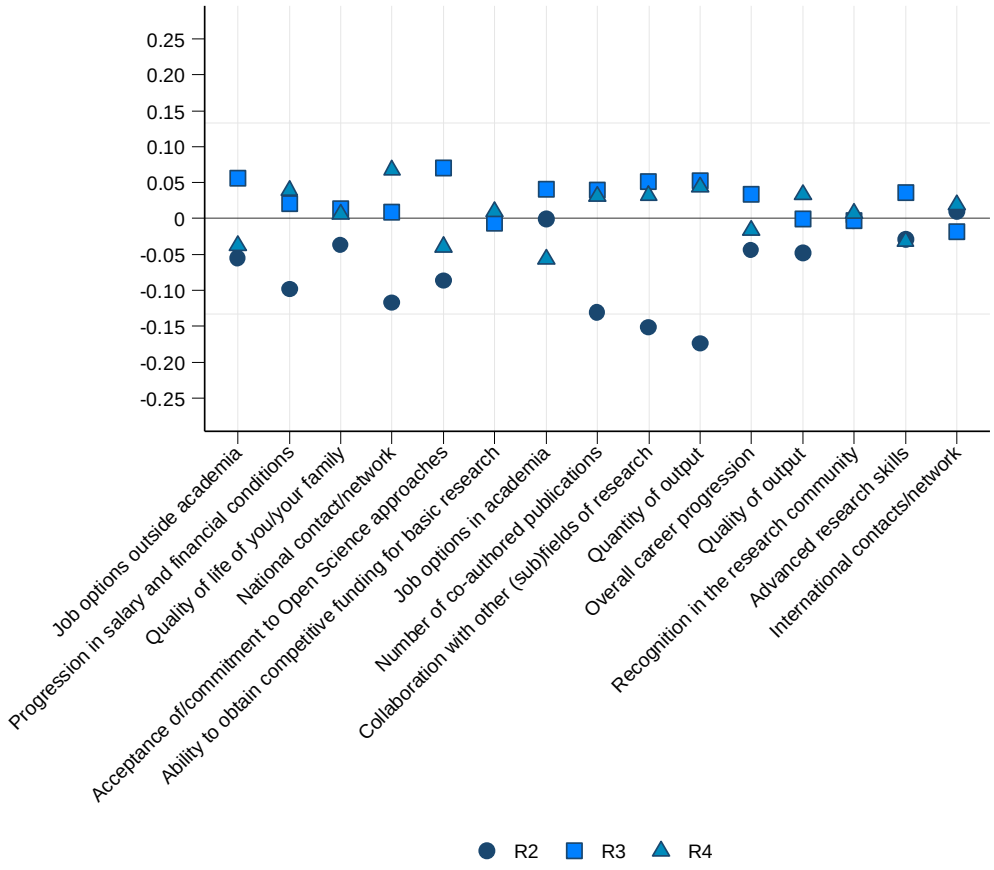
Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Only R2, R3 and R4 researchers who were >3 month mobile in the last ten years.
- With the average calculated by assigning values to each category: 2 = strongly increased; 1 = increased; 0 = unchanged; -1 = decreased; -2 = strongly decreased. A value greater than zero indicates an increase, a negative value indicates a decrease.
- Countries with less than 30 observations in this question are omitted.
- Based on question 75: "Please indicate below the effects, if any, of your entire mobility experience on your career to date?"
- (2019: n=1,512); 2016: n=1,989)

Career stage: Figure 109 shows that effects are not the same for researchers in different career stages. R2 researchers tend to have a less positive view of the effects of mobility on their career. The difference between this group and R3 and R4 researchers is larger in those effects related to the quantity of output, the collaboration with other (sub) fields of research, the number of co-authored publications and national contacts. On the opposite side, there are no differences across career stages in the effects related to the recognition in the research community and the international contacts.

Gender: There are very little differences between men and women regarding the effects of their mobility experiences in all the items analysed in the survey.

Figure 109: Difference in effects of entire mobility experience on the research career, by career stage (EU28)



	R2	R3	R4
Ability to obtain competitive funding for basic research	0.00	-0.01	0.01
Acceptance of/commitment to Open Science approaches	-0.09	0.07	-0.04
Advanced research skills	-0.03	0.04	-0.03
Collaboration with other (sub)fields of research	-0.15	0.05	0.03
International contacts/network	0.01	-0.02	0.02
Job options in academia	0.00	0.04	-0.06
Job options outside academia	-0.05	0.06	-0.04
National contact/network	-0.12	0.01	0.07
Number of co-authored publications	-0.13	0.04	0.03
Overall career progression	-0.04	0.03	-0.02
Progression in salary and financial conditions	-0.10	0.02	0.04
Quality of life of you/your family	-0.04	0.01	0.01
Quality of output	-0.05	0.00	0.03
Quantity of output	-0.17	0.05	0.04
Recognition in the research community	0.00	0.00	0.01

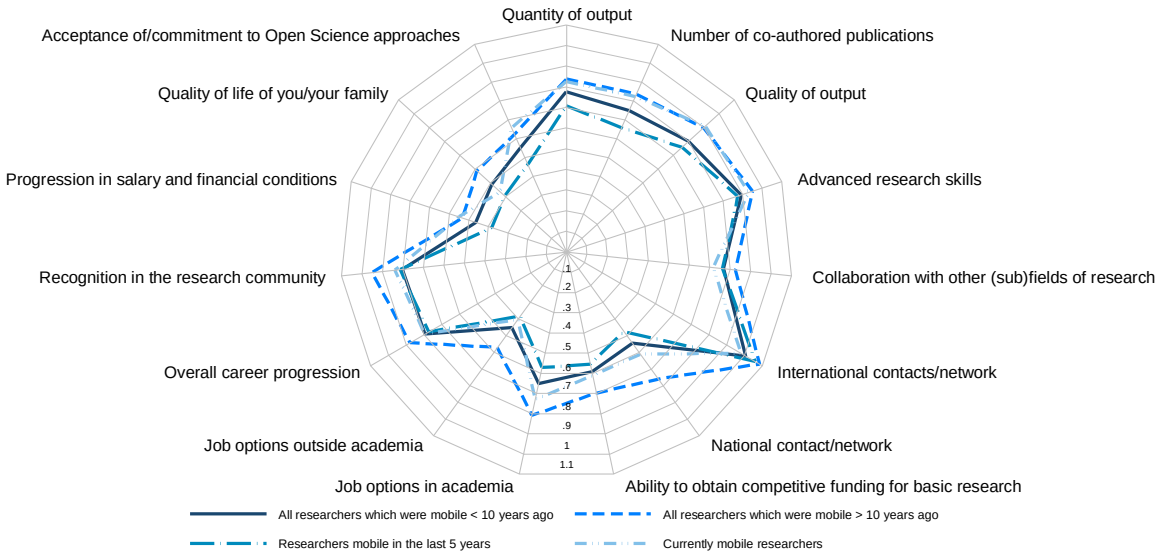
Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers who were >3 month mobile in the last ten years.
- The figures show the average value per career stage minus the average value across all career stages.
- With the average calculated by assigning values to each category: 2 = strongly increased; 1 = increased; 0 = unchanged; -1 = decreased; -2 = strongly decreased.
- Based on question 75: "Please indicate below the effects, if any, of your entire mobility experience on your career to date?"
- (n=1,512)

8.1.1.6.2 Effects of >3 month post-PhD mobility: recent mobility

Figure 110 provides an overview of the effects of the entire mobility experience according to the time passed since the mobility occurred, differentiating between those that have been mobile more than ten years ago, those that moved less than ten years ago, those that have done so less than 5 years ago and those that are currently mobile. The patterns across different profiles are very similar (and very similar to the patterns found in 2016). Most effects are slightly more pronounced for those that were mobile more than ten years ago, indicating that effects are not automatic and that it might take some time for researchers to experience them.

Figure 110: Effects of entire mobility experience on the researcher's career for the recently mobile (EU28)



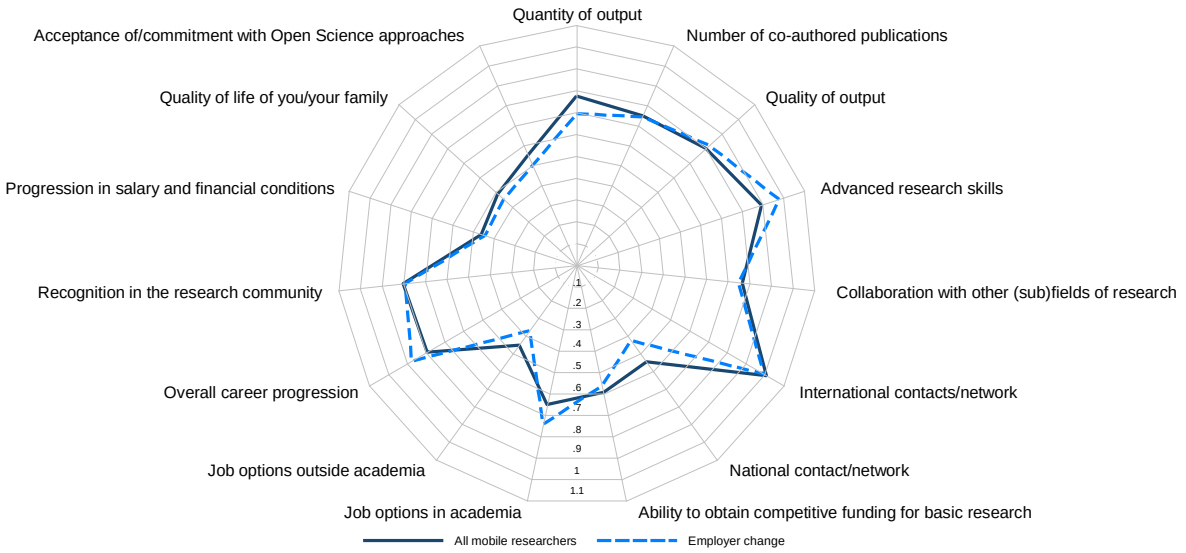
Source: MORE4EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers who were >3 month mobile in the last ten years or before.
- Average effect on the specific aspect of career for the groups of all mobile researchers < 10 years, all mobile researchers > 10 years ago, currently mobile and recent mobile (in the last five years).
- With the average calculated by assigning values to each category: 2 = strongly increased; 1 = increased; 0 = unchanged; -1 = decreased; -2 = strongly decreased.
- Based on question 75: "Please indicate below the effects, if any, of your entire mobility experience on your career to date?" and question 64: "Please indicate the 3 most recent international steps/moves in the last ten years of your researcher career after your PhD up to (but excluding) your current position in which you are employed."
- (n=3,165).

8.1.1.6.3 Effects of >3 month post-PhD mobility: employer mobility

In 2016 the effects of entire mobility experience on the researcher's career were slightly more pronounced when researchers undertake a change of employer. In 2019 we observe that the differences in the perception of the effects are smaller between those that have changed employer when moving to another country and those that have not. It is especially the effects on career progression and the job options in academia the effects that are more strongly perceived by those that have changed employer.

Figure 111: Effects of entire mobility experience on the researcher's career when at least one change in employer (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers who were >3 month mobile in the last ten years.
- Average effect on the specific aspect of career for the groups of all mobile researchers in the last ten years versus researchers with at least once employer mobility.
- With the average calculated by assigning values to each category: 2 = strongly increased; 1 = increased; 0 = unchanged; -1 = decreased; -2 = strongly decreased.
- Based on question 75: "Please indicate below the effects, if any, of your entire mobility experience on your career to date?" and question 67: "Did you change employer?"
- (n=1,682)

8.1.2. International short-term mobility of <3 months

Next to the moves of three months or longer, the EU HE survey also covered shorter-term moves of less than three months. In this section the main findings in terms of short-term mobility stock, the characteristics of the short-term moves and the relation to longer-term mobility profiles are presented.

8.1.2.1 Stock of <3 month international mobility

SHARE OF RESEARCHERS WITH <3 MONTH INTERNATIONAL MOBILITY EXPERIENCE (of all R2, R3 and R4 researchers)			
	<3 month mobile less than ten years ago	**<3 month mobile more than ten years ago**	**Never <3 month mobile**
2012 (n=7,131)	41.0%	13.4%	45.6%
2016 (n=8,073)	37.2%	11.6%	51.2%
2019 (n=7,653)	31.8%	18.6%	49.5%
SHARE OF RESEARCHERS WITH <3 MONTH INTERNATIONAL MOBILITY EXPERIENCE IN THE LAST TEN YEARS (of all R2, R3 and R4 researchers)			

	EU total	Per career stage	Per FOS	Per gender
2012 (n=7,131)	41.0%	R2: 35.8% R3: 41.0% R4: 45.1%	MED: 36.5% NAT: 42.3% SOC: 41.0%	F: 37.0% M: 43.3%
2016 (n=8,073)	37.2%	R2: 31.0% R3: 37.8% R4: 40.1%	MED: 34.9% NAT: 37.8 % SOC: 37.4%	F: 35.1% M: 38.4%
2019 (n=7,653)	31.8%	R2: 30.3% R3: 29.8% R4: 35.5%	MED: 25.4% NAT: 30.9% SOC: 37.1%	F: 31.9% M: 31.8%
SHARE OF RESEARCHERS WITH <3 MONTH INTERNATIONAL MOBILITY EXPERIENCE MORE THAN TEN YEARS AGO (of all R2, R3 and R4 researchers)				
	EU total	**Per career stage**	**Per FOS**	**Per gender**
2012 (n=7,131)	13.4%	R2: 8.9% R3: 12.0% R4: 18.5%	MED: 15.6% NAT: 13.9% SOC: 11.3%	F: 13.0% M: 13.6%
2016 (n=8,073)	11.6%	R2: 8.7% R3: 9.0% R4: 16.8%	MED: 11.8% NAT: 12.2 % SOC: 10.6%	F: 10.4% M: 12.3%
2019 (n=7,653)	18.6%	R2: 8.5% R3: 18.4% R4: 23.6%	MED: 22.4% NAT: 20.7% SOC: 13.3%	F: 17.2% M: 19.5%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Note:

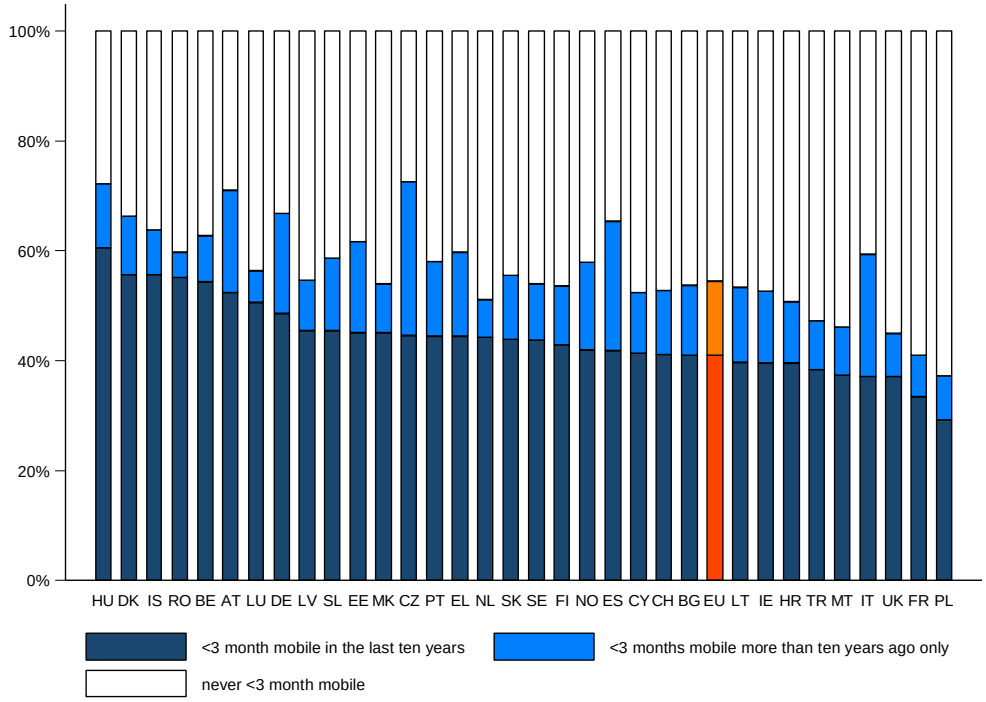
- Based on question 77: "Short term mobility (<3 months)"

32% of post-PhD researchers in the EU28 have worked abroad as researchers for less than 3 months at least once in the last ten years. This is a small decrease of 5pp compared to 2016 and of 9 pp compared to 2012. 19% of the post-PhD researchers in the EU28 have been mobile for less than 3 months but more than ten years ago (12% in 2016 and 13% in 2012). In total, half of the researchers have experienced short-term mobility, an indicator that shows a remarkable stability over time (49% had experienced short-term mobility in 2016).

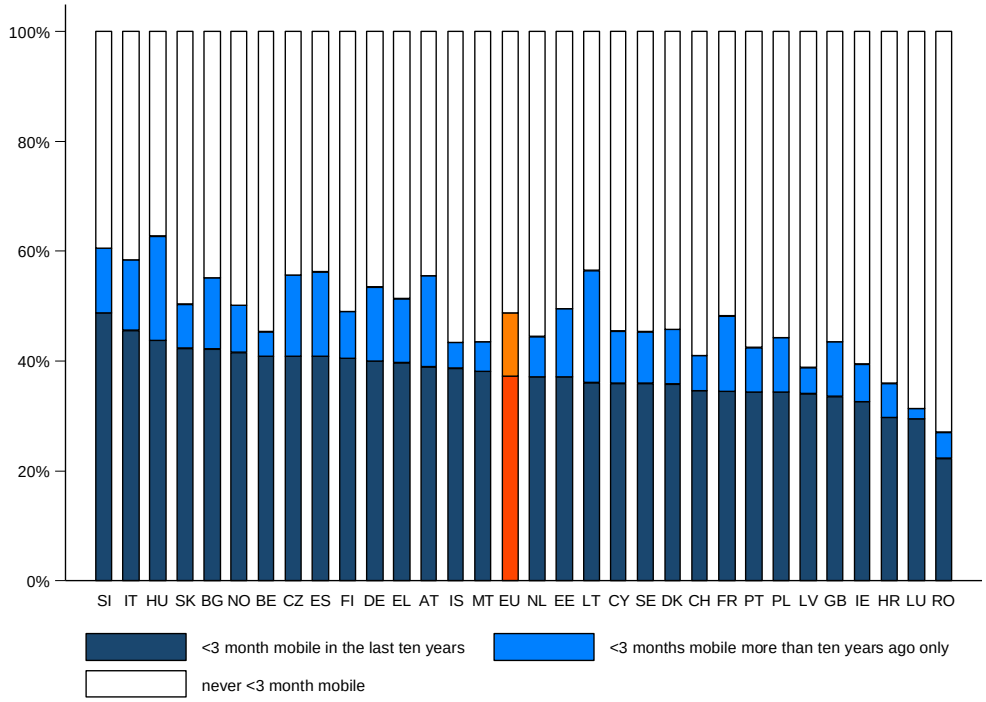
Country level: As in MORE3, the analysis of short-term mobility per country shows that most countries are located around the EU average of 32% (see Figure 112). In Latvia (24%), Malta (26%) and Ireland (27%) there are relatively fewer researchers that have engaged in this type of mobility in the last ten years. Among the countries with a higher level of short-term mobility, we can find Romania (42%), Italy (41%), Belgium (39%), Switzerland (38%), Croatia (38%) and Luxembourg (38%). When comparing with MORE3 results, it can be observed that some countries have experienced a large variation over time: Romania and Luxembourg have passed from being some of the countries with a lower level of short-term mobility in 2016 (22% and 29% respectively) to the group of countries with the highest levels in 2019. However, Romania and Luxembourg were in the fourth (55%) and seventh (51%) highest positions respectively for this indicator in 2012. This indicates that while at EU level this indicator shows a certain stability, the indicator is much less stable at country level.

Figure 112: <3 month international mobility in post-PhD career stage, in the last ten years, by country

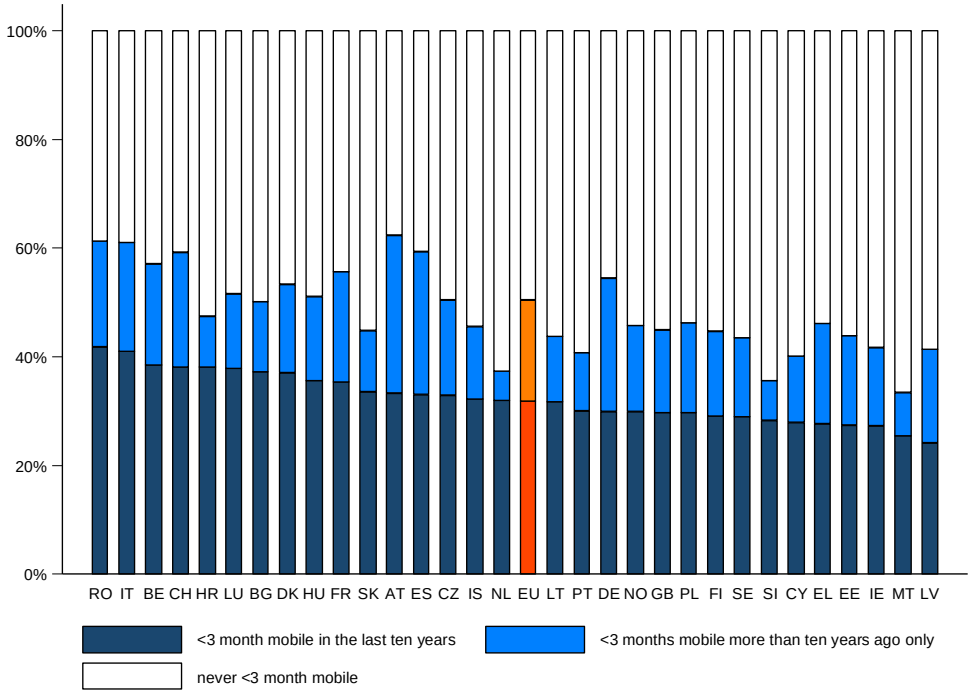
2012:



2016:



2019:



Source: MORE4 EU HE survey (2019) , MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- Only R2, R3 and R4 researchers.
- Percentage of R2, R3 and R4 researchers who have worked abroad for under 3 months at least once in the last ten years, per country.
- Based on question 77: "Short term mobility (<3 months)"
- (2019: n=7,653; 2016: n=8,824; 2012: n=8,357)

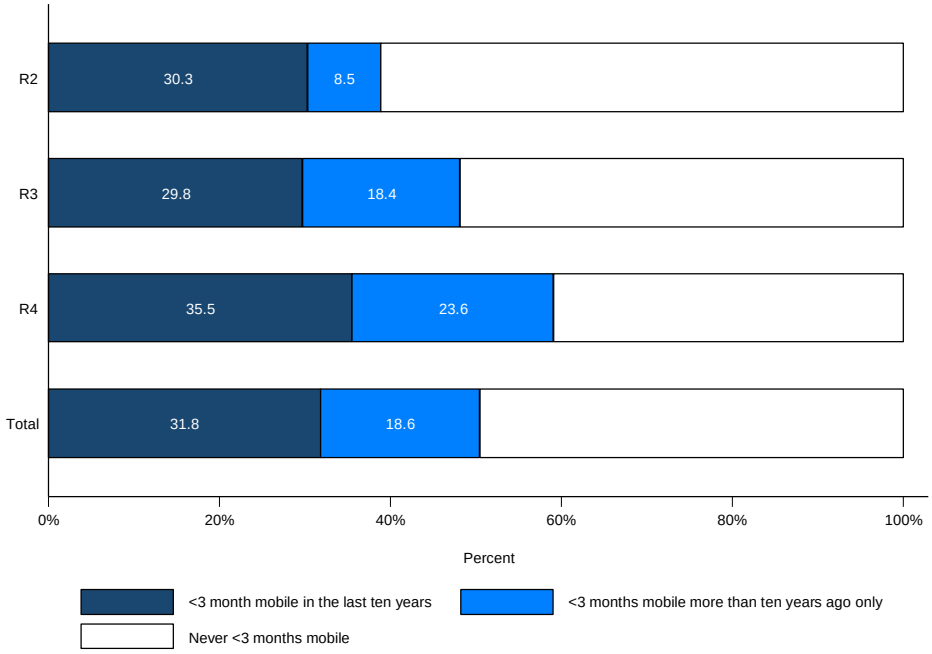
Career stage: R4 researchers present the highest levels of short-term mobility in the last ten years (36%) compared to R2 and R3 (both 30%). This increasing pattern is logical when considering that on average age increases with career stage and thus researchers in a later career stages will have had more time and opportunities to engage in networks for (short-term) mobility. They have also had more time to engage in short term mobility, which is clearly visible in the indicator of short-term mobility of more than ten years ago: 24% of R4 versus 18% and 9% for R3 and R2 respectively. The same pattern – i.e. higher shares of mobility among R4 - was observed in MORE3 and in MORE2, but the values were then slightly higher in each of the career stages.

Field of science: When comparing the various scientific disciplines, only little differences are observed: the highest degree of researchers undertaking short-term mobility is 40% in the Humanities (39% in 2016), the lowest is 25% in the Medical Sciences and Agricultural Sciences (see Figure 114). The Medical Sciences form the group that has experienced the strongest decline since 2016: while the share in 2016 was 34.5% in 2019 it only reaches 25%. Except for the Humanities, where the share went from 39% in 2016 to 40% in 2019, the values have dropped slightly in all fields compared to 2016 values.

Gender: At the EU-level, there are no substantial differences between male and female researchers with regards to their levels of short-term mobility in the last ten years (less than 1pp difference). This result confirms the trend observed in previous studies, where the differences between male and female researchers were small as well (3pp difference in MORE3 and 4pp difference in MORE2). Larger

differences occur at country level (see Figure 115), where in particular in Malta and Iceland short-term mobility in the last ten years is 13pp and 11pp higher for female compared to male researchers. Denmark and Croatia on the contrary have more male researchers in short-term mobility (difference around 11pp). Although there is a lot of heterogeneity at country level, it seems that the gender differences concerning short term mobility in the last ten years are decreasing in most countries compared to MORE3.

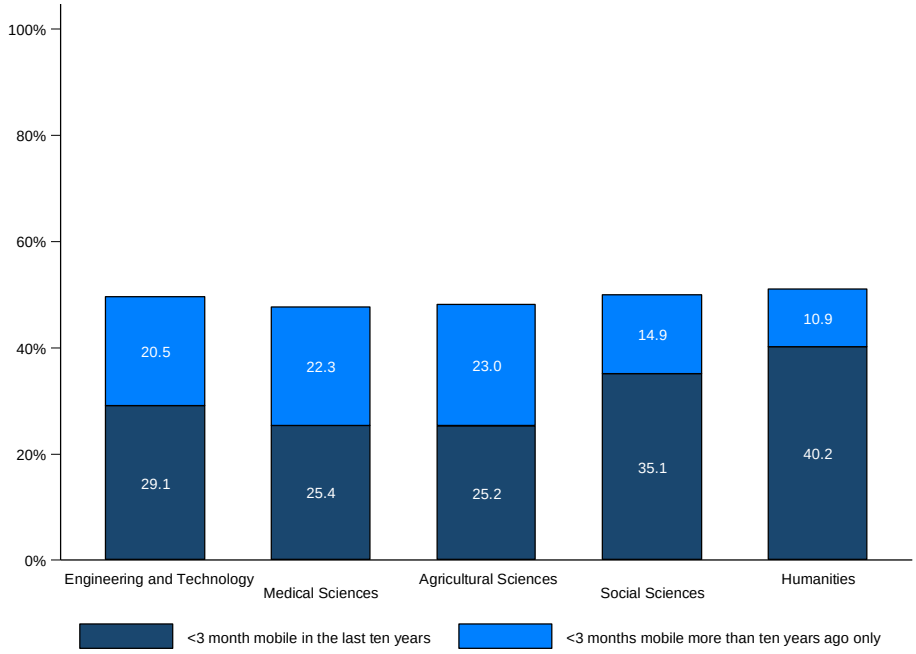
Figure 113: <3 month international mobility in post-PhD career stage, in the last ten years, by (current) career stage (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers.
- Percentage of R2, R3 and R4 researchers who have worked abroad for under 3 months at least once in the last ten years, per career stage.
- Based on question 77: "Short term mobility (<3 months)"
- (n=7,653)

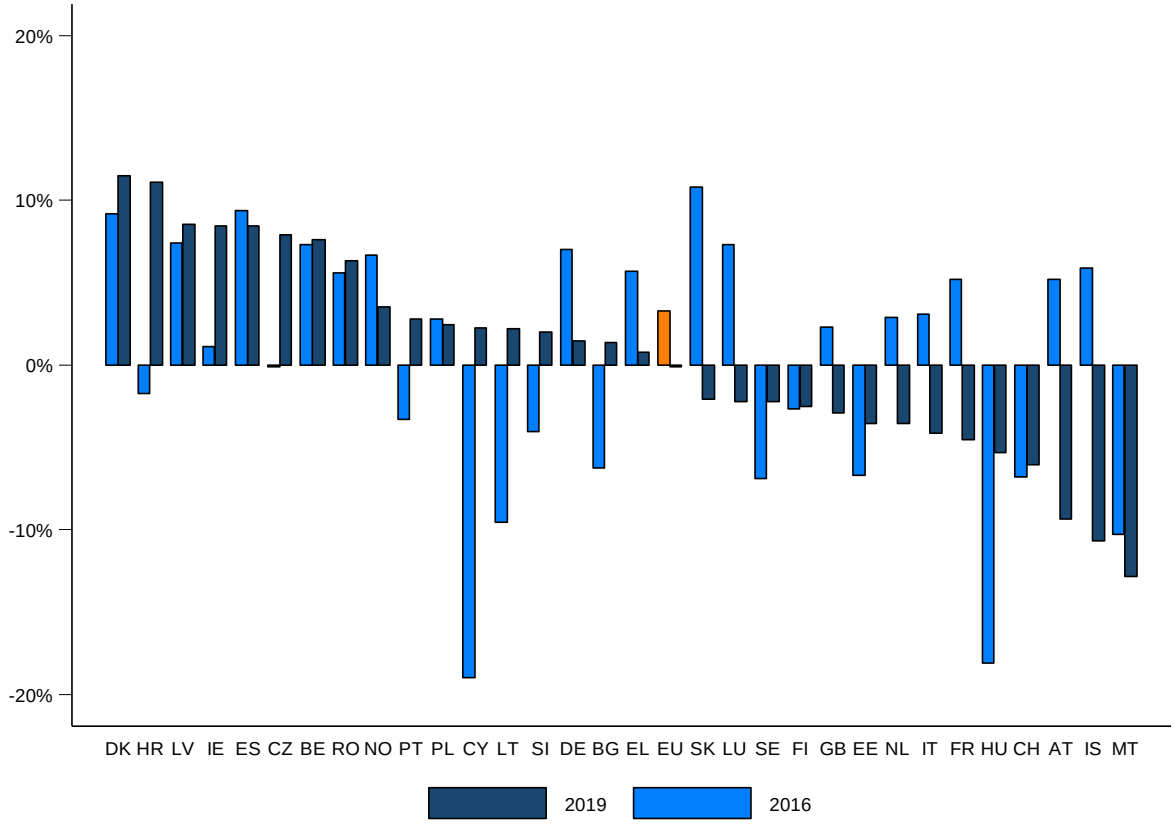
Figure 114: <3 month international mobility in post-PhD career stage, in the last ten years, by field of science (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers.
- Percentage of R2, R3 and R4 researchers who have worked abroad for under 3 months at least once in the last ten years, per field of science.
- Based on question 77: "Short term mobility (<3 months)"
- (n=7,653)

Figure 115: <3 month international mobility in post-PhD career stage, in the last ten years, by gender (difference between male and female researchers) and country



Source: MORE4 EU HE survey (2019)
Notes:

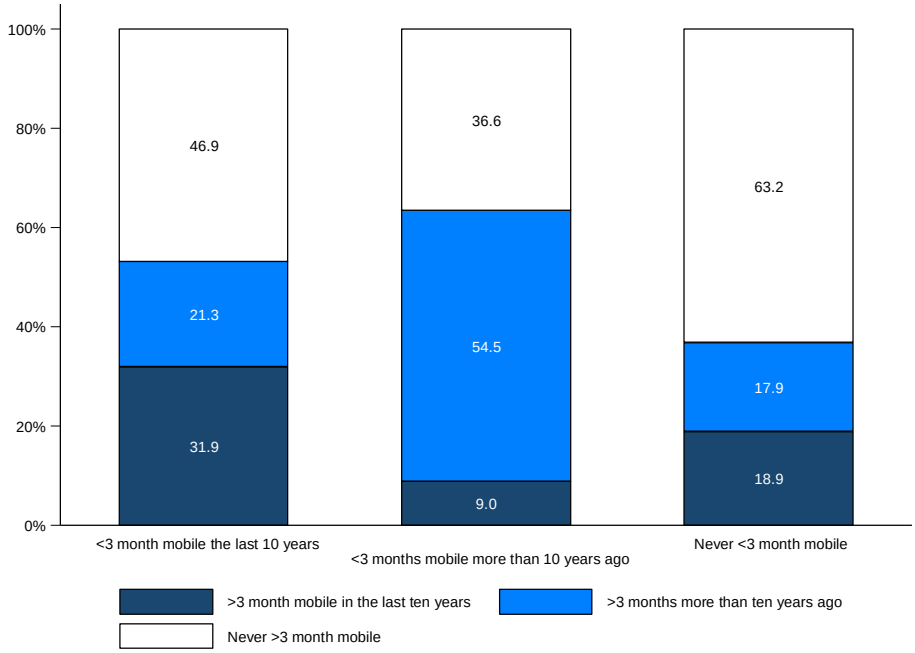
- Only R2, R3 and R4 researchers.
- Difference between percentage of male and female researchers in R2, R3 and R4 career stage who have worked abroad for <3 months at least once in the last ten years.
- Based on question 77: "Short term mobility (<3 months)"
- (2019: n=7,653; 2016: n=8,073)

8.1.2.2 Relation to >3 month international mobility

As in MORE3, there is a strong interrelation between short (<3 months) and longer term (>3 months) mobility (see Figure 116):

- 63% of the researchers who have never been short-term mobile have not been long-term mobile either (60% in 2016).
- Of the researchers who have been short-term mobile more than ten years ago, 55% have been long-term mobile more than ten years ago, and 37% have never been long-term mobile (39% and 45% respectively in 2016, hence indicating a decline in the share of those that have never been long-term mobile).
- 32% of the researchers who have been short-term mobile in the last ten years have also been long-term mobile in the last ten years (33% in 2016).

Figure 116: >3 month international mobility in post-PhD career stages, by <3 month mobility profile (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

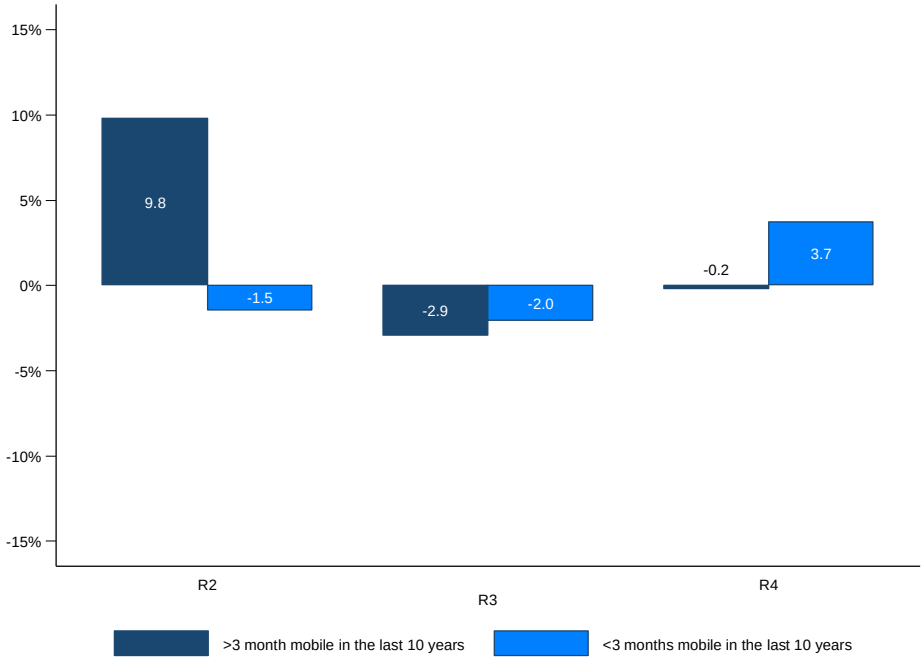
- Only R2, R3 and R4 researchers.
- Distribution over >3 month mobility categories of R2, R3 or R4 researchers per <3 month mobility category.
- Based on question 79: "Short term mobility (<3 months)" and question 64: "After gaining your highest educational qualification (PhD or other), how would you typify your international mobility experience?"
- (n=7,653)

Career stage: Figure 117 shows the difference between the share of researchers having been >3 months mobile and <3 months mobile (both in the last ten years) and the EU average for the 3 post-PhD career stages. It shows that there are no large differences. The largest variation occurs for R2 researchers, who tend to be more long-term (>3months) mobile than the rest of researchers (10pp difference with the total average), while R4 researchers are more inclined to be short-term mobile (<3months; 4pp difference with the total average).

Gender: There are no differences between male and female researchers in their levels of short- and long-term mobility (the small differences found fall within the margins of error of the survey).

Field of science: When we look at the patterns per field of science, we find that both forms of mobility are closely interlinked: when there is relatively more (less) long-term mobility, there is also relatively more (less) short-term mobility. In the Social Sciences and Humanities both long- and short-term mobility occur relatively more often than the average. For Natural Sciences, the difference is also positive, but not significant. For Medical Sciences, Agriculture and (to a lesser extent) Engineering and Technology, the pattern is reversed: >3 month as well as <3 month mobility occurs relatively less often than the average (see Figure 117).

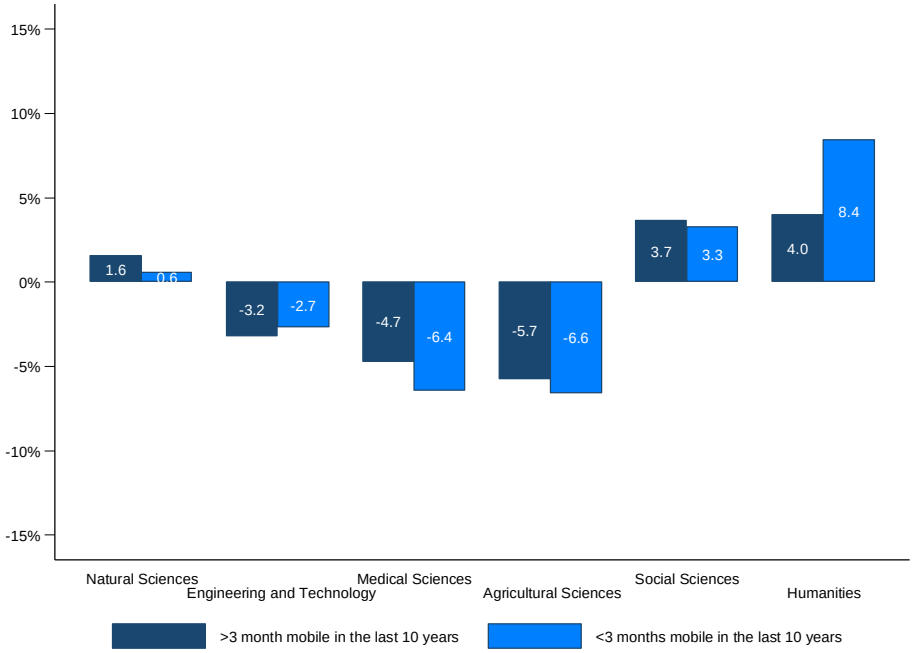
Figure 117: Comparison of <3 month and >3 month international mobility rates in post-PhD career stages, by (current) career stage (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers.
- Difference between percentage of researchers who were <3 month respectively >3 month mobile per career stage and the total share of <3 month respectively >3 month mobile researchers
- With '<3 month mobility' defined as international steps in the last ten years of R2, R3 or R4 researchers to work abroad for under 3 months.
- With '>3 month mobility' defined as international steps in the last ten years of R2, R3 or R4 researchers to work abroad for more than 3 months.
- Based on question 77: "Short term mobility (<3 months)" and question 62: "After gaining your highest educational qualification (PhD or other), how would you typify your international mobility experience?"
- (n=7,653)

Figure 118: Comparison of <3 month and >3 month international mobility rates in post-PhD career stages, by field of science (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers.
- Difference between percentage of researchers who were <3 month respectively >3 month mobile per field of science and the total share of <3 month respectively >3 month mobile researchers.
- With '<3 month mobility' defined as international steps in the last ten years of R2, R3 or R4 researchers to work abroad for under 3 months.
- With '>3 month mobility' defined as international steps in the last ten years of R2, R3 or R4 researchers to work abroad for more than 3 months.
- Based on question 77: "Short term mobility (<3 months)" and question 62: "After gaining your highest educational qualification (PhD or other), how would you typify your international mobility experience?"
- (n=7,653)

8.1.3. *International collaboration*

8.1.3.1 *Stock*[123]

INTERNATIONAL COLLABORATION					
	Year	**EU28 total**	**Per (current) career stage**	**Per FOS**	**Per gender**
Researchers in your country	**2016**	62.9%	R1: 51.2% R2: 54.4% R3: 63.1% R4: 73.7%	NAT: 67.0% ENG: 64.1% MED: 61.9% AGR: 61.3% SOC: 60.6% HUM: 60.4%	F: 62.2% M: 63.4%
	2019	63.1%	R1: 43.8 R2: 45.9 R3: 67.7 R4: 70.4	NAT: 64.5% ENG: 56.9% MED: 62.6% AGR: 65.7% SOC: 62.8% HUM: 69.3%	F: 62.4% M: 63.5%
Researchers in EU countries	**2016**	63.2%	R1: 39.5% R2: 48.3% R3: 67.7% R4: 78.2%	NAT: 70.0% ENG: 65.1% MED: 56.0% AGR: 60.0% SOC: 60.9% HUM: 65.3%	F: 60.1% M: 65.2%
	2019	65.3%	R1: 41.3 R2: 41.1 R3: 68.8 R4: 78.9	NAT: 69.0% ENG: 64.0% MED: 60.8% AGR: 65.6% SOC: 63.2% HUM: 70.8%	F: 63.1% M: 66.7%
Researchers in non-EU countries	**2016**	45.9%	R1: 22.9% R2: 31.0% R3: 47.1% R4: 64.8%	NAT: 56.6% ENG: 43.1% MED: 40.4% AGR: 47.2% SOC: 42.7% HUM: 44.4%	F: 40.5% M: 49.3%
	2019	48.8%	R1: 24.6 R2: 25.8 R3: 51.4 R4: 63.6	NAT: 53.2% ENG: 45.7% MED: 46.1% AGR: 46.4% SOC: 46.6% HUM: 54.5%	F: 43.9% M: 52.1%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Multiple collaboration types per respondent are possible.
- Based on question 82: "Please indicate with whom you collaborate in your research"
- (2019: n= 9,321; 2016: n=9,412)

One of the objectives of the European Research Area is the development of a critical mass of researchers in Europe that is able to face the challenges ahead in terms of technological innovation and development. However, in order to do so, international mobility is not the only or most important requirement. Indeed, the degree to which researchers collaborate with other researchers is also

[123] Changes in the wording of this question compared to the MORE2 study do not allow to compare the evolution of these indicators over time.

paramount. In a context of increasing specialisation, the establishment of cross-border networks of researchers is a necessary condition for the development of excellent research. At the EU level, the main policy frameworks – e.g. the European Research Area, the Innovation Union, the three O´s – all aim at fostering this type of collaboration by promoting the exchange of knowledge across countries.

The survey included questions to unveil the patterns of collaboration along two main dimensions: sectoral collaboration and international collaboration. These questions were asked to all researchers. This section addresses international collaboration, disregarding the sector with which researchers collaborate -academic or non-academic. The latter is analysed in-depth in section 8.3.2. In general terms, a similar share of researchers collaborates with other researchers in the same country (63%) and with researchers located in other EU countries (65% - 63% and 63% respectively in MORE3). Working with colleagues from non-EU countries is less common, but nevertheless it constitutes nearly one half of the total population.

Country level: There is a large heterogeneity regarding these types of collaboration across countries, although the level of heterogeneity is somewhat smaller for international collaboration, especially with non-EU researchers.

- The shares of those engaging in national collaboration range from 22% found in Luxembourg and Romania to more than 80% found in Italy or Iceland.
- The Nordic countries stand out as being among the countries with higher levels of researchers collaborating with other researchers within the EU. A completely different situation is found in Luxembourg (41%), Switzerland (43%) and in some large countries, such as Germany (47%) or Spain (55%), where the shares are much lower.
- Collaboration with others located in non-EU countries is the least frequent option in some of the Eastern European countries, such as Slovakia, Poland or Bulgaria (34%). Germany and Spain also stand out by having lower-then-average levels of this type of collaboration: 29% and 39% respectively. The United Kingdom, Sweden and Iceland are the countries with a higher share of researchers collaborating with counterparts in non-EU countries: more than half of the researchers in these countries indicate to have been involved in this type of collaboration.

Career stage: Collaboration with other researchers is highly dependent on career stage, being higher for those researchers in higher career stages. This pattern is similar for collaboration with researchers located in the same country and for those from other countries – both EU and non-EU countries. This pattern is also consistent with the findings obtained in MORE3.

Table 44: Types of collaboration, by country

	RESEARCHERS IN YOUR COUNTRY		RESEARCHERS IN EU COUNTRIES		RESEARCHERS IN NON-EU COUNTRIES	
	2016	2019	2016	2019	2016	2019
Austria	63.0%	66.3%	70.1%	80.9%	47.1%	51.9%
Belgium	55.7%	59.3%	69.6%	63.0%	50.4%	49.4%
Bulgaria	61.6%	56.9%	59.6%	58.1%	40.7%	34.5%
Croatia	84.4%	73.3%	74.8%	71.1%	47.2%	42.8%
Cyprus	49.7%	56.6%	72.1%	76.0%	46.9%	55.1%
Czech Republic	45.8%	57.8%	69.2%	65.8%	27.2%	39.9%
Denmark	72.6%	56.6%	78.4%	77.6%	57.5%	60.6%
Estonia	76.0%	54.6%	82.0%	70.0%	44.2%	44.3%
Finland	56.5%	55.2%	70.9%	69.3%	48.5%	48.7%
France	50.7%	72.5%	53.0%	67.1%	38.2%	59.3%
Germany	69.3%	47.0%	48.9%	47.3%	37.4%	28.6%
Greece	64.3%	72.7%	79.9%	72.7%	50.5%	44.3%
Hungary	66.9%	59.8%	64.8%	67.9%	36.3%	42.9%
Iceland	69.6%	80.6%	77.3%	84.0%	53.0%	59.6%
Ireland	66.8%	66.0%	76.4%	69.4%	54.4%	53.2%
Italy	60.6%	81.9%	63.8%	77.2%	40.6%	58.8%
Latvia	70.0%	55.3%	79.8%	64.4%	40.6%	42.1%
Lithuania	66.1%	44.5%	65.1%	62.5%	36.7%	37.4%
Luxembourg	49.3%	21.6%	71.6%	41.2%	51.2%	26.0%
Malta	73.4%	54.2%	84.3%	65.6%	45.0%	35.0%
Norway	69.7%	60.9%	75.3%	69.6%	53.3%	48.5%
Poland	38.3%	52.7%	53.9%	61.7%	33.7%	33.9%
Portugal	68.7%	58.2%	77.1%	67.8%	47.4%	49.4%
Romania	79.7%	22.1%	69.7%	70.9%	32.6%	42.2%
Slovakia	71.9%	55.1%	73.6%	65.5%	36.4%	33.8%
Slovenia	56.7%	50.5%	79.0%	57.0%	50.0%	36.5%
Spain	64.5%	56.7%	61.5%	55.2%	47.2%	38.6%
Sweden	66.6%	62.0%	68.5%	73.0%	53.1%	56.5%
Switzerland	54.1%	43.8%	52.7%	43.1%	42.8%	33.4%
The Netherlands	52.1%	33.8%	76.1%	57.2%	53.4%	38.8%
United Kingdom	65.5%	79.4%	68.7%	75.5%	57.7%	67.6%
EU28	**62.9%**	**63.1%**	**63.2%**	**65.3%**	**45.9%**	**48.8%**

Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Multiple collaboration types per respondent are possible. The cells coloured in red represent a decline with respect of MORE3 figures, and the cells in green represent an increase.
- Based on question 82: "Please indicate with whom you collaborate in your research" (n=9,321)

Field of science: When analysing the types of collaboration across fields of science we observe that there is a similar level of heterogeneity in international collaboration and in national collaboration.

