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Analysis and Policy Options

Jürgen Janger, Alexandros Charos, Peter Reschenhofer, Anna Strauss-Kollin, Fabian Unterlass, Stefan Weingärtner (WIFO)

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This report maps employment contracts and career models with a view to gain knowledge about where and which groups of researchers suffer most from precarious careers. It suggests policies to reduce the precariousness of researcher careers and indicators to monitor progress. It follows a mixed methods approach, using as much as possible internationally comparative data.

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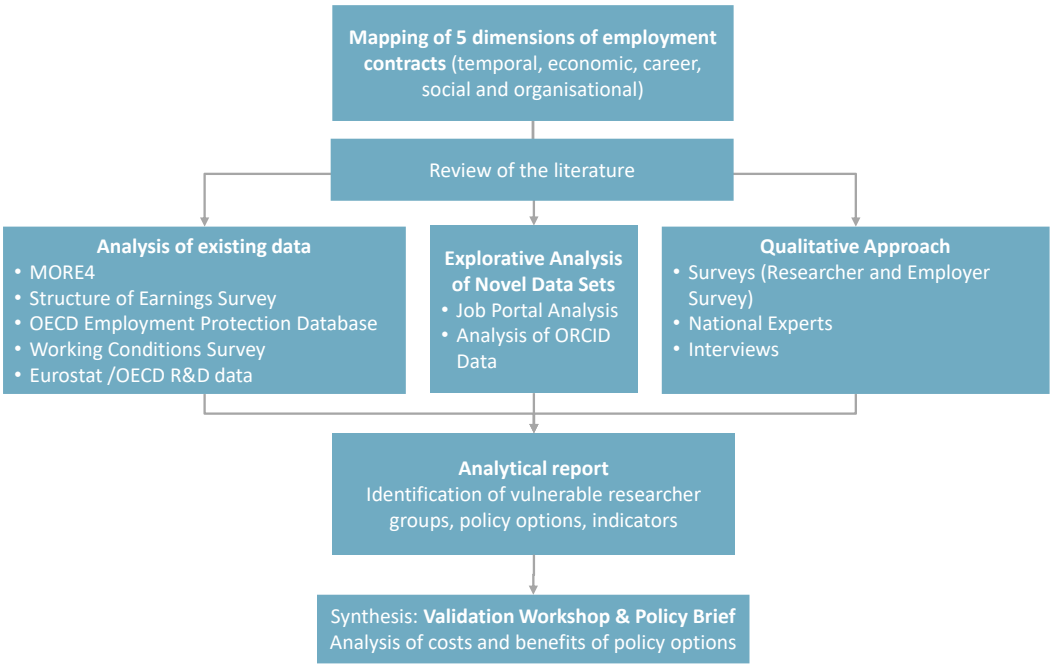
EXECUTIVE SUMMARY

Objective and methodology of the study

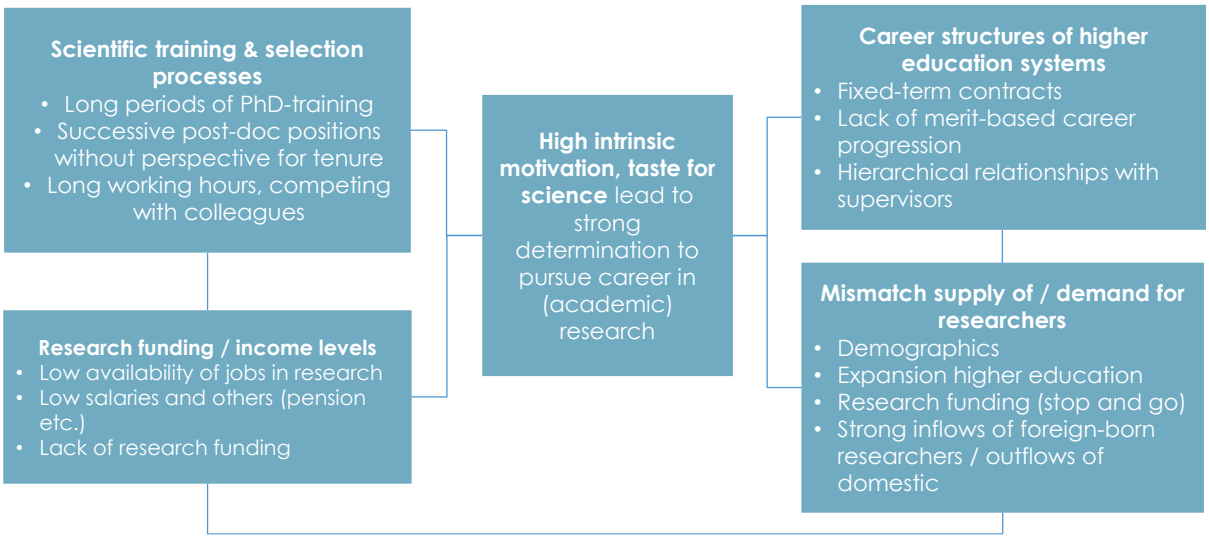
This study maps employment contracts and career models with a view to gain knowledge about where and which groups of researchers suffer from the most precarious careers and remuneration packages, to develop indicators and suggest policies to reduce the precariousness of researcher careers. It follows a mixed methods approach, using as much as possible internationally comparative data. The results also reflect the results from a workshop with stakeholders.[1]



Factors potentially contributing to precarious careers in research

Precarity can show up in economic, social, career and organizational aspects of a job, e.g. due to low pay, fixed-term contracts without a perspective, mobbing, etc. **The factors potentially leading to precarious careers are manifold:** the high intrinsic motivation of researchers – they like their job – can together with long periods of training lead to a lot of time spent in a job with uncertain employment perspectives. Insufficient research funding or generally poor economic conditions may lead to low availability of permanent jobs in research, or low salaries and pensions. Specific career structures of higher education systems can lead to a high share of fixed-term contracts or intransparent recruitment and career progression. Competitive group environments and hierarchical relationships with supervisors can give rise to unacceptable social behaviour. A mismatch between the supply and demand for researchers may arise due to stop-and-go research funding, demographic or higher education enrolment developments, as well as asymmetric international mobility.

[1] Note that this version is a draft version by the study team and not an official EU publication.



Potentially particularly vulnerable groups of researchers are the following:

- PhD-students without employment contracts
- PhD-holders, either
    - on fixed-term contracts (post-docs), without a perspective for a permanent position
    - on early permanent positions in higher education systems with unclear career paths or non-merit based career progression criteria
- All researchers, including in firms, suffering from low pay or other contract features (low pensions, minimal healthcare etc.); or from potential socially unacceptable or discriminatory behaviour
- International researchers from outside the EU, who on top of potential discrimination may suffer from unclear migration rules and bureaucratic uncertainty with regard to remuneration and social security benefits

Selected findings across the EU Member States:

The study presents data for various job dimensions for the EU on average, the individual 27 Member States, the average of the 15 so-called "widening" countries (characterised by low participation/success rates in the EU research framework programmes)[2] and the remaining 12 "non-widening" countries[3]. Key job dimensions investigated are the extent of fixed-term and part-time contracts, perceptions of recruitment and career progression, length of career stages, satisfaction with research autonomy and funding, salaries and other social security benefits, perception of socially unacceptable behaviour. Note

[2] Bulgaria, Croatia, Cyprus, Czechia, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, Slovenia

[3] Belgium, Denmark, Germany, France, Ireland, Italy, Luxembourg, Netherlands, Spain, Finland, Austria, Sweden

that data is coming from a variety of sources, among them surveys, existing databases and offers on job portals. They are not always fully representative and may differ from e.g. registry-based data from national higher education authorities. Results should hence be interpreted with caution and seen as a first step in data-based analysis of precarious careers in research, to be followed up by more detailed analyses at the national level.

- A main issue perceived particularly in the more research-intensive countries is the struggle for obtaining a permanent position in research, while in the less research-intensive widening countries main issues perceived relate rather to salaries and research funding: in more research-intensive countries in the EU, there seems to be more competition of junior researchers for permanent jobs. This is a stylized picture, note that there is a lot of heterogeneity among EU countries.

- Higher shares of fixed-term positions are particularly common for younger researchers in more research-intensive countries, where – based on survey data - on average in the year 2019, 86% of academic researchers below the age of 35 are on a fixed-term contract. According to micro-data from the structure of earnings survey, 40% of academic researchers across all career stages are on fixed-term contract, compared with 8% in industry. On average more than half (54%) of researchers from widening countries perceive to be not well paid. Perception of salary data is corroborated by hard data from e.g. job offers or pay scales. In addition, early stage researchers – mostly PhD trainees – are on average more likely to not have a formal employment contract at all (28%, vs. 10% on average in the EU).

- On average in the EU, female researchers are more likely to be less well paid, on a fixed-term contract and in a part-time position.

- Over time but pre-COVID19, based on the mobility of researcher survey, there are however positive trends with respect to declining shares of researchers on fixed-term positions and rising satisfaction on average in the EU with merit-based and transparent recruitment. There are also favourable trends in terms of growing R&D spending and only weakly growing or even declining numbers of PhD-graduates in several countries in the EU, pointing to a better balance of supply and demand for researchers in the future, should current trends hold which will also be influenced by the demographic situation in many countries. This needs however more field-specific analysis.

Beneficial side effects of policies against precarity in research

Implementing policies against precarious research careers don't just matter for the wellbeing of researchers. Precarious employment conditions lead to risk aversion, so that research performance overall suffers from such conditions. Moreover, many of the policy options mentioned below carry double dividends with them – they don't just improve precarious careers, they help to boost competitiveness in science, innovation performance, tackling grand challenges, and so on.

A policy framework to reduce precarious careers in research

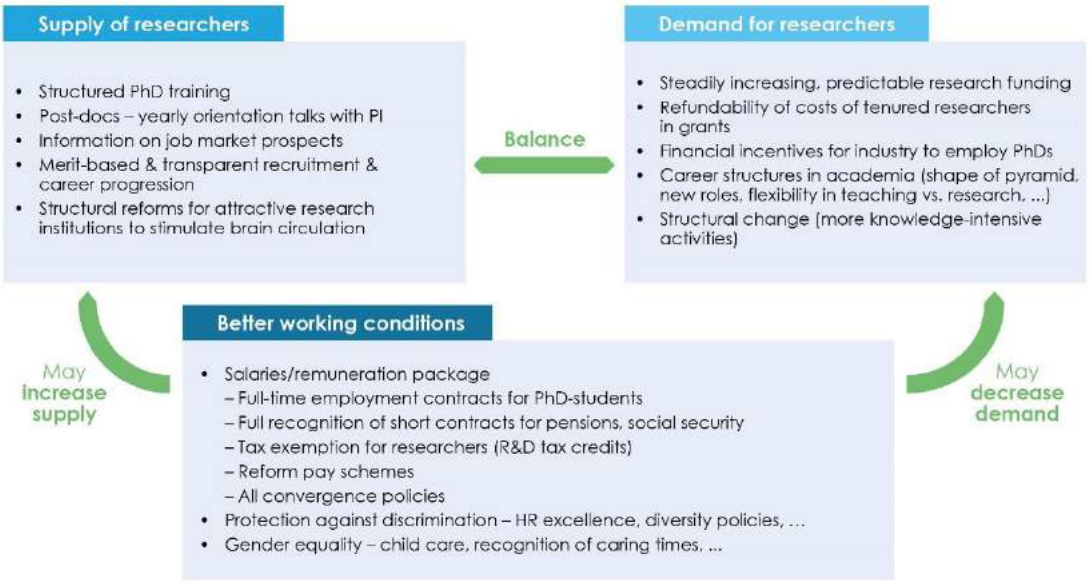
When designing policies against precarious careers in research, policymakers can think in terms of a policy framework with two main directions: **first**, attempt to **balance the supply of researchers with the demand for them**, and **second**, **improve working conditions**.

Policies should not unilaterally restrict (expand) supply or demand without compensating measures on the other side – they should come in integrated bundles. As an example, legally limiting the time researchers can spend on fixed-term contracts, effectively restricting the supply of researchers, as in

Germany with the *Wissenschaftszeitvertragsgesetz*, or in Austria with the *Kettenvertragsregelung,* should be accompanied by measures on the demand side. Another example, expanding supply without demand measures, such as increasing PhD production without increasing the funding which increases demand for permanent positions, as happened in Romania, is bound to lead to exodus of PhDs or precarious careers.

Policymakers should also take into account that improving working conditions of jobs in research – such as increasing pay or granting full social security coverage – may increase the supply of researchers and reduce the demand for them, if public and/or private research spending stays unchanged.

Also, depending on the situation, it may make sense to differentiate between structural policies that are effective for all newcomers, and acting against precarity for researchers who have already spent a long time in the system with specific individual support. In the following we present key policy options for the supply and demand side as well as for improving working conditions.



<u>Key policy options acting on the supply side:</u>

- Even in the best of systems, not everyone who is interested in a career as a principal investigator in academic research will obtain a permanent position. E.g., researcher candidates may find out themselves that alternative career options are better suited to them, or their supervisors provide feedback accordingly. It is all the more important that researchers should be able to follow a **career path with early, transparent and merit-based selection points** (e.g., application for PhD programme, PhD completion, application for post-doc or tenure track positions…). Late career decisions increase the risk of experiencing precarity.

- More precisely, during their PhD- and post-doc training stages researchers should get four types of support: i) career/job market information, ii) training in transferable skills, iii) early & regular feedback from supervisors/research group leaders and iv) access/exposure to former PhD-graduates or post-docs working in different sectors in research and non-research roles. **Researchers should have all the information they need to make informed decisions on**

their careers as early as possible, including information on careers in non-research roles using their skill set. Information should already flow at the application stage for PhD training.

- Supervisors/research group leaders should not see researchers who don't stay in a classic principal investigator academic research career as a "failure" – but be aware of the many research and non-research career options advanced research skills bring with them, as well as be aware of the importance of early feedback. They should be provided with information and HR training to be able to do this.

- Three main organisational units in universities or PhD-granting research institutions could be involved in providing these types of support: 1) Graduate or doctoral schools, 2) Post-doc offices and 3) Human resources departments.

- This implies that PhD studies should preferably take place as structured, formal PhD programmes, where support by the administrative staff of Graduate Schools and training in transferable skills are much easier to provide, by contrast with less formal PhDs relying on bilateral Master-Apprentice relationships. Evidence shows that in many EU countries, such structured PhD programmes – and with them, dedicated Graduate Schools – can be significantly expanded, in particular by comparison with the US. This would also increase the international attractiveness of the EU as a research location.

- Post-doc offices – dedicated administrative units providing different types of support to researchers in temporary post-doc positions – are also not standard, but a proper study on this is missing. Such a study could identify the prevalence of such offices in the EU and establish best-practice.

- Associations who represent PhDs and post docs can also help voice concerns and contribute to policy design, while also offering individual support. Compared with PhD-assocations, post-doc associations (or even junior faculty associations) are much rarer – similar to post-doc offices, a study could do more analysis, contribute to networking and spread best practice.

Key policy options acting on the demand side:

- Public research budgets should follow a multi-annual, stable growth path to improve predictability of jobs in research and to avoid stop-and-go situations, which can lead to pronounced mismatch between the supply of researchers coming onto the market and the demand for them – leading to permanently negative "cohort effects", where the researchers who happen to graduate in the bust cycle year experience a negative, lasting impact on their career by comparison with researchers who graduate in good years. Growing public research budgets in the EU are a necessity anyway, as the EU risks falling behind China and faces tremendous societal challenges.

- Strong business-science links, example given as in collaborative PhD programmes or shorter-term exchange or placement programmes, contribute to career options outside academia. The importance of such measures however depends on the research intensity of the private sector. The share of R&D spending by firms in total national R&D spending varies between 20 and 70% in the EU, indicating very different options for diversifying careers.

- This is why well-designed research and innovation policies which boost research intensity and the number of research active firms are also relevant for boosting demand for researchers, not "just" for increasing competitiveness and the capacity to manage the green transformation.

- Demand potential lies also within the academic research sector itself. There are four options: first, scientific knowledge production has changed, often requiring teams with specialised roles such as data specialists. Career options seldom reflect this, with permanent positions still mainly given to principial investigators who become professors. Positions such as permanent senior lecturer or senior data staff scientist may make sense not just against precarity, but to make the research enterprise overall more efficient.

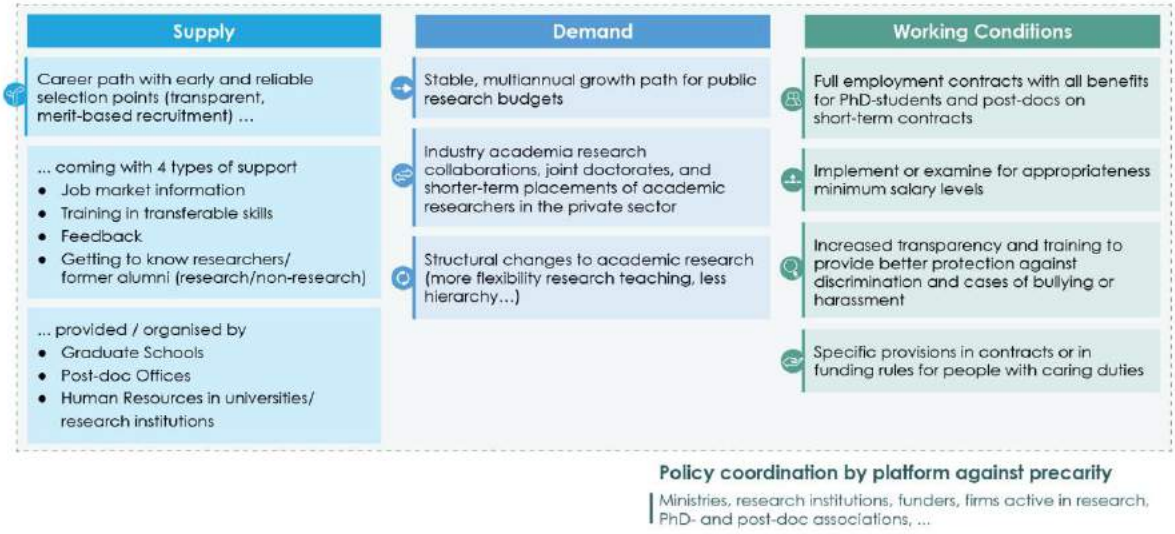
- Second, allow for flexibility between research, teaching and administrative tasks over time. Some countries fix the amount of teaching which has to be provided by tenured researchers independently of their scientific productivity. More time for teaching if interest in research activities is declining over time can free up institutional resources to offer more research-intense positions to younger researchers, or grant younger researchers more time for their research.

- Third, tenured researchers – on permanent positions – should be able to put their salary cost on research grants, this is not possible in several countries. In that case, grants only fund new PhD or post-docs on temporary positions rather than contributing to financing permanent positions. Grant funding tenured researchers would also free up university base funding to pay for researchers on temporary positions, such as researchers on tenure track positions. Researchers on temporary positions who need grants to continue their career may choose less risky research to be sure to find something publishable, so that also this measure would not just potentially reduce precarity, but also foster scientific breakthroughs.

- Options 2 and 3 would also work against the issue that once more positions are permanent, new job openings could become rarer, paradoxically making it harder for newcomers to find an entry into the research job market.

- Fourth, the organisational structure of universities influences the number or share of permanent positions available. Chair-based organisation generally leads to fewer permanent positions than department-based organisation, where more tenured professors can co-exist.

- Finally, symmetric European or international mobility of researchers would also contribute to balancing supply of and demand for researchers at the national level. Many of the policy options mentioned would contribute to making research systems internationally attractive.



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Diversifying research careers is a cross-cutting issue that can help against precarity, involving both demand- and supply-side options.

- On the supply-side, levers are e.g. providing career information, providing training in transferable skills, facilitating contact with graduates in a variety of roles, organising visits to industry and other sectors as well as receiving regular feedback from research supervisors.

- On the demand side, levers are e.g. increased industry science collaborations, joint doctorates, and funding for shorter-term industry placements of academic researchers.

Key policy options acting on the working conditions of researchers:

- Full-time employment contracts with all social security benefits should be standard for all researchers in PhD training – they are professionals, not students, according to several guidelines and principles of doctoral training. This is not the case in several countries, where PhD trainees are either not paid or formally employed at all, or even if they are employed, they are only paid part-time, in spite of a PhD position usually asking for much more time than a standard full-time job. This would also be an effective lever to increase the EU's attractiveness for international talent. Also shorter term post-doc positions should fully count towards social security benefits and pension entitlements.

- Appropriate minimum salary levels for researchers are one option to reduce economic precarity, including for researchers in PhD-training.

- To prevent and reduce socially unacceptable behaviour, increased transparency at the institutional level may help, including monitoring of such cases and reporting them also to higher-level government authorities. Moreover, training of supervisors or research groups leaders what to do when such cases arises is also an option, which could also be part of a general Human Resources training package provided by research institutions, including how to provide feedback and career guidance (see policy options above).

- Specific provisions in contracts or funding rules for people with caring duties should be made standard, so that time spent caring does not have a negative impact on careers.

- The EU-level Human Resources Excellence in Research Award can be further promoted.

- International researchers from outside the EU often suffer from unclear migration rules and bureaucratic uncertainty with regard to remuneration and social security benefits – this situation could be improved, if EU countries want to be internationally attractive.

Options to incentivise or support the implementation of policies to reduce precarious careers:

- Policies could be made part of the funding for research institutions, e.g. they could figure in block grant funding agreements, but also in research grant funding criteria; both asking for implementation of policies and providing specific funding and support for the arising costs.

- National and EU-level coordination platforms could be established, including policy makers from ministries, representatives of employers of researchers (university management, but also industry e.g.), representatives of researchers, in particular also younger researchers, representatives from funding agencies, etc. Such platforms could facilitate a more systematic

and comprehensive look at policies to reduce precarious careers in research, avoiding one-sided measures which act only on the supply or on the demand side – **precarious careers need integrated policy bundles**.

- Importantly, such coordination platforms could overcome the clear information asymmetries present which may lead to coordination failures. PhD-students choose their PhD with regard to their subject interests and their competencies. They are usually not fully aware about the labour market for researchers, or what skills they will acquire in their PhD/post-doc stage and for which employers these skills could be useful. It is difficult to take informed decisions about future careers without information on job market perspectives, awareness about the diversity of careers available and the transferability of skills. At the other side, public budgets for research are usually planned without regard to the future supply of researchers, as are firm-level budgets for research.

- While a clear increase in public funding for R&D is necessary in many EU countries anyway, care should be taken to spend additional money efficiently and effectively, using the available evidence such as international best practice models.

1. INTRODUCTION: MOTIVATION AND OBJECTIVES

This analytical report is part of the larger project "Knowledge Ecosystems in the new ERA" which aims at contributing to the implementation of the recent Communication on a new and deepened ERA.[4] Among its four strategic priorities, the report contains relevant information in particular for the priorities on 'Nourishing talents for excellence' and 'A European Framework for Research Careers'. The ERA Communication in particular observes the persistent disparities among countries and regions, and the imbalanced mobility and knowledge circulation (e.g. brain drain), which is also confirmed by the recent MORE4-studies[5].

To implement policies which may effectively address such policies, a clear-cut empirical picture is needed on the extent and nature of these disparities. The present report focuses in particular on the material and career-related working conditions of researchers in EU Member States. Its objectives are to map employment contracts and career models with a view to gain knowledge about where and which groups of researchers suffer from the most precarious careers and remuneration packages, to develop indicators and suggest policies to reduce the precariousness of researcher careers.

To achieve these objectives, in a nutshell the analytical report maps employment contracts or positions in research with a focus on 5 dimensions: temporal, organisational, economic, career and social. Overall though the focus is more on the material side of working conditions, rather than on conditions for research themselves. Material aspects of a job are less relevant as a driver of job attractiveness or international mobility (as a pull factor), but are more relevant as a push factor, when careers are precarious (i.e., when they are bad, they can lead to escape mobility of researchers, when they are good, they don't work on their own as an attractor, unless the job also offers good conditions for knowledge production).[6] The results will hence be particularly useful for policies to reduce involuntary international mobility linked to precarious careers and low remuneration, working on one driver of asymmetric international mobility.

The results of the report should in the short-term provide insights on the nature and extent of precarious careers in research, both in the private and in the academic sectors, feeding policy-making. In the medium-term, they should facilitate a monitoring mechanism on precarious careers, and in the long-term contribute to a general improvement of the precariousness of research careers. A specific outcome should be the availability of evidence to support policy measures that help increase remuneration levels in certain vulnerable areas, in order to improve the attractiveness of researcher careers and to facilitate brain circulation, rather than brain drain.

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[4] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2020:628:FIN Note that this version is a draft version by the study team and not an official EU publication.

[5] EU Higher Education Survey Report: https://op.europa.eu/de/publication-detail/-/publication/487036ad-bdd1-11eb-8aca-01aa75ed71a1/language-en/format-PDF/source-search and Global Survey Report: https://op.europa.eu/de/publication-detail/-/publication/e9a18042-bdce-11eb-8aca-01aa75ed71a1/language-en/format-PDF/source-search and MORE4 final Report: https://cdn5.euraxess.org/sites/default/files/policy_library/more4_final_report.pdf

[6] (Janger et al., 2017)

2. METHODOLOGY

This section describes the overall methodology for the report. More detailed accounts are in the individual sections and in the annex. To identify precarious careers / jobs in research, the report maps five dimensions of contracts based on a variety of methodological approaches (Figure 1).

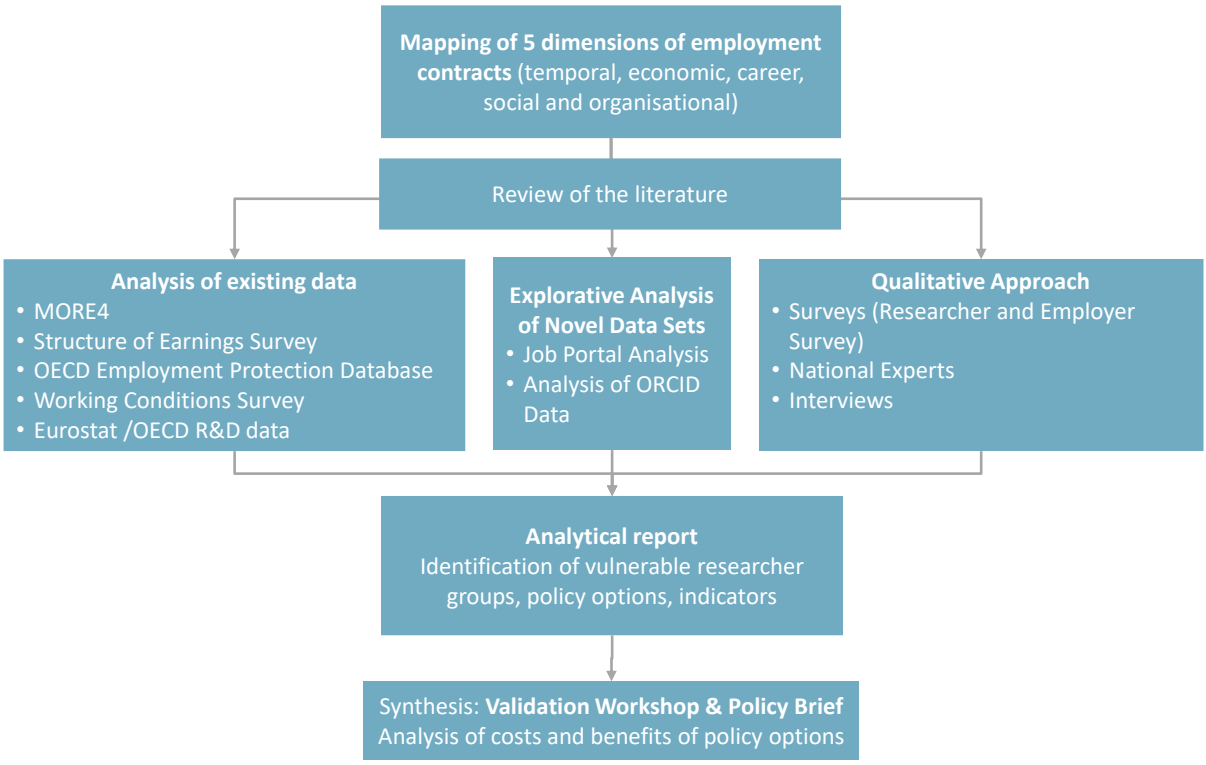
A precarious career in research can be due to aspects in all five dimensions examined, e.g. it can be due to

- Economic aspects (low pay, low job security, low pension…)
- Temporal aspects (uncertainty over future job prospects due to fixed-term contracts without perspective of a permanent contract); linked of course to
- Career aspects (no career perspectives or clear-cut career path, uncertainty about future as a researcher, recruitment or career progression not transparent or not based on merit,…)
- Social aspects (e.g. discrimination – due to gender, nationality, age, …)
- Organisational aspects (tight working deadlines, overtime, little autonomy…)

The mapping of contracts and remuneration packages at disaggregated levels (country, gender, sector, seniority) in both the academic and private sectors is a very challenging task in terms of the data required. The report hence tries to make the broadest possible use of data sources and methodologies. Among them are:

- Review of the existing literature
- Analysis of existing datasets (recent MORE4 study, Structure of Earnings Survey by Eurostat, OECD employment protection database, …; see full list in overview table 2 below)
- Explorative "big data" analysis: Webscraping/text mining of job portals, use of ORCID data for mapping career models
- Information from national country experts and EURAXESS country officers
- New surveys of researchers and employers of researchers, which cover the specific areas of interest of this study not covered by existing surveys such as MORE (e.g.: remuneration, social security issues, discrimination issues…), as well as interviews with researchers, funders, policy-makers (partly overlapping with the work for work package 8 on brain drain)

Figure 1: Methodological approach and data sources for the analytical report



Obtaining information on private-sector researchers is particularly challenging. E.g., a survey in MORE1[7] on private-sector researchers was faced with much lower response rates than the twin survey on academic researchers.

To present the information, we always provide the EU27-average, as well as the average of the 15 so-called "widening" countries[8] and the average of the 12 non-widening countries; when there is information from non-EU OECD countries available, we also include it to show the data in a broader context.

[7] https://cdn2.euraxess.org/sites/default/files/policy_library/more_hei_report_final_version.pdf

[8] Widening countries are low performers in research & innovation, characterised by low participation/success rates in the EU research framework programmes. See https://ec.europa.eu/programmes/horizon2020/en/h2020-section/spreading-excellence-and-widening-participation

Table 1:Widening and non-widening countries in the EU

Country group	Countries
Widening countries (EU-WIDE)	Bulgaria, Croatia, Cyprus, Czechia, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, Slovenia
Non-widening countries (EU-NONWIDE)	Belgium, Denmark, Germany, France, Ireland, Italy, Luxembourg, Netherlands, Spain, Finland, Austria, Sweden

A fundamental issue with comparing working conditions and more specifically remuneration across countries is the question whether the researchers being offered the employment contracts are actually comparable in terms of their profile – remuneration comparisons across countries are only valid, when they refer to similar researcher profiles. What the same or similar researchers would be offered as an employment contract in different countries is hence of paramount importance to detect issues with remuneration and social security that may lead researchers to move out involuntarily (escape mobility) or to be deterred from moving to another country. To account for this, we will use the established researcher profile definition R1-R4 which holds for both private and academic sector researchers. Moreover, our research interest is rather at the bottom end of working conditions or remuneration packages, as we want to identify precarious careers. Here, observed differences between countries are less bound to be influenced by unobserved differences in quality between researchers (e.g., flexible salary schemes may allow universities to discriminate pay for researchers, according to their research performance, e.g., so that at the top of remuneration packages, it can be difficult to compare salaries across countries).

We use the standard EU researcher Career Framework[9] which we slightly modified for the researchers in firms:

Higher public or private education institution

- First Stage Researcher (PhD student or equivalent, without having undertaken a doctorate)
- Recognised Researcher (PhD holder or equivalent who is not yet fully independent; nontenured assistant professor; post-doctoral stage)
- Established Researcher (researcher who has developed a level of independence; tenured, assistant or associate professor; senior lecturer, senior scientist, …)
- Leading Researcher (researcher leading his/her research area or field; professor stage)

[9] https://cdn5.euraxess.org/sites/default/files/policy_library/towards_a_european_framework_for_research_careers_final.pdf

Private firm, non-profit or other organisation

- First Stage Researcher (PhD student or equivalent, without having undertaken a doctorate; junior researcher with less than five years of experience)
- Recognised Researcher (PhD holder or equivalent who is not yet fully independent; experienced researcher with more than five years but less than 10 years of experience)
- Established Researcher (researcher who has developed a level of independence; research specialist or manager of research groups, senior researcher with more than 10 years of experience)
- Leading Researcher (researcher leading his/her research area or field; manager of R&D department)

Moreover, jobs and careers in research are characterised by a multitude of different contracts and career models. We hence focus on "typical" employment contracts or remuneration packages, i.e. the ones which are relevant for a majority of researchers in a country/per career stage, attaching less weight to specific contracts which apply only to a minority of researchers. A detailed overview of sources used for the various mapping dimensions can be found in the following table.

Table 2: Overview of data sources for the mapping of employment contracts

Dimensions	Data Source/Method	Year	Country	Region	Gender	Sector
Temporal						
Type of contract	MORE4 EU HE survey (question 28)	2019	x		x	
	Structure of Earnings Survey	2014/2018	x	x	x	x
	Researcher Survey & Job Portal	2021	x	x	x	x
Type of position (full-time vs. part-time)	MORE4 EU HE survey (question 29)	2019	x		x	
	Researcher Survey & Job Portal	2021	x	x	x	x
Employment duration	MORE4 EU HE survey (question 26)	2019	x		x	
	Structure of Earnings Survey	2014/2018	x		x	
	Researcher Survey & Job Portal	2021	x	x	x	x
Organisational						
Research autonomy	MORE4 EU HE survey (question 32)	2019	x		x	
Balance between teaching and research	MORE4 EU HE survey (question 32)	2019	x		x	
Work intensity	Structure of Earnings Survey	2014/2018	x	x	x	x
	European Working Conditions Survey	2015	x		x	x

Economic						
Remuneration	Structure of Earnings Survey	2014/2018	x	x	x	x
	Analysis of pay schemes (national experts)	2021	x	x	x	x
	MORE4 EU HE survey (question 33)	2019	x		x	
	MORE4 EU HE survey (question 35)	2019	x		x	
	Researcher Survey	2021	x	x	x	x
Salary progression	Structure of Earnings Survey	2014/2018	x	x	x	x
	Researcher Survey	2021	x	x	x	x
Satisfaction with job security and pension plan	MORE4 EU HE survey (question 32)	2019	x		x	
Career						
Career progression – time it takes to next career stage	MORE4 EU HE survey (question 14-18)	2019	x		x	
Satisfaction with career perspectives	MORE4 EU HE survey (question 32)	2019	x		x	
Career progression – perspectives for a tenured position	MORE4 EU HE survey (question 38)	2019	x		x	
Confidence in career prospects	MORE4 EU HE survey (question 47)	2019	x		x	
Overall mapping of career model	ORCID	2021	x	x	x	
Career progression – shape of the pyramid or perspectives for reaching professorial / leading researcher level	MORE4 EU HE survey	2019	x		x	
Training and development/upskilling	MORE4 EU HE survey (PhD only – transferable skills question 53)	2019	x		x	
Skills assessment	Researcher Survey	2021	x	x	x	x
Social						
Protection against unfair dismissal	OECD employment protection legislation database	2019	x			
Protection against unacceptable working practices	European Working Conditions Survey, literature	2015	x		x	x
Information about collective protection	OECD employment protection legislation database	2019	x			

The resulting information is then used for a cross-country analysis in section 4 along the five contract dimensions mentioned, preceded by a section on the context conditions for research. Section 5 presents the country-level analysis with country fiches, summarising all the information available per country. Section 6 summarises the main findings, section 7 draws general policy implications and suggests EU- and Member State-level policy

options. These implications were discussed in a workshop with stakeholders and serve as an input for a policy brief on precarious careers in research.

3. LITERATURE

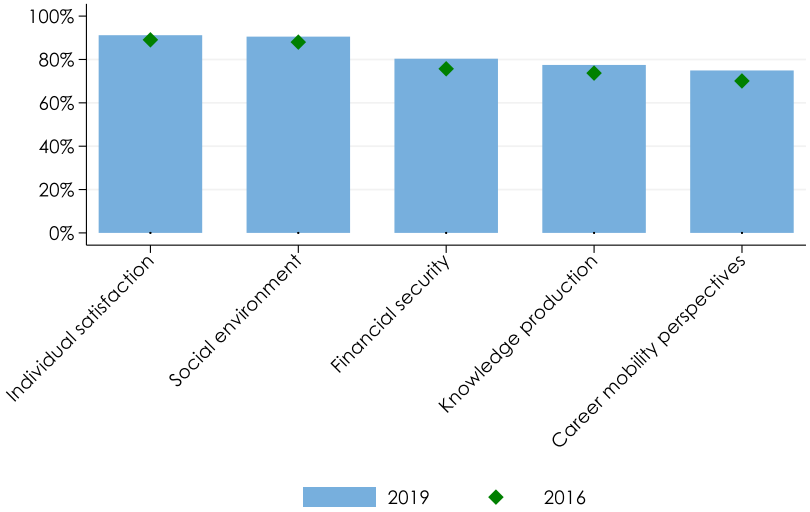
Which researcher groups are particularly affected by precarious careers? What do we know from the literature? As with the availability of data, academic researchers have been much more studied than researchers in firms. An important issue is the motivation to engage in research. **Researchers like what they are doing**, they are highly intrinsically motivated. In the most recent representative survey of researchers working at PhD-granting higher education institutions (MORE4), 91% in the EU declared that they were satisfied with content-related or individual aspects of their jobs (an average of intellectual challenge, dynamic work environment, level of responsibility and quality of life). Researchers also perceive satisfaction with the social environment and recognition they get for their work (91%, an average of social status, reputation of employer and contribution to society; Figure 2)[10] Moreover, researchers with a strong taste for science – intellectual freedom, research autonomy, peer recognition – or "nonmonetary returns" to a career in research, are more likely to choose academic careers in research, while those with a higher interest in salaries and/or access to research resources will go to industry (Agarwal & Ohyama, 2012; Roach & Sauermann, 2010).

In the MORE surveys, academic researchers in the EU and in the US perceive intersectoral mobility of little importance to recruitment or career progression, and PhD-students or recent holders perceive industry funding or intersectoral collaborations as much less important principles for PhD training than research excellence or attractive working conditions (Figure 3). Academic researchers will hence tend try to pursue a career in academic research as long as possible, rather than switch to an alternative career in industry. If job availability or working conditions are not good, academic researchers with a strong taste for science may choose first to become internationally, rather than intersectorally mobile, although there is a lack of evidence on this point due to lacking representative surveys of researchers in industry (MORE4[11]); but also Stephan (2012), mentions the strong culture of university which keeps researchers attracted to academic research careers. It may hence be, that even if there was plenty of information on outside careers, or diversified research careers was available and actively communicated to academic researchers on fixed-term contracts, that researchers stay in precarious careers.

[10] MORE4 EU HE survey https://op.europa.eu/de/publication-detail/-/publication/487036ad-bdd1-11eb-8aca-01aa75ed71a1/language-en/format-PDF/source-search.

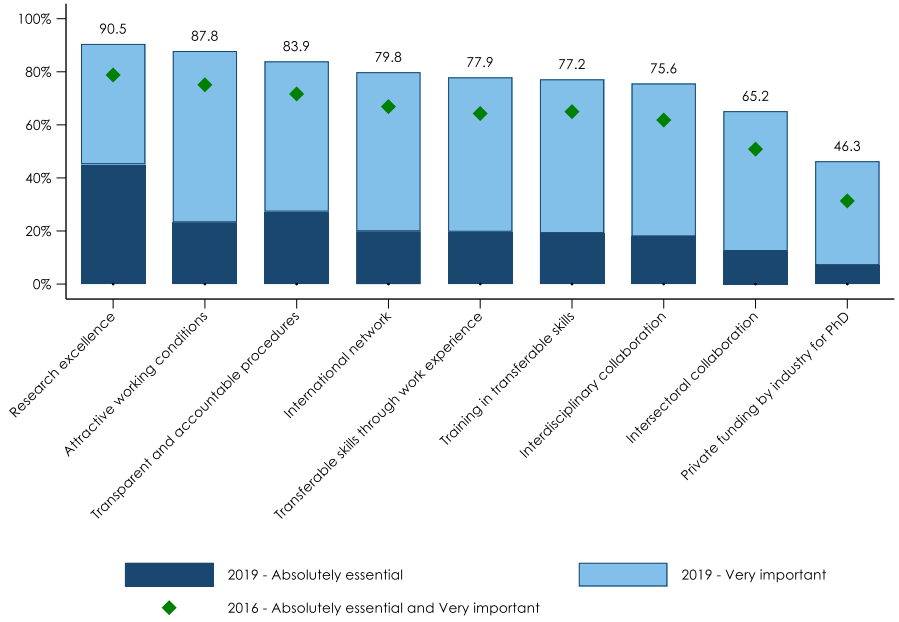
[11] https://op.europa.eu/de/publication-detail/-/publication/ee160e2e-b788-11eb-8aca-01aa75ed71a1/language-en/format-PDF/source-215150175

Figure 2: Satisfaction with different aspects of jobs in PhD-granting higher education institutions (EU28), 2019



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)

Figure 3: 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)

This general interest in research faces up against several context conditions, which can give rise to precarious careers. First, the requirements of scientific training and selection; second, structural features of different higher education systems; third, gender bias and socially unacceptable behaviour which can be facilitated by competitive group environments; fourth, public budgets for research and higher education, generally linked to differences in economic development; fifth, so-called cohort effects (Stephan, 2012) arising from diverging developments of supply and demand for new entrants into research careers, turning the labour market for scientists into a "buyer" or "seller" market, sixth, rules and provisions making careers uncertain for international researchers.

First, scientific training in the form of a PhD takes a lot of time. While non-researcher friends of PhD students may already be in well-paid graduate jobs, the latter may not even have an employment contract or if they do, suffer from intensive workload at low pay, sometimes at the benefit of the productivity of labs of established researchers. During the post-doc stage researchers may live on a succession of badly paid fixed-term contracts, waiting for a permanent position. The amount and length of post-doc work clearly depends also on the availability of permanent or tenured jobs in academia (so is also related to cohort effects, see below), but the post-doc stage is also linked to a selection process, in which in theory the most able researchers show themselves worthy of a career in research. The selectivity and length of the selection process however does not just depend on the researcher herself, but to a large extent on "cohort" conditions, such as the size of PhD graduate cohorts, cyclical variation of public budgets, structural changes to university career structures etc., which the postdocs may not always know about. This includes outside career options for academic researchers, which they may not be aware of for a lack of contact with researchers in other sectors.

> *"Although it is difficult to prove, it is assumed that the ones most likely to wait it out as a postdoc are those who most aspire to an academic position and have difficulty finding one." Stephan, 2012, p. 169*

The US has seen particular problems within life sciences, where the growth in both US- and foreign-trained PhDs was much larger than the corresponding growth of jobs in academia (Stephan, 2012; see also box below). In the wake of post-doc unionisation in the US, there seems to have been a gentleman's agreement among many research universities to limit postdoc positions to 5 years (Stephan 2012, 169). Limiting the amount or total duration of fixed-term contracts has also been tried in other countries, most recently e.g. new regulations in Austria and Germany[12] limit how often fixed-term contracts at universities can be renewed. Such measures are generally not appreciated by researchers, because it can mean a definite exit from a research position in which they are very interested (and the history of mRNA research shows the potential loss to humanity)[13]. Nevertheless, in all countries, only a relatively small share of doctoral students will get a

[12] See e.g. https://www.academics.at/ratgeber/wisszeitvg-wissenschaftszeitvertragsgesetz#subnav_reform_des_wisszeitvg ; there are exceptions however, e.g. for third party funded projects.

[13] https://www.nytimes.com/2021/06/10/podcasts/the-daily/mrna-vaccines-katalin-kariko.html

permanent position. Stephan (2012, p. 170) estimates that at most 25% of doctoral students will get a permanent position in academe, while surveys on post-docs in the US show that 70% of them want to work at a research university.

Box: 1996 Committee on careers of early stage life scientists

In 1996, the National Research Council in the US set up a committee to study trends in early careers of life scientists against the background of increasingly bleak job market opportunities for life scientists.

Analysis

- ➔ Increase in PhDs by 40% over 10 years
- ➔ increase in time to degree, share of post-doc positions, duration of post-doc positions; age of getting funded first time
- ➔ Decrease of % of tenure-track position; and of success rates at NIH (grant funding)

Recommendations

- ➔ Restraint in the growth of the number of graduate students in the life sciences
- ➔ Dissemination of accurate information on career prospects of life scientists
- ➔ Improvement of educational experience of graduate students
- ➔ Enhancement of opportunities for independence of postdoctoral fellows
- ➔ Alternative careers for individuals in the life sciences

Source: Stephan, 2012, p. 176f.

Second, precarious careers can arise due to structural career features in higher education systems, e.g. when steep hierarchies lead to one permanent full professor at the top, with many fixed-term research assistants at the bottom in the so-called "chair-based" model[14], which used to be practiced in Germany but is now changing to some extent because of the introduction of junior tenure-track positions. Another difficult situation is faced by higher education systems which give early permanent jobs to young entrants, who then face unclear or not merit-based career progression perspectives, as well as blocking jobs for interested new entrants, as is or was the case e.g. in Italy or France. Enders & Musselin, 2008, call this system the "protective pyramid" 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 (Lissoni et al., 2011; Pezzoni et al., 2012). Career progression may also not be perceived as fair due to staff appraisal systems which ask researchers to produce excellent research without giving them the necessary resources, in terms of time for research (instead of teaching) or funding for equipment.

More generally, the issues faced by a variety of higher education systems show that it is difficult to balance the interests of existing and future generations of PhD graduates interested in research, as high shares of permanent contracts (and hence career certainty)

[14] As opposed to the department-based, less hierarchial and more collegial organisation of working units e.g. in US universities. (Enders & Musselin, 2008) call the classic German model the « survivor model ».

within a cohort will make it more difficult for future cohorts to get permanent positions in academia, unless the number of positions in the academic sector continuously expands in line with the PhD graduate cohorts.

Third, in both scientific training & selection processes as well as in career structures, gender-based discrimination may arise, either purposefully or as a result of working conditions making it harder for people with caring responsibilities, such as young mothers working part-time struggling to meet performance criteria for tenure. The COVID crisis may have exacerbated the negative impact from caring duties on research careers, as people were forced to stay at home without access to childcare or schools. Moreover, social group environments facing long working hours and competition with colleagues, and hierarchical relationships with supervisors, can also facilitate socially unacceptable behaviour, such as discriminatory behaviour or bullying and harassment.