- The shares of researchers working with others located in the same country are very similar across the different fields. 57% of the researchers working in Engineering and Technology engage in some type of national collaboration. The shares are slightly higher for those working in the Medical field (62%), Social Sciences (63%), Natural Sciences (65%), Agricultural Sciences (66%) and Humanities (69%).
- Collaboration with EU researchers range from 71% found among researchers working in Humanities to 61% of those working in the Medical field.
- When looking into collaboration with non-EU researchers, the variation is slightly smaller: the lower levels (46%) are found in Engineering and Technology, Medical Science and

Agriculture. Higher levels are displayed in the Natural Science (53%) and the Humanities (55%).

Gender: The pattern of gender differences remains stable compared to MORE3 but gender differences depend on the type of collaboration that is analysed.

- National collaboration is roughly the same for male and female researchers.
- The differences are larger regarding collaboration in EU countries: 67% of male researchers compared to 63% of the female researchers (65% and 60% in MORE3).
- The largest gap is found for collaboration with researchers located in non-EU countries: 52% and 44% of male and female researchers respectively (49% and 40% in MORE3 respectively).

8.1.3.2 Collaboration as a result of mobility

Some forms of collaboration are more related to mobility experiences than others. Collaboration with colleagues in foreign countries tends to be more associated with mobility experiences, compared to collaboration with researchers located in the same country.

Among those who collaborate in some way with other researchers, the share of individuals considering that their collaboration activities in their own country are the result of a previous mobility experience barely reaches 16% (11% in MORE3). However, when considering collaboration with researchers in other countries, the percentages are higher. Mobility is felt as the cause of collaboration with EU researchers for 36% (26% in MORE3). The relationship between having been mobile and collaboration with non-EU researchers is perceived by 26% (20% in MORE3). Hence, in the three cases, the shares have increased since 2016.

The duration of the mobility experience also seems to matter. In MORE3, researchers having been long-term mobile (i.e. for more than three months) in the last ten years, tended to attribute collaboration to mobility to a greater extent than those who have been short-term mobile (<3 months) or those who have never been mobile. In MORE4 the findings are reversed: on average, those individuals having been short-term mobile in the last three years tend to link collaboration to previous mobility experiences more strongly than those that have a long-term mobility experience in the last ten years. This occurs in all types of collaboration: in the one taking place within the same country, with researchers located in the EU and in non-EU countries.

Table 45: Relation between collaboration as a result of mobility, types of collaboration, and duration of the mobility

	SHORT-TERM MOBILE LESS THAN 10 YEARS AGO		LONG-TERM MOBILE LESS THAN TEN YEARS AGO		TOTAL	
	2016	2019	2016	2019	2016	2019
Collaboration with researchers in the same country as a result of mobility	12.5%	33.3%	16.9%	27.2%	11.5%	16.0%
Collaboration with Researchers in other EU countries as a result of mobility	37.1%	40.8%	43.4%	32.0%	25.8%	35.5%
Collaboration with Researchers in non-EU countries as a result of mobility	27.1%	44.8%	37.4%	32.2%	19.8%	26.5%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

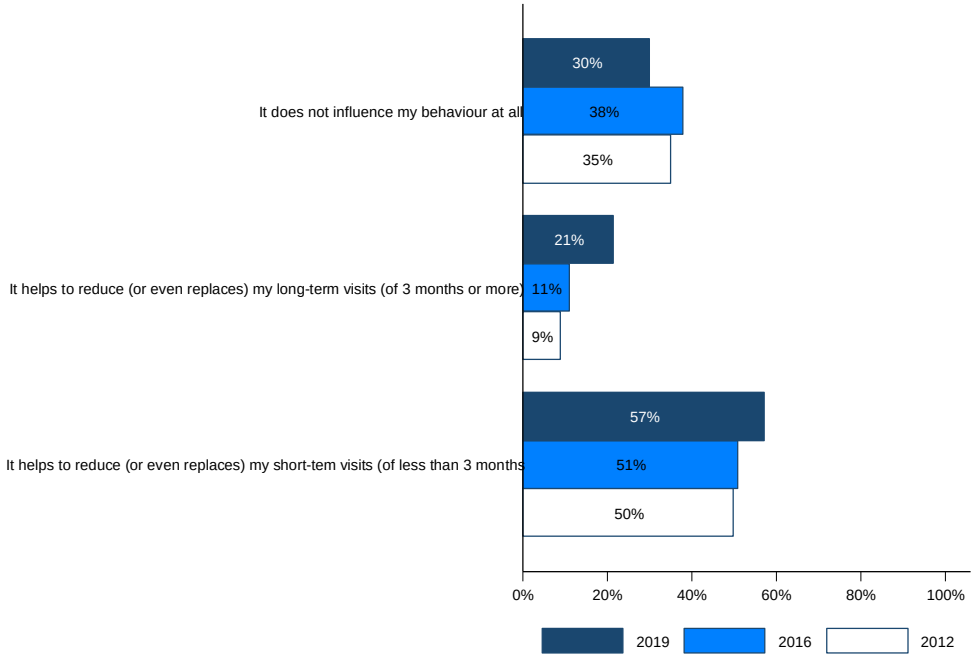
- Shares of mobile and non-mobile researchers indicating that this is the result of a previous mobility experience among those engaging in each type of collaboration.
- Based on question 83: "Which of these collaborations was the result of a previous mobility experience (of 3 months or more, in or outside the EU)?"
- (2019: long-term mobile: n= 1,682; short-term mobile: n=2,466; 2016: long-term mobile: n= 1,572; short-term mobile: n=2,594).

8.1.4. International virtual mobility

The use of web-based tools can facilitate collaboration between researchers located in different places. However, the extent to which this virtual collaboration impacts on researchers´ mobility decisions depends strongly on the context characteristics of country, career stage, field, etc. In general terms, the responses to the survey indicate that virtual mobility has a greater impact on reducing short-term mobility (57% of the researchers that collaborate with international partners) than on reducing long-term mobility (21%).

A comparison with the previous MORE studies suggests the existence of several trends. First, virtual mobility seems to have an increasing impact on the reduction of international mobility. The change is larger for short-term visits: while in MORE4 57% of the researchers indicate this option, the share was 51% in 2016 (MORE3) and 50% in 2012 (MORE2). The share of researchers that indicate that virtual mobility reduces their long-term visits (more than three months) has also increased over time. In 2012, 9% of the researchers indicated this option, 11% did so in 2016 and the share reaches 22% in 2019.

Figure 119: Influence of web-based or virtual technology on international behaviour and decisions (EU28)



Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Notes:

- Only respondents who collaborate with international partners.
- Multiple options per respondent are possible.
- Based on question 84: "How does the use of web-based or virtual technology in international collaboration influence your mobility behaviour and decisions?"
- (2019: n=6,066; 2016: n=6,967; 2012: n=6,980)

Country level: Comparing the evolution at country level we observe that in most of the European countries there has been an increase in the share of researchers considering that virtual mobility reduced long-term mobility (in green in Table 46). On the opposite side, the shares of researchers indicating that virtual mobility has no influence on their mobility behaviour has decreased in most countries. More mixed findings are found when looking into the effect of virtual mobility on the reduction of short-term mobility. In some countries the evolution is positive (larger share in 2019), while in several others we find a decrease.

Table 46: Influence of web-based or virtual technology on international behaviour and decisions, by country

	IT REDUCES SHORT-TERM MOBILITY		IT REDUCES LONG-TERM MOBILITY		IT HAS NO INFLUENCE	
	2016	2019	2016	2019	2016	2019
Austria	47.6%	65.7%	11.8%	9.0%	40.0%	27.9%
Belgium	55.7%	60.5%	6.8%	23.6%	38.5%	23.7%
Bulgaria	49.2%	40.8%	15.2%	27.0%	37.9%	37.3%
Croatia	48.3%	56.1%	9.3%	10.4%	43.6%	34.7%
Cyprus	51.7%	56.5%	21.8%	47.1%	29.3%	26.4%
Czech Republic	53.0%	39.6%	11.3%	28.5%	34.3%	39.1%
Denmark	39.6%	58.2%	8.2%	8.7%	50.9%	35.3%
Estonia	46.3%	51.5%	13.3%	17.3%	41.5%	34.1%
Finland	59.1%	51.3%	18.6%	22.6%	25.2%	33.7%
France	47.2%	50.4%	3.9%	19.5%	43.4%	32.9%
Germany	38.7%	55.4%	8.3%	16.3%	54.1%	32.1%
Greece	57.0%	50.7%	16.3%	23.0%	30.2%	32.5%
Hungary	53.8%	46.4%	19.2%	23.4%	31.5%	43.3%
Ireland	55.0%	53.6%	7.3%	28.5%	35.8%	33.5%
Italy	50.9%	69.4%	8.4%	20.7%	38.3%	22.7%
Latvia	60.3%	53.3%	16.9%	24.4%	22.0%	25.0%
Lithuania	57.2%	42.6%	11.0%	34.4%	29.0%	27.1%
Luxembourg	51.0%	63.7%	20.6%	24.7%	36.4%	23.3%
Malta	55.9%	62.1%	8.0%	20.2%	36.9%	23.0%
Poland	52.2%	41.8%	15.4%	41.3%	28.0%	25.8%
Portugal	53.7%	57.4%	10.7%	24.9%	38.5%	28.5%
Romania	57.5%	30.8%	9.7%	63.9%	34.0%	7.8%
Slovakia	74.9%	36.8%	14.4%	30.3%	15.6%	38.8%
Slovenia	59.4%	65.4%	23.3%	31.6%	18.5%	8.4%
Spain	50.3%	64.7%	10.9%	15.1%	42.0%	23.9%
Sweden	47.9%	49.0%	9.5%	28.0%	43.0%	33.4%
The Netherlands	56.0%	53.0%	18.0%	24.7%	24.7%	25.8%
United Kingdom	58.8%	63.4%	10.7%	20.3%	32.2%	31.8%
EU28	**51.0%**	**57.3%**	**11.0%**	**21.5%**	**38.3%**	**30.1%**

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Reading note: The cells coloured in green indicate an increase over time (2016-2019), the cells coloured in red represent a decrease over the same period of time.
Notes:

- Only respondents who collaborate with international partners.
- Multiple options per respondent are possible.
- Based on question 84: "How does the use of web-based or virtual technology in international collaboration influence your mobility behaviour and decisions?"
- (2019: n=6,066; 2016: n=6,967)

Field of science: Table 47 shows that in 2016 only a minority of researchers within each field of science considered that virtual mobility had a significant impact on reducing long-term visits (between 9% and 13%). In 2019 these shares have increased for all fields of science, with the Medical Sciences being the field where we find the largest increase (from 9% in 2016 to 23% in 2019). There is more heterogeneity with respect to the impact of virtual mobility on short-term mobility: there has been a decline in the

Agricultural Sciences (from 61% in 2016 to 55% in 2019) and, though only marginally, in the Social Sciences (from 54% to 53% in the same period). The share increased in the rest of the fields. Finally, Table 47 presents the average shares of researchers indicating that virtual technology has no impact on their mobility decisions: the shares have decreased since 2016 in each of the six fields of science.

Table 47: The effects of virtual mobility, by field of science (EU28)

FIELD OF SCIENCE	IT REDUCES SHORT-TERM MOBILITY		IT REDUCES LONG-TERM MOBILITY		NO INFLUENCE	
	2016	2019	2016	2019	2016	2019
Natural Sciences	49.1%	58.4%	10.5%	23.4%	40.3%	28.5%
Engineering and Technology	55.1%	62.0%	13.3%	19.4%	31.8%	26.5%
Medical Sciences	47.2%	56.9%	9.4%	23.4%	43.8%	29.1%
Agricultural Sciences	61.4%	54.7%	12.7%	21.6%	31.6%	31.3%
Social Sciences	54.2%	53.2%	11.2%	23.6%	34.7%	32.9%
Humanities	47.6%	57.4%	10.7%	15.5%	41.1%	33.9%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Reading note: The cells coloured in green indicate an increase over time (2016-2019), the cells coloured in red represent a decrease over the same period of time.
Notes:

- Only respondents who collaborate with international partners.
- Multiple options per respondent are possible.
- Based on question 84: "How does the use of web-based or virtual technology in international collaboration influence your mobility behaviour and decisions?"
- (2019: n=6,066; 2016: n=6,967)

Career stage: Similar trends are found in the analysis by career stage. Regarding the impact of virtual technologies on long-term visits, the shares have increased in all the career stages since 2016. R2 researchers tend to indicate more often this type of effect (28%), while R1 researchers constitute the group that indicate this less frequently (18%).

R1 and R2 researchers differ from the higher career stages in that researchers in this stage consider to a lesser extent that this type of collaboration reduces short-term mobility: 52% of R1 researchers and 50% of R2, versus 59% of R3 and 58% of R4 respectively). One reason for this difference can be related to the different perspective of the younger researchers, who have grown up in the digital era and consider digitalisation as the standard. In that respect, they probably already use both approaches in their collaboration and see only a small degree of interchangeability remaining between both approaches.

Table 48: Different perceptions on the effect of virtual technologies on career stage (EU28)

CAREER STAGE	IT HELPS TO REDUCE MY SHORT-TERM VISITS		IT HELPS TO REDUCE MY LONG-TERM VISITS		NO INFLUENCE	
	2016	2019	2016	2019	2016	2019
R1	42,4%	52,4%	10,3%	17,7%	48,0%	36,5%
R2	54,2%	49,4%	12,4%	27,8%	35,4%	31,9%
R3	51,4%	59,3%	10,5%	21,8%	37,8%	28,4%
R4	51,5%	57,6%	11,2%	20,1%	37,4%	30,9%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Reading note: The cells coloured in green indicate an increase over time (2016-2019), the cells coloured in red represent a decrease over the same period.
Notes:

- Only respondents who collaborate with international partners.
- Multiple options per respondent are possible.
- Based on question 84: "How does the use of web-based or virtual technology in international collaboration influence your mobility behaviour and decisions?"
- (2019: n=6,066; 2016: n=6,967)

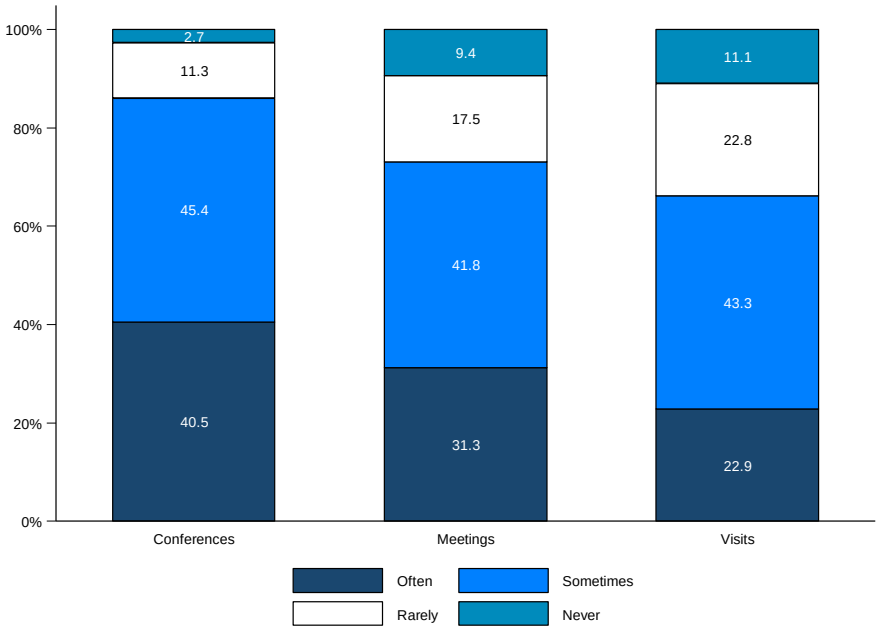
Gender: Coherent with the results obtained in MORE3, there are no major differences between male and female researchers regarding the effect of virtual technology on their mobility behaviour. A similar share of male researchers (56%) and of female researchers (59%) declare that it helps to reduce short-term mobility. 21% of men and 22% of women consider that virtual technology reduces long-term mobility. Finally, 32% of male researchers state that it has no influence at all. The same opinion is held by 28% of female researchers.

8.1.5. Short travel for conferences, meetings and visits

Of all R2, R3, and R4 researchers, 97.3% went to conferences or events, 90.6% to meetings with supervisors, partners or collaborators and 88.9% moved for study visits, research visits or fieldwork. Conferences are hence slightly more common than the other types of short travels analysed here.

Frequency: Most researchers indicate that they have undertaken these types of short travels 'sometimes', i.e. once or twice a year (45%, 42%, 33% respectively of R2, R3, R4 researchers), and another important part indicates that the moves took place 'often' (41%, 31% and 23% respectively). These findings are consistent with the results in MORE3 (2016) and in MORE2 (2012).

Figure 120: Participation in conferences, visits and meetings, by frequency (EU28)

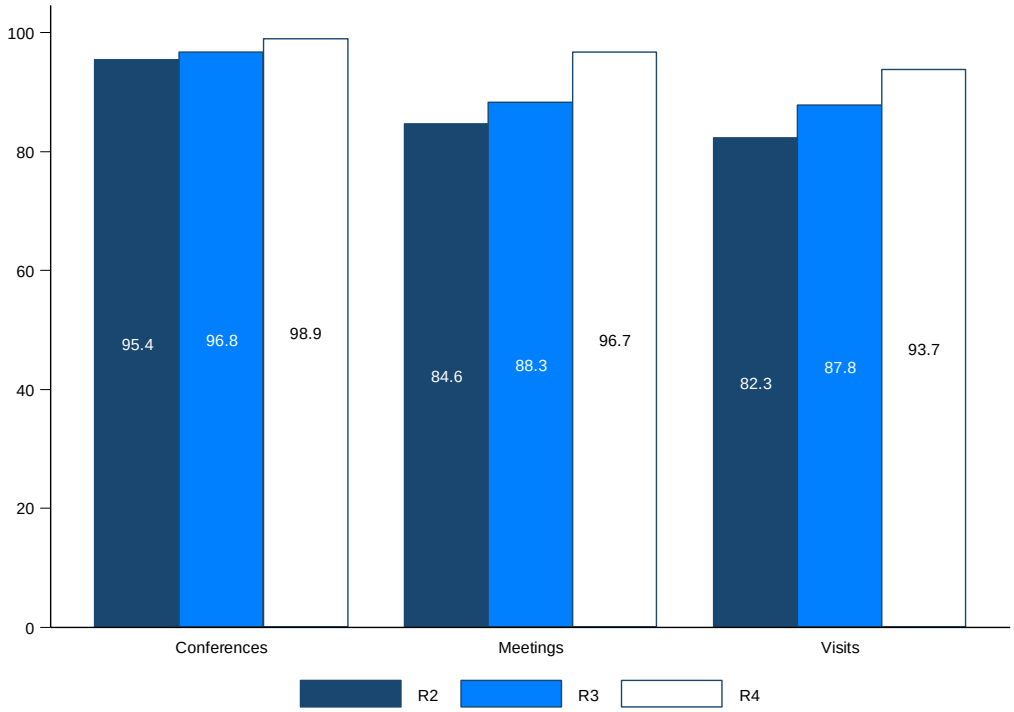


Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers.
- Percentage of R2, R3 and R4 researchers, distributed over types of <3 month mobility and their duration.
- Per type, the respondent could only indicate one frequency category.
- Based on question 78: "What types of work-related international travel have you undertaken during your research career (but after you PhD)?"
- (n=7,653)

Career stage: Conferences, visits and meetings are related to research seniority: those in higher career stages report to engage in this kind of short travel more than younger researchers. However, whereas the differences between R2 and higher career stages are only marginal in the case of conferences, more pronounced differences are found for the other two types of short travels. This is shown in Figure 121.

Figure 121: Participation in conferences, visits and meetings, by career stage (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers.
- Percentage of researchers in R2, R3 or R4 career stage, distributed over types of <3 month mobility and career stage.
- Based on question 78: "What types of work-related international travel have you undertaken during your research career (but after you PhD)?"
- (n=7,653)

Field of Science: The propensity to attend conferences, meetings or visits is similar across the three main domains. The largest difference is found in the case of the meetings: researchers in the domain of Social Sciences (Social Science and Humanities) seem to be less likely to engage in this kind of short travel (88%) compared to 92% of the researchers in the Natural Science domain (Natural Sciences and Engineering and Technology) or in the Health domain (Medical Sciences and Agricultural Sciences).

Gender: Similar shares of male and female researchers go to conferences (98% each) and do study visits (90% and 87% respectively). There is a 6pp difference for meetings being higher among female researchers.

8.2. Interdisciplinary mobility and collaboration in post-PhD stage

This section discusses the interdisciplinary mobility related to the post-PhD stage. This type of mobility is, together with international and intersectoral mobility, one of the cornerstones of European science

policy and programmes. Indeed, programmes such as the Marie Skłodowska-Curie actions[124] or the European Research Council granting schemes[125] stress the importance of this type of mobility. In a context where knowledge economies are at the forefront of economic and technological evolution this comes as no surprise. Interdisciplinary mobility has been said to foster certain skills that are of key importance for researchers today. Entrepreneurial skills[126], an increased ability to effectively communicate beyond the frontiers of one´s own field, and a greater capacity of adaptation to ever-changing environments are some of the advantages related to this type of mobility. The analysis is structured as follows:

- Interdisciplinary mobility (section 8.2.1);
- Interdisciplinary collaboration (section 8.2.2);
- Interdisciplinary virtual mobility (section 8.2.3).

8.2.1. Interdisciplinary mobility

8.2.1.1 Stock

SHARE OF RESEARCHERS WHO HAVE SWITCHED TO ANOTHER (SUB)FIELD DURING THEIR ACADEMIC CAREER
(of all EU28 researchers)

	EU28 total	Per career stage	Per FOS	Per gender
2016 (n=9,412)	34.3%	R1: 28.9% R2: 29.5% R3: 33.6% R4: 40.9%	NAT: 35.5% ENG: 36.8% MED: 32.5% AGR: 34.2% SOC: 37.2% HUM: 28.7%	F: 34.2% M: 34.4%
2019 (n=8,540)	18.9%	R1: 15.2% R2: 20.1% R3: 17.4% R4: 21.7%	NAT: 17.8% ENG: 20.7% MED: 16.7% AGR: 16.6% SOC: 22.2% HUM: 17.1%	F: 19.7% M: 18.4%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Note:
- Based on question 12: "Did you switch to another (sub)field of research during your academic career?"

Based on a direct question in the survey, almost one fifth of all researchers have switched to another field or subfield of research during their academic career (19%). This was not part of the MORE2 EU HE survey, so comparison to 2012 cannot be made in this section. In MORE3 this percentage was significantly higher (34%). We believe this difference may be (partly) related to a small change in the

[124] COMMISSION (DG RTD). 2012. Marie Curie Actions- Where Innovation Science becomes success. Available: http://ec.europa.eu/research/mariecurieactions/documents/documentation/publications/eu-marie-curie-actions-fellowships-innovative-science-becomes-success-publication_en.pdf

[125] ERC (2009). Towards a world class Frontier Research. Organisation Review of the European Research Council's Structures and Mechanisms. https://erc.europa.eu/sites/default/files/content/pages/pdf/final_report_230709.pdf

[126] The State of the Innovation Union 2011 report: http://ec.europa.eu/research/innovation-union/pdf/state-of-the-union/2013/state_of_the_innovation_union_report_2013.pdf

questionnaire of MORE4 compared to MORE3. In MORE3, researchers are first asked about their interdisciplinary collaboration, and are thus made aware of the reasoning in the framework of the FOS-classification before they are asked about interdisciplinary moves. This introductory question was removed in the MORE4 questionnaire for reasons of simplification. It is possible that this changed the perspective of the researchers for this remaining question on interdisciplinary moves.

Country level: There are important differences across countries in the extent to which researchers move across disciplines during their academic careers. Some countries, such as Croatia and Bulgaria (both 27%), Latvia (30%) and Denmark (32%) stand out for their high shares of researchers having moved at least once to another field in the past. In other countries, such as France (13%), Belgium (14%), Switzerland (15%) and Germany (16%), researchers are less likely to have undertaken this type of interdisciplinary move.

Career stage: Not surprisingly, the R4 career stage shows the highest share of researchers with moves between disciplines in their careers (22%). The question refers to the entire research career, so the longer the career the higher the chance of any event to have occurred. The lowest share of researchers with moves between disciplines can be found among R1 researchers (15%). The share of researchers with multidisciplinary moves in their career in the R2 and R3 career stages are respectively 20% and 17%.

Field of science: Small differences are observed when comparing the shares of researchers having undertaken an interdisciplinary move in their career in the different fields of science. The shares of this type of researchers range between 17% and 22% in all the fields of science.

Gender: It is important to note that the shares of male and female researchers having switched to another field or subfield of science during their research career are very similar (1.3 percentage points difference).

Table 49: Share of researchers having switched to another field during their research careers, by country

COUNTRY	SHARE THAT SWITCHED TO ANOTHER FIELD	COUNTRY	SHARE THAT SWITCHED TO ANOTHER FIELD
Austria	22.8%	Latvia	30.0%
Belgium	14.1%	Lithuania	26.5%
Bulgaria	27.4%	Luxembourg	21.3%
Croatia	27.4%	Malta	26.1%
Cyprus	22.5%	Norway	21.4%
Czech Republic	20.2%	Poland	25.4%
Denmark	31.6%	Portugal	23.9%
Estonia	16.7%	Romania	18.7%
Finland	24.7%	Slovakia	21.2%
France	13.3%	Slovenia	18.3%
Germany	15.6%	Spain	15.9%
Greece	24.0%	Sweden	24.9%
Hungary	25.0%	Switzerland	14.8%
Iceland	24.4%	The Netherlands	20.9%
Ireland	25.8%	United Kingdom	18.4%
Italy	16.3%	**EU28**	**18.9%**

Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 12: "Did you switch to another (sub)field of research during your academic career?"
- (n=9,321)

8.2.1.2 Effects

In contrast to the MORE3 survey results, in MORE4 we do not find that the perceived effect of interdisciplinary mobility on recruitment and career progression depends on whether researchers have previously worked in other disciplines (i.e. were interdisciplinary-mobile). Differences between interdisciplinary-mobile and immobile researchers are small and insignificant. The detailed analysis of the factors underlying recruitment and career progression are presented in sections 5.3.3 (factors for recruitment) and 5.4.3.2 (factors for career progression).

8.2.2. Interdisciplinary collaboration[127]

SHARE OF RESEARCHERS WHO HAVE COLLABORATED WITH OR WORKED IN MORE THAN ONE FIELD IN THEIR CURRENT POSITION
(of all researchers)

	EU28 total	Per career stage	Per FOS	Per gender
2016 (n=9,412)	73.5%	R1: 66.2% R2: 73.7% R3: 73.2% R4: 77.5%	NAT: 74.4% ENG: 75.5% MED: 76.2% AGR: 84.7% SOC: 67.7% HUM: 71.6%	F: 74.0% M: 73.2%
2019 (n=8,540)	79.5%	R1: 74.2% R2: 84.9% R3: 78.3% R4: 80.6%	NAT: 78.6% ENG: 80.6% MED: 83.4% AGR: 85.0% SOC: 76.9% HUM: 76.9%	F: 80.1% M: 79.1%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Note:
- Based on question 82: "Please indicate with whom you collaborate in your research"

Based on a direct question in the survey, 80% of the researchers collaborated with or worked in more than one field in their current position. Compared to MORE3 this indicates an increase of around 6pp. In contrast to MORE3, this type of collaboration is not affected by the extent to which researchers themselves have previously worked in other fields.

[127] No specific question on interdisciplinary collaboration was included in the MORE2 study.

Table 50: Researchers that collaborate with other researchers in another field or discipline (EU28)

INTERDISCIPLINARY COLLABORATION				
2016 (n=9,412)	**EU28 total**	**Per (current) career stage**	**Per FOS**	**Per gender**
Within the same institute	59.7%	R1: 53.9% R2: 56.7% R3: 60.1% R4: 63.8%	NAT: 61.9% ENG: 61.3% MED: 63.2% AGR: 70.7% SOC: 52.8% HUM: 58.0%	F: 61.0% M: 58.9%
Other universities/research institutes	56.6%	R1: 42.8% R2: 54.4% R3: 54.6% R4: 67.3%	NAT: 60.3% ENG: 57.5% MED: 54.7% AGR: 65.3% SOC: 52.7% HUM: 58.0%	F: 55.5% M: 57.2%
Researchers from the non-academic sector	30.7%	R1: 19.6% R2: 28.0% R3: 30.1% R4: 38.6%	NAT: 33.0% ENG: 38.6% MED: 30.4% AGR: 40.8% SOC: 26.4% HUM: 22.8%	F: 28.4% M: 32.1%
2019 (n=8,540)	**EU28 total**	**Per (current) career stage**	**Per FOS**	**Per gender**
Within the same institute	67.7%	R1: 59.7% R2: 69.6% R3: 67.9% R4: 69.2%	NAT: 67.2% ENG: 70.3% MED: 73.5% AGR: 72.4% SOC: 62.4% HUM: 64.1%	F: 66.7% M: 68.4%
Other universities/research institutes	62.9%	R1: 49.1% R2: 63.1% R3: 62.3% R4: 68.2%	NAT: 62.0% ENG: 61.4% MED: 68.5% AGR: 72.3% SOC: 59.5% HUM: 61.0%	F: 63.1% M: 62.8%
Researchers from the non-academic sector	25.6%	R1: 17.0% R2: 14.5% R3: 27.1% R4: 31.5%	NAT: 26.3% ENG: 32.3% MED: 25.3% AGR: 32.4% SOC: 21.5% HUM: 21.6%	F: 24.1% M: 26.7%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Multiple collaboration types per respondent are possible.
- Based on question 82: "Please indicate with whom you collaborate in your research"

The different types of interdisciplinary collaboration that were included in the questionnaire made cross-reference to the location of the researchers with whom respondents collaborate. The survey asked

whether researchers worked with colleagues working in other fields 1) in the same institute, 2) in other institutes or 3) in the non-academic sector.

Collaboration with researchers working in academic institutes is much higher than that with researchers in the non-academic sector (68% in the same institute and 63% in other universities or research institutes, versus 26% in the non-academic sector). Compared to MORE3, the share of researchers that collaborate with researchers working in the academic sector has increased (68% versus 60% with researchers in the same institute and 63% versus 57% with researchers in other universities/research institutes). The share of researchers that collaborate outside the academic sector has decreased from 31% in 2016 to 26% in 2019.

Country level: The patterns of collaboration differ across countries. Switzerland, Luxembourg, Belgium and Germany display the largest differences between the share of researchers collaborating within the same institute and the share of those who work with colleagues from other institutes (respectively 40, 33, 19 and 13 pp difference). In some countries the share of researchers working with colleagues in other institutes is larger than with colleagues in the same institute. Among those countries, the difference is the largest for Denmark, Poland, the Netherlands and Latvia (17, 8, 6, 5 pp difference respectively). The highest share of researchers working with researchers in other fields outside academia are found in Romania (40%), Austria (37%) and Italy (36%), whereas in Slovakia (11%), Luxembourg (12%) and the Netherlands (16%), this is much less common.

Career stage: Interdisciplinary collaboration with other institutions or outside the academic world is the highest among established R4 researchers. Interdisciplinary collaboration within the own institution is similar for R2 and R4 researchers (69.6% and 69.2% respectively). In all types of interdisciplinary collaboration there is a large gap between R1 and R4 researchers. For interdisciplinary collaboration within the own institution, with other institutions and outside academia the gap between R1 and R4 researchers is respectively 10, 19 and 15 pp. Apart from somewhat higher relative values for R2 in MORE4, the observations are consistent with the MORE3 data.

Field of science: Agricultural Sciences reveals the highest shares of interdisciplinary collaboration outside the researcher's own institute and outside academia. Medical Sciences has the highest share of interdisciplinary collaboration within the home institute of the researcher. The Social Sciences stand out for being the discipline with the lowest shares in each of the categories. Humanities has the second lowest shares of interdisciplinary collaboration across all types. This pattern is consistent with the observations in MORE3.

Gender: As in MORE3, differences between genders are small. Male researchers tend to work with or collaborate only slightly more in other fields than female researchers, considering both the own institution (68% versus 67%) and outside academia (27% versus 24%). In what concerns interdisciplinary collaboration with other institutes, female researchers have the same share as male researchers (63%).

Table 51: Types of interdisciplinary collaboration, by country

COUNTRY	RESEARCHERS IN ANOTHER DISCIPLINE BUT WITHIN THE SAME INSTITUTE	RESEARCHERS IN ANOTHER DISCIPLINE AND WORKING AT OTHER INSTITUTES	RESEARCHERS IN ANOTHER DISCIPLINE AND WORKING IN THE NON-ACADEMIC SECTOR
Austria	82.1%	72.4%	36.6%
Belgium	73.5%	54.7%	26.1%
Bulgaria	67.2%	60.0%	25.7%
Croatia	55.6%	58.8%	20.5%
Cyprus	57.7%	53.5%	26.3%
Czech Republic	64.6%	59.5%	22.7%
Denmark	51.5%	68.3%	30.6%
Estonia	68.4%	65.8%	16.9%
Finland	69.2%	65.6%	24.9%
France	63.4%	54.7%	26.0%
Germany	76.8%	64.1%	18.9%
Greece	45.0%	45.6%	19.3%
Hungary	60.3%	48.8%	20.0%
Iceland	61.8%	58.6%	34.9%
Ireland	64.2%	62.4%	33.9%
Italy	78.0%	72.8%	36.1%
Latvia	67.2%	72.7%	21.1%
Lithuania	65.3%	57.3%	16.6%
Luxembourg	69.6%	36.8%	11.7%
Malta	51.8%	49.1%	22.9%
Norway	56.5%	52.8%	17.8%
Poland	59.7%	67.3%	18.9%
Portugal	63.9%	58.1%	21.3%
Romania	84.1%	79.7%	39.8%
Slovakia	63.2%	51.2%	11.3%
Slovenia	69.7%	70.5%	17.2%
Spain	68.8%	61.1%	17.2%
Sweden	55.0%	56.1%	21.8%
Switzerland	77.7%	37.3%	17.9%
The Netherlands	56.6%	62.3%	16.3%
United Kingdom	66.5%	65.7%	34.7%
EU28	67.7%	62.9%	25.6%

Source: MORE4 EU HE survey (2019)
Notes:
- Multiple collaboration types per respondent are possible.
- Based on question 82 "Please indicate with whom you collaborate in your research"
- (n=9,321)

8.2.3. Interdisciplinary virtual mobility

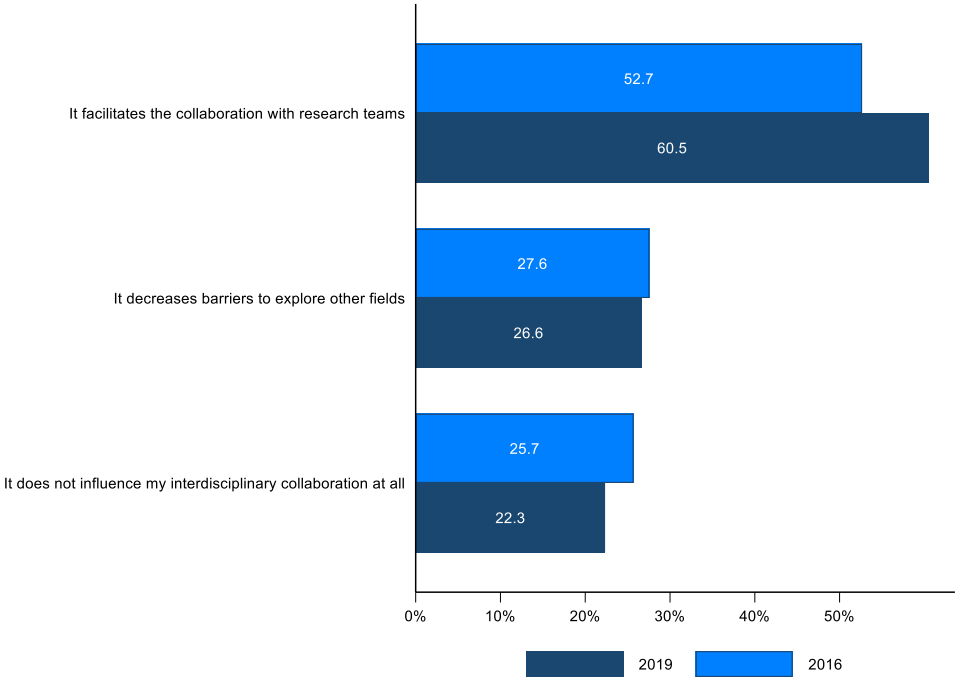
As for international mobility and collaboration, virtual tools can also facilitate interdisciplinary interaction between researchers. The extent to which this virtual collaboration has an impact on

researchers´ interdisciplinarity was surveyed for the first time in the MORE3 EU HE survey (2016). It is analysed in the following paragraphs for those researchers that collaborate across disciplines.

In general terms, the responses to the survey indicate that virtual mobility has a greater impact on facilitating collaboration with research teams (61% of the researchers collaborating across disciplines) than on decreasing barriers in order to exploit other fields (27%). For 22% of the respondents the web-based tools did not influence their interdisciplinary collaboration.

In comparison with MORE3, the most notable differences are that a larger share of researchers (who collaborate with partners in other disciplines) believes virtual technology facilitates the collaboration with research teams (61% in MORE4 versus 53% in MORE3) and that less researchers report that virtual technology has no influence on interdisciplinary collaboration (22% in MORE4 versus 26% in MORE3).

Figure 122: Influence of web-based or virtual technology on interdisciplinary collaboration (EU28)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Only respondents who collaborate with partners in other disciplines.
- Multiple options per respondent are possible.
- Based on question 85: "How does the use of web-based or virtual technology influence your interdisciplinary collaboration?"
- (2019: n=6,624; 2016: n=7,085)

Country level: We see again significant differences across European countries, such as only 67% of researchers in Denmark, 67% in The Netherlands and 69% in Finland admitting an influence of web-based tools on their interdisciplinary collaboration (either facilitating collaboration, removing barriers,

or both[128]). Similar to MORE3, we find the opposite in Eastern European countries like Romania (93%), Bulgaria (85%) and Poland (83%), as well as in a number of Southern European countries like Spain (86%) and Malta (83%).

Career stage: Differences across career stages are pronounced with R4 seeing the smallest influence of virtual technology on interdisciplinary collaboration. 27% indicated that virtual technologies have no influence (compared to 22% for R1 researchers and 20% for R2 and R3 researchers).

Field of science: The share of researchers that indicate virtual technologies have no influence on interdisciplinary collaboration is very similar across Natural Sciences, Engineering and Technology, Social Sciences and Humanities. Among these fields of science, the lowest share reported is 23% (Social Sciences) and the highest share 24% (Humanities). Across all fields of science, Medical Sciences (19%) and Agricultural Sciences (20%) are the ones with the lowest shares of researchers that indicate there is no influence of virtual technology.

Gender: As in MORE3, there is no significant difference between male and female researchers. The most important difference between male and female researchers with respect to their views on the influence of virtual technology on interdisciplinary collaboration is linked to the perception that it decreases barriers to explore other fields. 28% of the female researchers report it indeed decreases barriers, compared to 25% of the male researchers.

8.3. Intersectoral mobility and collaboration in post-PhD stage

This section discusses the intersectoral mobility related to the post-PhD stage. This dimension of mobility is strongly related to what has been called the "European Paradox"; that is, the difficulties faced in Europe "to sufficiently turn research results into globally competitive products"[129]. The fact that there were not enough researchers working in industry has been pointed out as one of the reasons behind this paradox, and as a factor that may hinder European economic development and innovation[130]. In this context, one of the objectives of the European Research Area (ERA) has always been the consolidation of a critical mass of researchers that would be sufficiently large to be able to develop the R&D that Europe needs to foster its competitiveness at a global level. This section of the report shows the main figures and trends related to this type of mobility among researchers working in HEIs. It generally shows a situation characterised by overall stability over time. The analysis is structured as follows:

- Intersectoral mobility (section 8.3.1), including the stock of intersectoral researchers and the effects on recruitment and career progression;
- Intersectoral collaboration (section 8.3.2).

[128] This is the share of researchers that did not indicate virtual technology has no influence on interdisciplinary collaboration at all in question 85.

[129] European Commission (2006), Mobility of Researchers between Academia and Industry. 12 Practical Recommendations. http://ec.europa.eu/euraxess/pdf/research_policies/mobility_of_researchers_light.pdf

[130] Vandevelde, K (2014). Intersectoral Mobility. Report from the 2014 ERAC mutual learning workshop on Human Resources and Mobility.

8.3.1. *Intersectoral mobility*

SHARE OF RESEARCHERS WITH INTERSECTORAL POST-PHD DEGREE MOBILITY (of all R2, R3 and R4 researchers in EU28)					
	EU28 Total	**Per (current) career stage**	**Per FOS**	**Per gender**	**Per destination sector**
2012 (n=7,131)	30.0%	R2: 27.3% R3: 28.9% R4: 33.3%	NAT: 28.6% ENG: 34.0% MED: 26.6% AGR: 44.9% SOC: 33.0% HUM: 26.3%	F: 28.1% M: 31.0%	Public sector:15.5% Private sector: 17.8%[131]
2016 (n=8,073)	24.8%	R2: 22.1% R3: 24.5% R4: 26.7%	NAT: 22.8% ENG: 29.9% MED: 18.5% AGR: 33.2% SOC: 29.6% HUM:19.4%	F: 23.5% M: 25.4%	Public sector:12.7% Private sector: 15.7%
2019 (n=7,653)	23.8%	R2: 17.4% R3: 23.4% R4: 27.4%	NAT: 21.4% ENG: 26.8% MED: 18.5% AGR: 27.0% SOC: 31.6% HUM:18.2%	F: 22.6% M: 24.5%	Public sector:12.4% Private sector: 14.7%

Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016) and MORE2 EU HE survey (2012)
Note:

- Based on question 86: "Have you ever worked as a researcher (excluding PhD) in the non-university/higher education sector (e.g. companies, NGOs, charities, non-university research institutes, governmental bodies/agencies)?"

8.3.1.1 *Stock*

If we analyse the group of researchers formed by R2, R3 and R4 researchers, it can be observed that almost one in every of four have worked in non-academic sectors at some point during their career (24%). Men tend to be slightly more intersectorally-mobile than women: 25% of men compared to 23% of women. However, this difference is small and may also be related to the fact that researchers are more likely to have had the opportunity to work in other sectors when they have longer careers and that men are more strongly represented among R4 researchers.

While there was a drop in the share of intersectorally-mobile researchers between 2012 and 2016 (30% to 25%), the figure now remains relatively stable at 24% in 2019. Differences have grown larger between career stages, with 6pp difference between R2 and R3 (versus 2pp difference in 2016) and 4 pp difference between R3 and R4 (versus 2pp difference in 2016).

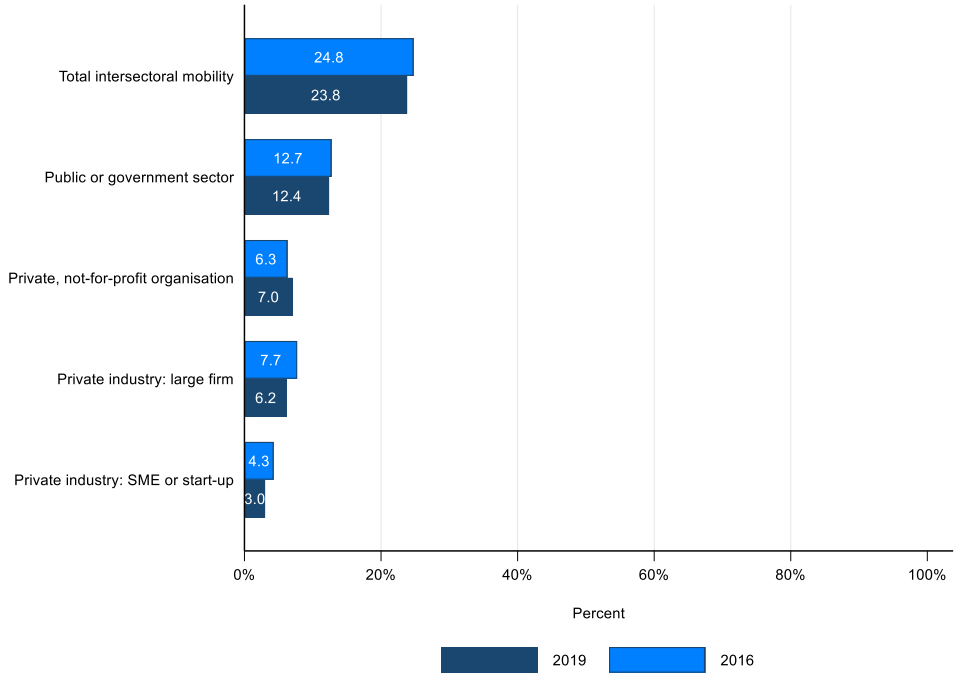
[131] The share of private sector mobility includes the private not-for-profit sector.

8.3.1.2 Flows and moves

The survey also provides information on the non-academic sectors in which researchers have worked. Comparing the private to the public sector, the private sector attracts relatively more researchers (15% versus 12%, see Figure 123). In total, 6% of all R2 to R4 researchers indicated that they had been intersectorally-mobile to large firms, 3% to SMEs or start-ups, and another 7% indicated that they had been to private not-for-profit organisations. Figure 123, shows that the distribution of intersectoral mobility destinations remained stable between 2016 and 2019.

Within each non-academic sector, the difference between the share of female and male researchers that report having worked in the sector in question is less than 1 percentage point, excluding large firms. In this sector a more pronounced difference can be noticed. 7% of male researchers indicate having worked in large firms, compared to 4% of female researchers.

Figure 123: Intersectoral mobility, by sector (EU28)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Only R2, R3 and R4 researchers.
- The total share of intersectoral mobility is not equal to the sum of the rest of the categories because multiple options were possible per respondent.
- Based on question 87: "Please indicate in which sector(s) you have worked that were not a university or higher education setting"
- (2019: n=7,653;2016: n=8,073)

As Table 52 and Figure 124 show, these figures conceal a significant variation across countries. The least intersectorally-mobile countries are Portugal (18%), Belgium (20%) and Italy (20%), closely followed by Germany (20%). The most mobile countries are Latvia (37%), Switzerland (36%) and Bulgaria (33%). France and Switzerland are the only countries with an increased indicator for intersectoral mobility

since 2016 (from 17% to 22% and from 33% to 36% respectively). In most countries, the indicator has decreased. The strongest decrease is observed in Iceland and Lithuania (from 49% to 26% and from 42% to 22% respectively).

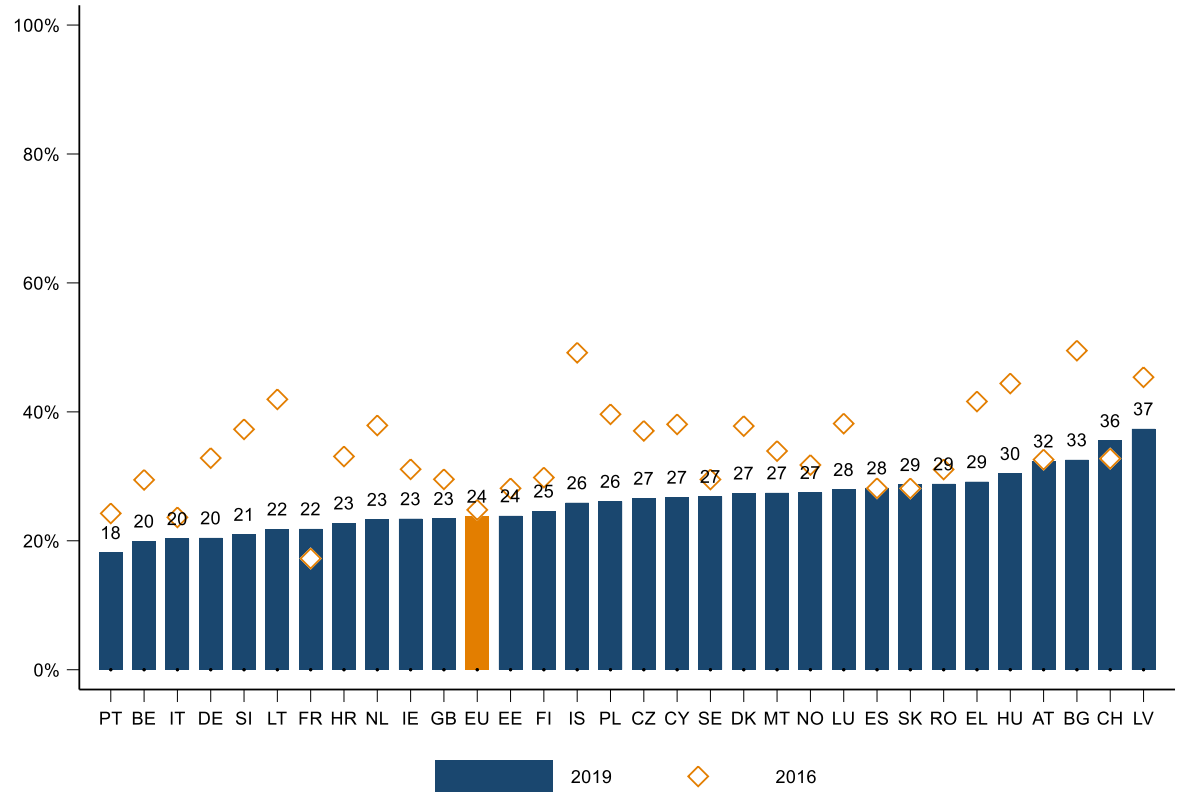
Table 52: Share of researchers having been intersectorally-mobile, by country

COUNTRY	TOTAL INTERSECTORAL MOBILITY	TO PUBLIC/ GOVERNMENT SECTOR	TO PRIVATE NOT-FOR-PROFIT SECTOR	TO PRIVATE SECTOR: LARGE INDUSTRY	TO PRIVATE SECTOR: SMES AND START-UPS
Austria	32.4%	15.7%	10.1%	10.5%	4.4%
Belgium	20.0%	10.2%	10.2%	1.7%	1.7%
Bulgaria	32.6%	14.2%	13.4%	8.8%	5.7%
Croatia	22.8%	8.4%	5.6%	7.8%	6.5%
Cyprus	26.8%	12.2%	8.7%	8.7%	2.3%
Czech Republic	26.6%	14.6%	6.7%	8.2%	2.6%
Denmark	27.4%	16.6%	5.4%	7.3%	4.2%
Estonia	23.9%	13.3%	7.0%	4.2%	4.2%
Finland	24.6%	13.6%	7.5%	4.8%	4.0%
France	21.8%	11.6%	7.8%	4.4%	2.9%
Germany	20.4%	7.4%	3.4%	10.1%	2.0%
Greece	29.2%	14.5%	7.6%	10.1%	3.8%
Hungary	30.4%	13.0%	10.6%	9.7%	7.2%
Iceland	25.9%	13.3%	6.3%	9.1%	2.8%
Ireland	23.4%	12.7%	7.6%	6.5%	2.8%
Italy	20.3%	12.8%	5.3%	4.4%	4.4%
Latvia	37.4%	17.4%	9.7%	12.9%	5.8%
Lithuania	21.8%	10.4%	7.8%	3.0%	7.0%
Luxembourg	27.9%	20.3%	5.1%	6.4%	0.0%
Malta	27.4%	15.4%	6.0%	8.2%	3.8%
Norway	27.5%	12.1%	9.8%	6.5%	6.9%
Poland	26.1%	14.5%	7.7%	3.9%	2.9%
Portugal	18.2%	9.8%	4.8%	4.2%	6.0%
Romania	28.8%	11.7%	14.0%	4.3%	4.3%
Slovakia	28.7%	19.7%	9.0%	5.6%	5.1%
Slovenia	21.0%	13.6%	3.7%	4.7%	0.5%
Spain	28.2%	17.6%	13.0%	1.6%	3.3%
Sweden	26.9%	15.9%	5.9%	8.4%	4.1%
Switzerland	35.5%	15.2%	8.0%	13.1%	8.0%
The Netherlands	23.3%	8.5%	4.3%	7.4%	5.4%
United Kingdom	23.5%	12.7%	7.0%	5.9%	1.9%
EU28	**23.8%**	**12.4%**	**7.0%**	**6.2%**	**3.0%**

Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers.
- Based on question 87: "Please indicate in which sector(s) you have worked that were not a university or higher education setting"
- (n=8,300)

Figure 124: Evolution of intersectoral mobility, by country (2016-2019)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Only for R2, R3 and R4 researchers.
- Based on question 86: "Have you ever worked as a researcher (excluding PhD) in the non-university/higher education sector (e.g. companies, NGOs, charities, non-university research institutes, governmental bodies/agencies)?"
- (2019: n=8,300; 2016: n=8,073)

8.3.1.2.1 Types of contract

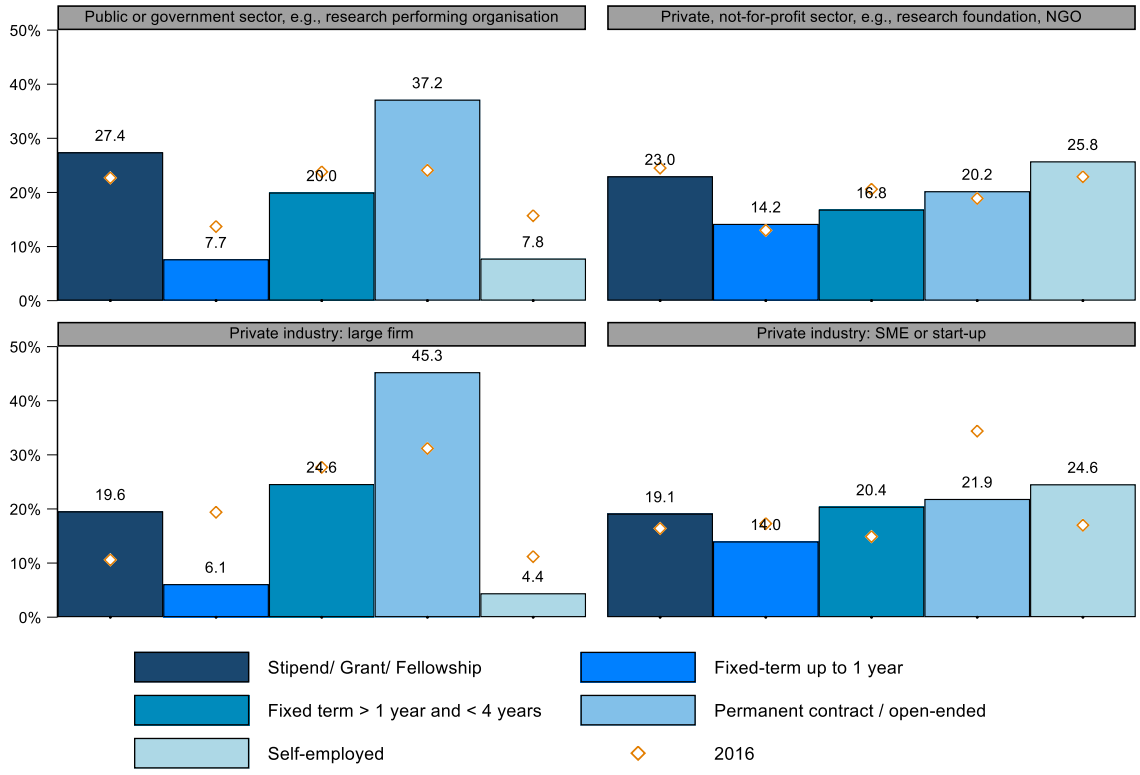
When the last intersectoral mobility event took place less than ten years ago, the researchers were asked about specific characteristics, such as the type of contract they had when employed outside the academic sector. The survey results show that the type of contract is highly dependent on the sector in which researchers are hired.

The distribution of the types of contract is highly similar in the public sector and large firms on the one hand, and in the private not-for-profit sector and SMEs/start-ups on the other. In the former two sectors, the share of permanent contracts is the highest, while in the latter two sectors, self-employment is more common.

Stipends, grants or fellowships are an important category in each sector. Furthermore, in all sectors the shares of researchers with a specific fixed term or permanent contract increased in line with the duration of the contract.

In comparison to MORE3, the shares of permanent contracts and stipends/grants/fellowships increased significantly within the public sector and large firms. Among SMEs and start-ups, the share of permanent contracts decreased sharply to the benefit of the self-employment status and fixed term contracts of between 1 and 4 years in duration.

Figure 125: Types of contract for intersectoral mobility, by sector (EU28)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Only R2, R3 and R4 researchers who were intersectorally-mobile in the last ten years.
- Based on question 90: "Type of contract"
- (2019: n=930; 2016: n= 1333)

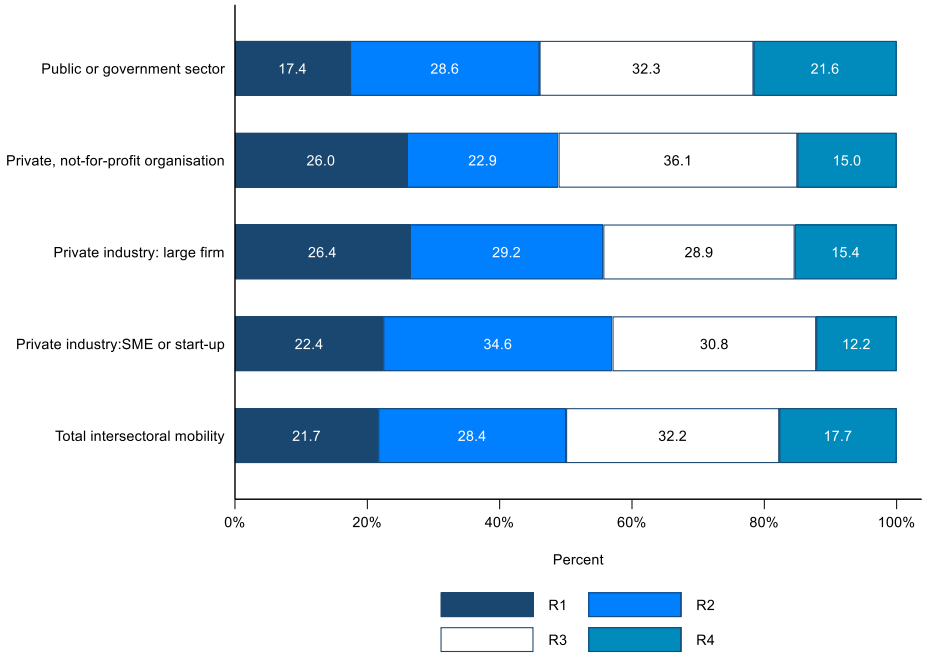
8.3.1.2.2 Career paths

Not all sectors attract researchers at the same level of career development. The experience and skills researchers have in each career stage might be either more or less suited to the needs of each sector. Figure 126 shows how researchers are most inclined to engage in intersectoral mobility while they are in the established stage (R3). This is even more pronounced than in MORE3, and the case for every sector. The shares of R3 researchers are particularly high among mobile researchers to the public sector or large firms. Recognised researchers (R2) constitute the second largest group in all sectors, except when it comes to mobility to SMEs or start-ups where R4 researchers are more common. The younger cohorts (R1) are the least common group of researchers in every sector considered. This is different from MORE3, where R1 researchers were significantly more intersectorally-mobile to all sectors (11pp decrease in total), and R4 were less mobile on average (4pp increase in total, and in particular 18pp

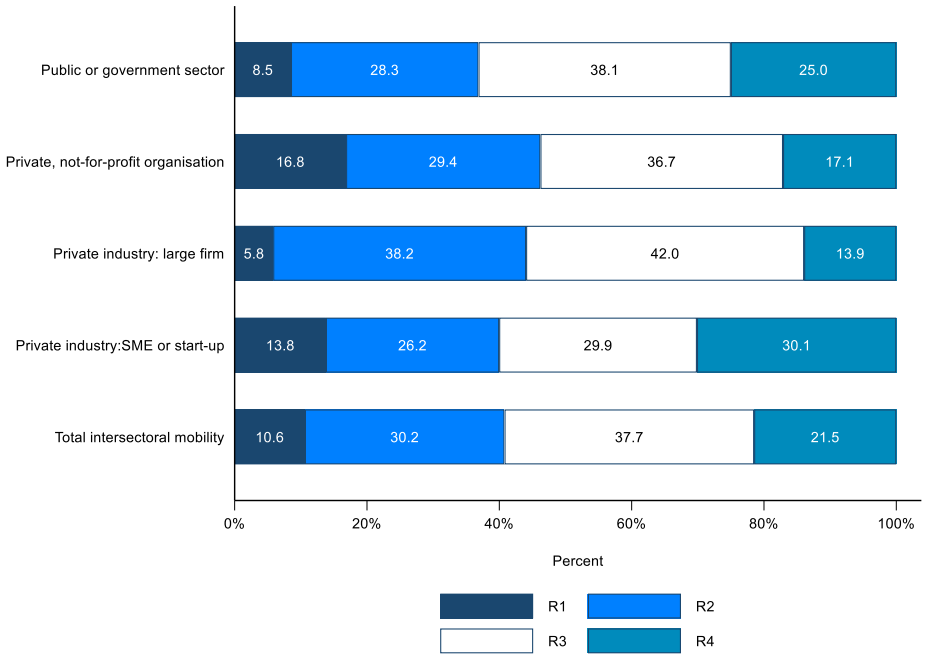
increase in SMEs and start-ups). These observations suggest that there is some volatility in these data on intersectoral mobility. Longer time series will be able to confirm whether there are any trends in this indicator.

Figure 126: Career stages at the start of the intersectoral move, by sector

2016:



2019:

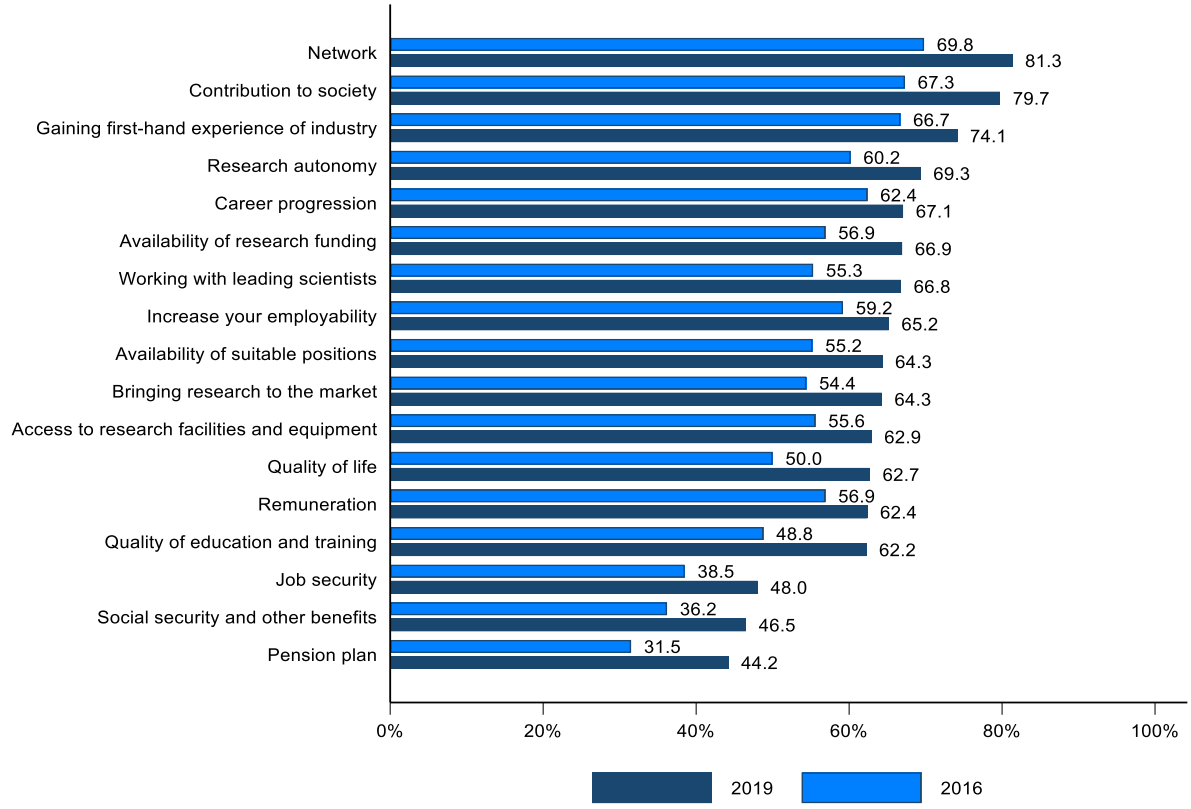


Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Only R2, R3 and R4 researchers who were intersectorally-mobile in the last ten years.
- Based on question 91: "What was your career stage at the start of this research position/employment?"
- (2019: n=1,084; 2016: n=1,333)

8.3.1.3 Motives

Figure 127: Motives for intersectoral mobility (EU28)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Only R2, R3 and R4 researchers who were intersectorally-mobile in the last ten years.
- Share of intersectorally-mobile researchers who consider the factor important over those who consider it important or not important (total minus 'NA' category).
- Based on question 92: "Which of the following factors were important in your decision to undertake this move?"
- (2019: n= 1,084; 2016: n=1,333)

The main motives for researchers taking part in intersectoral mobility are the same as in 2016 (see Figure 127): networking (81% in 2019, 70% in 2016), contribution to society (80% in 2019, 67% in 2016) and gaining first-hand experience of industry (74% in 2019, 67% in 2016). Furthermore, all motives for intersectoral mobility have gained in importance. In particular quality of education and training, quality of life and pension plan increased by 13pp, while career progression and renumeration increased only by 5pp and employability by 6pp. Quality of education and training may have become more important since more R1 researchers are involved in intersectoral mobility in 2019 than in 2016.

Different factors motivate researchers to work in a non-academic sector. Building a network stands out as a motive that is mentioned across the four main sectors analysed in the survey: public sector, not-for-profit organisations, large companies[132] and SMEs. However, there are important differences for the

[132] With respect to the decision of intersectoral mobility to large firms building a network is the fourth most cited motive.

other motives. The will to contribute to society is one of the top three motives for those working in the public sector and in not-for-profit organisations. Among those working in large firms, the desire to gain industry-specific experience is the most relevant motive, whereas renumeration is the most important motive in SMEs and start-ups. In SMEs and start-ups, researchers are also motivated by the idea of bringing research to the market.

Table 53: Three most frequently cited motives for intersectoral mobility, by destination sector (EU28)

2016 (n=1,333)	
Public sector or government organisation	Network (73.1%) Contribution to society (72.6%) Career progression (64.3%)
Private, not for profit sector	Contribution to society (71.9%) Network (71.7%) Research autonomy (69.9%)
Private sector: large companies	Gaining first-hand experience of industry (72%) Remuneration (66.3%) Career progression (64.5%)
Private sector: SMEs and start-ups	Gaining first-hand experience of industry (77.71%) Network (73%) Bringing research to the market (59.7%)
2019 (n=1,084)	
Public sector or government organisation	Contribution to society (86.0%) Network (84.3%) Research autonomy (74%)
Private, not for profit sector	Network (81.4%) Contribution to society (79.8%) Gaining first-hand experience of industry (72.3%)
Private sector: large companies	Gaining first-hand experience of industry (76.2%) Career progression (73.2%) Access to research facilities and equipment (72.8%)
Private sector: SMEs and start-ups	Renumeration (83.5%) Network (83.4%) Bringing research to the market (82.1%)

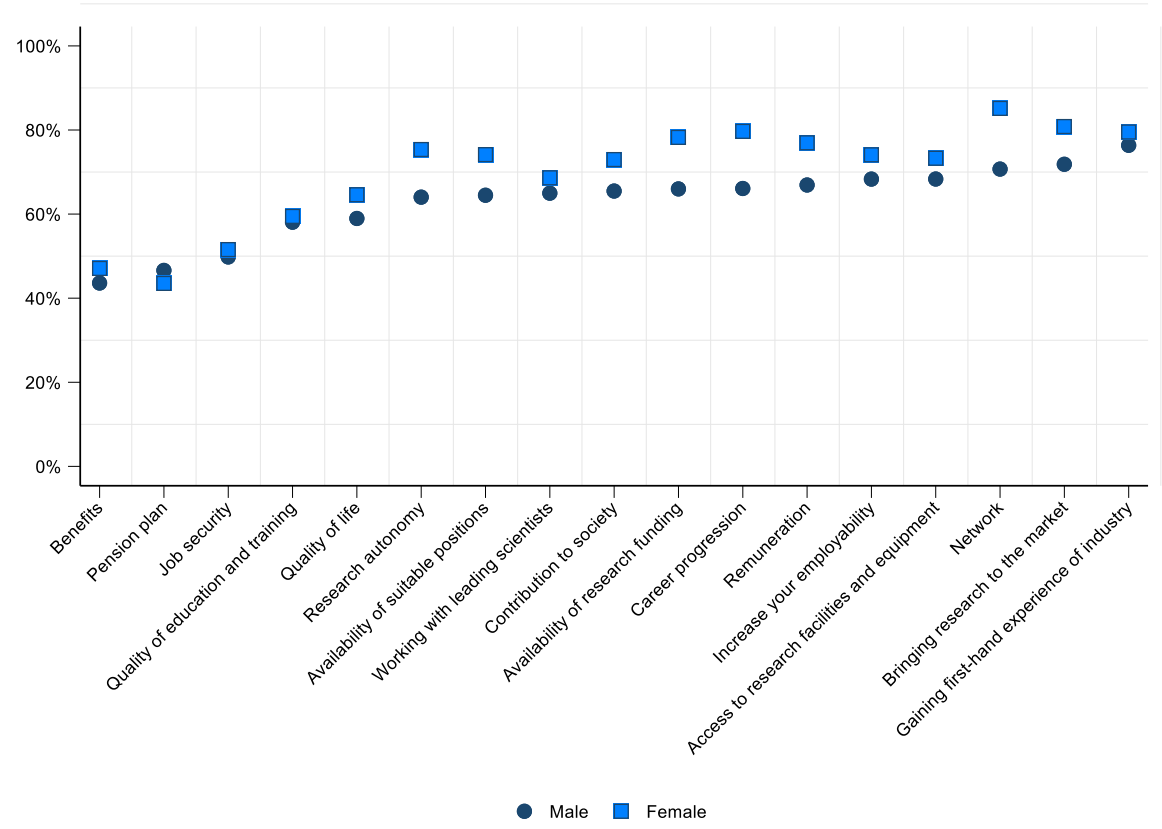
Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:
- Only R2, R3, R4 researchers who have undertaken an intersectoral move in the last ten years
- Based on question 92: "Which of the following factors were important in your decision to undertake this move?"

In terms of gender-related differences, Figure 128 displays the relative shares of male and of female researchers that consider each of the factors important in the private sector. In general, the share of female researchers reporting that the considered motives are important is higher than or equal to the share of male researchers. In MORE3, in contrast, male researchers found network opportunities and bringing research to the market more important than female researchers.

The top three motives among female researchers were access to networks (85%), bringing research to the market (81%) and career progression (80%). Among male researchers, the top three motives are

gaining first-hand experience of the industry (76%), bringing research to the market (72%) and network (71%). The fact that gaining first-hand experience of the industry is the most important motive among male researchers, comes as no surprise given the higher share of male researchers working in large firms (see also section 8.3.1.2 on flows and moves). Note that two of the motives are both in the top three motives for undertaking intersectoral mobility among male and female researchers. The least important motives among both male and female researchers, and reflecting the earlier observations, are those related to social security and other benefits, pension plans and job security. However, secondary literature indicates that whilst these areas are still important to researchers, they are not the primary motivators for undertaking a period of intersectoral mobility.

Figure 128: Motives for intersectoral mobility to the private sector among those who have undertaken an intersectoral move in the last ten years (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers who are currently working in the private sector.
- Within the private sector only large firms and SMEs/start-ups are considered.
- Based on question 92: "Which of the following factors were important in your decision to undertake this move?"
- (n=298)

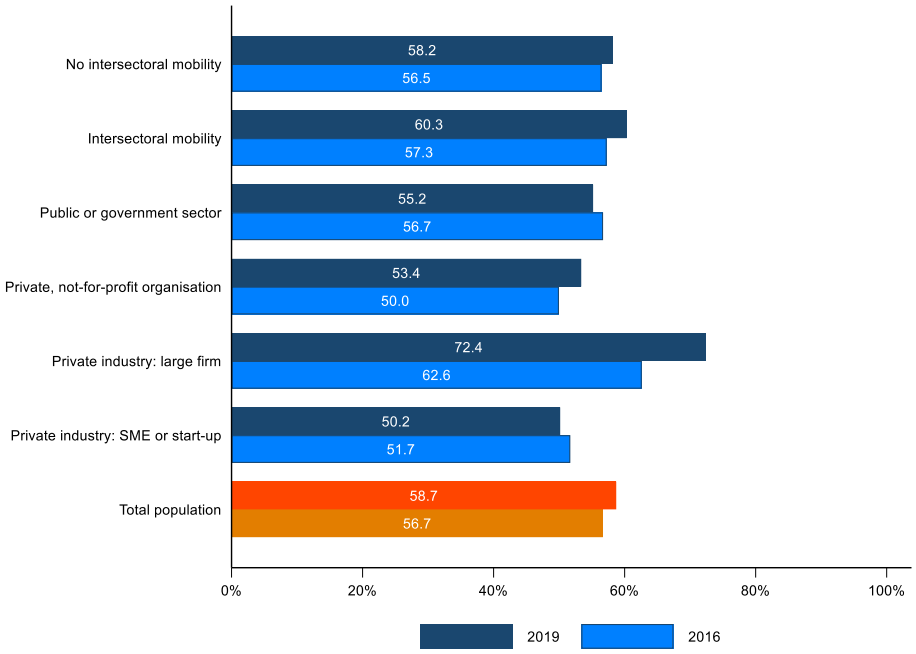
8.3.1.4 Effects

In this section the effects of taking part in intersectoral mobility are considered. The analysis is based on the survey questions on whether or not different aspects are a positive factor for recruitment and career progression. Two of these aspects refer to intersectoral mobility: 1) an intersectoral mobility experience to the private industry and 2) an intersectoral mobility experience to the not-for-profit, public or government sectors. The detailed analysis of these factors is presented in sections 5.3.3 (factors for recruitment) and 5.4.3.2 (factors for career progression). Here, we focus on whether it makes a difference that researchers have experienced intersectoral mobility as regards their perception as to the nature and extent of its influence on recruitment and career progression.

Recruitment and intersectoral mobility to the private industry: Interestingly, there are no major differences between researchers who have been intersectorally-mobile and those who have not in terms of whether they consider such mobility to the private industry as a positive factor for recruitment. On average 60% of the researchers that have been intersectorally-mobile report that such mobility to the private sector is a positive factor for recruitment, compared to 58% of those who were not (total also 59%, see Figure 129) .

Among intersectorally-mobile researchers, however, there are important differences depending on the sector where they worked and the size of enterprise (Figure 129). Those having worked for large firms are convinced that working in the private industry is important for recruitment as a researcher in their home institution. Their share has increased even further from 63% in 2016 to 72% in 2019. This is not the case for those having worked in SMEs or start-ups. Together with the researchers who have worked in the non-profit sector and (to a smaller extent) the public or government sector, they are even less positive about this factor than those who have not worked in another sector in the last ten years. This is comparable to the observations made in the MORE3 study.

Figure 129: Agreement with intersectoral mobility to private industry as positive factor for recruitment depending on the intersectoral mobility experience



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

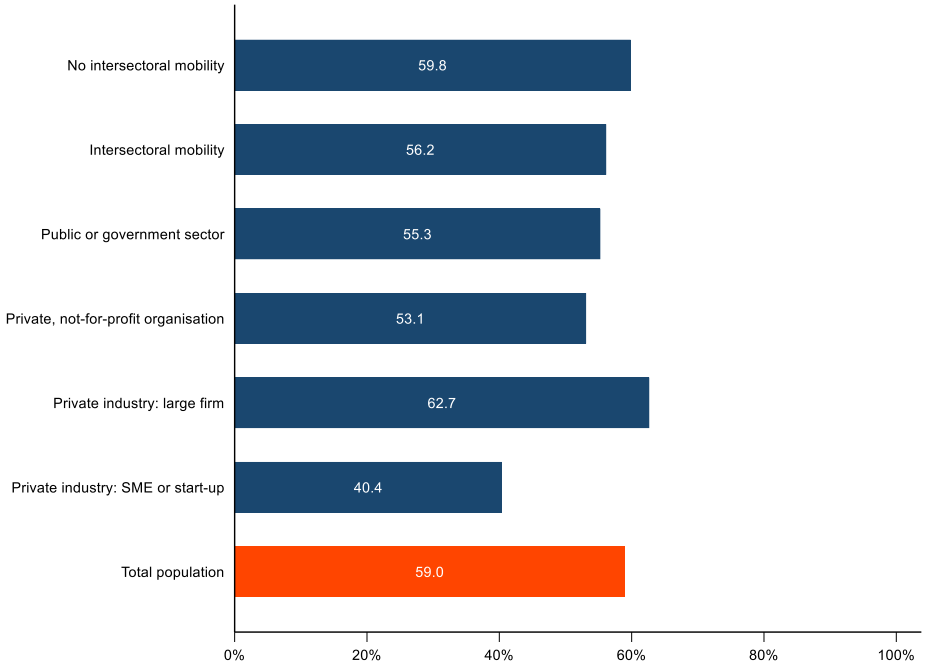
- Only R2, R3 and R4 researchers
- Based on question 39: "In your experience, would you say the following factors are regarded as positive or negative factors for recruitment in your home institution?" and question 87: "Please indicate in which sector(s) you have worked that were not a university or higher education setting"
- (2019: n=7,653; 2016: n=8,073)

Recruitment and intersectoral mobility to the not-for-profit, public or government sector: In contrast to MORE3, the MORE4 survey additionally asks whether an intersectoral mobility experience to the not-for-profit, public or government sector is regarded as a positive or negative factor for recruitment in the home institution. Figure 130 reveals that the overall perception is similar to the effects of mobility to the private sector. There is almost no difference in total in the share of researchers that consider intersectoral mobility to the private sector versus to the not-for-profit, public or government sector as a positive factor for recruitment (59%, see Figure 130).

The difference between researchers that were intersectorally-mobile (to any sector) and those who were not is more pronounced than in the case of intersectoral mobility to the private sector. 60% of the researchers that have not been intersectorally-mobile report intersectoral mobility to the public sector as a positive factor for recruitment compared to on average 56% of those who were intersectorally-mobile (versus respectively 58% and 60% for intersectoral mobility to the private sector).

There is also an important difference among the researchers who previously worked in large firms and SMEs. A smaller share of 63% and 40% respectively, consider this type of intersectoral mobility a positive factor for recruitment (versus 72% and 50% for mobility to the private sector).

Figure 130: Agreement with intersectoral mobility to the not-for-profit, public or government sector as positive factor for recruitment depending on the intersectoral mobility experience



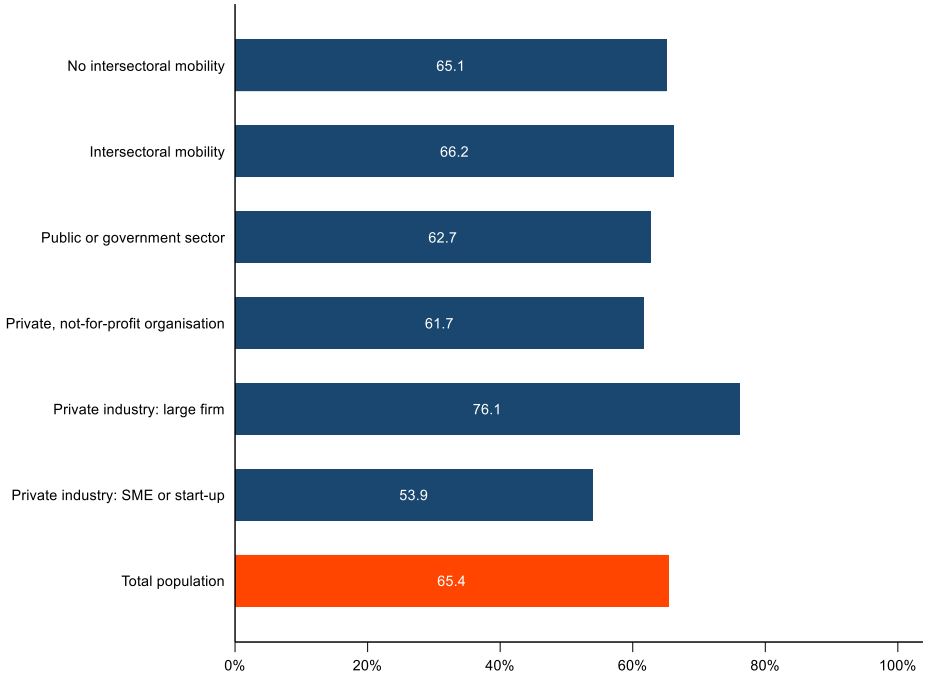
Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers
- Based on question 39: "In your experience, would you say the following factors are regarded as positive or negative factors for recruitment in your home institution?" and question 87: "Please indicate in which sector(s) you have worked that were not a university or higher education setting"
- (n=7,653)

Recruitment and intersectoral mobility in general: Figure 131 presents the share of researchers that agree on intersectoral mobility in general (aggregating mobility to private industry and/or not-for-profit, public or government sector) to be a positive factor for recruitment. Comparing researchers who were intersectorally-mobile (to any sector) and those who were not, we find no significant difference in their perception of intersectoral mobility in general to be a positive factor for recruitment. 65% of the researchers that were not intersectorally mobile consider intersectoral mobility to be a positive factor for recruitment versus 66% of those who were intersectorally mobile.

The results are again presented depending on the sector of their own intersectoral mobility experience (Figure 131). When combining both aspects, 76% of the researchers who have worked in a large firm in the last ten years consider one of the two (or both) forms of intersectoral mobility as a positive factor for recruitment. This is 54% for those who worked in an SME or start-up, 62% for those who have worked in the private not-for-profit sector and 63% for those who worked in the public sector.

Figure 131: Agreement with intersectoral mobility in general (private industry and/or not-for-profit, public or government sector) as positive factor for recruitment depending on the intersectoral mobility experience



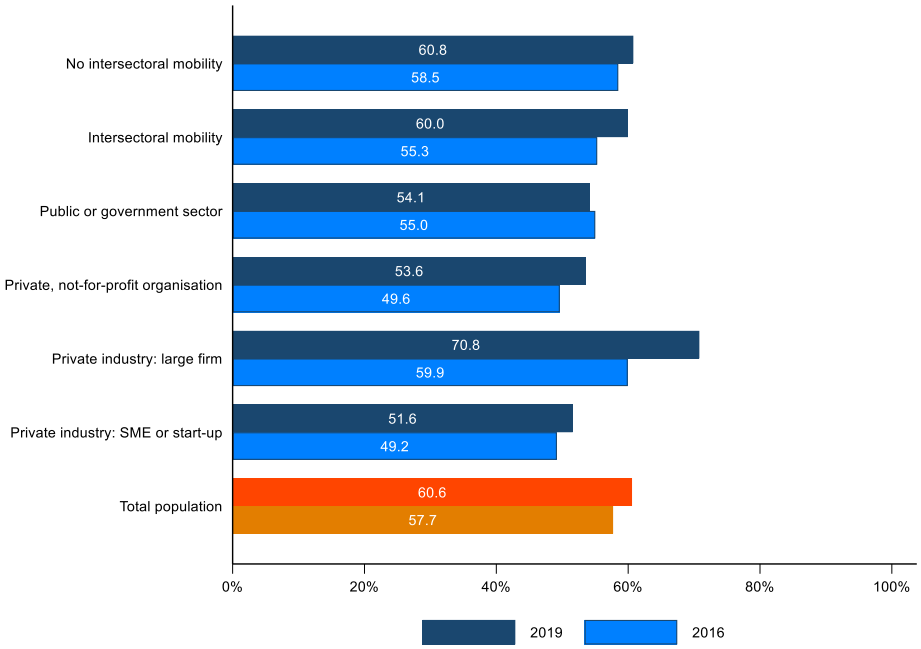
Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers.
- Based on question 39: "In your experience, would you say the following factors are regarded as positive or negative factors for recruitment in your home institution?" and question 87: "Please indicate in which sector(s) you have worked that were not a university or higher education setting"
- (n=7,653)

Career progression and intersectoral mobility to the private industry: Whether or not a researcher is intersectorally-mobile does not seem to have a significant impact on the extent to which they believe intersectoral mobility to the private industry is important for their career progression. The share of researchers that were intersectorally-mobile and consider intersectoral mobility to the private industry as a positive factor for career progression is 60% compared to 61% of the researchers that were not intersectorally-mobile.

Figure 132 shows how the pattern is similar to that found in the analysis for recruitment (see Figure 129). Across the different sectors again important variation can be noticed. The share of researchers having worked in large firms that believe intersectoral mobility to the private industry to be a positive factor for career progression is higher than average. The opposite holds for researchers that worked in SMEs, the public sector or the not-for-profit sector.

Figure 132: Agreement with intersectoral mobility to the private industry as positive factor for career progression depending on the intersectoral mobility experience



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

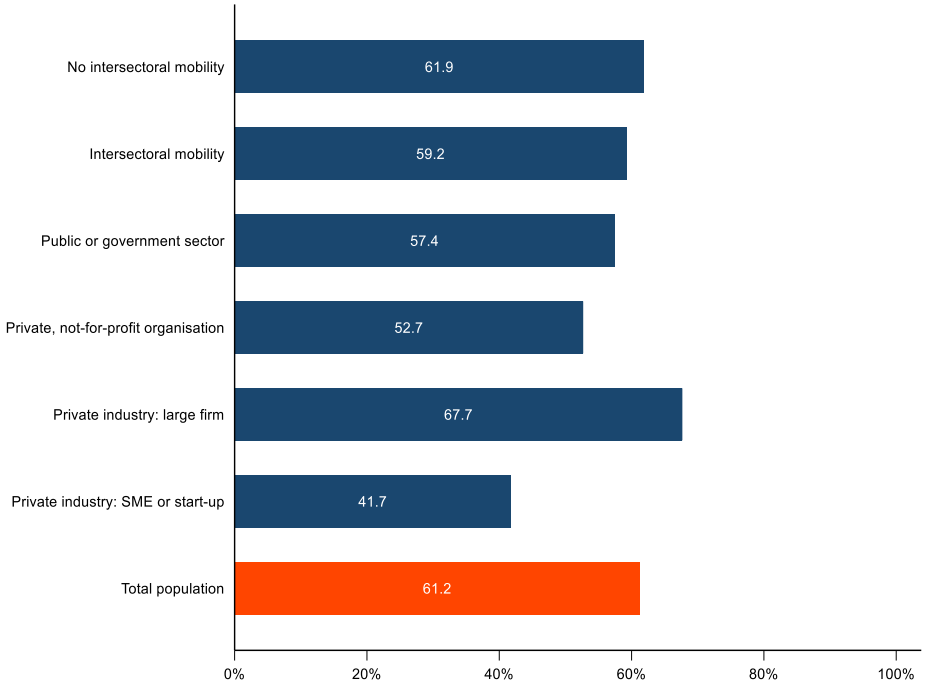
- Only R2, R3 and R4 researchers.
- Based on question 40: "In your experience, would you say the following factors are regarded as positive or negative factors for career progression in your home institution?", and question 87: "Please indicate in which sector(s) you have worked that were not a university or higher education setting"
- (2019: n=7,653; 2016: n=8,073)

Career progression and intersectoral mobility to the not-for-profit, public or government sector: Figure 133 reveals that the share of researchers that consider intersectoral mobility to the not-for-profit, public or government sector to be positive for career progression is overall comparable with the share of researchers that consider intersectoral mobility to the private industry to be important (61%, see Figure 132 and Figure 133).

Like for recruitment, however, intersectorally mobile reseachers are on average less convinced that intersectoral mobility to the not-for-profit, public or government sector is positive for career progression (59% versus 62% among the intersectorally non-mobile; 61% in total). Again, like for recruitment, this is a small but stronger difference than for intersectoral mobility to the private sector.

The researchers that have worked in SMEs are less inclined to answer positively for the not-for profit, public and government sector than for the private sector. In other words, having worked in an SME as a researcher, tends to increase the perceived importance of intersectoral mobility to the private industry relative to the not-for-profit, public and government sector – both for recruitment and career progression.

Figure 133: Agreement with intersectoral mobility to the not-for-profit, public or government sectors as positive factor for career progression depending on the intersectoral mobility experience



Source: MORE4 EU HE survey (2019)
Notes:

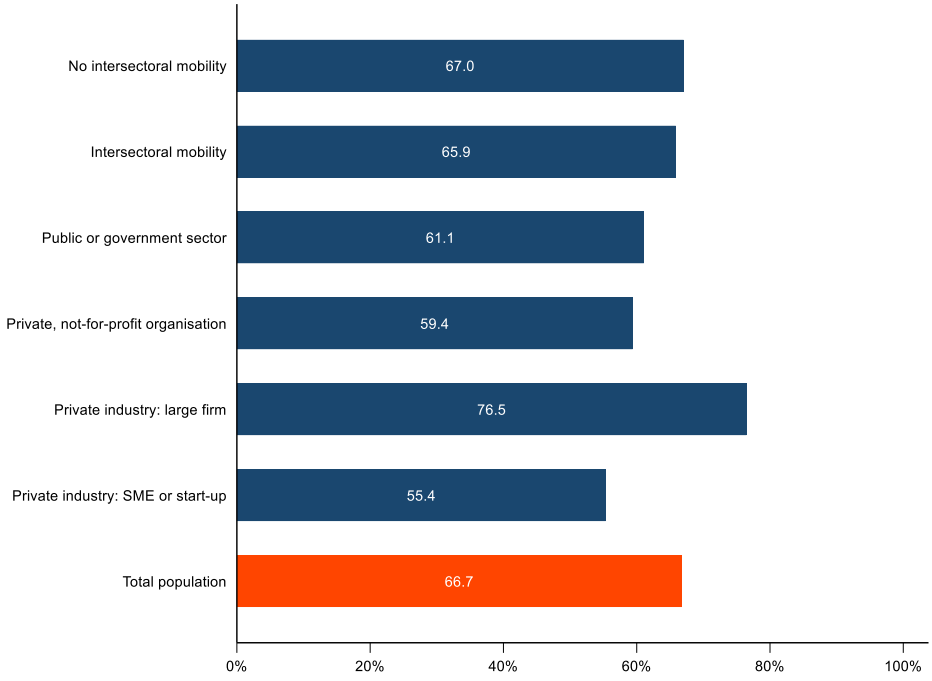
- Only R2, R3 and R4 researchers.
- Based on question 40: "In your experience, would you say the following factors are regarded as positive or negative factors for career progression in your home institution?", and question 87: "Please indicate in which sector(s) you have worked that were not a university or higher education setting"
- (n=7,653)

Career progression and intersectoral mobility in general: Figure 134 presents the share of researchers that agree that intersectoral mobility in general (aggregating mobility to private industry and/or not-for-profit, public or government sector) is a positive factor for career progression. When combining both aspects, 67% of the researchers without intersectoral mobility experience consider one of the two (or both) forms of intersectoral mobility as a positive factor for career progression. For those who had an intersectoral mobility experience (to any sector), this share drops to 66%.

Considering the specific sectors to which researchers were intersectorally-mobile, almost 77% of the researchers who have worked in a large firm in the last ten years perceive intersectoral mobility in general as having been a positive factor in their career progression. These shares are only 55% for those who have worked in an SME or start-up, 59% for those having worked in the private not-for-profit sector and 61% for those who worked in the public sector.

In summary, the general perception of the effects of intersectoral mobility on career progression, does not seem to improve after an intersectoral mobility experience, except for moves to large firms in the private industry.

Figure 134: Agreement with intersectoral mobility in general (private industry and/or not-for-profit, public or government sector) as positive factor for career progression depending on the intersectoral mobility



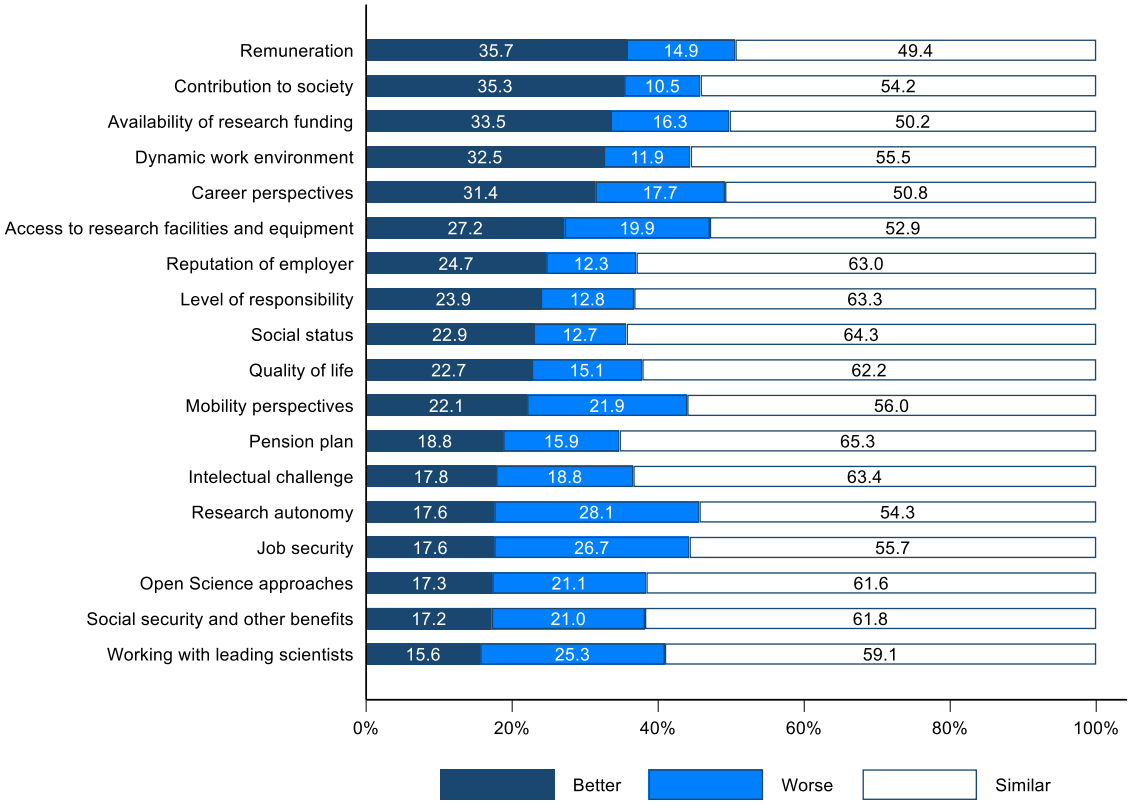
Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers.
- Based on question 40: "In your experience, would you say the following factors are regarded as positive or negative factors for career progression in your home institution?", and question 87: "Please indicate in which sector(s) you have worked that were not a university or higher education setting"
- (n=7,653)

Satisfaction with intersectoral mobility: When asked about the differences between working in the HEI sector compared to working outside, on almost every dimension considered, the majority of (intersectorally-mobile) researchers report that the HEI sector and the outside sector are similar. The exception is related to remuneration. Only 49% of the researchers who were intersectorally-mobile consider remuneration outside and inside the HEI sector to be similar.

For most of the criteria the share of researchers that consider working outside the HEI sector is better, is larger than the share of those that consider it worse. Among those criteria, the five most important ones are remuneration, contribution to society, availability of research funding, dynamic working environment and career perspectives. For six criteria, the share of researchers that consider working outside the HEI sector to be worse, is larger than the share of those who believe it is better. These are working with leading scientists, social security, Open Science approaches, job security, research autonomy and intellectual challenge.