Fourth, low funding for research, often but not always linked to limited economic resources or low GDP per capita, can limit the number of jobs in research, as well as salaries, pensions and other attributes of jobs in research. This may also be a regional phenomenon, in case of large regional economic disparities. The COVID crisis may lead to budget cuts, but some research fields such as medicine should rather get more resources in the future. Large intra-institutional disparities in salary, e.g. due to a pay bonus for winning grants, or pay according to research performance (and due to the heavily skewed distribution of research productivity), may also lead to tensions and dissatisfaction. Moreover, different allocation mechanisms may make it more or less easy for institutions to plan open-ended positions for researchers. E.g., increases in block-funding may make it easier for institutions to plan open positions, and the increase of project-based funding is often linked with increasingly precarious careers (see also OECD, 2021). However, grants can be designed so as to also fund tenured researchers (i.e. permanent positions at research institutions). E.g., in Sweden, wages of tenured researchers are funded by research grants. This is not possible in all countries, where research grants can only fund wages of researchers on fixed-term contracts; any increase in such grant funding will hence indeed lead to more fixed-term contracts.

Fifth, cohort effects or periods of divergence between supply of new researchers and demand for them can lead to pronounced increases in the share of precarious careers (more researchers are coming into the system than there are open permanent positions, which e.g. Stephan (2012) also describes as a natural tendency of the US system of research universities). Without the inflow of foreign researchers or the exit of national ones, academic labour markets adjust slowly – when demand increases, e.g. due to higher research budgets, or challenge-driven R&D spending it can take 4-5 years for the supply of PhD holders to increase, as these are typical PhD-training times (Stephan, 2012). Divergence can be due to demographic effects, when strong birth cohorts arrive on a labour market where jobs depend on public budgets which don't grow as fast. Strong expansion of higher education, leading to many more doctoral students without concomitant increase in research budgets, produces a similar effect. It can also be due to large changes in research budgets (e.g. due to an economic crisis, or due to idiosyncratic budget decisions such as the doubling of the National Institutes for Health budget in the US around 1998), or to stop-and-go funding decisions; or to a large inflow of foreign-trained students or PhD-holders, e.g. due to asymmetric mobility from weaker research systems to attractive research systems, as seen as in the US, but also in the EU.

Sixth, in the validation workshop the case of international researchers coming from outside the EU was also brought up, which who on top of potential discrimination may suffer from unclear migration rules and bureaucratic uncertainty with regard to remuneration and social security benefits. Moreover, in some countries they are restricted to research or teaching tasks when they enter, a division of labour which can't be changed later.

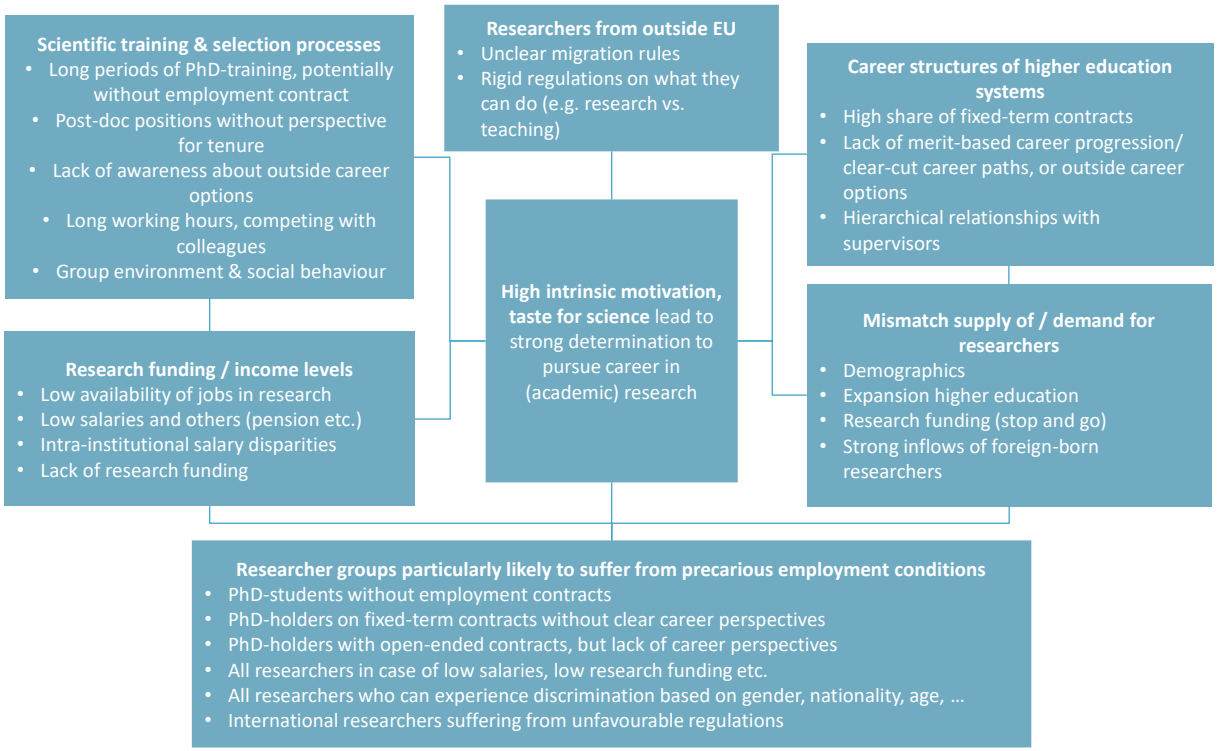
These six general factors which can increase the likelihood of precarious careers can surface in principle both in higher and lower-income countries: The large disparities in the satisfaction with working conditions between Member States perceived by academic researchers in the MORE4 survey are the result of differences in both higher education systems and in economic development, as well as of country-specific regulation e.g. on immigration of researchers, or result from a lack of institutional protection against discrimination. E.g., satisfaction with career perspectives is low in some non-widening Member States, where the share of fixed-term contracts is high; while satisfaction with salaries and research funding is low in several widening countries. The combination of these factors, in conjunction with very high intrinsic motivation by researchers (in particular academic researchers), gives rise to a number of potentially vulnerable groups:

- PhD-students without employment contracts
- PhD-holders, either
    - on fixed-term contracts (post-docs), without a perspective for a permanent position (due to e.g. career structures, cohort effects, low funding, a lack of awareness of careers in other sectors etc.), or
    - on early permanent positions in higher education systems with unclear career paths or non-merit based career progression criteria such as unfair staff appraisal systems
- All researchers, including in firms, suffering from low pay or other contract features (low pensions, minimal healthcare etc.), which may also be specific to regions within a country
- All researchers, including in firms, suffering from potential socially unacceptable (such as bullying or harassment) or discriminatory behaviour (e.g., linked to age, gender, nationality, ethnic origin…)
- International researchers from outside the EU, who on top of potential discrimination may suffer from unclear migration rules and bureaucratic uncertainty with regard to remuneration and social security benefits

Even if all researchers can suffer from precarious conditions, in general, younger, early stage researchers are much more likely to be affected by these problems, as they are bound to suffer most from a lack of available jobs and career perspectives. Outside the scope of this report are country-specific factors leading to precarious careers; such examples were e.g. brought up during the workshop on this report. In Bulgaria, e.g., a new regulation required a PhD from people teaching in higher education institutions, even from people who had spent already many years in teaching. For some, this may lead to an end of their career.

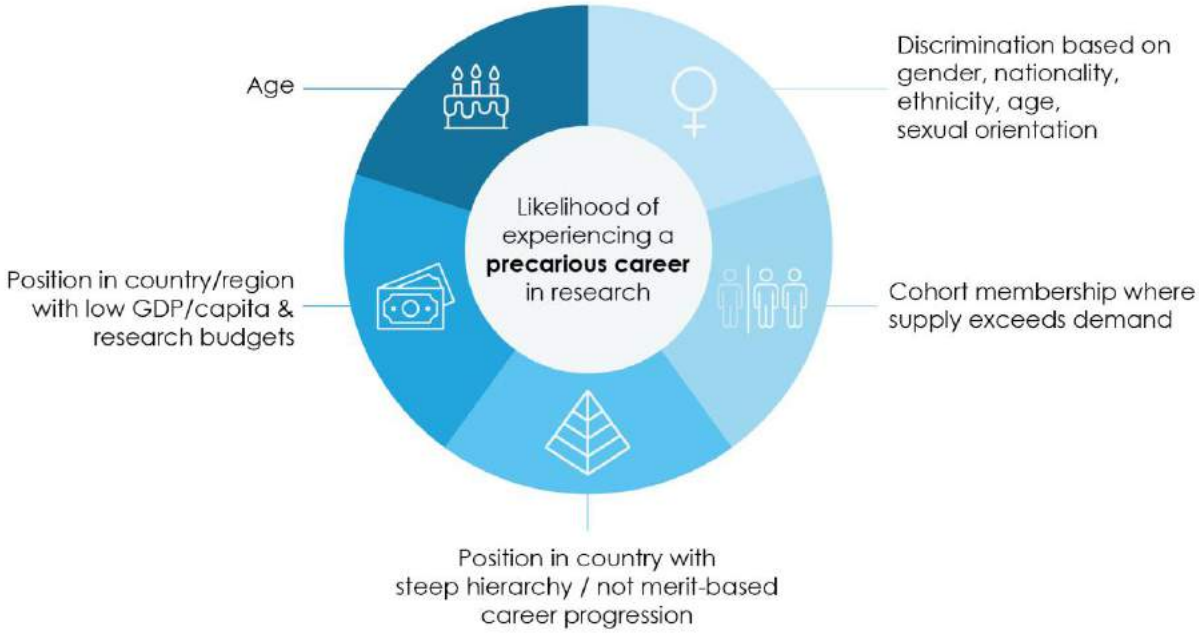
The figures below illustrate the factors contributing to precarious careers at the group level and then risk factors at the level of individual researchers. Over time, recent publications observe a worsening of precarious careers in (academic) research.[15] E.g., (Milojević et al., 2018, p. 12616), find based on data up to 2015 a "dramatic shortening of careers of scientists ... The time over which half of the cohort has left the field has shortened from 35 y in the 1960s to only 5 y in the 2010s… Altogether, the fraction of entering researchers who achieve full careers has diminished, while the class of temporary scientists has escalated." However, available data from within the EU indicate a decrease of fixed-term contracts since 2012, with the latest data point at 2019 (MORE4 EU HEI survey). This may be due to a better economic environment up to 2019, with higher budgets for research funding more researchers/more permanent positions, while the impact of COVID-19 could again diminish perspectives for careers in research. However, there have also been more structural improvements in the EU, e.g. in the MORE4 EU HEI survey, agreement with the statement that recruitment is merit-based and transparent went from 65% in 2012 to 82% of responding researchers in 2019.

Figure 4: Factors contributing to precarious careers in research and groups potentially most vulnerable



[15] (Milojević et al., 2018; OECD, 2021)

Figure 5: Risk factors increasing the probability to experience a precarious career in research



4. RESULTS: CROSS-COUNTRY ANALYSIS OF FIVE CONTRACT DIMENSIONS

This section presents the main information on the five contract dimensions in a cross-country perspective. The first sub-section sets out with an analysis of important framework conditions for careers in research, or the number and quality of employment contracts for jobs in research: public and private R&D expenditures, as well as PhD graduation rates as a measure of the potential inflow of job seekers in research. After a second subsection summarising the main information from the five dimensions, each dimension is then presented in more detail.

4.1. Context for careers in research: R&D spending and size of research workforce as proxies for job availability

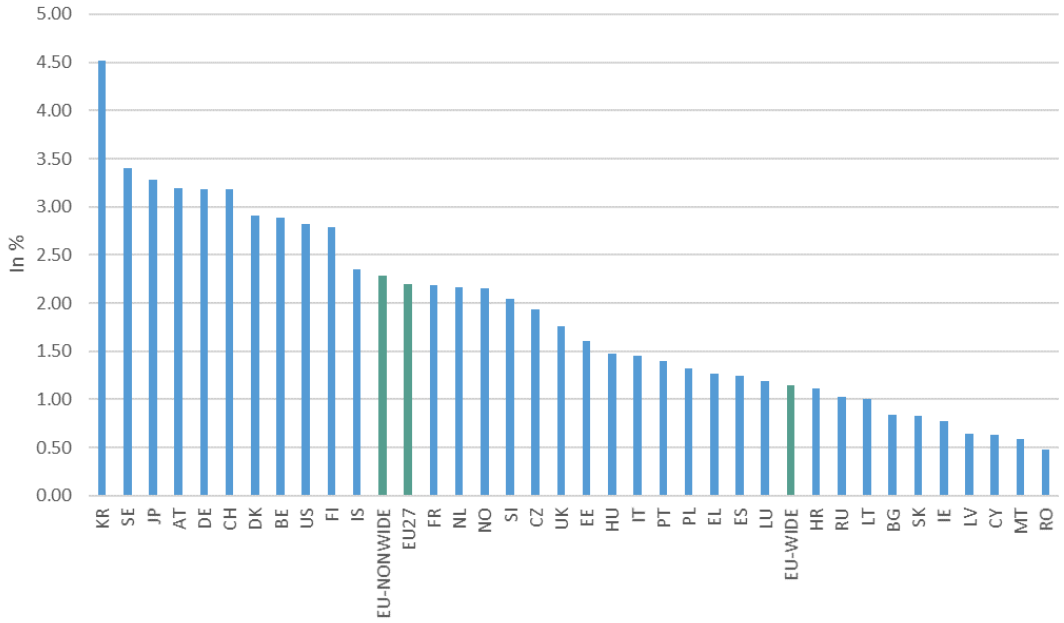
Careers in research, or the quality of employment contracts in research, can only be assessed when there are jobs in research (either in the academic or other sectors, such as industry). Many issues of precarity relate to a mismatch between supply and demand of researchers, as outlined in section 3. This subsection presents data on R&D spending (as a proxy for the demand for researchers), the researcher workforce and PhD graduates (as a proxy for the supply of researchers) to illustrate potential supply and demand issues. As far as data are available, leading innovative non-EU countries are included, to provide international context.

4.1.1. R&D spending

This subsection presents data on R&D expenditures as a share of GDP, R&D expenditures per inhabitant at power purchasing standards, the share of business R&D in total R&D as

well as satisfaction with research funding as perceived by researchers working in PhD-granting higher education institutions. R&D expenditures as a share of GDP can be misleading, if GDP per capita levels differ strongly, as is the case between some of the widening Member States and higher income EU countries. Indeed, differences between the EU averages for widening and the non-widening countries amount to a factor of 2 in the case of R&D as a share of GDP and twice as much in the case of R&D expenditures per inhabitant.[16]

Figure 6: Gross domestic R&D (GERD) expenditure as a % of GDP, 2019

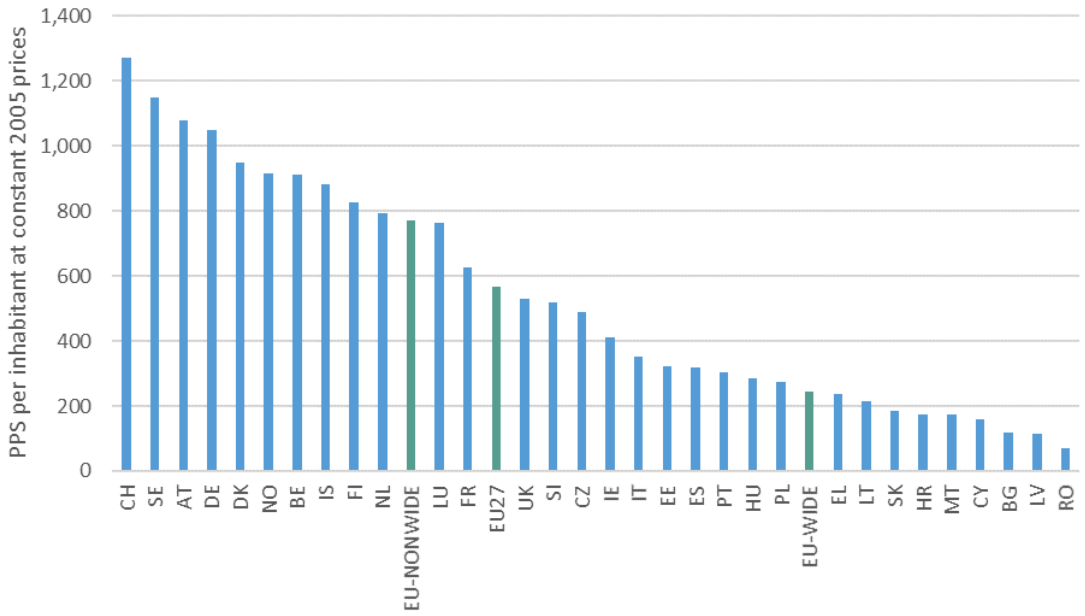


Source: Eurostat

At the level of individual countries, the spread is even more pronounced, with an R&D ratio of 0,5% in Romania, 7 times less than Sweden; in PPS-expenditures per capita, Sweden spends approx. 17 times more than Romania.

[16] Note that the same mechanism holds true in the case of US R&D expenditures due to the high US GDP per capita.

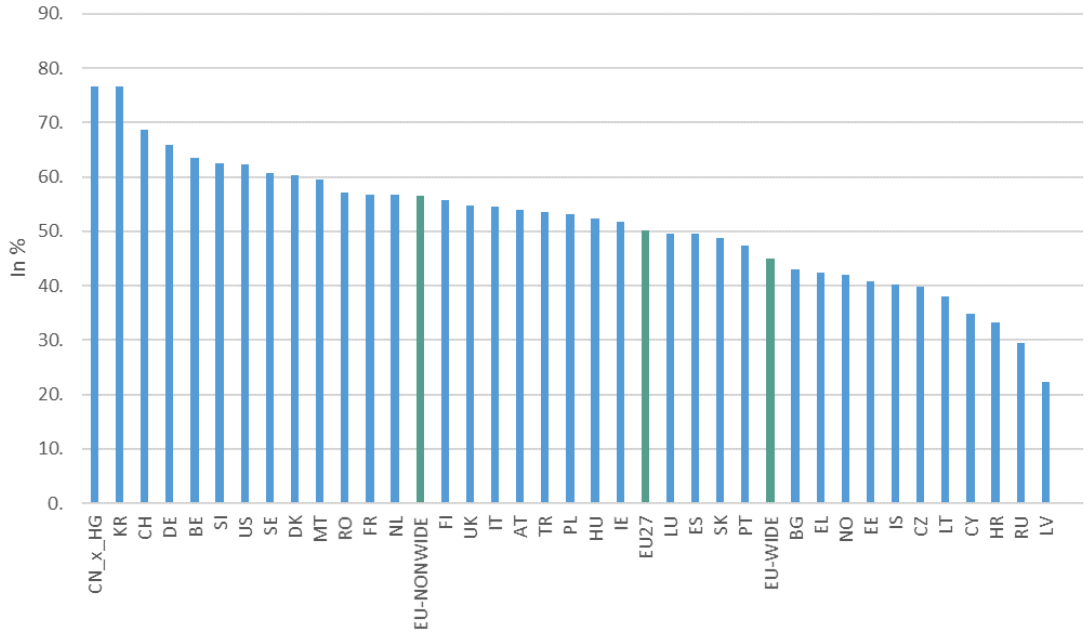
Figure 7: R&D expenditures at power purchasing standards, per Inhabitant, 2019



Source: Eurostat, calculations by authors.

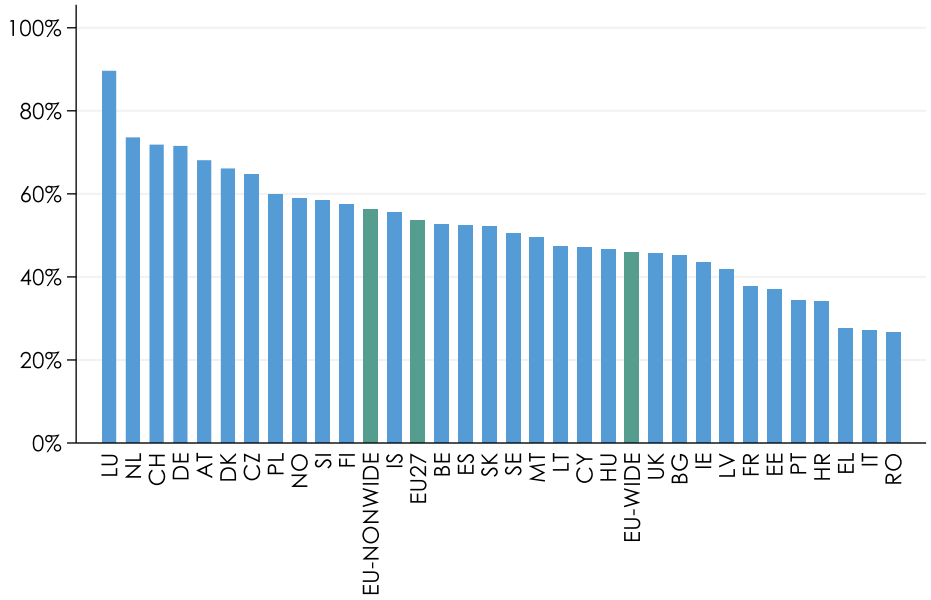
The share of business R&D expenditure in total R&D points (approx. the inverse of the share of government and higher education R&D expenditures) may point to sources of high/low R&D spending. Overall, the share of business R&D in total R&D is higher in the non-widening countries, pointing to structurally more R&D intensive business activities, consistent with structural change in favour of more knowledge-intensive industries in higher income countries (Janger et al., 2011). There are also widening countries with higher business shares, though, in particular Slovenia and Romania. In the case of Romania, which has the lowest total R&D expenditures, this points to a particularly low research intensity in the public (government and higher education) R&D sector.

Figure 8: Share of business sector expenditures (intramural) in total R&D expenditures, 2019



Source: Eurostat

Figure 9: Individual satisfaction with research funding, 2019



Source: MORE4 EU HE survey (2019)
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)

Next to statistical data, we also show perceptions by researchers working in PhD-granting higher education institutions, based on the representative MORE4 EU higher education survey.[17] The picture is similar for the EU averages, with higher satisfaction for non-widening EU countries than for widening countries; some countries are at identical rank to R&D spending data, as for e.g. Romania, but others are better or worse than statistical data. This may be linked to research funding allocation mechanisms (e.g., in Sweden, grant funding plays a large role compared with institutional base funding, which may explain why satisfaction is below the EU average), but also to the size of the research workforce in search of funding opportunities. Research funding satisfaction in Italy is very low, pointing to low public research budgets relative to research endeavours looking for funding. By contrast, satisfaction with research funding in the Czech Republic or Poland is quite high, suggesting that research funding is more in line with needs by researchers there. This leads to the question of supply of researchers, illustrated in the next subsection.

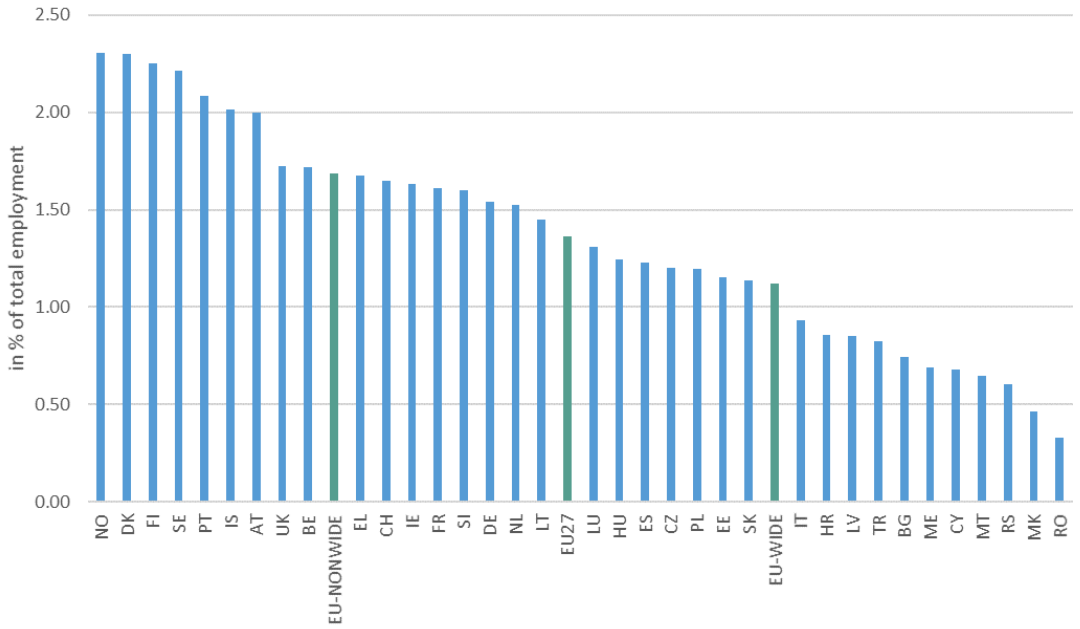
4.1.2. Number of researchers and PhD-graduates

Data on the number of researchers relative to total employment and per 1,000 of the population give an indication of the size of the overall research workforce, or the size of the labour market for researchers. In principle it is hence a measure of the probability that a young graduate will end up with a job as a researcher: what are the career prospects of someone who wants to become a researcher, how likely is it for that person to obtain a job in research? The size of the labour market depends in principle on the demand for and supply of researchers, with the latter growing through new graduates and shrinking from exits into the non-research workforce or into retirement.

Overall, data on the share of researchers in total employment and on the number of researchers per 1,000 population provide a picture similar to research spending. The non-widening countries are significantly ahead of the widening countries, by a factor of about 1,5. Spreads between the countries with the highest number of researchers relative to their size range from 7 to 9 (e.g., Denmark to Romania).

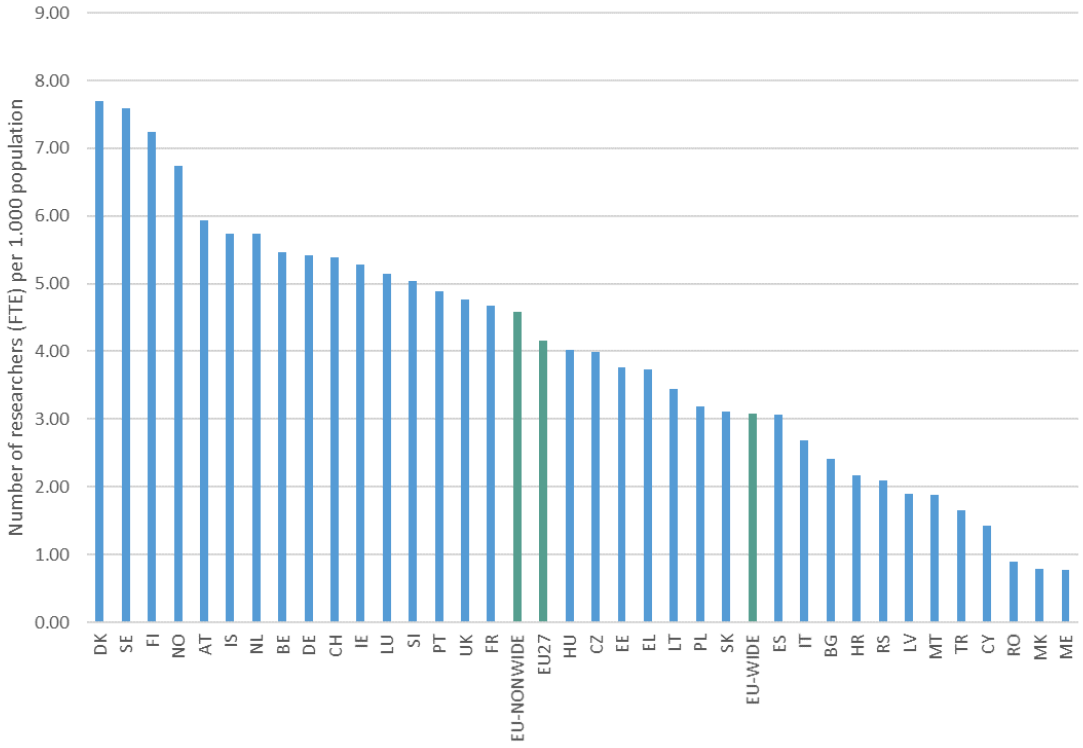
[17] MORE4 EU HEI Report.

Figure 10: Researchers in % of total employment – headcount, 2018



Source: Eurostat, calculations by authors.

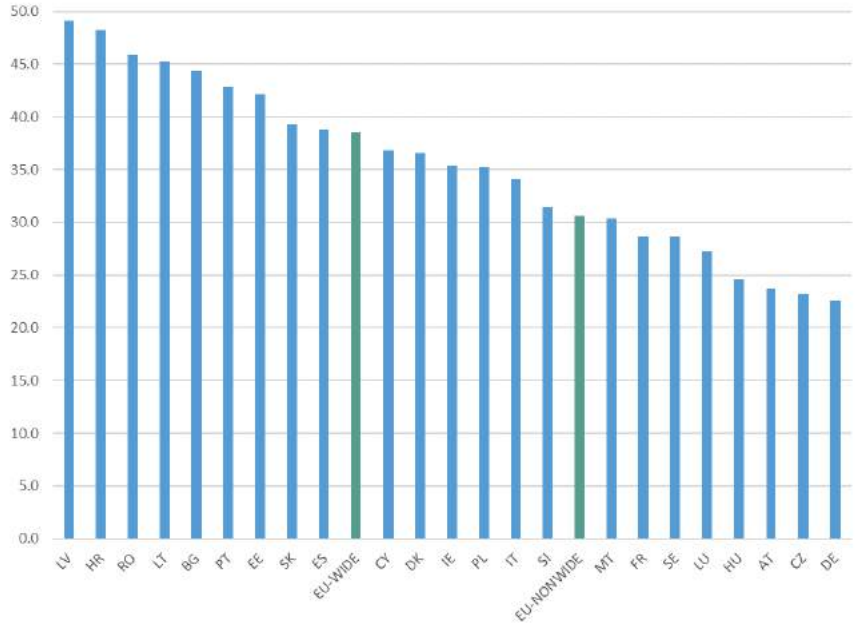
Figure 11: Number of researchers (FTE) per 1,000 population, 2019



Source: Eurostat, calculations by authors.

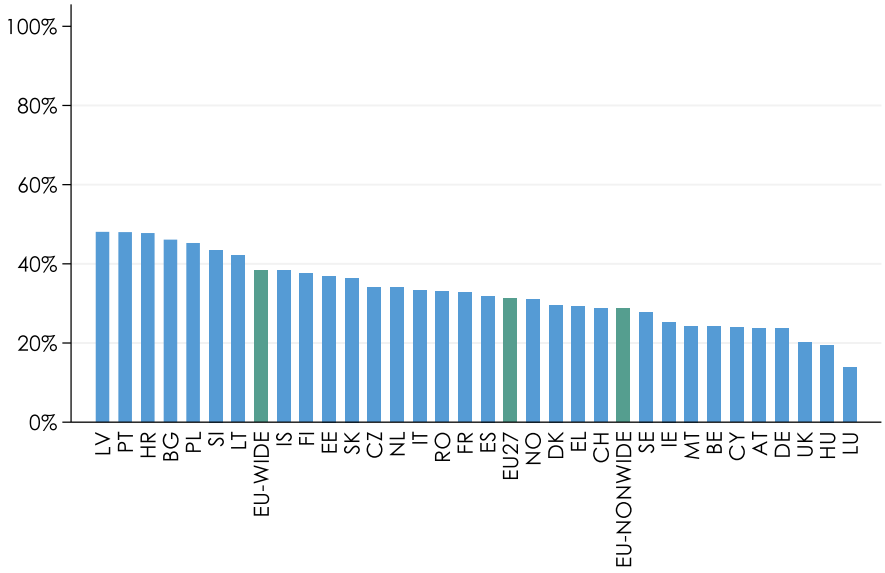
A different picture comes with the share of female researchers both in the number of all researchers (Eurostat) and in leading positions in the academic sector (MORE4): the widening countries have on average a higher female researcher share. The reasons for this are not clear.

Figure 12: Female researcher in % of all researchers, in full time equivalents, 2018



Source: Eurostat

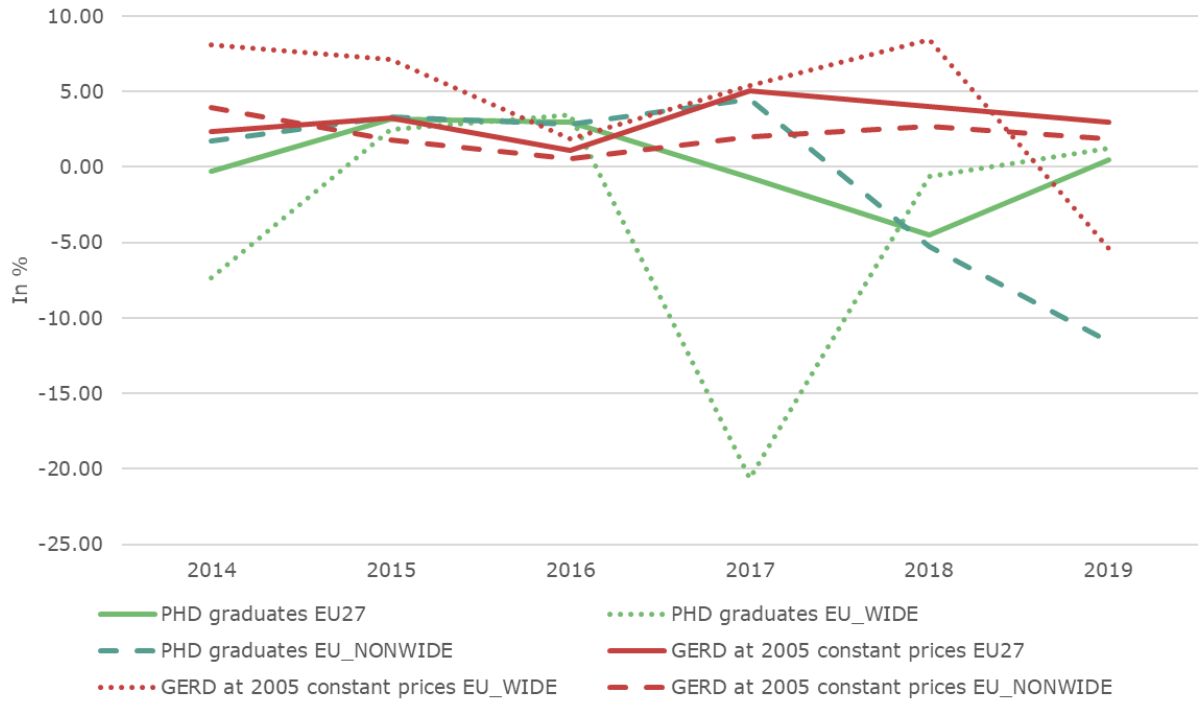
Figure 13: Share of female researchers in R4 career stage, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 2: "What is your gender" and question 13: "In which career stage would you currently situation yourself?"
- (2019: n=9,321)

The next figure and the table below directly compare a proxy for the (future) supply of researchers (PhD graduates p.a.) with a proxy for the demand for researchers, total R&D expenditures and R&D funded by public sources. At least in the period 2013-2019, most countries have actually seen higher growth of R&D expenditures (at constant prices) than PhD graduates. In the widening countries, R&D expenditures grow faster than in the non-widening countries, while PhD graduates are declining at an average annual rate of 4%.[18]

Figure 14: Growth of PhD-graduates vs. R&D expenditures, 2014-2019



Source: Eurostat, WIFO-calculations.

This is not necessarily a good thing for overall research performance, but these trends, should they continue in the medium term, would alleviate some of the pressure on the labour market for researchers. It is unclear why the number of PhD-graduates is declining. This may be due to reforms in the higher education sectors, limiting the number of PhDs by switching to more structural PhD training requiring selection of applicants; to people leaving before their PhD to do their PhD in another country (this has come up, e.g. in an interview with a researcher from Hungary); to purely demographic reasons; or to a declining interest in research careers due to bad job market prospects. This would require further analysis.

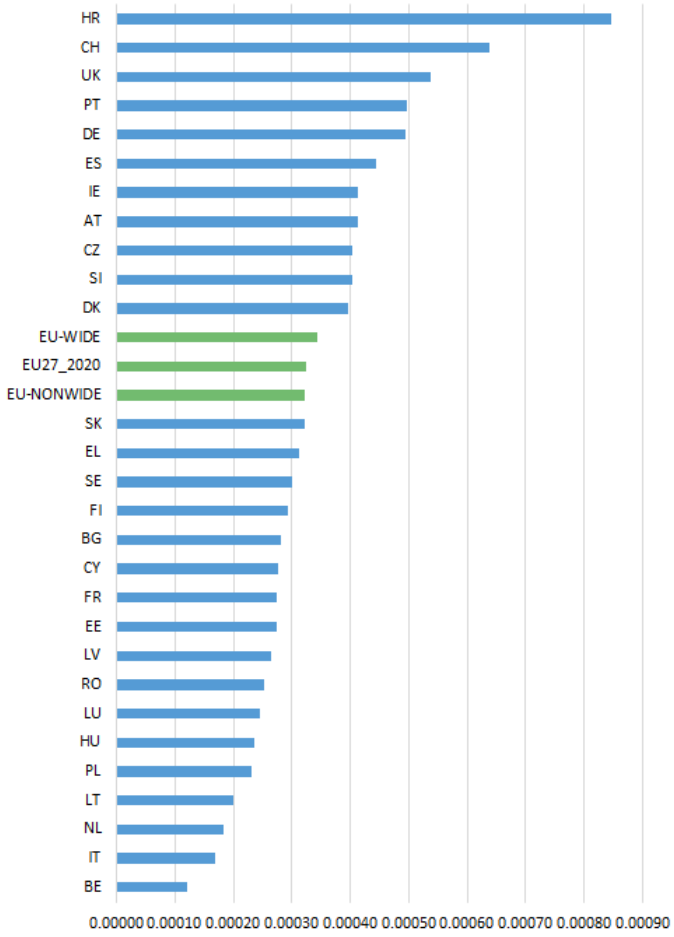
[18] Eurostat also has data on new PhD-students per year; the data point in the same direction, with an overall declining number of EU PhD-students (see figure 15).

Table 3: Average annual growth rate of PhD graduates vs. R&D expenditures (in constant prices)

Country	GERD funded by government (2013-2018)	PHD graduates (2013-2019)	GERD (2013-2019)	Difference GERD - PHD graduates
BE	0.1%	0.0%	5.4%	5.4
BG	0.6%	1.1%	8.1%	7.0
CZ	3.5%	-0.6%	4.0%	4.6
DK	1.1%	1.7%	2.2%	0.4
DE	3.0%	0.2%	3.7%	3.5
EE	-2.3%	0.1%	2.8%	2.6
IE	0.1%	0.2%	-2.4%	-2.7
EL	3.5%	2.6%	8.5%	5.9
ES	0.1%	-1.9%	2.3%	4.2
FR	-1.2%	-0.6%	1.1%	1.7
HR	7.4%	-7.9%	7.9%	15.9
IT	-1.9%	-9.3%	2.6%	11.9
CY	-2.8%	16.2%	8.0%	-8.2
LV	11.7%	-13.3%	3.7%	17.0
LT	1.7%	-5.0%	4.3%	9.2
LU	0.2%	28.2%	1.9%	-26.4
HU	3.6%	2.9%	5.2%	2.3
MT	-1.2%	8.9%	2.6%	-6.3
NL	0.9%	3.4%	2.1%	-1.3
AT	0.5%	-0.1%	3.0%	3.1
PL	4.9%	1.4%	11.7%	10.3
PT	-0.1%	-2.6%	3.2%	5.8
RO	0.6%	-15.8%	8.2%	24.0
SI	-4.5%	-13.8%	-0.4%	13.4
SK	3.3%	-6.3%	3.3%	9.6
FI	-0.3%	-0.9%	-1.2%	-0.2
SE	1.0%	-0.1%	3.3%	3.3
EU27	1.0%	0.2%	3.1%	2.9
EU-NONWIDE	0.7%	-0.9%	2.7%	3.6
EU-WIDE	3.0%	-4.0%	6.8%	10.7

Source: Eurostat, WIFO-calculations. In the last column, a positive (green) value indicates faster growth of R&D spending than of PhD-graduates.

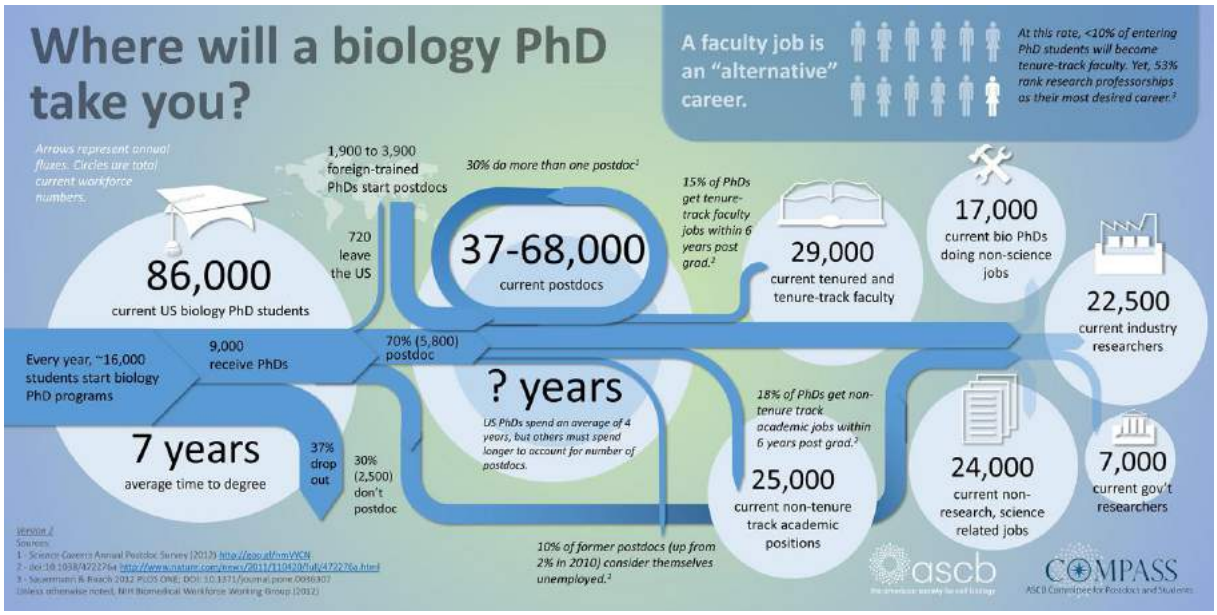
Figure 15: New PhD students, average 2017-2019 per capita



Source: Eurostat, WIFO-calculations.

This analysis of PhD graduates vs. research spending takes however place at a very aggregate level, masking differences between fields of sciences and sectors of industry. There could be a lack of engineering PhDs and a massive oversupply of PhDs in life sciences (as happens or happened in the US, see e.g. Stephan, 2012, or Philippon, 2010). The graph below is an infographic for the life sciences only. While the data is quite old now, it illustrates how a detailed, field-specific analysis of supply vs. demand could look like. This would be valuable information to be communicated to potential PhD students, before they start their training.

Figure 16: Supply of and demand for PhDs in biology, 2012



Source: https://lifesciencephdadventures.files.wordpress.com/2014/12/workforce-infographic-biophd.jpg .

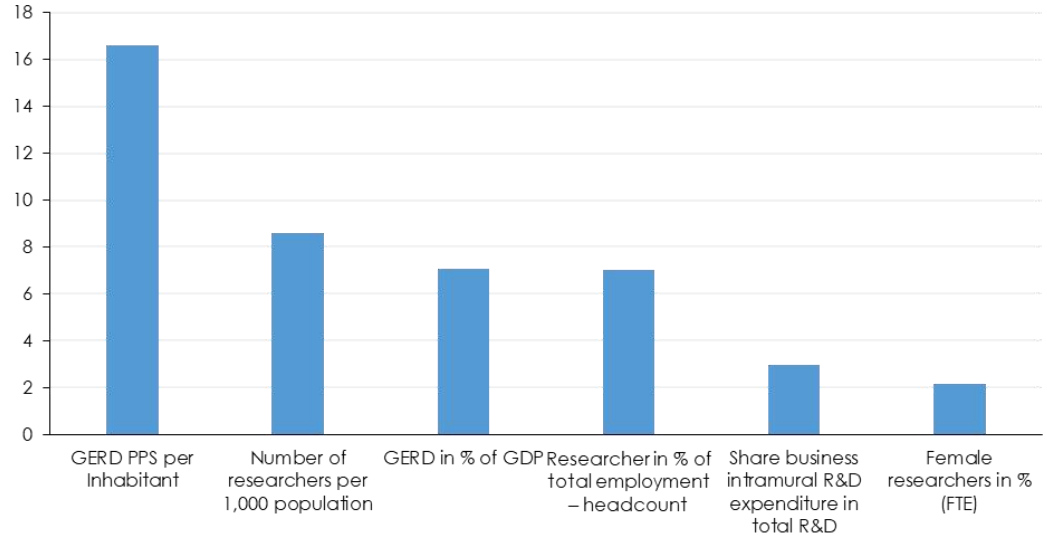
To summarise the data presented on R&D spending and researchers, we show first a table and a graph showing next to each other the various measures, with the min and max countries as well as the ratio between them. The highest spread is in R&D expenditures per inhabitant, at PPS, the lowest in the share of female researchers. Figure 18 illustrates the contrasts visually for each of the various EU countries.

Table 4:Top and bottom values for R&D spending and number of researchers

	EU values		Ratio	EU countries		Non-EU countries	
	Min EU	Max EU	Max EU/Min EU	Min	Max	Min	Max
GERD in % of GDP	0.48	3.40	7	RO	SE	Bosnia	Korea
Share of business intramural R&D expenditure in total R&D	22.30	66.00	3	LV	DE	Serbia	Japan
GERD PPS per Inhabitant	69.40	1151.00	17	RO	SE	North Macedonia	Switzerland
Researcher in % of total employment – headcount	0.33	2.30	7	RO	DK	North Macedonia	Norway
Female researchers in % (FTE)	22.60	49.10	2	DE	LV	Turkey	North Macedonia
Number of researchers per 1,000 population	0.89	7.69	9	RO	DK	Montenegro	Switzerland

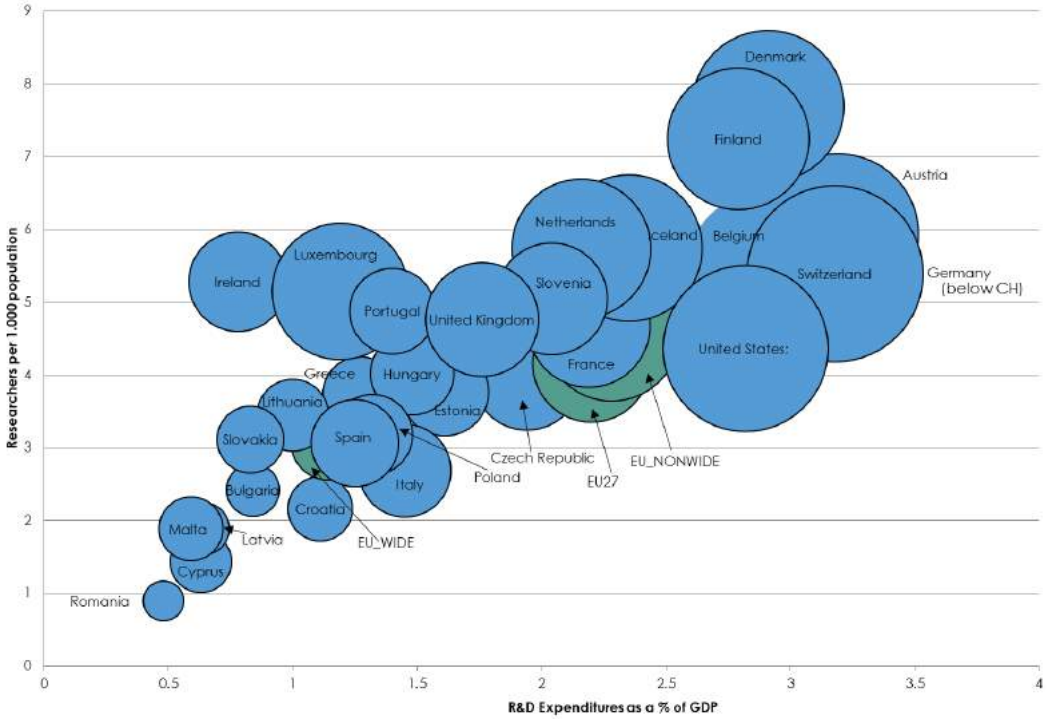
Source: Eurostat.