Figure 135: Share of intersectorally mobile researchers considering that working outside he institutions is better, worse or similar to working inside (EU28)



Source: MORE4 EU HE survey (2019)
Notes:

- Only R2, R3 and R4 researchers who were intersectorally-mobile in the last ten years.
- Based on question 93: "How does working as a researcher outside the HEI sector compare to working in the HEI sector?"
- (n=1,173)

8.3.2. *Intersectoral collaboration*

8.3.2.1 *Collaboration with academic researchers outside the own institution and non-academic researchers*

INTERSECTORAL COLLABORATION [133]				
2016 (n=9,412)	**EU28 total**	**Per (current) career stage**	**Per FOS**	**Per gender**
Academic (Outside own institution)	80.2%	R1: 66.8% R2: 71.3% R3: 81.2% R4: 91.0%	NAT: 85.9% ENG: 80.8% MED: 73.9% AGR: 80.0% SOC: 79.5% HUM: 81.0%	F: 78.6% M: 81.2%
Non-academic (Intersectoral collaboration)	35.5%	R1: 24.6% R2: 25.6% R3: 35.3% R4: 47.3%	NAT: 41.0% ENG: 44.5% MED: 34.5% AGR: 43.0% SOC: 29.2% HUM: 26.4%	F: 30.5% M: 38.7%
2019 (n=8,540)	**EU28 total**	Per (current) career stage	Per FOS	Per gender
Academic (Outside own institute)	77.4%	R1: 57.7% R2: 56.3% R3: 82.5% R4: 86.0%	NAT: 80.7% ENG: 72.8% MED: 75.1% AGR: 75.6% SOC: 76.3% HUM: 83.5%	F: 76.9% M: 77.7%
Non-academic (Intersectoral collaboration)	32.2%	R1: 19.6% R2: 18.2% R3: 34.0% R4: 40.0%	NAT: 34.0% ENG: 35.5% MED: 32.6% AGR: 41.8% SOC: 29.9% HUM: 25.5%	F: 30.5% M: 33.2%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Note:
- Based on question 82: "Please indicate with whom you collaborate in your research (e.g., joint projects, joint papers, etc)"

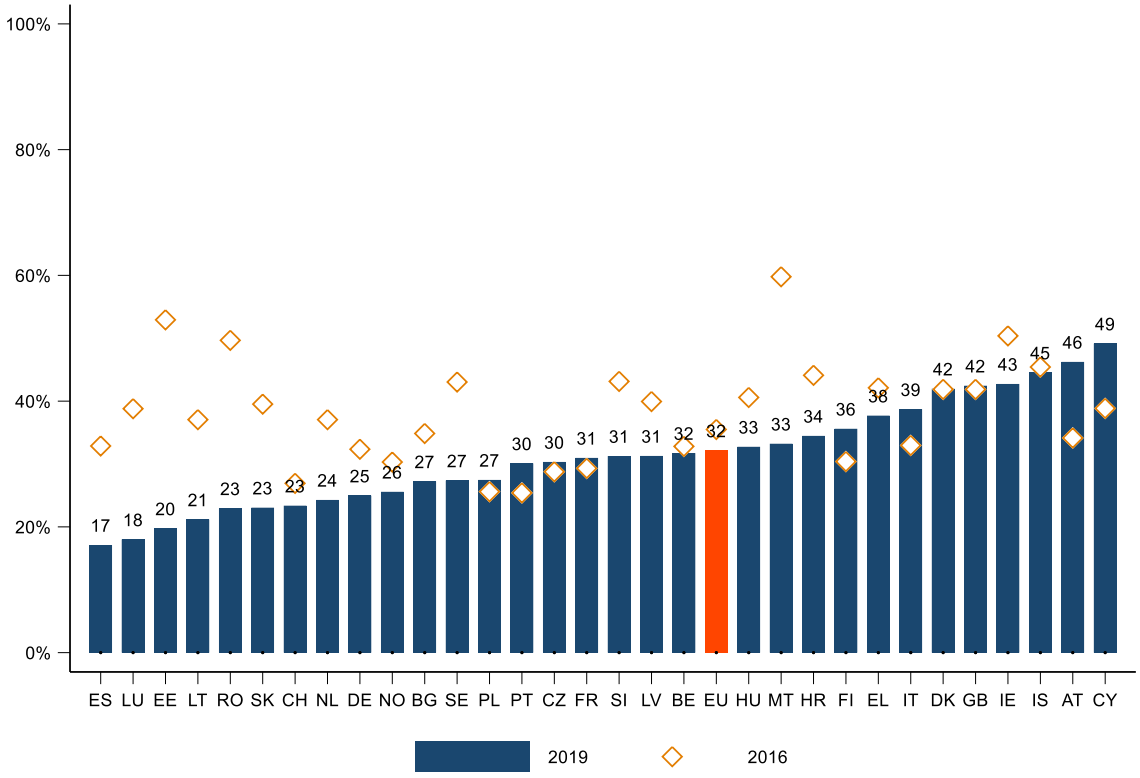
Overall, 79% of the researchers in the EU Member States are or were involved in some type of academic collaboration with researchers outside the own institution or non-academic collaboration, i.e. intersectoral collaboration. 77% of the researchers report they collaborate with the academic sector outside the own institution, while 32% of the researchers report that they collaborate with the non-academic sector. 31% of the researchers collaborate with the academic sector as well as the non-academic sector, implying only 1% of researchers collaborate with the non-academic sector exclusively.

[133] The MORE2 EU HE survey (2012) included a similar question on collaboration, but with less categories of collaboration partners. The data are not sufficiently comparable to include the MORE2 results as comparison basis here.

Comparing these shares with MORE3, we can conclude that, at the aggregate level, these shares remain stable.

Country level: Intersectoral collaboration with non-academic partners is still somewhat rare in European countries. In none of the countries do over half of researchers collaborate with the non-academic sector: The highest shares are being reported in Cyprus (49%), Austria (46%), Iceland (45%) and Ireland (43%). Spain (17%), Luxembourg (18%), Estonia (20%) and Lithuania (21%) are the countries where a lower share is found. Comparing MORE4 to MORE3, we find that the geographical pattern is not stable over time and that there are large changes per country. 16 of the 31 countries reported a decrease in the share of intersectoral collaboration with more than 5 percentage points. The countries that show the largest decrease since MORE3 are Estonia (33 pp), Romania and Malta (27pp) and Luxembourg (21pp). On the other hand, countries such as Austria (12pp), Cyprus (10pp), Italy (6pp) and Finland (5pp) are the countries that report the largest increase since MORE3.

Figure 136: Non-academic collaboration, by country



Source: MORE4 EU HEY survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Based on question 82: "Please indicate with whom you collaborate in your research (e.g., joint projects, joint papers, etc)"
- (2019: n=9,321; 2016: n=10,394)

Career stage: For both academic collaboration outside the own institution and intersectoral collaboration, more experienced researchers (R3 and R4) display larger shares compared to researchers in earlier career stages (R1 and R2). As with all types of mobility and collaboration, this is in part related

to the career length effect. Note that since MORE3, academic and intersectoral collaboration among researchers in earlier career stages has declined.

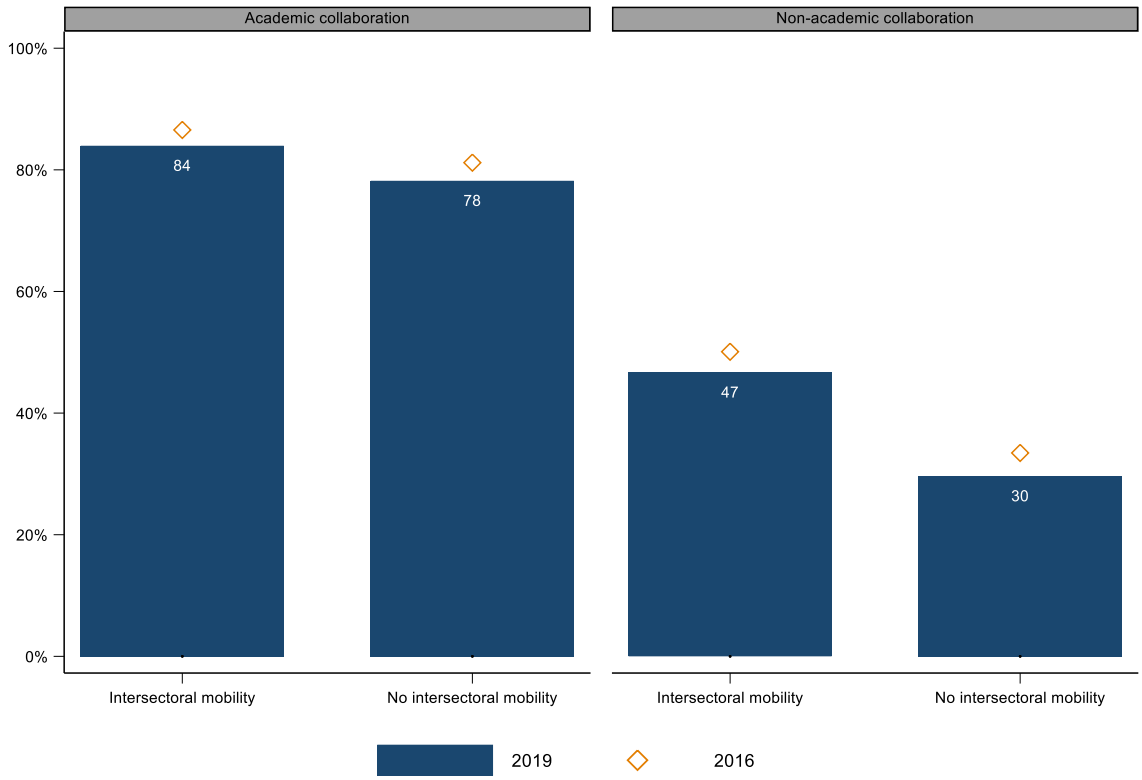
Field of science: Collaboration with academic researchers outside the own institution is common in all fields, with shares ranging from 84% in Humanities to 73% in Engineering and Technology. Regarding intersectoral collaboration, Agricultural Sciences (42%), Engineering and Technology (36%), and Natural Sciences (34%) show the highest shares. Intersectoral collaboration is considerably lower in Humanities (26%). Although the reported shares in Natural Sciences and Engineering and Technology are still among the highest, since MORE3 a decline in particular in these fields can be observed (respectively from 42% to 34% and from 45% to 36%).

Gender: Male and female researchers collaborate to a similar degree in the academic sector outside their own institute (respectively 78% and 77%) and intersectorally (respectively 33% and 31%). In MORE3, the overall figures were similar, but male researchers tended to collaborate more with researchers in the non-academic sector than female researchers (39% versus 31%).

Intersectoral mobility and collaboration: Figure 137 shows that researchers who have been intersectorally-mobile tend to collaborate more both with academics outside the own institution and with non-academics than those without this type of working experience. The difference is rather limited in terms of academic collaboration (78% for non-mobile researchers versus 84% among intersectorally-mobile researchers). However, as expected, having an intersectoral working experience has a strong correlation with the extent to which researchers collaborate with the non-academic sector: 30% of the non-sectorally mobile researchers compared to 47% of the mobile researchers.

Based on this, we see evidence that mobility and collaboration go hand in hand and influence each other positively for a substantial proportion of researchers. Furthermore, the results discussed above are fully in line with those of the MORE3 study.

Figure 137: Intersectoral mobility and intersectoral collaboration (EU28)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Only R2, R3 and R4 researchers.
- Based on question 82: "Please indicate with whom you collaborate in your research (e.g., joint projects, joint papers, etc)" and question 86: "Have you ever worked as a researcher (excluding PhD) in the non-university/higher education sector (e.g. companies, NGOs, charities, non-university research institutes, governmental bodies/agencies)?"
- (2019: n=7,653; 2016: n=8,073)

8.3.2.2 Intersectoral collaboration as a result of a previous mobility experience

When analysing the group of researchers that collaborate with academic partners outside the own institute we observe that 51% of them (versus 42% in MORE3) consider academic collaboration outside the institution to be the result of a previous mobility experience (of 3 months or more, in or outside the EU). A much lower, but still substantial share of researchers of the group that collaborate with non-academic partners state that collaboration with non-academic partners is the result of a previous mobility experience (32% versus 30% in MORE3).

Gender: Male researchers tend to attribute collaboration (with academic partners outside the own institution and intersectoral mobility) to previous mobility experiences to a larger extent than do their female counterparts. While 55% (44% in MORE3) of the male researchers that collaborate with academic partners outside the own institution consider this type of collaboration as the result of a previous mobility experience, the share of women with the same opinion is 46% (39% in MORE3). A less pronounced difference is observed with respect to intersectoral collaboration: 35% (31% in MORE3) of

the male researchers who collaborated intersectorally consider it the consequence of having been mobile compared to 27% (28% in MORE3) of the female researchers.

8.4. Combined mobility in post-PhD stage

COMBINED FORMS OF MOBILITY (only R2, R3 and R4 researchers)	EU28 Total	Per (current) career stage	Per FOS	Per gender
Short-term international mobility AND intersectoral mobility	5.1%	R2: 5.7% R3: 4.2% R4: 6.1%	NAT: 2.7% ENG: 4.9% MED: 3.0% AGR: 3.7% SOC:8.7% HUM: 6.8%	F: 4.5% M: 6.0%
Long-term international mobility AND intersectoral mobility	3.3%	R2: 3.4% R3: 2.8% R4: 4.0%	NAT: 2.8% ENG: 3.8% MED: 1.6% AGR: 2.5% SOC:5.7% HUM:2.1%	F: 3.4% M: 3.1%
Intersectoral mobility AND interdisciplinary mobility	3.5%	R2: 3.0% R3: 3.4% R4: 3.8%	NAT: 2.0% ENG: 4.0% MED: 2.5% AGR: 2.6% SOC:6.4% HUM:2.2%	F: 3.2% M: 3.9%
Short-term international mobility AND interdisciplinary mobility	6.3%	R2: 6.8% R3: 5.5% R4: 7.3%	NAT: 5.8% ENG: 4.1% MED: 5.7% AGR: 7.9% SOC:8.6% HUM:7.0%	F: 5.8% M: 7.2%
Long-term international mobility AND interdisciplinary mobility	4.7%	R2: 8.1% R3: 3.6% R4: 4.8%	NAT: 4.8% ENG: 4.4% MED: 3.1% AGR: 3.1% SOC:5.3% HUM:6.8%	F: 4.4% M: 5.2%

Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 77: "Short term mobility (<3 months)", question 64: "After gaining your highest educational qualification (PhD or other), how would you typify your international mobility experience?", question 88: "Have you ever worked as a researcher (excluding PhD) in the non-university/higher education sector (e.g. companies, NGOs, charities, non-university research institutes, governmental bodies/agencies)?" and question 12: "Did you switch to another (sub)field of research during your academic career?"
- (n=7,653)

This section investigates the link between different types of mobility: short-term and long-term international mobility, intersectoral mobility and interdisciplinary mobility. International and intersectoral mobility only refer in this section to those experiences that have taken place in the last ten years. The analyses only consider researchers in a post-PhD stage: R2, R3 and R4.

There is relatively little overlap across the different types of mobility. The type in which there is a larger overlap is between short-term international and interdisciplinary mobility. The shares show a decrease in almost all the combinations with respect to MORE3. The only exceptions are the categories combining international (short- and long- term) and intersectoral mobility that are remarkably stable over time (Table 54).

Table 54: Evolution over time of each type of combined mobility (EU28)

	2016	2019
Short-term international mobility AND intersectoral mobility	5.3%	5.1%
Long-term international mobility AND intersectoral mobility	3.8%	3.3%
Intersectoral mobility AND interdisciplinary mobility	6.0%	3.5%
Short-term international mobility AND interdisciplinary mobility	14.8%	6.3%
Long-term international mobility AND interdisciplinary mobility	9.9%	4.7%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Based on question 77: "Short term mobility (<3 months)", question 64: "After gaining your highest educational qualification (PhD or other), how would you typify your international mobility experience?", question 88: "Have you ever worked as a researcher (excluding PhD) in the non-university/higher education sector (e.g. companies, NGOs, charities, non-university research institutes, governmental bodies/agencies)?" and question 12: "Did you switch to another (sub)field of research during your academic career?"
- (2019: n=7,653; 2016: n=8,073)

Country level: Table 55 shows the share of researchers within each country who have experienced each type of mobility combinations. This shows that some countries perform better than the EU28 average in all the different types of mobility. This is the case for the Nordic countries, Slovakia, Hungary and Luxembourg. Italy, Germany and United Kingdom, on the contrary, consistently perform worse than the EU28 average in each of the combinations.

Table 55: Share of researchers with each type of combined mobility

	SHORT-TERM INTERNATIONAL AND INTERSECTORAL MOBILITY	LONG-TERM INTERNATIONAL AND INTERSECTORAL MOBILITY	SECTORAL AND INTER-DISCIPLINARY MOBILITY	SHORT-TERM INTERNATIONAL AND INTER-DISCIPLINARY MOBILITY	LONG-TERM INTERNATIONAL AND INTER-DISCIPLINARY MOBILITY
Austria	1.90%	6.10%	3.90%	8.20%	6.60%
Belgium	4.90%	3.10%	4.70%	7.00%	6.10%
Bulgaria	8.90%	4.00%	8.20%	11.00%	4.50%
Croatia	4.70%	1.20%	4.50%	12.20%	3.40%
Cyprus	6.50%	6.30%	4.00%	5.60%	9.50%
Czech Republic	5.20%	2.30%	4.80%	6.90%	3.20%
Denmark	4.50%	5.10%	4.90%	15.40%	12.80%
Estonia	5.70%	3.50%	1.30%	5.10%	4.90%
Finland	5.50%	3.30%	4.00%	7.70%	4.00%
France	6.20%	3.10%	2.40%	6.60%	3.90%
Germany	5.10%	3.10%	3.00%	3.90%	4.30%
Greece	4.90%	3.70%	2.90%	7.00%	4.70%
Hungary	6.50%	5.10%	4.70%	10.90%	5.30%
Iceland	4.30%	2.70%	0.80%	10.50%	10.50%
Ireland	3.30%	5.70%	4.00%	6.60%	9.10%
Italy	4.30%	1.40%	1.80%	5.90%	3.50%
Latvia	6.40%	5.70%	4.70%	10.60%	4.30%
Lithuania	9.20%	2.80%	5.40%	11.70%	4.80%
Luxembourg	8.30%	8.30%	5.40%	14.70%	14.20%
Malta	11.50%	2.60%	9.20%	10.20%	2.30%
Netherlands	5.50%	3.50%	1.80%	8.10%	8.30%
Norway	7.00%	6.00%	3.90%	8.50%	6.70%
Poland	7.00%	3.30%	5.50%	9.10%	4.30%
Portugal	4.90%	2.90%	2.90%	8.90%	2.20%
Romania	10.60%	5.30%	5.40%	9.00%	3.60%
Slovakia	8.90%	5.80%	4.70%	6.70%	6.00%
Slovenia	6.00%	5.90%	6.70%	6.50%	6.30%
Spain	6.30%	6.00%	4.20%	6.20%	5.90%
Sweden	5.80%	5.00%	5.40%	11.00%	7.30%
Switzerland	3.50%	4.00%	5.10%	6.10%	8.30%
United Kingdom	3.70%	2.00%	3.10%	4.60%	4.20%
EU28	**5.10%**	**3.30%**	**3.50%**	**6.30%**	**4.70%**

Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 77: "Short term mobility (<3 months)", question 64: "After gaining your highest educational qualification (PhD or other), how would you typify your international mobility experience?", question 88: "Have you ever worked as a researcher (excluding PhD) in the non-university/higher education sector (e.g. companies, NGOs, charities, non-university research institutes, governmental bodies/agencies)?" and question 12: "Did you switch to another (sub)field of research during your academic career?"
- (n=7,653)

Career stages: When each type of mobility is analysed individually, in general terms, we observe that mobility is more frequent among higher career stages. The main reason for this is probably the fact that these researchers have simply had more time than younger researchers to have this type of experiences. However, when the combination of different types of mobility is considered, this pattern is not found

for some of the combinations. Interestingly, there is a negative relationship between career stage and having had long-term international mobility AND interdisciplinary mobility: it is slightly more common among R2 researchers (8%) than among R3 and R4 researchers (4% and 5% respectively).

Field of science: Social Sciences and the Humanities are the fields in which there are higher shares of researchers in most combinations of mobility types. On the opposite, Agricultural Sciences tend to show lower levels of combined mobility in almost all the categories.

Gender: There are no large differences between male and female researchers regarding the combination of different types of mobility.

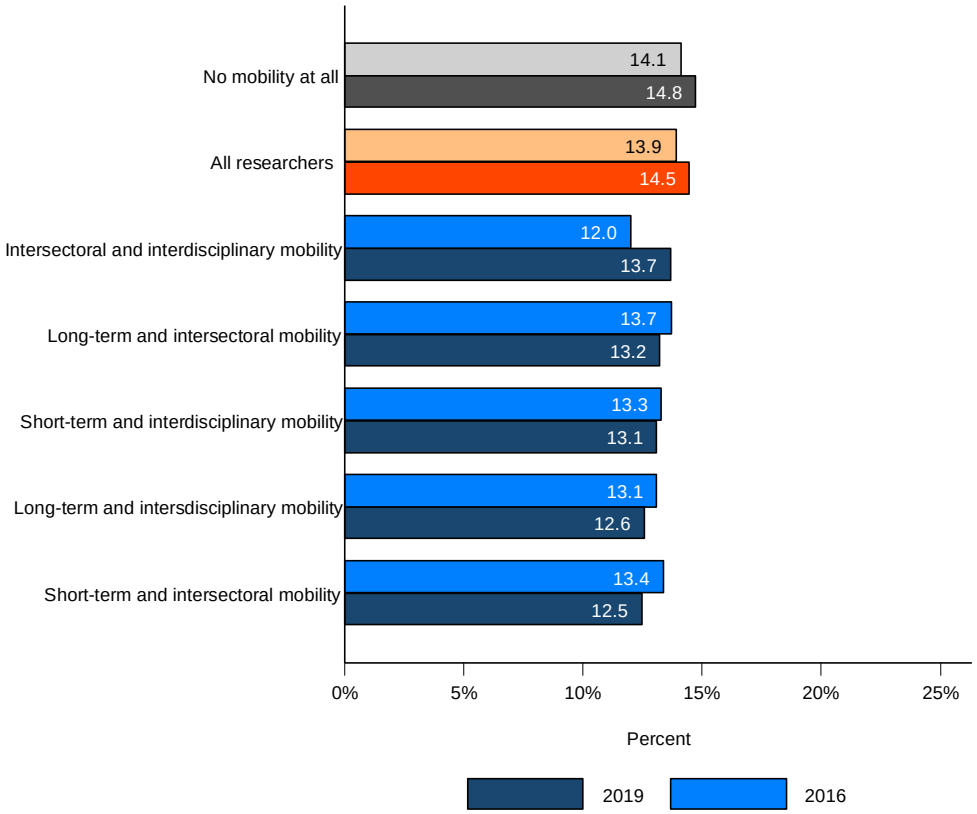
Satisfaction with current position: The experiences researchers have in terms of the different types of mobility they undertake can have an impact on how they evaluate and perceive their current position. Indeed, mobile researchers might have a more diverse range of experiences with which to compare their actual position. Mobility experiences can also help in improving researchers´ working conditions and, hence, affect the overall degree of satisfaction. Figure 138 reflects the average number of factors researchers are satisfied with in their current position. The maximum number of factors for which respondents could indicate whether they were satisfied was 18[134].

Although the differences are not very large, it is interesting to note that those researchers that have never experienced any type of mobility – international, interdisciplinary, nor intersectoral – report an average level of satisfaction (14.8) that is aligned with the population average (14.5). However, this is higher than the satisfaction that is reported among those that have done some type of combination of mobility types.

This might be due to several factors. First, the fact that these researchers have a broader set of experiences in other fields and sectors might entail that they have a more critical viewpoint than other researchers with respect to their position and to academia in general. Second, this finding might suggest that researchers feel that their background is not sufficiently valued in the academic environment, and hence might be less satisfied non-mobile colleagues.

[134] Intellectual challenge, dynamic work environment, research autonomy, contribution to society, level of responsibility, working with leading scientists, balance between teaching and research time, access to research facilities and equipment;, quality of training and education, availability of research funding, career perspectives, mobility perspectives, social status, reputation of employer, social security and other benefits, pension plan, job security and quality of life.

Figure 138: Combined mobility and satisfaction with current position (EU28)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Based on question 77: "Short term mobility (<3 months)", question 64: "After gaining your highest educational qualification (PhD or other), how would you typify your international mobility experience?", question 88: "Have you ever worked as a researcher (excluding PhD) in the non-university/higher education sector (e.g. companies, NGOs, charities, non-university research institutes, governmental bodies/agencies)?" and question 12: "Did you switch to another (sub)field of research during your academic career?"
- (2019: n=7,653; 2016: n=8,073)

9. Attractiveness of the European Research Area

The analysis of the attractiveness of the European Research Area is preliminary and will be complemented towards the final report with the information from Task 2, the Global survey. This is essential to consider also the opinions from EU researchers currently working outside the EU who will be asked in the Global survey to compare their experience of working outside the EU with working inside the EU.

On the other hand, as the preceding sections in this report have shown, the EU is heterogeneous, so issues of individual country attractiveness can also partly be judged from the point of view of EU (and non-EU) researchers mobile within the EU. Heterogeneity is pronounced in areas such as research funding, career perspectives, PhD-training and international mobility experiences, which are at the same time important determinants of scientific productivity. It must be borne in mind when interpreting the results that, although the MORE surveys provide valuable information on the destination countries of mobile researchers, the analysed flows only reflect the information provided by the respondents to the survey. The analysis does not take into account the general flow of workers to and from these countries or the exact global migration patterns.

Following the analysis based on MORE2 and MORE3, we have a clear picture of what drives attractiveness among researchers in academia (Janger - Nowotny, 2016; Janger – Campbell - Strauss, 2019[135]). While attractiveness is influenced by research job characteristics related to remuneration, pensions and job security ("financial and social" working conditions) and other non-science related conditions, the main drivers of attractiveness are those job characteristics which influence a researcher's scientific productivity, such as research autonomy, career paths and working with high quality peers (see also section 6 on working conditions).

"Financial and social" working conditions:

- Salary, pension and health characteristics;
- Job security;
- Quality of life;
- Satisfaction with job content and challenge.

Working conditions relevant for scientific productivity:

- Research organisation at working unit level (research and financial autonomy);
- Balance between teaching, administrative tasks, and research;
- Availability of funding (including research infrastructure);

[135] Janger, J., Campbell, D., F.J., Strauss, A., (2019), "Attractiveness of jobs in academia: a cross-country perspective", Higher Education, pp. 1-20.

- Quality of peers.

Career perspectives are cross-cutting working conditions, as they influence both financial conditions and scientific knowledge production. To this, cooperating with industry or commercialising own research results can be added as influencing attractiveness. Attractiveness is hence a result of the structure of career paths and the quality of working conditions (analyzed in sections 5 and 6).

International mobility in particular is to some extent driven by perceptions of varying attractiveness. In turn, mobility indicators (see section 7 and 8), e.g. in terms of which countries researchers choose for their international mobility experience, can also be interpreted as indicators of attractiveness.

Based on the MORE4 EU HE survey analysed in this report, we can thus provide some preliminary evidence on how researchers perceive attractiveness. We use the following information from the survey:

- Perception of attractiveness of current academic position;
- Direct comparison of research systems (EU vs. non-EU);
- Comparison of barriers and motives for mobility.

Based on this analysis, Table 56 presents an overview of the findings of the MORE4 EU HE survey along the criteria "shaping attractiveness" as presented at the top of this section, comparing the EU with non-EU OECD countries. The features which are perceived as attractive are marked in green, and those which are perceived to be less attractive or dissatisfying are in red; features with substantial country variation or heterogeneity within the EU, or when the EU is on par with non-EU OECD, are marked in orange. This table indicates the biggest gaps in what researchers perceive to be attractive, according to the MORE4 EU HE survey. It is important to note that this analysis is based on perceptions of researchers as revealed through the MORE4 survey.

Most relevant for the perception of the attractiveness of ERA is the direct comparison of the EU versus non-EU research systems by researchers. Here, researchers who have been mobile to a non-EU OECD country or an EU associated country, i.e. to advanced research systems, generally perceive working outside the EU to be "better" than working inside the EU for several working conditions and career path features of researchers.

Otherwise, including the analysis on motives for geographical mobility, the EU generally fares better regarding working conditions in terms of financial and social security or quality of life. Regarding working conditions relevant for scientific knowledge production, researchers are generally less satisfied, particularly in terms of research funding, working with leading scientists and career paths/progression. However, as in the chapters of this report, the attractiveness of the ERA can only be understood by reference to its constituent countries. Substantial heterogeneity across national research areas also influences perceptions of the attractiveness of the ERA, as shown in the analysis.

In order to help make the EU more attractive for researchers, a clear finding in line with previous analyses is that researchers move for reasons of scientific productivity, rather than issues such as salary, social security or quality of life (see section 7 and 8). This means that addressing the attractiveness of ERA would mainly work through improving the conditions for scientific knowledge production, above all: clear career paths with the option of tenure based on performance only; research funding and access to research facilities; research autonomy and providing perspectives for international mobility (as international collaboration is usually positive for the quality of research). Once these conditions become

best practice in Europe, the EU will succeed in attracting increasing numbers of leading scientists and in creating positive feedback loops (as more leading scientists attract more leading scientists).

Table 56: Perception of era attractiveness: a preliminary assessment based on MORE4 data on…

	…satisfaction in current academic position	…comparison between research systems in and outside EU*	…motives for international mobility to EU versus non-EU: main motive	…motives for international mobility to EU versus non-EU: important motives
Financial and social conditions				
Salary				
Job Security				
Social Security				
Pension Plan				
Individual job satisfaction, quality of life			na	na
Conditions for scientific productivity				
Research funding				
Access to research facilities				
Working with leading scientists				
Career paths and progression	na	na		
Career perspectives				
Mobility perspectives, international networking				na
Research autonomy				
Balance research teaching				
Administrative burden	na		na	na
Quality of training and education	na			na
Engagement with society and industry				
Engagement with society	na	na	na	na
Engagement with industry	na		na	na

Source: MORE4 EU HE survey (2019), Janger and Nowotny, 2016 (analysis of attractiveness based on MORE2 data[136])
Notes:

- Only R2, R3 and R4 researchers. Interpretation based on EU-averages which sometimes hides large country variation.
- Colour coding: Satisfaction in current academic position (<50%: red; 50-75% orange; >75% green); Direct comparison of research systems, non-EU OECD (<-10pp red; -10pp-+10pp orange; >10pp green); Motives for mobility (motive EU vs. motive non-EU OECD: <-3pp red, -3pp - +3pp orange, >3pp green)
- Satisfaction in current academic position based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- Comparison between research systems in and outside EU is based on question 74: "How does working as a researcher outside the EU compare to inside the EU? Please indicate if something was worse, similar or better than in the EU." Comparison is

[136] Janger, J., Nowotny, K., (2016) "Job choice in academia", Research Policy, 45(8), pp. 1672–1683.

made with non-EU OECD systems and EU associated countries (Iceland, Norway, Switzerland); when comparing with less advanced systems such as the BRICS, results would be more positive for the EU.

- Motives for international mobility to EU versus non-EU: main motive is based on question 67: "And what was your main motive to move to each of these countries?"
- Motives for international mobility to EU versus non-EU: important motives is based on question 71: "Please consider your last instance of mobility. Which of the following factors were important motives to make this move?"

9.1. Attractiveness based on perceptions in the current academic position

Here we refer to the information on the (dis)satisfaction of researchers with their current academic position analysed in section 6 on working conditions, which (in the survey's methodology) is an EU position. We also refer to the perception of career paths and recruitment in section 5. While not directly relevant for a comparison with a non-EU research position, this analysis is used to provide an insight into the relative strength of different aspects of the EU research system.

The relevant findings of these sections are summarised here, based on the overall summary of MORE4 findings, which are very similar to MORE3 findings – MORE4 results have generally improved by a few percentage points. Overall, regarding non-science related conditions, high levels of social (security and environmental) and individual (job content) satisfaction can be seen to compensate for dissatisfaction with pay when compared to outside academia. Satisfaction with working conditions relevant for scientific knowledge production is lowest for research funding, the balance between teaching and research time and career perspectives, but high for research autonomy (see Table 56).

9.1.1. Financial and social (non-science related) working conditions

While on average in the EU 70% of researchers perceive salaries to be reasonable, this

i) masks large country variation along lines of economic development and performance; and
ii) does not hold up by comparison with outside academia, where on average close to 60% of researchers in the EU feel less well paid than their counterparts outside academia (34% similar and 10% better).

By contrast, satisfaction with financial and social security is high, with close to 86% of researchers satisfied with job security, 87% with social security and 78% with pension plans. Country variation for the latter is, however, large (e.g. only 39% of researchers in Greece but 97% of researchers in Iceland are satisfied with their pension plan). Also, social environment and recognition are generally regarded as positive working conditions: 92% of all EU researchers are satisfied with their contribution to society, 89% with their social status and 91% with the reputation of their current employer. More than 4 out of 5 EU researchers are satisfied with their individual working conditions in terms of intellectual challenge, dynamic work environment, and level of responsibility or quality of life.

Overall, high levels of social (security and environmental) and individual (job content) satisfaction – on average in the EU – can be seen to compensate dissatisfaction with pay when compared with outside academia. Researchers are willing to trade-off salary against other aspects of their job, as previous studies show (Janger and Nowotny, 2016).

9.1.2. Conditions affecting scientific productivity

On average, only 52% (MORE3: 42%) of researchers in the EU28 are satisfied with the availability of research funding and 79% (MORE3: 76%) with access to research facilities. Possibly linked to overall economic conditions, Western and Northern European researchers are more satisfied than their colleagues in Southern and Eastern Europe.

About 85% (MORE3: 76%) of researchers in the EU28 are satisfied with their opportunities to work with leading scientists. Country variation is large - between 53-95% (MORE3: 61-94%) - and corresponds roughly to the performance of countries in research excellence.

According to the MORE4 data, about 70% (MORE3: 67%) of researchers in the EU28 are satisfied with the balance between teaching and research time. It is highest among early-stage R1 and recognised R2 researchers, particularly in Western (83% and 91%) and Northern European (81% and 75%) countries. In contrast, less than 65% of established R4 researchers in Southern European countries are pleased with the balance between their research and teaching responsibilities (see Table 19).

About 91% (MORE3: 89%) of all researchers in the EU28 are satisfied with their level of research autonomy, with leading R4 researchers particularly satisfied, while early stage researchers are – not surprisingly - somewhat less satisfied (91 vs. 95%).

Career perspectives also include relevant working conditions, as they influence the time horizon available for implementing research agendas, and mobility perspectives can shape collaboration opportunities. MORE4 finds that on average, 75% (MORE3: 68%) of researchers in the EU are satisfied with their career perspectives, and 75% (MORE3: 74%) of researchers are satisfied with their mobility perspectives. This masks again strong country variation (with only 62% of researchers in Southern European countries reporting satisfaction with career perspectives, in contrast to more than 80% in Anglo-Saxon Countries).

All in all, satisfaction with working conditions relevant for scientific knowledge production is lowest for research funding, the balance between teaching and research time and career perspectives. By comparison with MORE3, satisfaction has somewhat increased, however country variation remains an issue.

9.2. Attractiveness based on direct comparison of research systems

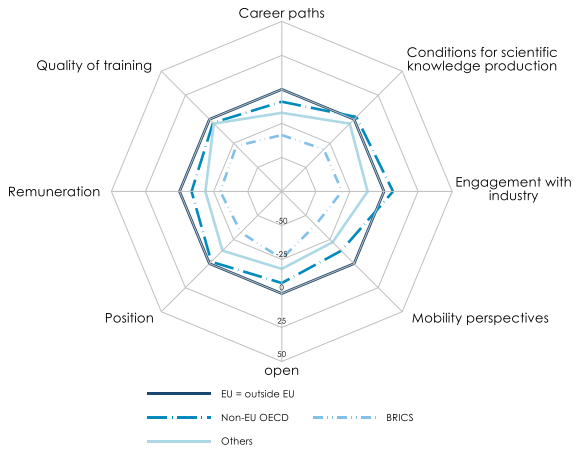
In this section, we analyse the information gained from the directly targeted questions 46 and 74 of the MORE4 EU HE survey, which compare a number of aspects of the research system outside and inside the EU. Researchers eligible to respond to these questions are:

- Researchers with non-EU citizenship currently working in the EU; and
- Researchers with EU citizenship who indicate that one of their long-term international moves was to a country outside the EU.

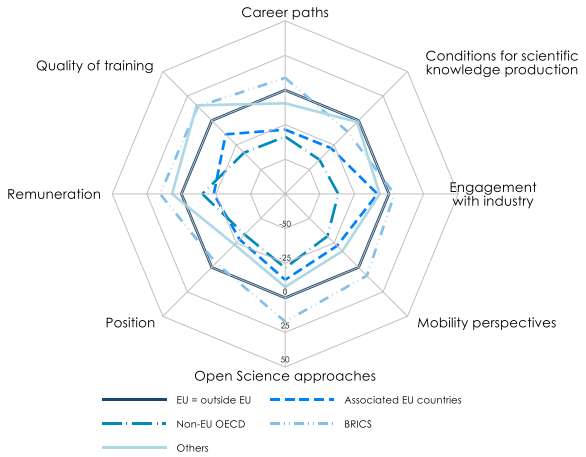
Overall, whether researchers in the target groups for direct comparison of research systems appreciate the non-EU research system as being either better or worse than the EU system depends heavily on their experience, i.e. which system they know. This observation confirms again the picture of heterogeneity.

Figure 139: comparison between working outside the EU and working inside the EU as a researcher[137]

By citizenship: Non-EU citizens in EU positions



By mobility experience: EU citizens with non-EU mobility experience



Source: MORE4 EU HE Survey (2019)
Notes:

- Non-EU researchers working in the EU are grouped by country of citizenship (left panel), EU researchers with mobility experience by their mobility destination country (right panel). Researchers from the EU-associated countries were dropped in the left panel as the number of observations was too low.
- Working conditions are bundled together (see footnote 137); for a full picture, see annex.
- Based on question 46: "How does working as a researcher outside the EU compare to inside the EU? Please indicate if something was worse, similar or better outside the EU than in the EU." and question 74: "How does working as a researcher outside the EU compare to inside the EU? Please indicate if something was worse, similar or better than in the EU."
- (left graph: n=227, right graph: n=717)

Figure 139 contrasts the share of researchers assessing the EU as more attractive against the share of researchers who assess it as less attractive. The graph contains net shares (i.e. share of "better in the EU" – "worse in the EU" in percentage points), and the line where better and worse are equally balanced is shown explicitly as the line "EU = outside EU". The panel on the left is based on responses from those researchers currently working in the EU but having non-EU citizenship, while the right panel focuses on researchers who had at least one mobility experience outside the EU within the last ten years[138].

The responses of the interviewees are clustered into 4 country groups based on stages of economic development outside the EU:

[137] The graphs summarise more detailed indicators (for a more detailed graph see Figure 156 and Figure 157 in Annex):

1) "remuneration and other material factors" includes remuneration, social security and other benefits, quality of life, job security, an pension plan;
2) "Conditions for scientific knowledge production" includes availability of research funding, access to research facilities and equipment, working with leading scientists, research autonomy, administrative burden, and balance between teaching and research time;
3) "Engagement with industry" includes ease of commercialisation of research results, and ease of industry collaboration.

[138] If a researcher had more than one stay abroad (i.e. outside the EU), the most recent stay was used to assign him/her to the non-EU country groups.

1) Iceland, Norway and Switzerland as EU associated countries;
2) OECD countries outside the EU;
3) the BRICS countries (Brazil, Russia, India, China and South Africa); and
4) other non-EU countries.

Unfortunately, a more precise comparison (i.e. by countries) is not possible given the too low observation numbers. Nevertheless, the results provide some first insights into the attractiveness of the EU28 countries. Table 91 and Table 92 in Annex provide an overview of the detailed shares.

Overall, both groups of surveyed researchers, who are either citizens of or have working experience in non-EU OECD countries or the EU associated countries, assess the EU as less attractive than non-EU countries, in particular as regards more advanced economies (EU-associated countries and non-EU OECD countries). Exceptions are conditions for scientific knowledge production, where the EU is perceived on par by researchers from non-EU OECD countries working in the EU, and engagement with industry, where the EU is perceived as better by the same group.

EU-associated countries: EU researchers having been mobile to an EU-associated country (researchers from these countries currently working in the EU had to be dropped due to the low number of respondents) perceive the EU as less attractive across the board, by a net share difference of approx. 25pp; in three categories the EU is seen as less bad, featuring a net share difference of approx. 10pp (quality of education and training, engagement with industry and Open Science approaches).

Non-EU OECD countries: Regarding the comparison with non-EU OECD countries, the net difference between the share assessing working inside the EU as better and that assessing it as worse is 13pp for citizens of these countries and 24pp for EU researchers with working experience there. EU researchers having worked in non-EU OECD countries are on balance more negative towards the EU than researchers having worked in EU associated countries, with the exception of remuneration. Non-EU OECD researchers currently working in the EU are less negative and in one category assess the EU even as more attractive (engagement with industry).

BRICS-countries: Regarding the group of researchers who are related to BRICS-countries, similar to MORE3, the EU is seen as more attractive for some of the surveyed factors by EU researchers who have worked in the BRICS-countries. This holds in particular for training and education, remuneration and other financial factors as well as Open Science approaches as seen by those researchers who already worked in the BRICS countries. However, two important categories for attractiveness and international mobility, conditions for scientific knowledge production and the availability of suitable positions, are seen as less attractive in the EU. Remarkably, among the group of BRICS-citizens more researchers assess the EU as less attractive.

Other countries: Finally, unlike MORE3, on balance the group of researchers who are linked to other countries tend to assess the working conditions inside the EU as less attractive than outside the EU, with the exception of the categories of training and remuneration for EU researchers who have been mobile to these countries.

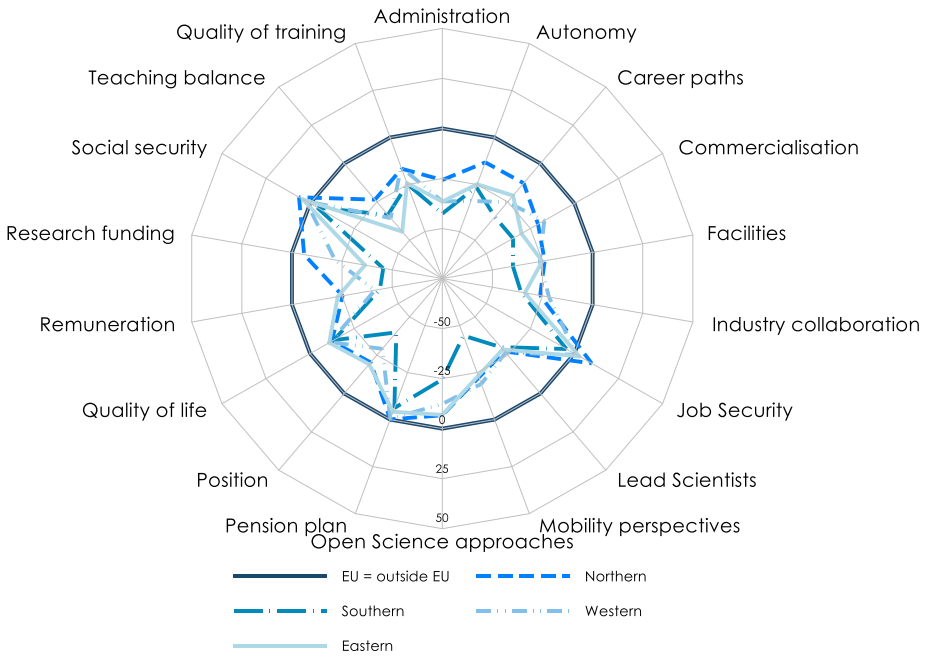
Summarising, on average the EU tends to be seen as less attractive by researchers than other high-income countries. This holds, on average, particularly for the attractiveness of career paths. This could indicate a lack of proper tenure track models which are rated as very attractive (Janger and Nowotny,

2016[139]) and commonplace in the US, but not often present in the EU. On the other hand, the EU's attractiveness is less often below the attractiveness of non-EU countries regarding education and training. However, non-EU OECD countries as well as the EU associated countries are still assessed as more attractive. Regarding remuneration and other financial aspects, the EU outperforms the BRICS and the residual group of other countries (mainly including developing and catching-up countries) but is still less attractive than high-income countries.

As a robustness analysis, we also show in Figure 140 the perception of EU attractiveness by mobile EU researchers (same group as in the right panel of Figure 139) grouped by their current country of employment, which will be indicative of how these researchers assess the attractiveness of their home country relative to the country which they visited for their mobility experience. While in general, working outside the EU is rated better than inside, it is clear that this perception depends on the quality of the system researchers know – researchers from Northern and Western European countries tend to be less negative than researchers from Southern European countries, particularly as regards conditions relevant for scientific productivity, while researchers from all country groups show a good rating of the EU as regards quality of life, social security and job security. Researchers from Eastern Europe are on balance in between the Northern and Western countries on the one side and the Southern countries on the other side, except for time for teaching vs. time for research. This analysis is confirmed by the mobility indicators of sections 7 and 8 which show that destination countries for mobility are mostly well-performing research systems such as the US, UK and Germany.

[139] Janger, J., Nowotny, K., (2016) "Job choice in academia", Research Policy, 45(8), pp. 1672–1683.

Figure 140: Perception of EU attractiveness by mobile researchers grouped by their current country of employment



Source: MORE4 EU HE Survey (2019)
Notes:

- Only EU researchers who have worked outside the EU, grouped by their current country of employment in the EU.
- Based on question 74: "How does working as a researcher outside the EU compare to inside the EU? Please indicate if something was worse, similar or better than in the EU."
- (n= 757)

9.3. Attractiveness based on the analysis of motives for, effects of and barriers to mobility

Motives for mobility indirectly shed light on attractiveness in a comparative perspective, particularly if mobility is not generally motivated by a lack of opportunities in the home country (see section 8.1.1.4.1 for an analysis on this). While motives for mobility reflect the expectations of a researcher towards the research system he or she is going to move to/or moved from, effects of mobility mirror outcomes of the mobility stint and can be seen as a kind of reality check for the expectations associated with mobility, e.g. whether expectations of attractiveness are met by actual conditions for knowledge production. Finally, barriers to mobility are relevant when non-EU researchers would be interested in principle to move to the EU because they think that it is an attractive location for a research career, but various hurdles for mobility prevent them from doing so. This provides additional insight for policy-relevant analysis in terms of how to make it easier for non-EU researchers to come and work in the EU.

9.3.1. Motives for mobility

We compare the general motives to move to an EU versus a non-EU destination for the subgroup which was mobile in or outside the EU:

- By main motive to move to a country within or outside the EU, for the last three mobility steps;
- By importance of each of the potential motives for the most recent mobility move.

Asking only about the main motive to move (for the last three mobility steps) forces researchers to focus on one motive which was particularly important. The advantage of this approach is that fewer motives will stand out, providing more policy guidance as to the crucial factors determining country attractiveness or mobility. The disadvantage is that often, mobility is driven by more than just one factor and as a result the information by main motive may be too stylised. This is why we also show the results when researchers are asked about a range of different motives for their last mobility episode only.

Table 57 below shows that, as in MORE3, three reasons stand out across all destinations when it comes to motives for mobility: working with leading scientists, career progression and research autonomy, all relevant for scientific knowledge production. These are exactly the three factors which were found in the analysis by Janger and Nowotny (2016)[140] to be most influential for job choice among early stage researchers. In comparison to MORE3, international networking has clearly gained importance as an additional motive for researchers to move within or outside the EU.

- Working with leading scientists is a particular motive for moving to a non-EU OECD country (25%), but also in general for moving to another country within the EU (20%).
- Career progression is at 25% about equally important as a motive to move within the EU or to move outside the EU, also confirming the picture of large heterogeneity among EU research systems.
- Research autonomy is an important mobility motive for within the EU at approximately 15%, but even more important for moving to a non-EU OECD country or a BRICS country (around 20%).

The availability of suitable positions mirrors "escape" mobility (see section 8.1.1.4.1) and is particularly important for moving to the associated EU countries (Iceland, Switzerland, Norway) but also for moving within the EU itself. However, the importance of the availability of a suitable position has decreased compared to MORE3. When research funding and the access to research facilities is taken together, this important condition affecting scientific productivity would be comparable or slightly more important as a main motive to move than the availability of a suitable position (except for moving to the associated EU countries). Personal or family reasons are the first non-productivity related motive.

This is in line with the analysis in MORE3 and with Janger and Nowotny (2016)[141] and Stephan - Franzoni - Scellato, 2015[142]: researchers move abroad both within the EU and outside the EU for career progression, research autonomy, working with leading scientists, research funding and gaining an international network. These are factors related to scientific productivity, whereas other factors such as remuneration and personal reasons play a smaller role. These factors hence clearly determine the attractiveness of a research system. Moves outside the EU are less motivated by material working conditions such as social security, pensions or other personal reasons – people are more motivated to

[140] Janger, J., Nowotny, K., (2016) "Job choice in academia", Research Policy, 45(8), pp. 1672–1683.

[141] Ebd.

[142] Stephan, P., Franzoni, C., Scellato, G., (2015) "Global competition for scientific talent: evidence from location decisions of PhDs and postdocs in 16 countries", Ind. Corp. Change, 2015, p. dtv037.

move outside Europe for career reasons or reasons related to scientific productivity, rather than for other factors.

Table 57: Main motive to move to a different country, within or outside the EU

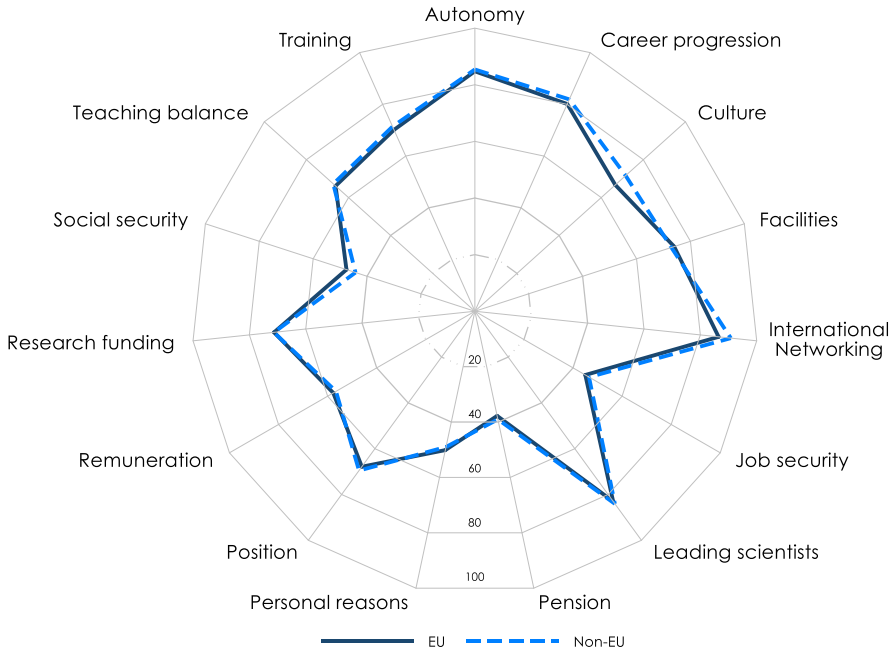
Observations	EU n=1.929	Non-EU n=1.187	EU associated n=135	OECD non-EU n=717	BRICS n=120	Other n=149
Career progression	25.0%	22.4%	24.4%	25.0%	15.0%	20.1%
Working with leading scientists	19.7%	20.5%	19.3%	25.1%	12.5%	7.4%
Research autonomy	15.1%	18.6%	14.1%	18.5%	20.8%	20.1%
International networking	12.1%	11.3%	7.4%	9.5%	18.3%	14.8%
Other	7.1%	8.3%	12.6%	6.7%	10.8%	8.7%
Availability of a suitable position	4.0%	3.5%	8.1%	2.0%	5.0%	6.0%
Availability of research funding	3.5%	3.2%	1.5%	2.6%	6.7%	2.0%
Access to research facilities and equipment	3.5%	2.5%	0.7%	3.2%	0.8%	3.4%
Quality of training and education	3.1%	1.5%	2.2%	1.4%	0.0%	2.7%
Personal/family reason	2.7%	3.5%	3.7%	2.8%	2.5%	8.1%
Balance between teaching and research time	1.3%	1.9%	3.0%	1.4%	3.3%	0.7%
Remuneration (salary, other financial incentives, etc.)	1.0%	1.2%	2.2%	0.6%	0.8%	3.4%
Culture and/or language	1.0%	1.3%	0.0%	1.0%	3.3%	2.0%
Job security	0.8%	0.3%	0.7%	0.1%	0.0%	0.7%
Pension plan	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Social security and other benefits	0.1%	0.1%	0.0%	0.1%	0.0%	0.0%

Source: MORE4 EU HE Survey (2019)
Notes:

- Only R2, R3 and R4 researchers.
- Based on question 67: "And what was your main motive to move to each of these countries?"
- (n=4,237)

The analysis of differences in important motives to move to an EU country versus to a non-EU country yields essentially the same picture, with research autonomy, working with leading scientists, research funding and gaining an international network counting as important motives for researchers who moved within the EU or outside the EU. Financial, social security and personal reasons are less important. In summary, the analysis of important motives to move does not reveal big differences between the main motives to move outside the EU or within the EU.

Figure 141: Important motives for >3 month international mobility in the last ten years to destinations in and outside the EU, most recent move



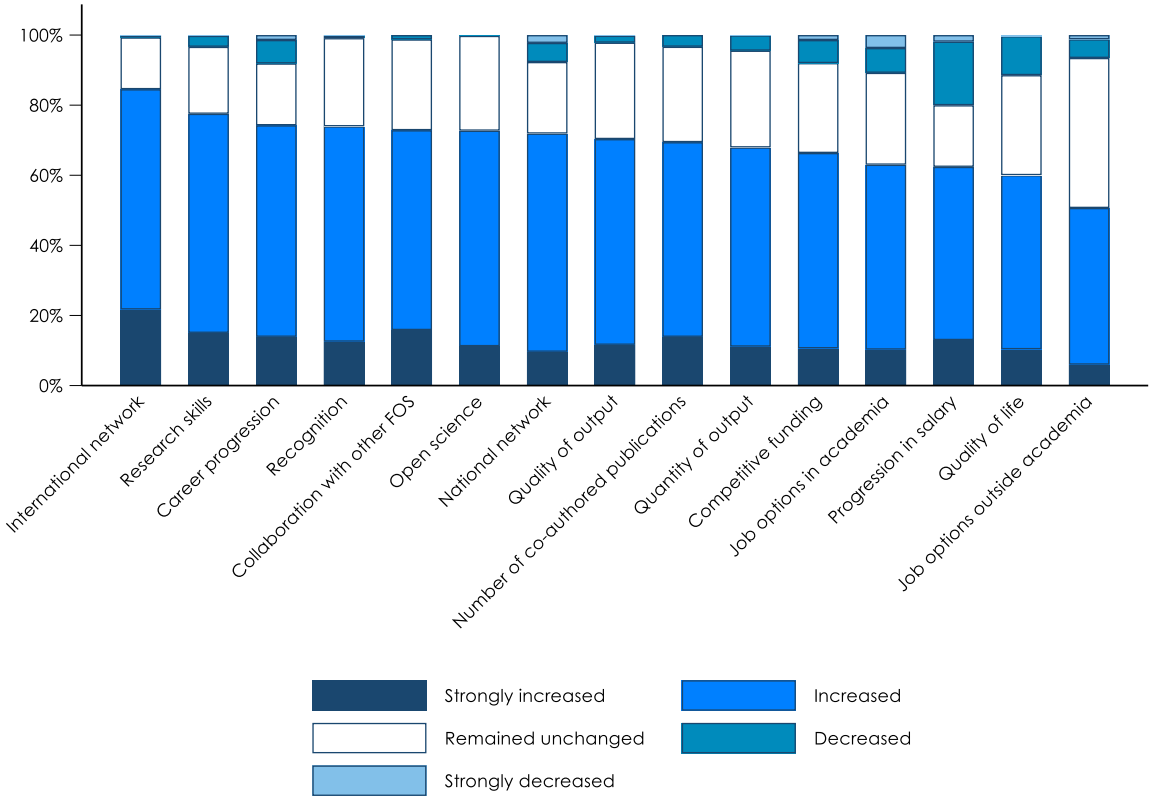
Source: MORE4 EU HE Survey (2019)
Notes:

- Only R2, R3 and R4 researchers who were >3 month mobile in the last ten years.
- Based on question 71: "Please consider your last instance of mobility. Which of the following factors were important motives to make this move?"
- (n=1,770)

9.3.2. *Effects of mobility*

Effects of mobility have been analysed more in depth in section 8.1.1.6. In terms of the effects of a stay in Europe by non-EU researchers, the most important effects are gaining an international network and advanced research skills, closely followed by career progress and recognition. Overall, expectations – motives for mobility – seem to correspond to effects, as scientific productivity related factors such as international networks, research funding and career progression all seem to have benefitted from mobility to the EU. There is not much difference between the other effects; for a final interpretation, this needs to be contrasted with the effects of EU researchers who are currently staying outside the EU.

Figure 142: Effects of current stay in Europe for non-EU researchers



Source: MORE4 EU HE Survey (2019)
Notes:

- Only non-EU researchers currently working in the EU.
- Based on question 44: "You are a non-EU researcher currently working in the EU. Please indicate below the effects, if any, of your current stay in Europe."
- (n=278)

9.3.3. Barriers to mobility

Barriers to mobility have been analysed in depth in section 8.1.1.5. For the non-EU, visa and work permits as well as language barriers were top ranked as barriers for their move to EU. These were followed by funding for research, adequate accommodation, culture and personal reasons. The practical and personal barriers are thus important factors that hinder researchers coming from outside the EU to take up a research position in the EU.

9.3.4. *Estimation of the number of non-EU researchers in the EU*

SHARE OF NON-EU RESEARCHERS IN EU28 COUNTRIES (of all researchers)				
	EU 28 total	**Per career stage**	**Per FOS**	**Per gender**
2016 (n=9,412)	4.3%	R1: 7.6% R2: 4.5% R3: 3.9% R4: 2.9%	MED: 5.9% NAT: 3.0% SOC: 3.4%	F: 3.4%% M: 4.8%%
2019 (n=8,540)	3.9%	R1: 11.6% R2: 4.7% R3: 3.0% R4: 2.3%	MED: 2.5% NAT: 4.9% SOC: 3.8%	F: 3.5% M: 4.1%

Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Note:
- Based on question 5: "What is your country of citizenship?"

On the basis of MORE4 data it is possible to estimate the number of non-EU researchers working in the European countries included in the survey: 3.9% (MORE3: 4.3%) of the researchers working in EU28 countries come from non-EU countries.

Country level: The estimate of the number of non-EU researchers is contingent upon having a sufficient number of respondents at country level in order to obtain a sufficiently robust indicator. Table 58 displays the shares of non-EU researchers in those countries in which the number of non-EU respondents is higher than 20. These figures show that there is a large heterogeneity across countries.

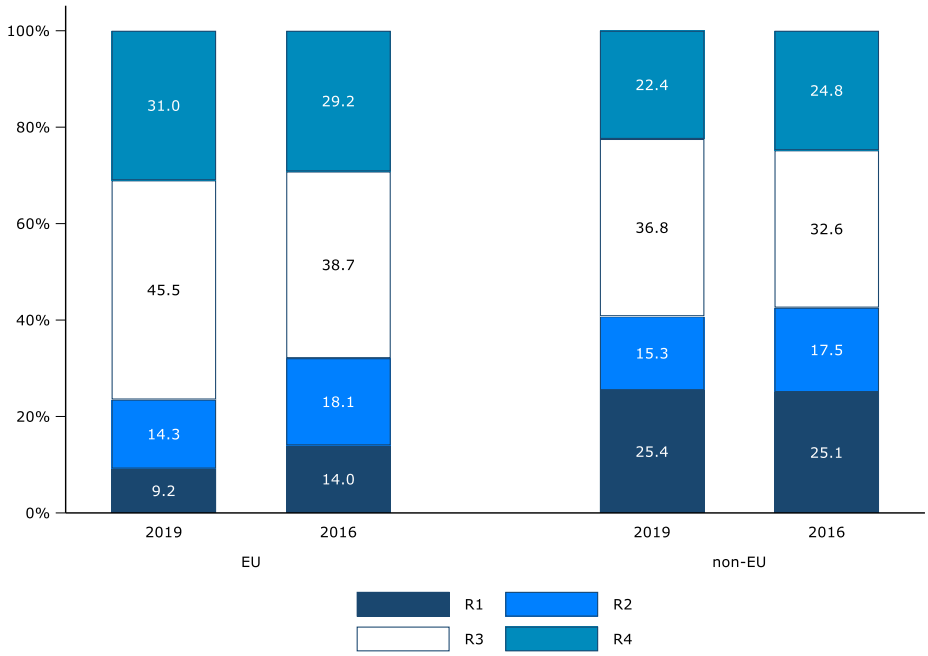
Table 58: Share of non-EU researchers, by country

	Share of non-EU researchers	
	2016	**2019**
Denmark	10,3%	10%
Germany	4,9%	-
Iceland	87,2%	93%
Ireland	6,3%	-
Luxembourg	16,6%	-
Norway	73,1%	79%
Sweden	11,9%	11%
Switzerland	47,7%	52%
The Netherlands	7,6%	6%
United Kingdom	7,3%	7%
EU28	**4,3%**	**3.9%**

Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:
- The countries included in the table are those for which there are more than 20 non-EU respondents.
- Based on question 5: "What is your country of citizenship?"

Career stage: Figure 143 shows that non-EU researchers are more likely to be in earlier career stages: the share of non-EU researchers in the R1 career stage (25%) is nearly three times as large as the share of researchers in that same career stage among EU researchers (9%). While the share of researchers in R2 is similar among EU and non-EU researchers, logically the share of researchers in R3 and in R4 is lower among non-EU researchers.

Figure 143: Share of researchers per career stage, by EU versus non-EU origin (EU28)



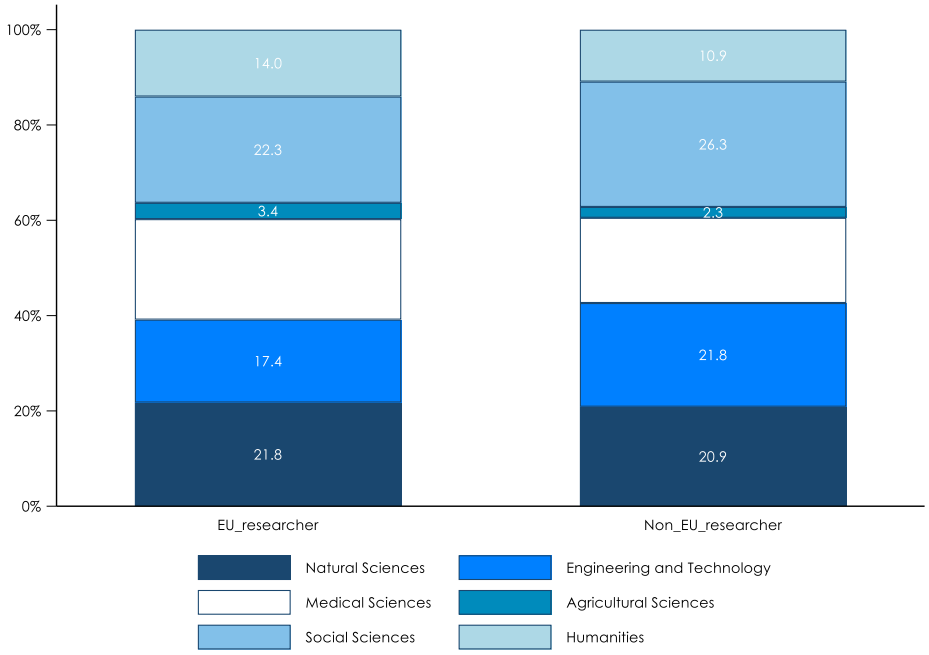
Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Based on question 5: "What is your country of citizenship?"
- (2019: n=9,321; 2016:n=10,394)

Fields of science: Figure 144 displays the shares of researchers in each field of science depending on their origin, i.e. EU and non-EU countries. Compared to EU researchers, non–EU researchers are more likely to work in the Social Sciences and in Engineering and Technology.

Gender: The gender gap is slightly larger among non-EU researchers than among EU researchers: female representation among non-EU researchers working in EU28 countries is 3 pp lower than among EU researchers.

Figure 144: Share of researchers in each field of science, by EU versus non-EU origin (EU28)



Source: MORE4 EU HE Survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Based on question 5: "What is your country of citizenship?"
- (2019: n=9,321; 2016:n=10,394)

9.4. Improving the attractiveness of the EU as a destination for researchers: policies

The conclusions of MORE4 regarding the attractiveness of the EU for researchers have not changed compared to 2016. Researchers move and are attracted to other research systems mainly because of working conditions influencing their scientific productivity, rather than because of issues such as salary, social security or quality of life. This means that still in 2019, addressing the attractiveness of ERA would mainly work through improving the conditions for scientific knowledge production. Uppermost here are clear career paths leading to tenure based on a performance-assessment, research funding and access to research facilities, research autonomy and providing perspectives for international mobility as international collaboration is usually positive for the quality of research. Once these conditions become best practice in Europe, the EU will succeed in attracting increasing numbers of leading scientists and creating positive feedback loops as more leading scientists attract more leading scientists.

The EU has introduced a series of policy instruments to strengthen the quality of European research, and to promote researchers´ mobility and the quality of working conditions in the research profession: EURAXESS, the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers as well as different funding schemes such as the ERC or the MSCA schemes.

In EU28 countries, only 19% (2016: 16%) of researchers know EURAXESS[143]. Awareness is particularly low among R1 (11%) researchers, while R2 (18%), R3 and R4 researchers (20%) show similar degrees of awareness. Knowing the service does not automatically entail that researchers use it: only 34% (2016: 33%) of those who know the service make use of it. The differences of use across career stages are small and perfectly mirror those of the awareness of the service; that is, lower use among R1 (30%, 2016: 21%) and higher use among R3 and R4 researchers (34%, 2016: 37% vs. 34%). However, MORE4 only asks researchers about their experience, and there is no information on how HEI have changed their recruitment policies as a result of the awareness building measures promoted by the EU. As the data on perception of public advertisement of vacancies indicate, there seems to be also an improvement in terms of these practices, at least in the perception of the researchers.

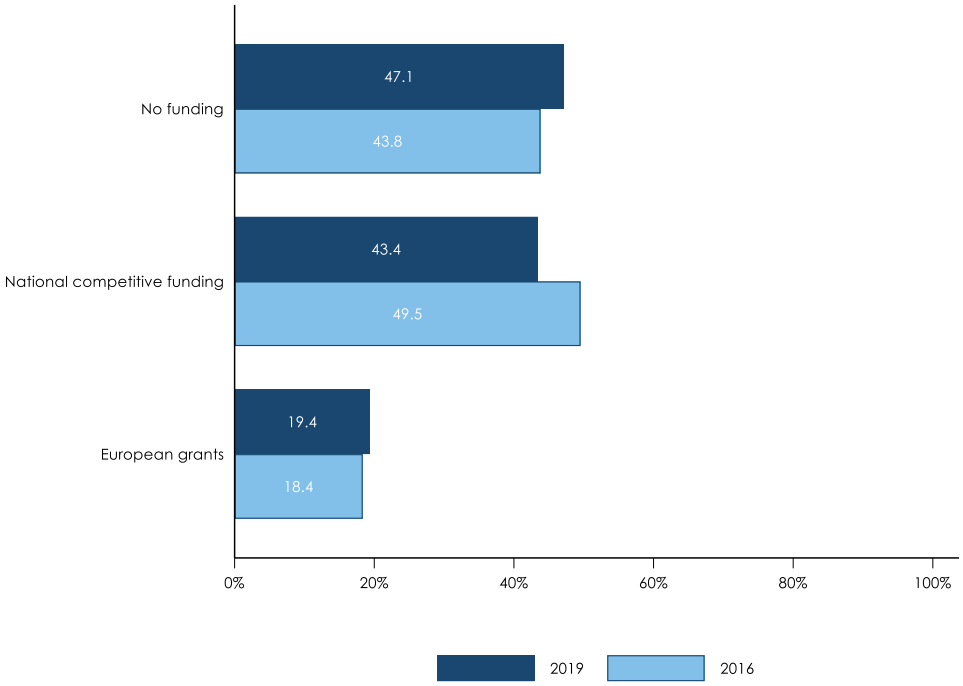
Regarding the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers, nearly one out of four researchers are aware of these instruments (25%, 2016: 22%). Similarly to EURAXESS, awareness of the Charter and Code is larger among the later career stages: 32% (2016: 30%) among R4 leading researchers compared to just 14% (2016: 10%) among R1 doctoral researchers.

Obtaining competitive funding for research from EU and national sources is a major element of research careers. As such, it is important to note that 53% (2016: 56%) of the researchers declare having obtained this kind of funding from at least one source[144]. The largest group is the one formed by those who have obtained funding from national funding schemes (2019: 43%; 2016: 50%). European grants of different types have been obtained by 19% (2016: 18%) of researchers, with a large focus on funding under the Research and Innovation Framework Programmes (Figure 145 and Figure 146).

[143] 2019: n= 8,540; 2016: n=9,412

[144] Note that the survey allowed for multiple choices when answering this question.

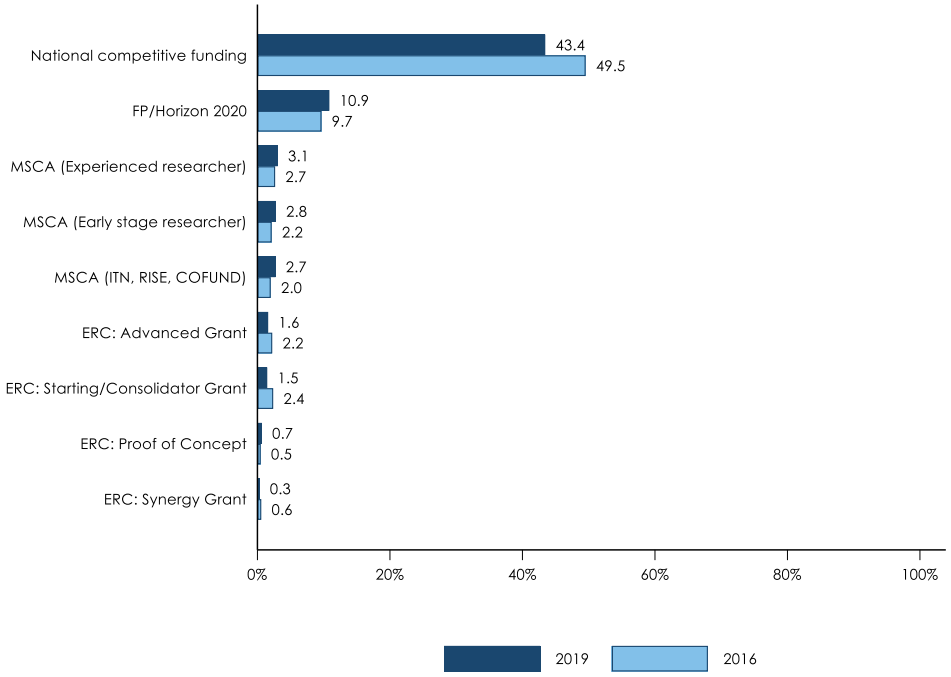
Figure 145: Shares of researchers who have obtained competitive funding (EU28)



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Researchers can receive funding from more than one of the listed sources. Therefore, the sum of the percentages per funding source exceeds 100%.
- Based on question 98: "Have you obtained competitive funding for basic research (based on peer review) from one or more of the following sources?"
- (2019: n=8,540; 2016: n=9,412)

Figure 146: Shares of researchers who have obtained competitive funding, by type of funding (EU28)



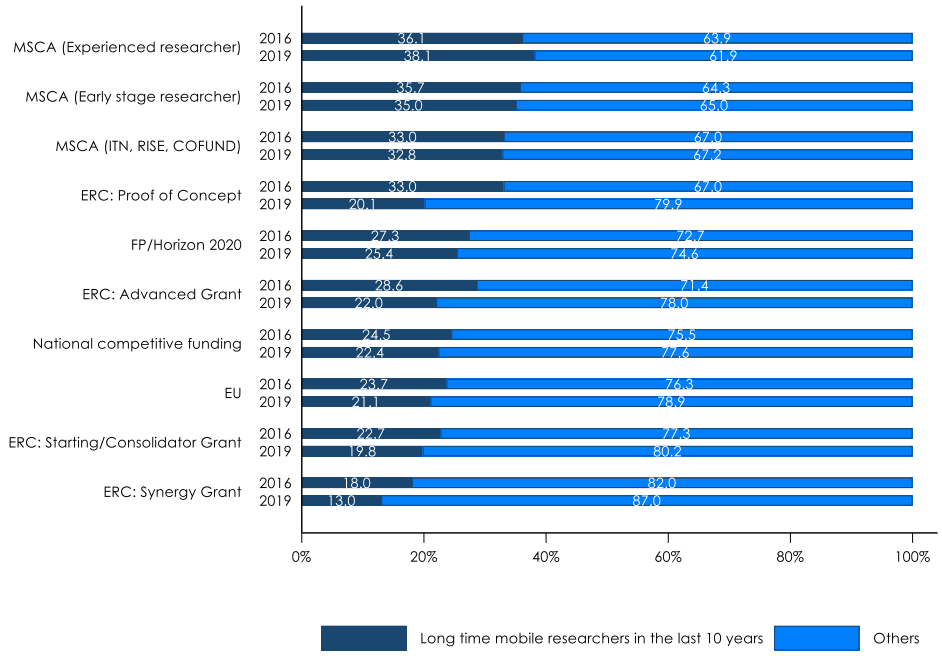
Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Researchers can receive funding from more than one of the listed sources. Therefore, the sum of the percentages per funding source exceeds 100%.
- Based on question 98: "Have you obtained competitive funding for basic research (based on peer review) from one or more of the following sources?"
- (2019: n=8,540; 2016: n=9,412)

The survey allowed for multiple choices when answering this question. In terms of number of grants, it is important to note that 63% (2016:67%) of the competitive grants obtained by researchers come from national funding schemes. 18% (2016:12%) come from EU programmes, such as the Marie Sklodowska-Curie Actions, which are also very relevant for PhD training, the FP, (Horizon 2020), or ERC granting schemes. 19% (2016:21%) of researchers have obtained both national funding and an EU grant.

Both national and international schemes are mostly positively associated with researchers' mobility profiles. Figure 147 shows the distribution of researchers that have engaged in long term mobility (>3 months) in the past ten years and the rest of the population of researchers. It can be seen that, whereas in the overall population the share of mobile researchers is 21% (2016: 24%), within each funding scheme the shares of mobile researchers are larger except for some types of ERC grants. In particular, mobility-oriented funding schemes such as MSCA achieve not surprisingly much higher shares of mobile researchers. Whether research funding causes mobility or more able researchers are more likely to both obtain competitive funding and be mobile cannot be answered by MORE4 data. It can be said though that European research funding not only plays a role for improving the working conditions of researchers, and hence of the attractiveness of the EU, but also in fostering mobility, which in turn affects scientific productivity. However, the share of short-term mobile (<3 months) researchers that obtain competitive funding is not higher than in the general population (Figure 148).

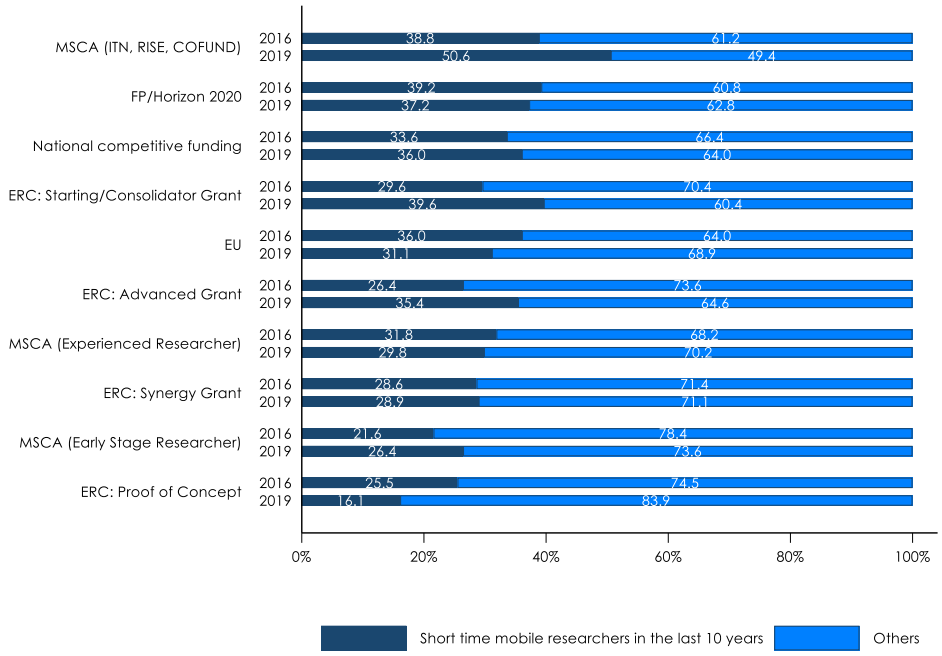
Figure 147: Distribution of >3 months mobile researchers within each type of funding



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Only R2, R3 and R4 researchers.
- Based on question 98: "Have you obtained competitive funding for basic research (based on peer review) from one or more of the following sources?" and question 62 "After gaining your highest educational qualification (PhD or other), how would you typify your international mobility experience?
- (2019: n= 7,653; 2016:n=8,073)

Figure 148: Distribution of <3 month mobile researchers within each type of funding



Source: MORE4 EU HE survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Only R2, R3 and R4 researchers.
- Based on question 98: "Have you obtained competitive funding for basic research (based on peer review) from one or more of the following sources?" and question 77 "Short term mobility"
- (2019:7,653;2016:n=8,073)

Based on this short discussion of EU policies and MORE4 findings, there seem to be three potential directions for policies:

- Continue working on the quality of PhD studies as the main point of entry into research careers, e.g., through the Marie Sklodowska-Curie Actions; foster more structured training and doctoral schools through sharing best practice and providing competitive grants to innovative doctoral school projects across the EU. Only approximately 17% of R1 researchers are aware of the principles of innovative doctoral training. Some of this funding could be earmarked for countries struggling with current economic conditions or which are still in the process of catching up as is the case for some Eastern European countries.
- Continue and renew the focus on research funding and on economic conditions for researchers in struggling countries; most of the basic research funding of the EU (Horizon2020, ERC) now is distributed on the basis of excellence, with good reason, so that primarily countries with well-performing research systems benefit. One way to combine "efficiency and equity" may be to locate large research facilities in struggling countries, which would still be open to researchers from across the EU, so that they could serve as European platforms, while still generating positive local spillovers.
- Diffuse best practice as to how to structure recruitment policies, career paths and conditions for scientific knowledge production, to spread excellence from existing centres in the EU to wider areas of the EU; this needs to be tailor-made for the heterogeneous situation of the EU

and address country specific issues, such as the balance between teaching and research in some Eastern European countries, transparent and merit-based recruitment and career paths in some Southern European countries and the high share of fixed-term contracts in countries such as Germany. The evidence for comparative higher education to do this is increasingly available, including from the MORE studies. Over the past couple of years, this has been done increasingly at EU level by the Policy Support Facility (PSF), with several country ("peer reviews") and policy reviews ("Mutual Learning Exercise") aimed at stimulating learning from best practice.[145]

In the following section we first summarise all findings from the analysis and then link these back to the policy context in a broader sense.

[145] See https://rio.jrc.ec.europa.eu/en/policy-support-facility.

10. Summary of main findings

10.1. Sociodemographic information

NO EVOLUTION IN GENDER DISTRIBUTION OF RESEARCHERS: 39.5% ARE WOMEN

GENDER IMBALANCE PERSISTS IN PARTICULAR IN TECHNOLOGICAL FIELDS AND WOMEN RESEARCHERS STILL FACE A GLASS CEILING TO REACH THE HIGHER CAREER STAGES

The gender distribution remains at about 40% women researchers compared to 60% men researchers. Female representation is smaller in later career stages (28% of researchers in R4 are women). This share has remained more or less stable over time: 29% in 2012, 25% in 2016 and 28% in 2019. The share of female researchers is the lowest in the field of Engineering and Technology, an observation which also stands over time (2012-2019). In 2019, 24% of the researchers in this field are women.

SIMILAR CAREER STAGE DISTRIBUTION

Overall, the career stage distribution is similar to the 2012 and 2016 data. In each sample there is a strong emphasis on the later career stages (in particular R3), a trend which is growing slightly stronger over time.

DUAL CAREERS ARE COMMON: 20% OF RESEARCHERS LIVING IN COUPLE HAVE A PARTNER WHO ALSO WORKS AS A RESEARCHER

Most researchers live in couple (75%) and/or have children (61%), with shares being very similar to those in 2012-2016. Interestingly, the partners of about one fifth of those who live in a couple in EU28 countries also work as researchers (20%). This is 7pp lower than in 2016. Like in 2016, female researchers are less likely to live in couple than male researchers (70% versus 78%), or to have children (56% versus 64%).

10.2. Education and training: PhD studies

PHD REMAINS THE MAIN POINT OF ENTRY INTO RESEARCH CAREERS: 92% OF RESEARCHERS HOLD A PHD

About 92% (2016: 92%, 2012: 91%) of EU researchers hold a PhD, while 75% of R1 researchers (2016: 61%, 2012: 87%) are currently enrolled in a PhD programme, which means that PhD studies are the main point of entry into research careers and that their quality matters not just for attracting researchers into research careers, but also affects scientific productivity in the EU.

ROOM FOR FURTHER PROFESSIONALISATION OF PHD TRAINING: 60% OF PHD CANDIDATES ARE STILL SUPERVISED BY A SINGLE RESEARCHER

The majority of PhD candidates (60%, 2016: 56%) are supervised by single researchers, supervisory committees (28%, 2016: 29%) or doctoral schools (12%, 2016: 15%) remain a minority which indicates that there is room for further professionalisation in European PhD training, or an increase in structured PhD training. There is large variation at the country level, with 80% of Polish PhD-students supervised by single researchers and less than one-third in Norway (26%) and the Netherlands (31%).

PhD candidates in Anglo-Saxon and Nordic Systems (e.g. Denmark: 75%) perceive their studies as more attractive than with the Southern HE system (e.g. Portugal, Spain) or the Continental system (e.g. Hungary, Poland); besides Romania (which has a very high share, 86%), on average the Anglo-Saxon and Nordic system seem also to be more transparent and accountable than the Southern and Continental system. The lowest shares can be found in Luxembourg (24%), Portugal (37%), Poland (38%), and Switzerland (40%).

ALMOST ONE THIRD OF PHD CANDIDATES RECEIVE TRANSFERABLE SKILLS TRAINING, AND THIS TRAINING FOCUSES ON SKILLS RELATED TO CORE RESEARCH ACTIVITIES

On average in the EU, 32% (2016: 33%) of PhD candidates receive training in transferable skills such as research skills, people and project management. This compares unfavourably with the share of researchers that thinks that such skills have an important influence on career progression (86% in the EU28, 2016: 81%). It varies widely among EU countries, with some Eastern European countries (e.g. 19% in Lithuania, 22% in Bulgaria) faring worse than other Eastern European countries (Romania 80% and Hungary 62%) or Western and Northern European countries (e.g. 52% in Denmark and Belgium 48%).

Training in transferable skills focuses on skills more closely related to core research activities, such as research skills, communication and presentation skills, critical and autonomous thinking, time management and decision making and problem solving (62-90%). Skills such as negotiation and entrepreneurship (both 23%) are less frequently part of transferable skills training.

ONLY 17% (2016: 9%) OF R1 AND 13% (2016: 11%) R2 RESEARCHERS ARE AWARE OF THE INNOVATIVE DOCTORAL TRAINING PRINCIPLES. ALSO, HERE RESEARCH-ORIENTED PRINCIPLES ARE CONSIDERED MORE IMPORTANT

A similar picture is found when asking PhD-students about the most important principles for PhD training: principles more closely related to the research endeavour are deemed to be essential or very important (research excellence: 90%, followed by attractive working conditions such as research independence and career development opportunities: 88%). Yet industry funding (46%) and inter-sectoral collaboration (65%) are at the bottom of principles deemed important for PhD training. This is mirrored in the share of researchers receiving industry funding (EU: 6%, with Estonia and Switzerland at 2% and the Netherlands with 25%; in engineering, the share is higher at 12%).

A similar pattern is found for internships and work placements. In the EU, 11% of R1 and R2 researchers undertook a work placement or internship in the public sector, while about 2-3% experienced one in the private sector.

10.3. Career paths

10.3.1. Recruitment

FURTHER IMPROVEMENTS IN SATISFACTION WITH OPEN, MERIT-BASED AND TRANSPARENT RECRUITMENT COMPARED TO 2016 and 2012

Most researchers (EU28: 87%) are of the opinion that recruitment in their home institutions is sufficiently publicly advertised and that the required qualifications and competencies are in line with the needs of the position (90%), that the job advertisements include clear and detailed information and that there is a procedure to deal with complaints (87%). Also, many researchers consider feedback about the selection process supplied to all candidates as a standard procedure (66%). Less than half of the researchers report recruitment issues due to the lack of fluency in the national language (43%).

Country differences are observed regarding the assessment of researchers whether recruitment at their home institution is generally merit-based (EU: 83%) and transparent (EU28: 82%). In particular researchers in some Southern (e.g. Italy 75%, Portugal 67%) and Eastern European countries (e.g. Hungary 77%) think that merit-based recruitment is less standard than on average in the EU28s. In comparison with 2016 there is improvement: in 2016, 80% of the researchers stated that vacancies were sufficiently publicly advertised. For merit-based and transparent recruitment, changes are also positive (2016: 77 and 74%, respectively).

PROJECT-RELATED WORK EXPERIENCE, ENGAGEMENT IN KNOWLEDGE TRANSFER, TRANSFERABLE SKILLS AND INTERNATIONAL MOBILITY ARE MORE IMPORTANT FOR RECRUITMENT IN A HEI THAN INTERSECTORAL MOBILITY

The perception of researchers of which factors next to the publication record count positively for recruitment yields a clear picture, in that a project related work experience is seen as most positive EU28: 92%), followed by engagement in knowledge transfer (EU28: 88%), an international mobility experience (87%) and transferable skills (86%). An intersectoral mobility experience to the private sector is seen as positive by 59% (2016: 58%), or 33 percentage points lower than a project related work experience.

There are differences between countries in particular for publication in open access journals, which is perceived as a positive factor for recruitment especially by researchers in Romania (91%) and by researchers in Latvia (89%), while only 49% of researchers in Italy and 61% in Austria would perceive this as a positive factor. But also, the perception of intersectoral mobility varies widely, with 77% of researchers in Latvia and 75% in the Netherlands, believing that they are positively affecting recruitment, while only about one out of three researchers in Italy (29%) and 41% of Croatian researchers agreed.

10.3.2. Characteristics of career paths

STRUCTURAL HETEROGENEITY IN CAREER PATHS ACROSS EUROPE

The heterogeneity of higher education systems across the EU leads to heterogeneous careers, affecting the distribution of researchers over the career stages R1-R4. Southern European systems such as Greece and Italy feature high shares of tenured R3 and R4 researchers, leading to a lower number of R1 and R2 researchers; it may also reflect funding difficulties which limit the entry into academic careers of young

researchers. Countries with hierarchical chair-based systems and few tenured positions such as in Germany tend to have a smaller share of R4 and R3 researchers (40%). Such structural features of higher education systems usually change only slowly. Compared to 2016, the shares of R1 and R2 researchers have declined in most countries. In particular, the shares of R1 researchers have remained stable or even further decreased in countries that were already below EU average in 2016 and 2012 (e.g. Italy).

Researcher characteristics across career stages keep their established patterns from previous analyses (MORE2 and MORE3). Researchers in the career stages R1 and R2 are younger (below 44 - R1: 87%, R2: 68%; 2016: 78% and 66%), more likely to be on a fixed-term contract (share of permanent contract: R1: 19%, R2: 52%; 2016: R1: 28% and R2: 49%) and have less research autonomy; R3 and R4 are more likely to be on a permanent contract (R3: 87%, in R4 95%), male (share of female researchers in R1: 51%, in R4: 28%), and have more research autonomy but also higher teaching loads.

THE USE OF FIXED-TERM CONTRACTS SEEMS TO HAVE SLOWED DOWN: 20% in 2019, 26% IN 2016 COMPARED TO 34% IN 2012

There are positive trends with respect to MORE2 and MORE3, with fewer researchers now on fixed-term contracts (EU28 2012: 34%, 2016: 26%, 2019: 20%), marking an opposite development to the USA when judging by the recent literature. Fewer fixed-term contracts are unlikely to be a result of less research funding as satisfaction with research funding is on the rise.

DUAL POSITIONS (IN MORE THAN ONE INSTITUTION) ARE RARE: 11% OF RESEARCHERS (2016: 10%) COMBINE POSITIONS IN HEIs ONLY AND 1% (2016: 0.8%) COMBINE HEI AND PRIVATE INDUSTRY POSITIONS

The share of researchers combining positions in more than one institution either inside or outside the higher education sector (dual positions) continues to be rare in the EU28 at about 11% (2016:10%) of R2-R4 researchers, of which most are at career stage R3 and or R4; dual positions between HEI and non-HEI (2019:4.8%, 2016:3.3%) and, in particular, between HEI and industry are even rarer, at only 1% (2016: 0.8%), which is not surprising, given that it is often not regarded as a positive factor for recruitment. However, in some smaller, particularly Eastern and South-eastern European countries, dual positions in all sectors (either combined positions in more than one HEI or combined position in a HEI and in another sector) reach up to 40% of all positions (e.g. Lithuania, Latvia, Romania and Bulgaria). This is probably due to working conditions, in particular salaries.

10.3.3. Career progression

CAREER PATH FROM R1 TO R4 TAKES AROUND 12-22 YEARS IN EUROPE

The time necessary from going from the earliest career stage R1 to R4 differs across countries between approximately 12 years (Romania) and 22 (Greece) years (EU: 18 years). It is more attractive to undertake a research career when the early stages of a research career (R1 and R2) do not take a long time. Early stages are usually characterised by reduced research autonomy, fixed-term contracts and lower salaries. Average time in the EU28 to reach R3 is 10 years, ranging from 7-8 (Romania, Slovenia) to 12 (Greece and Hungary) and 14 (Austria) years.

CAREER PATHS ARE CONSIDERED TRANSPARENT BY 76% (2016: 71%) OF RESEARCHERS, AND MERIT-BASED (74%; 2016: 65%). THERE ARE LARGE DIFFERENCES ACROSS COUNTRIES, POINTING AGAIN AT THE HETEROGENEITY OF EUROPEAN RESEARCH CAREERS.

While career paths are seen as relatively transparent on average 76% (2016: 71%) in some countries there is a significant share of researchers who disagree on this (e.g., Portugal: 40%, Luxembourg: 38%). The assessment of merit-based career progression is similarly positive on average in the EU28, with about 3 in 4 researchers stating that it is merit-based. Researchers from Southern European countries (Portugal, France, Italy are between 45-62%) are less optimistic, while researchers from some Eastern and Northern European countries are more positive (70-80%). Almost the same pattern is true for the assessment of whether obtaining a tenured contract only based on researchers' performance is common practice at their home institution.

SAME FACTORS ARE POSITIVE FOR CAREER PROGRESSION AS FOR RECRUITMENT

Positive factors for career progression are very similar to recruitment: On average, in the EU28 researchers perceive project related work experience (91%), engagement in knowledge transfer (88%) international mobility (86%, 2016: 85%) and transferable skills (86%, 2016: 81%) as positive for their career progression, while a mobility experience to the private sector is perceived to have the weakest positive impact (61%, 2016: 58%) and the highest negative impact (6%, 2016: 11%), again with the exception of some Eastern European countries. 4% (2016: 7%) of researchers in the EU28 think that interdisciplinary mobility has a negative impact on their career progression.

In terms of skills seen as important for career progression in HEI, skills at the core of an academic research career are most valued, such as regarding decision-making and problem solving, critical and autonomous thinking, communication and presentation, networking, project management, teamworking and grant and/or proposal writing (>95%); entrepreneurship (71%, 2016: 67%) and dealing with IPR (74%) are on average deemed to be less important for career progression in a HEI.

83% (2016: 76%) OF RESEARCHERS IN THE EU HEI SECTOR FEEL CONFIDENT ABOUT THEIR FUTURE CAREER

With respect to future confidence in their careers, the majority of researchers in the EU28 feel very or somewhat confident about their future research career (2019: 83%, 2016: 76%, 2012: 78%). Large differences across countries are observable and Northern European researchers dominate the group of the most optimistic ones (e.g. Iceland, Sweden, Norway 96-87%, 2016: 93-86%). By contrast, in Southern European countries, particularly in Portugal and Italy (63-68%), researchers are the least confident about their professional future. In general, a higher share of female researchers lacks or lacks confidence very much in their future career than their male colleagues (23 vs. 14%, 2016: 31 versus 20%).

10.4. Satisfaction with working conditions

ACROSS THE BOARD, SATISFACTION WITH WORKING CONDITIONS IS HIGHER IN 2019 THAN IN 2016

This holds for academic aspects such as intellectual challenge (2012: 89%, 2016: 91%, 2019: 95%), in particular for employment aspects such as job security or salary (job security: 86% (2019) vs 78% (2016);

remuneration: 70% (2019) vs 67% (2016)), personal aspects such as contribution to society (2012: 84%, 2016: 87%, 2019: 92%) and career-related aspects (2012: 63%, 2016: 70%, 2019: 75%).

10.4.1. Remuneration and financial security

OVERALL SATISFACTION WITH REMUNERATION MASKS LARGE COUNTRY VARIATION

Among working conditions related to financial remuneration and other non-science related ones, on average in the EU 2 out of 3 researchers perceive salaries to be reasonable. This masks large country variation along lines of economic development and performance, with countries such as Luxembourg, Germany, the Netherlands and Switzerland reporting close to 90-92% of at least reasonably paid researchers, and some Eastern European countries and Greece at the bottom, approaching only a share of 23% (2016: 25%) of reasonably paid researchers. Female researchers report on average more frequently to be somewhat less well paid (by 5-9ppt depending on the career stage), but it is likely that this figure understates the true wage gap as female and male perceptions of identical salary levels are known to deviate systematically.

By comparison with outside academia, on average close to 56% (2016: 60%) of researchers in the EU feel less well paid than their counterparts outside academia. In France and Italy, this reaches 73-85% (2016: 71-80%), which makes research careers in academia less attractive than outside options. 10% feel better paid on average, with some countries such as Latvia (25%) and some other countries which joined the EU in 2004 or later reporting higher shares of researchers being better paid than their non-academic counterparts (e.g. Romania, Slovenia and Cyprus). Overall, the shares of researchers feeling paid worse than outside academia have decreased in most of the countries since 2016.

SATISFACTION WITH JOB SECURITY REFLECTS DIFFERENCES IN ECONOMIC CONDITIONS

MORE4 findings on other financial security features such as job security are also linked to economic conditions, with high levels of satisfied researchers in terms of job security in Western and Northern European countries (e.g. the Netherlands and Norway) and lower levels in Southern and Eastern European countries (e.g. Greece and Lithuania). In the EU, on average, there are rather high levels of satisfaction with financial security, with 86% (2016: 80%) of researchers satisfied with job security, 87% (2016: 85%) with social security and 78% (2016: 70%) with pension plans. Compared to 2016 the shares of satisfied researchers have increased in all three aspects. Country variation for the latter is however large (Netherlands: 97%, Greece: 39%).

Part-time researchers working more than 50% of full-time are on similar levels as full-time researchers in terms of satisfaction with remuneration (around 70%). On the other hand, there is a clear gap in terms of satisfaction with job security (87% of full-timer vs. 64% of part-timer with less than 50% working hours). There is also significant country variation, with part-time researchers in Southern European countries experiencing much less satisfaction with financial security such as pension plans than do full-time researchers (48% vs. 66%). Possibly linked to the issue of dual labour markets, where full-time, permanent positions feature good social security but fixed-term, part-time jobs are much more precarious. In Northern European countries, there is much less of a difference between full- and part-timers (less than 7 ppt).

10.4.2. Social environment

HIGH SATISFACTION WITH CONTRIBUTION TO THE SOCIAL ENVIRONMENT IN THE ACADEMIC RESEARCH POSITIONS (89-92%, 2016: 86-89%)

The satisfaction of researchers with their social environment related to their current job position is high on average in the EU28. 92% (2016: 89%) of all EU researchers are satisfied with their contribution to society, 89% (2016: 86%) with their social status and 91% (2016: 89%) with the reputation of their current employer, with researchers in Southern and Eastern Europe less satisfied than in Northern and Western Europe. Later stage researchers and researchers from the Medical Sciences also report slightly greater satisfaction with the social environment.

10.4.3. Individual satisfaction

HIGH SATISFACTION WITH INDIVIDUAL SITUATION IN THE ACADEMIC RESEARCH POSITIONS (87-95%, 2016: 85-95%)

More than 6 out of 7 EU researchers are satisfied with their individual working conditions in terms of intellectual challenge, dynamic work environment, and level of responsibility or quality of life. 95% of researchers in the EU28 are satisfied with their intellectual challenge in their current position, 93% (2016: 92%) with their level of responsibility, 87% (2016: 85%) with their dynamic work environment, and 89% (2016: 85%) with their quality of life. Again, researchers from Northern Europe as well as researchers from the Medical Sciences report higher satisfaction.

ATTRACTIVENESS OF ACADEMIC RESEARCH CAREERS: TRADE-OFF BETWEEN SOCIAL AND INDIVIDUAL FACTORS AND REMUNERATION

High levels of social (security and environmental) and individual (job content) satisfaction – on average in the EU – can be seen to compensate dissatisfaction with pay when compared with outside academia, making research careers attractive. Researchers are willing to trade-off salary against other job features, as previous studies show.

10.4.4. Working conditions affecting scientific knowledge production

MIXED, BUT IMPROVED PATTERN FOR SCIENTIFIC KNOWLEDGE PRODUCTION FACTORS: LOWER SATISFACTION REGARDING AVAILABILITY OF FUNDING (52%, 2016: 42%), TEACHING TIME (70%, 2016: 67%) AND CAREER PERSPECTIVES (75%, 2016: 67%) BUT HIGHER SATISFACTION REGARDING WORKING WITH LEADING SCIENTISTS (85%, 2016: 83%) AND RESEARCH AUTONOMY (91%, 2016: 89%).

On average, 52% (2016: 42%) of researchers in the EU28 are satisfied with the availability of research funding and 79% (2016: 76%) with the access to research facilities (financial support for researchers). Possibly linked to overall economic conditions, Western and Northern European researchers (56 and 57% for research funding (2016: 49% and 45%) ; 84 and 88% for access to research facilities (2016: 84% and 85%)) are more satisfied than their colleagues in Southern and Eastern Europe (39 and 53% for research funding (2016: 21% and 41%); 65 and 71% for access to research facilities (2016: 53% and 66%)). Levels of satisfaction with research funding are much lower than for other working conditions, but have improved most since 2016.

On the other hand, about 85% (2016: 83%) of researchers in the EU28 are satisfied with their opportunities to work with leading scientists. Country variation is between 53-95% (2016: 61%-94%) and corresponds roughly to the performance of countries in research excellence. Researchers working in Anglo-Saxon and Nordic higher education systems, like Denmark, the Netherlands or the U.K., are on average more satisfied with their opportunities to work with leading scientists (87%) than researchers working in Continental (approximately 80%; 2016: 82%) or Southern European (89%; 2016: 80%) higher education systems.

According to the MORE3 data, about 70% (2016: 67%) of researchers in the EU28 are satisfied with their balance between teaching and research time. This level is highest among early-stage R1 and recognised R2 researchers, particularly in western (R2: 91%, 2016: 84%) and northern European (R1: 81%, 74%) countries. In contrast, less than 63% (2016: 51%) of established researchers in southern European countries are happy with their shares of research and teaching.