Figure 17: Ratio between EU country with the highest and the lowest value



Source: Eurostat, WIFO-calculations.

Figure 18: "Intensity" of researchers (relative to population) and R&D expenditures (relative to GDP), R&D expenditures per inhabitant at power purchasing parities



Source: Eurostat, WIFO-calculations.

4.2. Setting the stage: Perception of research employment contract issues by researchers and employers

In this first subsection, we present findings across all five dimensions, by data which show aspects of several contract dimensions together. This gives a first impression of how the various contract dimensions differ in their impact on careers in research, on precarity or satisfaction with research jobs. We set out by confronting data from two surveys carried out within this project, one surveying researchers, the other employers. We ask researchers about what they do not like in their current positions, why they have changed employers in the past and how these conditions have affected several aspects of their approach to research, such as the willingness to take risks or their research performance. We ask employers about the main reasons why they may struggle to fill vacancies in research, and both researchers and employers about what they think about conditions for research careers in general in their countries. Note that the analysis focuses on material aspects of research jobs, with a view to identify precarious positions in research, and less on research conditions per se, although items such as research funding, which indirectly impact on careers, figure also in the analysis, not least to assess their relative importance with regard to aspects such as salary or contract duration.[19]

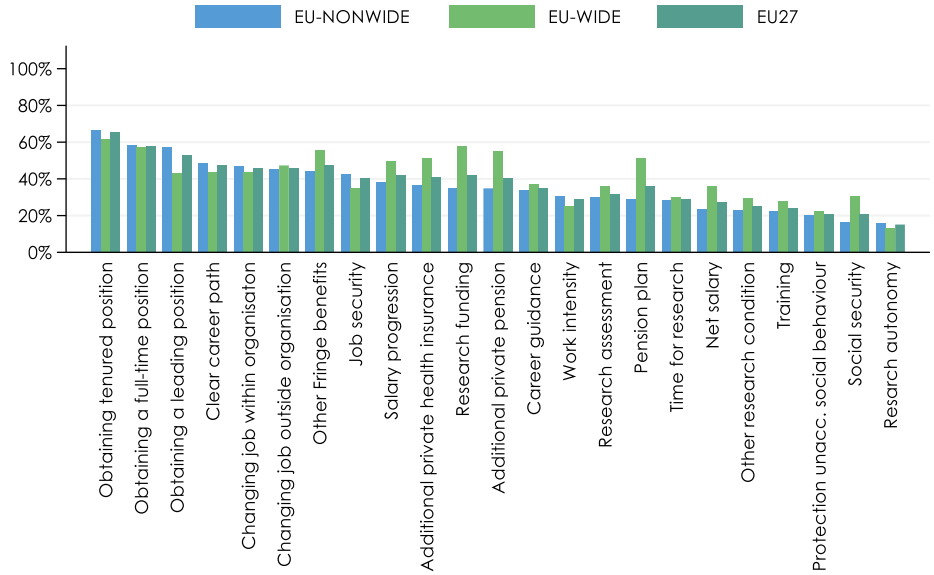
The figure below shows the shares of dissatisfied researchers per aspect of their employment contract or position, across academic and private sectors. At the EU-average, first come aspects related to career and temporal aspects, with up to 60% dissatisfaction with obtaining a tenured, full-time or leading position, or with the presence of a clear career path. At the other end, aspects such as research autonomy, social security, protection against unacceptable social behaviour, social security, can be found, with dissatisfaction at about 20%, still a considerable share of researchers. Salaries and research funding are more in the middle range. Differences between non-widening and widening countries are most pronounced for remuneration aspects (salary, pension plan, fringe benefits, social security) and research funding, indicating the impact of different income levels, consistent with the results from the MORE4 survey.

Higher dissatisfaction in non-widening countries can however be observed for some career-related aspects, such as obtaining a tenured or a leading position, a clear career path or job security. This is consistent with the analysis in the more detailed individual sections, where e.g. non-widening countries show a higher share of fixed-term positions. Researcher labour markets in the non-widening countries seem to be characterised by a more competitive setting, induced by higher supply (both domestic and from abroad) of researchers who compete for the tenured positions available. Similar results are found in the analysis with ORCID data on research careers which are detailed in a separate report.[20]

[19] Methodological details are presented in the annex. Note that neither the researcher nor the employer survey are representative; their results are however plausible and consistent with representative surveys such as the MORE4 survey or statistical data.

[20] Costas, R., Dudek, J., Francisco-Borruel, M., ORCID analysis of career paths across ERA countries, DG R&I, 2021.

Figure 19: Dissatisfaction with different aspects of employment contracts/positions, 2021

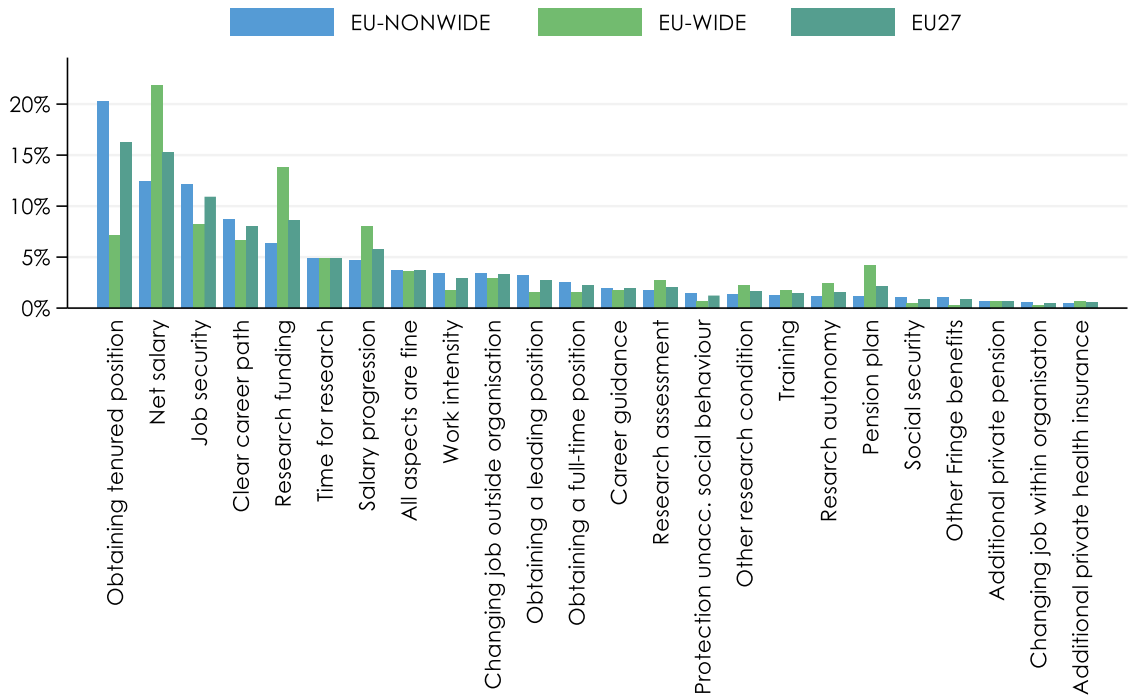


Source: Researcher survey (2021)
Notes:
- Sum of shares of researchers declaring to be very dissatisfied or dissatisfied.
- Based on question B1: "Please indicate your satisfaction with each factor as it relates to your current position/employment"
- Obtaining tenured position: only respondents who don´t have a permanent contract
- Obtaining a full-time position: only respondents who don´t have a full-time position
- (2021: n=219-1,468)

The next figure presents the results from a question which asked respondents to name one aspect of their current position which they would like to improve, to single out the aspects researchers are most troubled with. Here, career related aspects are again highest placed, but in the second position is already net salary, and for researchers from widening countries that is the one aspect which they would like to improve most, followed by research funding. For non-widening countries, by far the aspect cited most often is obtaining a tenured position, reinforcing the picture of research career systems where it is more difficult to obtain a tenured position.

Table 5 presents the same data for the individual countries, for the 7 aspects cited most often on average (note that some countries have few answers and should hence be regarded with great caution). The data fully support the analysis at EU-level, researchers in widening countries such as Bulgaria, Poland and Romania would like to see net salary or research funding to be improved, while researchers in non-widening countries such as Denmark, Sweden or the Netherlands cite most often job security, in Germany and Luxemburg obtaining a tenured position.

Figure 20: If respondents could improve one aspect of their current position, which one would it be (share of respondents choosing the particular aspect), 2021



Source: Researcher survey (2021)
Notes:
- Based on question B2: "If you could improve one aspect of your current position, which one would it be"
- Obtaining tenured position: only respondents who don´t have a permanent contract
- Obtaining a full-time position: only respondents who don´t have a full-time position
- (2021: n=1,465)

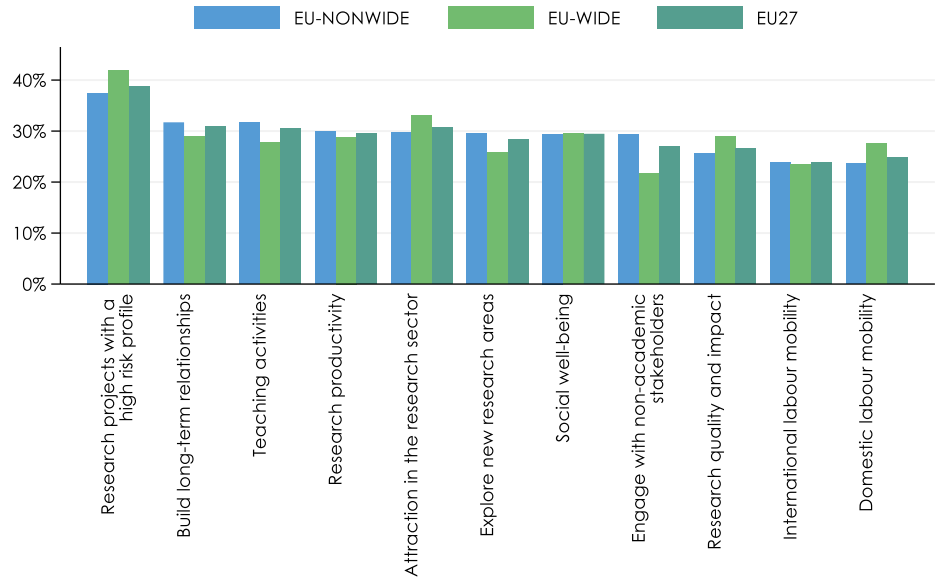
Table 5: If respondents could improve one aspect of their current position, which one would it be (share of respondents choosing the particular aspect – selected aspects cited most often on average across the EU), 2021

Country	Number of all aspects	All aspects are fine	Net salary	Job secu-rity	Salary pro-gression	Research funding	Time for res-earch	Obtain-ing tenured position	Clear career path
AT	32	6	13	16	3	3	16	22	6
BE	68	0	16	15	6	7	6	19	7
BG	18	0	33	0	17	17	6	0	6
CY	4	0	25	0	0	25	0	0	0
CZ	32	0	34	3	6	0	3	16	13
DE	385	4	10	14	4	3	3	26	7
DK	13	15	8	23	15	8	8	0	0
EE	17	0	18	24	6	29	0	0	12
EL	32	0	28	9	3	13	0	13	9
ES	143	0	18	9	7	6	3	14	8
FI	9	22	0	11	0	0	0	22	11
FR	110	5	21	5	5	13	10	19	5
HR	22	0	18	0	23	14	5	5	9
HU	10	0	30	0	30	20	10	0	10
IE	26	0	4	12	0	4	19	4	0
IT	150	5	11	7	4	7	2	19	20
LT	13	8	8	8	8	8	0	8	8
LU	6	0	0	17	0	17	0	33	0
LV	5	0	20	0	20	0	0	0	20
MT	4	0	50	25	0	0	0	0	0
NL	38	8	5	21	5	11	8	13	8
PL	50	4	30	6	6	14	6	4	4
PT	91	4	9	19	7	11	5	16	10
RO	44	5	18	5	2	25	9	0	2
SE	36	3	11	25	6	14	3	14	6
SI	15	0	0	13	0	7	13	7	7
SK	92	8	28	3	10	15	4	3	2
EU27	1,465	4	15	11	6	9	5	16	8
EU-NON WIDE	1,016	4	12	12	5	6	5	20	9
EU-WIDE	449	4	22	8	8	14	5	7	7

Source: Researcher survey (2021)
Notes:
- Only the seven aspects with the highest shares at the EU-level have been selected for this table.
- Based on question B2: "If you could improve one aspect of your current position, which one would it be".
- Obtaining tenured position: only respondents who don´t have a permanent contract

The next figure presents answers from researchers to the question to which extent working conditions in their position restricted their activities or behaviours. The most often perceived restriction at close to 40% is that their working conditions lead them to avoid engaging in high-risk research projects, which is a worrisome finding for the European Union. Challenges such as the twin transition ask for high-risk, novel approaches to finding solutions. At some distance, approx. cited 10 percentage points less often, follow restrictions to building long-term relationships, teaching, research productivity, attraction to the research sector, exploring new research areas, and social well-being.

Figure 21: Share of respondents who indicate that the working condition strongly restrict or restrict them, 2021



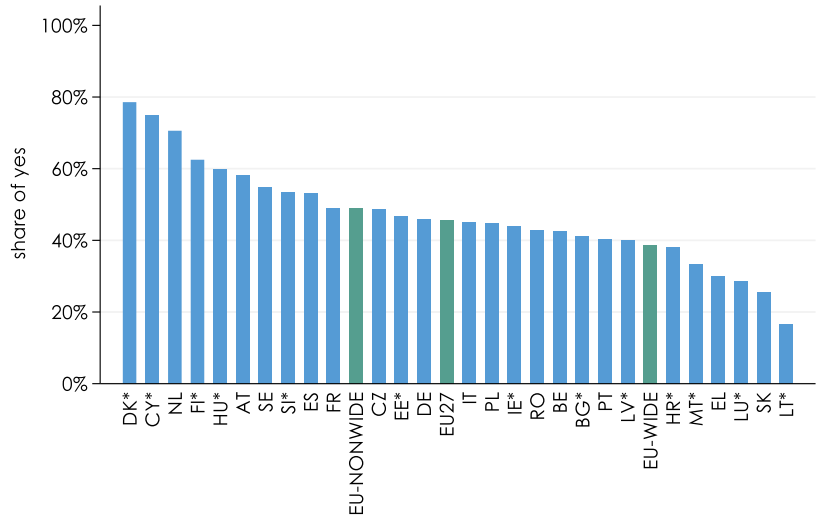
Source: Researcher survey (2021)
Notes:
- Based on question B3: "To which extent did or do working conditions in your position (such as salary, job security, research funding…) restrict or support your…"
- (2021: n=1,339-1,457)

Another way of asking about what researchers dislike most is to ask what made them change their employer. The figure below shows the share of respondents by their current country of employment who have changed their employer in the past 10 years. On average, non-widening countries are ahead of widening countries (more researchers have changed their employer), although at the country level, the picture is less clear-cut than with salaries or research funding, with widening countries being among both countries with high and low shares of employer changes. High shares of employer changes can also point to dynamic labour markets, or to competitive labour markets with high shares of fixed-term contracts, where employer changes naturally occur more often than in countries with fewer in- and outflows. This is confirmed by the next

Figure 23, which shows the share of respondents who considered, but did not actually change their employer. Here, widening countries show a higher share of respondents who considered changing their employer (even if, here as well, this does not always hold at the

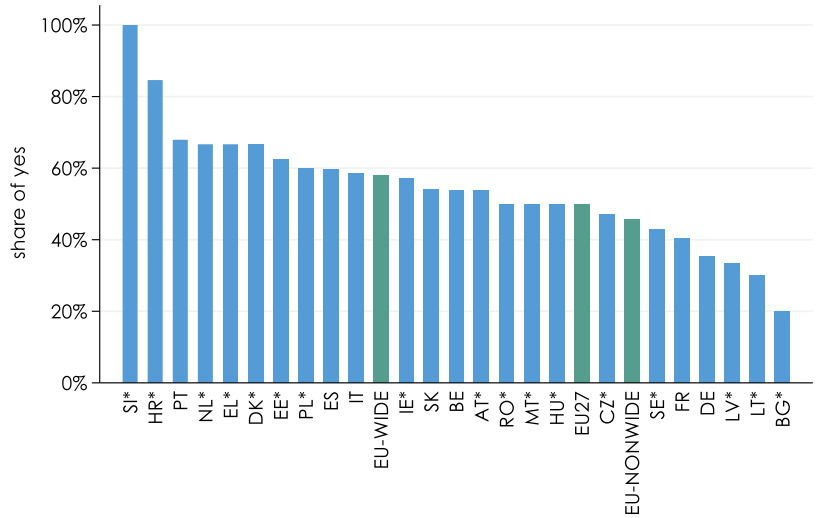
country level), which may be due to fewer options for changing jobs in research, although on average the differences between widening and non-widening countries are not that large.

Figure 22: Share of respondents, who have changed their employer in the same country or to a different country, 2021



Source: Researcher survey (2021)
Notes:
- Based on question B4: "Did you change your employer at least once in the past 10 years, because your working conditions were not satisfactory?"
- *= less than 30 observations
- (2021: n=1,337)

Figure 23: Share of respondents, who have considered changing the employer, per country, 2021

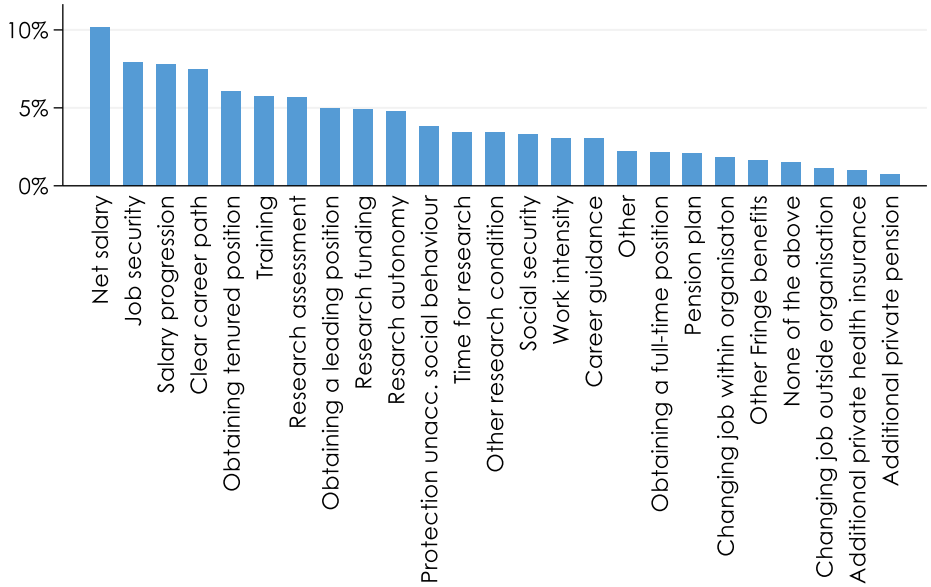


Source: Researcher survey (2021)
Notes:
- Based on question B8: "Have you considered changing your employer in the past 10 years because your working conditions were not satisfactory?"
- Only respondents who have not changed the employer (Question B4: "Did you change your employer at least once in the past 10 years, because your working conditions were not satisfactory?")

- *= less than 30 observations
- (2021: n=740)

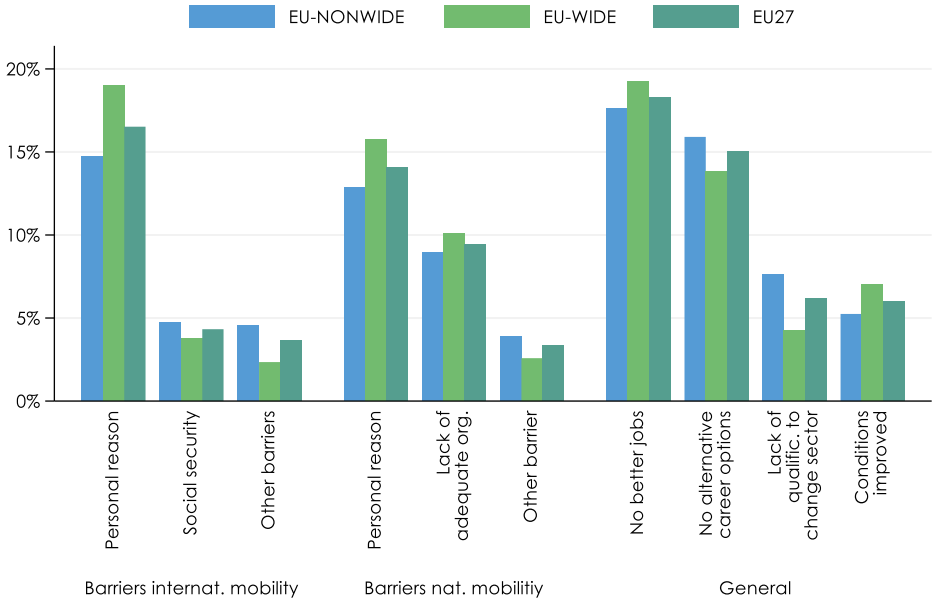
Across all respondents, the reasons to switch employers are again related to remuneration and career aspects most often, with net salary now at the top of reasons, followed by job security, salary progression, a clear career path and obtaining a tenured position. There is no analysis by country, as responses contain both changes within the current country of employment as well as a change from an employer in a different country. Reasons not to change the employer, in spite of having considered it, can be analysed by country (Figure 25). The main reasons not to leave is the lack of alternative jobs, followed by barriers to national and international mobility related to personal reasons, such as e.g. family/children going to school. Behind this come the lack of alternative career options and barriers to national mobility linked to the lack of an appropriate organisation for mobility. Differences between widening and non-widening countries are most pronounced for barriers to national and international mobility (researchers from widening countries reporting this more often as a barrier). Researchers from non-widening countries report more often the lack of alternative career options and a lack of qualifications to change sector. They seem to be more specialised in their careers and potentially lack training in transferable skills, an issue which will be analysed below. Table 6 presents the responses at a country level.

Figure 24: Reasons to switch employer as a percentage of all reasons, 2021



Source: Researcher survey (2021)
Notes:
- Based on question B7: "Which of the following aspects of your working conditions / employment contract have contributed to the switch of employer?"
- Only respondents who have changed the employer (Question B4: "Did you change your employer at least once in the past 10 years, because your working conditions were not satisfactory?")
- (2021: n=832)

Figure 25: Reasons to not change the employer, in spite of having considered it, as a percentage of all reasons, 2021



Source: Researcher survey (2021)
Notes:
- Based on question B9: "Why did you not change your employer, even though you have considered it?"
- Only respondents who have not changed the employer, but considered to change the employer (Question B4: "Did you change your employer at least once in the past 10 years, because your working conditions were not satisfactory?" and B8: "Have you considered changing your employer in the past 10 years because your working conditions were not satisfactory?")
- (2021: n=149-512)

Table 6: Share of reasons to not change the employer as a percentage of all reasons per country, 2021

	General				Barriers to national mobility			Barriers to international mobility			
Country	Conditions improved	No better jobs	No alternative career	Lack of qualification to change	Personal reason	Lack of adequate organisation	Other barriers	Social security	Personal reason	Other barriers	Any other
AT*	6	6	22	0	22	11	0	6	28	0	0
BE	8	17	14	5	16	5	3	8	14	6	3
BG*	0	14	29	14	0	29	0	0	14	0	0
CZ*	13	38	13	0	13	6	0	6	13	0	0
DE	6	20	14	15	9	5	6	6	8	4	8
DK*	14	14	0	0	14	14	14	0	0	29	0
EE*	30	20	10	0	20	0	0	0	20	0	0
EL	8	18	11	3	13	16	3	5	24	0	0
ES	5	19	17	7	16	8	2	4	18	2	2
FR	2	16	19	6	14	11	2	2	21	5	3
HR	6	23	13	0	6	19	6	0	16	6	3
HU*	0	0	33	0	33	0	0	0	33	0	0
IE*	0	33	5	0	5	14	10	0	24	5	5
IT	7	12	16	4	13	16	4	5	16	5	3
LT*	0	23	15	15	0	15	8	8	15	0	0
LV*	25	0	0	0	0	25	0	25	25	0	0
MT*	0	100	0	0	0	0	0	0	0	0	0
NL	0	19	25	6	19	0	6	0	13	13	0
PL	12	16	16	2	16	7	0	7	14	5	5
PT	4	18	16	6	19	9	2	2	20	1	2
RO	7	20	15	5	12	5	10	5	15	5	2
SE*	6	24	24	6	12	6	0	12	12	0	0
SI*	10	19	5	0	14	14	5	10	14	0	10
SK	5	18	13	5	21	9	0	2	23	3	1
EU27	6	18	15	6	14	9	3	4	17	4	3
EU-NON WIDE	5	18	16	8	13	9	4	5	15	5	4
EU-WIDE	7	19	14	4	16	10	3	4	19	2	2

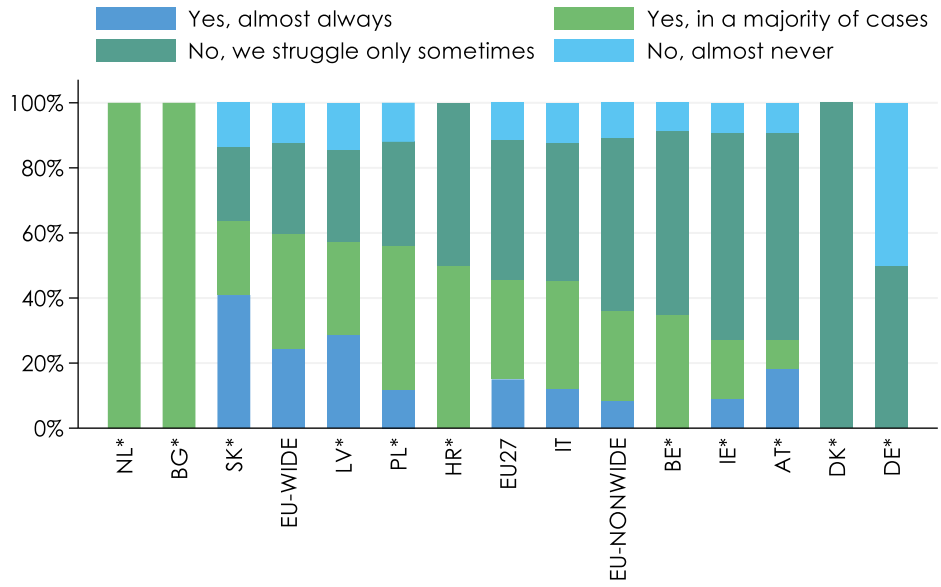
Source: Researcher survey (2021)
Notes:
- Based on question B9: "Why did you not change your employer, even though you have considered it?"
- Only respondents who have not changed the employer, but considered to change the employer (Question B4: "Did you change your employer at least once in the past 10 years, because your working conditions were not satisfactory?" and B8: "Have you considered changing your employer in the past 10 years because your working conditions were not satisfactory?")
- *= less than 30 observations
- (2021: n=368)

- Results from employer survey

We now turn to the results of the employer survey (the "buyers" side on the labour market for researchers, as opposed to the researchers, who are the "sellers" side). The employer survey has much fewer respondents and in some countries unfortunately none at all, however even a few respondents per country are valuable, as the respondents are mostly large organisations (universities or large firms, e.g.; see annex) which represent relevant shares of researchers in the EU countries.

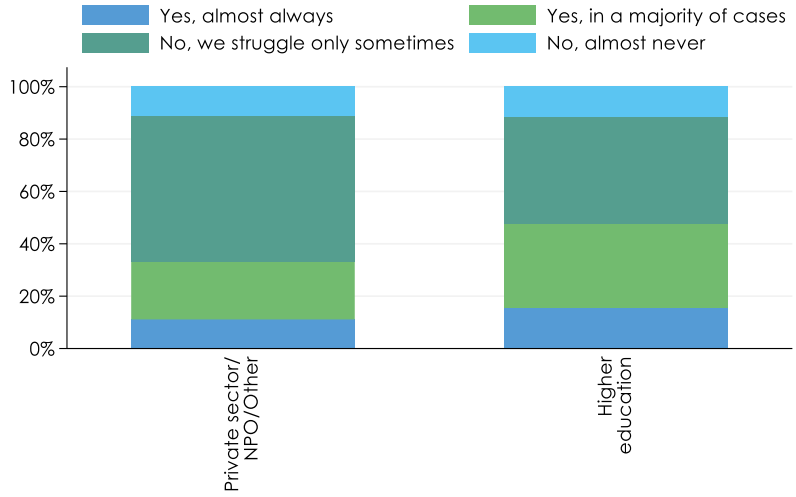
On average, employers from widening countries struggle more to recruit or retain both junior (Figure 26) and senior researchers (Figure 28; exception Netherlands for junior researchers, Austria, Bulgaria, Croatia for senior researchers). This is consistent with the data presented above on there being a "thicker" labour market of researchers in non-widening countries, or there being relatively higher supply relative to demand (a buyers' market), even though there is also much higher demand for researchers in non-widening countries. Between sectors of employment for researchers, across all countries, higher education institutions struggle more to recruit or retain junior researchers (Figure 27) than firms or other organisations.

Figure 26: Ease of recruitment of junior researchers as perceived by employers, per country, 2021



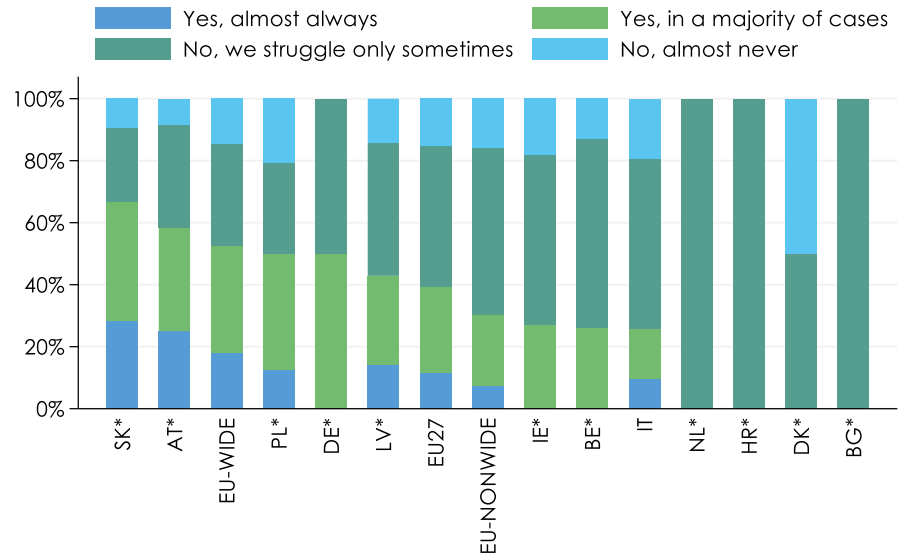
Source: Employer survey (2021)
Notes:
- Based on question B1: "Does your organisation struggle to recruit or retain appropriately qualified junior researchers (first stage and / or recognised researchers) for open positions in research?"
- *= less than 30 observations
- EU27, EU-WIDE, EU-NONWIDE: average over available EU countries
- (2021: n=140)

Figure 27: Ease of recruitment of junior researchers as perceived by employers, 2021



Source: Employer survey (2021)
Notes:
- Based on question B1: "Does your organisation struggle to recruit or retain appropriately qualified junior researchers (first stage and / or recognised researchers) for open positions in research?"
- (2021: n=140)

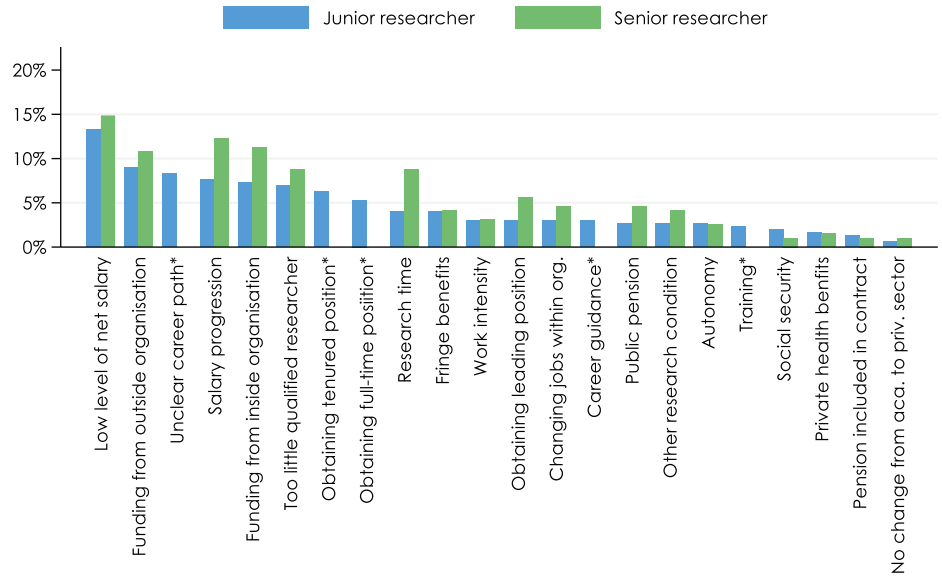
Figure 28: Ease of recruitment of senior researchers as perceived by employers, per country, 2021



Source: Employer survey (2021)
Notes:
- Based on question B5: "Does your organisation struggle to recruit or retain appropriately qualified senior researchers (established and / or leading researchers) for open positions in research?"
- *= less than 30 observations
- EU27, EU-WIDE, EU-NONWIDE: average over available EU countries
- (2021: n=137)

Among those organisations which struggle to recruit or retain junior researchers, a low level of net salary is perceived to be the main reason, followed by research funding from outside the organisation, an unclear career path, salary progression, research funding from inside the organisation and the lacking availability of suitably qualified junior researchers. Consistent with the researchers survey above, employers in widening countries (Table 7) cite more often salary and funding issues as reasons, while employers in non-widening countries perceive more often career issues such as obtaining a tenured position. For senior researchers, it is also net salary, but then salary progression, research funding from inside and then outside the organisation, as well as enough time for research, which feature among the main culprits. The latter may be due to the usually higher teaching loads for senior researchers compared with junior researchers in the academic sector, and too much supervision/management/administrative tasks for senior researchers in the private sector.

Figure 29: Reasons for struggling to recruit or retain suitable researchers, 2021



Source: Employer survey (2021)
Notes:
- Based on question B2: "Why do you think that your organisation struggles to recruit or retain appropriately qualified junior researchers (first stage and / or recognised researchers)?" and question B6: "Why do you think that your organisation struggles to recruit or retain appropriately qualified senior researchers (established and / or leading researchers)?"
- Only respondents who indicate, that the organisation struggle to recruit or retain appropriately researcher (Question B1: "Does your organisation struggle to recruit or retain appropriately qualified junior researchers (first stage and / or recognised researchers) for open positions in research?" and question B5: "Does your organisation struggle to recruit or retain appropriately qualified senior researchers (established and / or leading researchers) for open positions in research?")
- (2021: junior: n=301; senior: n=195)

Table 7: Reasons for struggling to recruit or retain suitable researchers, per country, 2021

		AT*	BE/*	BG*	DE/*	EU27	EU-NONWIDE	EU-WIDE	HR*	IE*/*	IT/*	LV*/*	NL*	PL	SK
Autonomy	Junior	0	6	0		3	3	2	0	0	3	0	0	4	0
	Senior	5	4		0	3	4	1		2	4	0		0	2
Career guidance	Junior	5	3	0		3	2	3	0	1	0	0	17	5	2
Changing jobs within organisation	Junior	9	6	0		3	5	2	0	2	2	0	17	2	2
	Senior	10	11		0	5	8	1		4	4	0		3	0
Fringe benefits	Junior	5	0	0		4	3	5	0	1	5	0	0	4	6
	Senior	2	4		0	4	4	5		1	8	0		3	6
Funding from inside organisation	Junior	5	11	17		7	7	7	0	1	7	9	0	5	9
	Senior	15	14		0	11	12	10		6	12	17		6	12
Funding from outside organisation	Junior	0	8	17		9	6	11	0	0	9	18	0	9	12
	Senior	5	11		0	11	7	16		2	4	33		19	12
Low level of net salary	Junior	9	0	17		13	10	15	100	2	17	9	0	12	20
	Senior	7	0		33	15	10	20		3	15	17		25	18
No change from academic to private sector	Junior	0	0	0		1	0	1	0	0	0	0	0	2	0
	Senior	0	0		0	1	1	1		0	0	0		3	0
Obtaining full-time position	Junior	5	14	0		5	8	3	0	1	7	9	0	4	2
Obtaining leading position	Junior	9	6	0		3	5	2	0	2	3	0	0	3	0
	Senior	10	14		33	6	10	1		4	4	0		0	2
Obtaining tenured position	Junior	5	17	0		6	12	2	0	1	12	0	17	4	0
Other research condition	Junior	9	3	0		3	4	2	0	2	3	0	0	2	2
	Senior	7	7		0	4	6	2		3	4	0		3	2
Pension included in contract	Junior	0	0	0		1	0	2	0	0	0	0	0	2	3
	Senior	2	0		0	1	2	0		1	4	0		0	0
Private health benefits	Junior	0	0	0		2	2	2	0	0	3	0	0	2	2
	Senior	0	0		0	2	2	1		0	8	0		3	0
Public pension	Junior	0	0	0		3	0	5	0	0	0	0	0	4	6
	Senior	0	0		0	5	3	7		0	12	0		6	8
Research time	Junior	9	8	17		4	4	4	0	2	0	0	0	4	3
	Senior	15	11		0	9	10	7		6	8	0		9	6
Salary progression	Junior	5	0	17		8	4	10	0	1	5	18	17	6	14

		AT*	BE/*	BG*	DE/*	EU27	EU-NONWIDE	EU-WIDE	HR*	IE*/*	IT/*	LV*/*	NL*	PL	SK
	Senior	10	4		33	12	10	14		4	15	0		13	16
Social security	Junior	0	0	0		2	2	2	0	0	3	0	0	2	3
	Senior	0	0		0	1	0	2		0	0	0		0	4
Too few qualified researchers	Junior	5	6	0		7	6	8	0	1	5	27	0	6	8
	Senior	7	11		0	9	8	10		3	0	33		6	10
Training	Junior	5	0	0		2	1	3	0	1	0	0	0	4	3
Unclear career path	Junior	9	8	17		8	12	6	0	2	14	9	17	5	5
Work intensity	Junior	9	6	0		3	4	2	0	2	0	0	17	4	0
	Senior	5	11		0	3	5	1		2	0	0		0	2

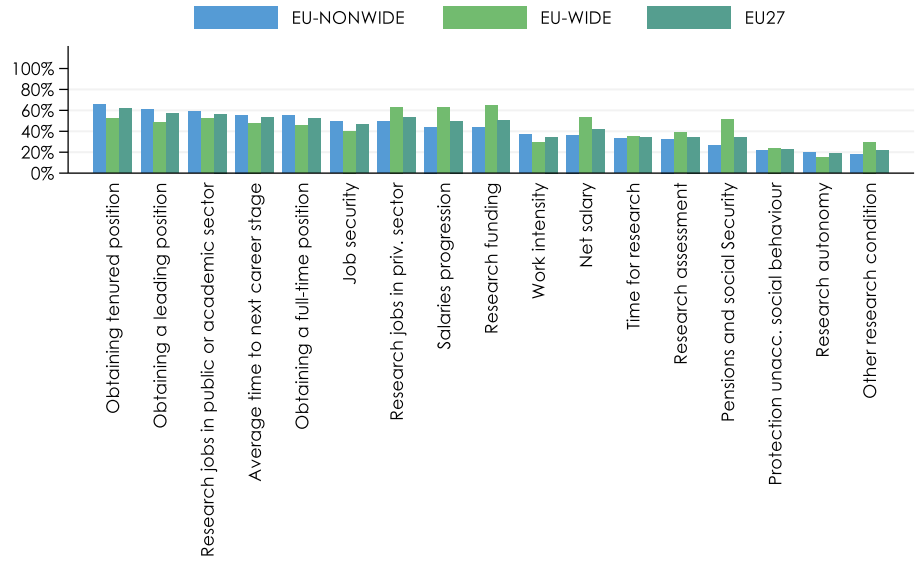
Source: Employer survey (2021)
Notes:
- Based on question B2: "Why do you think that your organisation struggles to recruit or retain appropriately qualified junior researchers (first stage and / or recognised researchers)?" and question B6: "Why do you think that your organisation struggles to recruit or retain appropriately qualified senior researchers (established and / or leading researchers)?"
- Only respondents who indicate, that the organisation struggle to recruit or retain appropriately researcher (Question B1: "Does your organisation struggle to recruit or retain appropriately qualified junior researchers (first stage and / or recognised researchers) for open positions in research?" and question B5: "Does your organisation struggle to recruit or retain appropriately qualified senior researchers (established and / or leading researchers) for open positions in research?")
- *=variables with more and with less than 30 observations; Asterisk in front of the slash indicates the observation for junior research and behind the slash for senior researcher
- EU27, EU-WIDE, EU-NONWIDE: average over available EU countries
- (2021: junior: n=1-301; senior: n=2-193)

- Perception of conditions for research careers in general

Finally, both researchers and employers were also asked to assess the general conditions for research careers in their countries (independent of their job or their organisation; Figure 30). For researchers, it is mostly about career perspectives and the availability of jobs in general, with researchers in widening countries more dissatisfied with salary and funding issues, as above. The same holds true for employers from widening countries, while employers from non-widening countries are, consistent with above, more dissatisfied with career prospects for researchers.

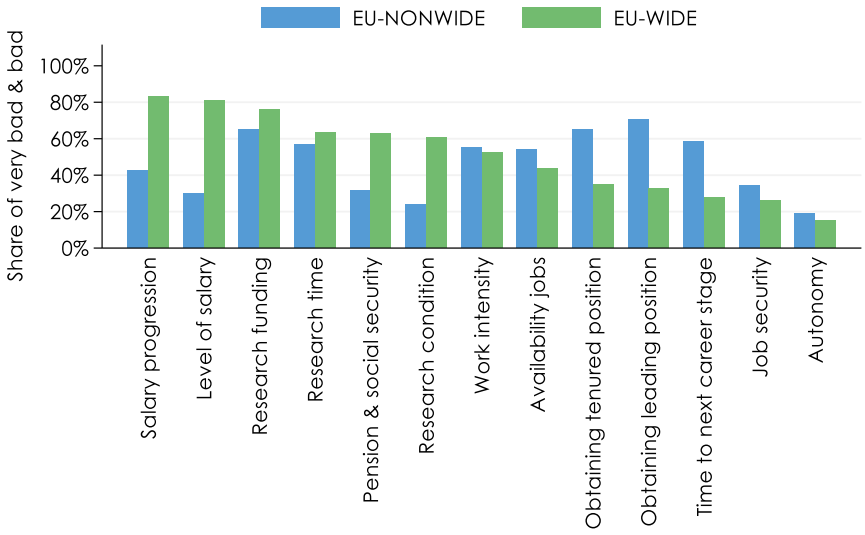
Overall, the researcher and employer survey lead actually to a similar assessment of problems with positions in research, namely remuneration and funding as the top issues in widening countries, and careers/obtaining tenure as the top issue in non-widening countries. In the following sections, we present a more detailed analysis of positions or employment contracts in research.

Figure 30: Dissatisfaction with conditions for research careers, perception by academic researchers, 2021



Source: Researcher survey (2021)
Notes:
- Sum of shares of researchers declaring to be very dissatisfied or dissatisfied.
- Based on question B10: "How satisfactory or dissatisfactory do you rate the following general conditions for research careers in your current sector of activity in your current country of employment?
- Time for research: only respondents who work in a public higher education institution or non-university research institute
- (2021: n=30-1,331)

Figure 31: Dissatisfaction with conditions for research careers, perception by employers, 2021



Source: Employer survey (2021)
Notes:
- Sum of shares of researchers declaring that the condition is very bad or bad.
- Based on question B11: "Please indicate your perception of the following conditions in your country for research careers in organisations similar to yours."
- EU-WIDE, EU-NONWIDE: average over available EU countries
- (2021: n=2-121)

Table 8: Perception of conditions in the country for research career in similar organisations, sum of share of very bad & bad per country, 2021

Country	Level of salary	Salary progression	Pension & social security	Job security	Time to next career stage	Obtaining tenured position	Obtaining leading position	Availability jobs	Work intensity	Autonomy	Research time	Research funding	Research condition
AT**	18	45	8	25	67	50	82	50	73	25	75	36	17
BE**	0	32	0	47	53	67	87	33	50	11	50	71	11
BG**	100	100	0	0	0	0	0	0	100	0	100	0	100
DE**	0	0	0	0	0	0	0	0	0	0	0	0	0
DK**	0	0	0	0	0	0	0	0	0	0	0	50	0
HR**	100	100	100	50	100	100	100	100	100	50	100	100	100
IE**	33	33	50	63	63	63	33	29	67	29	86	29	0
IT*	57	55	62	24	63	77	75	77	60	23	53	86	46
LU**	0	0	0	0	0	0	0	100	0	0	0	0	0
LV**	86	86	86	43	17	71	0	29	67	14	57	100	33
NL**	0	100	0	100	100	100	100	100	0	0	100	100	0
PL**	67	78	44	22	38	25	42	58	58	22	75	70	53
SK**	90	85	72	22	17	24	29	32	35	6	50	76	71
EU27*	50	59	44	31	47	54	55	50	54	18	59	70	38
EU-NON WIDE*	30	42	32	34	58	65	71	54	55	19	57	65	24
EU-WIDE*	81	83	63	26	28	35	33	44	52	15	64	76	60

Source: Employer survey (2021)
Notes:
- Based on question B11: "Please indicate your perception of the following conditions in your country for research careers in organisations similar to yours."
- *=variables with more and with less than 30 observations; **=all variables have less than 30 observations
- EU27, EU-WIDE, EU-NONWIDE: average over available EU countries
- (2021: n=1-121)

4.3. Temporal Dimension

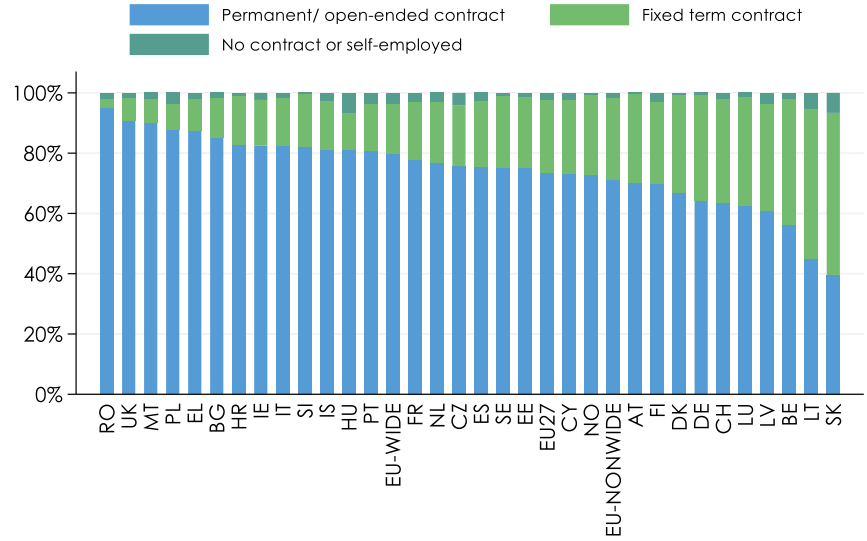
It is well known that in particular in the academic sector, there is a high share of fixed-term contracts at the early career stages (see e.g. the detailed MORE2[21] study on researcher careers that found that "in the vast majority of the countries, researchers' careers start with temporary contracts, which, depending on the career stage, differ in terms of their length" (see link in footnote, p. 10). This section presents information from various data sources on whether employment contracts in research are permanent/open-ended vs. fixed-term, as well as full-time (vs. part-time). Both fixed-term and part-time increase the risk of experiencing a precarious career, due to uncertain career (and hence earnings) prospects in the future in the case of fixed-term contracts, and due to possibly insufficient remuneration in the case of part-time contracts. Fixed-term contracts have also been shown to increase risk aversion by researchers, as uncertain job prospects lead them to prioritise "safe" research approaches which lead to a publishable result rather than taking risks which may leave them without publications to apply for their next job (Petersen et al., 2012); something which is also found by the researcher survey undertaken within this project. It needs to be pointed out that the existing survey data on fixed-term contracts do not provide information on whether researchers have a perspective for a tenured contract, or whether their current fixed-term contract comes in addition to previous fixed-term contracts and how long their total time on a fixed-term contract has been.

4.3.1. Permanent vs. fixed-term contracts

MORE4 data show large differences between countries in the share of permanent vs. fixed-term contracts among researchers working in PhD-granting higher education institutions. Interestingly, but consistent with the data in the preceding sections, widening countries show a higher share of permanent contracts than non-widening countries, with exceptions (Latvia, Lithuania and Slovakia). This may reflect both different career structures in the higher education systems and different job markets for researchers, with more junior researchers engaged in research projects in the non-widening countries.

[21] https://cdn3.euraxess.org/sites/default/files/policy_library/report_on_case_study_of_working_conditions_and_career_paths_of_researchers.pdf

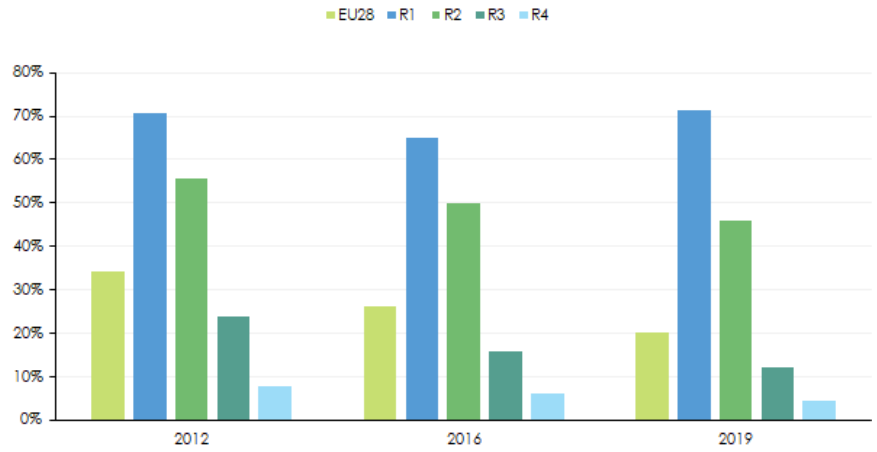
Figure 32: Time dimension of contracts in the academic sector by country, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 28: "Type of contract
- (2019: n=9,321)

Over time, the share of fixed term contracts has decreased in the EU, albeit not for R1 researchers (it is puzzling that PhD-students are not at 100% fixed-term, though). This is likely due to better economic conditions and may change due to the effects of the COVID-19-pandemic.

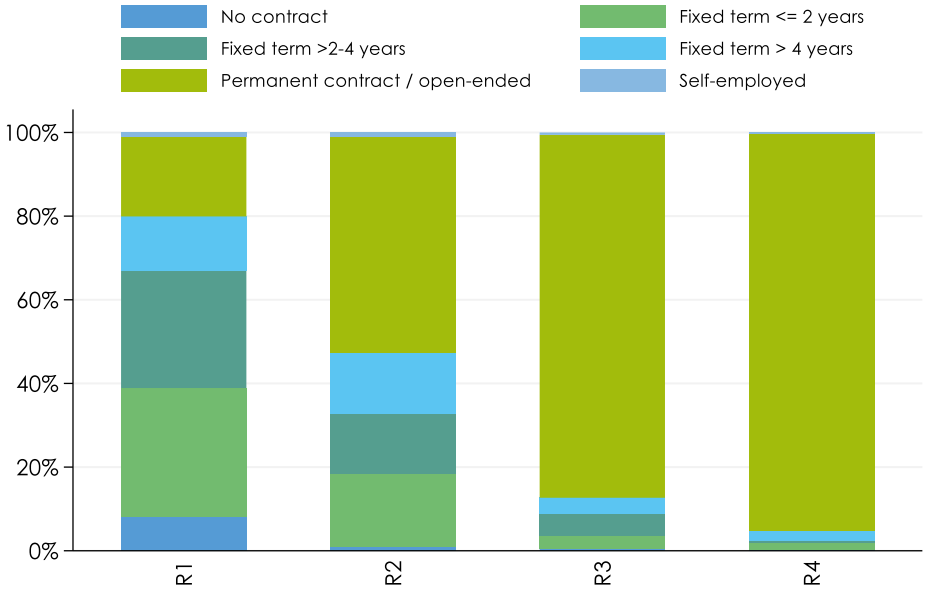
Figure 33: Share of researchers with a fixed-term contract by career stage, EU-average, academic sector, 2012-2019



Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 13: "In which career stage would you currently situation yourself?" and question 28 "Type of contract"
- (2019: n=9,321)

The figure below provides more detailed information on the type of contract per career stage. Having no contract or being self-employed is very rare in career stages beyond R1; the type of fixed-term contract is usually below 4 years, with only a small share amounting to more than 4 years.

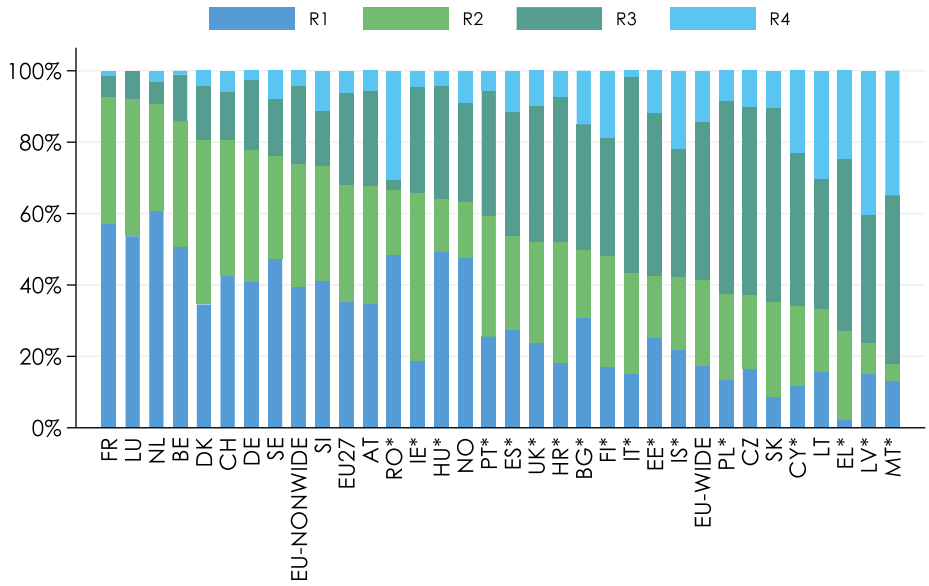
Figure 34: Share of contract types in the academic sector per career stage, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 28: "Type of contract and question 13 "Career stage"
- (2019: n=9,321)

The share of the various career stages in the total number of fixed-term contracts shows an even clearer indication of more junior researchers (R1/R2) on fixed-term contracts in the labour markets of the non-widening countries, with a share of close to 80%, whereas in widening countries, their share is at "only" approx. 40%.

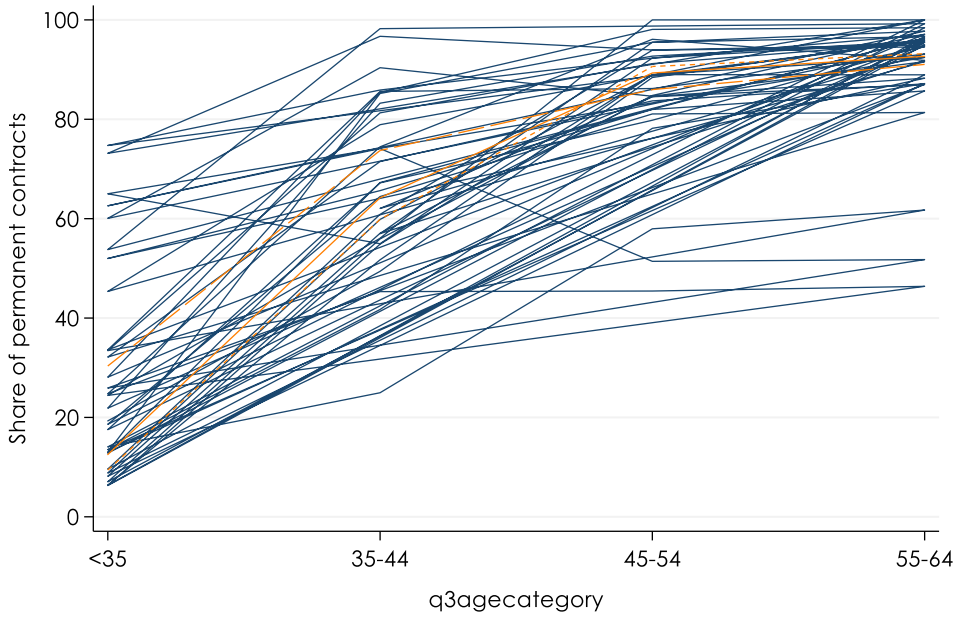
Figure 35: Fixed term contracts by career stage in the academic sector, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 13: "In which career stage would you currently situation yourself?"
- *= less than 30 observations
- (2019: n=9,321)

By age, the following graph illustrates that in most countries, later stage researchers eventually end up with a permanent contract, but the spread between countries at the early age groups is large. The table below the graph provides the numbers for each age group. Below 35, 86% of academic researchers in the non-widening countries are on a fixed-term contract, compared with 43% in the widening countries. Even the latter figure is high when comparing with the share of fixed-term contracts among highly qualified employees in the private sector (8%, according to SES data). Germany and Sweden top the list of fixed-term contracts below 35 with shares of 91%. Among 55-64 year olds, it is however three widening countries with the highest shares of fixed-term contracts (Slovakia, Latvia and Lithuania, 36-51%).

Figure 36: Permanent contracts by age group in the academic sector, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- EU27, EU-WIDE, EU-NONWIDE averages in orange.
- Based on question 28: "Type of contract" and question 3 "Age"
- (2019: n=9,321)

Table 9: Share of fixed-term contracts by age, academic sector, 2019

Country	Below 35	35 to 44	45 to 54	55 to 64
AT	81	51	11	4
BE*	87	38	6	2
BG*	28	10	15	8
CH*	77	33	19	5
CY*	81	34	17	13
CZ	44	25	15	13
DE	91	48	11	7
DK	90	43	15	12
EE*	43	34	18	14
EL*	17	42	8	4
ES*	84	42	9	10
FI*	61	56	21	11
FR	80	10	4	3
HR*	55	19	11	
HU	47	9	12	4
IE*	67	24	4	5
IS*	42	35	15	13
IT*	83	43	5	2
LT*	60	50	52	51
LU	76	40		
LV*	20	25	48	46
MT*	11	3	3	5
NL	73	15	4	2
NO	93	44	15	3
PL*	28	15	1	2
PT*	63	28	14	4
RO*	26	2	1	0
SE	91	38	11	3
SI*	63	19	9	4
SK*	57	72	42	36
UK*	22	12	6	3
EU27	79	34	10	6
EU-NONWIDE	86	39	9	6
EU-WIDE	43	24	13	8

Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 28 "Type of contract"
- *=variables with more and with less than 30 observations
- (2019: n=9,321)

The next table shows the share of fixed-term contracts by career stage, which can take different amounts of time in different countries and hence is not equivalent to the data by age – although the pattern is similar, differences between the countries are smaller.

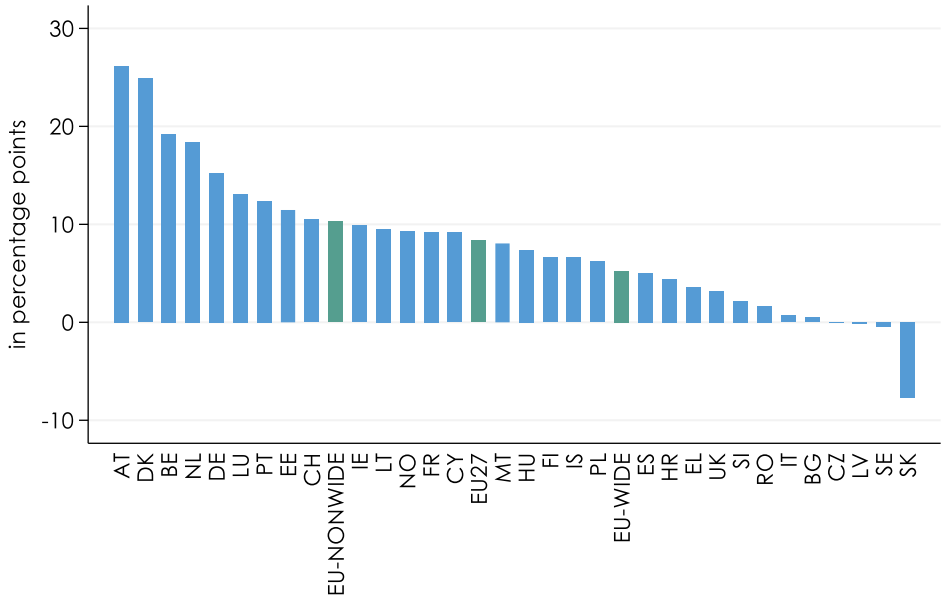
Table 10: Share of fixed-term contracts, by career stage, academic sector, 2019

Country	R1	R2	R3	R4
AT	75	60	25	4
BE	86	74	18	2
BG*	44	20	8	9
CY*	86	55	19	19
CZ	39	25	23	7
DE	87	54	21	3
DK	83	84	12	5
EE*	49	30	22	11
EL*	10	52	12	5
ES	81	66	14	8
FI*	49	51	26	13
FR	84	47	3	1
HR*	41	51	13	4
HU*	42	22	7	2
IE*	42	41	9	3
IT*	60	65	15	1
LT	58	55	45	49
LU	80	50	9	
LV*	41	23	34	42
MT*	17	3	7	9
NL	74	45	3	2
PL*	25	11	10	2
PT*	44	27	10	5
RO*	38	2	0	3
SE	85	56	9	6
SI	48	28	8	6
SK	44	66	59	30
EU27	75	48	15	5
EU-NONWIDE	83	57	15	4
EU-WIDE	39	25	16	8

Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 28 "Type of contract"
- *=variables with more and with less than 30 observations
- (2019: n=9,321)

In most EU countries, male researchers are more likely to be on a permanent contract than female researchers, with the exception of Slovakia, Sweden and Latvia; in Italy, Bulgaria and the Czech Republic the difference is very small. In non-widening countries, the difference is on average larger, with countries such as Austria, Denmark, Belgium, the Netherlands and Germany showing particularly large differences, from approx. 15 percentage points to above 25.

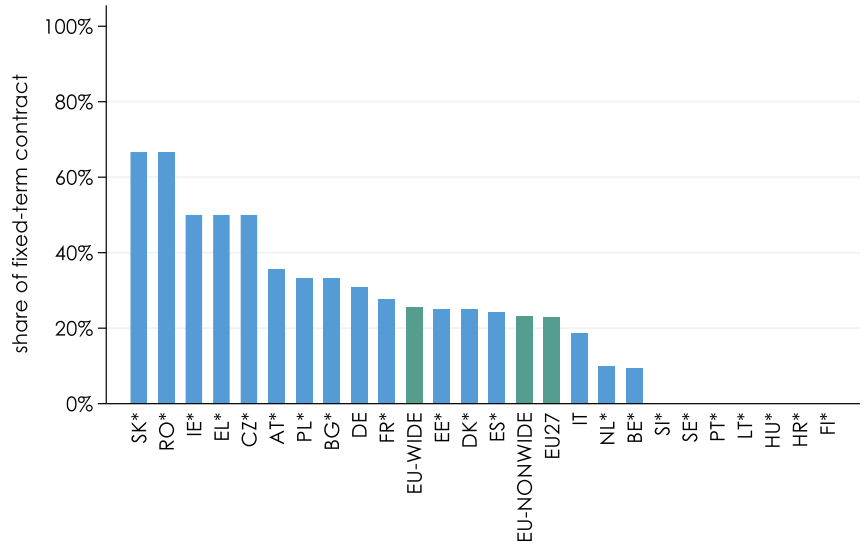
Figure 37: Difference between male and female researchers in share of permanent contracts, academic sector, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- A country with a higher share of females with permanent contracts than men has a negative value.
- Based on question 28 "Type of contract"
- (2019: n=9,321)

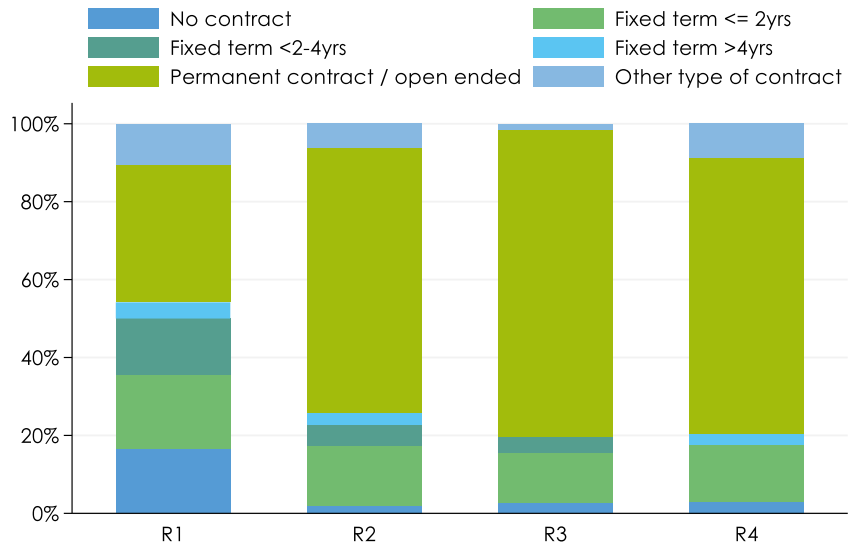
Data on private sector researchers are much less readily available. Within this project, a survey tried to also obtain responses from private sector researchers, but in some countries there were no responses at all and only in Germany and Italy a number of observations higher than 30 was reached. Hence, the next figure should be interpreted with great caution; on average though, shares of fixed-term researchers seem to be on a similar level as in the academic sector at about 20%. Again similar to the academic sector, fixed-term contracts decrease in higher career stages, although not as much as in the academic sector, where higher career stages are usually characterised by tenured or even civil service contracts (Figure 39).

Figure 38: Share of fixed-term contracts in the private sector, 2021



Source: Researcher survey (2021)
Notes:
- Based on question A9: Is your current employment contract (in your main position) permanent or fixed-term?" and question A2: "Which type of organisation do you work for?"
- *=less than 30 observations
- (2021: n=2-233)

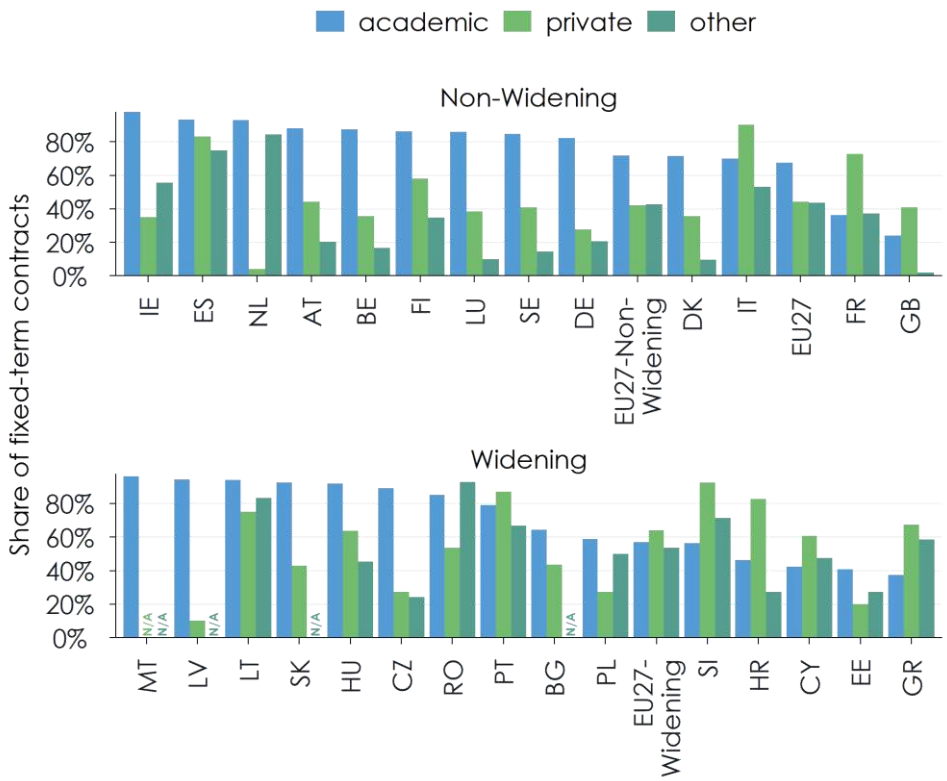
Figure 39: Share of contract types in the private sector - firm per career stage, 2021



Source: Researcher survey (2021)
Notes:
- Based on question A9: Is your current employment contract (in your main position) permanent or fixed-term?" and question A2: "Which type of organisation do you work for?" and question A8.2: "In which career stage would you currently situate yourself?"
- (2021: n=34-97)

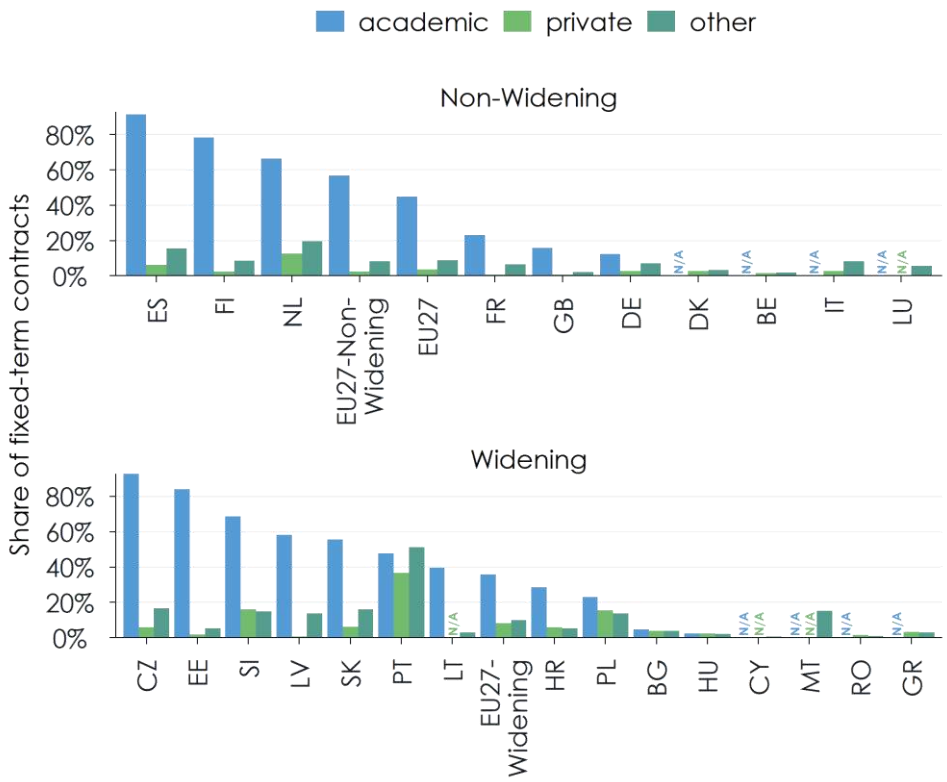
The next figures show data on the share of fixed-term contracts from the online job board analysis (mainly the Euraxess database, see section 9.2.1) and the Structure of Earnings Survey (see section 9.2.3). Interestingly, jobs posted online (between 2016 and 2021) are mostly fixed-term, presumably because they relate to new job openings which will be mostly fixed-term in a first instance. There are also many PhD-positions advertised. The share of fixed term jobs is however again higher in non-widening countries than in widening countries, in both the online job board and SES data. The share of fixed-term contracts is usually higher among jobs for academic research, with the exception of some countries in the job board analysis (in particular Italy, France, UK, Greece, Croatia, Slovenia). This may be due to the special selection of jobs posted online, or the overall smaller number of private-sector research jobs posted online on Euraxess. By contrast, the SES data, which provide information not just on new job openings, but on a sample of all existing jobs, show a much higher share of fixed-term contracts in the academic sector (40%, vs. 8% in industry). Given the issues of representativity, the SES data are likely to be the most robust ones for fixed-term contracts for private-sector researchers.

Figure 40: Share of fixed-term contracts according to job portal analysis, 2016-2021



Source: Job board analysis (2021), see section 8.2.1
Notes:
- Share of fixed-term contracts among all online job board postings, in the academic (universities, public research institutions), private and other (NGO e.g.) sectors
- (2021: n=204,395)

Figure 41: Share of fixed-term contracts according to Structure of Earnings Survey, 2014

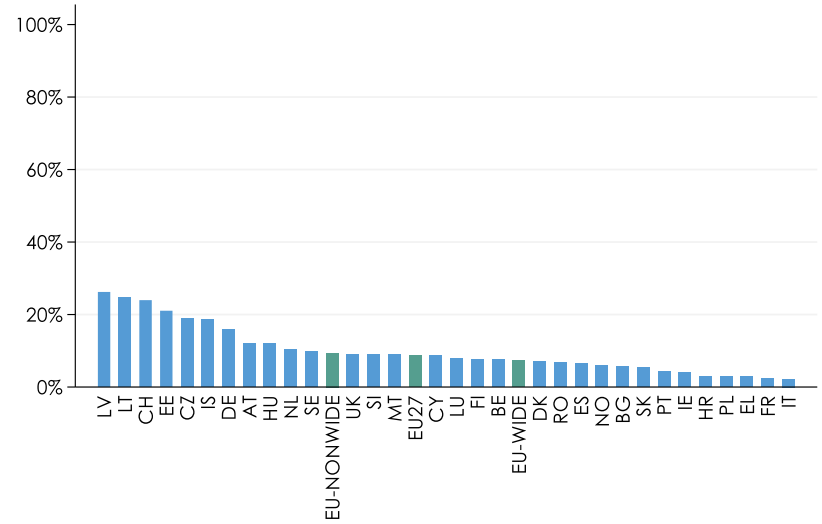


Source: SES (2014), see section 8.2.3
Notes:
- "2.1 Professionals in Science and Engineering" (ISCO-08), PhD or master's degree, for NACE rev. 2.0 sectors 85 education ("academic") and the sectors 21, 23, 24 25, 26, 27, 28, 33 ("private"). Due to data restrictions we added the sectors 21, 23, 24, 27 and 33 to "private" sectors. We used all entries that were marked as employed for 40 weeks or more in the observation period and extrapolated salaries to a 52-week employment.
- Share of fixed-term contracts among all observations in the Structure of Earnings Survey.
- (2014: n=159,896)

4.3.2. Full-time vs part-time

Part-time contracts may be involuntary or voluntary; they increase the risk of not being paid enough to make ends meet. The figure below indicates that on average in the academic sector in the EU, they are not very commonplace, with only a few countries reaching shares close to 20%. Different to fixed-term contracts, there is no pronounced pattern distinguishing non-widening from widening countries.

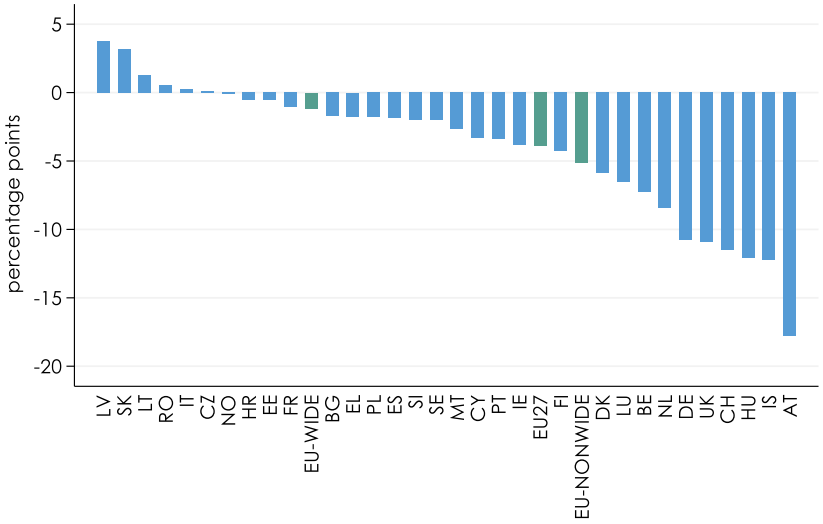
Figure 42: Share of part-time positions in the academic sector, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 29: "Type of position"
- (2019: n=9,321)

Female researchers are more likely to work part-time, although in many countries the difference is small. This may reflect also the general situation for child-care, full-day schooling availability in a country, rather than research-specific issues.

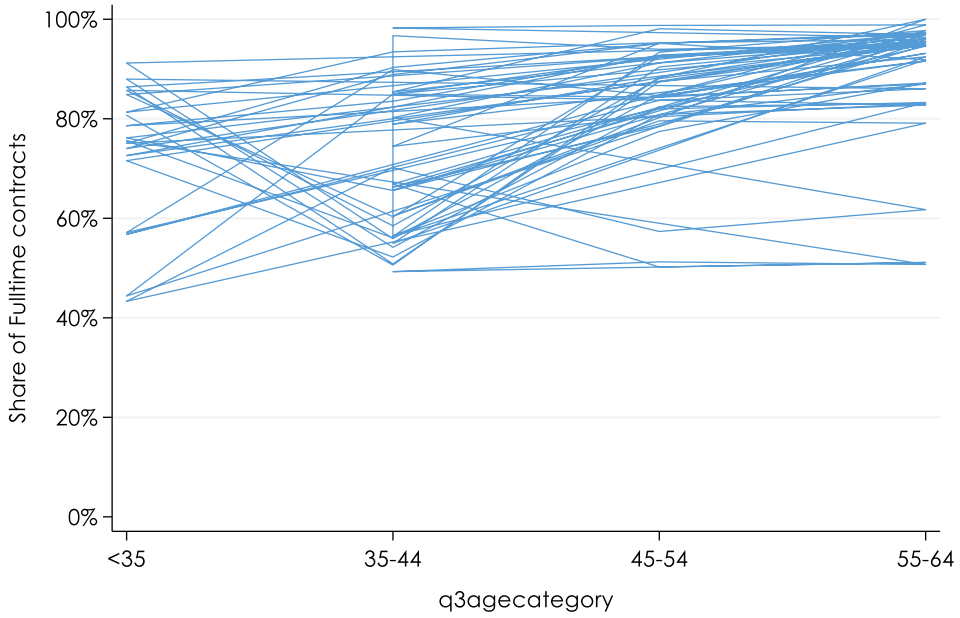
Figure 43: Difference between male and female researchers with part-time positions, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- A country with a higher share of females with part-time contracts than men has a negative value.
- Based on question 29: "Type of position"
- (2019: n=9,321)

By age group, many work full-time at higher ages, although the pattern is less pronounced than with fixed-term contracts, as researchers in higher age groups may also want to work part-time before retirement.

Figure 44: Share of fulltime contracts over age groups in the academic sector, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 29: "Type of position" and question 3 "Age"
- (2019: n=9,321)

The next table shows the share of full-time contracts in the academic sector by career stage. Austria, Germany and Estonia have a particularly low share of R1-researchers on full-time contracts, but improve later; Lithuania, the Czech Republic and Latvia show comparatively low shares of full-times contracts even in the last career stage.

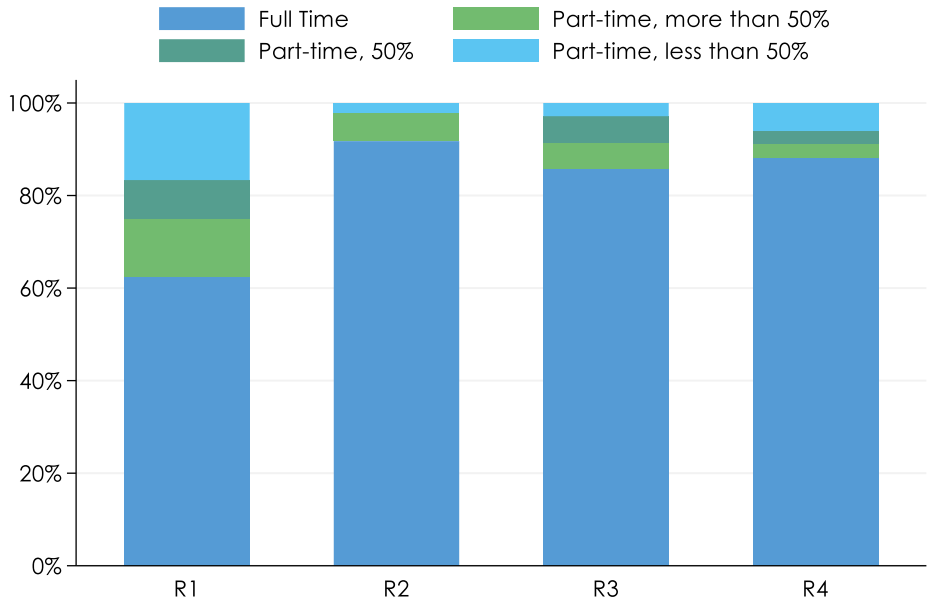
Table 11: Share of full-time contracts by career stage, academic sector, 2019

Country	R1	R2	R3	R4
AT	46	85	94	99
BE	92	93	90	95
BG*	77	92	97	96
CH	65	64	82	90
CY*	72	90	91	95
CZ	63	79	84	83
DE	48	79	95	98
DK	91	98	95	89
EE*	50	75	80	93
EL*	90	87	99	97
ES	87	81	95	96
FI*	62	96	96	95
FR	93	97	98	99
HR*	94	83	99	99
HU*	69	81	92	93
IE*	95	91	97	97
IS*	72	82	74	94
IT*	95	94	99	97
LT	62	77	78	77
LU*	87	85	98	100
LV*	58	68	74	81
MT*	70	95	91	95
NL	84	78	89	99
NO	87	98	96	94
PL*	75	100	99	95
PT*	90	96	96	96
RO*	66	93	97	92
SE	82	92	92	90
SI	92	84	93	93
SK	86	99	94	96
UK*	69	71	96	90
EU27	70	87	95	96
EU-NONWIDE	69	85	95	97
EU-WIDE	77	93	95	93

Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 29: "Type of position"
- *=variables with more and with less than 30 observations
- (2019: n=9,321)

In the private sector, the picture is similar in that only at the R1 stage there is a higher share of part-time contracts, whereas later they are a small share of the total respondents to this survey.

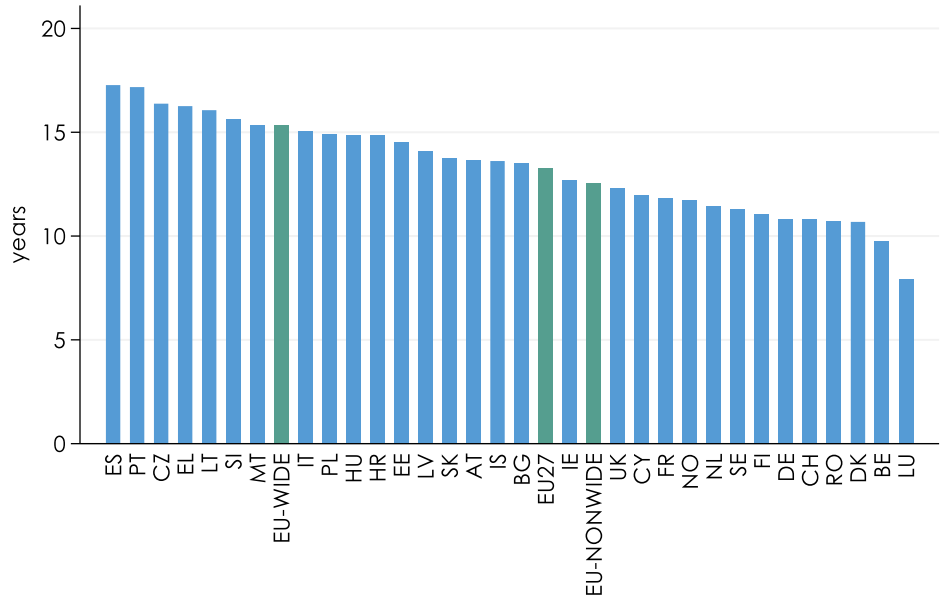
Figure 45: Share of position in private sector firm by career stage, 2021



Source: Researcher survey (2021)
Notes:
- Based on question A10: "Is your current position full-time or part-time?" and question A8.2: "In which career stage would you currently situate yourself?"
- (2021: n=34-97)

Finally, we show as the last aspect of the temporal dimension the average duration of the current employment in the academic sector. Researchers in widening countries have been spending on average more time in their current position than researchers in non-widening countries, again pointing to differences in the dynamics of the labour market, related to different in- and outflows in the labour market of researchers, due to different career structures, but also due to higher funding, more people competing for jobs in the non-widening countries.

Figure 46: Average duration of current employment per country in the academic sector, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 26: "Employed since"
- (2019: n=9,321)

The annex (section 9.3.2) contains information on part-time contracts from the job boards and the SES.

4.4. Organisational Dimension

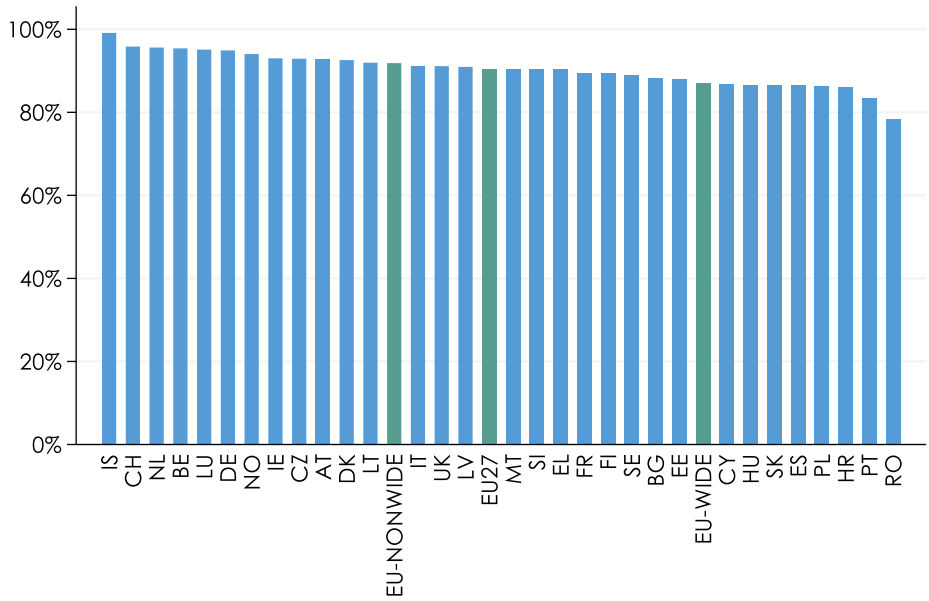
In this subsection, we present data on aspects of employment contracts linked to their organisational context, such as research autonomy, the balance between time for teaching and time for research, work intensity as well as research funding and assessment.

- Research autonomy

Researchers in most EU countries are quite happy with their autonomy (Figure 47). Researchers from widening countries are somewhat less satisfied with their autonomy, although the differences are not as large as with fixed-term contracts. By career stage (Table 12), there are interestingly no strong differences across career stages overall. The change from R1 (or PhD-studies) to R2 (which can include a post-doc stage) is also not negative across the board, only in Spain, Slovakia, Romania and Croatia is there a drop to levels of below 75%. The post-doc stage may come with a loss of autonomy, as researchers contribute to the research projects of principal investigators without setting their own research agenda. However, the MORE-surveys usually find that a lack of research autonomy is among the top 3 reasons for international mobility; even though research autonomy on average is hence not perceived as being low, it significantly affects motives for international mobility and could hence indirectly impact on precarious careers in the

case of asymmetric mobility towards research-intensive countries, where many junior researchers compete for a limited number of permanent contracts in academia.

Figure 47: Shares of researchers satisfied with research autonomy in the academic sector, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=9,146)

Table 12: Satisfaction with research autonomy by career stage, 2019

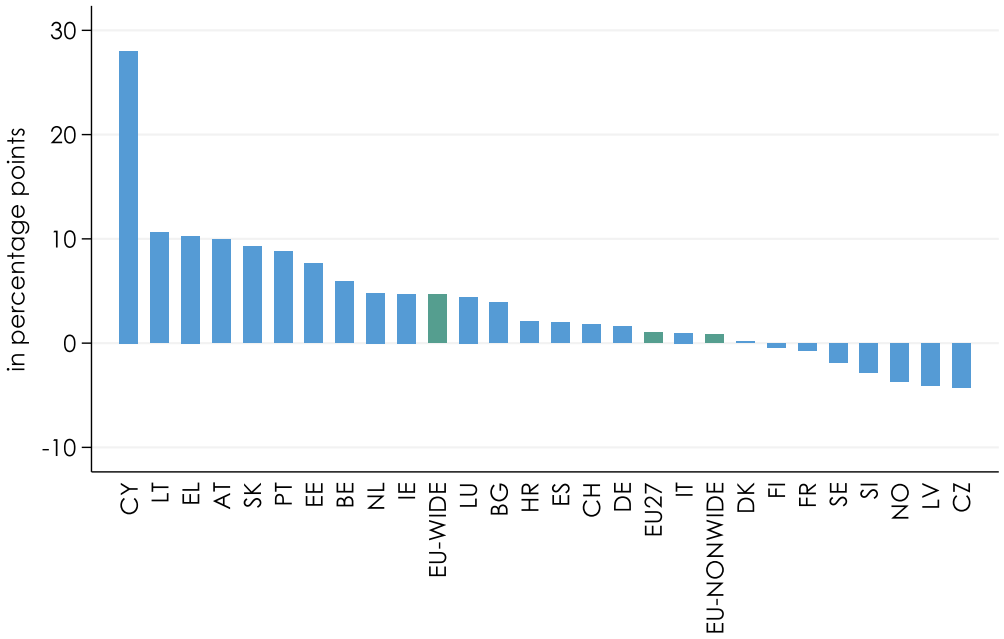
Country	R1	R2	R3	R4
AT	88	85	94	97
BE	96	94	92	100
BG*	91	87	89	88
CH	100	93	95	96
CY*	53	74	88	94
CZ*	92	95	91	95
DE	91	98	93	98
DK	92	91	92	94
EE*	90	90	88	87
EL*	90	95	91	90
ES	87	75	85	92
FI*	83	88	85	96
FR	95	89	85	94
HR*	87	73	87	89
HU*	73	94	85	96
IE*	85	91	93	97
IS*	100	91	99	100
IT*	100	86	91	91
LT	94	92	88	96
LU*	97	87	98	100
LV*	88	85	91	95
MT*	88	88	89	94
NL	92	96	95	98
NO*	96	95	93	94
PL*	80	83	84	94
PT*	82	83	81	92
RO*	80	63	83	84
SE	86	90	88	92
SI*	94	93	91	87
SK	90	79	87	93
UK*	100	90	87	98
EU27	90	90	88	94
EU-NONWIDE	91	93	89	95
EU-WIDE	85	84	85	92

Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- *=variables with more and with less than 30 observations
- (2019: n=9,321)

On average, more researchers on permanent contracts declare to be satisfied with their research autonomy, although the differences are not large in most countries.

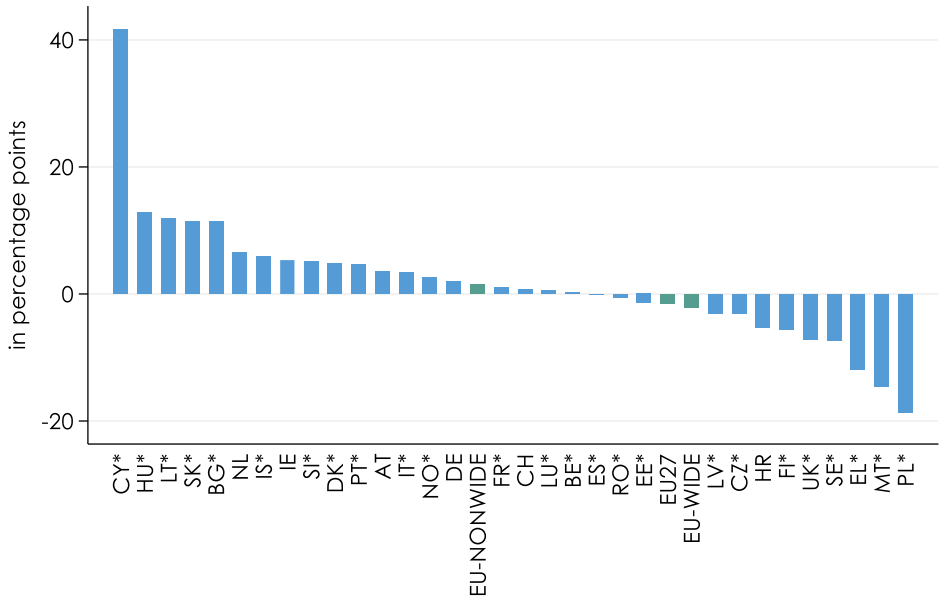
Figure 49 shows the responses to the same question, but only for the early stage researchers (R1 and R2). Here, differences are even less pronounced with the exception of Cyprus. In several countries, early stage researchers on fixed-term contracts are even more satisfied with their research autonomy. This could be linked to their grant funding (through the grant, their research agenda is specified, rather than being dependent on the agreement of hierarchical superiors in the case of university-internal funds), but the number of responses is too small to further divide this group.