About 91% (2016: 89%;2012: 87%) of all researchers in the EU28 are satisfied with their level of research autonomy, with leading R4 researchers particularly satisfied, while early stage researchers are somewhat less satisfied.

Career perspectives are also relevant working conditions, as they influence the time horizon available for implementing research agendas, and mobility perspectives can shape collaboration patterns. MORE4 finds that on average 3 out of 4 researchers in the EU are satisfied with their career perspectives (2016: 68%, 2012: 62%), and 3 out of 4 researchers are satisfied with their mobility perspectives (2016: 73%; 2012: 64%). This masks however country variation, with only 65% of researchers in Southern European countries reporting satisfaction with career perspectives, in contrast to more than 80% in Northern Europe; a similar pattern holds for mobility perspectives.

All in all, satisfaction with working conditions relevant for scientific knowledge production is lowest for research funding, the balance between teaching and research time and career perspectives, unchanged from 2016; but they all have improved.

10.5. Mobility and collaboration during PhD stage

INDICATIONS OF INCREASING MOBILITY DURING PHD

At EU level the share of PhD candidates that engage in PhD degree mobility (16%) is relatively stable since 2012 (15% in MORE2). This share is however smaller than the percentage of researchers that engage in >3month mobility during their home country to finish the PhD (24%). This latter share of researchers that engaged in during PhD mobility increased substantially since 2016, where it still amounted to 18%. The current R1 researchers are more inclined towards PhD degree mobility than the current R2 researchers were at the time of their PhD (18% versus 14%). For the category of during PhD mobility we observe the opposite effect. The R2 share of PhD degree mobility is relatively stable since 2016 (14.1% versus 14.6%), but the R1 share of PhD degree mobility has dropped since the last survey (18% in 2019, versus 20% in 2016).

Family status is an important determinant of mobility in the PhD stage, as is whether or not the researcher's partner is also a researcher. The probability of mobility is also substantially higher when the partner is also a researcher. This effect is more important with respect to during PhD mobility than

to PhD degree mobility (in MORE3 this effect was more outspoken with respect to PhD degree mobility).

Citizens from Greece, Italy, Bulgaria, the Netherlands and Denmark are the most PhD degree mobile (25% or more). Researchers in Finland, Slovenia, and the United Kingdom are least PhD degree mobile (below 6%). When comparing to 2016 data, some remarkable differences can be observed. In MORE3, Romania and Ireland were among the top 3 countries with the highest shares of international PhD degree mobility, while in MORE4, they exhibit shares close to the EU28 average.

Researchers who will/did obtain their PhD in Spain, Italy, Denmark and Hungary are considerably more mobile during their PhD to another country for over 3 months than the EU average (between 46% and 59% compared to 24%). Estonia, Slovakia, Portugal and Norway are also ranked high for this indicator, with values over 25%. Researchers who obtain(ed) their PhD in Switzerland, Romania, and Luxembourg were less frequently engaged in during PhD mobility (10% or below). For Luxembourg and Switzerland, this could be in part due to other types of mobility being more prevalent in these countries, such as the PhD degree mobility or Master mobility.

The main destination countries for >3 month mobility during PhD are the United States (13%), Germany (12%) and the United Kingdom (10%). In MORE3 and MORE2, these countries were also among the top 3, but in a different order (Germany surpassed the United Kingdom in the most recent MORE survey). In MORE3, the percentages of these countries amounted to 12%, 12% and 11% respectively for the US, the UK and Germany. Of the R1 and R2 researchers who moved for >3 months during their PhD towards the United States, 12% were Italian, 12% Danish and 12% German. We can also observe that most of the R1 and R2 researchers who moved to the top 10 destination countries, come from neighbouring countries (apart from the United States and the United Kingdom).

PHD DEGREE MOBILITY IS NOT OFTEN COMBINED WITH MOBILITY DURING PHD

6% of the R1-R2 researchers combined the two forms of PhD mobility, while 64% did not engage in either of them. In MORE3, these shares amounted to 4% and 70%, respectively. In most countries, the values of PhD degree mobility and during PhD mobility mirror each other: mobility of one form is linked to a lower probability of mobility of the other form. This observation is valid for all MORE surveys.

MASTER MOBILITY IS NO SIGNIFICANT INDICATION OF THE INTERNATIONAL ORIENTATION DURING PHD

In MORE3, we observed that the rate of during PhD mobility was considerably higher among researchers who were not mobile for their PhD degree, because they already moved during their Master degree (37% versus 18% in total). It was argued that Master mobility could be considered an early indication of their international orientation. However, in MORE4, we can notice that these percentages are no longer significant from each other (23% versus 24% in total).

TWO THIRDS OF EU28 R1 AND R2 RESEARCHERS WERE NOT MOBILE FOR OR DURING PHD

64% of EU28 R1 and R2 researchers were not mobile for or during their PhD. Compared to MORE3, this is a drop of 6pp (70% in MORE3). PhD candidates in Romania, Slovenia, Germany, the United Kingdom and Czech Republic are the most non-mobile (with shares above 70%). Denmark, Spain, Hungary and

several small, open countries have lower shares of non-mobility in PhD. In these countries, researchers are thus more inclined to undertake at least one type of PhD mobility than on average in the EU.

10.5.1.1 Motives for PhD mobility

THE AVAILABILITY OF RESEARCH FUNDING AND SUITABLE PHD POSITIONS AS WELL AS WORKING WITH LEADING SCIENTISTS ARE THE THREE MOST OFTEN CITED MOTIVES FOR PHD MOBILITY

The availability of research funding is the most frequently mentioned motive in 2019 (80%) - a very similar percentage to the one found in 2016. Working with leading scientists was the most commonly cited motive in 2016 (88%). In 2019 it remains an important motive, but it is mentioned by 74% of the researchers (73% in 2012). These motives have been included among the five most commonly cited motives over time (2012-2019).

INTERNATIONAL NETWORKING (92%), WORKING WITH LEADING SCIENTISTS (90%), CAREER PROGRESSION (86%) AND THE QUALITY OF TRAINING AND EDUCATION (84%) ARE THE MOST IMPORTANT MOTIVES FOR MOBILITY *DURING* PHD.

There are small differences across gender in terms of motives to be mobile during PhD: men tend to more frequently mention motives related to the quality of training and education; balance between teaching and research time, culture and/or language, personal/family reasons and pension plan.

10.5.1.2 Barriers to PhD mobility

THE MAIN BARRIERS FOR PHD MOBILITY ARE PERSONAL OR FAMILY RELATED (58%) FOLLOWED BY THE ABILITY TO OBTAIN FUNDING FOR MOBILITY (44%) OR FOR RESEARCH (43%) AND FINDING A SUITABLE POSITION (42%).

In 2016 and 2012 the ranking of the main barriers was very similar, but the shares have increased in all the items since then, especially for the personal and family reasons which have experienced an increase since then.

R1 researchers seem to observe slightly more barriers to PhD mobility than R2 researchers. R1 researchers indicate more often that the language for the PhD programme, culture and obtaining a visa or work permit are important barriers for their PhD mobility.

Men and women tend to converge, though men tend to indicate more often than women some of the barriers. This is most notably the case of access to research facilities and equipment for research, transferring social security entitlement, culture, and the quality of training and education.

10.6. Mobility and collaboration in post-PhD career stages

10.6.1. International long-term mobility (>3 months) in post-PhD stages

The share of researchers working in European Higher Education Institutions who have been long-term mobile in the last ten years has decreased from 31.0% in 2012 and 27.4% in 2016 to 26.5% in 2019. On the

opposite side, there is an increase in those who have never been mobile: from 52% in 2012 and 55% in 2016 to 50% in 2019.

THE MORE4 SURVEY CONFIRMS THAT LONG-TERM MOBILITY IS LESS COMMON IN SOUTHERN AND EASTERN EUROPEAN COUNTRIES AND REDUCING IN SOME OF THE TECHNOLOGICALLY-ADVANCED MEMBER STATES

THE LEVELS OF LONG-TERM MOBILITY OF FEMALE AND MALE RESEARCHERS ARE CONVERGING AT A SLOWER PACE COMPARED TO THE PERIOD 2012-2016

Male researchers continue to be more mobile than female researchers: 28% versus 25%, but the gap has decreased from a 9pp difference in 2012 to a 3.6pp difference in 2016 and 2.7pp in 2019. This convergence is also observed at country level. Family situation is found to have an important effect on mobility: having a partner and having children reduce the likelihood of being mobile.

Among those who have never been mobile, most have never considered it (66%), some did consider it but have never searched for a position (23%), 12% made some effort and 5% was offered a position but turned it down.

10.6.1.1 Motives for international long-term mobility in post-PhD career stages

12% OF THE EUROPEAN RESEARCHERS HAVE FELT FORCED TO MOVE TO ANOTHER EU COUNTRY

When considering mobility to EU and non-EU countries, 6% of researchers that have been mobile for more than 3 months indicated that they felt forced to move because there were no options for a research career in their home country. Another 6% felt forced because international mobility is a requirement for career progression in their home country. The levels of forced mobility reach the highest levels in Slovenia, Luxembourg, Estonia and Latvia. Italy continues to be one of the countries with a higher level of forced mobility linked to the absence of other options to develop a career in academia.

R2 RESEARCHERS FEEL MORE FREQUENTLY FORCED TO MOVE

Forced mobility has been reduced across all career stages since 2016, even among R2 researchers which were in 2016 the group in which a higher share of individuals felt forced to move (their last move). Only forced mobility as a requirement for career progression increased among R3 researchers.

INTERNATIONAL NETWORKING, RESEARCH AUTONOMY AND WORKING WITH LEADING SCIENTISTS ARE THE MAJOR DRIVERS FOR MOBILITY WITHIN THE EU

The most frequently indicated motive to move to another EU country is international networking (87%), followed by research autonomy (85%) and working with leading scientists (83%). Since 2012 the share of researchers indicating to be driven by research autonomy has increased steadily: (from 47% in MORE2 to 76% in 2016 and 85% in 2019).

VARIATION IN MOTIVES FOR MOBILITY IS LOWER AMONG RESEARCHERS IN HIGHER CAREER STAGES

Compared to researchers in higher career stages, R2 researchers are more inclined to be driven by career progression and motives related to intellectual support when deciding whether or not to be mobile to an EU country.

Female researchers tend to indicate more often that personal or family reasons (+8pp), and career progression (+6pp) are important motives. On the contrary, men mention more frequently the balance between teaching and research time (-12pp), pension (-7pp) and working with leading scientists (-7pp) as important motives for their last EU move.

LARGE HETEROGENEITY OF THE MOTIVATIONS TO MOVE ACROSS EUROPEAN COUNTRIES

The analysis of the motivations in each of the moves indicated by respondents shows that researchers from Eastern and Southern European countries are more driven by intellectual support. As in MORE3 (2016), researchers from Western European countries researchers tend to be more driven by factors related to career progression and financial support.

Career progression is also the most frequently indicated factor as a motive for employer mobility (24%), followed by the availability of suitable positions (11%) and research autonomy (14%). These were also the more often cited motives in 2016.

10.6.1.2 Barriers during international long-term mobility in post-PhD career stages

ONE OUT OF THREE NON-EUROPEAN RESEARCHERS INDICATES THAT PERSONAL OR FAMILY REASONS WERE A BARRIER TO UNDERTAKING A LONG-TERM MOVE TO THE EU

In addition to family or personal reasons, obtaining finding for research (29%), finding adequate accommodation (26%) and obtaining a visa or work permit constitute the most frequently mentioned barriers. R2 researchers tend to mention more often barriers related to settling in a different country and career progression, such as the barriers to find appropriate accommodation, or those related to the language used for teaching or to communicate with other colleagues. More experienced researchers (R4) tend to put greater importance on barriers related to maintaining the status quo for their current position: they seem to be more concerned by the difficulties to transfer pension and social security benefits.

THERE HAS BEEN AN INCREASE IN THE BARRIERS REPORTED BY RESEARCHERS TO BE MOBILE TO EU COUNTRIES SINCE 2016

The analysis of the barriers to move to EU countries indicate that most of the barriers included in the survey have experienced an important increase compared to MORE3: the shares of researchers sometimes even double those obtained in the MORE3 survey. The most frequently indicated barriers to the last move in 2019 are obtaining funding for mobility (57%), obtaining funding for research (55%), and finding a suitable position (53%). These were also the three most important barriers indicated in MORE3 and were among the most important barriers also in MORE2.

OBTAINING FUNDING FOR MOBILITY AND FOR RESEARCH ARE THE MOST IMPORTANT MOTIVES TO DECIDE NOT TO MOVE, TO A GREATER EXTENT THAN IN 2016

As in MORE3, obtaining funding for research and mobility, as well as finding a suitable position are important reasons for non-mobility. In this sense, the reasons to be non-mobile are similar to the barriers to mobility, with a similar distribution across career stages: R4 researchers are the less affected by different reasons to be non-mobile, while R2 researchers indicate a much higher number of motives to explain their non-mobility.

10.6.1.3 Effects of international long-term mobility in post-PhD career stages

MOBILITY HAS A POSITIVE EFFECT ON NETWORKING, ADVANCED SKILLS AND THE RECOGNITION IN THE RESEARCH COMMUNITY. THE LEAST IMPORTANT EFFECTS ARE OBSERVED IN TERMS OF JOB OPTIONS OUTSIDE ACADEMIA AND THE PROGRESSION IN SALARY AND FINANCIAL CONDITIONS

In general, respondents tend to have a more positive position in 2019: the shares of researchers having indicated that their mobility experience had a positive effect are larger in 2019 than in 2016, with the exception of the items on international and national contacts, collaboration with other fields, and job options outside academia.

THERE IS A LARGE CROSS-COUNTRY VARIATION REGARDING THE EFFECTS OF MOBILITY AND IMPORTANT VARIATIONS HAVE OCCURRED OVER TIME

Mobile researchers tend to have a more positive perspective about the mobility effects in some countries, such as Poland, Greece and Bulgaria. On the contrary, researchers from other countries tend to have a less optimistic vision of the effects of their mobility experiences. This is most notably the case for Slovakia, Lithuania and Estonia.

Over time we observe large variations in some countries: researchers in Spain and Denmark had in 2016 one of the more negative views on the effects of mobility. In 2019 the scores in these countries have improved and are now close to the EU average.

R2 researchers tend to have a less positive view of the effects of mobility on their career. The difference between this group and R3 and R4 researchers is larger in those effects related to the quantity of output, the collaboration with other (sub) fields of research, the number of co-authored publications and national contacts.

10.6.2. International short-term mobility (<3 months) in post-PhD stages

The MORE4 confirms the existence of a downward trend in the level of short-term mobility: from 41% in 2012 to 37% in 2016 and 32% in 2019. Consistently with this, the share of those who have never been short-term mobile has increased (from 46% to 51% and 50%).

At the EU-level, there are no substantial differences between male and female researchers with regards to their levels of short-term mobility in the last ten years (less than 1pp difference). This result confirms the trend observed in previous studies.

As in MORE3, the analysis of short-term mobility per country shows that most countries are located around the EU average of 32%: in Latvia (24%), Malta (26%) and Ireland (27%) there are relatively fewer short-term mobile researchers, while in Romania (42%), Italy (41%), Belgium (39%) stand out by the high levels of this type of mobility.

NON-MOBILITY IN THE LONG-TERM AND IN THE SHORT-TERM ARE RELATED TO EACH OTHER: 63% OF THE RESEARCHERS WHO HAVE NEVER BEEN SHORT-TERM MOBILE HAVE NOT BEEN LONG-TERM MOBILE EITHER.

10.6.3. International collaboration in post-PhD stages

THE LEVELS OF INTERNATIONAL COLLABORATION ARE STABLE OVER TIME: 63% COLLABORATE WITH OTHER EU RESEARCHERS, 49% WITH NON-EU RESEARCHERS (63% AND 46% RESPECTIVELY IN 2016).

Collaboration with others located in non-EU countries is the least frequent option in some of the Eastern European countries, such as Slovakia, Poland or Bulgaria (34%). Germany (29%) and Spain (39%) also stand out by having lower-then-average levels of this type of collaboration. One out of two researchers in the United Kingdom, Sweden and Iceland indicate to have been involved in this type of collaboration.

10.6.4. International virtual mobility in post-PhD stages

AS IN 2012 AND 2016, 57% OF THE RESEARCHERS INDICATE THAT VIRTUAL MOBILITY REDUCES SHORT-TERM MOBILITY. A HIGHER SHARE THAN IN 2016 AND 2012 (51% AND 50% IN 2016 AND 2012 RESPECTIVELY)

Virtual mobility has a greater impact on reducing short-term mobility (57% of the researchers that collaborate with international partners) than on reducing long-term mobility (21%), though the latter has increased since 2016 where only 11% of the researchers indicated this option. These trends are also visible when analysing by career stage, country or field of science.

10.6.5. Conferences, meetings and visits in post-PhD stages

ATTENDING CONFERENCES OR EVENTS IS A VERY COMMON PRACTICE AMONG RESEARCHERS IN EU HEI SECTOR.

97.3% went to conferences or events, 90.6% to meetings with supervisors, partners or collaborators and 88.9% moved for study visits, research visits or fieldwork These findings are fully consistent with the results in the previous MORE studies (2012 and 2016).

10.6.6. Interdisciplinary mobility in post-PhD stages

ALMOST ONE FIFTH OF ALL RESEARCHERS HAVE SWITCHED TO ANOTHER FIELD OR SUBFIELD DURING THEIR ACADEMIC CAREER

Almost on fifth of all researchers have switched to another field or subfield during their academic career (19%). Large differences are observed across countries, with shares ranging from 13% to 32%. The overall share is considerably lower than in 2016, but variation across countries is smaller as well. Only small differences occur between genders and fields.

Around three quarters of researchers think that interdisciplinary mobility is positive for recruitment (2019: 75%; 2016: 74%) and for career progression (2019: 76%; 2016: 74%). In contrast to the MORE3 survey results, in MORE4 we do not find that the perceived effect of interdisciplinary mobility on recruitment and career progression depends on whether researchers have previously worked in other disciplines (i.e. were interdisciplinary-mobile).

10.6.7. Interdisciplinary collaboration in post-PhD stages

80% OF RESEARCHERS HAVE COLLABORATED WITH OTHER FIELDS, INDEPENDENT OF INTERDISCIPLINARY MOBILITY EXPERIENCE

80% of all researchers have collaborated with other fields. This was only 74% in MORE3. One of the factors that can explain the willingness to collaborate with other fields stems from the extent to which researchers themselves have previously worked in other fields: however, in contrast to MORE3, this type of collaboration is not affected by the extent to which researchers themselves have previously worked in other fields.

Interdisciplinary collaboration with researchers working in academic institutes is much higher than that with researchers in the non-academic sector: 68% in the same institute (2016: 60%) and 63% in other universities or research institutes (2016: 57%), versus 26% in the non-academic sector (2016: 31%). This difference has increased since 2016.

BELOW AVERAGE SHARES OF INTERDISCIPLINARY COLLABORATION IN SSH

Differences are observed between fields. Agricultural Sciences reach the highest shares of multidisciplinary collaboration across the different types of collaboration outside the own institute. On the contrary, the Social Sciences stand out for being the discipline with the lowest share in each of the categories. Humanities has the second lowest shares of interdisciplinary collaboration across all types.

10.6.8. Interdisciplinary virtual mobility in post-PhD stages

VIRTUAL MOBILITY HAS AN EFFECT ON INTERDISCIPLINARY RESEARCH ACCORDING TO 78% OF THE RESPONDENTS

With respect to interdisciplinary research, virtual mobility has a greater impact on facilitating collaboration between research teams (61% of the researchers collaborating across disciplines; 2016: 53%) than on decreasing barriers to exploit other fields (2019: 27%; 2016: 28%). For 22% of the respondents the web-based tools did not influence their interdisciplinary collaboration (2016: 26%).

Differences between fields are small, although researchers in Social Sciences and Humanities see virtual technologies less a supporting tool than in other fields (23% and 24% respectively versus 22% on average do not see an effect of virtual technologies on their interdisciplinary collaboration).

10.6.9. Intersectoral mobility in post-PhD stages

16% OF THE POST-PHD RESEARCHERS WHO CURRENTLY WORK IN EUROPEAN HEI HAVE AT LEAST ONCE MOVED TO THE PRIVATE SECTOR

24% of R2, R3 and R4 researchers moved to another sector during their research career. This is a decrease from 30% in 2012 but similar to the share of 25% in 2016. 16% (2016: 18%) moved at least once to the private sector (6% to large firms, 3% to SME or start-up and 7% to not-for-profit).

The contractual conditions differ depending on the destination sector. The distribution of the types of contract is highly similar in the public sector and large firms on the one hand, and in the private not-for-profit sector and SMEs/start-ups on the other. In the former two sectors, the share of permanent contracts is the highest, while in the latter two sectors self-employment is more common. Stipends, grants or fellowships are an important category in each sector.

In comparison to MORE3, the shares of permanent contracts and stipends/grants/fellowships increased significantly within the public sector and large firms. In SMEs and start-ups the share of permanent contracts decreased sharply to the benefit of the self-employment status and fixed term contracts of between 1 and 4 years duration.

EVEN THOUGH INTERSECTORAL MOVES DO NOT APPEAR MUCH APPRECIATED IN RECRUITMENT OR CAREER PROGRESSION, NETWORKING IS STILL THE MOST IMPORTANT MOTIVE TO ENGAGE IN AN EXPERIENCE IN ANOTHER SECTOR

Even though intersectoral moves do not appear much appreciated in recruitment or career progression (see sections 10.3.1 and 10.3.3 of this summary), networking is still the most important motive for moving to all sectors (81% of the cases; 2016: 70%). Other motives are more typical per destination sector e.g. contribution to society is more common as a motive to move to government and not-for-profit sectors, whereas gaining first-hand experience of industry, remuneration and bringing research to the market are more common in moves to the private industry.

10.6.10. Intersectoral collaboration in post-PhD stages

32% OF RESEARCHERS COLLABORATE WITH NON-ACADEMIC SECTORS, 32% SEE THEIR COLLABORATION AS THE RESULT OF A PREVIOUS MOBILITY EXPERIENCE

32% of researchers collaborate with non-academic sectors (2016: 35%). It is more common in later career stages (40% in R4 and 34% in R3) and less common in SSH fields (25% in Humanities and 30% in Social Sciences). Gender differences are reduced compared to MORE3, both for collaboration with non-academic sectors and with academic sectors outside the own institute.

32% of researchers that collaborate with non-academic partners state that collaboration with non-academic partners is the result of a previous mobility experience (2016: 30%).

Also, intersectoral mobility has a small but still positive effect on intersectoral collaboration. Here, the non-academic collaboration is more affected than the academic collaboration: there is a 17pp difference between the intersectorally-mobile and non-mobile with respect to non-academic collaboration, versus a 6pp difference with respect to non-academic collaboration. This is very similar to the 2016

observations. Based on this, we see evidence that mobility and collaboration go hand in hand and influence each other positively for a substantial part of researchers.

10.7. Attractiveness of the ERA

The attractiveness of ERA is a result of the structure of career paths and the quality of working conditions, while international or intersectoral mobility may be driven by perceptions of varying attractiveness, so that mobility indicators, e.g. in terms of which countries researchers choose for their international mobility experience, can also be interpreted as indicators of attractiveness. Because the information from the global survey is missing, the analysis of attractiveness must be regarded as preliminary.

WORKING INSIDE THE EU IS GENERALLY ASSESSED AS WORSE THAN OUTSIDE THE EU, IN PARTICULAR IN NON-EU ADVANCED RESEARCH SYSTEMS

The main findings on the satisfaction of researchers working in the EU with working conditions and career path features have been reported above – this is the "self-assessment". Additional information is gained from non-EU researchers working in the EU and EU researchers who have worked abroad in the past.

Looking at advanced research systems only (non-EU OECD and EU-associated countries Iceland, Norway and Switzerland), the share of researchers who say that working outside the EU is better than inside the EU is (much) higher than the share of researchers who say that working outside the EU is worse, in particular for EU researchers who have been mobile to non-EU OECD countries (who are also the largest group in the survey among researchers with experience of non-EU research systems). The share of these researchers who have moved to non-EU OECD countries perceiving working outside the EU to be better than inside is higher by about 40pp (2016: 30pp) than the share perceiving this as worse as regards conditions for scientific knowledge production (an average of research funding, working with leading scientists, research autonomy and balance between research and teaching); by about 34 pp and 37pp (2016: 33% and 29%) regarding the availability of suitable positions and engagement in industry; by about 33pp and 32pp with respect to career and mobility perspectives (2016: 32% and 24%); by 22pp for Open science approaches; and by remuneration by about 15pp (2016: 11pp).

Looking at non-EU OECD researchers currently working in the EU, or researchers from emerging countries or researchers who moved there, the results for the EU are better, but also not positive across the board. Grouping researchers by current country of employment leads to the finding that researchers from Eastern and Southern Europe find it relatively more attractive than researchers from Western and Northern Europe to work outside the EU than inside, which indirectly reflects on the attractiveness of their countries of employment.

THE EU IS ATTRACTIVE IN TERMS OF FINANCIAL AND SOCIAL WORKING CONDITIONS, BUT LESS SO IN TERMS OF FACTORS FOR SCIENTIFIC KNOWLEDGE PRODUCTION

A further source for assessing attractiveness are the motives for geographical mobility, grouped by mobility within the EU and outside the EU, again differentiating between advanced and emerging research systems.

Researchers move abroad for working with leading scientists (within EU: 20%, outside EU: 21%; 2016: within EU: 20%, outside EU: 25%), career progression (25% vs. 23%; 2016: 19 vs 19%), research autonomy (15% vs. 19%; 2016: 15 vs 16%), gaining an international network (12 vs. 11%; 2016: 7 vs 8%) and research funding and access to research facilities ((7 vs. 6%; 2016: 9 vs 8%). These are factors related to scientific productivity, which clearly determine the attractiveness of a research system. The motives regarding scientific productivity are very similar both for moving within the EU and outside the EU, showing that the forces of attraction of researchers are very similar across the board and that the EU is very heterogeneous in terms of attractiveness.

Again in line with previous research and also MORE2 and MORE3, moves outside the EU are less motivated by non-science related working conditions such as social security, pensions or other personal reasons – people are more motivated to move outside Europe for career reasons or reasons related to scientific productivity, rather than for other factors.

10.8. Implications for policy

Even though this report presents the results of only one out of three data collection and monitoring tasks of the MORE4 study, it contains very useful insights that will serve as a basis for policy implications in the final report of the study (triangulated with the results from the other tasks). In this section, we first provide a summary of the main findings with a view to policy relevance; we then link these findings to the ERA and 3 O's (Open Innovation, Open Science, Open to the World) and we outline potential policy implications.

The EU is heterogeneous, with variability of answers across different national research systems influenced by:

- Structural differences in research/university organisation acting e.g. on the nature of authority relationships, the structure of PhD studies, the share of fixed-term contracts, the prevalence of merit-based recruitment and career progression.
- General economic conditions acting e.g. on salaries, research funding and career perspectives in terms of availability of suitable positions.

Furthermore, considerable heterogeneity in researchers' assessment of career paths and working conditions comes from differences linked to gender, fields of science and career stages. The main dimensions of this study thus grasp an important part of the determinants of career and mobility decisions of researchers, in turn influencing scientific knowledge production and the EU's overall research performance.

Several aspects of career paths and working conditions of relevance for the ERA have improved since 2012 (MORE2) and 2016 (MORE3), among them the share of fixed-term contracts, public advertisement of vacancies, merit-based recruitment and satisfaction with working conditions both relating to financial conditions and conditions relevant for scientific knowledge production. While MORE4 cannot make a causal attribution to EU policy initiatives, the awareness for such issues has been raised. More positive economic developments between 2016 and 2019 will certainly have played a role, allowing budgets for R&D and universities to grow.

"Classic" features of the EU such as comparatively good social security also show up in the MORE4 findings, with researchers on average being very satisfied with social security. Attractiveness of

research careers in academia – by comparison with jobs outside academia – is negatively influenced by pay levels in academia, but positively by satisfaction with the job challenge as well as job security.

Cooperation with industry or experience with industry is less highly valued for recruitment and career progression than core research activities, with the exception of some Eastern European countries (this needs to be investigated further: dual positions, cooperation with industry may be linked to low pay in Eastern European countries). This is already obvious at the level of PhD training and continues along the research career of respondents, with differences by field of science (Engineering and Technology and Medical Sciences reporting higher involvement with industry). It is natural that researchers strive foremost for skills related to knowledge production and that recruitment and career progression as well as PhD skills focus on these skills. From this perspective, a share of 71% (2016: 67%) % of researchers saying that entrepreneurship skills will be important in their future career may actually be quite high, and this number is higher than the share of researchers receiving entrepreneurship training at PhD level (20%; 2016: 40%). Indeed, at the PhD level a need emerges to further promote the innovative doctoral training principles, where exposure to industry figures prominently.

Researchers move and are attracted to other research systems mainly because of working conditions influencing their scientific productivity, rather than because of issues such as salary, social security or the quality of life. As in MORE3, the mobility flows show a clear picture, with most mobility during PhD and in post-PhD career stages going to countries that are traditionally considered attractive research systems: the United States, the United Kingdom and Germany. Also, mobility shapes collaboration patterns and hence mobility perspectives influence scientific knowledge production. This means that addressing the attractiveness of ERA would mainly work through improving the conditions for scientific knowledge production, above all clear career paths, research funding and access to research facilities, research autonomy and also providing perspectives for international mobility as international collaboration is usually positive for the quality of research. Once these conditions are best practice in Europe, the EU will succeed in attracting increasing numbers of leading scientists, creating positive feedback loops as more leading scientists attract more leading scientists.

These findings can be linked to the main priorities that are listed in the ERA reinforcement strategy[146] and addressed in the ERA roadmap 2015-2020[147], together focusing on a European research system that can compete in a global research landscape:

1. More effective national research systems;
2. Optimal transnational cooperation and competition, including optimal transnational cooperation and competition (jointly addressing grand challenges) and research infrastructures (make optimal use of public investments in research infrastructures).
3. An open labour market for researchers (facilitating mobility, supporting training and ensuring attractive careers);
4. Gender equality and gender mainstreaming in research;
5. Optimal circulation and transfer of scientific knowledge including knowledge circulation and open access;
6. International cooperation.

[146] COM(2012) 392 final

[147] Draft Council conclusions on the European Research Area Roadmap 2015- 2020
http://data.consilium.europa.eu/doc/document/ST-8975-2015-INIT/en/pdf

The table below summarises some of the main findings of MORE4 as they relate to each of these priorities. Based on this, a number of potential policy directions are identified.

ERA PRIORITY AREAS	RELATED TO CONCEPTS	RELATED FINDINGS IN MORE4
1. More effective national research systems		- European national research systems are still heterogeneous. This is determined historically and convergence requires structural changes that may only happen gradually in the medium-term. - The MORE4 results point at a persisting imbalance in terms of satisfaction of researchers with their current position between research systems in Europe, as well as in the flows from and to European countries. Countries that are regarded traditionally as more attractive research systems are frequent destinations. Southern and Eastern European countries are the main sending systems. Career-related factors (better conditions for research) are the main drivers for mobility, explaining these flows and the imbalances therein.
2. Optimal transnational cooperation and competition	International cooperation	- International mobility and collaboration rates are stable over time. There is a clear link between international mobility and international collaboration, thus confirming the need for optimal mobility conditions and an open labour market for researchers to reach optimal transnational cooperation. (EU) Mobility funding contributes thus to international cooperation.
	International competition	- In total, about 52% of researchers in the EU28 are satisfied with the availability of research funding which is low when compared with other working conditions; however, it has improved by 10pp since 2016. Heterogeneity between countries is high. Together with access to research facilities and proper equipment, the availability of research funding is one of the working conditions researchers look out for when deciding between jobs. Low research funding in non-aligned systems makes competition inefficient and frustrating, as researchers spend their time writing proposals which get rejected. - They are the 5th and 6th most common motive for researchers in their last move, ticked by 74% (access to research facilities and equipment) and 71% (availability of research funding) of the mobile respondents. Their importance for mobility is also relatively stable over time (2012: 69% and 70%; 2016: 75% and 68%). So indeed the availability of research funding is a significant determinant of the attractiveness of a research position or career.

ERA PRIORITY AREAS	RELATED TO CONCEPTS	RELATED FINDINGS IN MORE4
3. An open labour market for researchers (facilitating mobility; supporting training and ensuring attractive careers)	Facilitating mobility, open labour market for non-native researchers	- The patterns for international mobility and collaboration are stable. Compared to 2012 barriers to mobility seemed to have become less important by 2016. For a few barriers this trend persisted by 2019 (e.g. language barrier for teaching going down from 38% in 2012 to 27% in 2016 and 19% in 2019), but for most the 2019-share is again closer to the 2012-levels. - Open, transparent, and merit-based recruitment is perceived to have improved further compared to 2012 and 2016, but we do not know from the survey whether this also means that more international profiles are attracted to the institutes. EURAXESS is still not known by the majority of researchers, but there is no information on how HEI have changed their recruitment policies as a result of the awareness building measures promoted by the EU.
	Open labour market based on merit, recognition of all relevant skills	- Open, transparent, and merit-based recruitment is perceived to have improved further compared to 2012 and 2016, but we do not know from the survey whether this also means that more international profiles are attracted to the institutes. - Next to academic publications, the majority of researchers believe in a variety of positive factors for their future research career. The main ones are project-related work experience, knowledge transfer, transferable skills and international mobility. Publication in open access journals does not figure as prominently, but is still held by 71% as positive for career progression. Again, large differences between higher education systems emerge, with Southern European countries being more sceptical about intersectoral mobility and publication in open access journals as positive for their career. - Regarding their future career the vast majority of researchers in the EU28 agree that a wide range of types of transferable skills is important for a successful future career, e.g. related to critical and autonomous thinking, decision-making and problem solving, communication and presentation, networking, project management and grant and/or proposal writing. At the lower end – but still valued by more than 70% of researchers – are entrepreneurship skills and knowledge about intellectual property rights.
	Training of research skills, as well as other skills to create openness towards careers outside academia	- Within the EU, the supervision of doctoral training mainly lies in the hands of single researchers. Only 12% are embedded in a doctoral school, similar to 2016, which indicates that there is a need for more urgent emphasis on a further professionalisation in European PhD training, or an increase in structured PhD training.

ERA PRIORITY AREAS	RELATED TO CONCEPTS	RELATED FINDINGS IN MORE4
		- Training for young scientists in transferable skills broadens their labour market options. On average in the EU28 countries, 32% of PhD candidates receive training in transferable skills. The country differences are significantly high though, ranging from 19% to 80%. Research skills are the most commonly trained skills. Communication and presentation skills, decision making and problem solving, and critical and autonomous thinking are also well covered in PhD programs. The least often offered training is collaboration with citizens, government and broader society. - A relatively low share of researchers highlight the importance of industry funding or intersectoral collaboration and this is also reflected in the pattern of internships and work placements – these are least common in the private sector. - Training is a further driving factor for mobility. Quality of training and education is regarded an important motive for PhD degree mobility, ranking sixth after (amongst others) availability of research funding and availability of suitable PhD positions.
	Attractiveness of research careers	- There is an upward trend in the satisfaction of researchers in their current research position in Europe since 2012 and 2016. - European research careers are in general attractive in terms of financial and social working conditions, but less so in terms of factors for scientific knowledge production. - Improving the conditions for scientific knowledge production, above all clear career paths, research funding and the balance between time for teaching and time for research, and also providing perspectives for international mobility as international collaboration, can be expected to be positive for the quality of research and for the attractiveness of the European research careers.
4. Gender equality and gender mainstreaming in research	Mainstreaming	- 40% of researchers are women in 2019, compared to 39% in 2016 and 38% in 2012. There is large country heterogeneity however, with 31% of researchers being female in the Czech Republic and 60% in Latvia and Croatia. - Women researchers are more represented in early career stages, and clearly underrepresented in the R4 career stage (roughly stable since 2012, at 28%). Partly due to this pattern, women researchers are less likely to live in a couple or have a family. - Male and female researchers are not equally distributed across fields of science. The most balanced disciplines are the Humanities (51%), Agricultural Sciences (47%), Medical Sciences (45%) and the Social Sciences (45%). On the opposite, in Engineering and Technology (24%) and in the Natural Sciences (32%) the presence of women is clearly lower. This distribution

ERA PRIORITY AREAS	RELATED TO CONCEPTS	RELATED FINDINGS IN MORE4
		is very similar to the findings in 2012 and 2016. Moreover, MORE shows that in Engineering and Technology, few females enter the research profession to start with, so that the problem may be related to pre-tertiary education systems. However, in medicine, a large share of females enters a research career at the early R1 and R2 levels, while in later stages (R3 and particularly R4), males dominate, pointing to reasons for gender imbalances which are linked to research careers in medicine, rather than pre-tertiary education.
	Equality	- Women researchers are still, as in 2012 and 2016, participating less in (long-term) international mobility and collaboration. The gaps are more or less stable compared to MORE3. Before that we did observe a convergence both in PhD and post-PhD stage international mobility in the last ten years between 2012 and 2016. - Women researchers are also participating less in intersectoral mobility and collaboration, but the gaps are relatively small. For intersectoral collaboration with non-academic partners the gap decreased from 8pp in 2016 to about 3pp in 2019. - The shares for interdisciplinary mobility and collaboration are very similar for men and women.
5. Optimal circulation and transfer of scientific knowledge	Open innovation	- Of all types of collaboration and mobility, intersectoral activities are the least common among the academic researchers in Europe, and they are also not expected to be valued highly in recruitment or career progression. - Industry funding and work placements are regarded less important for PhD training than the other Innovative Doctoral Training Principles. Schemes such as the pilot action 'Horizon 2020 SME Innovation Associate', which provides financial support to the recruitment of post-doctoral research associates in the European SMEs and start-ups, could hence be valuable. - The third least important principle for doctoral training is perceived to be interdisciplinary collaboration, it has however improved considerably since 2016, in line with other principles of doctoral training. - There is only very limited cooperation with non-researchers. Training for collaboration with non-researchers and other actors in society is among the least often received trainings, often not available as training even.
	Open science:	- As mentioned before, publication in open access journals is not among the main positive factors for career progression, but still valued by more than 70% of researchers. 83% of researchers have already published in Open Access journals.

ERA PRIORITY AREAS	RELATED TO CONCEPTS	RELATED FINDINGS IN MORE4
	- Digital innovations - New ways of disseminating research results - New ways of collaborating (globally)	- Similarly, 81% have participated in public awareness activities (these activities are considered to be positive for recruitment/career progression by 74%/77% of researchers). - Moreover, most researchers are willing to share research data, software and codes publicly. Already in 2019, 75% of researchers have at some point shared this kind of information. Time will show whether this trend is persistent. - 88% of researchers consider innovative digital skills important for their future careers, and 85% consider collaboration with citizens, government and broader society as important. - Virtual mobility can also support Open Science. 61% of the interdisciplinary collaborating researchers see virtual mobility as a tool to support collaboration and for 57% of the international mobile, it replaces short visits abroad.
	Open to the world	- See global survey - 49% of researchers that currently work in the EU collaborate with non-EU researchers (compared to 65% in EU countries and 63% in the own country). This is similar to 2012 and 2016, when respectively 52% and 46% collaborated outside the EU.
	Knowledge circulation	- The above summarised factors of international, intersectoral, interdisciplinary and virtual mobility and collaboration show that there is significant interaction with other researchers, and to a lesser extent with other sectors and disciplines. There are thus indications of a strong knowledge circulation and efficiency in academic research, with important spillovers to other levels of society. At the same time, there is room for improvement given the large and persisting country differences and the limited orientation towards industry and society.
6. International cooperation	Cross-cutting priority	- See priorities 2, 3 and 5.

Based on these insights, there seem to be five potential directions for policies for the EU:

- Continue working on the quality of PhD studies as the main point of entry into research careers; foster more structured training and doctoral schools through sharing best practice and providing competitive grants to innovative doctoral school projects across the EU. Some of this funding could be earmarked for countries struggling with economic conditions or which come from far behind as is the case in some Eastern European countries.
- Satisfaction with research funding, the availability of positions and career perspectives has improved since 2016, but is still characterised by large country heterogeneity, so that a continued focus on both increasing EU and national research funding but also addressing country-specific issues is warranted. The current proposals for Horizon Europe are promising in that they entail a significant budget increase compared with H2020.
- Diffuse best practice as to how to structure recruitment policies, career paths and conditions for scientific knowledge production, to spread excellence from existing centres in the EU to wider areas of the EU. This needs to be tailor-made for the heterogeneous situation of the EU and address country specific issues, such as the balance between teaching and research in some Eastern European countries, transparent and merit-based recruitment and career paths in some Southern European countries and the high share of fixed-term contracts in countries such as Germany. The instruments available within the Policy Support Facility, such as the Peer Review or the Mutual Learning Exercise can play an important role here.
- The contribution of researchers to economic goals needs to be further analysed: open innovation – one of the three O's - currently profits less from intersectoral mobility of academic researchers. Schemes such as the pilot action 'Horizon 2020 SME Innovation Associate' could be valuable. However, one result of empirical studies is that higher scientific productivity goes hand in hand with higher commercialisation of research results, with e.g. top US institutions generating the biggest part of licensing income or academic spin-offs. Hence, addressing the conditions for scientific knowledge production will also indirectly foster the economic impact of researchers.
- On gender, the picture of a high share of male researchers (72%) in the highest career stage R4 also continues in MORE4. Gender policies should be continued.

These policies would influence the effectiveness of national research systems. E.g., low quality of working conditions and non-merit-based recruitment and career progression lead to asymmetric mobility within ERA, which may become worse as ERA becomes more open.

ANNEXES

1. Definitions: career stages

A **first stage researcher (R1)** will:

- Carry out research under supervision;
- Have the ambition to develop knowledge of research methodologies and discipline;
- Have demonstrated a good understanding of a field of study;
- Have demonstrated the ability to produce data under supervision;
- Be capable of critical analysis, evaluation and synthesis of new and complex ideas and
- Be able to explain the outcome of research and value thereof to research colleagues.

One desirable competence is defined for R1 researchers:

- Develops integrated language, communication and environment skills, especially in an international context.

Recognised researchers (R2) are doctorate holders or researchers with an equivalent level of experience and competence who have not yet established a significant level of independence. In addition to the characteristics assigned to the profile of a first stage researcher a recognised researcher:

- Has demonstrated a systematic understanding of a field of study and mastery of research associated with that field
- Has demonstrated the ability to conceive, design, implement and adapt a substantial program of research with integrity
- Has made a contribution through original research that extends the frontier of knowledge by developing a substantial body of work, innovation or application. This could merit national or international refereed publication or patent.
- Demonstrates critical analysis, evaluation and synthesis of new and complex ideas.
- Can communicate with his peers - be able to explain the outcome of his research and value thereof to the research community.
- Takes ownership for and manages own career progression, sets realistic and achievable career goals, identifies and develops ways to improve employability.
- Co-authors papers at workshop and conferences.

Desirable competences for R2 researchers are:

- Understands the agenda of industry and other related employment sectors
- Understands the value of their research work in the context of products and services from industry and other related employment sectors
- Can communicate with the wider community, and with society generally, about their areas of expertise
- Can be expected to promote, within professional contexts, technological, social or cultural advancement in a knowledge based society
- Can mentor First Stage Researchers, helping them to be more effective and successful in their R&D trajectory.

An **established Researcher (R3)** has developed a level of independence and, in addition to the characteristics assigned to the profile of a recognised researcher:

- Has an established reputation based on research excellence in his field.
- Makes a positive contribution to the development of knowledge, research and development through co-operations and collaborations.
- Identifies research problems and opportunities within his area of expertise Identifies appropriate research methodologies and approaches.
- Conducts research independently which advances a research agenda.
- Can take the lead in executing collaborative research projects in cooperation with colleagues and project partners.
- Publishes papers as lead author, organises workshops or conference sessions.

Desirable competences for R3 researchers are:

- Establishes collaborative relationships with relevant industry research or development groups
- Communicates their research effectively to the research community and wider society
- Is innovative in their approach to research
- Can form research consortia and secure research funding / budgets / resources from research councils or industry
- Is committed to professional development of his/her own career and acts as mentor for others.

A **leading researcher (R4)** leads research in his area or field. He/she leads a team or a research group or is head of an industry R&D laboratory. "In particular disciplines as an exception, leading researchers may include individuals who operate as lone researchers." (European Commission 2011, p. 11). A leading researcher, in addition to the characteristics assigned to the profile of an established researcher:

- Has an international reputation based on research excellence in their field.
- Demonstrates critical judgment in the identification and execution of research activities.
- Makes a substantial contribution (breakthroughs) to their research field or spanning multiple areas.
- Develops a strategic vision on the future of the research field.
- Recognises the broader implications and applications of their research.
- Publishes and presents influential papers and books, serves on workshop and conference organizing committees and delivers invited talks.

Desirable competences of R4 researchers are:

- Is an expert at managing and leading research projects
- Is skilled at managing and developing others
- Has a proven record in securing significant research funding / budgets / resources
- Beyond team building and collaboration, focusing on long-term team planning (e.g. career paths for the researchers and securing funding for the team positions)
- Is an excellent communicator and networker within and outside the research community [creating networks]
- Is able to create an innovative and creative environment for research
- Acts as a professional development role model for others.

2. Survey methodology

2.1. Ex-ante: Survey and sampling design

The sampling strategy is at the core of the methodological approach of the MORE4 EU HE survey. It is based on stratified random sampling, the best option for a survey of individuals that have to be classified according to a number of common characteristics (e.g. country, gender, age, field of science, career stage, etc.). It was as such designed at the start of the process with the aim of producing estimates with a minimum degree of accuracy (5% max error -p value of 5%) at both EU28 and individual country level for the EU28+3 countries, and in consistency with the MORE3 EU HE survey (2016) and the MORE2 EU HE survey (2012).

In what follows, we briefly summarise the sampling strategy of the MORE4 EU HE survey in view of interpreting the indicators in this report correctly and to their full value. For more detailed information, we refer to the Methodological Report complementing this report.

Objective: The objective in the MORE studies is to define a sampling methodology under the requirements of random selection of the units in order to define the necessary sample size in accordance with a predefined level of accuracy of the estimates. Estimates are to be produced at country level after stratification of researchers by field of science (FOS). The sampling strategy is therefore built from the start on information on researchers in Europe per country and field and the necessary sampling size is calculated for each combination of country and field.

The rationale behind a FOS-based stratification, arises from the assumption that the field of science affects closely some variables of analysis (for example mobility), even if it is not the only relevant feature affecting the variables of the survey. Career stages (e.g. distinguishing PhD phase[148]) , age, university size, level of funding, territorial allocation and many other factors are relevant for the study, yet the lack of available information on these variables make that they cannot be adopted for stratification. Thus, estimates in some cases can be affected by not including these variables in the sampling frame[149].

Sampling frame: The 'optimal' sampling frame consists of an up-to-date nominal list of researchers including both contact details and the auxiliary information necessary for the definition of stratification variables (e.g. country, gender, age, field of science, career stage, etc.). If this kind of information is available, it is possible to define a random stratified sample of units that, after the survey, can be weighted for representing the total population with respect to the selected variable(s).

[148] Even if many HEI usually include PhD candidates in the research workforce the lack of official totals by country and by FOS is an obstacle for adopting this variable as a stratification one.

[149] As we will describe further, and like in MORE3, we have made an attempt for post-stratification based on career stage, a characteristic that turned out to have large explanatory power in the MORE2 study. However, as no information was available ex-ante this could not be considered in the sampling design ex-ante and only serves for the purposes of post-stratification of the results.

This sampling frame for researchers currently working in HEI in Europe is not given, but the study team developed a proxy frame in the early stages of the project based on available information on the HEI in Europe (HEI websites, national Ministry of Education directories, etc.). In this proxy frame, publicly available information for individual researchers has been registered: country and field of science are generally available. Information on age, gender or career stage are not generally available and are as such not included in the proxy frame.

Further, we have developed a two-stage stratified sampling strategy.

Two-stage stratified sampling strategy:

- A proxy frame for HEI is available, so in the first stage HEI clusters were sampled from this (first stage or primary unit);
- In the second stage researchers (second stage or secondary unit) were then selected in these HEI and stratified by FOS.

The clustering of HEIs has the property to ensure that the sample of researchers is allocated proportionally to the FOS in each country so that estimates are consistent with the country number of researchers in each FOS. This also avoids that a too limited number of clusters cover all the sampled researchers which would in turn result in a bias of the estimates.

The practical implementation of this sampling strategy consists of the following steps:

- Calculation of the sample size for each country necessary for making country estimates according to the random sampling formula for estimating proportions with a maximum (sampling) error of 5% with a probability of 95%.
- Allocation of the initial sample into the 3 broad FOS according the known totals (stratification procedure) under the assumption that FOS affects the variables of study.
- Since the sampling frame for researchers is not a priori available, a list of HEI clusters is developed as sampling frame for the primary units (HEI) and we know by our sampling frame the contact references of each cluster/HEI and its FOS.
- Under the assumption that each secondary unit is specialised in the FOS of the primary unit we can calculate the population of researchers within each cluster and select a subsample.
- The implementation of the sampling strategy is based on an oversampling methodology ensuring a selection at random to ensure sample significance at country and FOS level. The sampling matrix will thus consist of 93 final cluster strata (each cluster strata is composed of the HEIs found for the same country and the same FOS, where the target countries are 31 in number and the FOS are 3), and will indicate for each cluster (HEI) the minimum number of researchers to be surveyed.