Figure 48: Difference in satisfaction with research autonomy between permanent and fixed term contacts, 2019.



Source: MORE4 EU HE survey (2019)
Notes:
- Negative values indicate higher levels of satisfaction with research autonomy perceived by researchers on fixed-term contacts.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=9,321)

Figure 49: Difference in satisfaction with research autonomy between permanent and fixed term contacts, R1 and R2 researchers only, 2019.



Source: MORE4 EU HE survey (2019)
Notes:
- Negative values indicate higher levels of satisfaction with research autonomy perceived by R1 and R2 researchers on fixed-term contacts.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=2,271)

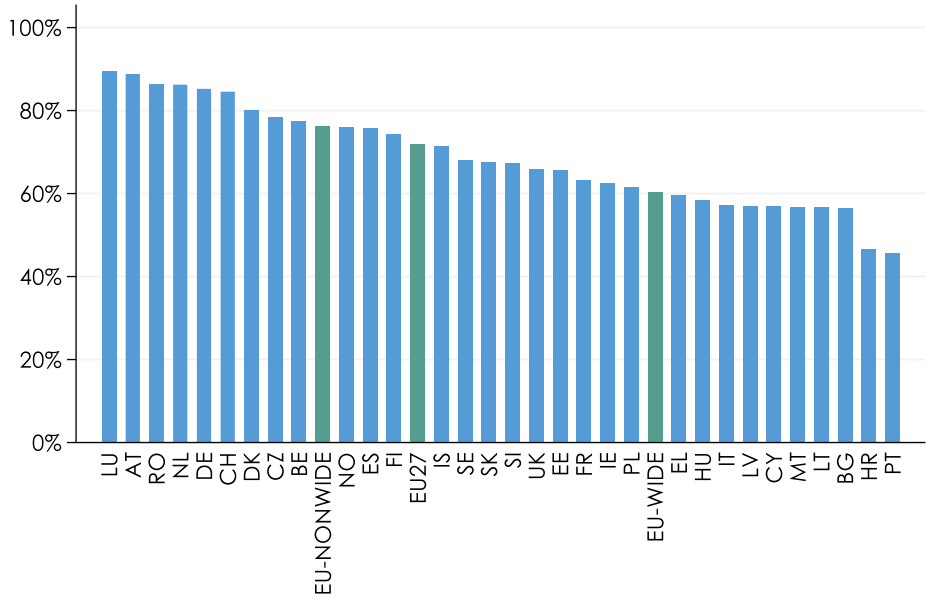
- Time for teaching vs. time for research

With respect to the satisfaction with the balance between time for teaching and time for research, there is a clear pattern of researchers from widening countries being considerably less satisfied than researchers from non-widening countries in particular in the career stages R1-R3 (

Table 13). Satisfaction generally decreases across career stages in non-widening countries, but increases in widening countries (see table below). This points to different task sharing over time between early and later stage researchers across EU countries, which would need more analysis on the teaching duties by career stage. Too much time for teaching is not necessarily something which leads to a precarious career as defined in section 2 (methodology).[22] However, it may bear on precarity in academic careers through two channels: by leading to asymmetric mobility and concentration of researchers in research-intensive countries, where the labour market of researchers hence becomes a "buyers' market"; and by making it more difficult to reach publication output benchmarks which are linked to salary bonuses. E.g., in Hungary such a system has recently been introduced according to an interview within the framework of the sister project on brain drain. Time for teaching vs. time for research does however not figure among the top motives for international mobility in the EU.

Researchers on fixed-term contracts (Figure 51) are on average in the EU more satisfied with the balance between teaching and research (not in the widening countries, however, but the difference is small). They are more likely to be grant-funded, with little teaching obligations.

Figure 50: Share of researchers satisfied with the balance between teaching and research, 2019

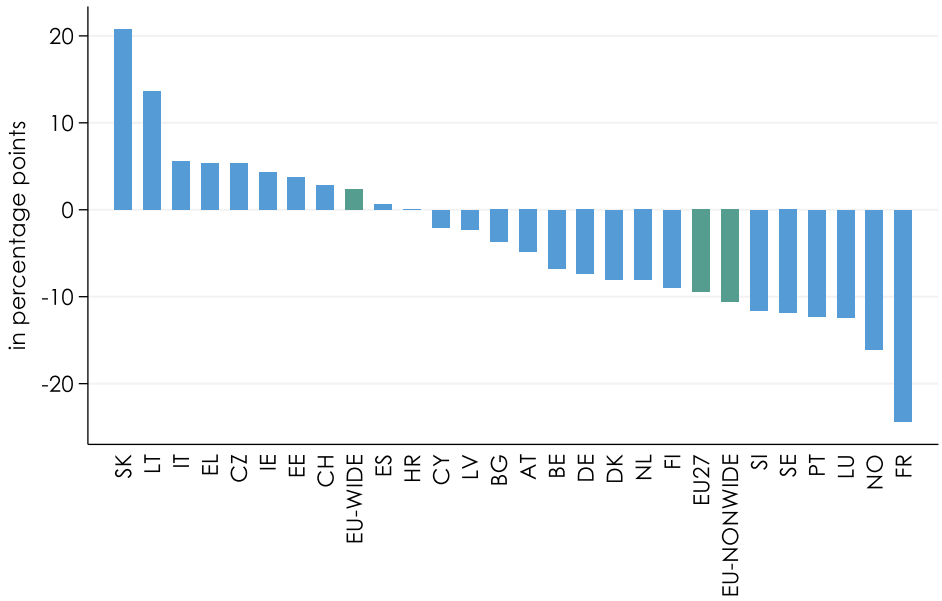


Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"

[22] Some teaching is not disliked by academics per se, on the contrary; but when it becomes too much and time for research is too low, dissatisfaction rises. There seems to be a threshold value for the time of teaching. Previous work by Janger and Nowotny (2016, https://doi.org/10.1016/j.respol.2016.05.001, using MORE2 data, estimate that from a share of teaching in total time for teaching and research of about 27% or approx. 10h, dissatisfaction increases.

- (2019: n=9,321)

Figure 51: Satisfaction with the balance between teaching and research, difference between researchers on open-ended and researchers on fixed-term contracts, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=9,321)

Table 13: Satisfaction with balance between time for teaching and time for research by career stage, 2019

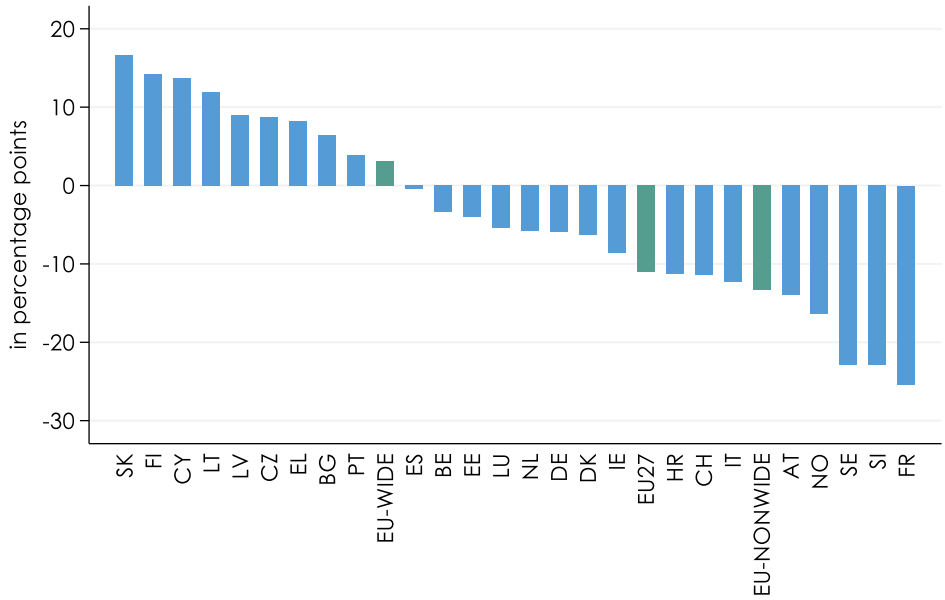
Country	R1	R2	R3	R4
AT	97	84	90	87
BE	87	80	72	74
BG*	76	67	51	57
CH	90	91	87	70
CY*	52	67	53	61
CZ*	69	77	75	88
DE	89	94	81	81
DK	92	84	70	87
EE*	70	69	58	77
EL*	54	57	55	64
ES	80	56	82	70
FI*	67	75	73	77
FR	71	91	54	62
HR*	45	30	44	57
HU*	51	78	45	85
IE*	39	69	57	77
IS*	70	72	73	70
IT*	71	58	55	61
LT	42	64	47	72
LU*	100	92	90	73
LV*	52	71	53	58
MT*	68	56	49	69
NL	92	88	81	90
NO*	89	54	75	76
PL*	100	51	57	71
PT*	51	58	37	56
RO*	64	89	84	89
SE	73	74	60	76
SI	67	84	56	70
SK*	81	53	65	83
UK*	62	89	57	77
EU27	81	79	66	73
EU-NONWIDE	84	86	71	74
EU-WIDE	65	61	54	70

Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- *=variables with more and with less than 30 observations
- (2019: n=9,321)

- Research funding

Research funding data was already presented in section 4.1.1. Here, we provide additional information on differences in satisfaction with research funding between researchers on permanent and on fixed-term contracts. Interestingly, in non-widening countries, satisfaction with funding is higher on average for researchers on fixed-term contracts, in the widening countries it is the other way round. This may be linked to fixed-term researchers in non-widening countries often being grant-funded, so that even though they lack career perspectives, their research is funded at least for the duration of their contract.

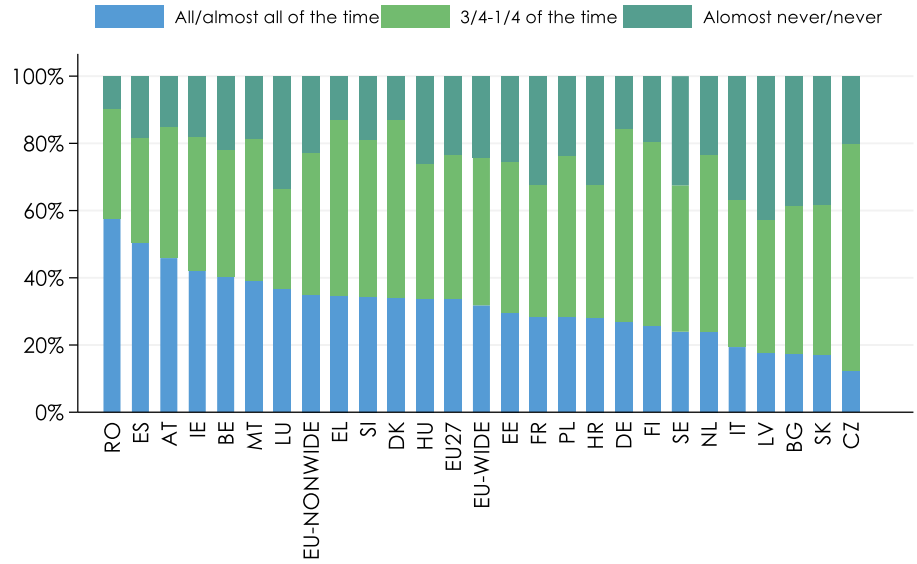
Figure 52: Difference in satisfaction with research funding between permanent and fixed term contacts, 2019.



Source: MORE4 EU HE survey (2019)
Notes:
- Negative values indicate higher levels of satisfaction with research funding as perceived by researchers on fixed-term contacts.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=9,321)

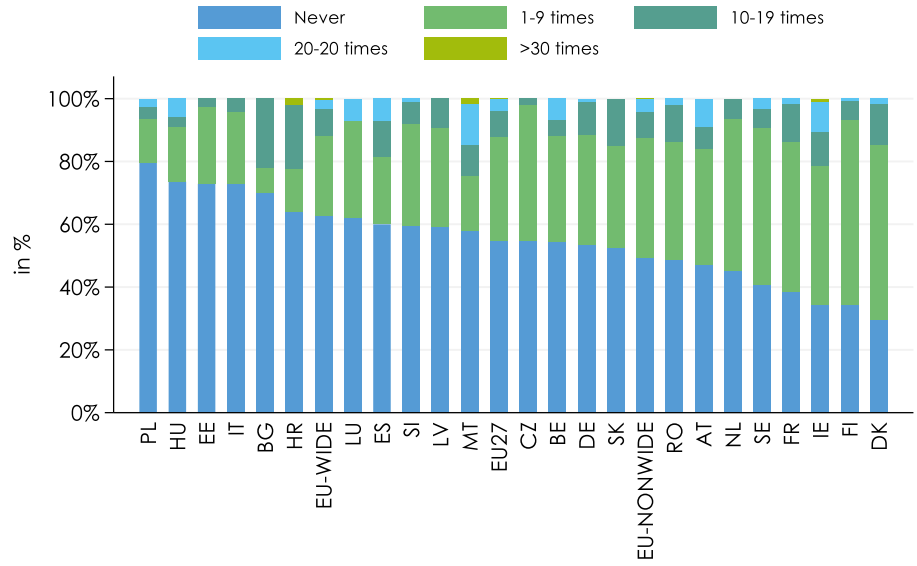
The next figure shows the share of respondents to the European Working Conditions Survey who indicate working to tight deadlines almost all of the time, some of the time (1/4-3/4 of the time) and almost never. Note that the data are not specific for researchers, but refer to Science and Engineering Professionals. The data are from 2015, as the latest wave of results from the EWCS is delayed due to the COVID-19-pandemic. On average, respondents from non-widening countries report more often to work to tight deadlines almost all of the time, but there are exceptions at the high (Romania, Spain, Ireland) and at the lower end (Netherlands, Sweden,…). The figure below presents data from the same survey on the share of work days with more than 10 hours. Here, the relationship is opposite, with widening countries reporting a higher share of long work days. This may be due to different regulations on working time, with non-widening countries having work weeks with fewer hours (and hence possibly also a higher share of tight deadlines).

Figure 53: Share of respondents working to tight deadlines, 2015



Source: European Working Conditions Survey, 2015.
Notes:
- Only Science and engineering (associate) professionals (ISCO-08: 21, 31)
- Based on question 49: "Does your job involve – working to tight deadlines?"

Figure 54: Share of workdays with more than 10 hours, 2015



Source: European Working Conditions Survey
Notes:
- Only Science and engineering (associate) professionals (ISCO-08: 21, 31)
- Based on question 37: "Normally, how many times a month do you work more than 10 hours a day?"

The following table presents results from the researcher survey undertaken for this project, namely shares of dissatisfied researchers, by organisational aspect of their position/employment contract. The columns are ranked according to the EU average. The data are mostly consistent with the data presented above: research funding tops the list of dissatisfaction, with researchers in widening countries more dissatisfied. Work intensity and research autonomy also show similar patterns as above. Satisfaction with research assessment is a new item, that has not been asked before in the MORE surveys. It figures in second place behind research funding, on average about a third of researchers are dissatisfied with the assessment of their research. This may impact on precarity, if researchers' positions depend on their research performance and assessment of this performance is in some way flawed.

Table 14: Perception of dissatisfaction with various organisation related factors, academic and private sector researchers, 2021

Country	Research funding	Research assessment	Work intensity	Time for research	Other research conditions	Research autonomy
AT*	31	27	22	23	16	10
BE	28	23	25	22	13	10
BG**	56	13	24	18	12	0
CY**	75	50	50	25	25	25
CZ	27	24	24	21	17	14
DE	21	25	28	20	17	13
DK**	45	27	27	38	29	29
EE**	47	35	12	25	12	18
EL	67	32	25	23	25	23
ES	56	43	48	42	35	26
FI**	25	25	22	11	11	0
FR	42	26	21	34	19	16
HR**	50	50	19	40	40	23
HU**	50	11	0	0	22	0
IE**	38	23	30	37	42	24
IT	52	37	31	32	32	18
LT**	45	45	36	45	55	0
LU**	33	83	0	17	17	17
LV**	60	20	40	20	20	0
MT**	25	25	25	25	33	25
NL	32	34	39	42	26	14
PL	59	36	26	31	35	12
PT	67	47	30	31	32	17
RO	67	35	33	33	40	14
SE	29	31	31	26	23	9
SI**	62	64	50	60	50	27
SK	57	30	18	32	26	4
EU27	42	32	29	29	25	15
EU-NONWIDE	35	30	31	28	23	16
EU-WIDE	58	36	25	30	30	13

Source: Researcher survey (2021)
Notes:
- Sum of shares of researchers declaring to be very dissatisfied or dissatisfied
- Based on question B1: "Please indicate your satisfaction with each factor as it relates to your current position/employment"
- *=variables with more and with less than 30 observations; **=all variables have less than 30 observations
- (2021: n=3-1,403)

4.5. Economic Dimension

The economic dimension of employment contracts is crucial for the question of precarious careers of researchers. In this section, we present information from various sources, first on net salary levels and perception of salaries (by researchers and employers); then, second, we show salary progression mechanisms and satisfaction with them, as well as additional income sources; third, we present evidence on the perception of pensions, social security benefits and job security; fourth, on fringe benefits. The following table provides an overview based on the researcher survey undertaken within this project. Columns are ranked by the EU27 average. Overall, with the exception of job security, researchers from widening countries are more dissatisfied than their counterparts from non-widening countries with economic aspects of their employment contracts. Differences are highest for pensions (public pension plan and private pension), at about 20 percentage points on average; they are lowest for fringe benefits (8 pp) and are about 12-14 percentage points for most other items, including net salary levels. Countries with particularly high shares of dissatisfaction (in terms of on average higher than the average of widening countries) are Croatia, Greece, Portugal, Italy, Spain, for salary also Bulgaria and Slovakia.

Higher dissatisfaction with job security in non-widening countries shows again the higher share of fixed-term contracts in these countries, related to a higher number of junior researchers looking for permanent jobs, as well as other structural factors such as career structures (see above for a discussion).

Table 15: Dissatisfaction with economic aspects of employment contracts, 2021

Country	Other fringe benefits	Salary progression	Additional private pension	Additional private health insurance	Job security	Pension plan	Net salary	Social security
AT*	25	19	24	30	26	26	6	6
BE	43	33	25	27	33	26	21	13
BG**	11	24	29	33	6	59	39	41
CY**	33	33	50	50	0	33	25	25
CZ*	48	47	71	40	42	39	35	6
DE	32	31	27	25	50	21	15	11
DK**	55	27	17	40	33	7	13	13
EE**	44	35	57	67	41	24	24	18
EL*	73	47	75	56	38	48	45	23
ES	69	52	67	54	51	45	37	15
FI**	17	22	0	0	44	0	11	0
FR	44	41	29	21	25	18	36	6
HR**	71	59	86	67	27	73	45	41
HU**	14	50	0	0	0	56	20	20
IE**	56	32	29	65	31	30	8	46
IT	63	52	57	56	45	54	38	41
LT**	25	60	20	20	44	55	36	18
LU**	20	20	33	33	33	20	17	0
LV**	33	20	25	50	40	40	0	20
MT**	33	25	100	33	25	0	25	0
NL*	38	45	28	62	37	22	16	16
PL	47	43	48	48	19	47	28	33
PT	76	70	79	61	66	51	43	33
RO*	72	30	48	68	24	57	27	55
SE*	23	32	24	36	39	15	14	6
SI**	29	21	38	29	57	50	14	36
SK	60	57	50	51	22	58	44	28
EU27	47	42	41	41	40	36	27	21
EU-NONWIDE	44	38	35	37	43	29	23	16
EU-WIDE	56	50	55	51	35	51	36	30

Source: Researcher survey (2021)
Notes:
- Sum of shares of researchers declaring to be very dissatisfied or dissatisfied.
- Based on question B1: "Please indicate your satisfaction with each factor as it relates to your current position/employment"
- *=variables with more and with less than 30 observations; **=all variables have less than 30 observations
- (2021: n=1-1,454)

4.5.1. Salary levels and satisfaction with pay

We first present graphs on the distribution of yearly net salaries (for full-time positions) across the various countries. The following figure presents salary according to four different sources for both academic and private sectors and across all career stages. The sources

are the structure of earnings survey (SES), online job boards (mainly from the Euraxess job board), the researcher survey undertaken within this project and information from national experts from this project, who also reported any pay scales relevant for researchers (we show data below that indicate that salaries in particular for a majority of researchers in the academic sectors are based on pay scales). Methodological details for the various sources can be found in the annex (section 9.2). Note that SES data are only a proxy for researchers (science and engineering professionals with Master or PhD, in the higher education and manufacturing sectors).

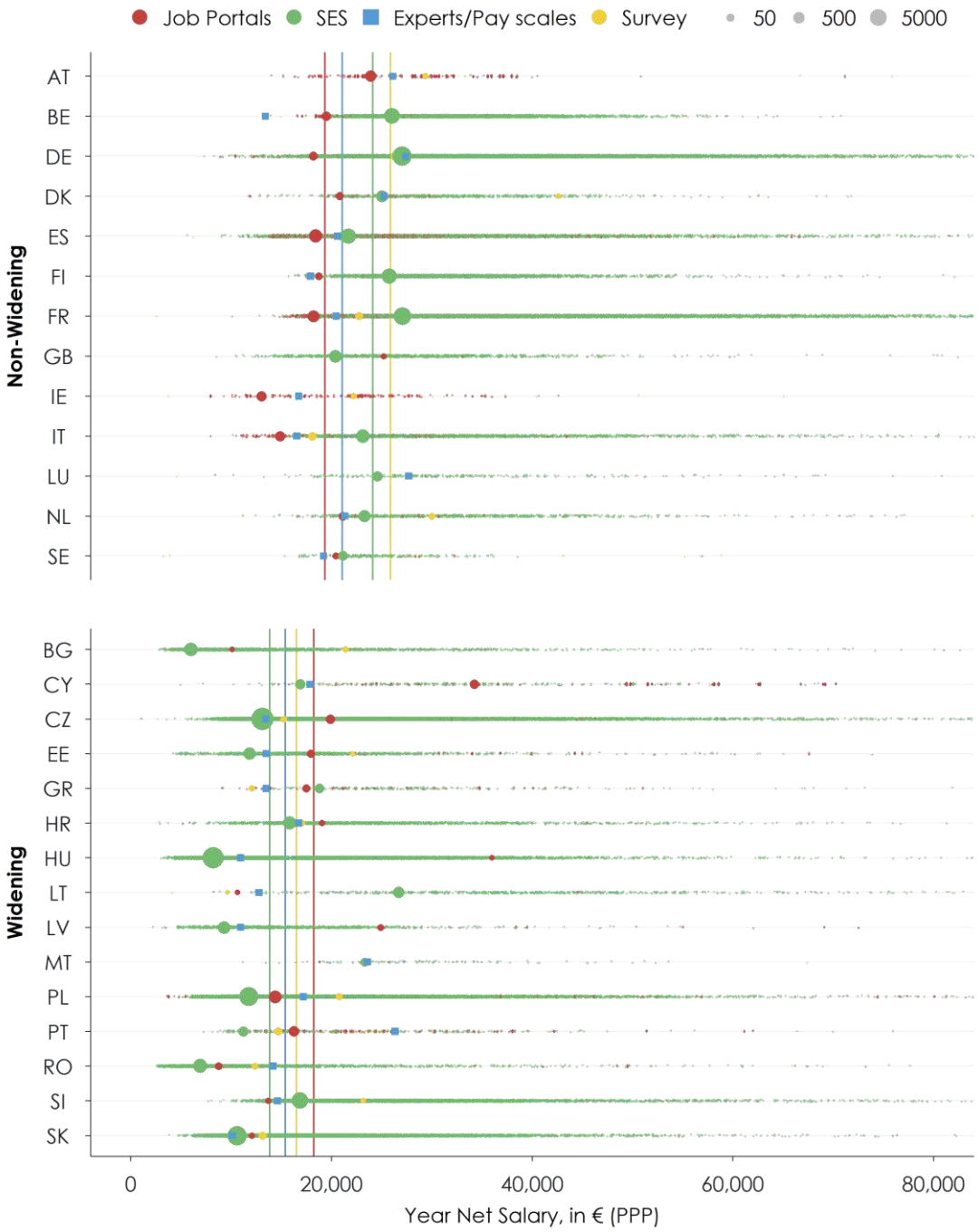
We choose to mark the first quintile with the symbols for the various sources, meaning that we show the point in the data at which 20% of the observations lie below the marker. We choose this threshold for presentation because of the interest in precarious careers in research – we are interested in the lower end of salaries, less in the upper end. To enable international comparison, we use power purchasing parities. The figure illustrates the large spread of salaries, but points to lower salaries on average in the widening countries relative to the non-widening countries, consistent with the evidence above. In

, we present the data on an index basis (EU = 100). On average, non-widening countries are at 124 and widening countries at 82 (difference of 42 index points). Interestingly, differences in the private sector are higher than in the academic sector (25 index points for later academic career stages R3 & 4, 36 for early academic career stages R1 & R2; 46 and 43 for the respective career stages in the private sector). Over time (4 years, 2014 vs. 2018) there is a slight convergence effect of 2 index points, which if trends continue, would mean that salary levels still have some way to go before they converge on average between non- and widening countries.
Conversion into PPS does however compress the differences considerably; because researchers may not always consider cost of living differences when comparing salaries between different countries, we present in the figure below the next one also the net salaries without adjustment for PPS, where differences between widening and non-widening countries are much larger.

It is interesting to note that the data from the online job portals (Euraxess) show smaller differences between countries (i.e. job portal salaries in non-widening countries are below the SES data, whereas it is the other way round in widening countries, on average). This may be due to selective use of job portals by research organisations which are aware of the international audience of online job portals adverts – e.g., research organisations from widening countries may post more selectively higher paid jobs, because they know about the international differences, whereas eg. in the Netherlands, it seems that a large share of all PhD- and post-doc positions is advertised on Euraxess. Job adverts e.g. from Poland explicitly mentioned competitive salaries when considering differences in cost of living.

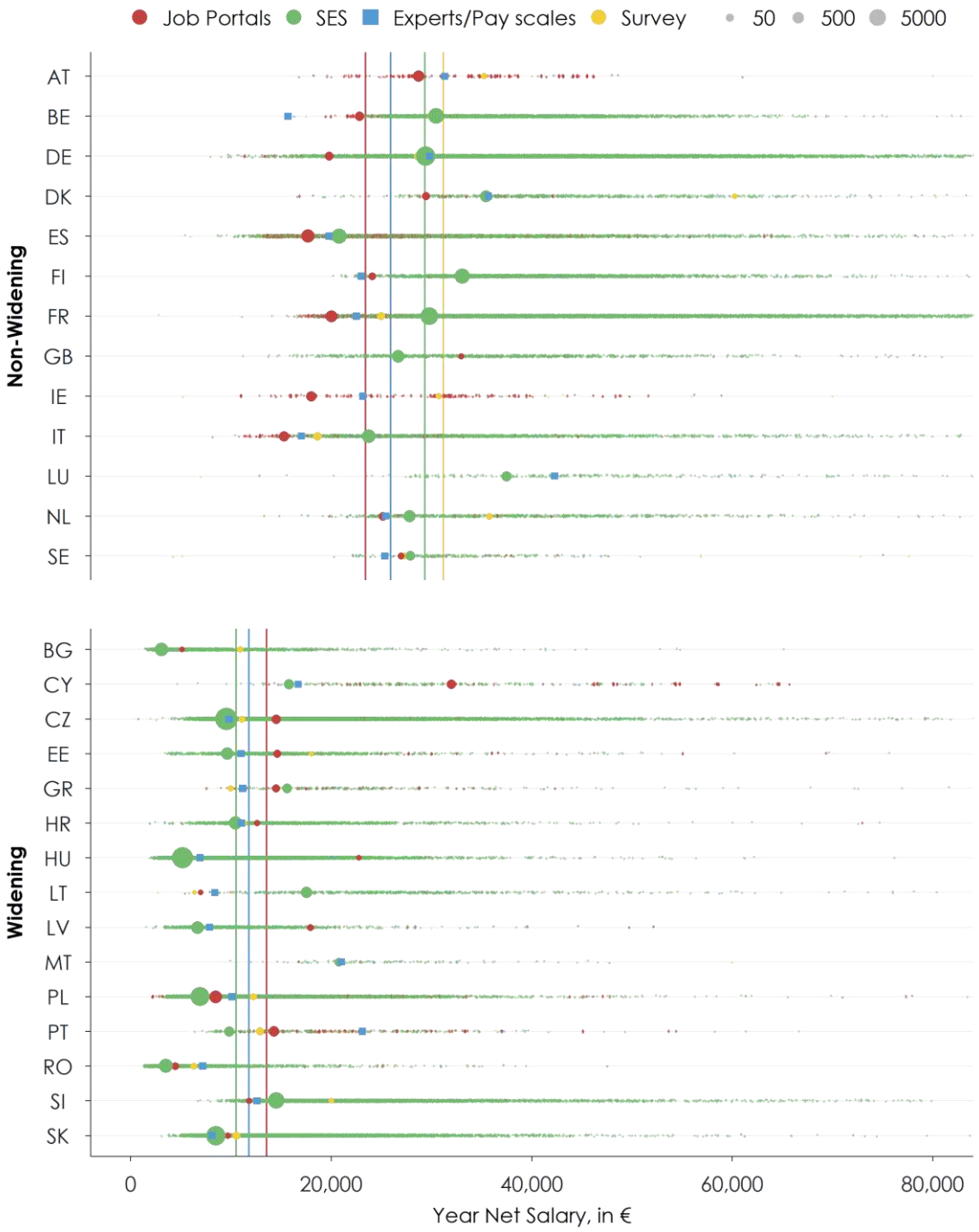
Early stage researchers (R1&R2) in the academic sector are probably most vulnerable to precarious working conditions (see section 3). We hence show the data specifically for this group of researchers in Source: Structure of Earnings Survey (data from 2014; data from 2018 shown below; details see section 9.2.3); online job boards (pooled data 2016-2021; details see section 9.2.1); researcher survey undertaken within this project (2021; details see section 9.2.2); information on salaries and pay scales per career stage and academic vs. private sector provided by national experts (see list in section 9.4)
Notes:
- Conversion into net salaries at PPS: see section 9.2.5. Circle size refers to the number of observations used. Only values from national experts/pay scales use a square symbol, as they refer to one number rather than an average of various observations.
- Straight lines refer to the simple means of widening vs. non-widening countries, for the various data sources.
Figure 57. The overall pattern remains similar though, with more compressed data following from a lower number of observations.

Figure 55: Net yearly salary levels at PPS, marker at first quintile, across academic and private sector and all career stages, according to various sources, 2014-2021



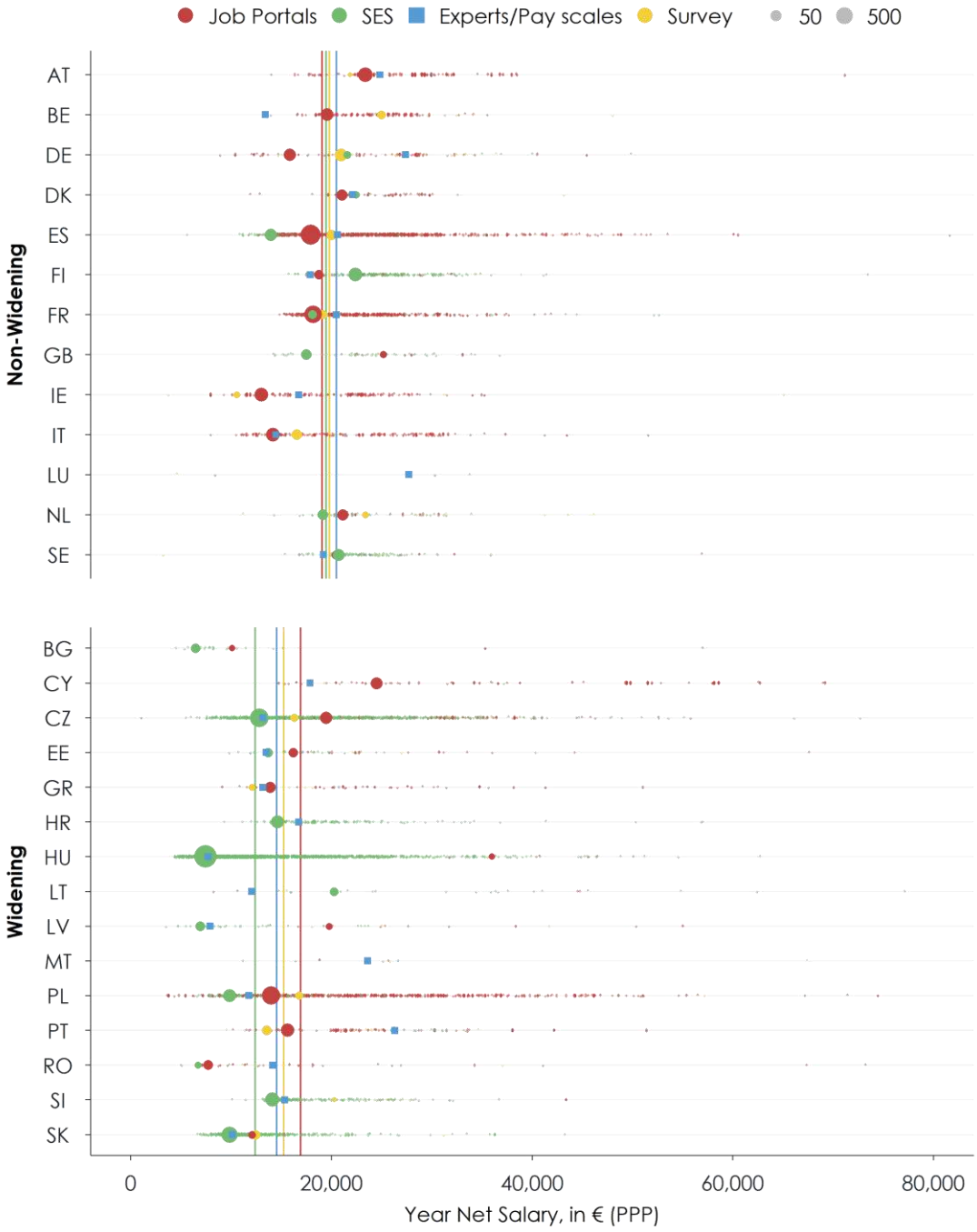
Source: Structure of Earnings Survey (data from 2014; data from 2018 shown below; details see section 9.2.3); online job boards (pooled data 2016-2021; details see section 9.2.1); researcher survey undertaken within this project (2021; details see section 9.2.2); information on salaries and pay scales per career stage and academic vs. private sector provided by national experts (see list in section 9.4)
Notes:
- Conversion into net salaries at PPS: see section 9.2.5. Circle size refers to the number of observations used. Only values from national experts/pay scales use a square symbol, as they refer to one number rather than an average of various observations.
- Straight lines refer to the simple means of widening vs. non-widening countries, for the various data sources.

Figure 56: Net yearly salary levels in Euro, not corrected for PPS, marker at first quintile, across academic and private sector and all career stages, according to various sources, 2014-2021



Source: Structure of Earnings Survey (data from 2014; data from 2018 shown below; details see section 9.2.3); online job boards (pooled data 2016-2021; details see section 9.2.1); researcher survey undertaken within this project (2021; details see section 9.2.2); information on salaries and pay scales per career stage and academic vs. private sector provided by national experts (see list in section 9.4)
Notes:
- Conversion into net salaries at PPS: see section 9.2.5. Circle size refers to the number of observations used. Only values from national experts/pay scales use a square symbol, as they refer to one number rather than an average of various observations.
- Straight lines refer to the simple means of widening vs. non-widening countries, for the various data sources.

Figure 57: Net yearly salary levels in Euro, at PPS, academic institutions, career stages R1& R2, marker at first quintile, according to various sources, 2014-2021



Source: Structure of Earnings Survey (data from 2014; data from 2018 shown below; details see section 9.2.3); online job boards (pooled data 2016-2021; details see section 9.2.1); researcher survey undertaken within this project (2021; details see section 9.2.2); information on salaries and pay scales per career stage and academic vs. private sector provided by national experts (see list in section 9.4)
Notes:
- Conversion into net salaries at PPS: see section 9.2.5. Circle size refers to the number of observations used. Only values from national experts/pay scales use a square symbol, as they refer to one number rather than an average of various observations.
- Straight lines refer to the simple means of widening vs. non-widening countries, for the various data sources.

The following table shows a weighted mean of the first quintile over the various sources (details see footnote to the table) for five different population sub-groups:

- All researchers across all career stages
- Academic researchers, junior (R1&R2 career stages) and senior (R3&R4)
- Private-sector researchers, junior and senior as above

The usual pattern is that the academic sector pays less than the private sector, and that later career stages pay more than early career stages, as well as that researchers in non-widening countries earn more than researchers in widening countries, although there are some exceptions (see also table 17). In particular, in Estonia and in Lithuania the later stage private sector researchers earn less than their early stage counterpart; this may be due to a lower number of observations in general for the private sector, or to the chosen first quintile value. In Cyprus, the value for R3&4 academic researchers is implausibly high, linked again to the generally lower number of observations in small countries such as Malta, Cyprus, Estonia, etc.

Overall, the countries with the lowest salaries, adjusted for PPS, are Bulgaria, Hungary, Latvia, Romania and Slovakia.

Table 16: Salaries in EUR, at PPS, average at first quintile (0.2-quantile)

Country	Salary at 20th quantile	Salary at 20th quantile, R1&R2, academic sector	Salary at 20th quantile, R3&R4, academic sector	Salary at 20th quantile, R1&R2, private sector	Salary at 20th quantile, R3&R4, private sector
AT	25,065	24,105	32,969	23,838	33,862
BE	19,614	16,809	25,658	24,455	30,645
BG	6,089	7,183	9,222	6,747	7,531
HR	16,323	15,690	22,446	14,487	17,984
CY	20,551	21,175	45,209	18,205	31,117
CZ	13,328	13,335	16,583	13,909	19,050
DK	25,040	21,672	23,490	28,052	39,288
EE	12,834	14,253	24,111	13,615	13,591
FI	21,790	19,937	25,500	26,571	30,118
FR	23,436	19,356	26,472	26,847	35,245
DE	27,166	23,129	33,191	28,701	35,429
EL	15,831	13,431	21,528	19,021	22,663
HU	9,583	7,637	12,913	13,337	23,511
IE	15,109	14,839	24,507	19,589	0
IT	19,267	14,525	23,087	19,643	26,001
LV	10,221	8,680	14,194	14,755	21,511
LT	19,592	16,150	20,007	21,618	19,069
LU	26,127	27,697	33,825	24,165	29,048
MT	23,443	23,599	29,967	19,887	45,479
NL	22,288	20,905	30,220	23,639	32,523
PL	14,608	12,576	17,141	16,761	17,903
PT	20,183	21,077	28,968	14,568	0
RO	10,593	10,833	28,023	11,193	23,655
SK	10,374	10,091	12,171	11,298	12,798
SI	15,752	14,794	20,912	15,022	17,952
ES	20,654	19,173	26,415	21,217	29,577
SE	20,132	19,942	25,055	17,342	34,260
EU27	17,963	16,763	24,214	18,833	25,992
EU-NONWIDE	22,009	20,066	27,085	23,390	31,541
EU-WIDE	14,620	14,034	21,560	14,962	20,987

Source: Structure of Earnings Survey (data from 2014; details see section 9.2.3); online job boards (pooled data 2016-2021; details see section 9.2.1); researcher survey undertaken within this project (2021; details see section 9.2.2); information on salaries and pay scales per career stage and academic vs. private sector provided by national experts (see list in section 9.4)
Notes:
- Conversion into net salaries at PPS: see section 9.2.5.
- Country values (20th quantile, or first quintile in the distribution) are the result of an average of the salary information from national experts (pay scales) and the weighted mean of the three other sources (job boards, SES, researcher survey) which are weighted by the number of observations.

An important question is how salaries of researchers relate to economy-wide salaries, and how academic salaries relate to private-sector salaries. The first column in the table below

relates the mean of economy wide salaries to the mean of researcher salaries. In most countries, the figure is above 100, indicating higher salaries for researchers. This is to be expected however, as researchers are usually highly qualified with degrees and their salaries are compared with the mean across the whole economy, which includes salaries of people with lower qualifications, working e.g. in retail or tourism. Only Great Britain and Ireland show lower salaries; organisations in widening countries pay their researchers on average relatively more than those in non-widening countries.

By contrast, as stated above, academic salaries are usually lower than private-sector salaries for researchers, an exception being later stage researchers in widening countries; this could be due however to the small number of observations in the private sector in the countries of Bulgaria, Croatia, Cyprus, Estonia, Lithuania and Slovenia. Countries which pay academic researchers considerably less than private sector researchers are Denmark, Hungary and Latvia.

Table 17: Ratios of salary levels, in local currency

Country	Researchers vs. total economy	Academic to private sector (R1 and R2)	Academic to private sector (R3 and R4)
AT	113	101	97
BE	108	69	84
BG	117	106	122
CY	151	116	145
CZ	120	96	87
DE	126	81	94
DK	118	77	60
EE	120	105	177
ES	133	90	89
FI	112	75	85
FR	137	72	75
GB	97	94	97
EL	133	71	95
HR	162	108	125
HU	113	57	55
IE	91	76	.
IT	139	74	89
LT	180	75	105
LU	123	115	116
LV	143	59	66
MT	132	119	66
NL	107	88	93
PL	114	75	96
PT	170	145	.
RO	153	97	118
SE	103	115	73
SI	138	98	116
SK	116	89	95
EU27	127	89	93
EU-NONWIDE	116	86	86
EU-WIDE	138	94	103

Source: OECD for economy-wide net salaries (gross wages from tax and benefit calculator, net salaries calculated by WIFO using tax and social security levies at 100% of average salary), Structure of Earnings Survey (data from 2014; details see section 9.2.3); online job boards (pooled data 2016-2021; details see section 9.2.1); researcher survey undertaken within this project (2021; details see section 9.2.2); information on salaries and pay scales per career stage and academic vs. private sector provided by national experts (see list in section 9.4

How does the relationship between countries change over time? The salary levels presented above used data from the Structure of Earnings Survey 2014. In the following table, we show the same salary levels as indices relative to the EU27-average, which is set at 100.

Table 18: Indexed salaries EU27 = 100, in EUR, at PPS, average at first quintile (0.2-quantile)

Country	Salary at 20th quantile	Salary at 20th quantile, R1&R2, academic sector	Salary at 20th quantile, R3&R4, academic sector	Salary at 20th quantile, R1&R2, private sector	Salary at 20th quantile, R3&R4, private sector
AT	140	144	135	127	129
BE	110	100	105	131	117
BG	34	43	38	36	29
HR	91	93	92	77	68
CY	115	126	185	97	118
CZ	74	79	68	74	72
DK	140	129	96	150	149
EE	72	85	99	73	52
FI	122	119	105	142	115
FR	131	115	109	143	134
DE	152	138	136	153	135
EL	88	80	88	102	86
HU	54	45	53	71	89
IE	84	88	101	105	.
IT	108	87	95	105	99
LV	57	52	58	79	82
LT	109	96	82	115	73
LU	146	165	139	129	111
MT	131	141	123	106	173
NL	125	125	124	126	124
PL	82	75	70	90	68
PT	113	126	119	78	.
RO	59	65	115	60	90
SK	58	60	50	60	49
SI	88	88	86	80	68
ES	115	114	108	113	113
SE	112	119	103	93	130
EU27	100	100	100	100	100
EU-NONWIDE	124	120	113	126	123
EU-WIDE	82	84	88	80	80

Source: Structure of Earnings Survey (data from 2014; details see section 9.2.3); online job boards (pooled data 2016-2021; details see section 9.2.1); researcher survey undertaken within this project (2021; details see section 9.2.2); information on salaries and pay scales per career stage and academic vs. private sector provided by national experts (see list in section 9.4)
Notes:
- Conversion into net salaries at PPS: see section 9.2.5.
- Country values (20th quantile, or first quintile in the distribution) are the result of an average of the salary information from national experts (pay scales) and the weighted mean of the three other sources (job boards, SES, researcher survey) which are weighted by the number of observations. Table 19 below shows the differences between the salary levels using SES 2018 and SES 2014 based on indices, with the EU at 100 (and hence 0 in

differences).[23] On average, non-widening countries lose a little bit relative to the EU average, whereas widening countries gain a little bit. This is consistent with a slow convergence process, with economies showing lower GDP per capita levels catching slowly up to economies with higher GDP per capita levels. For some individual countries, the process of catching up can also be faster, e.g. for Bulgaria, Hungary and Romania, although there are also non-widening countries such as Denmark which increased their salaries relative to the EU level. As a general takeaway however, differences between salary levels of EU countries are not going to disappear quickly.

Table 19: Index differences in salaries using 2014 versus 2018 SES data, in EUR, at PPS, average at first quintile (0.2-quantile)

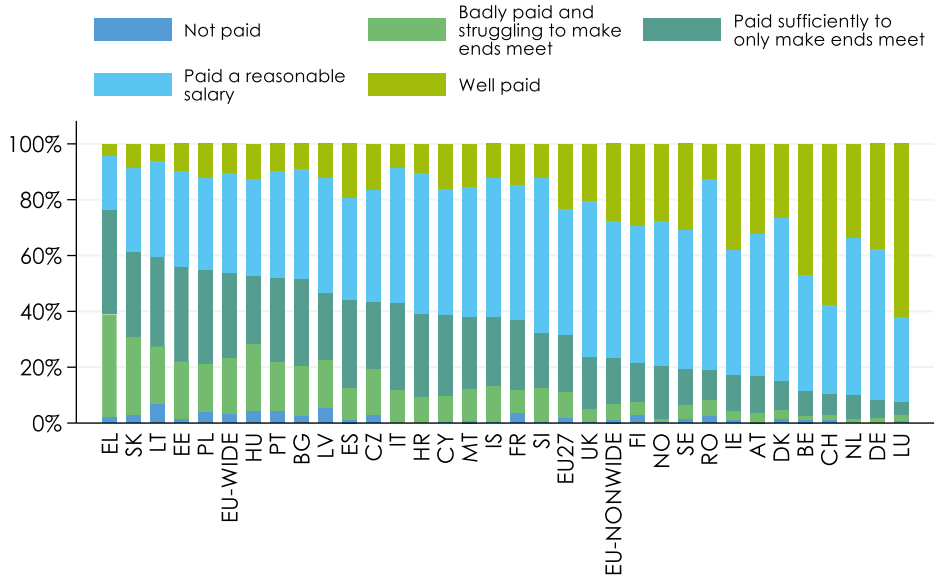
Country	Salary at 20th quantile	Salary at 20th quantile, R1&R2, academic sector	Salary at 20th quantile, R3&R4, academic sector	Salary at 20th quantile, R1&R2, private sector	Salary at 20th quantile, R3&R4, private sector
AT	-4	0	-4	-8	-4
BE	4	3	7	10	1
BG	12	7	4	11	9
HR	0	2	-1	13	3
CY	-9	0	-6	-4	-4
CZ	8	5	2	5	6
DK	8	11	14	0	-6
EE	5	4	-5	14	10
FI	-5	-10	-5	-7	-1
FR	0	0	-2	-5	-5
DE	1	-4	9	-5	-1
EL	0	-1	2	-1	-7
HU	11	4	-1	12	6
IE	-2	1	-3	-6	.
IT	-4	0	-5	-10	1
LV	5	6	3	2	6
LT	-45	-32	-28	-48	-11
LU	-6	0	-4	-12	-15
MT	-9	0	13	-6	-5
NL	0	3	9	6	15
PL	4	1	0	2	3
PT	0	-1	-1	7	.
RO	12	4	-1	7	7
SK	5	5	2	7	7
SI	2	2	5	0	1
ES	-2	0	-2	-5	2
SE	1	2	0	-6	-4
EU27	0	0	0	0	0
EU-NONWIDE	-1	1	1	-4	-2
EU-WIDE	1	2	2	2	4

[23] The salary levels in Euro using SES 2018 are in the annex; for most countries, changes are small.

Source: Structure of Earnings Survey (data from 2014 and 2018; details see section 9.2.3); online job boards (pooled data 2016-2021; details see section 9.2.1); researcher survey undertaken within this project (2021; details see section 9.2.2); information on salaries and pay scales per career stage and academic vs. private sector provided by national experts (see list in section 9.4)
Notes:
- A positive value indicates catching up to the EU average, or faster salary growth than on average in the EU.
- Conversion into net salaries at PPS: see section 9.2.5.
- Country values (20th quantile, or first quintile in the distribution) are the result of an average of the salary information from national experts (pay scales) and the weighted mean of the three other sources (job boards, SES, researcher survey) which are weighted by the number of observations.
- EU averages without Lithuania as there are implausibly high reductions from 2014 to 2018.

How do these numbers compare with the perception of salaries by researchers in the academic sector? Based on MORE4 data, the pattern is very similar – on average (54%), researchers from widening countries are much more likely to report that they are either not paid at all, badly paid and struggling to make ends meet, or paid sufficiently to only make ends meet, than researchers from non-widening countries, where only 23% perceive remuneration to not be reasonable or even good. By comparison with the real salary data presented above, the only country which is much more negative is Greece. This may be due to the protracted severe economic crisis in Greece, which led e.g. to the cut of the 13th and 14th salary in the public sector in Greece (whereas the private sector continues to receive 14 salaries). The perception in Greece may hence be dominated by the time trend of remuneration, rather than current levels (which are not high, but not at the bottom as could be expected from the figure below).

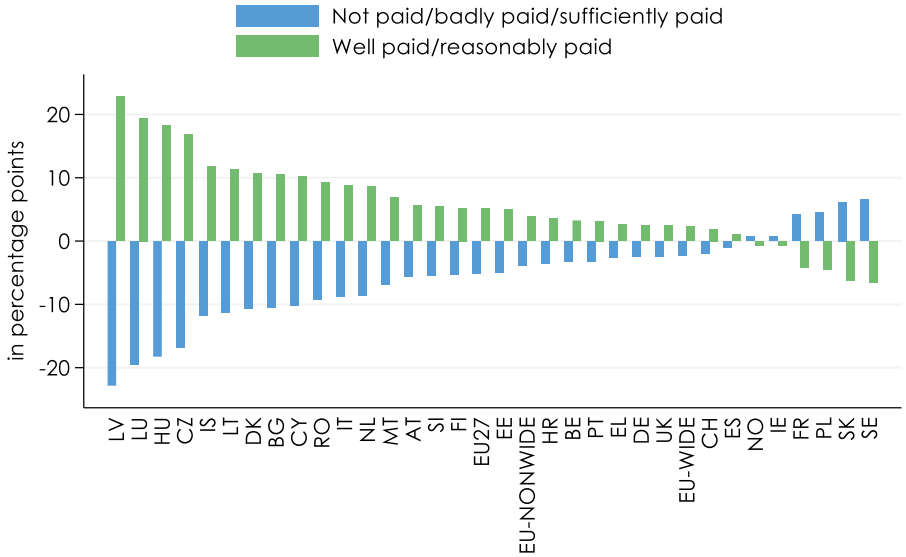
Figure 58: Perception of remuneration, academic sector, 2019



Source: MORE4 EU HE survey (2019)
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)?"
- (2019: n=9,321)

Male researchers perceive themselves on average more often to be well or reasonably paid, with the exception of researchers in France, Poland, Slovakia and Sweden. Differences are higher on average in non-widening EU countries.

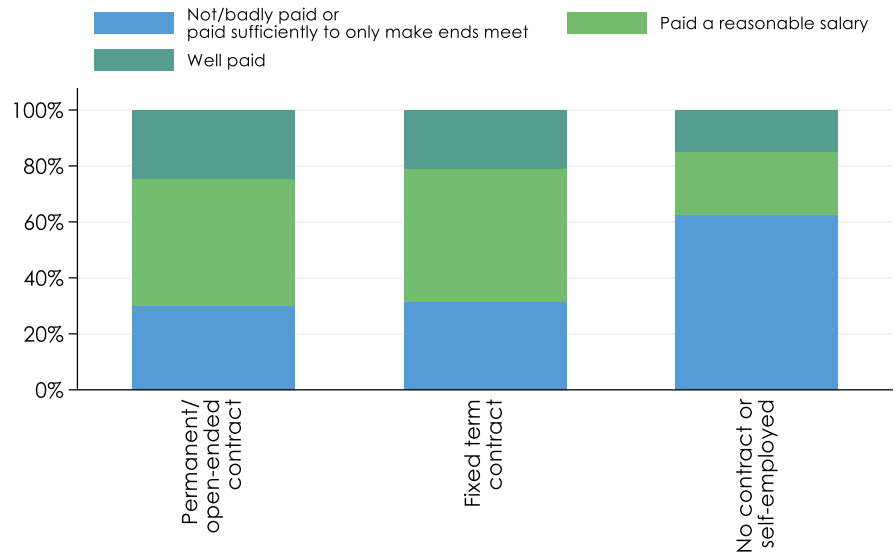
Figure 59: Difference in satisfaction with remuneration between male and female researchers, academic sector, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- Negative values indicate that a higher share of females compared with males in the respective question
- 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=9,321)

By contract type, across the EU there is actually not a large difference between researchers on permanent contracts vs. researchers on fixed-term contracts, however researchers without contracts report much more often to feel not or badly paid, or to be paid sufficiently only to make ends meet.

Figure 60: Satisfaction with remuneration by contract type, academic sector, 2019



Source: MORE4 EU HE survey (2019)
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)?" and question 28 "Type of contract"
- (2019: n=9,321)

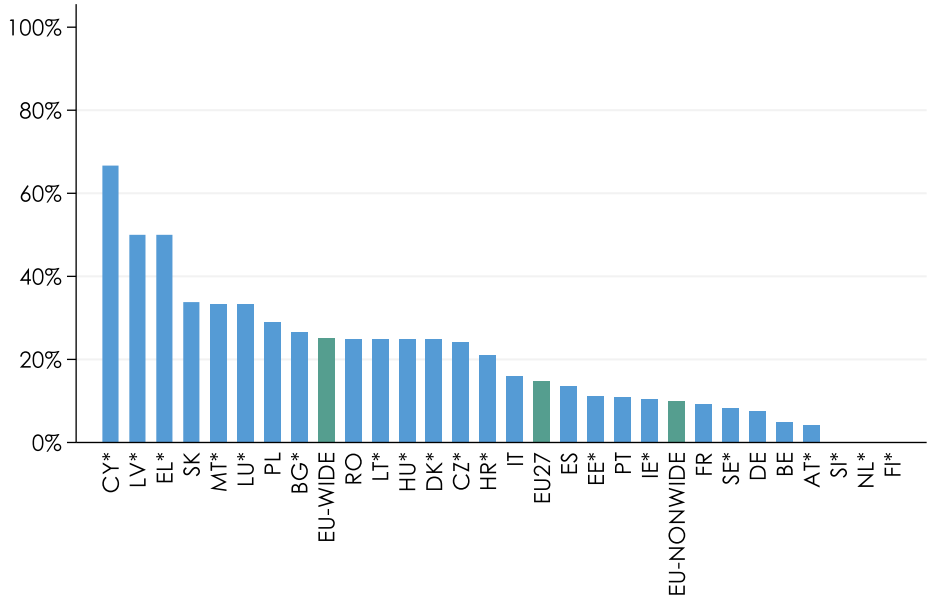
Table 20: Shares of researchers responding to be not paid, badly paid or paid sufficiently to just make ends meet, by type of position and contract, 2019

Country	Type of position		Type of contract		
	Full-time	Part-time	Permanent/ open-ended contract	Fixed-term contract	No contract/self-employed
AT/*	13.8	38.4	14.3	21.5	100.0
BE*/*	11.4	11.5	12.8	8.1	53.2
BG*/*	50.5	71.0	50.7	57.1	38.7
CY*/*	37.0	55.2	35.7	40.8	47.8
CZ/*	40.3	56.7	39.2	51.0	78.5
DE/*	6.7	16.7	3.2	15.3	33.3
DK*/*	14.9	19.7	13.4	14.8	32.4
EE/*	55.2	59.8	53.6	61.3	100.0
ES*/*	42.0	78.4	40.0	60.6	61.1
FI*/*	19.1	50.4	18.0	25.3	80.6
FR*/*	36.8	47.0	35.7	31.7	75.2
EL*/*	76.5	75.7	76.8	72.7	78.3
HR*/*	39.1	36.1	38.5	40.1	53.0
HU*/*	50.3	70.5	49.8	59.7	68.2
IE*/*	16.4	38.2	11.4	46.5	28.3
IT*/*	42.4	68.3	42.9	41.1	55.5
LT/*	55.9	70.6	53.3	65.8	48.4
LU/*	8.4		3.3	13.8	50.0
LV/*	40.4	64.3	41.3	56.3	36.4
MT*/*	35.9	61.3	38.3	38.6	18.6
NL/*	9.1	18.9	7.8	15.6	26.5
PL*/*	55.3	38.7	52.5	60.1	93.5
PT*/*	51.4	68.4	49.9	55.7	51.8
RO*/*	18.2	32.9	17.6	51.4	46.1
SE/*	17.4	40.6	17.5	22.1	30.7
SI*/*	29.4	61.0	31.1	34.5	100.0
SK*/*	61.9	54.0	51.2	70.1	48.7
EU27	31.2	36.0	30.2	31.4	62.4
EU-NONWIDE	22.8	29.3	21.4	24.6	56.9
EU-WIDE	53.3	59.8	51.1	60.8	69.0

Source: MORE4 EU HE survey (2019)
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)?" question 29: "Type of position" and on question 28: "Type of contract
- Only researchers who consider themselves Not paid or badly paid or paid sufficiently to only make ends meet
- *=variables with more and with less than 30 observations; Asterisk in front of the slash indicates the observation for Type of position and behind the slash for Type of contract.
- (2019: n=9,321)

Another way to ask researchers about whether their salary is actually sufficient to make ends meet, is to ask for another job on top of a (nominal) full-time position which is necessary to make ends meet. With the exception of Cyprus, the data show a very similar pattern to both real salary and the perception data, with more than 20% of full-time researchers in widening countries having to take on an additional job.

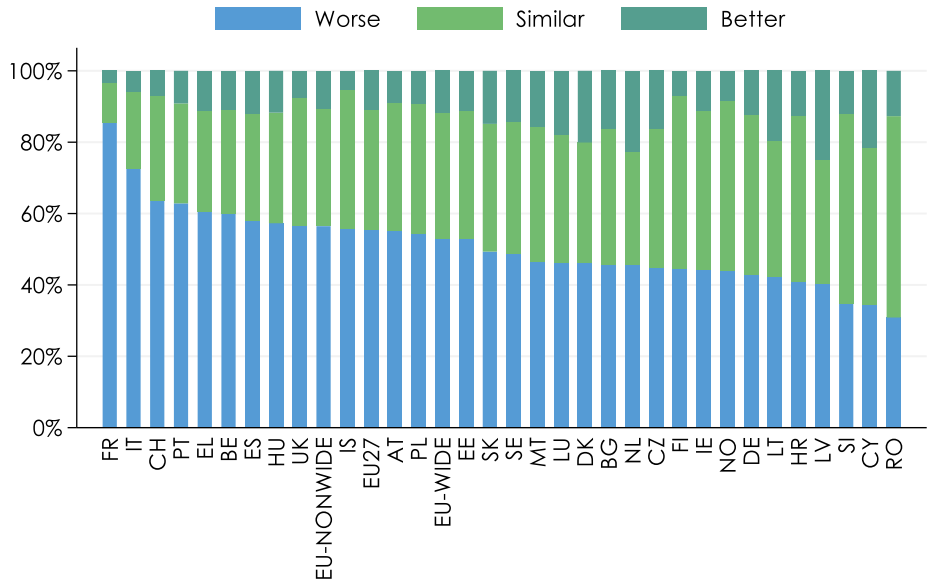
Figure 61: Share of respondents who has to take an additional job to make ends meet per country, academic and private sector researchers, 2021



Source: Researcher survey (2021)
Notes:
- Based on question C5: "Do you have to take on additional jobs on top of your current full-time position to make ends meet?"
- Only respondents who have a full-time position (Question A10: "Is your current position full-time or part-time?")
- *=less than 30 observations
- (2021: n=3-1,068)

The next figures and tables show how researchers working at PhD-granting higher education institutions perceive their salaries to be in comparison with researchers in the private sector. Close to 60% believe it to be worse on average in the EU, with slightly higher shares in the non-widening countries. This is consistent with real data, which for most countries show higher salaries in the private sector. The table below shows the shares of researchers who say that it is worse, by career stage. There is no clear-cut pattern across career stages. Only in the R4 stage do researchers in widening countries perceive worse remuneration package less often and vice versa in non-widening countries.

Figure 62: Perception of remuneration in academia compared to outside academia, 2019



Source: MORE4 EU HE survey (2019)
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=9,321)

Table 21: Perception of remuneration in academia vs. private sector, by academic researchers and career stage, shares of researchers indicating that salaries are worse in the academic sector, 2019

Country	R1	R2	R3	R4
AT	52	70	52	53
BE	55	44	72	62
BG*	54	42	42	55
CH	69	76	69	33
CY*	30	53	33	32
CZ*	43	48	48	38
DE	51	32	39	51
DK	53	64	46	33
EE*	67	55	55	41
EL*	64	40	61	62
ES	60	65	54	63
FI*	49	47	40	46
FR	84	72	92	84
HR*	36	54	42	34
HU*	49	45	61	58
IE*	83	45	40	44
IS*	62	58	72	32
IT*	89	85	70	73
LT*	56	34	47	35
LU*	70	35	35	54
LV*	52	26	48	34
MT*	29	34	53	43
NL	57	45	44	41
NO*	54	39	44	39
PL*	42	66	58	43
PT*	33	61	71	57
RO*	22	29	36	28
SE	65	55	45	45
SI*	32	40	40	27
SK*	22	47	56	49
UK*	46	56	58	56
EU27	57	50	57	56
EU-NONWIDE	59	48	57	60
EU-WIDE	41	54	58	48

Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 35: "How would you compare your remuneration package to that of people with comparable skills and experience outside academia?"
- *=variables with more and with less than 30 observations
- (2019: n=9,321)

The next table shows responses from employers who think that a low level of salary makes them struggle to recruit or retain junior or senior researchers. The reasons cited most often for widening countries are that salaries in similar organisations in other EU countries are higher, in particular as regards senior researchers, and that the financial resources of the organisation are insufficient to pay higher salaries. For non-widening countries, employers report more often that salary levels are outside of their influence, presumably due to the larger importance of pay scales in the determination of salaries in non-widening countries (see below), followed by salaries in other EU countries being higher.

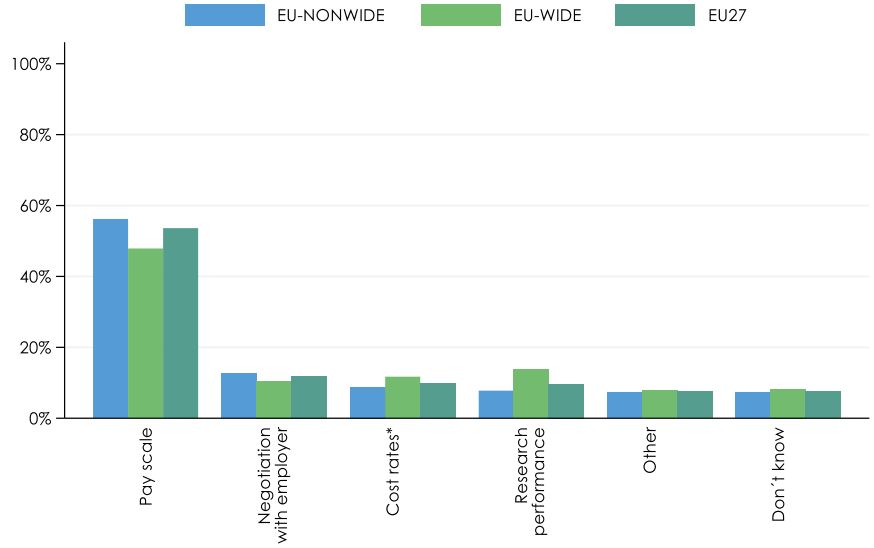
Table 22: Reasons for the perception of a low level of salary, employer organisations of researchers, 2021

		AT*/*	BG*	DE/*	HR*	IE*/*	IT*/*	LV*/*	PL*/*	SK/*	EU27	EU-NON-NWIDE/*	EU-WIDE
Cost of living	Junior	20	0		0	0	8	50	23	14	15	10	17
	Senior	20		50		0	0	50	7	8	10	13	10
Financial resources in organisation	Junior	20	33		100	0	13	0	14	29	20	13	24
	Senior	40		0		0	0	0	20	36	24	13	29
Income taxes- & social sec. contribution	Junior	20	0		0	0	13	0	18	6	11	13	10
	Senior	20		0		0	14	0	7	0	5	13	2
Salaries in similar org. in other EU countries are higher	Junior	20	33		0	0	29	50	27	26	27	27	27
	Senior	20		50		0	29	50	40	32	33	25	36
Salary level outside the influence	Junior	20	33		0	100	38	0	18	26	27	37	22
	Senior	0		0		100	57	0	27	24	28	38	24

Source: Employer survey (2021)
Notes:
- Based on question B3 & B7: "Which factors contribute to explaining the perception of a low level of salary?"
- Only respondents who indicate that a low level of net salary is a factor explaining why the organisation struggles to recruit or retain appropriately qualified researchers (Question B1 & B5: "Does your organisation struggle to recruit or retain appropriately qualified junior researchers/senior researcher for open positions in research?" and question B2 & B6: Why do you think that your organisation struggles to recruit or retain appropriately qualified junior researchers/senior researchers?")
- *=variables with more and with less than 30 observations; Asterisk in front of the slash indicates the observation for junior research and behind the slash for senior researcher
- EU27, EU-WIDE, EU-NONWIDE: average over available EU countries
- (2021: Junior: n=1-93; Senior: n=1-58)

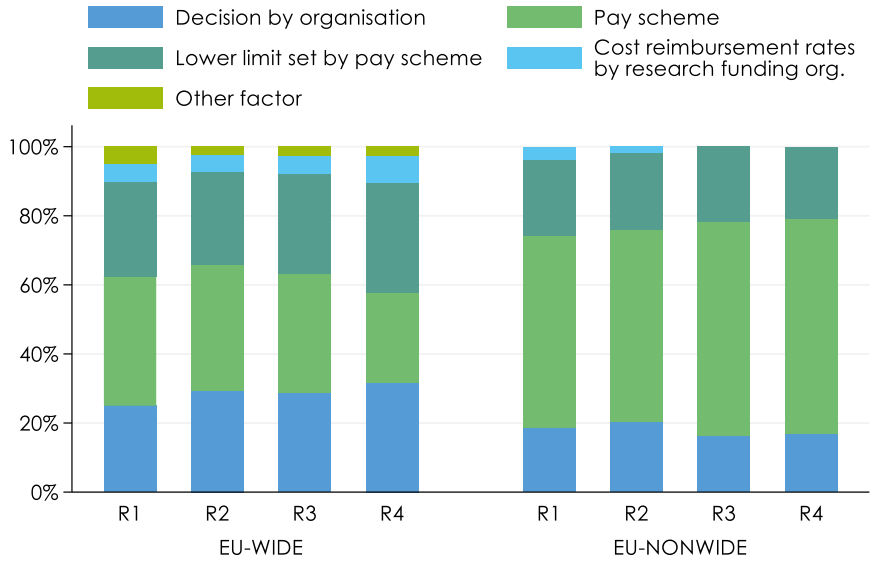
Close to 60% of researchers (Figure 63, Table 23) and 80% of employers (Figure 64) from non-widening countries indicate that salary levels result from pay schemes, either directly or at least by setting a lower limit. In widening countries, salary levels are more often the result of organisational decisions, even if pay schemes also play an important role. Many employers also report having minimum salary levels in place (Figure 65), mostly also the result of pay schemes (Table 24).

Figure 63: Determinants of entry level salary for researchers, 2021



Source: Researcher survey (2021)
Notes:
- Based on question C6: "Which of the following factors were relevant in determining your salary when you entered your current position?"
- *= Cost rates conceded by research funding agencies.
- (2021: n=400-1,300)

Figure 64: Determinants of entry level salary in academic/non-university research organisations, 2021



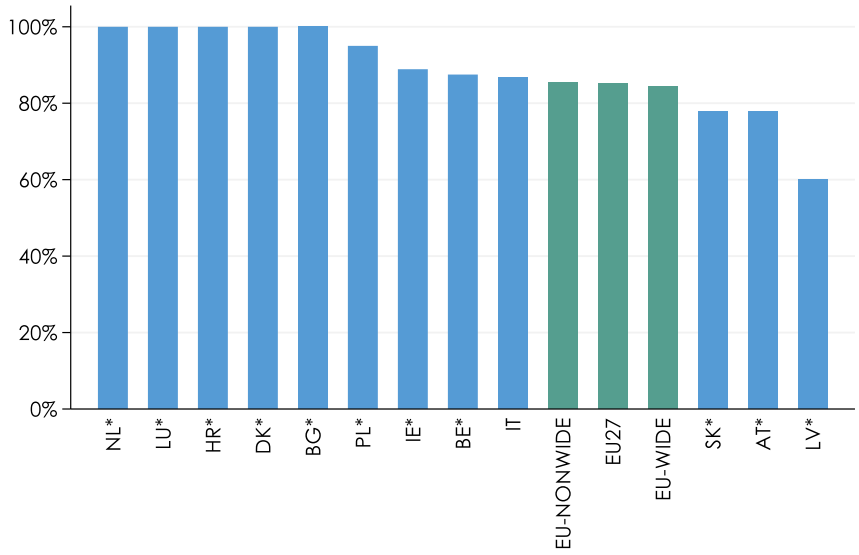
Source: Employer survey (2021)
Notes:
- Based on question C2.2: "Are these salary levels determined by…"
- EU-WIDE, EU-NONWIDE: average over available EU countries
- (2021: n=38-95)

Table 23: Determinants of entry level salary per country, share in %, 2021

Country	Number of responses	Pay scale	Negotiation with employer	Cost rates from research funding agencies	Research performance	Don´t know	Other
AT	38	45	21	13	8	5	8
BE	74	70	15	4	1	4	5
BG	20	45	10	10	25	10	0
CY	3	67	0	33	0	0	0
CZ	48	38	19	15	21	6	2
DE	410	61	8	9	9	8	6
DK	19	58	26	5	5	5	0
EE	19	32	26	21	11	0	11
EL	37	59	8	11	14	5	3
ES	152	45	14	14	9	7	10
FI	11	45	27	18	9	0	0
FR	113	61	12	5	6	7	8
HR	26	46	12	8	12	8	15
HU	7	43	14	0	43	0	0
IE	29	59	17	10	3	0	10
IT	160	53	7	9	8	12	12
LT	16	19	13	19	19	25	6
LU	6	50	17	0	0	0	33
LV	5	40	20	0	20	20	0
MT	5	40	20	0	40	0	0
NL	49	49	24	8	10	6	2
PL	52	50	12	10	13	8	8
PT	94	43	9	19	4	10	16
RO	50	58	8	10	16	6	2
SE	44	48	36	0	9	2	5
SI	21	52	5	14	24	0	5
SK	92	57	7	4	11	12	10
EU27	2117	54	12	10	10	8	8
EU-NONWIDE	1105	56	13	9	8	7	7
EU-WIDE	495	48	11	12	14	8	8

Source: Researcher survey (2021)
Notes:
- Based on question C6: "Which of the following factors were relevant in determining your salary when you entered your current position?"

Figure 65: Share of respondents with a minimum level of salaries in the organisation, 2021



Source: Employer survey (2021)
Notes:
- Based on question C3: "Are there minimum level of salaries for researchers in your organisation?"
- EU27, EU-WIDE, EU-NONWIDE: average over available EU countries
- (2021: n=1-114)

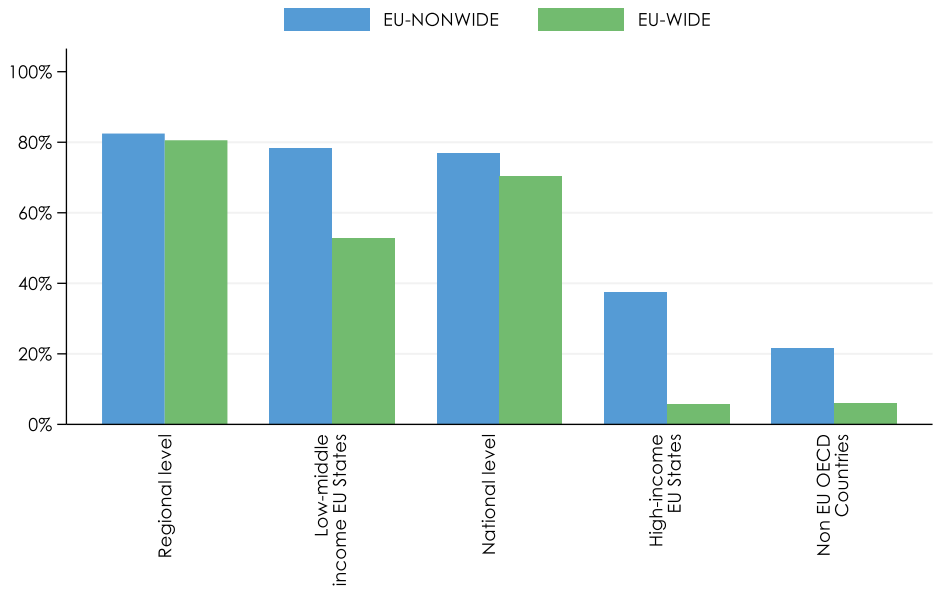
Table 24: Motivation for minimum level of salaries in organisation, per country 2021

Country	Number of all reasons	Public minimum income regulations	Pay schemes	Organisation's decisions	Cost reimbursement rates by research funding organisations
AT	7	0	43	57	0
BE	21	24	52	19	5
BG	2	50	50	0	0
HR	1	100	0	0	0
DK	2	0	100	0	0
IE	8	13	63	25	0
IT	29	34	55	10	0
LV**	6	33	0	50	0
LU	1	0	0	100	0
NL	1	0	100	0	0
PL	23	26	39	35	0
SK	18	39	56	6	0
EU27	119	28	49	22	1
EU-NONWIDE	69	23	55	20	1
EU-WIDE	50	34	40	24	0

Source: Employer survey (2021)
Notes:
- Based on question C4: "The minimum level of salaries for researchers in your organisation is the result of"
- Only if respondents indicate that there is a minimum level of salaries in the organisation (Question C3: "Are there minimum level of salaries for researchers in your organisation?")
- EU27, EU-WIDE, EU-NONWIDE: average over available EU countries
- (2021: n=1-119)

Finally, employers were also asked how competitive they think their remuneration package for researchers is, at the regional and national level, as well as vis-à-vis low-middle income EU countries, high-income ones and non-EU OECD countries. Only 6% of employers from widening countries indicate that their remuneration package is competitive with the ones from similar organisations in high-income EU countries, while for employers from non-widening countries this share is at 38%.

Figure 66: Employers who perceive their remuneration package to be very competitive or competitive, 2021



Source: Employer survey (2021)
Notes:
- Based on question C8: "How competitive is the overall remuneration package your organisation offers to researchers – level of salary, pension and health benefits, job security, any fringe benefits - with respect to similar organisations?"
- EU-WIDE, EU-NONWIDE: average over available EU countries
- (2021: n=8-56)

Table 25: Share of organisation with very competitive or competitive remuneration package, per country, 2021

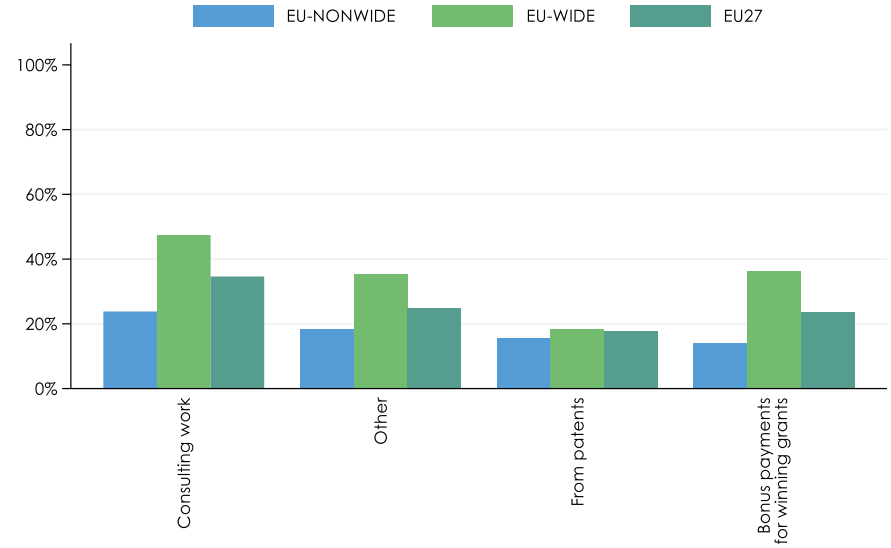
Country	Regional level	National level	Low-Middle income EU states	High-income EU states	Non EU OECD countries
AT**	83	50	100	57	20
BE**	88	88	92	67	25
BG**	100	100	100	0	0
DE**	100	100	100	100	100
DE**	0	0	100	100	100
HR**	100	100	100	0	0
IE**	88	88	83	67	50
IT**	78	73	61	7	12
LU**	100	100	100	100	0
LV**	100	100	60	0	0
NL**	100	100	0	0	0
PL**	73	67	44	13	13
SK**	80	60	54	0	0
EU27	82	74	68	25	15
EU-NONWIDE	82	77	78	38	22
EU-WIDE*	81	70	53	6	6

Source: Employer survey (2021)
Notes:
- Based on question C8: "How competitive is the overall remuneration package your organisation offers to researchers – level of salary, pension and health benefits, job security, any fringe benefits - with respect to similar organisations?"
- EU27, EU-WIDE, EU-NONWIDE: average over available EU countries
- *=variables with more and with less than 30 observations; **=all variables have less than 30 observations
- (2021: n=1-90)

4.5.2. Salary progression and additional forms of income

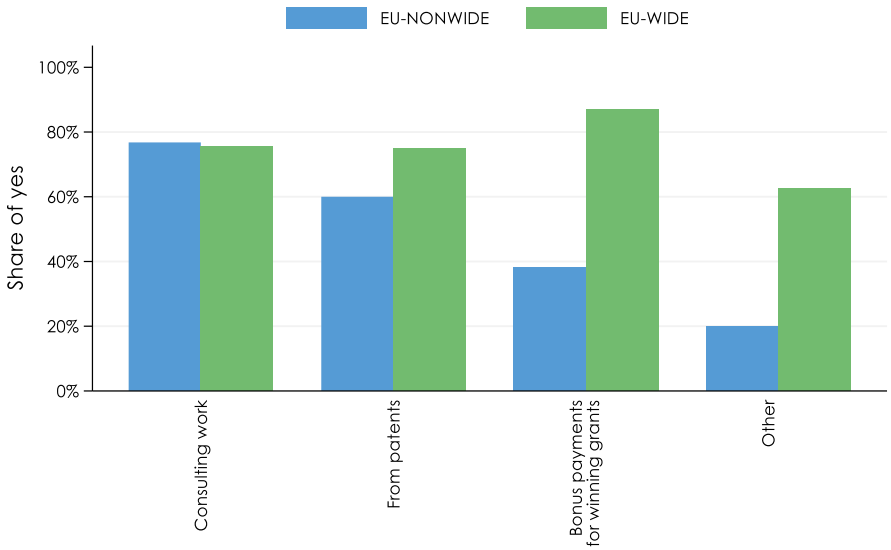
This sub-section presents data on salary progression, rather than levels, and on additional forms of income for researchers. The first two graphs compare the responses to the researcher and the employer survey. In widening countries, bonus payments from winning grants seem to be more widespread, this was also confirmed in an interview with a Hungarian researcher, but also other options are more frequent in widening countries. To some extent, lower base salaries in widening countries could hence be compensated by a larger variety of additional sources of income. In terms of share in total income (Figure 67) the average in widening countries is close to 20%, while in non-widening countries it is only half that amount, as indicated by responses to the researcher survey. Moreover, additional sources of income are often less predictable than standard salaries and can hence contribute to economic uncertainty.

Figure 67: Options to obtain additional personal income for researchers, as reported by researchers, 2021



Source: Researcher survey (2021)
Notes:
- Based on question C4: "Can you obtain additional personal income from research activities?"
- (2021: n=105-1,013)

Figure 68: Options to obtain additional personal income for researchers, as reported by employers, 2021



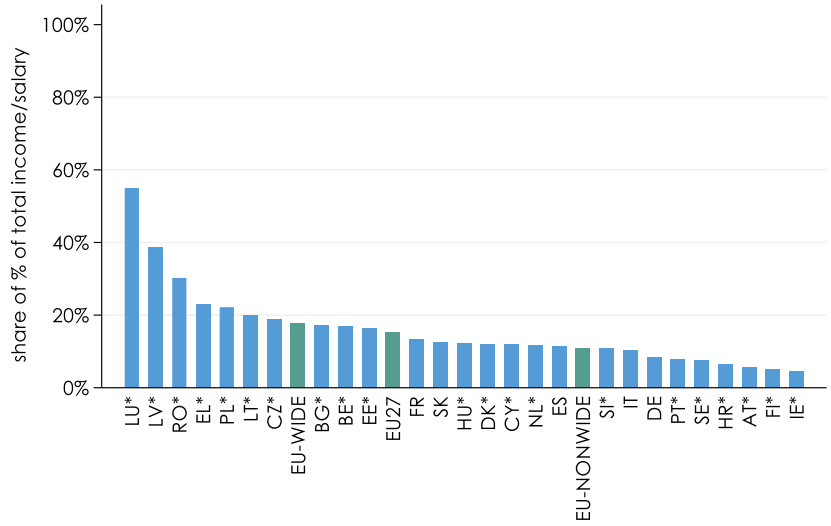
Source: Employer survey (2021)
Notes:
- Based on question C7: "Can researchers in your organisation obtain additional personal income from sources linked to their research activity?"
- EU-WIDE, EU-NONWIDE: average over available EU countries
- (2021: n=5-56)

Table 26: Options for additional income sources, as a % of respondents, 2021

Country	From patents you own	Bonus payments for winning research grants	For consulting work	Other
AT**	6	14	33	33
BE*	19	8	24	17
BG**	44	75	93	67
HR**	10	7	38	0
CY**	50	0	0	0
CZ**	21	48	46	30
DK**	20	8	25	40
EE**	0	27	58	40
FI**	0	20	20	0
FR	22	18	28	40
DE	8	11	15	9
EL**	21	38	52	50
HU**	25	100	67	0
IE**	15	7	31	33
IT	21	15	27	16
LV**	0	60	75	0
LT**	50	71	78	50
LU**	50	25	50	100
MT**	0	0	0	
NL**	11	21	13	0
PL*	9	52	55	44
PT*	21	11	30	21
RO*	25	46	61	67
SK*	9	45	39	29
SI**	40	9	64	100
ES	14	18	33	24
SE**	50	14	33	11
EU27	16	21	31	23
EU-NONWIDE	16	14	24	18
EU-WIDE	19	36	47	35

Source: Researcher survey (2021)
Notes:
- Based on question C4: "Can you obtain additional personal income from research activities?"
- *=variables with more and with less than 30 observations; **=all variables have less than 30 observations
- (2021: n=1-1,013)

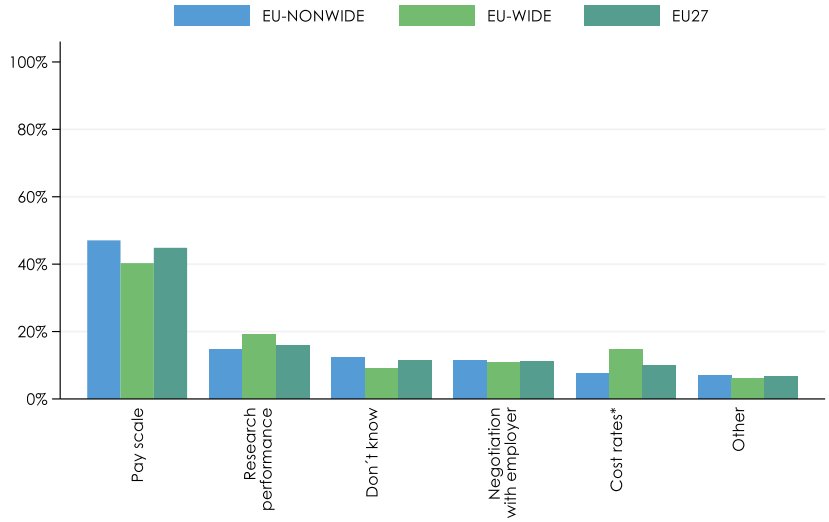
Figure 69: Percentage of additional income source, average per country, 2021



Source: Researcher survey (2021)
Notes:
- Based on question C4a: "Which percentage of your income/salary do you obtain approx. from these additional income sources?"
- Malta: no observation
- *=less than 30 observations
- (2021: n=1-598)

Similar to salary levels, salary progression is often determined by pay schemes; 10% of researchers surveyed indicate that research performance was used to determine their salary progression, 12% that they negotiated with their employer.

Figure 70: Who decides on salary progression for researchers, 2021



Source: Researcher survey (2021)
Notes:
- Based on question C7: "Which of the following factors are relevant in determining your salary increases?"
- *= Cost rates conceded by research funding agencies.
- (2021: n=399-1,295)

Table 27: Factors for salary progression as a percentage of all factors per country, 2021

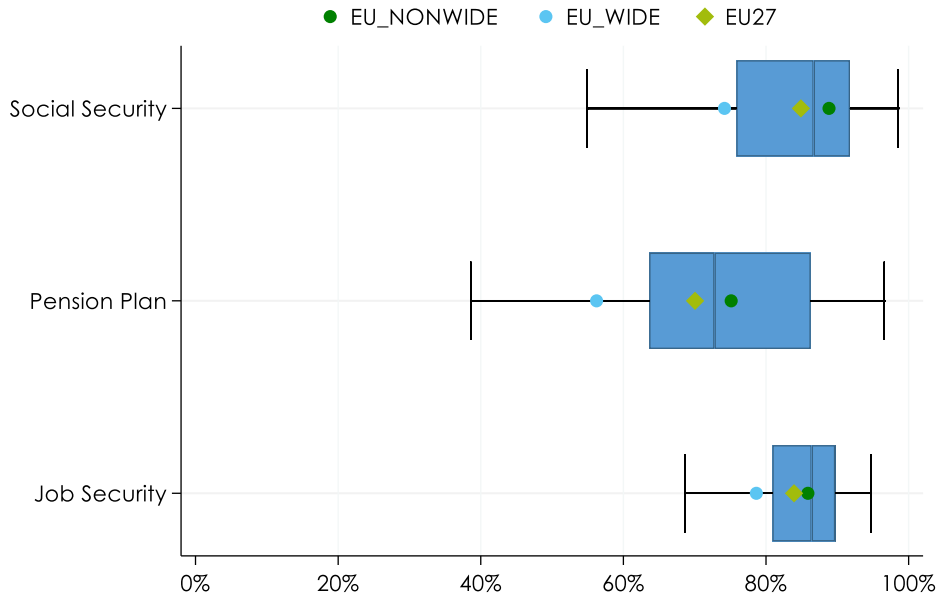
Country	Number of all factors	Pay scale	Negotiation with employer	Cost rates from research funding agencies	Research performance	Don´t know	Other
AT	38	34	29	5	13	13	5
BE	82	48	13	4	18	9	9
BG	23	39	9	17	26	4	4
CY	3	67	0	0	33	0	0
CZ	50	28	14	16	28	8	6
DE	414	53	7	8	12	14	5
DK	23	43	22	4	26	4	0
EE	18	33	33	11	17	0	6
EL	38	42	11	21	16	11	0
ES	155	39	11	14	15	12	9
FI	10	30	30	10	20	10	0
FR	126	53	12	3	17	8	6
HR	27	48	19	7	11	7	7
HU	6	67	0	0	33	0	0
IE	27	56	4	15	11	7	7
IT	145	38	10	8	10	23	10
LT	18	22	17	17	17	22	6
LU	7	43	14	0	14	0	29
LV	5	20	20	0	20	40	0
MT	5	60	0	20	20	0	0
NL	46	48	4	7	28	2	11
PL	56	34	20	9	23	9	5
PT	110	32	5	22	15	15	10
RO	59	47	8	14	19	7	5
SE	47	47	32	2	17	0	2
SI	20	45	5	20	10	10	10
SK	103	53	7	11	19	4	6
EU27	2212	45	11	10	16	11	7
EU-NONWIDE	1120	47	11	8	15	12	7
EU-WIDE	541	40	11	15	19	9	6

Source: Researcher survey (2021)
Notes:
- Based on question C7: "Which of the following factors are relevant in determining your salary increases?"

4.5.3. Pensions, social security and job security

This subsection presents data on a different economic dimension – pensions, social security and job security. The figure below presents box plots illustrating the spread in the satisfaction of academic researchers with these three aspects of contracts across the EU based on MORE4 data. The differences are particularly large as regards pensions, consistent with information from the researcher survey. For job security, the differences are much smaller.

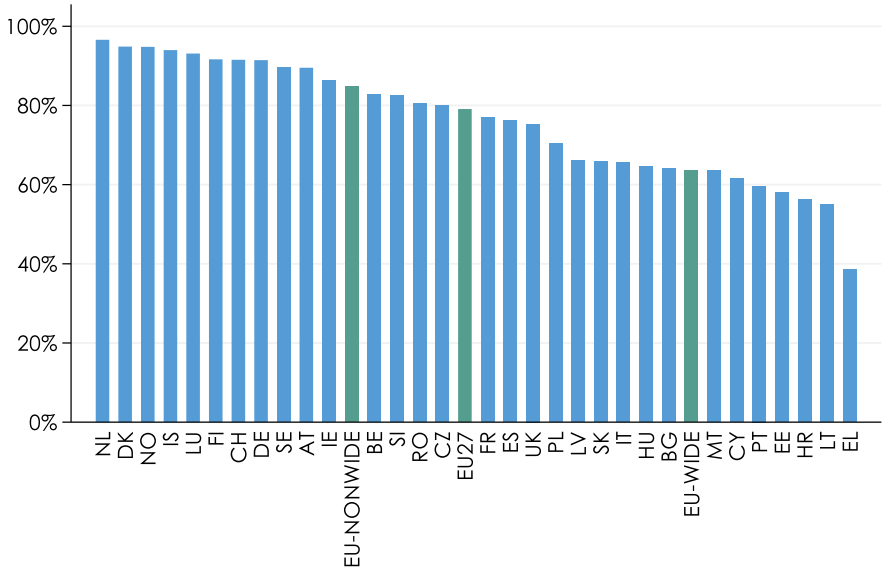
Figure 71: Satisfaction with social security, pension plan and job security, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=9,321)

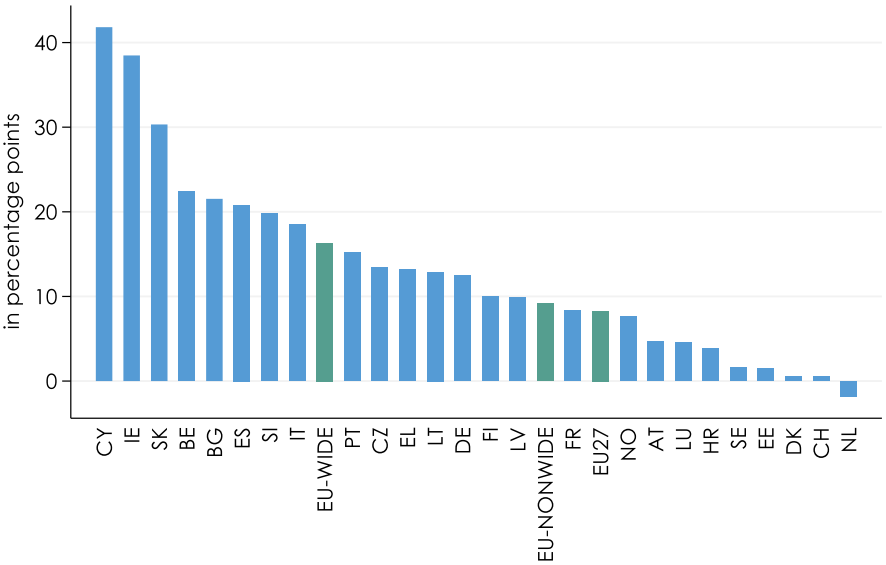
The next graphs and tables present country-specific and/or career-stage specific information on the satisfaction with pensions and job security. Differences between researchers on permanent and fixed-term contracts are not surprisingly pronounced, in particular so for job security.