Each of these steps is further detailed in the Methodological report complementing this report.

Once the sample of researchers to address for the survey is finalised, the survey is implemented. As in the previous MORE studies, the raw data collection in MORE4 was organised through computer-assisted telephone interviews (CATI) and computer-assisted web interviews (CAWI).

To further refine the information and in particular its statistical significance, a calibration and editing strategy is applied:

- First, a non-response survey is organised to collect data on why researchers did not participate in the main survey and on whether they would deviate from the general answering pattern in three key questions (>3 month mobility, <3 month mobility and intersectoral mobility).
- A second action in the refinement of the main data is the editing of partial responses by means of donor techniques so as to recycle information of researchers that have filled in a substantial part of the survey but did not reach the end.

The sampling strategy to collect sufficient information per country and field of science, combined with the calibration and editing strategy to refine the information and correct for non-response effects, results in the calibrated final sample on which all indicator development and measurement is based.

2.2. Ex-post: Stratification strategy

The MORE4 HE survey strategy (as that of the predecessors) is thus based on stratified random sampling, for which a proxy frame is developed and a sample selected in two stages. As mentioned before, the standard stratification that was already defined and integrated in the sampling strategy ex-ante, is based on the variable 'field of science'. However, we also looked into post-stratification based on gender and career stage. In the analysis phase, it is the available information in both the sampling frame and population that together determine the extent to with ex-ante or post stratification is possible in the analysis. This is explained below in order to understand the applied stratifications in our analysis, reflected in the indicators of this report.

Sampling frame: If sufficient information is available for specific variable(s) in the sampling frame, it is possible to define a random stratified sample of units that, after the survey, can be weighted for representing the total population with respect to the selected variable(s). Given the set-up of our sampling strategy, this is the case for country and the fields of science. Information on age, gender or career stage are not generally available and are as such not included in the proxy frame (see supra).

Population: Eurostat provides statistics on the overall research population in Europe, distributed per country, gender, age and field of science. In other words, for these variables also information on the distribution in the total population is available. This is a benchmark for the representativeness of the responses and allows weighting sample information in order to reflect this population with a specific level of accuracy. There is however no information on the distribution for career stage in Eurostat.

Ex-ante versus ex-post stratification : For the MORE4 EU HE survey (as for its predecessors), accuracy is aimed for at country level, and the sampling strategy EX-ANTE takes into account the distribution across countries and fields of science. This is indeed possible because these two types of information are known up front for the sampling frame (proxy frame) as well as their distribution for the entire population (Eurostat data).

For those variables where the information is not publicly available upfront, like for gender (only population, not proxy frame) and career stage (not in population nor proxy frame), the EX-POST weighting is the only option. An EX-ANTE strategy is not possible as the response cannot be steered

towards this if there is no information in the proxy frame to steer on. We also point out that ex-post weighting will result in less accurate estimates than the ex-ante defined country level estimates (the aim for accuracy of the country level estimates is 5% at a probability of 95%) because the response is not 'steered' for these variables and weighting is only done ex-post.

An EX-POST weighting is possible under the conditions that:

- If the variable is not available ex-ante, it is surveyed so that it becomes available ex-post for all respondents;
- There is information on the distribution of the population to allow for ex-post weighting (to better reflect the constitution of the population with respect to this variable).

For gender, the information is surveyed and the information on the distribution of the population is available in Eurostat. The first condition for careers stage is also fulfilled by asking about the career stage in the MORE4 survey. But for career stage there is no information on the population available in Eurostat. However, to make post-stratification possible, the second condition needs to be fulfilled: information on the distribution over the total population needs therefore be collected. Therefore, we have collected data from other, national, sources in order to come to an indicative distribution for the research population in Europe (per country).

An important limitation when population information is built on many different national sources, is a lack of consistency and coverage. That is why we combine the information from national sources with the MORE3 career stages estimates and methods. Second, based on data availability, we formulate a proposal for the post-stratification for career stages. For the detailed outline of this approach, we refer to the Methodological Report complementing this report. Important for the interpretation of the results in this report is that:

- Only a **rough approximation** of the distribution of the researcher population per country over career stages could be obtained due to the strong heterogeneity of national sources across countries and within countries[150]. On the one hand, estimates have improved compared to MORE3 thanks to the availability of more and higher-quality national data for most countries and additional consistency checks made possible by this. On the other hand, the limited comparability of national data across countries, combined with difficulties with the measurement of R1 compared to the total number of researchers[151], remain important

[150] Heterogeneity of data across countries is due to the following factors:

- Each country adopts its own methods to classify researchers according to national legislations – which are not necessarily harmonised at international level.
- In addition, data is not available for all countries in the sample: in two cases a career breakdown is missing in the national data; in three other cases national sources publish figures about career stages only in aggregations like R1&R2 or R3&R4, and in one case, the only available source there is only data from one HEI available on career stage distribution.
- The reference years in national sources often differ from that of the Eurostat totals and also across countries. Information is in some cases outdated.
- Within countries as well, different national sources are found with different approaches depending on their purposes (statistical or administrative purpose, for instance).

[151] Eurostat data were used for the total number of researchers in HEI per country as well as the total number of PhD students (R1 researchers) per country. However, these two indicators stem from two different statistical domains: R&D and education

issues for the accuracy of the estimates. This reflects on the framework built for the post-stratification for career stages and **leads to the resulting indicators being an equally rough estimation of the reality.**

- The survey stratification is designed to achieve 5% error estimates of researchers at country level – but not at career stage level. In the interpretation of the results, it must thus be taken into account that **errors for estimates based on career stage post-stratification will be (substantially) higher than this 5%,** in particular for those strata where only a small number of responses was obtained (career stage*country).

These are important limitations that cannot be addressed without better quality of the basic data on career stages at national level and that lead us to predominantly report on the key indicators weighted for the ex-ante defined strata based on country and field of science (also consistent with the MORE2 and MORE3 indicators). The post-stratification for career stages will be used mainly as a validation of how well this indicator is balanced for the career stages and/or how it might be affected by a potential unbalance. It is only reported at EU level and for the key indicators in the report.

2.3. Description of the sample

The survey has been administered in 31 European countries: the 28 Member States of the European Union and Iceland, Switzerland and Norway. It has been implemented through both CAWI (Computer-assisted web interviewing) and CATI (Computer-assisted telephone interviewing) techniques. One third (28.7%) was collected through CAWI and the remaining two thirds of the responses (71.3%) through CATI. The total number of respondents that answered the survey is 9,321.

In the following sections we describe the MORE3 EU HE sample and how its characteristics compare to:

1) The information collected ex-ante in the sampling frame (country, field of science) – this helps to assess the quality of the sampling frame;
2) Each other, i.e. are response patterns logical (age and career stage) – this helps to assess the quality of the collected survey data;
3) The characteristics of the population according to Eurostat; this helps to assess the effect of the weighting on the final results at population level.

2.3.1. Country level

The number of respondents per country and field of science are given in the table below. For more information on the relation with the sample size requirements and the error rates based on the comparison of both, we refer to the Methodological Report complementing this report.

respectively. For the total number of researchers per country we use the official Eurostat data for the year 2016, which is also the reference data for the MORE4 HEI survey sampling design. However, comparing the Eurostat estimates for R1 researchers with this figure brings about a number of issues: in two cases, the number of R1 researchers is higher than the total population of researchers according to Eurostat and in one case, this is close to the total number of researchers. Also in other countries, the share of R1 researchers seems to be relatively high compared to the total.

Table 59: Sample per country and field of science

	NATURAL	HEALTH	SOCIAL	TOTAL
Austria	243	48	89	380
Belgium	116	96	130	342
Bulgaria	170	63	89	322
Croatia	158	72	138	368
Cyprus	87	18	78	183
Czech Republic	207	66	85	358
Denmark	169	66	153	388
Estonia	90	39	61	190
Finland	120	38	102	260
France	190	50	153	393
Germany	186	83	71	340
Greece	191	107	91	389
Hungary	134	29	85	248
Iceland	63	20	68	151
Ireland	145	59	112	316
Italy	188	59	137	384
Latvia	41	58	103	202
Lithuania	136	48	96	280
Luxembourg	65	12	60	137
Malta	77	38	75	190
Netherlands	143	59	111	313
Norway	121	46	175	342
Poland	155	54	43	252
Portugal	144	92	75	311
Romania	136	85	154	375
Slovakia	120	75	82	277
Slovenia	117	43	53	213
Spain	131	97	159	387
Sweden	125	98	145	368
Switzerland	122	45	121	288
United Kingdom	167	63	144	374
Total EU28	**3,951**	**1,715**	**2,874**	**8,540**
Total EU28+3	**4,257**	**1,826**	**3,238**	**9,321**

Source: MORE4 EU HE survey (2019)
Note:

- (n=9,321)

The questionnaire included a set of sociodemographic questions that allow to validate and refine the relationship of each of the researchers with the countries in which they have worked and studied. These questions allow to validate the stratification procedure at country level: 94% of the respondents declare to currently work in the same country that was used for the sampling process. There is also a very high correlation between country of residence and country of current employment. This correlation pattern is logical and comparable to the one found in previous MORE studies.

Around 84% of the respondents have the citizenship of the country where they currently work. 76% of the respondents indicate to have obtained their PhD in the same country where they are currently working. 79% has obtained their PhD in the country of their citizenship.

Table 60: Overlap across countries of reference

	EQUAL TO PANEL COUNTRY	EQUAL TO COUNTRY OF CURRENT EMPLOYMENT	EQUAL TO COUNTRY OF RESIDENCE	EQUAL TO COUNTRY OF CITIZENSHIP (FIRST)
Country of current employment	93.6%			
Country of residence	93.4%	95.8%		
Country of citizenship (first)	82.3%	84.4%	85.4%	
Country of PhD degree	73.2%	76.1%	76.0%	79.4%

Source: MORE4EU HE survey (2019)
Notes:

- Panel country is equal to country of current employment for 98% of the respondents in the sample.
- Country of employment is based on question 27: "Country of employer"
- Country of residence is based on question 4: "Country of residence"
- Country of citizenship is based on question 5: "Country of citizenship"
- Country of PhD degree is based on question 9: "Please indicate below all higher education (=post-secondary) diplomas/degrees you have obtained so far and their details."
- (n=9,321)

2.3.2. *Fields of science*

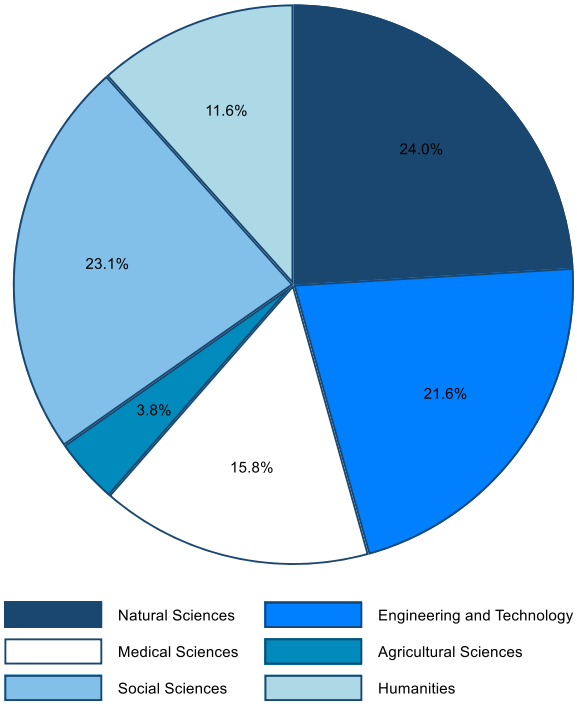
The MORE4 EU HE survey asked the respondents to self-select their field of science from a list of six fields, based on the Fields of Research and Development (FORD) classifications proposed by the OECD in the 2015 Frascati Manual[152] :

- Field 1 (Natural Sciences);
- Field 2 (Engineering and Technology);
- Field 3 (Medical and health sciences);
- Field 4 (Agricultural and veterinary sciences);
- Field 5 (Social Sciences);
- Field 6 (Humanities and the Arts).

Figure 149 shows the overall distribution of respondents across the six fields of science. The largest share of respondents corresponds to the Natural Sciences and the smallest to Agricultural Sciences.

[152] OECD (2015), Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/9789264239012-en.

Figure 149: Distribution of fields of science in the sample



Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 11: "What is your main field of research in your current position?"
- (n=9,321)

As described in detail in the previous section, the MORE4 EU HE survey applied a stratification strategy in order to achieve representative results in the combined strata of country of employment and fields of science. Consistent with the stratification applied in the previous MORE studies, this was based on an aggregated level of three fields of science:

- NATURAL: Field 1 (Natural Sciences) and Field 2 (Engineering and Technology)
- MEDICAL: Field 3 (Medical and health sciences) and Field 4 (Agricultural and veterinary sciences)
- SOCIAL: Field 5 (Social Sciences) and Field 6 (Humanities and the Arts)

The table below provides an overview of the sample distribution in terms of the fields of sciences declared by the respondents and the population distribution according to Eurostat. From this we find that in most countries, the sample distribution is similar to the population distribution.

Overall, the Natural Sciences and Engineering and Technology have a 6pp higher share in the sample than in the population, mainly to the expense of Medical and Agricultural Sciences. Important differences between the composition of the sample and that of the population are found in only a few countries. The share of researchers working in the Natural Sciences and Engineering and Technology is lower in the sample than in the population in Latvia (29pp) and in Romania (26pp). This field has higher shares in the sample than in the population in Hungary (20pp) and in Poland (24pp). The Medical and

Agricultural Sciences are underrepresented in Denmark (25pp), Iceland (30pp), Norway (20pp). The Social Sciences and Humanities are overrepresented in Romania (29pp) and Latvia (22pp) and underrepresented in Poland (22pp) and in Portugal (18pp).

When FOS-based weights are applied in the analysis, we see that in countries with a lower share of one of the FOS than in the population, the responses of researchers in this FOS will receive higher weight than those of researchers in the overrepresented fields. In general, the responses of the researchers in Natural Sciences and Engineering and Technology will be given less weight in the calculation of aggregated indicators than those of Medical and Agricultural Sciences.

Table 61: Field of science distribution in the sample and in the population

	POPULATION			SAMPLE		
Country	**Health**	**Natural**	**Social**	**Health**	**Natural**	**Social**
Austria	22.1%	45.8%	32.1%	12.6%	63.9%	23.4%
Belgium	31.1%	39.0%	29.9%	28.1%	33.9%	38.0%
Bulgaria	27.0%	33.3%	39.7%	19.6%	52.8%	27.6%
Croatia	30.2%	36.1%	33.8%	19.6%	42.9%	37.5%
Cyprus	7.9%	44.6%	47.5%	9.8%	47.5%	42.6%
Czechia	26.2%	46.1%	27.7%	18.4%	57.8%	23.7%
Denmark	41.6%	29.4%	29.0%	17.0%	43.6%	39.4%
Estonia	15.6%	48.8%	35.7%	20.5%	47.4%	32.1%
Finland	20.8%	39.1%	40.1%	14.6%	46.2%	39.2%
France	24.3%	39.2%	36.6%	12.7%	48.3%	38.9%
Germany	25.9%	41.0%	33.1%	24.4%	54.7%	20.9%
Greece	19.0%	43.0%	38.0%	27.5%	49.1%	23.4%
Hungary	23.2%	33.6%	43.2%	11.7%	54.0%	34.3%
Iceland	42.8%	22.2%	35.0%	13.2%	41.7%	45.0%
Ireland	20.4%	45.2%	34.4%	18.7%	45.9%	35.4%
Italy	22.4%	40.5%	37.1%	15.4%	49.0%	35.7%
Latvia	22.2%	48.9%	28.9%	28.7%	20.3%	51.0%
Lithuania	18.1%	35.9%	45.9%	17.1%	48.6%	34.3%
Luxembourg	12.3%	43.8%	43.9%	8.8%	47.4%	43.8%
Malta	22.6%	28.4%	49.0%	20.0%	40.5%	39.5%
Netherlands	35.4%	34.1%	30.5%	18.8%	45.7%	35.5%
Norway	33.9%	24.2%	42.0%	13.5%	35.4%	51.2%
Poland	23.3%	37.4%	39.3%	21.4%	61.5%	17.1%
Portugal	18.7%	39.4%	41.9%	29.6%	46.3%	24.1%
Romania	24.3%	62.4%	13.3%	22.7%	36.3%	41.1%
Slovakia	19.0%	41.2%	39.8%	27.1%	43.3%	29.6%
Slovenia	29.3%	41.5%	29.2%	20.2%	54.9%	24.9%
Spain	20.2%	39.0%	40.8%	25.1%	33.9%	41.1%
Sweden	27.2%	37.2%	35.7%	26.6%	34.0%	39.4%
Switzerland	17.1%	48.1%	34.8%	15.6%	42.4%	42.0%
United Kingdom	24.3%	37.6%	38.1%	16.8%	44.7%	38.5%
EU28+3	**24.2%**	**39.4%**	**36.4%**	**19.6%**	**45.7%**	**34.7%**

Source: MORE4 EU HE survey (2019)
Note:

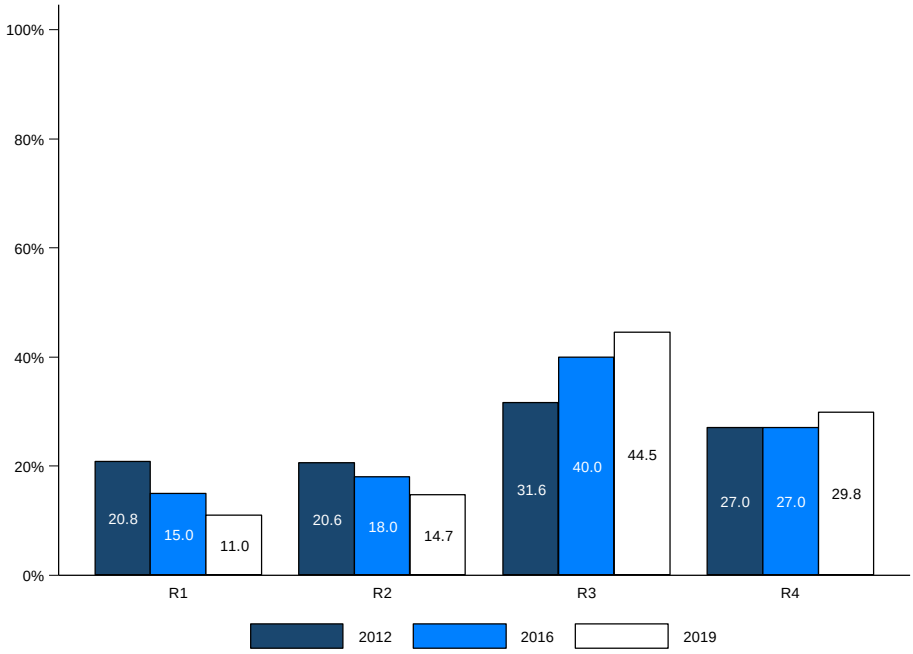
- (n=9,321)

2.3.3. *Career stage*

Figure 150 shows the distribution per career stage of researchers as declared by them in the three MORE studies. In the three MORE studies there is a strong emphasis on the later career stages in the sample (R3 in particular) and that this trend is stronger over time.

In Table 62, we observe that R3 is the category with a higher share of researchers across almost all countries. Only in Austria, Finland, and Greece, R4 researchers constitute relatively larger groups (38%, 39%, and 51% respectively). The largest shares of R1 researchers are found in Luxembourg (24%), Belgium (24%) and Switzerland (20%). R2 researchers constitute a larger group in Luxembourg (27%), Romania (23%), Germany (23%) and Slovakia (22%).

Figure 150: Self-declared career stages



Source: MORE4 EU HE survey (2019), MORE3 EU HE survey (2016), and MORE2 EU HE survey (2012),
Notes:

- Based on question 13: "In which career stage would you currently situate yourself?"
- (2019: n=9,321; 2016: n=10,394; 2012: n=10,546)

Table 62: Number of respondents per career stage (self-declared in the survey)

	TOTAL	R1	R2	R3	R4	R1 %	R2 %	R3 %	R4 %
Austria	380	48	61	127	144	12.6%	16.1%	33.4%	37.9%
Belgium	342	81	68	104	89	23.7%	19.9%	30.4%	26.0%
Bulgaria	322	28	43	185	66	8.7%	13.4%	57.5%	20.5%
Croatia	368	26	40	191	111	7.1%	10.9%	51.9%	30.2%
Cyprus	183	7	20	102	54	3.8%	10.9%	55.7%	29.5%
Czech Republic	358	32	57	166	103	8.9%	15.9%	46.4%	28.8%
Denmark	388	59	70	157	102	15.2%	18.0%	40.5%	26.3%
Estonia	190	24	27	92	47	12.6%	14.2%	48.4%	24.7%
Finland	260	24	45	90	101	9.2%	17.3%	34.6%	38.8%
France	393	48	52	160	133	12.2%	13.2%	40.7%	33.8%
Germany	340	56	78	109	97	16.5%	22.9%	32.1%	28.5%
Greece	389	8	17	165	199	2.1%	4.4%	42.4%	51.2%
Hungary	248	34	21	131	62	13.7%	8.5%	52.8%	25.0%
Iceland	151	20	11	66	54	13.2%	7.3%	43.7%	35.8%
Ireland	316	21	56	164	75	6.6%	17.7%	51.9%	23.7%
Italy	384	15	29	223	117	3.9%	7.6%	58.1%	30.5%
Latvia	202	31	28	81	62	15.3%	13.9%	40.1%	30.7%
Lithuania	280	34	47	111	88	12.1%	16.8%	39.6%	31.4%
Luxembourg	137	33	37	45	22	24.1%	27.0%	32.8%	16.1%
Malta	190	11	22	104	53	5.8%	11.6%	54.7%	27.9%
Netherlands	313	56	46	129	82	17.9%	14.7%	41.2%	26.2%
Norway	342	57	30	138	117	16.7%	8.8%	40.4%	34.2%
Poland	252	12	40	118	82	4.8%	15.9%	46.8%	32.5%
Portugal	311	29	62	161	59	9.3%	19.9%	51.8%	19.0%
Romania	375	12	88	152	123	3.2%	23.5%	40.5%	32.8%
Slovakia	277	30	61	132	54	10.8%	22.0%	47.7%	19.5%
Slovenia	213	31	44	70	68	14.6%	20.7%	32.9%	31.9%
Spain	387	32	32	205	118	8.3%	8.3%	53.0%	30.5%
Sweden	368	50	44	161	113	13.6%	12.0%	43.8%	30.7%
Switzerland	288	57	67	99	65	19.8%	23.3%	34.4%	22.6%
United Kingdom	374	15	28	209	122	4.0%	7.5%	55.9%	32.6%
EU28+3	**9,321**	**1,021**	**1,371**	**4,147**	**2,782**	**11.0%**	**14.7%**	**44.5%**	**29.8%**

Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 13: "In which career stage would you currently situate yourself?"
- These figures reflect the distribution in the sample. No weights are applied.
- (n=9,321)

When we compare the age structure in the sample with the self-declared career stages, we expect a higher average age for higher career stages. Table 63, Table 64 and Table 65 confirm that this is indeed the case in the sample of the MORE4 EU HE survey, both with or without weighting of the sample.

Table 63: Distribution of groups of age per self-declared career stage (no weighting is applied)

AGE GROUP	R1	R2	R3	R4	TOTAL
<35	63.9%	23.1%	4.2%	0.7%	12.5%
35-44	19.8%	44.1%	33.1%	9.1%	26.1%
45-54	10.6%	21.7%	35.7%	32.9%	30.1%
55-64	5.0%	8.5%	21.4%	38.5%	22.8%
>65	0.8%	2.6%	5.6%	18.8%	8.6%
Total	**1,021**	**1,371**	**4,147**	**2,782**	**9,321**

Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 13: "In which career stage would you currently situate yourself?" and question 3: "What is your year of birth?"
- (n=9,321)

Table 64: Distribution of groups of age per self-declared career stage (weighted by field of science)

AGE GROUP	R1	R2	R3	R4	TOTAL
<35	69.4%	22.8%	3.8%	0.6%	12.3%
35-44	17.7%	45.9%	31.4%	8.0%	25.0%
45-54	8.4%	18.5%	37.2%	35.4%	31.0%
55-64	3.9%	9.9%	21.8%	37.7%	23.1%
>65	0.6%	2.8%	5.7%	18.3%	8.6%
Total	**154,745**	**216,353**	**674,786**	**457,621**	**1,503,505**

Source: MORE4 EU HE survey (2019)
Notes:
- These figures are the result of applying the weights designed on the basis of field of science.
- Based on question 13: "In which career stage would you currently situate yourself?" and question 3: "What is your year of birth?"
- (n=9,321)

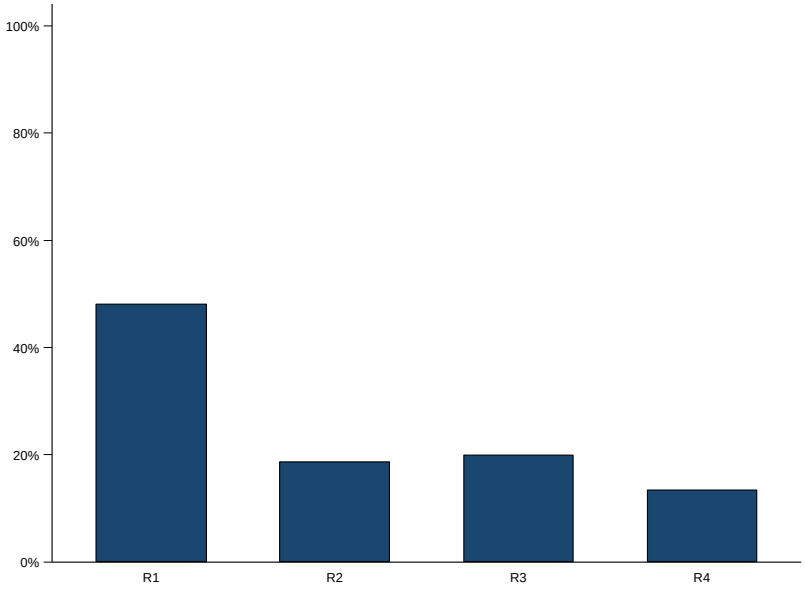
Table 65: Distribution of groups of age per self-declared career stage (poststratification weights are applied)

AGE GROUP	R1	R2	R3	R4	TOTAL
<35	67.5%	21.2%	4.5%	0.8%	37.4%
35-44	16.8%	43.9%	31.2%	9.0%	23.7%
45-54	9.5%	22.5%	37.1%	35.4%	20.9%
55-64	5.7%	9.2%	20.6%	37.8%	13.6%
>65	0.6%	3.3%	6.6%	16.9%	4.5%
Total	722,330	281,290	298,799	201,087	1,503,505

Source: MORE4 EU HE survey (2019)
Notes:
- These figures are the result of applying the weights designed on the basis of career stage post stratification weights.
- Based on question 13: "In which career stage would you currently situate yourself?" and question 3: "What is your year of birth?"
- (n=9,321)

To what extent the distribution of researchers per country over career stages in the sample reflects the reality is difficult to assess as no Eurostat data on this dimension is available. Based on the information that is available in literature and Eurostat totals and R1 data, we assume that there are relatively higher shares of R3 researchers and lower shares of R1 researchers in the sample than expected. When the career stage-based weights are applied, we see that indeed the distribution is shifted towards a majority of R1 and decreasing shares in the following career stages (Figure 151).

Figure 151: Distribution of self-declared career stages (poststratification weights are applied)



Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 13: "In which career stage would you currently situate yourself?" (n=9,321)

2.3.4. Gender

In total, 41% of the respondents in the sample are female. A similar share was obtained in the MORE3 survey. This is also very close to the share found in Eurostat for the entire population of researchers (42%). Also, at country level the distributions of sample and population are similar (Table 66). The main differences are found in Latvia (+14pp), Croatia (+10pp) and United Kingdom (-13pp)[153]. When gender-based weights are applied in the analysis, we will see that in countries with a lower share of female researchers than in the population, the responses of the female researchers receive higher weight than those of their male counterparts. As the overall balance between sample and population is good, this will have only limited effect on the values for the indicators.

[153] In the MORE3 survey these were also the countries where the largest variations were found: Croatia (13pp), Latvia (10pp) and United Kingdom (-15pp).

Table 66: Gender distribution in the sample and in the population

	SHARE OF FEMALE RESEARCHERS IN THE POPULATION	SHARE OF FEMALE RESEARCHERS IN THE SAMPLE
Austria	39.9%	36.6%
Belgium	41.6%	38.3%
Bulgaria	51.9%	49.7%
Croatia	49.0%	58.7%
Cyprus	37.6%	33.3%
Czechia	34.4%	29.3%
Denmark	44.5%	38.1%
Estonia	47.8%	49.5%
Finland	48.4%	46.2%
France	35.4%	43.8%
Germany	38.9%	34.4%
Greece	37.7%	29.0%
Hungary	39.9%	30.2%
Iceland	54.4%	43.7%
Ireland	45.1%	39.2%
Italy	41.0%	43.5%
Latvia	54.1%	68.3%
Lithuania	55.8%	49.3%
Luxembourg	38.1%	34.3%
Malta	33.1%	30.5%
Netherlands	42.8%	37.1%
Norway	48.2%	37.7%
Poland	43.7%	49.2%
Portugal	48.8%	52.7%
Romania	48.4%	44.3%
Slovakia	45.9%	41.5%
Slovenia	41.7%	48.8%
Spain	42.1%	41.3%
Sweden	44.9%	38.3%
Switzerland	38.8%	41.7%
United Kingdom	45.5%	32.4%
Total	**42.4%**	**41.3%**

Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 2: "What is your gender?"
- (n=9,321)

2.4. Ex-ante versus ex-post stratification: a comparison of estimates

This section presents the results for the main indicators when the post-stratification by career stage is applied, comparing it to the results obtained by ex-ante weighting procedures, and it addresses the reasons behind the few cases in which there are differences across both types of estimates.

Section 2.2 of this Annex has presented the main potential limitations of post-stratifying the data by career stage, being the most important ones the incomplete availability of secondary data (lack of data for specific countries), and substantially higher error rates. In spite of these potential pitfalls, the

estimates obtained applying both stratification weights are very similar, with the differences being lower than the sampling error in most of the cases.

Table 67: Career paths and working conditions (EU28)

INDICATOR	WEIGHTS BASED ON FIELD OF SCIENCE	WEIGHTS BASED ON CAREER STAGES	DIFFERENCE (in pp)
Early stage researchers in doctoral programme	74.8%	73.2%	1.6
Share of researchers with a PhD degree	83.6%	54.9%	28.7
Average duration current employment	13.0%	9.1%	4.0
Share of researchers with a fixed term contract	20.2%	41.2%	-21
Share of researchers with a dual position in current employment	10.9%	11.6%	-0.7
Share of researchers with a dual position in the private industry	1.1%	1.5%	-0.4
Share of researchers with a dual position in the public sector	3.3%	3.7%	-0.4
Satisfaction with current position: academic factors	92.6%	92.8%	-0.15
Satisfaction with current position: employment factors	85.0%	82.8%	2.2
Satisfaction with current position: career progression	74.9%	73.6%	1.3
Satisfaction with current position: personal factors	89.2%	89%	0.2
Share of researchers in full time positions	91.1%	81.7%	9.4
Average category of teaching load	48.8%	40.1%	8.7

Source: MORE4 EU HE survey (2019)

Table 67 shows the indicators related to career paths and working conditions. The cases in which the differences between indicators are larger are those referring to the share of researchers with a PhD degree: +29pp difference between the estimate weighted by field of science compared to the one weighted by career stage. This difference is also consistent with one that was obtained in 2016 when applying the poststratification weights in MORE3 data (+25 pp.). Other variables where the differences is substantial are the share of researchers with a fixed-term contract (-21 pp. difference), and the share of researchers in full time positions (+9 pp. difference). These are precisely the indicators which show a larger variation across career stages, especially between R1 researchers and higher career stages.

Table 68 shows the distribution of researchers with a PhD across career stages. The shares of researchers are very similar within the career stages when applying the weight based on field of science and the weight based on career stages. It can be observed that R1 researchers have a much lower share of researchers with a PhD than the other career stages since many of them are still enrolled in PhD training. Since the post-stratification weight increases the importance of this group to the expense of R2, R3 and R4 stages, this entails that that the overall estimate produces a significantly different result.

Similarly, Table 69 reflects the extent to which the ex-ante stratification and the career stage weight post-stratification produce consistent findings at career stage level on the shares of researchers with a fixed-term contract. It is the reweighting of the sample – through giving a larger weight to R1 researchers – what produces the disparities at EU level. Similarly, the shares of researchers in full-time positions are displayed in Table 70 and show that the difference in the estimates produced by the ex-ante stratification

and by the career weight post-stratification comes from attributing a larger importance to R1 researchers in post-stratification estimates.

Table 68: Share of researchers with a PhD across career stages (EU28)

CAREER STAGES	WEIGHTS BASED ON FIELD OF SCIENCE	WEIGHTS BASED ON CAREER STAGES
R1	16.8%	16.5%
R2	90.0%	90.0%
R3	90.1%	89.1%
R4	92.4%	92.3%

Source: MORE4 EU HE survey (2019)

Table 69: Share of researchers with a fixed-term contract across career stages (EU28)

CAREER STAGES	WEIGHTS BASED ON FIELD OF SCIENCE	WEIGHTS BASED ON CAREER STAGES
R1	68.5%	62.6%
R2	44.8%	40.5%
R3	11.8%	9.2%
R4	4.2%	4.4%

Source: MORE4 EU HE survey (2019)

Table 70: Distribution of researchers in full-time positions across career stages (EU28)

CAREER STAGES	WEIGHTS BASED ON FIELD OF SCIENCE	WEIGHTS BASED ON CAREER STAGES
R1	69.8%	71.2%
R2	85.1%	85.0%
R3	95.4%	95.4%
R4	94.5%	95.2%

Source: MORE4 EU HE survey (2019)

In Table 71 we observe that the indicators referring to PhD mobility and mobility during the PhD stage are very robust. The ex-ante stratification and the post-stratification produce very similar results.

Table 72 presents the indicators related to mobility and collaboration in the post-PhD stage. The only case in which the difference between both indicators is larger than the sampling error is the one referring to international collaboration. The differences between the two indicators rely on the fact that the distribution of responses is very much dependent on career stage, as it is shown in Table 73.

Table 71: PhD mobility and mobility during PhD stage (EU28)

INDICATOR	WEIGHTS BASED ON FIELD SCIENCE	WEIGHTS BASED ON CAREER STAGES	DIFFERENCE (in pp)
PhD Mobility	15.5%	16.8%	1.3
Mobility during PhD	22.7%	21.3%	-1.4

Source: MORE4 EU HE survey (2019)

Table 72: Collaboration and mobility in post-PhD stage (EU28)

INDICATOR	WEIGHTS BASED ON FIELD OF SCIENCE	WEIGHTS BASED ON CAREER STAGES	DIFFERENCE (in pp)
Post PhD: Long-term mobility in the last ten years	26.5%	23.1%	3.4
Post PhD: Long-term mobile more than ten years ago	24%	21.7%	2.3
Post PhD: Never long-term mobile	49.4%	55.3%	-5.9
Post PhD: Short-term mobility in the last ten years	31.8%	29.9%	1.9
Post PhD: Short-term mobility more than ten years ago	18.6%	15.3%	3.3
Post PhD: Never short-term mobile	49.6%	54.7%	-5.1
International collaboration with colleagues from EU or non-EU countries	70.1%	58.9%	11.2
Interdisciplinary mobility	18.9%	18%	0.9
Interdisciplinary collaboration	79.5%	77.1%	2.4
Intersectoral mobility	23.8%	22.7%	1.1
Intersectoral collaboration	26.5%	23.1%	3.4

Source: MORE4 EU HE survey (2019)

Table 73: Distribution of international collaboration across career stages

CAREER STAGES	WEIGHTS BASED ON FIELD SCIENCE	WEIGHTS BASED ON CAREER STAGES
R1	47.1%	47.2%
R2	45.4%	55.1%
R3	74.8%	77.2%
R4	82.1%	79.5%

Source: MORE4 EU HE survey (2019)

3. ADDITIONAL TABLES AND GRAPHS

3.1. Additional Tables for Section 5

Able 74: Researchers' perception of specific characteristics of the recruitment process in the home institutions, by country

	Job advertisements include clear and detailed information	Required qualifications and competencies are in line with the needs of the position	Lack of knowledge of national language is not a barrier	There are measures to foster representation of underrepresented groups	Clear and transparent information on the selection process	Administrative burden for candidates is kept to a minimum	Feedback to all candidates	Procedure to deal with complaints
Austria	84.1%	89.5%	50.2%	79.3%	68.8%	67.7%	42.5%	73.3%
Belgium	88.4%	95.2%	59.9%	70.9%	79.9%	70.3%	66.2%	87.4%
Bulgaria	80.8%	86.8%	46.4%	69.5%	80.0%	63.6%	66.1%	79.3%
Croatia	79.3%	85.6%	36.4%	60.0%	75.0%	57.0%	71.3%	83.7%
Cyprus	84.3%	86.5%	63.1%	64.3%	72.8%	69.7%	66.6%	69.1%
Czech Republic	91.5%	94.2%	68.7%	86.3%	90.2%	75.9%	81.4%	88.2%
Denmark	91.8%	94.9%	76.5%	76.4%	83.3%	82.5%	78.9%	90.3%
EU	86.5%	90.4%	56.6%	76.3%	81.2%	70.3%	66.1%	85.5%
Estonia	86.1%	92.8%	68.5%	69.9%	82.7%	77.3%	67.0%	87.0%
Finland	86.9%	86.6%	67.5%	78.9%	73.5%	76.7%	61.7%	86.9%
France	80.5%	91.1%	43.0%	52.1%	74.9%	50.6%	45.5%	76.6%
Germany	90.0%	94.8%	63.4%	90.1%	79.2%	77.1%	65.1%	84.8%
Greece	77.3%	85.7%	35.0%	56.5%	86.6%	55.6%	73.5%	80.5%
Hungary	81.2%	87.8%	52.3%	58.9%	67.1%	60.6%	59.0%	66.9%
Ireland	85.8%	87.9%	68.2%	77.8%	76.9%	65.9%	70.0%	84.6%
Italy	74.4%	83.1%	44.0%	54.8%	78.5%	58.3%	61.7%	77.8%
Latvia	87.8%	90.2%	59.5%	72.8%	86.7%	81.0%	71.7%	85.9%
Lithuania	79.2%	80.5%	71.3%	66.9%	72.0%	62.0%	57.7%	81.4%
Luxembourg	85.9%	88.6%	80.4%	71.8%	67.7%	75.7%	60.8%	75.8%
Malta	94.3%	93.6%	85.8%	81.0%	86.0%	78.8%	73.8%	89.9%
Poland	85.2%	91.7%	62.1%	69.6%	83.0%	77.6%	77.0%	79.3%
Portugal	79.5%	85.5%	63.3%	58.9%	74.0%	57.3%	61.1%	81.6%
Romania	91.8%	91.4%	83.0%	81.5%	87.9%	77.9%	81.6%	89.5%
Slovakia	88.6%	89.0%	63.8%	74.4%	84.1%	73.0%	70.2%	76.9%
Slovenia	83.2%	87.8%	69.8%	85.2%	83.8%	82.0%	85.3%	89.1%
Spain	72.9%	72.9%	64.6%	66.2%	74.5%	66.3%	63.4%	87.0%
Sweden	82.6%	88.8%	66.7%	77.4%	77.2%	64.9%	69.6%	89.5%
The Netherlands	93.9%	96.8%	88.2%	88.4%	84.1%	92.3%	82.8%	89.0%
United Kingdom	95.0%	95.3%	47.7%	84.9%	89.7%	74.9%	71.2%	93.4%

Source: MORE4 EU HE survey (2019)
Notes: Based on question 36: "What is your opinion on the recruitment process in your home institution" (n=6,797-8,047)

Table 75: Shares of researcher agreeing on recruitment policies, by country

	Externally and publicly advertised	Transparent	Merit-Based
Austria	87.5%	76.7%	81.2%
Belgium	87.7%	82.6%	85.5%
Bulgaria	79.8%	78.6%	77.6%
Croatia	76.9%	75.6%	72.5%
Cyprus	79.1%	74.3%	74.0%
Czech Republic	84.9%	89.0%	90.2%
Denmark	89.0%	84.1%	89.8%
EU	87.0%	81.5%	82.9%
Estonia	85.1%	82.3%	84.8%
Finland	88.2%	78.3%	80.5%
France	82.5%	74.7%	77.8%
Germany	91.7%	83.5%	86.6%
Greece	84.2%	83.6%	76.4%
Hungary	76.7%	65.7%	76.7%
Iceland	90.7%	92.2%	92.8%
Ireland	86.3%	81.0%	80.9%
Italy	77.1%	75.2%	75.4%
Latvia	84.7%	86.1%	85.1%
Lithuania	75.0%	73.2%	80.9%
Luxembourg	84.2%	71.1%	80.9%
Malta	90.5%	86.6%	87.3%
Norway	88.7%	83.4%	86.8%
Poland	85.1%	82.1%	81.9%
Portugal	73.2%	71.8%	67.1%
Romania	89.9%	90.4%	84.3%
Slovakia	86.9%	85.8%	80.4%
Slovenia	82.0%	80.1%	83.2%
Spain	75.6%	73.2%	76.1%
Sweden	88.8%	79.0%	85.5%
Switzerland	90.2%	84.3%	86.4%
The Netherlands	90.5%	85.3%	91.4%
United Kingdom	93.7%	87.8%	87.7%

Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 37 "What is your opinion on the following issues with respect to recruitment in general in your home institution"
- (n=8,540)

Table 76: Perception of merit-based and transparent career progression in the home institution, by country

	Merit-Based	Transparent	Tenured
Austria	63.5%	69.9%	53.6%
Belgium	73.0%	77.2%	73.6%
Bulgaria	72.4%	76.0%	74.3%
Croatia	63.3%	70.2%	70.7%
Cyprus	71.7%	70.8%	74.0%
Czech Republic	86.0%	86.3%	86.4%
Denmark	82.0%	71.5%	73.3%
EU	73.9%	76.3%	73.3%
Estonia	73.6%	77.1%	72.0%
Finland	75.1%	66.9%	74.3%
France	62.0%	74.0%	64.3%
Germany	77.5%	80.7%	71.8%
Greece	66.6%	78.0%	67.2%
Hungary	69.0%	70.8%	64.5%
Iceland	84.9%	83.0%	83.6%
Ireland	63.0%	68.5%	69.7%
Italy	60.9%	65.9%	58.8%
Latvia	83.7%	84.0%	81.4%
Lithuania	76.3%	68.7%	78.4%
Luxembourg	58.4%	62.0%	57.9%
Malta	78.6%	82.1%	80.8%
Norway	83.7%	79.6%	73.6%
Poland	80.2%	77.9%	81.5%
Portugal	45.3%	60.3%	45.2%
Romania	86.7%	90.1%	88.0%
Slovakia	76.9%	86.0%	77.4%
Slovenia	80.5%	87.1%	81.2%
Spain	70.6%	70.3%	69.3%
Sweden	79.3%	68.7%	77.8%
Switzerland	76.2%	78.8%	78.1%
The Netherlands	83.7%	80.3%	83.5%
United Kingdom	80.4%	81.2%	82.9%

Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 38." What is your opinion on the following issues with respect to career progression in your home institution"
- (n=8,540)

Table 77: Positive factors for recruitment, by career stage

	R1	R2	R3	R4
Interdisciplinary mobility	81.16%	77.11%	74.77%	73.02%
international mobility	85.29%	85.85%	86.48%	87.50%
Transferable skills	87.27%	87.72%	85.17%	85.37%
Intersectoral mobility to government sector	66.46%	61.77%	60.07%	56.41%
intersectoral mobility to private sector	65.32%	62.39%	59.24%	54.95%
Publication in open access journals	74.50%	75.35%	69.22%	62.44%
Engagement in knowledge transfer	88.71%	88.13%	88.31%	88.55%
Public awareness activities	73.76%	76.48%	71.62%	74.72%
Project related work experience	95.60%	92.13%	91.38%	91.03%

Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 39."In your experience, would you say the following factors are regarded as positive or negative factors for recruitment in your home institution?
- (n=784-3,711)

Table 78: Positive factors for recruitment, by field of science

	Agricultural Sciences	Engineering and Technology	Humanities	Medical Sciences	Natural Sciences	Social Sciences
Interdisciplinary mobility	83.7%	76.8%	70.7%	82.5%	74.7%	68.6%
International mobility	96.5%	88.8%	83.6%	87.6%	85.9%	84.8%
Intersectoral mobility to not-for-profit, public or government sector	69.0%	62.6%	51.3%	67.9%	56.2%	56.8%
Intersectoral mobility to private industry	69.4%	68.6%	46.7%	65.0%	56.6%	52.9%
Transferable skills	90.5%	89.1%	82.0%	93.0%	83.9%	79.8%
Publication in open access journals	80.4%	66.4%	69.8%	74.3%	65.4%	65.0%
Knowledge transfer	90.8%	92.3%	87.2%	91.3%	87.1%	84.0%
Public awareness activities	80.9%	74.7%	74.7%	79.0%	68.2%	70.5%
Project related work experience	94.4%	93.1%	90.4%	96.4%	89.3%	89.3%

Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 39."In your experience, would you say the following factors are regarded as positive or negative factors for recruitment in your home institution?
- (n=305-2012)

Table 79: Perception of positive factors for recruitment in the home institution, by country

	Interdisciplinary mobility	International mobility	Transferable skills	Intersectoral mobility to gvt sector	Intersectoral mobility to private sector	Publication in open access journals	Engagement in knowledge transfer	Public awareness activities	Project related work experience
Austria	65.4%	88.1%	90.2%	44.3%	49.2%	60.9%	87.0%	66.5%	93.1%
Belgium	82.3%	94.1%	88.0%	57.8%	56.7%	69.6%	92.8%	84.5%	95.1%
Bulgaria	79.7%	86.6%	83.6%	68.5%	65.6%	77.6%	87.2%	70.6%	90.1%
Croatia	60.3%	88.5%	76.6%	40.3%	41.1%	63.0%	74.5%	65.2%	83.3%
Cyprus	72.2%	86.4%	85.9%	58.2%	58.7%	72.3%	86.4%	73.2%	86.5%
Czech Republic	84.9%	94.9%	91.3%	73.2%	75.3%	77.9%	92.7%	78.0%	95.0%
Denmark	80.4%	90.5%	85.8%	63.9%	69.4%	66.6%	89.7%	76.2%	95.8%
EU	75.1%	86.6%	85.8%	59.7%	58.9%	68.5%	88.4%	73.5%	91.8%
Estonia	84.3%	91.4%	91.5%	54.7%	52.4%	74.4%	90.5%	78.1%	94.8%
Finland	80.9%	94.6%	86.2%	62.0%	62.5%	70.0%	87.9%	77.0%	89.7%
France	68.8%	92.1%	82.3%	53.9%	44.9%	64.5%	86.3%	77.9%	91.2%
Germany	78.4%	85.0%	90.0%	65.3%	66.5%	62.6%	89.3%	68.3%	95.3%
Greece	74.3%	86.7%	74.5%	58.4%	52.7%	70.6%	86.7%	66.1%	88.6%
Hungary	73.8%	90.5%	83.5%	52.7%	53.2%	61.5%	81.8%	60.4%	88.0%
Iceland	84.9%	97.5%	93.3%	67.2%	72.2%	81.8%	93.8%	87.1%	93.8%
Ireland	77.1%	84.2%	85.3%	59.7%	62.5%	67.0%	88.4%	78.6%	89.4%
Italy	59.1%	90.5%	73.8%	36.3%	28.6%	48.5%	82.3%	54.7%	86.2%
Latvia	88.2%	96.3%	90.6%	74.1%	77.0%	88.5%	92.9%	78.1%	96.6%
Lithuania	70.2%	85.9%	79.5%	61.4%	60.9%	75.1%	88.2%	79.7%	92.5%
Luxembourg	75.1%	95.8%	89.0%	48.2%	41.7%	68.6%	86.0%	74.1%	90.7%
Malta	77.7%	90.5%	92.1%	71.1%	74.2%	84.2%	92.5%	87.7%	92.1%
Norway	69.9%	90.5%	87.2%	54.9%	48.5%	63.4%	82.7%	74.6%	87.2%
Poland	74.5%	85.9%	81.0%	58.3%	61.3%	80.4%	83.2%	75.8%	88.8%
Portugal	65.7%	82.5%	71.2%	54.6%	54.4%	65.1%	87.1%	71.2%	89.7%
Romania	66.3%	87.1%	88.8%	55.2%	61.6%	90.8%	87.4%	84.8%	94.5%
Slovakia	79.2%	93.8%	89.5%	61.2%	65.8%	77.3%	92.2%	75.9%	94.1%
Slovenia	83.0%	95.1%	93.5%	68.1%	69.2%	82.1%	92.6%	82.5%	93.0%
Spain	72.4%	92.1%	78.2%	64.5%	61.4%	65.7%	88.9%	63.4%	87.0%
Sweden	76.2%	91.7%	84.5%	60.9%	59.8%	66.6%	85.9%	77.8%	91.3%
Switzerland	79.7%	90.3%	91.0%	60.0%	55.2%	73.6%	93.6%	79.6%	91.2%
The Netherlands	88.0%	94.7%	91.5%	77.6%	75.8%	75.8%	89.9%	88.6%	95.4%
United Kingdom	78.7%	79.7%	91.5%	60.9%	60.9%	75.1%	90.9%	81.2%	92.5%

Source: MORE4 EU HE Survey (2019)
Notes:

- Share of researchers agreeing that these factors are positive for career progression.