Figure 72: Share of satisfaction with pension, 2019



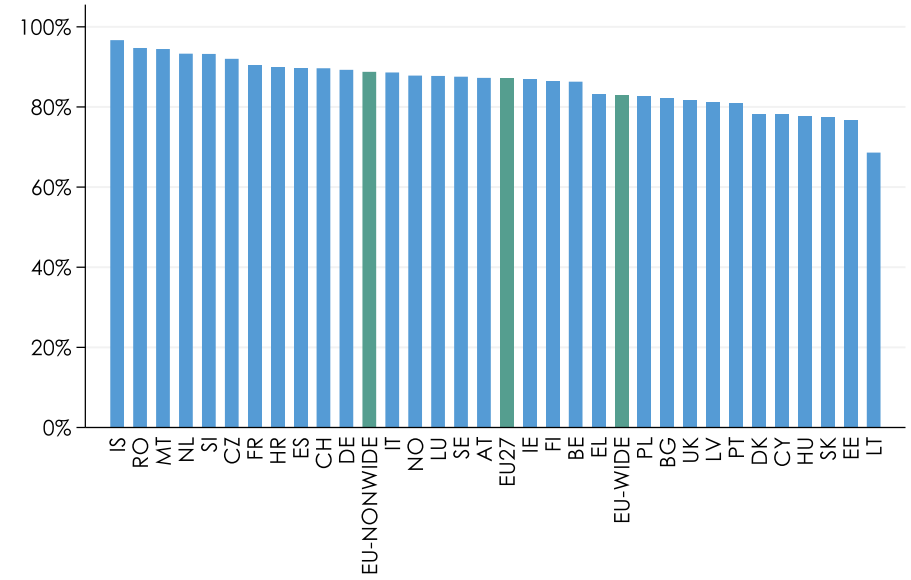
Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=9,321)

Figure 73: Difference in satisfaction with pensions between permanent and fixed term contacts, 2019.



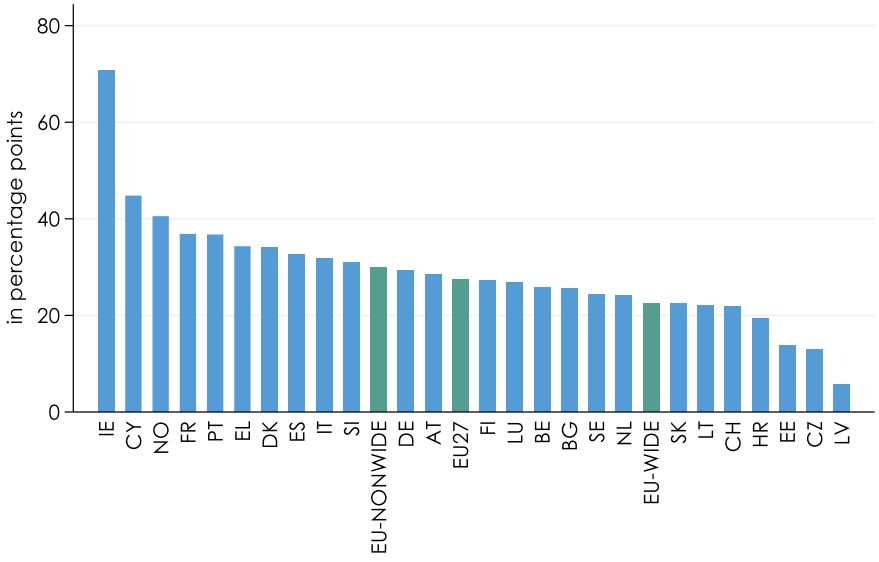
Source: MORE4 EU HE survey (2019)
Notes:
- Negative values indicate higher levels of satisfaction with pensions by researchers on fixed-term contacts.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=9,321)

Figure 74: Share of satisfaction with job security, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=9,321)

Figure 75: Difference in satisfaction with job security between permanent and fixed term contacts, 2019.



Source: MORE4 EU HE survey (2019)
Notes:
- Negative values indicate higher levels of satisfaction with job security by researchers on fixed-term contacts.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=9,321)

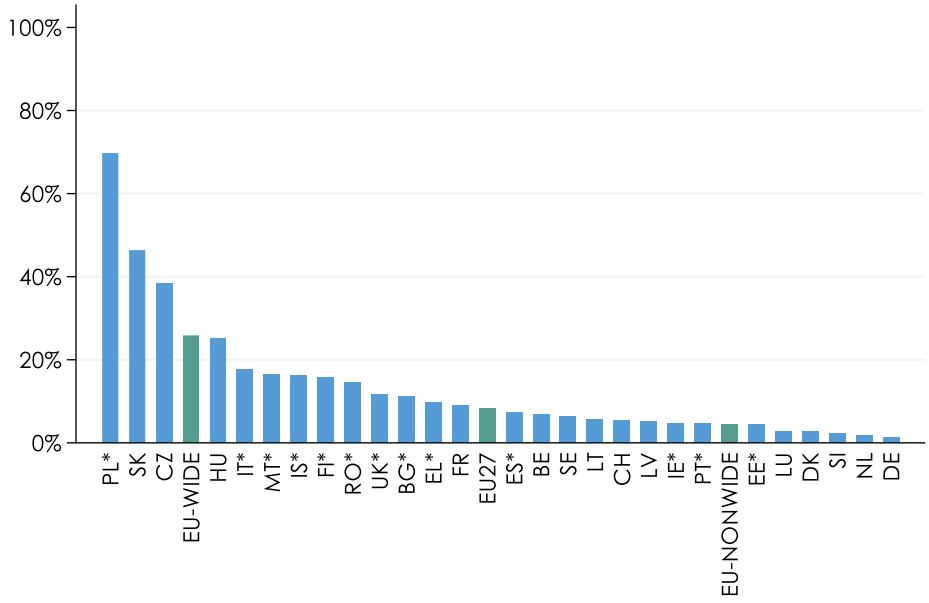
Table 28: Share of satisfaction with job security by career stage, 2019

Country	R1	R2	R3	R4
AT	77	62	92	98
BE	82	69	92	98
BG*	82	85	79	89
CH	92	72	94	97
CY*	12	44	84	88
CZ*	88	80	93	98
DE	76	79	94	100
DK	81	48	80	93
EE*	69	78	71	90
EL*	82	68	82	86
ES	72	50	94	98
FI*	76	68	91	93
FR	71	67	95	99
HR*	75	69	93	96
HU*	67	68	73	96
IE*	66	64	92	99
IS*	98	72	97	99
IT*	67	72	87	97
LT	62	70	65	76
LU*	84	72	98	100
LV*	70	79	85	82
MT*	100	100	97	87
NL	79	79	99	100
NO*	74	70	89	98
PL*	100	66	80	95
PT*	60	69	86	89
RO*	87	93	96	96
SE	76	72	90	95
SI	90	87	96	96
SK*	77	72	76	91
UK*	93	73	81	83
EU27	75	72	90	96
EU-NONWIDE	75	72	92	98
EU-WIDE	75	72	83	91

Source: MORE4 EU HE survey (2019)
Notes:
- Negative values indicate higher levels of satisfaction with fixed-term contacts.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- *=variables with more and with less than 30 observations
- (2019: n=9,321)

Not having a contract at all can also be seen as a lack of job security, or of social security, pensions, etc. This concerns mostly R1-researchers, or PhD-students. In some countries, such as in Poland, Slovakia and the Czech Republic, there are many R1 researchers without a contract, pointing to a lack of structured doctoral training, where PhD-students would be employed by the graduate school.[24] In the workshop, it was discussed that e.g. in Slovakia, the status of PhD-students as professional faculty or students is still subject to debate, and both versions exist, often without social security benefits such as vacation, maternity leave or contributions to a pension plan. This comes against the backdrop of clear guidelines, e.g. in the European charter and code, that PhD-students are professionals, rather than students. In the private sector, employee contracts dominate as well, only in the R1 stage is there a higher share of students; in R1 and R4, there is also a number of self-employed researchers.

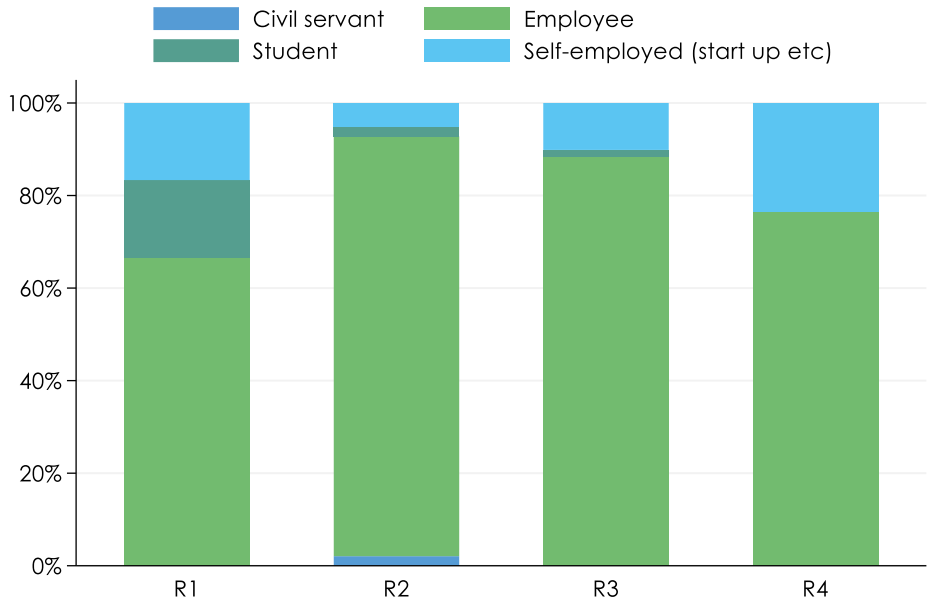
Figure 76: Share of R1 researchers without contract, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 28: "Type of contract
- *=less than 30 observations
- (2019: n=9,321)

[24] Stipends or fellowships were not included in the questionnaire; they contribute to living costs but usually are not equivalent to a full employment contract, e.g. with regard to pension contributions.

Figure 77: Share of legal status in private sector – firm, per career stage, 2021



Source: Researcher survey (2021)
Notes:
- Based on question A11: "What is your legal status in your main position?" and question A2: "Which type of organisation do you work for?"
- (2021: n=34-97)

4.5.4. Fringe Benefits

The next table and figures provide an overview of the nature and the frequency of fringe benefits which come with jobs in academic and private sector research jobs, based on the online job board analysis (see section 9.2.1). At least in new job openings posted online at Euraxess, fringe benefits are on average rare, in the EU27 only about 8% of jobs come with fringe benefits, somewhat more in non-widening than in widening countries (5 vs 8%). The Netherlands stand out with a share of close to 54% of all jobs advertised including any fringe benefits.

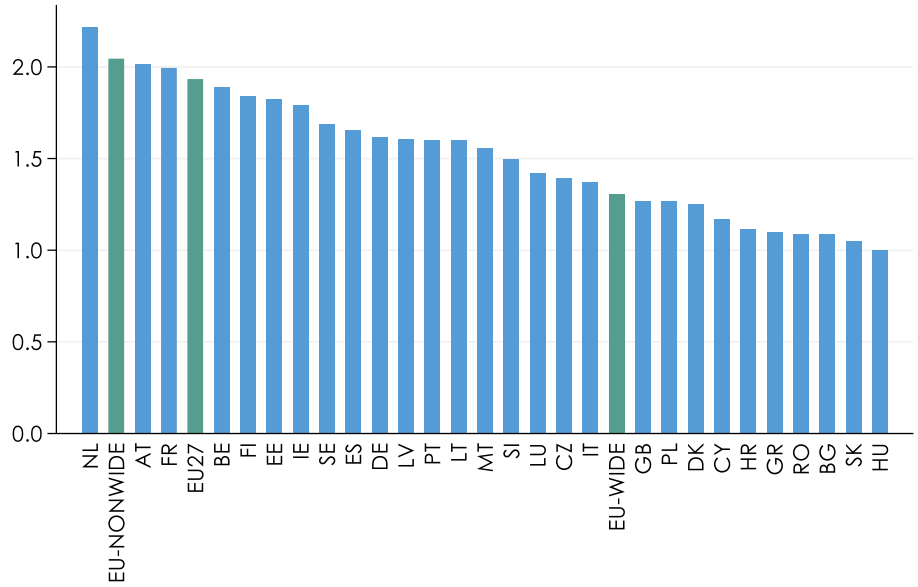
The most frequent fringe benefits relate to sports, training opportunities and a pension contribution/plan, followed by health benefits. Childcare and housing are rare.

Table 29:Share of fringe benefits per country, in % of all fringe benefits, 2016-2021

Country	Sports	Pension	Childcare	Health	Parental leave	Dual career	Relocation	Public transport	Training	Housing	Career development	% Jobs with FB	Number of jobs
AT	6.8	7.3	0.3	0.9	0.2	0.6	0.4	0.3	0.7	0.1	0.3	8.9	10,618
BE	4.4	2.5	0.2	1.4	0.2	0.0	0.4	3.1	4.8	0.5	0.5	9.4	9,868
BG	0.7	0.0	0.0	1.1	0.0	0.0	0.0	0.4	1.5	0.0	9.9	12.5	273
CY	0.0	1.5	0.0	5.1	0.0	0.0	0.2	0.0	2.6	0.0	0.7	8.6	547
CZ	3.7	4.0	0.6	4.2	0.1	0.0	1.8	0.2	3.7	0.2	0.7	13.8	1,890
DE	0.4	0.7	0.0	0.5	0.1	0.2	0.2	0.2	1.7	0.1	0.2	2.7	32,105
DK	0.0	2.1	0.1	0.5	0.1	0.1	0.1	0.0	1.5	0.0	0.2	3.8	3,608
EE	16.7	1.8	0.0	6.9	0.4	0.0	0.5	0.0	19.9	0.0	0.4	25.5	552
ES	1.2	4.4	0.0	8.8	0.1	0.0	2.3	0.3	8.6	0.2	1.7	16.8	11,685
FI	0.2	0.1	0.1	1.3	0.0	0.0	0.1	0.0	1.1	0.0	0.1	1.6	5,316
FR	1.1	0.1	0.0	0.7	0.1	0.0	1.1	0.9	1.1	0.1	0.1	2.7	33,029
GB	0.1	0.7	0.1	0.1	0.0	0.0	0.1	0.0	0.8	0.0	0.1	1.6	38,494
GR	0.0	0.0	0.0	0.2	0.1	0.0	0.1	0.0	1.0	0.0	0.1	1.3	3,851
HR	0.1	0.1	0.1	0.0	1.5	0.0	0.0	0.0	0.1	0.0	0.0	1.7	13,642
HU	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.0	5.3	114
IE	0.1	0.5	0.0	0.5	0.0	0.0	0.4	0.0	1.6	0.0	0.8	2.2	7,644
IT	0.2	0.2	0.0	0.1	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.6	56,250
LT	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	4.2	0.0	2.1	5.2	96
LU	0.1	0.3	0.0	0.1	0.0	0.0	0.0	0.0	0.4	0.0	0.3	0.8	2,260
LV	0.3	0.0	0.0	7.7	0.0	0.0	1.3	0.0	5.1	0.0	0.0	8.9	313
MT	2.7	0.0	0.0	4.5	0.0	0.0	0.0	0.0	5.4	0.0	0.0	8.1	111
NL	22.7	20.6	7.0	12.5	6.2	11.4	9.9	5.0	16.5	1.8	5.0	53.5	19,530
PL	1.5	0.3	0.0	1.6	2.0	0.0	0.0	0.0	1.5	0.3	0.2	5.9	31,229
PT	0.1	0.1	0.0	7.0	6.1	0.0	1.1	0.1	3.2	0.1	0.1	11.0	1,955
RO	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.0	1.9	0.0	0.7	2.8	2,784
SE	0.0	0.2	0.0	0.2	0.2	0.0	0.1	0.0	0.3	0.0	0.0	0.6	10,829
SI	0.3	0.5	0.0	1.1	0.0	0.0	0.2	0.0	2.2	0.2	0.3	3.1	641
SK	5.9	0.0	0.0	0.4	0.0	0.0	0.0	0.0	9.6	0.0	0.8	15.9	239
EU27	2.7	2.4	0.6	2.0	0.9	0.9	1.1	0.7	2.7	0.2	0.6	7.6	260,979
EU-NONWIDE	3.1	3.0	0.7	2.1	0.7	1.2	1.4	0.9	3.0	0.3	0.7	8.3	202,742
EU-WIDE	1.2	0.3	0.0	1.4	1.6	0.0	0.1	0.0	1.5	0.2	0.2	5.1	58,237

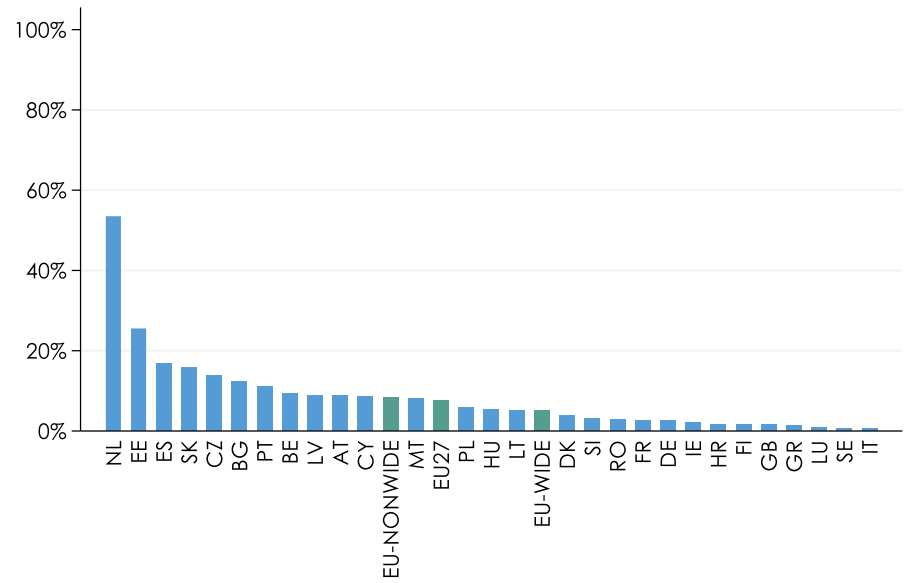
Source: Online Job Board Analysis
Notes:
- details see section 9.2.1.
- (n =260,979)

Figure 78: Average number of fringe benefits per job per country, 2016-2021



Source: Online Job Board Analysis
Notes:
- details see section 9.2.1.
- (n =260,979)

Figure 79: Share of jobs with at least one fringe benefit in all jobs per country



Source: Online Job Board Analysis
Notes:
- details see section 9.2.1.
- (n =260,979)

4.6. Career Dimension

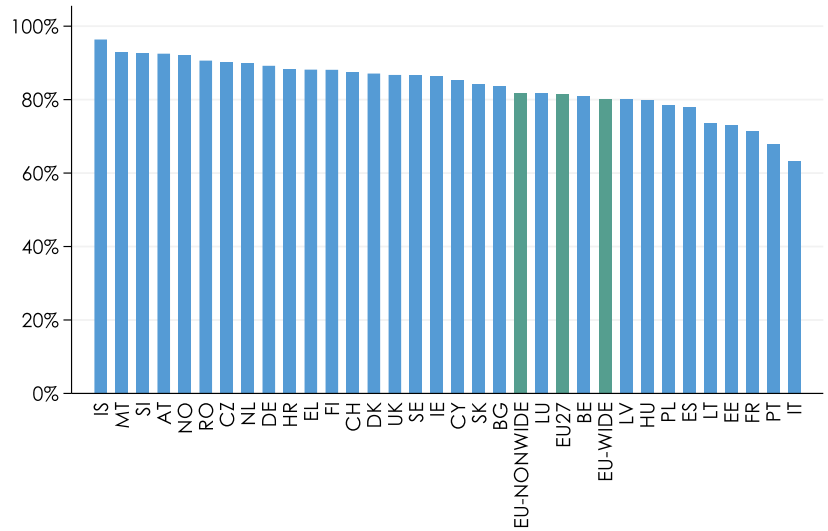
Just as the economic dimension of contracts, the career dimension is crucial for assessing the precarity of careers in research. In a sister report to this report, Costas et al., (2021) present a mapping of career paths in the EU Member States, based on ORCID data (ORCID is a unique identifier for researchers, enabling to analyse their career moves over time). Their findings support the findings in this section, eg., as regards the length of career stages, but also more generally the thrust of this analysis with respect to different labour markets for researchers in non-widening and widening countries, with a lack of dynamism in several widening countries.

This subsection presents various different aspects of the career dimension of contracts. We start with evidence on the confidence researchers have in their future careers, training, the average length of career stages, satisfaction with career perspectives and transparent career paths as well as progression.

4.6.1. Confidence in future career prospects

In terms of confidence in future career prospects, there is actually little difference on average between widening and non-widening countries. By career stage (table below), we do see on average a small dip in confidence in career stage R2 where uncertainty about future career prospects is usually highest and post-docs on fixed-term contracts strive for a tenured contract. Overall, however, the level of confidence is quite high, even at the R2 stage. The level is higher than satisfaction with career perspectives (section 4.6.4), indicating that in spite of lacking current career perspectives, some researchers still feel they can succeed in an academic research career, consistent with the discussion in section 3.

Figure 80: Confidence in future career prospects, academic researchers by country, 2019



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?"
- (2019: n=8,540)

Table 30: Very and somewhat confident in career, 2019

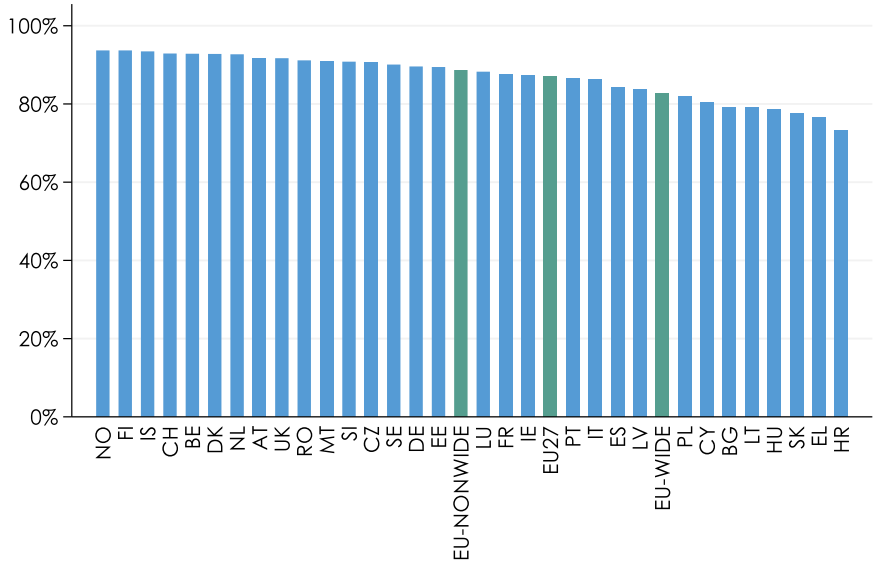
Country	R1	R2	R3	R4
AT	93	84	90	98
BE	84	57	87	90
BG*	79	86	84	83
CH	81	79	92	95
CY*	59	65	84	98
CZ	84	87	90	94
DE	89	79	90	97
DK	77	70	94	93
EE*	78	55	67	92
EL*	82	65	87	91
ES	50	51	82	86
FI*	68	82	89	96
FR	70	65	71	75
HR*	85	72	90	92
HU*	67	59	80	94
IE*	76	84	85	93
IS*	94	82	98	98
IT*	56	64	58	75
LT	69	68	72	80
LU*	85	78	80	87
LV*	72	81	78	85
MT*	80	100	93	93
NL	79	84	95	92
NO	79	75	97	96
PL*	90	55	79	91
PT*	68	62	65	83
RO*	93	87	92	91
SE	74	75	88	95
SI	95	94	89	95
SK	72	81	85	94
UK*	70	83	86	91
EU27	79	72	80	89
EU-NONWIDE	79	74	81	89
EU-WIDE	77	67	79	90

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?"
- *=variables with more and with less than 30 observations
- (2019: n=8,540)

4.6.2. Training

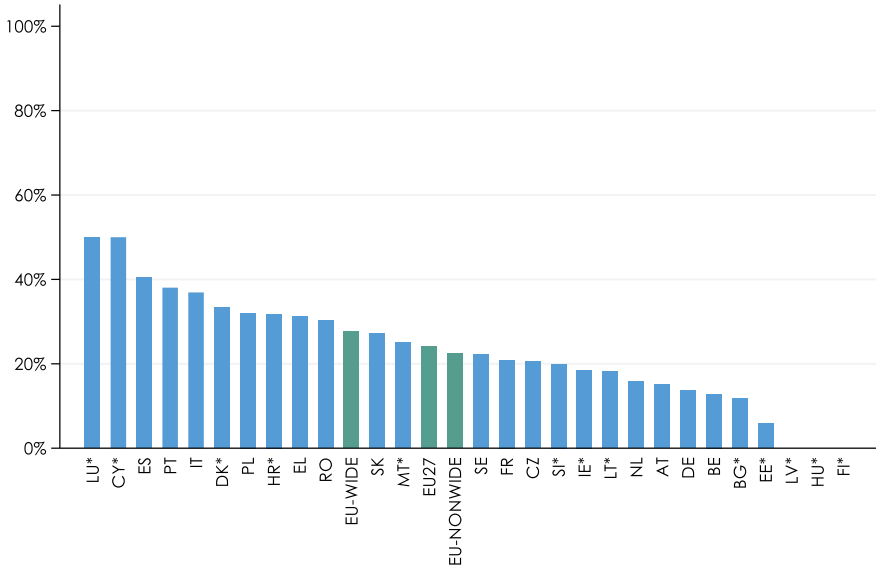
Satisfaction with the quality of training and education is higher in the non-widening countries, although the differences are not very large. The researcher survey asked for dissatisfaction with opportunities for training and development, with similar results on researchers in widening countries on average more dissatisfied.

Figure 81: Satisfaction with quality of training and education, academic researchers, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=9,321)

Figure 82: Dissatisfaction with opportunities for training and development per country, 2021

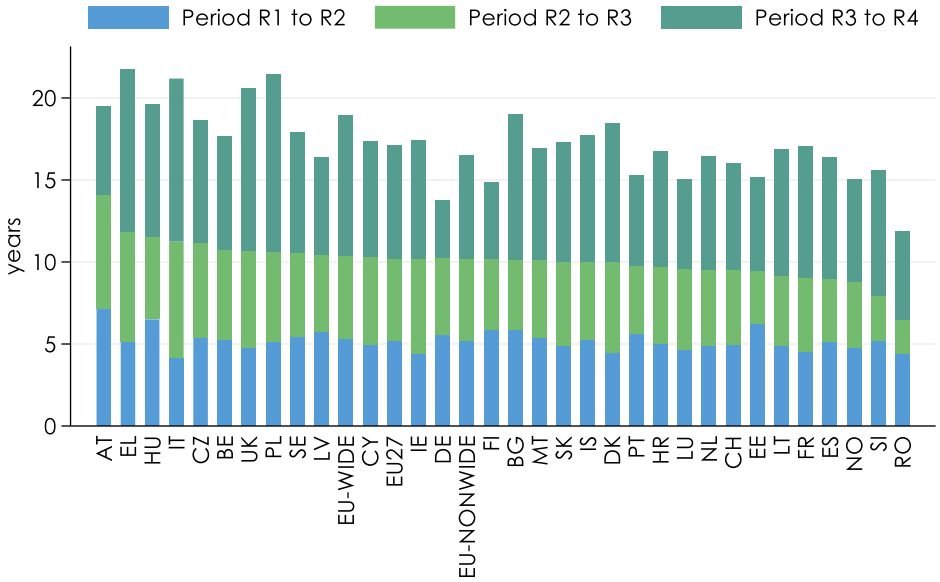


Source: Researcher survey (2021)
Notes:
- Based on question B1: "Please indicate your satisfaction with each factor as it relates to your current position/employment"
- *=less than 30 observations
- (2021: n=4-1,336)

4.6.3. Average length of career stages

The average length of career amounts to approx. 5 years for the stage R1, differences are larger for R2 and R3 career stages. As a result, there can be 10 years of difference between countries in reaching the last career stage R4.

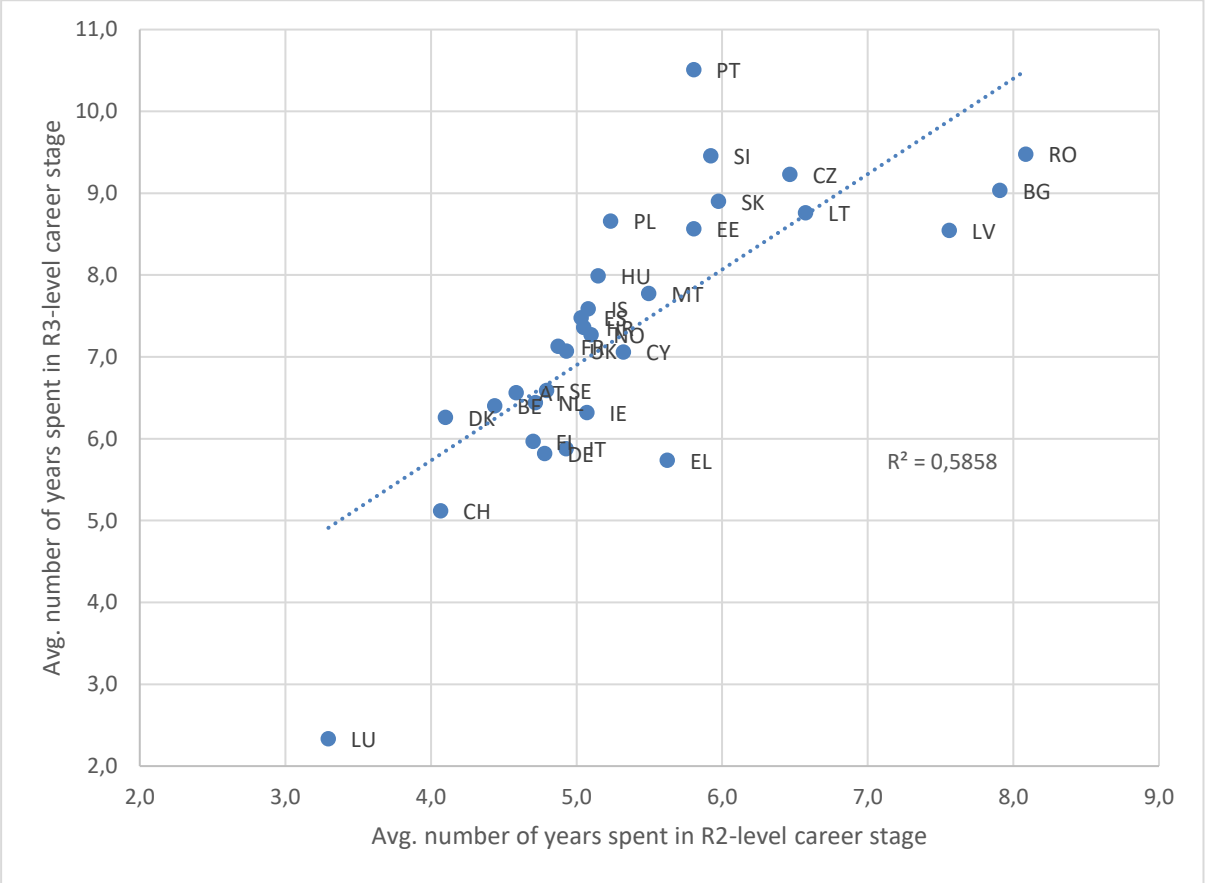
Figure 83: Average length of career stage, 2019



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: n=8,300)

The next figure – taken from the sister report from Costas et al., 2021 – illustrates the differences in career stage length based on ORCID data and uses them to show that countries with both long R2 and R3 career stages are clustered together, suggesting less dynamic labour markets for (academic) researchers there. In the words of Costas et al., 2021, p. 24: "The scatterplot … points to a moderate relationship between the time spent at R2 career stages and the time spent at R3 career stages. This could indicate that in those countries where the time spent in postdoctoral positions is longer, researchers who reach the R3-level are also more prone to spending longer periods in those positions. This could be related to countries with less dynamic research systems, or where researchers have more limited academic opportunities after their R2-level career stage. This would be in contrast to countries with more dynamic systems (e.g., Luxembourg, Germany, Denmark, or Switzerland) where researchers may transit faster from one to the next career level."

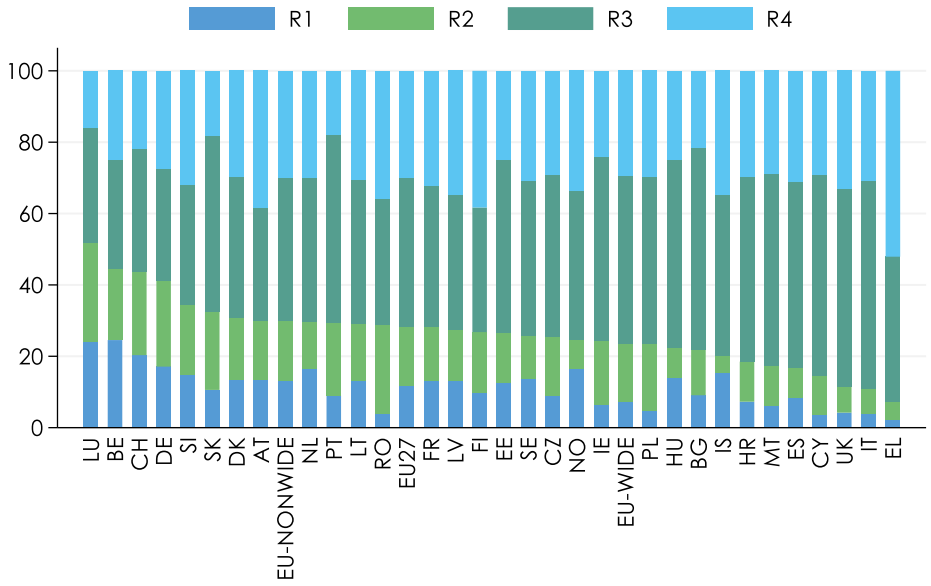
Figure 84: Length of career stages R2 vs. R3 as an indicator of the dynamics of labour markets in academic research



Source: Costas et al., 2021.

The distribution of researchers across career stages – or the share of R1&R2 researchers among all researchers – indicates the "shape of the pyramid", or how many junior researchers there are relative to senior researchers and hence how likely it is for junior researchers to make it to a senior permanent position (the effect of the "selection" process in academic research). The amount of junior researchers relative to senior researchers may depend on several factors, such as career-models (e.g., in chair-based models, there is one professor at the top, while in department-style models, there are several tenured researchers in flatter hierarchies (see the discussion in section 3); but also on the amount of (new) funding available, which can fund new junior positions. Consistent with the data presented previously, non-widening countries show a higher share on average of R1&R2 researchers in all career stages.

Figure 85: Distribution of researchers across career stages R1 to R4, by country, academic sector 2019



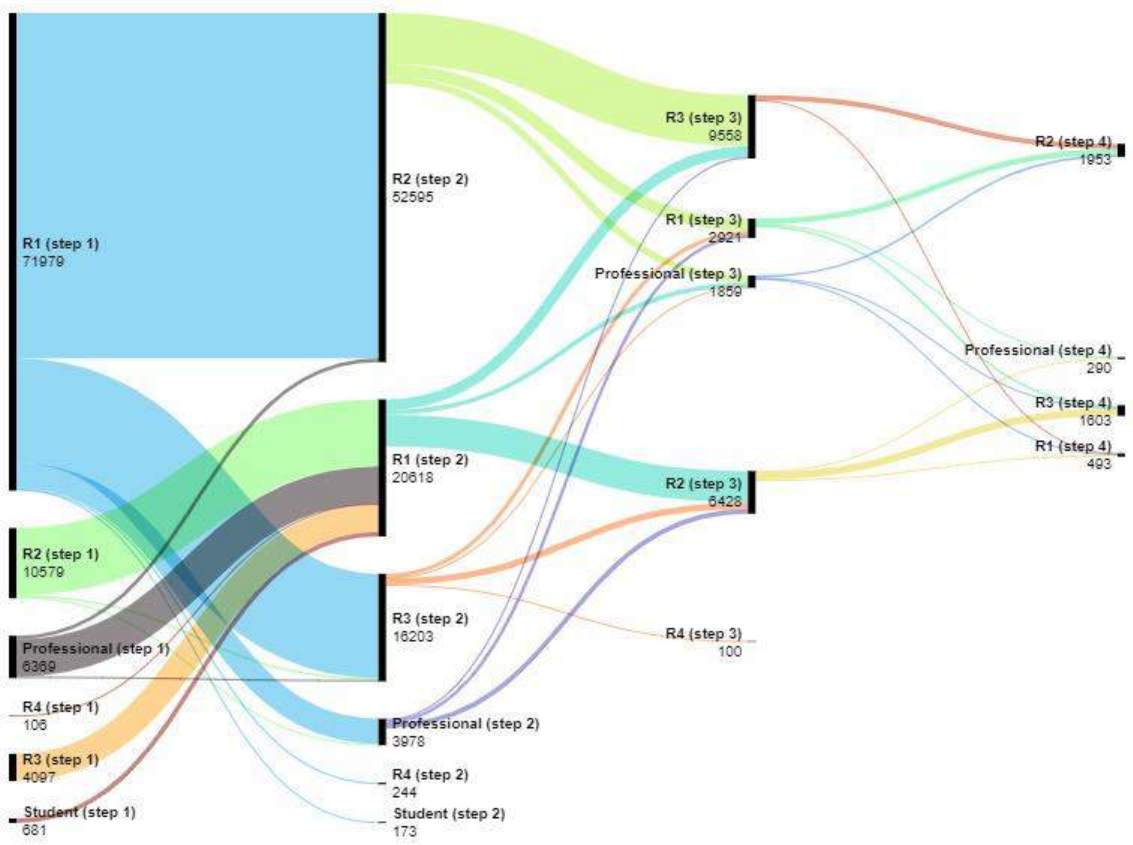
Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 13: "In which career stage would you currently situate yourself?"
- (2019: n=9,321)

The sister report to this report (Costas et al., 2021) provides more details on the selection effect over the various career stages, graphically visualising it based on ORCID data, the following text is taken directly from their report:

"[Figure 86] captures the first four consecutive career transitions in the profiles of the researchers. When following the steps from the left to the right, fewer and fewer researchers remain. This can have two reasons: either researchers have not (yet) advanced further, or they have stopped reporting their career development. As a consequence, there are fewer researchers with more advanced stages such as R3 or even R4. This confirms again a 'selection' effect in the presence of career steps in ORCID.

In Figure [86], the most common career path goes from the R1-stage to R2. The next biggest path is the one from R1 to R3 – apparently, there is a considerable number of researchers who 'skip' the R2-step and immediately obtain e.g., professorships or other, more senior roles. Another explanation could be that not all ORCID users report all of their different career stations, but e.g., only the first and the last one. On the other hand, career steps with a downward move (e.g., from R2 or R3 to R1) might also be observed for those who have teaching or research roles before they start a PhD-position (in our classification, those roles are always given at least an R2-label)."

Figure 86: Sankey diagram of four consecutive career steps. The decreasing number of researchers indicates a decreasing number of researchers with multiple steps. Filtered for steps with at least 100 cases.



Source: Costas et al., 2021, p. 13f.

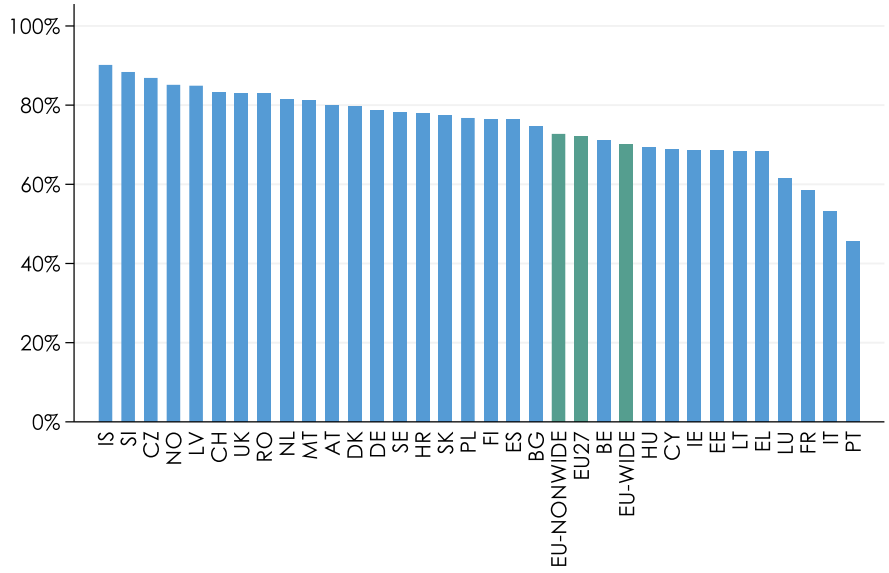
4.6.4. Satisfaction with career perspectives

We first present evidence on satisfaction with career perspectives from the MORE4 survey, which is limited to academic researchers and asks only one question on career perspectives. We then present the evidence from the researcher survey undertaken within this project, which has more detail on these questions and has also responses from private sector researchers, but is less representative than the MORE4 survey.

There is little difference on average in the satisfaction between researchers from widening and non-widening countries with their career perspectives in the MORE4 survey. Individual countries differ substantially though, from above 40-50% for Portugal, Italy and France, to close to 85% for Slovenia and the Czech Republic. Satisfaction with career perspectives across the EU has improved since 2012 (Figure 87). All lines for the various years show a slight U – a decrease in satisfaction after PhD-studies, when researchers struggle for a permanent job in the career stages R2 and R3, while researchers in the latest career stage have made it mostly to a permanent leading position. Note that these numbers do not included all the researchers who have left the system, either to the private sector as a researcher or to change jobs completely.

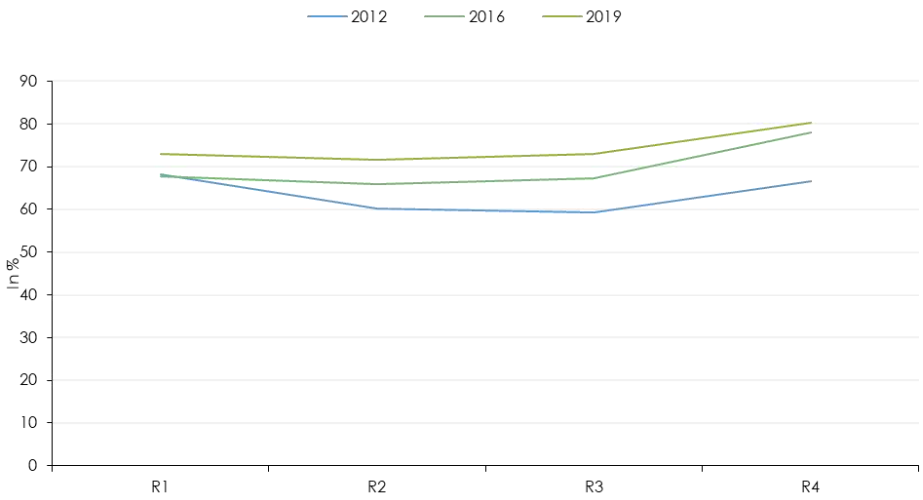
This U-shaped pattern does not hold for every country (Ireland, Hungary, Netherlands…). Table 31 shows satisfaction by career stage, and the next table makes the difference more explicit by calculating differences in satisfaction to career stage R1, with positive values indicating higher satisfaction in career stage R1.

Figure 87: Share of satisfaction with career perspectives, academic sector, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=9,321)

Figure 88: Satisfaction with career related aspects, academic sector, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=7,969; 2016=8,827; 2012=9,016)

Table 31: Share of satisfaction with career perspectives across career stages, 2019

Country	R1	R2	R3	R4
AT	80	63	75	92
BE	69	42	79	87
BG*	65	71	77	73
CH	93	67	87	86
CY*	12	44	73	78
CZ*	87	79	89	88
DE	70	79	74	89
DK	75	68	78	91
EE*	68	70	61	85
EL*	64	51	64	74
ES	65	44	81	80
FI*	67	70	73	85
FR	72	52	48	70
HR*	69	54	82	82
HU*	55	65	66	87
IE*	50	69	66	80
IS*	81	72	90	98
IT*	34	41	47	71
LT	42	80	58	87
LU*	84	54	51	63
LV*	61	89	91	85
MT*	80	85	80	82
NL	73	75	80	91
NO	73	67	88	92
PL*	75	59	73	96
PT*	60	38	42	59
RO*	75	80	85	84
SE	74	75	75	86
SI	87	90	85	91
SK*	75	69	77	90
UK*	81	79	82	86
EU27	69	66	68	83
EU-NONWIDE	69	68	69	83
EU-WIDE	66	60	67	83

Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- *=variables with more and with less than 30 observations
- (2019: n=9,321)

Table 32: Share of satisfaction with career perspectives across career stages, 2019: Difference to R1 share

Country	R1	R2	R3	R4
AT	80	16	5	-12
BE	69	27	-10	-18
BG*	65	-6	-12	-8
CH	69	1	-19	-17
CY*	12	-33	-61	-66
CZ*	87	8	-2	0
DE	75	-3	1	-14
DK	69	1	-9	-22
EE*	69	0	8	-15
EL*	66	15	2	-8
ES	68	24	-13	-13
FI*	64	-6	-9	-21
FR	55	3	7	-15
HR*	81	26	-1	-2
HU*	50	-16	-16	-38
IE*	34	-35	-31	-46
IS*	61	-11	-29	-37
IT*	42	1	-5	-29
LT	84	3	26	-3
LU*	80	26	28	16
LV*	73	-16	-18	-12
MT*	75	-10	-5	-7
NL	60	-15	-21	-31
NO	75	8	-13	-18
PL*	75	16	2	-21
PT*	87	49	45	28
RO*	65	-15	-20	-18
SE	74	-1	-1	-12
SI	93	3	8	2
SK*	73	4	-3	-16
UK*	81	2	-1	-5
EU27	67	1	-1	-16
EU-NONWIDE	72	4	3	-11
EU-WIDE	70	10	3	-13

Source: MORE4 EU HE survey (2019)
Notes:
- Negative values indicate a higher value than in R1, so more satisfaction.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- *=variables with more and with less than 30 observations
- (2019: n=9,321)

Differences in satisfaction with career perspectives between female and male researchers do not show clear trends across widening and non-widening countries. Female researchers are consistently less satisfied with career perspectives across career stages in the Czech Republic, Germany, France, Croatia, Italy, Latvia, Portugal and Romania.