- Based on question 39: "In your experience, would you say the following factors are regarded as positive or negative factors for recruitmentin your home institution?"
- (n=8,280)

Table 80: Perception of positive factors for career progression, by higher education systems

	2019				2016			
	Anglo_ Saxon	Continental_European	Southern_ European	EU	Anglo_ Saxon	Continental_ European	Southern_ European	EU
Interdisciplinary mobility	79.0%	77.4%	69.8%	76.1%	74.6%	79.7%	67.4%	74.3%
international mobility	80.8%	86.1%	89.3%	85.7%	80.0%	87.1%	86.3%	84.6%
Transferable skills	88.3%	88.6%	81.2%	86.2%	81.3%	84.0%	76.6%	80.7%
Intersectoral mobility to gvt sector	64.2%	65.2%	55.5%	62.1%	-	-	-	-
intersectoral mobility to private sector	65.5%	65.9%	49.8%	61.1%	-	-	-	-
Publication in open access journals	73.9%	72.4%	64.4%	71.3%	-	-	-	-
Engagement in knowledge transfer	89.5%	86.1%	87.3%	87.8%	-	-	-	-
Public awareness activities	81.9%	74.2%	71.9%	76.7%	-	-	-	-
Project related work experience	91.9%	92.4%	88.9%	91.3%	-	-	-	-

Source: MORE4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Share of researchers agreeing that these factors are positive for career progression.
- Average shares of the following country groups are shown: Anglo-Saxon (UK, SE, DK, NL, IE), Continental European (DE, AT, PL, HU, CZ, SK), Southern European (IT, FR; ES, PT) and EU28.
- Based on question 40: "In your experience, would you say the following factors are regarded as positive or negative factors for career progression in your home institution?"
- (2019: 1475-8540; 2016: 1843-)

Table 81: Perception of positive factors for career progression in the home institution, by country

	Interdisciplinary mobility	International mobility	Transferable skills	Intersectoral mobility to gvt sector	Intersectoral mobility to private sector	Publication in open access journals	Engagement in knowledge transfer	Public awareness activities	Project related work experience
Austria	68.4%	90.5%	88.0%	52.7%	54.5%	69.5%	86.6%	74.7%	93.9%
Belgium	81.5%	93.8%	89.6%	57.0%	53.4%	72.9%	94.0%	88.9%	96.3%
Bulgaria	85.5%	92.2%	87.4%	68.5%	68.9%	82.6%	90.5%	79.2%	93.5%
Croatia	62.4%	88.7%	76.0%	44.5%	45.3%	65.3%	76.1%	69.4%	85.8%
Cyprus	75.3%	87.9%	87.7%	62.7%	59.8%	77.7%	86.9%	74.2%	86.1%
Czech Republic	82.6%	90.6%	88.7%	72.4%	73.1%	82.5%	92.1%	79.8%	93.6%
Denmark	78.7%	89.6%	86.5%	65.4%	70.4%	69.6%	89.7%	81.5%	94.6%
EU	76.1%	85.7%	86.2%	62.1%	61.1%	71.3%	87.8%	76.7%	91.3%
Estonia	80.2%	93.4%	90.3%	55.6%	56.0%	77.3%	89.4%	79.9%	94.1%
Finland	83.1%	90.4%	85.5%	65.8%	63.8%	73.7%	86.7%	80.0%	89.6%
France	72.1%	92.1%	84.8%	57.9%	47.3%	66.8%	90.3%	83.4%	92.1%
Germany	77.8%	83.7%	90.3%	68.0%	67.8%	68.1%	85.6%	72.8%	92.7%
Greece	78.7%	85.9%	77.5%	64.4%	57.5%	72.3%	85.9%	70.2%	89.9%
Hungary	75.4%	93.6%	87.6%	56.0%	55.0%	71.9%	81.3%	69.3%	89.7%
Iceland	85.8%	94.0%	93.3%	72.7%	70.8%	86.8%	94.5%	86.7%	92.4%
Ireland	79.8%	84.3%	85.3%	63.4%	63.4%	67.9%	86.6%	81.0%	88.8%
Italy	60.1%	88.4%	75.6%	35.5%	28.4%	49.8%	80.4%	58.7%	85.3%
Latvia	87.5%	95.9%	93.7%	74.8%	78.4%	89.0%	93.1%	77.9%	96.2%
Lithuania	76.0%	92.0%	84.5%	67.9%	67.2%	80.0%	88.6%	80.4%	91.5%
Luxembourg	70.2%	90.4%	84.5%	47.8%	43.2%	73.6%	83.0%	76.2%	84.9%
Malta	81.3%	89.8%	89.8%	74.4%	75.1%	90.3%	91.0%	87.9%	92.5%
Norway	72.2%	89.8%	86.3%	54.4%	54.7%	69.4%	85.0%	74.7%	90.1%
Poland	78.6%	88.4%	83.5%	62.2%	65.6%	83.7%	86.0%	78.6%	91.3%
Portugal	68.0%	79.0%	75.5%	56.7%	53.7%	67.8%	87.1%	73.0%	86.9%
Romania	75.1%	90.4%	88.8%	62.1%	63.1%	91.7%	88.4%	87.2%	95.0%
Slovakia	78.5%	91.2%	86.4%	60.4%	62.2%	82.6%	90.4%	72.9%	91.1%
Slovenia	86.2%	95.8%	92.2%	71.2%	70.9%	83.2%	90.2%	82.7%	91.8%
Spain	74.5%	91.3%	83.5%	64.9%	63.0%	70.0%	88.8%	69.0%	88.9%
Sweden	75.3%	91.3%	86.0%	62.5%	59.0%	69.5%	86.4%	81.3%	90.3%
Switzerland	76.0%	89.8%	89.3%	60.3%	53.0%	78.3%	91.2%	81.5%	91.2%
The Netherlands	86.8%	91.9%	92.2%	76.8%	78.2%	79.2%	91.0%	90.0%	93.5%
United Kingdom	78.8%	77.9%	88.5%	63.3%	65.1%	74.6%	89.8%	81.4%	91.9%

Source: MORE4 EU HE Survey (2019)

Notes:

- Share of researchers agreeing that these factors are positive for career progression.

- Based on question40: "In your experience, would you say the following factors are regarded as positive or negative factors for career progression in your home institution?"
- (n=9,321)

Table 82: Perception of positive factors for career progression in the home institution, by field of science

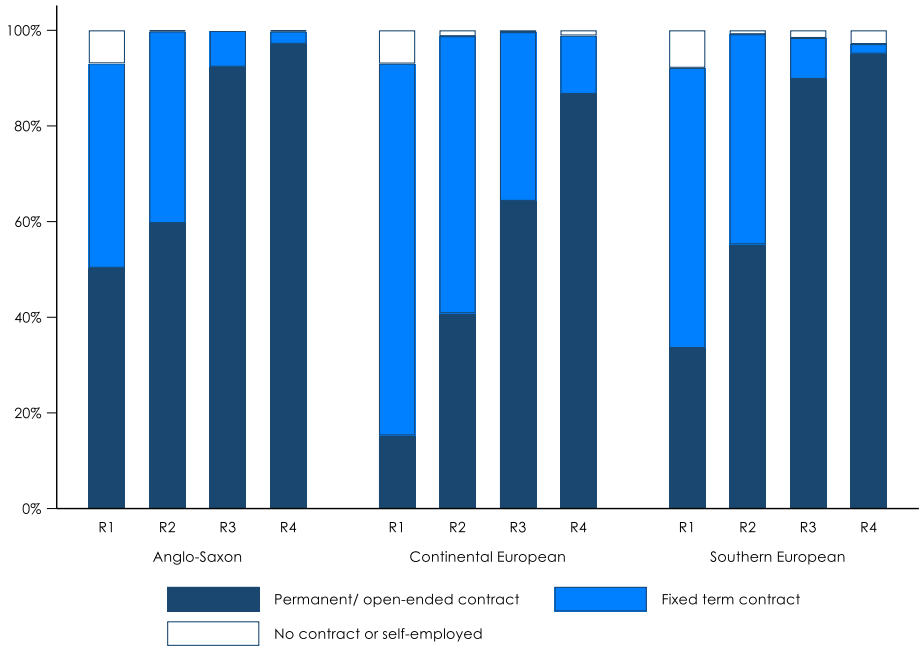
	Agricultural Sciences	Engineering and Technology	Humanities	Medical Sciences	Natural Sciences	Social Sciences
Interdisciplinary mobility	84.6%	77.7%	72.5%	84.0%	74.9%	69.6%
International mobility	94.5%	86.5%	81.7%	88.4%	84.1%	85.0%
Intersectoral mobility to not-for-profit, public or government sector	71.9%	66.9%	52.4%	71.0%	57.2%	58.8%
Intersectoral mobility to private industry	69.5%	68.6%	49.8%	69.1%	57.2%	56.3%
Transferable skills	90.3%	88.4%	84.4%	92.5%	84.7%	80.5%
Publication in open access journals	83.7%	67.8%	71.6%	77.6%	67.4%	69.8%
Knowledge transfer	92.7%	90.2%	87.5%	91.1%	86.4%	83.2%
Public awareness activities	85.8%	78.0%	75.7%	81.5%	72.0%	74.7%
Project related work experience	96.8%	91.4%	89.4%	95.8%	89.8%	88.7%

Source: MORE4 EU HE Survey (2019)
Notes:

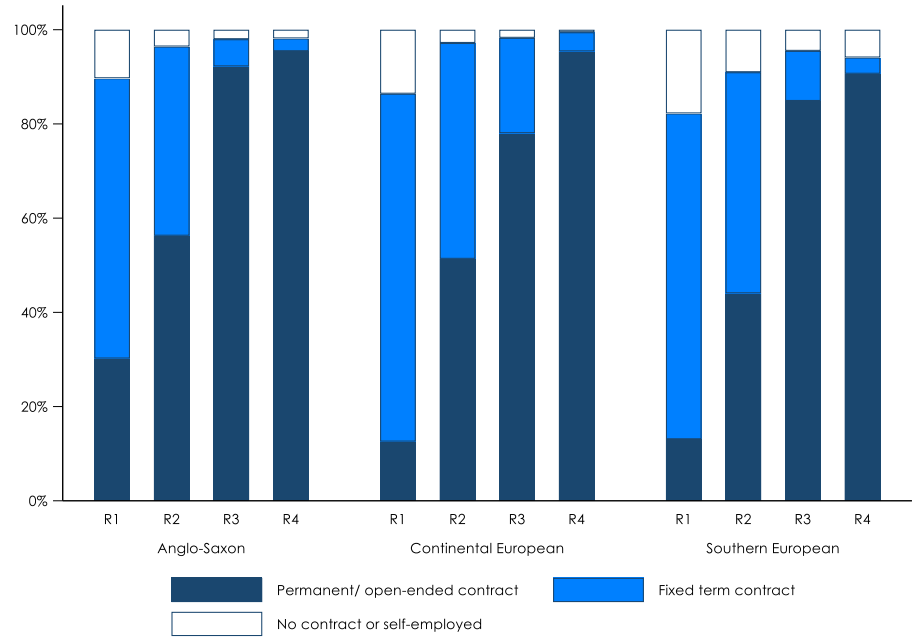
- Share of researchers agreeing that these factors are positive for career progression.
- Based on question 40: "In your experience, would you say the following factors are regarded as positive or negative factors for career progression in your home institution?"
- (n=8,810)

Figure 152: Contractual situation, by country groups and career stages

2016:



2019:



Source: MORE 4 EU HE Survey (2019) and MORE3 EU HE Survey (2016)
Notes:

- Average shares of the following country groups are shown: Anglo-Saxon (UK, SE, DK, NL, IE), Continental European (DE, AT, PL, HU, CZ, SK) and Southern European (IT, FR; ES, PT).
- Based on question 28: "Type of contract"
- (2019: n=1,021-4,147; 2016: n= 1,570-4,162)

Table 83: Skills considered important for future research career (in or out academia), by country

	Collaboration with others	Digital skills	Thinking	Decision making	Proposal writing	Entrepreneur-ship	Teamwork	Time management	People management	Project management	Networking	Negotiation	IPR	Communication skills	Ethics
Austria	69.8%	82.5%	97.0%	98.3%	97.9%	76.4%	95.7%	95.6%	89.5%	95.7%	98.4%	89.8%	76.7%	95.7%	85.8%
Belgium	85.3%	88.9%	99.1%	98.8%	96.0%	75.2%	96.3%	97.1%	92.9%	98.0%	97.0%	80.4%	80.6%	98.3%	92.8%
Bulgaria	87.9%	95.7%	95.8%	97.7%	91.1%	76.9%	95.7%	94.9%	86.9%	95.7%	94.9%	81.4%	78.6%	95.9%	94.5%
Croatia	73.2%	91.8%	98.3%	96.8%	92.7%	67.2%	95.4%	93.3%	91.8%	94.6%	95.8%	76.7%	68.2%	96.0%	92.5%
Cyprus	89.4%	92.3%	99.5%	99.0%	94.7%	76.6%	96.2%	94.4%	94.5%	97.2%	97.2%	84.6%	79.5%	97.9%	96.5%
Czech Republic	82.7%	93.2%	98.5%	97.5%	93.5%	74.1%	95.1%	93.6%	89.9%	94.5%	93.3%	84.3%	86.6%	97.4%	92.6%
Denmark	87.1%	83.6%	97.7%	97.4%	94.5%	72.2%	95.6%	92.5%	89.9%	96.4%	97.3%	84.4%	70.5%	97.5%	90.3%
EU	85.1%	88.2%	98.4%	98.2%	95.6%	71.1%	95.0%	94.9%	91.3%	95.9%	96.8%	82.7%	74.0%	97.4%	91.6%
Estonia	85.4%	94.5%	97.3%	96.8%	97.3%	72.3%	93.3%	96.0%	91.3%	96.6%	98.3%	83.5%	75.8%	97.2%	94.0%
Finland	91.5%	94.4%	96.2%	99.6%	93.7%	67.1%	97.1%	91.4%	90.1%	93.4%	97.2%	87.0%	75.0%	95.4%	91.8%
France	86.5%	84.7%	99.3%	96.6%	97.0%	70.4%	93.9%	93.7%	83.8%	94.6%	96.8%	80.6%	79.7%	98.4%	94.0%
Germany	80.9%	89.2%	99.1%	98.6%	95.0%	76.2%	95.5%	97.7%	92.3%	98.2%	98.6%	87.5%	77.9%	98.6%	87.5%
Greece	82.9%	88.6%	98.5%	98.3%	91.9%	64.8%	95.2%	93.9%	93.5%	94.6%	96.0%	82.8%	77.1%	94.8%	91.5%
Hungary	78.7%	88.9%	96.4%	98.5%	95.5%	68.1%	95.3%	92.1%	88.3%	90.8%	95.0%	77.4%	64.7%	96.1%	91.3%
Iceland	95.0%	91.2%	99.1%	100.0%	97.9%	80.8%	97.2%	94.6%	91.0%	92.1%	97.7%	83.0%	73.9%	98.4%	97.3%
Ireland	83.5%	86.8%	99.0%	98.4%	94.2%	62.9%	95.0%	94.4%	94.0%	96.2%	95.3%	80.6%	68.7%	98.4%	91.6%
Italy	79.4%	82.2%	97.7%	96.9%	94.2%	62.8%	92.3%	90.5%	85.5%	93.9%	94.8%	75.3%	64.2%	95.2%	91.5%
Latvia	91.8%	93.9%	98.4%	95.8%	96.2%	79.1%	96.8%	92.6%	90.8%	95.1%	97.8%	90.3%	88.2%	98.0%	92.0%
Lithuania	90.3%	95.0%	95.8%	98.2%	94.1%	81.2%	94.4%	93.8%	88.5%	94.8%	96.0%	87.4%	80.5%	94.7%	94.3%
Luxembourg	85.0%	93.4%	97.9%	98.6%	95.8%	80.1%	91.3%	94.7%	89.7%	96.8%	95.1%	82.9%	77.4%	97.5%	89.8%
Malta	97.2%	91.8%	99.3%	97.6%	94.8%	80.9%	95.6%	96.2%	95.1%	96.8%	98.0%	89.7%	90.0%	97.4%	96.3%
Norway	86.0%	82.7%	95.4%	95.1%	94.0%	57.1%	92.5%	89.4%	85.3%	91.9%	97.4%	77.4%	69.6%	97.0%	93.3%
Poland	83.6%	90.1%	96.1%	96.2%	94.4%	77.5%	91.5%	91.8%	90.3%	94.1%	93.3%	69.2%	82.3%	96.2%	88.9%
Portugal	91.6%	93.0%	97.5%	96.8%	95.0%	79.6%	95.8%	93.5%	90.3%	95.3%	97.7%	81.1%	78.7%	98.0%	94.6%
Romania	92.8%	96.1%	98.2%	99.5%	68.7%	87.9%	95.3%	88.7%	88.4%	89.8%	93.4%	83.4%	62.0%	67.1%	97.6%
Slovakia	86.4%	95.0%	97.0%	99.1%	97.5%	71.7%	97.0%	94.8%	90.4%	95.4%	96.1%	83.2%	85.8%	98.7%	95.4%
Slovenia	90.5%	96.2%	97.2%	99.0%	94.9%	81.9%	96.7%	93.6%	92.1%	96.7%	98.0%	85.3%	84.0%	95.0%	96.4%
Spain	90.2%	90.9%	99.0%	99.0%	96.5%	75.7%	97.6%	92.2%	92.4%	94.9%	96.5%	83.3%	81.3%	97.9%	94.7%
Sweden	86.0%	84.0%	95.8%	97.6%	96.2%	59.4%	96.8%	90.5%	88.9%	93.5%	95.5%	78.5%	61.1%	96.1%	91.5%
Switzerland	89.2%	92.3%	98.7%	99.1%	96.1%	78.2%	96.7%	97.1%	87.0%	95.8%	96.5%	84.9%	73.9%	96.9%	94.1%
The Netherlands	90.2%	92.5%	99.0%	98.4%	96.1%	80.1%	96.1%	96.3%	95.6%	96.9%	97.0%	90.8%	79.1%	97.4%	95.2%
United Kingdom	87.6%	86.5%	98.9%	99.1%	97.3%	64.5%	94.6%	97.1%	94.5%	96.7%	97.0%	82.8%	65.2%	98.6%	92.6%

Source: MORE4 EU HE Survey (2019)
Notes:

- Based on questions 42 "Which skills do you consider important for your future research career (in or outside academia)?"
- (n=8,540)

Table 84: Skills considered important for future research career (in or out academia), by field of science

	Natural Sciences	Engineering and Technology	Medical Sciences	Agricultural Sciences	Social Sciences	Humanities
Collaboration with others	80.2%	84.8%	88.7%	89.4%	86.1%	85.3%
Digital skills	86.2%	91.7%	89.6%	92.5%	86.1%	86.6%
Thinking	98.5%	98.4%	98.5%	99.1%	97.9%	98.5%
Decision making	98.5%	98.5%	98.9%	99.1%	97.8%	96.7%
Proposal writing	95.5%	95.2%	97.2%	95.9%	94.3%	95.9%
Entrepreneurship	70.2%	75.6%	76.3%	83.5%	68.5%	59.8%
Teamwork	95.1%	95.1%	98.0%	97.6%	94.1%	91.1%
Time management	95.3%	93.6%	97.7%	98.0%	92.9%	94.2%
People management	91.2%	92.7%	96.7%	96.7%	87.8%	86.1%
Project management	96.9%	95.9%	98.7%	98.1%	92.6%	94.8%
Networking	95.8%	97.4%	98.9%	98.0%	96.2%	95.2%
Negotiation	79.3%	83.9%	88.2%	85.0%	80.6%	80.5%
IPR	73.2%	80.4%	80.3%	81.8%	65.9%	67.5%
Communication skills	98.1%	97.3%	98.1%	98.1%	97.0%	96.2%
Ethics	91.1%	90.4%	94.4%	95.1%	92.4%	87.6%

Source: MORE4 EU HE Survey (2019)
Notes:

- Based on questions 42 "Which skills do you consider important for your future research career (in or outside academia)?"
- (n=8,540)

Table 85: Confidence in future career prospects, by country

	very confident	somewhat confident	lack confidence	very much lack confidence
Austria	46.7%	45.8%	4.6%	2.9%
Belgium	29.1%	51.8%	14.6%	4.4%
Bulgaria	26.4%	57.4%	12.4%	3.8%
Croatia	24.6%	63.6%	9.8%	2.0%
Cyprus	38.4%	46.8%	12.1%	2.7%
Czech Republic	38.8%	51.3%	8.1%	1.8%
Denmark	44.8%	42.3%	10.5%	2.4%
EU	29.9%	52.9%	13.8%	3.4%
Estonia	13.5%	59.5%	21.1%	5.8%
Finland	39.5%	48.6%	9.3%	2.6%
France	19.2%	52.2%	21.2%	7.5%
Germany	38.7%	50.5%	9.0%	1.8%
Greece	37.5%	50.7%	8.2%	3.6%
Hungary	28.2%	51.8%	17.4%	2.6%
Iceland	55.2%	41.2%	2.2%	1.4%
Ireland	34.9%	51.6%	10.1%	3.4%
Italy	16.1%	47.3%	26.2%	10.4%
Latvia	25.8%	54.4%	17.4%	2.4%
Lithuania	21.8%	51.9%	18.6%	7.7%
Luxembourg	30.1%	51.7%	11.9%	6.4%
Malta	39.9%	53.2%	5.9%	1.0%
Norway	38.6%	53.4%	5.4%	2.5%
Poland	23.1%	55.5%	15.9%	5.5%
Portugal	23.9%	44.0%	23.1%	9.0%
Romania	20.0%	70.7%	9.2%	0.2%
Slovakia	28.1%	56.2%	13.7%	2.0%
Slovenia	29.2%	63.4%	5.8%	1.6%
Spain	25.4%	52.4%	20.5%	1.6%
Sweden	42.9%	43.7%	11.0%	2.3%
Switzerland	39.7%	47.7%	11.3%	1.3%
The Netherlands	44.9%	45.0%	8.9%	1.1%
United Kingdom	27.1%	59.6%	11.5%	1.8%

Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 47." Overall, how confident do you feel about the future prospects for your research career?"
- (n=8,540)

Table 86: Confidence in future career prospects, by country group

	very confident	somewhat confident	lack confidence	very much lack confidence
North	42.6%	45.1%	9.9%	2.4%
South	23.7%	49.6%	21.0%	5.7%
West	31.5%	54.4%	11.4%	2.7%
East	25.7%	56.4%	14.1%	3.8%

Source: MORE4 EU HE survey (2019)
Notes:

- Based on question 47." Overall, how confident do you feel about the future prospects for your research career?"
- (n=8,540)

Table 87: Average length of career stages, by field of science

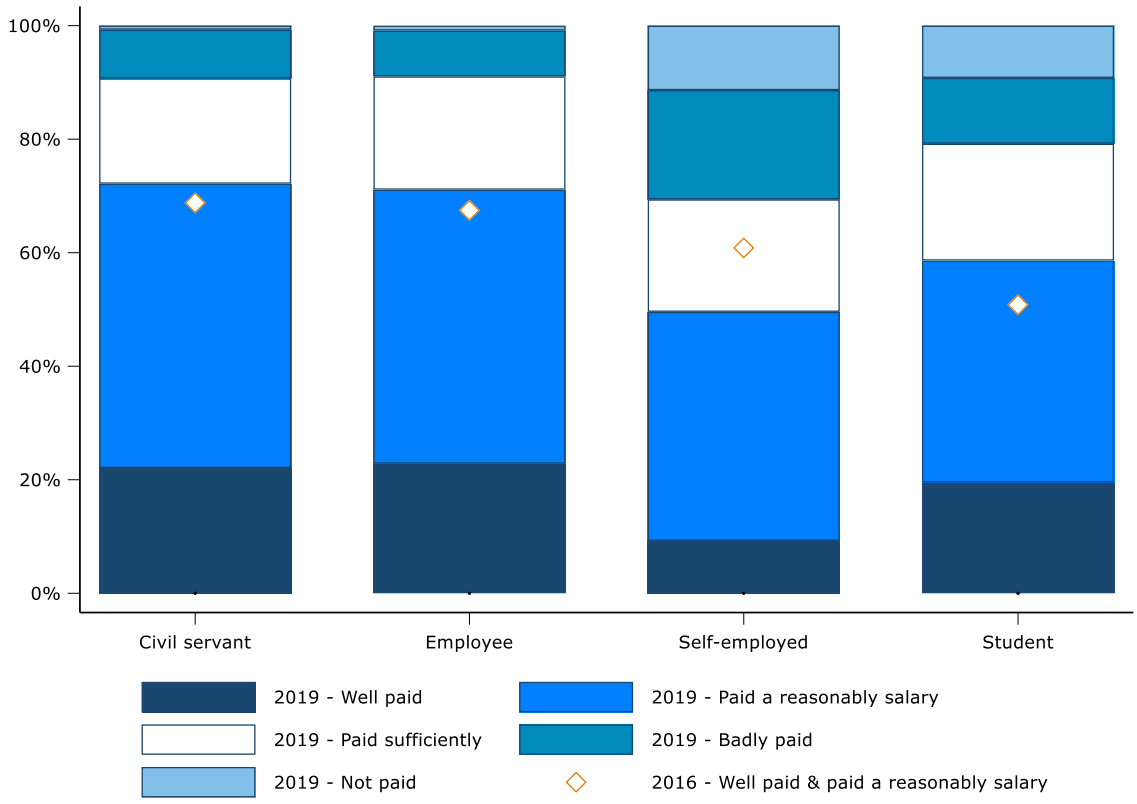
	Health			Natural			Social		
	R1-R2	R2-R3	R3-R4	R1-R2	R2-R3	R3-R4	R1-R2	R2-R3	R3-R4
Austria	7.3	8.3		7.1	6.0	5.6	7.1	7.4	5.3
Belgium	5.2	5.3		5.1	6.0		5.5	5.2	7.1
Bulgaria	6.8	4.3		5.9	4.3	10.5	5.2	4.3	
Croatia	4.5	4.8		5.1	4.9	7.2	5.3	4.4	7.1
Cyprus				4.4	6.7	8.3	5.5	4.3	
Czech Republic	5.2	6.9		5.3	6.4	6.4	5.6	3.9	
Denmark	4.6	6.6		4.1	5.4	8.1	4.6	4.1	8.3
EU	5.0	5.5	8.1	5.0	5.5	7.6	5.3	5.0	7.6
Estonia	6.3			5.9	3.1		6.6	3.1	
Finland	5.6			5.6	5.6	4.7	6.4	3.4	4.5
France	4.8			4.1	4.5	8.6	5.0	4.0	7.3
Germany	4.9	5.4		5.5	4.9	3.9	6.3	3.7	
Greece	5.2	7.8	10.5	4.9	6.8	9.7	5.3	5.9	10.0
Hungary				6.8	4.0	11.1	6.2	5.0	
Iceland				4.5	4.5		5.2	4.7	
Ireland	3.2	6.2		4.5	6.4		5.0	4.6	
Italy	4.6	8.2		3.9	7.4	8.7	4.1	6.1	10.3
Latvia	4.8	3.6		6.4	5.7		5.4	3.5	
Lithuania	4.4			5.1	3.9	8.4	4.9	4.3	
Luxembourg				4.3	4.5		5.1	5.1	
Malta	5.4			4.7	5.7		5.8	4.0	
Norway	4.9	5.5		4.2	4.2	6.5	5.0	2.7	6.2
Poland	4.7	4.8		5.0	6.1	11.4	5.5	5.2	
Portugal	5.8	3.7		5.4	4.2		5.8	4.4	
Romania	3.8	2.2		4.7	1.9	6.1	4.2	2.1	6.3
Slovakia	4.6	5.3		5.2	6.2		4.8	4.1	
Slovenia	5.1			5.2	2.3	7.5	5.3	3.2	
Spain	5.1	3.0		4.6	4.9	8.4	5.6	3.3	7.1
Sweden	5.7	5.7		5.0	4.9	7.1	5.6	5.0	6.9
Switzerland	5.7			4.8	4.5		4.9	4.7	7.0
The Netherlands	5.2	4.1		4.2	5.3		5.2	4.7	
United Kingdom	4.8	5.6		4.8	5.9	9.5	4.7	6.3	9.1

Source: MORE4 EU HE Survey (2019)
Notes:

- Based on questions 14-22: "Please indicate the starting year in which you first entered the subsequent career stages"
- (2019: 8,300)

3.2. Additional Tables for Section 6

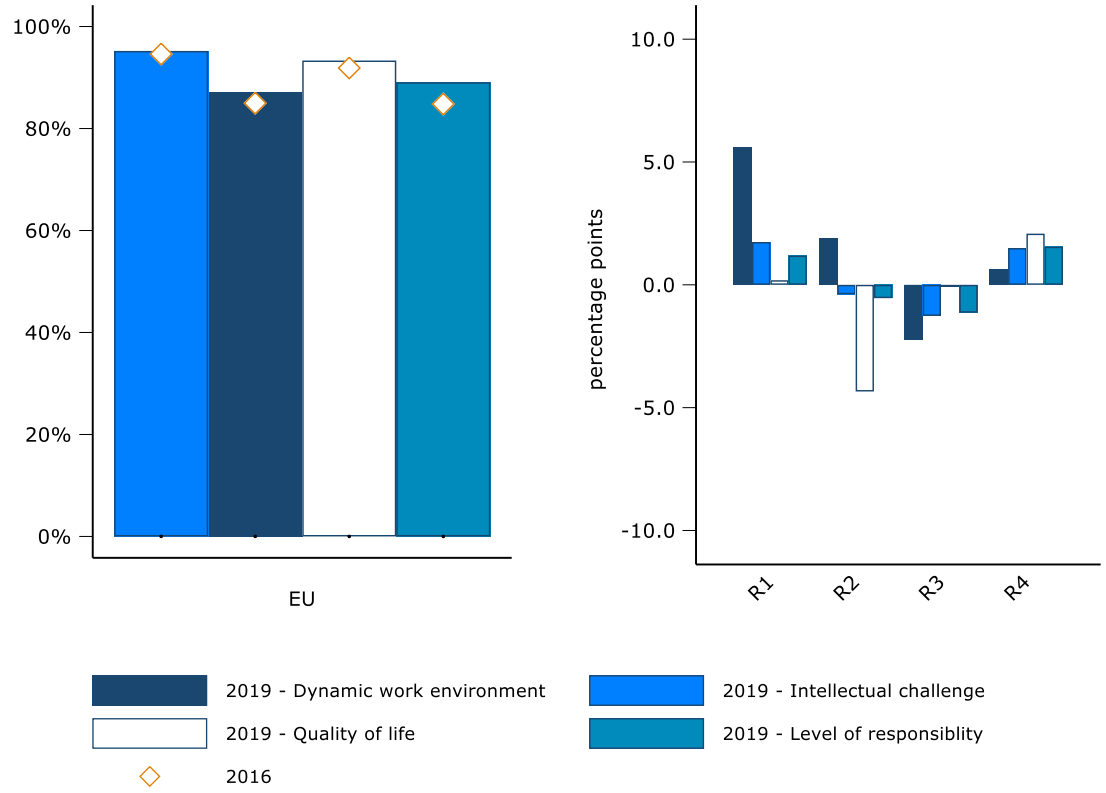
Figure 153: Remuneration package, by employment status



Source: MORE4 EU HE Survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Based on question 33: "How do you feel about your remuneration package (if you do not take into account a second income or, if applicable, the income of your partner)? I consider myself to be..."
- (2019: n=8,540;2016: n=9,412)

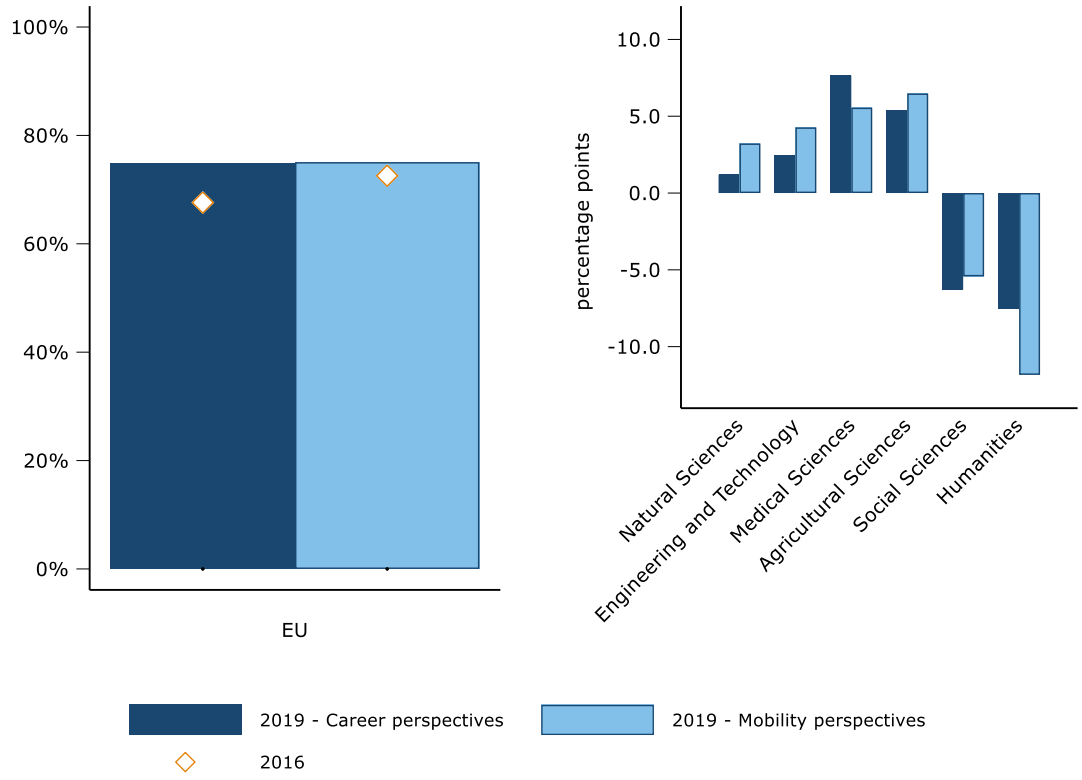
Figure 154: Individual satisfaction at work, by career stage (EU28)



Source: MORE4 EU HE Survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Based on question 32: Please indicate your satisfaction with each factor as it relates to your current position:"
- (2019: n=8,314-8,332;2016: n=9,926-10,035)

Figure 155: Career and mobility perspectives in the current position, by field of science (EU28)



Source: MORE4 EU HE Survey (2019) and MORE3 EU HE survey (2016)
Notes:

- Based on question 32: Please indicate your satisfaction with each factor as it relates to your current position:"
- (2019: n=7,879-7,969;2016: n=8,737-8,827)

3.3. Additional Tables for Section 8

Table 88: Long-term mobility in post-PhD stages in 2019

	>3 MONTH POST-PHD MOBILITY - LAST TEN YEARS	>3 MONTH POST-PHD MOBILITY - MORE THAN TEN YEARS AGO	POST-PHD NON-MOBILITY
Austria	40,8%	31,4%	27,8%
Belgium	33,5%	20,4%	46,1%
Bulgaria	18,8%	17,4%	63,8%
Croatia	14,6%	11,8%	73,7%
Cyprus	26,1%	26,8%	47,1%
Czech Republic	25,2%	21,1%	53,7%
Denmark	35,3%	23,6%	41,2%
Estonia	25,5%	19,2%	55,3%
Finland	24,8%	22,3%	52,9%
France	27,1%	28,6%	44,3%
Germany	32,5%	21,9%	45,5%
Greece	25,1%	31,5%	43,4%
Hungary	30,2%	23,5%	46,3%
Ireland	30,6%	23,3%	46,2%
Italy	24,5%	22,6%	52,9%
Latvia	19,2%	14,1%	66,7%
Lithuania	23,7%	11,6%	64,6%
Luxembourg	62,7%	14,7%	22,5%
Malta	12,6%	19,3%	68,1%
Poland	20,6%	25,0%	54,4%
Portugal	21,3%	9,4%	69,3%
Romania	28,5%	14,2%	57,4%
Slovakia	21,6%	12,9%	65,4%
Slovenia	28,5%	10,0%	61,5%
Spain	27,5%	30,9%	41,6%
Sweden	27,4%	20,9%	51,6%
The Netherlands	26,6%	15,1%	58,2%
United Kingdom	22,7%	26,3%	51,0%
EU28	26,5%	24,0%	49,4%

Table 89: Long-term mobility in post-PhD stages in 2016

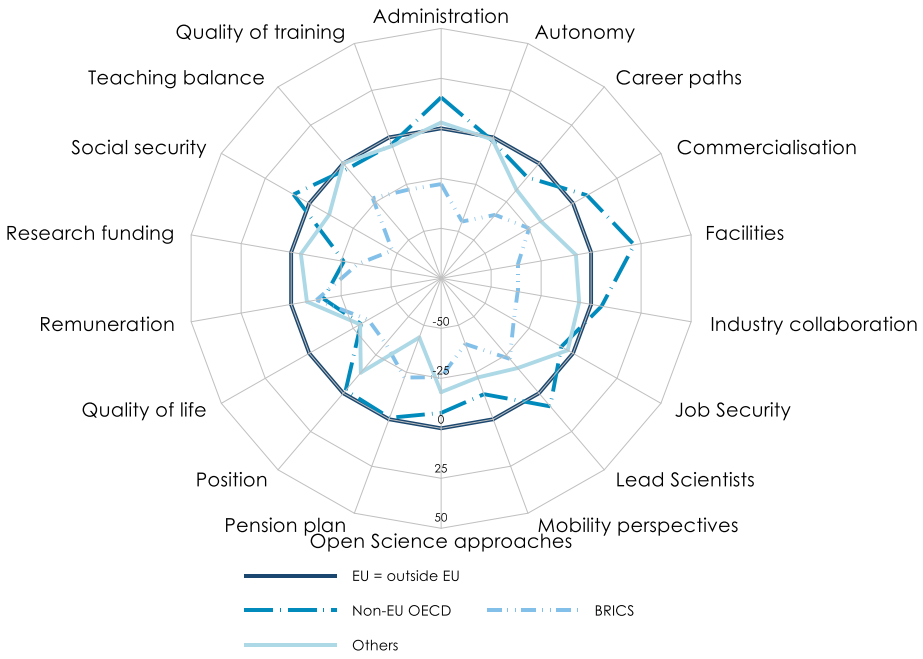
	>3 MONTH POST-PHD MOBILITY - LAST TEN YEARS	>3 MONTH POST-PHD MOBILITY - MORE THAN TEN YEARS AGO	POST-PHD NON-MOBILITY
Austria	38,4%	22,9%	38,8%
Belgium	33,3%	21,0%	45,6%
Bulgaria	21,3%	14,8%	63,9%
Croatia	18,7%	11,6%	69,7%
Cyprus	38,5%	16,3%	45,3%
Czech Republic	19,1%	16,9%	63,9%
Denmark	30,3%	21,5%	48,2%
Estonia	27,7%	21,1%	51,2%
Finland	24,8%	16,8%	58,4%
France	34,8%	17,8%	47,4%
Germany	33,3%	16,6%	50,1%
Greece	24,0%	26,9%	49,1%
Hungary	33,1%	19,4%	47,5%
Iceland	30,6%	12,8%	56,6%
Ireland	32,3%	17,4%	50,3%
Italy	22,4%	22,0%	55,6%
Latvia	12,2%	7,8%	79,9%
Lithuania	16,7%	19,2%	64,1%
Luxembourg	61,4%	9,8%	28,8%
Malta	16,9%	12,8%	70,2%
Norway	40,4%	13,0%	46,6%
Poland	19,5%	13,0%	67,5%
Portugal	16,9%	9,6%	73,6%
Romania	13,3%	7,2%	79,5%
Slovakia	23,6%	12,3%	64,1%
Slovenia	23,5%	19,4%	57,1%
Spain	29,1%	28,4%	42,4%
Sweden	28,0%	15,1%	56,9%
Switzerland	48,1%	18,2%	33,8%
The Netherlands	32,5%	15,2%	52,3%
United Kingdom	25,6%	16,6%	57,9%
EU28	**27,4%**	**18,1%**	**54,5%**

Table 90: Long-term mobility in post-PhD stages in 2012

	>3 MONTH POST-PHD MOBILITY - LAST TEN YEARS	>3 MONTH POST-PHD MOBILITY - MORE THAN TEN YEARS AGO	POST-PHD NON-MOBILITY
Austria	45,4%	19,6%	35,0%
Belgium	46,5%	12,7%	40,9%
Bulgaria	18,0%	12,8%	69,1%
Croatia	18,9%	12,0%	69,1%
Cyprus	44,1%	16,7%	39,2%
Czech Republic	16,2%	17,3%	66,5%
Denmark	53,0%	12,7%	34,3%
Estonia	26,6%	17,1%	56,3%
Finland	42,3%	14,2%	43,6%
France	26,5%	20,8%	52,7%
Germany	44,7%	14,0%	41,4%
Greece	33,9%	26,8%	39,2%
Hungary	34,0%	23,6%	42,4%
Iceland	48,9%	19,0%	32,1%
Ireland	36,9%	22,5%	40,5%
Italy	25,2%	18,8%	56,0%
Latvia	19,7%	9,1%	71,2%
Lithuania	18,1%	14,1%	67,8%
Luxembourg	47,4%	11,0%	41,6%
Malta	24,2%	15,3%	60,5%
Norway	43,4%	19,0%	37,7%
Poland	9,1%	12,1%	78,8%
Portugal	27,4%	12,3%	60,3%
Romania	19,7%	4,0%	76,4%
Slovakia	27,6%	16,0%	56,4%
Slovania	33,8%	12,8%	53,4%
Spain	32,3%	19,8%	47,8%
Sweden	39,5%	13,3%	47,2%
Switzerland	53,1%	12,1%	34,8%
The Netherlands	46,1%	13,5%	40,3%
United Kingdom	28,5%	20,1%	51,4%
EU27	**31,0%**	**17,4%**	**51,6%**

3.4. Additional Tables for Section 9

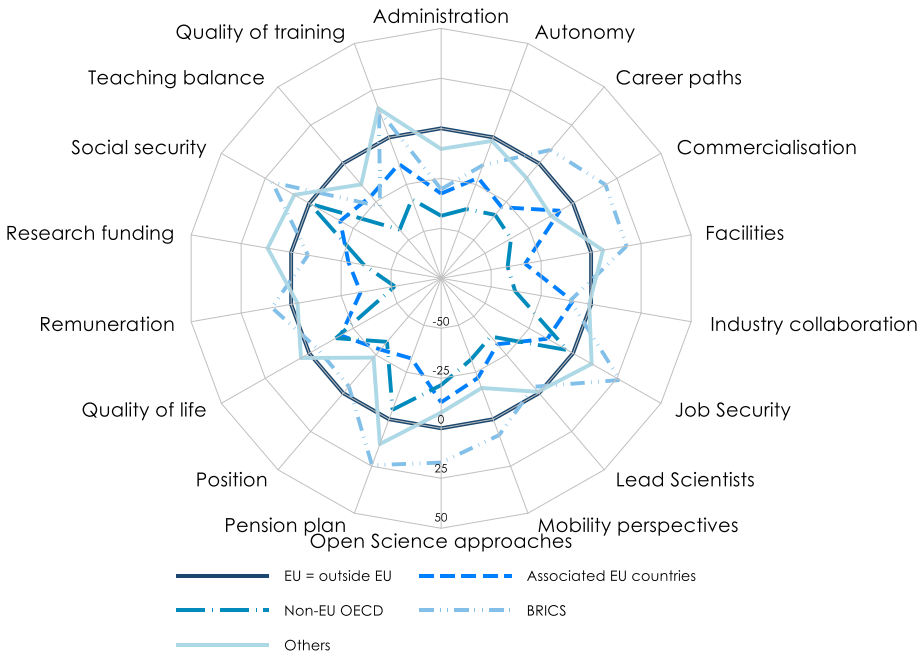
Figure 156: Comparison between working outside the EU and working inside the EU as a researcher by region of citizenship, detailed indicators



Source: MORE4 EU HE Survey (2019)
Notes:

- Based on question 46: "How does working as a researcher outside the EU compare to inside the EU? Please indicate if something was worse, similar or better outside the EU than in the EU."
- (n=227)

Figure 157: Comparison between working outside the EU and working inside the EU as a researcher by mobility experience, detailed indicators



Source: MORE4 EU HE Survey (2019)
Notes:

- Based on question 74: "How does working as a researcher outside the EU compare to inside the EU? Please indicate if something was worse, similar or better than in the EU."
- (n=717)

Table 91: Comparison between working outside the EU and working inside the EU as a researcher, by region of citizenship

	Country Groups - Citizenship	EU-associated countries n=24	Non-EU OECD n=70	BRICS n=66	Other n=91
Outside the EU is **better** than inside the EU regarding …	Attractive career paths	-	24.5	44.2	49.9
	Conditions for scientific knowledge Production	-	21.6	43.1	39.0
	Engagement in Industry	-	9.3	40.9	40.4
	Mobility perspectives	-	28.5	48.5	54.2
	Open Science	-	13.7	32.5	39.2
	Availability of suitable positions	-	24.6	45.7	46.8
	Remuneration and other material factors	-	27.5	44.5	48.9
	Quality of training and education	-	14.4	44.8	35.3
Outside the EU is **worse** than inside the EU regarding …	Attractive career paths	-	15.4	10.6	32.7
	Conditions for scientific knowledge Production	-	23.9	11.7	34.5
	Engagement in Industry	-	15.9	10.0	28.4
	Mobility perspectives	-	15.1	8.5	32.0
	Open Science	-	6.0	6.9	21.1
	Availability of suitable positions	-	22.7	13.3	33.3
	Remuneration and other material factors	-	18.7	14.6	30.0
	Quality of training and education	-	10.7	17.0	30.8

Source: MORE4 EU HE Survey (2019)
Notes:

- Based on question 47: "How does working as a researcher outside the EU compare to inside the EU? Please indicate if something was worse, similar or better outside the EU than in the EU."
- Green=high compared to the average of the column; Red = low compared to the average of the column.
- (n=227)

Table 92: Comparison between working outside the EU and working inside the EU as a researcher, by mobility experience

	Country Groups - Target countries	EU-associated countries n=83	non-EU OECD n=478	BRICS n=73	other n=83
Outside the EU is **better** than inside the EU regarding …	Attractive career paths	37.5	40.4	24.7	32.4
	Conditions for scientific knowledge Production	36.8	47.1	36.2	21.7
	Engagement in Industry	27.9	41.6	29.9	24.6
	Mobility perspectives	29.3	44.1	28.8	31.1
	Open Science	20.0	32.7	14.9	30.1
	Availability of suitable positions	34.3	43.9	32.5	37.2
	Remuneration and other material factors	33.8	36.1	26.2	20.7
	Quality of training and education	26.3	41.6	13.9	13.8
Outside the EU is **worse** than inside the EU regarding …	Attractive career paths	8.9	6.7	33.5	22.9
	Conditions for scientific knowledge Production	8.6	7.1	24.8	20.2
	Engagement in Industry	19.6	5.0	33.9	17.9
	Mobility perspectives	7.3	12.2	37.3	14.4
	Open Science	7.0	11.1	32.0	22.2
	Availability of suitable positions	5.8	10.4	28.1	14.0
	Remuneration and other material factors	10.3	21.0	41.7	27.4
	Quality of training and education	12.1	8.7	28.2	29.3

Source: MORE4 EU HE Survey (2019)
Notes:

- Based on question 74: How does working as a researcher outside the EU compare to inside the EU? Please indicate if something was worse, similar or better than in the EU. –
- Green=high compared to the average of the column; Red = low compared to the average of the column.
- (n=717)

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The MORE4 study aims to update, improve and further develop the set of indicators used in previous MORE studies in order to meet the need for indicators over time and to assess the impact on researchers of policy measures introduced to develop an open labour market for researchers. This study gathers data to highlight emerging policy needs and priorities with regard to mobility patterns, career paths and the working conditions of researchers.

The study carries out two surveys: one addressed to researchers currently working in the EU (and EFTA) in higher education institutions, the other addressing researchers currently working outside Europe.

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