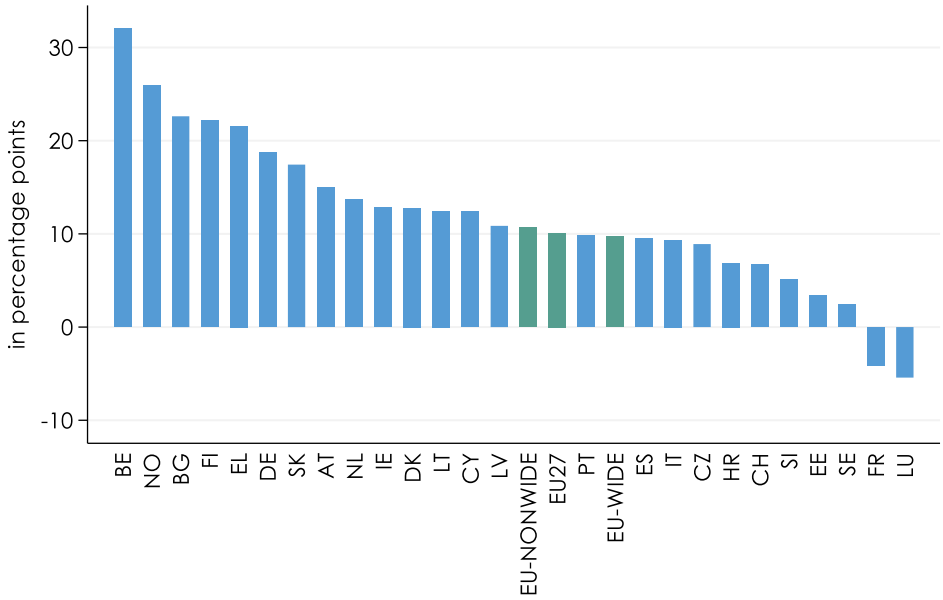
Table 33: Differences between male and female researchers in satisfaction with career perspectives across career stages, 2019

Country	R1	R2	R3	R4
AT*	-15	17	9	12
BE*	-5	19	11	24
BG*	49	-5	8	-9
CH*	6	-1	18	6
CY*		-12	14	2
CZ*	32	31	14	18
DE*	2	13	8	29
DK*	10	-3	8	17
EE*	-8	18	-2	-9
EL*	-35	24	-3	24
ES*	-9	2	7	2
FI*	-16	14	11	19
FR*	17	17	7	26
HR*	8	29	1	14
HU*	-30	14	14	0
IE*	-11	-16	5	21
IS*	1	-2	-5	-3
IT*	16	22	16	31
LT*	-27	-1	14	-5
LU*	10	6	-1	
LV*	42	9	4	16
MT*	-52	-24	5	7
NL*	23	-2	8	7
NO*	5	0	7	3
PL*	30	10	9	-4
PT*	9	11	9	13
RO*	43	5	22	4
SE*	22	-8	-3	2
SI*	10	0	7	-4
SK*	0	-32	8	12
UK*	14	34	13	-3
EU27	3	12	11	17
EU-NONWIDE	3	12	10	21
EU-WIDE	4	9	11	7

Source: MORE4 EU HE survey (2019)
Notes:
- Negative values indicate that a higher share of females compared with males is satisfied with career perspectives.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- *=variables with more and with less than 30 observations; **=all variables have less than 30 observations
- (2019: n=9,321)

Not surprisingly, researchers on fixed-term contracts are much less satisfied with career perspectives.

Figure 89: Difference in satisfaction with career perspectives between permanent and fixed term contacts, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- Negative values indicate higher levels of satisfaction with fixed-term contacts.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- *=variables with more and with less than 30 observations
- (2019: n=9,321)

The next table shows information on dissatisfaction with several career-related aspects from the researcher survey undertaken within this project. Columns are ranked in descending order according to the EU27 average. Highest dissatisfaction is perceived with the prospects for obtaining a tenured position (65% in the EU27), a full-time position, a leading position (58 and 57% resp.), the lack of a clear career path as well as opportunities for changing jobs outside or within the organisation (49-47%). Dissatisfaction with training and career guidance is comparatively lower at 35 and 24%. Researchers in non-widening countries are somewhat more dissatisfied with aspects such as obtaining a leading position (14pp difference) or a tenured position and the lack of a clear career path (about 5 pp).

The following Table 34 compares respondents from researchers working in higher education, NPO or other organisations with researchers working in firms. Although data need to be interpreted with caution, it is interesting to note that dissatisfaction with career aspects is much lower in firms, as regards e.g. the lack of a clear career path, obtaining a tenured, leading, or full-time position. Dissatisfaction is similar with opportunities to change jobs outside the organisation and with career guidance.

Table 34: Dissatisfaction with career aspects of contracts, academic and private sector researchers, 2021

Country	Obtaining a tenured position	Obtaining a full-time position	Obtaining a leading position	Clear career path	Changing job outside organisation	Changing job within organisation	Training	Career guidance
AT*	50	33	42	28	44	30	15	37
BE*	68	33	55	46	33	35	13	30
BG**	0		25	31	27	21	12	13
CY**	0	0	0	0	25	0	50	50
CZ*	50	67	48	33	47	44	21	38
DE	68	66	60	43	36	44	14	27
DK**	63	100	40	40	31	50	33	27
EE**	50	50	35	41	41	13	6	29
EL*	57	43	45	48	45	67	31	42
ES*	78	38	63	60	70	65	40	47
FI**	57	0	33	33	50	33	0	11
FR*	58	50	39	40	41	39	21	30
HR**	83	100	50	50	62	40	32	45
HU**	50	0	20	20	10	0	0	10
IE**	47	0	31	41	48	43	19	33
IT*	67	62	70	69	58	55	37	43
LT**	50	67	36	45	40	40	18	55
LU**	50	0	67	83	60	33	50	50
LV**	33	0	40	40	20	25	0	0
MT**	50		0	0	50	50	25	25
NL*	61	63	57	51	37	44	16	32
PL*	41	67	36	36	41	35	32	36
PT*	89	63	75	80	67	72	38	44
RO*	50	50	26	28	49	40	30	44
SE*	57	20	53	33	35	37	22	33
SI**	71	100	36	50	62	55	20	50
SK*	54	67	33	28	38	33	27	31
EU27	65	58	53	47	46	46	24	35
EU-NON WIDE	67	58	57	49	45	47	22	34
EU-WIDE	62	57	43	44	47	44	28	37

Source: Researcher survey (2021)
Notes:
- Based on question B1: "Please indicate your satisfaction with each factor as it relates to your current position/employment"
- Obtaining a tenured position: only respondents who don´t have a permanent contract
- Obtaining a full-time position: only respondents who don´t have a full-time position
- *=variables with more and with less than 30 observations; **=all variables have less than 30 observations
- (2021: n=1-1,468)

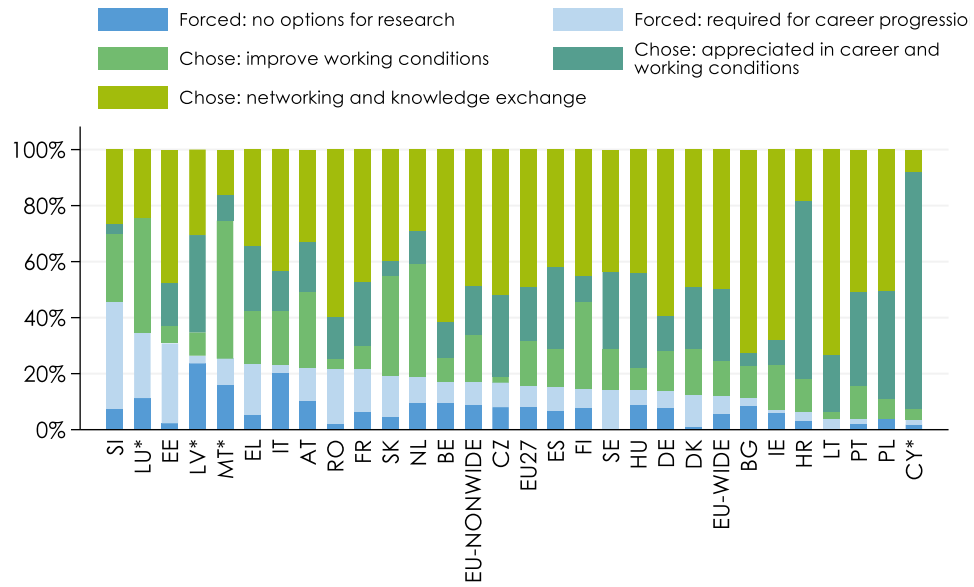
Table 35: Dissatisfaction with career aspects of contracts, researchers in higher education/NPO/other organisation vs. researchers in firms, 2021

Country	Clear career path		Obtaining tenured position		Obtaining a leading position		Obtain-ing a full-time position		Changing job within organisa-tion		Changing job outside organisa-tion		Career guidance	
	HE/NPO/other	Firm	HE/NPO/other	Firm	HE/NPO/other	Firm	HE/NPO/other	Firm	HE/NPO/other	Firm	HE/NPO/other	Firm	HE/NPO/other	Firm
AT/****	40	0	67	0	60	9	50	0	24	40	37	63	35	40
BE*/**	47	44	72	0	61	39	33		38	28	34	31	29	32
BG/****	33	25		0	25	25			30	0	18	50	18	0
HR/****	53	33	83		47	67	100		41	33	67	33	53	0
CY**	0		0		0		0		0		25		50	
CZ*/**	34	0	52	0	50	0	67		46	0	48	0	39	0
DK/****	57	25	80	33	71	13		100	67	38	33	29	43	13
EE/****	50	0	50		43	0	50		17	0	36	67	36	0
FI/****	38	0	57		38	0	0		33		57	0	13	0
FR*/**	41	36	63	20	40	38	50		40	38	39	50	30	29
DE/*	44	33	69	36	62	34	67	57	46	23	35	42	27	32
EL*/**	50	0	57		46	0	50	0	70	0	47	0	40	100
HU/****	33	0	50		33	0		0	0	0	0	25	17	0
IE/****	48	17	50	33	35	17	0		53	17	53	25	38	17
IT*/**	71	62	69	33	72	62	73	0	58	42	61	44	41	50
LV**	40		33		40		0		25		20		0	
LT/****	56	0	50		44	0	67		50	0	50	0	67	0
LU**	83		50		67		0		33		60		50	
MT**	0		50		0				50		50		25	
NL/****	63	20	65	0	62	44	83	0	44	43	37	38	36	20
PL*/**	41	0	47	0	41	0	67		40	0	45	17	41	0
PT/**	79	100	88		74	100	63		72	50	67	50	42	100
RO*/**	24	67	50	50	23	67	50		38	67	50	33	42	67
SK*/**	28	33	52	100	33	33	67		33	33	37	67	31	33
SI/****	50	50	71		42	0	100		50	100	64	50	46	100
ES*/**	63	44	76	89	66	48	43	0	66	63	70	73	47	48
SE*/**	37	17	57		57	33	20		46	0	36	33	37	17
EU27	49	34	67	38	55	36	61	29	48	33	46	44	35	32
EU-NON WIDE	51	37	69	39	61	39	61	33	49	36	45	47	33	34
EU-WIDE	45	24	62	38	45	24	60	0	46	19	48	35	39	21

Source: Researcher survey (2021)
Notes:
- Based on question B1: "Please indicate your satisfaction with each factor as it relates to your current position/employment" and question A2: "Which type of organisation do you work for?"
- Obtaining tenured position: only respondents who don´t have a permanent contract
- Obtaining a full-time position: only respondents who don´t have a full-time position
- *=variables with more and with less than 30 observations; **=all variables have less than 30 observations; Asterisk in front of the slash indicates the observation for the HE/NPO/other sector and behind the slash for private sector – firm

A different way to look at satisfaction with career perspectives is to examine whether international mobility was forced or chosen. The figure below indicates that on average, international mobility is chosen rather than forced by about 80 to 20%; researchers from non-widening countries are somewhat more likely to state that they had to become mobile in order to stay in research, consistent with the data presented above on different labour markets for researchers in non-widening vs widening countries.

Figure 90: Escape, expected and exchange mobility, by country of citizenship, academic researchers, 2019

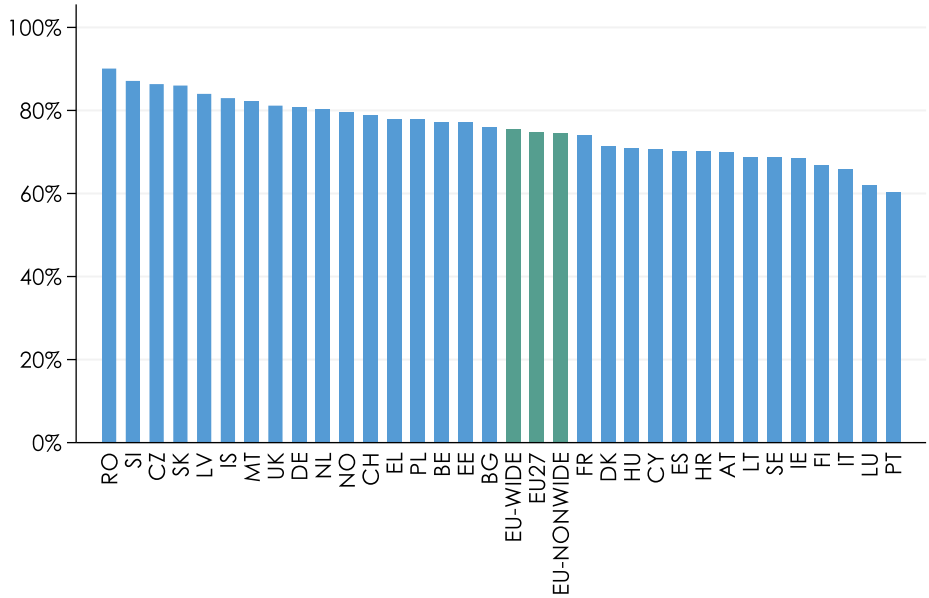


Source: MORE4 EU HE survey (2019)
Notes:
- Only R2, R3 and R4 researchers who were >3 month mobile in the last ten years.
- Share of researchers who have been >3 month mobile in post-PhD career and that experienced a specific degree of freedom in their decision to become mobile.
- Based on question 72: "Which of the following situations would you say is most applicable to your last instance of mobility?"
- (2019: n=1,573)

4.6.5. Transparent career paths, merit-based career progression

This subsection presents data on whether career paths are transparent, career progression is merit-based and whether obtaining tenure based on merit only is common practice. The first figure on whether researchers agree that career paths are clear-cut and transparent shows little difference between widening and non-widening countries. Across career stages, some countries show a marked dip in the R2 stage, but there is no pronounced general trend across countries.

Figure 91: Agreement with statement that career paths are clear-cut and transparent, academic sector, 2019



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”
-(2019: n=8,540)

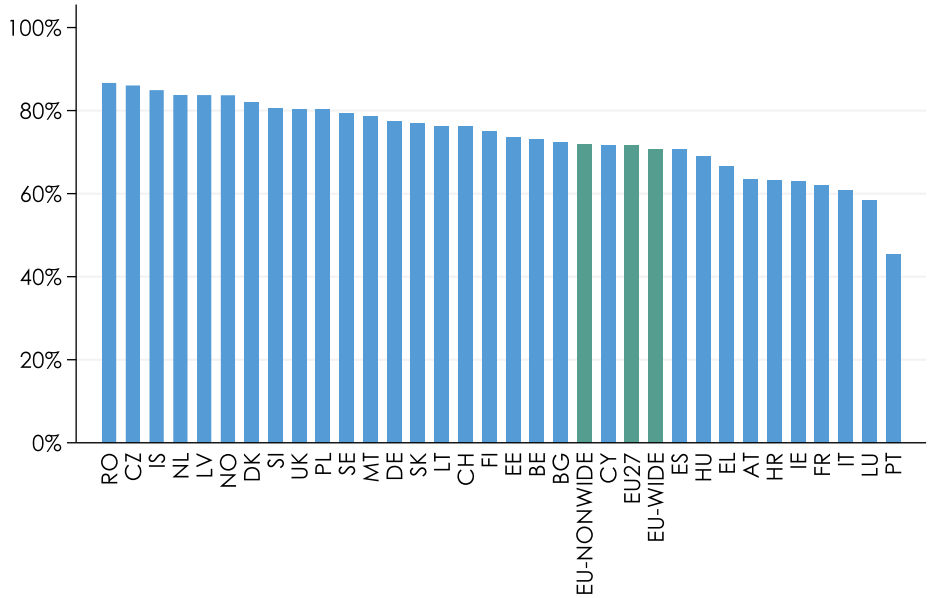
Table 36: Clear-cut and transparent career paths by career stage, 2019

Country	R1	R2	R3	R4
AT	78	54	70	74
BE	75	65	82	84
BG*	61	82	75	82
CH	80	79	76	82
CY*	57	63	70	77
CZ	81	80	86	92
DE	81	80	76	87
DK	65	60	68	86
EE*	84	73	72	86
EL*	72	71	77	80
ES*	68	52	77	64
FI*	50	53	62	82
FR	84	68	71	77
HR*	63	63	72	72
HU*	70	55	70	78
IE*	54	64	66	81
IS*	94	61	77	89
IT*	48	54	65	72
LT	56	69	62	83
LU*	78	59	60	46
LV*	74	83	91	81
MT*	79	96	81	80
NL	72	80	80	85
NO*	69	66	83	85
PL*	79	66	75	90
PT*	49	58	60	71
RO*	82	94	89	89
SE	62	65	68	74
SI	89	91	84	87
SK*	81	88	85	89
UK*	75	87	80	82
EU27	75	71	73	80
EU-NONWIDE	76	71	73	78
EU-WIDE	69	70	73	84

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”
- *=variables with more and with less than 30 observations
-(n=8,540)

In a similar vein, there are few pronounced differences on average between widening and non-widening countries with respect to the assessment of whether career progress is merit based. Here, idiosyncratic country career systems/higher education systems seem to drive the results. Across career stages (following table) some countries show again the "post-doc" depression in stage R2, but it is not happening in every country.

Figure 92: Career progression is merit based, 2019



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)

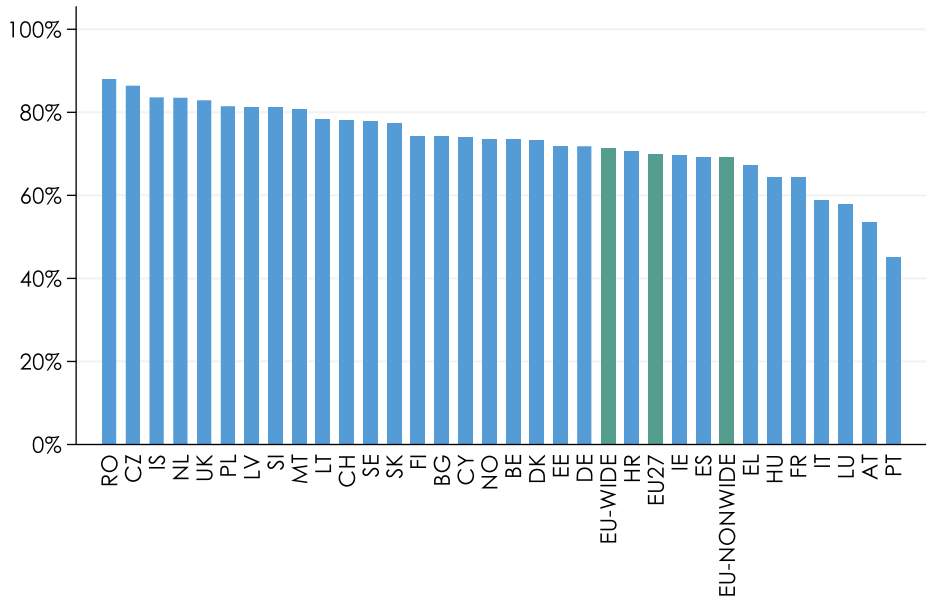
Table 37: Merit-based career progression by career stage, 2019

Country	R1	R2	R3	R4
AT	75	50	58	69
BE	74	62	75	78
BG*	75	75	72	72
CH	85	68	75	79
CY*	37	59	72	79
CZ*	81	82	88	86
DE	82	79	73	79
DK	71	76	81	90
EE*	83	71	66	86
EL*	46	60	64	70
ES*	80	64	74	64
FI*	69	71	70	83
FR	80	56	55	68
HR*	60	52	63	68
HU*	78	55	67	73
IE*	48	57	65	67
IS*	89	61	82	89
IT*	25	60	60	67
LT*	76	74	68	88
LU*	86	59	42	53
LV*	84	82	90	77
MT*	77	96	80	71
NL	77	83	82	90
NO*	78	67	87	86
PL*	64	71	80	90
PT*	40	41	46	52
RO*	86	91	83	87
SE	65	91	80	79
SI	89	85	76	79
SK*	69	85	71	86
UK*	83	84	77	86
EU27	75	71	69	75
EU-NONWIDE	77	72	69	74
EU-WIDE	65	66	69	78

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”
- *=variables with more and with less than 30 observations
-(n=8,540)

Finally, an almost identical picture results from the question on whether obtaining tenure based on merit is commonplace.

Figure 93: Obtaining a tenured position based on merit is commonplace, 2019



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 38: Obtaining a tenured position is based on merit, by career stage, 2019

Country	R1	R2	R3	R4
AT	68	40	53	55
BE	66	56	75	89
BG*	59	82	76	71
CH	90	69	76	80
CY*	17	64	74	82
CZ*	91	80	86	90
DE	73	80	65	71
DK	63	57	73	84
EE*	74	74	62	89
EL*	64	57	65	70
ES*	73	64	73	64
FI*	64	67	68	85
FR*	72	56	61	70
HR*	55	60	75	71
HU*	69	51	61	73
IE*	23	66	70	82
IS*	77	56	83	90
IT*	30	44	61	61
LT*	67	86	72	86
LU*	76	56	52	48
LV*	90	82	87	73
MT*	75	96	81	75
NL	72	87	81	90
NO*	68	74	77	72
PL*	64	74	81	89
PT*	40	44	43	54
RO*	61	95	87	85
SE	63	79	80	79
SI	87	92	72	82
SK*	68	80	75	84
UK*	80	84	81	87
EU27	69	70	68	73
EU-NONWIDE	70	71	67	71
EU-WIDE	63	68	69	78

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”
- *=variables with more and with less than 30 observations
-(n=8,540)

4.7. Social Dimension

In this section we present evidence on social aspects of employment contracts in research, among them general provisions and regulations for employment contracts and evidence on forms of unacceptable social behaviour.

4.7.1. General provisions and regulations for employment contracts

EU minimum requirements for labour law/employment contracts contain several provisions which provide a legal basis for protection against certain forms of discriminatory behaviour. E.g., it is illegal to discriminate against someone because of their:

- Gender
- Racial and ethnic origin
- Religion and belief
- Disability
- Sexual orientation
- Age

These six areas of discrimination are included in the Amsterdam Treaty of the European Union as areas where the EU can act to prevent discrimination.[25] Moreover, non-discrimination is specifically mentioned in the European Charter for Researchers[26]:

"Employers and/or funders of researchers will not discriminate against researchers in any way on the basis of gender, age, ethnic, national or social origin, religion or belief, sexual orientation, language, disability, political opinion, social or economic condition."

For the protection against unfair dismissal as well as collective dismissal, we use the recently updated OECD employment protection database (2019). For 22 EU countries, the database provides indicators among others on the regulatory framework for unfair dismissals and the enforcement of unfair dismissal regulation[27], for both individual and collective dismissals. This will be more relevant for researchers in firms as their employment contracts may more often be standard employment contracts, different to e.g. tenured contracts in academia.

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[25] https://ec.europa.eu/social/main.jsp?catId=158&langId=en

[26] https://euraxess.ec.europa.eu/jobs/charter/european-charter#custom-collapse-1-non-discrimination

[27] https://www.oecd-ilibrary.org//sites/1686c758-en/1/3/3/index.html?itemId=/content/publication/1686c758-en&_csp_=fc80786ea6a3a7b4628d3f05b1e2e5d7&itemIGO=oecd&itemContentType=book#tablegrp-d1e24327

Table 39: OECD indicators on employment protection legislation (unfair dismissals)

Dimension	Indicators
Regulatory framework for unfair dismissals	• *Definition of unfair dismissal* • *Length of trial period (i.e. the initial period during which unfair dismissal claims cannot be made)* • *Compensation to the worker following unfair dismissal* • *Possibility of reinstatement following unfair dismissal*
Enforcement of unfair dismissal regulation	• *Maximum time to make a claim of unfair dismissal* • *Burden of proof when the worker files a complaint for unfair dismissal* • *Ex-ante validation of the dismissal by an external authority* • *Pre-termination resolution mechanism granting unemployment benefits*

Another set of indicators measures hiring practices of temporary workers[28], which is particularly relevant for early stage researchers who often have to go from one fixed-term contract to the next.

Table 40: OECD indicators on employment protection legislation (hiring of temporary workers)

Dimension	Indicators
Hiring of temporary workers on fixed-term contracts	• *Valid cases for use of fixed-term contracts* • *Maximum number of successive fixed-term contracts* • *Maximum cumulated duration of successive fixed-term contracts*

These data are not specific for researchers but capture the general regulatory framework of a country. However, researcher-specific websites providing information on employment contracts, social security etc., such as the Euraxess portals for the EU Member States, also refer in general to the standard regulatory frameworks for employment contracts, with few specificities for researchers (such as e.g. specific tax deductions for highly qualified international researchers).

Information on protection against unacceptable work practices can come from the European Working Conditions Survey (most recent data 2015, 2020 is in the field)[29], which we show below by highly-skilled clerical occupations as the closest proxy for researchers. It contains a question on being subject to adverse social behaviour. Protections against unacceptable behaviour (more precisely, violence and harassment) differ however widely

[28] https://www.oecd-ilibrary.org//sites/1686c758-en/1/3/3/index.html?itemId=/content/publication/1686c758-en&_csp_=fc80786ea6a3a7b4628d3f05b1e2e5d7&itemIGO=oecd&itemContentType=book#tablegrp-d1e24588

[29] https://www.eurofound.europa.eu/data/european-working-conditions-survey?locale=EN&dataSource=EWCS2016&media=png&width=740&question=y15_Q88&plot=euBars&countryGroup=linear&subset=agecat_3&subsetValue=All

across countries, due to an idiosyncratic mix of policies and regulations[30]. This is a general point which concerns the analysis of employment contracts or employment legislation: according to a European Semester thematic factsheet on employment protection legislation, "rules and procedures may be enshrined in [three different sources], law or in collective or individual labour contracts. The effective-ness of employment protection also depends on additional factors including court interpretations of legislative and contractual provisions."…

"Employment protection legislation is usually the result of complex legislative and non-legislative frameworks. As such, there is no 'one-size-fits-all' approach and the policy response to challenges in this area should be tailored to each country's specificities. Moreover, employment protection legislation should be considered as part of a broader institutional framework which includes social protection systems, active labour market policies and access to lifelong learning."

In addition, "protection legislation mostly reflects different legal and institutional traditions. In countries with civil law traditions such legislation is usually regulated by law, while in common law countries it relies more on private contracts and dispute resolution. In the latter countries courts have ample judicial discretion while in the former legislation plays a greater role." [31]

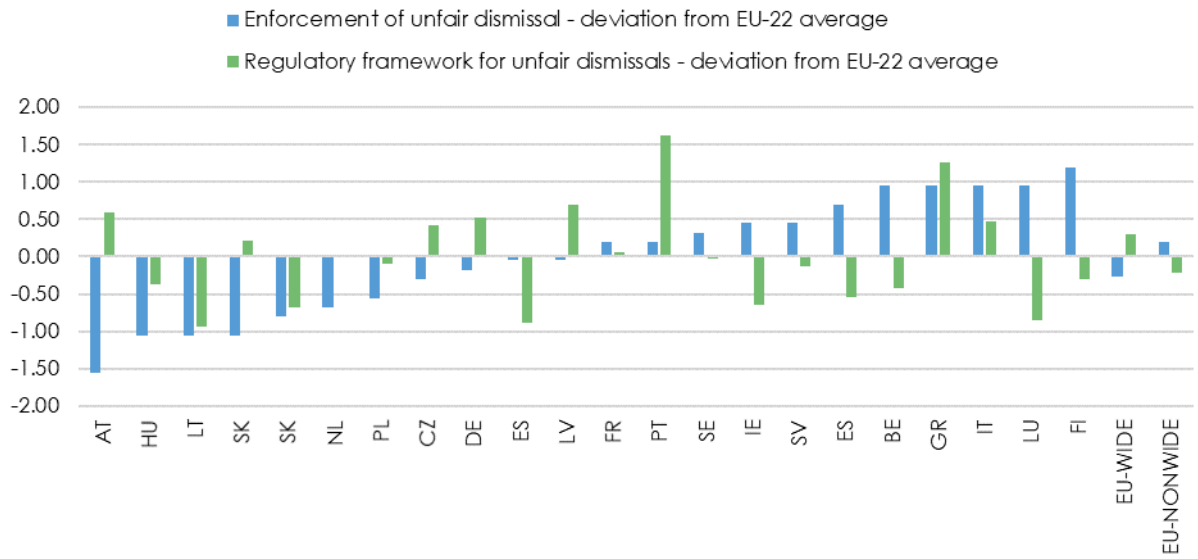
A general mapping of individual researcher contracts beyond the information outlined above would hence be a daunting exercise, as different firms in different sectors, and different research institutions may use different contracts. Within institutions, there may be civil servant employment contracts and standard employment contracts co-existing.

The figure below shows strictness of regulation of unfair dismissals by OECD employment legislation indicators. The more negative the number, the more liberal/the less restrictions are placed on unfair dismissals. On average, widening countries are more liberal regarding enforcement of stipulations relating to unfair dismissal, while their regulatory framework per se is stricter than the one from non-widening countries.

[30] https://www.eurofound.europa.eu/publications/report/2015/violence-and-harassment-in-european-workplaces-extent-impacts-and-policies

[31] European Semester thematic factsheet on employment protection legislation, European Commission, p. 1.f

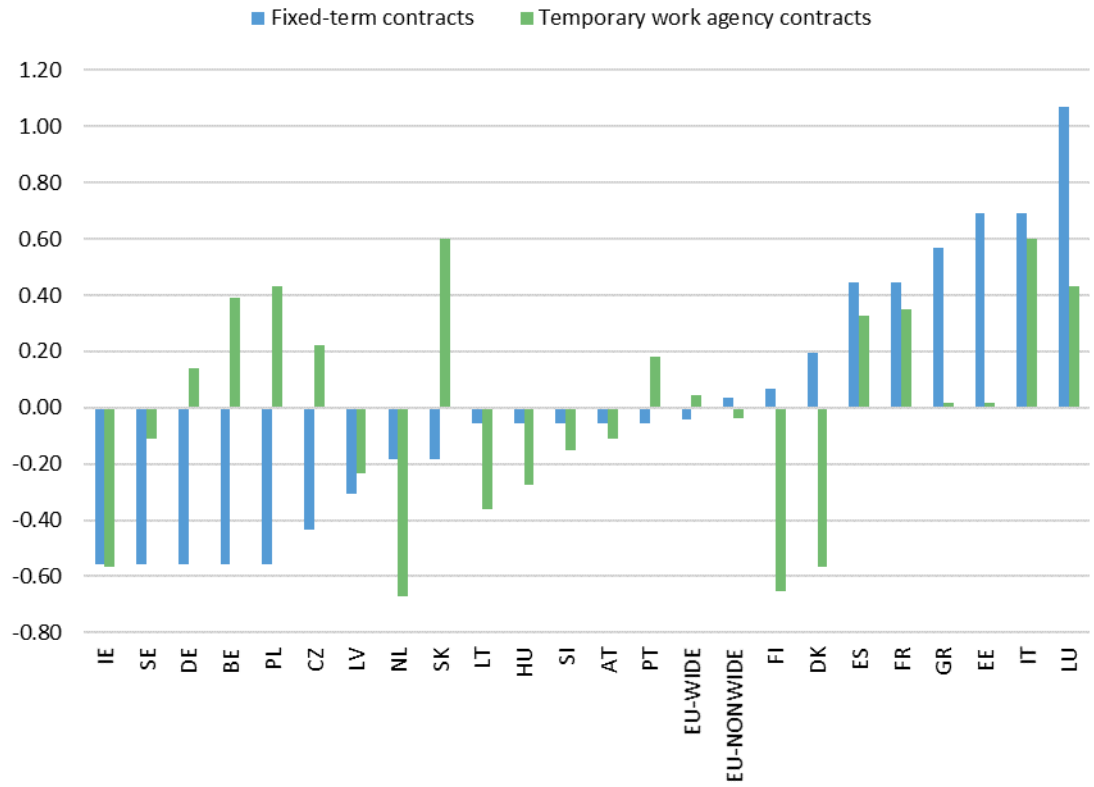
Figure 94: OECD employment protection legislation indicators, 2019



Source: OECD Employment Protection Legislation Database, 2020 edition.

Countries with liberal employment protection legislation tend to have also low regulation of fixed-term contracts, and vice versa – otherwise in countries with strict employment protection legislation, there would be dual labour markets with lots of fixed-term contracts used to avoid regular contracts. Countries with strict labour market protection can be found among both widening and non-widening countries, so that on average, there is little difference between the groups. However, there are large differences between countries with strict employment legislation (France, Spain, Greece, Italy…) and those with less strict employment legislation (Ireland, Sweden, Germany, Poland…). This may also contribute to explaining the varying use of fixed-term contracts for researchers in these countries.

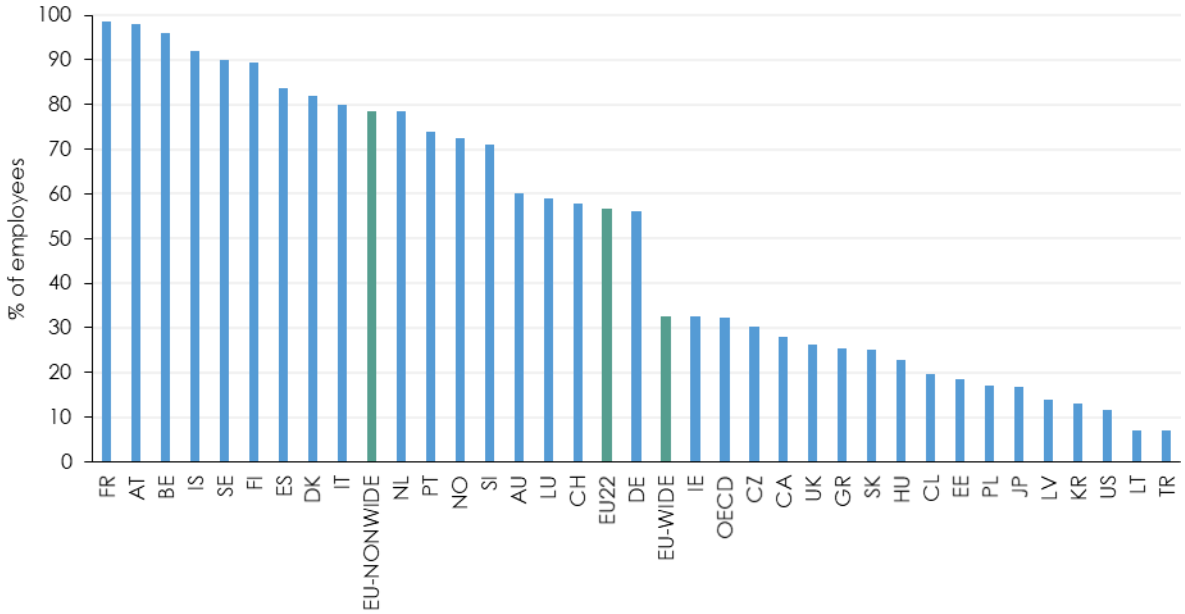
Figure 95: Regulation of hiring of fixed-term workers (directly or through temporary work agency contracts)



Source: OECD Employment Protection Legislation Database, 2020 edition.

For the private sector, collective bargaining agreements may include many stipulations on protection against discrimination or unacceptable social behaviour. Collective bargaining coverage differs a lot between countries, with non-widening countries much more likely to use widespread collective bargaining mechanisms than widening countries.

Figure 96: Collective bargaining coverage, 2016



Source: OECD Collective Bargaining Coverage.

4.7.2. Information on unacceptable social behaviour

We first present information from the European Working Conditions Survey, filtering science and engineering professionals as a proxy for resesearchers. The Survey collects responses on both discriminatory and other socially unacceptable behaviour, such as sexual harassment. The columns in the table below are ranked according to the EU27 average, in descending order. On average across the EU, science and engineering professionals report most often age-based discrimination, followed by bullying, sex-based discrimination and nationality- or race-based discrimination, where about 1% of respondents report having experienced such behaviour.

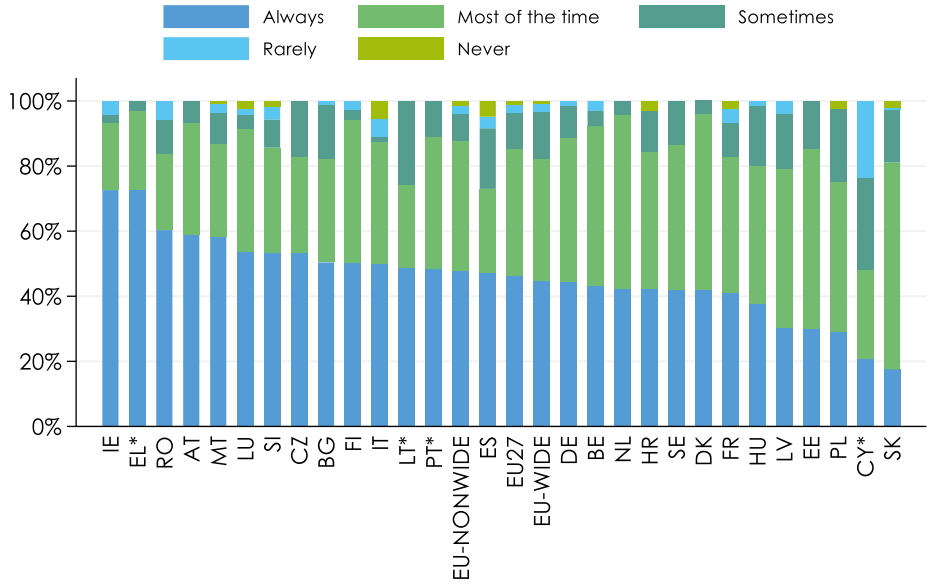
Table 41: Share of respondents who experienced discrimination or other unacceptable social behaviour, 2015

Country	Age discrimination	Bullying / harassment	Discrimination on the basis of your sex	Discrimination linked to nationality	Discrimination linked to race, ethnic background	Discrimination linked to disability	Discrimination linked to sexual orientation	Discrimination linked to religion	Physical violence	Sexual harassment
AT*	5.17	1.70	1.30	1.30	1.70	4.50	-	1.30	-	-
BE*	6.50	5.27	0.28	1.10	2.53	0.32	0.69	0.82	-	-
BG*	1.31	-	-	-	-	-	-	-	-	-
HR*	2.40	2.40	-	-	-	-	-	-	-	-
CY**	5.45	-	-	-	-	-	-	-	-	3.56
CZ*	2.69	5.66	-	0.85	-	-	1.51	-	-	-
DK*	1.20	5.21	1.14	2.07	-	-	-	-	-	-
EE*	10.52	2.53	2.30	5.48	-	-	-	-	-	-
FI*	5.80	2.20	5.99	1.53	2.72	-	1.53	-	-	-
FR*	2.55	8.93	1.94	0.78	1.59	1.60	-	1.59	-	-
DE*	2.84	6.94	5.08	0.61	0.61	1.06	1.07	-	-	-
EL*	3.37	-	3.45	-	-	-	-	-	-	-
HU*	3.75	-	6.38	-	3.00	4.00	-	-	-	-
IE*	0.90	3.70	-	-	-	-	-	-	-	1.83
IT*	10.22	3.85	1.63	-	-	-	-	-	3.85	-
LV*	-	3.27	-	-	-	-	-	-	-	-
LT*	-	-	-	-	-	-	-	-	-	-
LU*	4.62	12.24	5.49	6.78	5.76	1.01	-	-	2.57	-
MT*	0.45	7.33	0.68	2.13	-	-	-	-	-	-
NL*	3.86	2.19	-	-	4.00	-	4.00	7.28	2.19	-
PL*	-	-	-	-	-	-	-	-	-	-
PT*	-	-	-	-	-	-	-	-	-	-
RO*	13.59	-	11.73	2.40	2.42	7.76	4.04	4.07	-	-
SK*	1.59	0.65	-	-	-	0.94	-	-	-	-
SI*	0.80	7.63	5.03	0.72	0.72	-	-	-	0.42	-
ES*	5.46	4.25	2.43	0.36	-	-	1.13	-	-	0.24
SE*	9.60	3.31	8.08	-	-	-	-	-	-	-
EU27	4.21	4.12	2.66	1.09	1.06	0.79	0.61	0.53	0.33	0.13
EU-NONWIDE	4.98	5.16	2.83	1.17	1.49	0.65	0.72	0.67	0.54	0.13
EU-WIDE	3.16	2.71	2.42	0.98	0.48	0.99	0.45	0.35	0.05	0.13

Source: European Working Conditions Survey
Notes:
- Only Science and engineering (associate) professionals (ISCO-08: 21, 31)
- Based on question Q81 "And over the past 12 months, during the course of your work have you been subjected to any of the following?" and Question 72 "Over the past 12 months at work, have you been subjected to any of the following?"

Most countries show high shares of respondents reporting that they are always or most of the time treated fairly at work, there are however also respondents who clearly indicate to not being treated fairly.

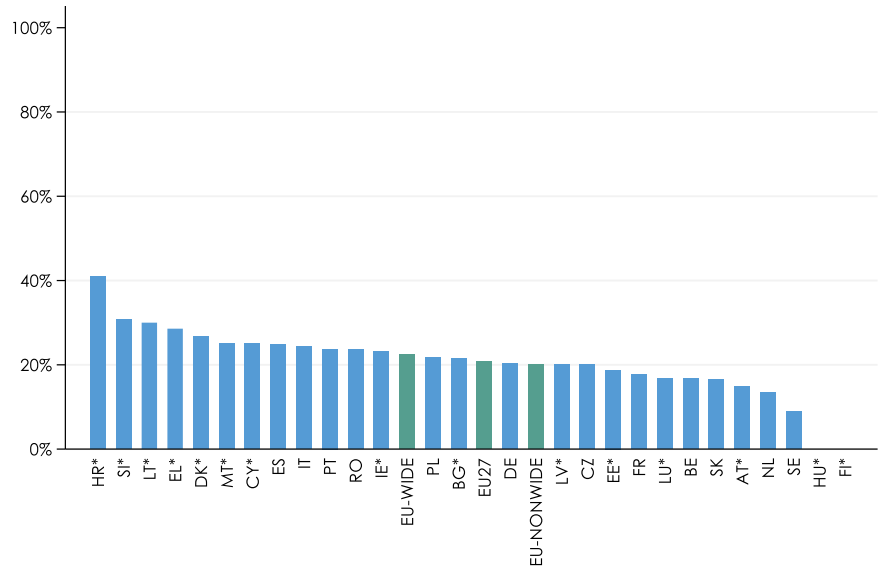
Figure 97: Treated fairly at work, 2015



Source: European Working Conditions Survey
Notes:
- Only Science and engineering (associate) professionals (ISCO-08: 21, 31)
- Based on question Q61 "For each of the following statements, please select the response which best describes your work situation"
- *=less than 30 observations

The researcher survey undertaken within this project asked respondents about whether they are dissatisfied with unacceptable social behaviour; on average, about 20% of respondents do so. Such behaviour seems to be more common in higher education institutions, NPO or other organisations by comparison with firms, but the low number of observations has to be borne in mind (Table 42).

Figure 98: Dissatisfaction with protection against unacceptable social behaviour per country, 2021



Source: Researcher survey (2021)
Notes:
- Based on question B1: "Please indicate your satisfaction with each factor as it relates to your current position/employment"
- *=variables with more and with less than 30 observations
- (2021: n=4-1,336)

Table 42: Share of dissatisfaction with social related factors, Higher education/NPO/other organisation vs. private sector: firm

Country	Protection against unacceptable social behaviour	
	HE/NPO/other	Firm
AT*/*	11	25
BE/*	21	5
BG*/*	30	0
HR*/*	47	0
CY*	25	0
CZ*/*	21	0
DK*/*	43	13
EE*/*	23	0
FI*/*	0	0
FR/*	17	21
DE	21	17
EL*/*	30	0
HU*/*	0	0
IE*/*	25	17
IT/*	24	25
LV*	20	
LT*/*	25	50
LU*	17	
MT*	25	
NL*/*	15	10
PL/*	25	0
PT/*	24	0
RO/*	26	0
SK/*	17	0
SI*/*	36	0
ES/*	23	32
SE*/*	11	0
EU27	22	15
EU-NONWIDE	20	18
EU-WIDE	24	3

Source: Researcher survey (2021)
Notes:
- Based on question B1: "Please indicate your satisfaction with each factor as it relates to your current position/employment"
- *= less than 30 observations; Asterisk in front of the slash indicates the observation for the HE/NPO/other sector and behind the slash for private sector – firm

In the open text answers, the form of unacceptable behaviour, but also other factors relating e.g. to careers, were sometimes further specified. In a total of 64 open text answers, responses relate to:

- Competitive stress ("the constant anxiety that you're not good enough" from Slovakia; "Huge stress, unfriendly competition at work, complete lack of interest displayed by the authorities, unfairness, lack of perspectives, lack of financing" from Poland), 3 text answers

- Behaviour of supervisors, 2 text answers
- Quality of employer ("Spain needs a structural reform in I+D. Universities are clientelar and outdated institutions.", "Quality of academic leadership and its compliance with University's charter and European-national and regional R&I strategic goals.", from Italy), 2 text answers
- Discrimination against foreigners ("Generalized non-acceptance of foreign researchers and abuse of their work." From Spain, "Racism against foreigners who are more qualified than locals" from Sweden, "Discrimination by German Institutions. Only Bio-German can make academic career or other." From Germany, "If your name is not western, and you are EU national, all the HE orgs will not accept you equally to the native Eu nationals. There is a big difference and no way to develop yourself in such so bad environment. The color is matter." From Netherlands), 5 text answers
- Age discrimination ("Age is discriminated, Over 60 are forced to stay at work but in practice, nobody wants us"), 1 text answer
- Career perspectives/quality of job/contract, 6 text answers
- Administrative delays by employer (lack of response, administrative burden), 2 text answers
- Access to research funding, 3 text answers

5. COUNTRY-LEVEL ANALYSIS: COUNTRY FICHES

The information presented in section 4 is in the following presented at the country level, using the list of indicators below. The country fiches themselves are in a separate file due to file size.

Table 43: Indicator list

Indicator	Relationship Precarity - Indicator	Labels	Data source
Contract context: Job availability		**Context**	
R&D expenditure per inhabitant, PPS	+	R&D expenditure per capita	Eurostat
Researchers per 1.000 of population	+	Researchers per 1.000 of population	Eurostat
Satisfaction with research funding	+	Satisfaction with research funding	MORE
Growth difference PhD graduates vs. R&D expenditures	-	Growth PhD graduates vs. R&D expenditures	
Temporal		**Temporal**	
Share of fixed-term contracts (academic sector)	-	Fixed-term contracts (academic sector)	MORE4 (academic only)
Share of fixed-term contracts (private sector)	-	Fixed-term contracts (private sector)	Researcher Survey (industry only)
Share of fixed-term contracts below the age of 35 (academic sector)	-	Fixed-term contracts below 35 (academic)	
Share of part-time contracts (academic sector)	-	Part-time contracts (academic)	MORE4 (academic only)
Share of part-time contracts (private sector)	-	Part-time contracts (private)	Researcher Survey (industry only)
Organisational		**Organisational**	
Satisfaction with research autonomy (academic sector)	+	Research autonomy (academic)	MORE4 (academic only)
Balance between teaching and research (satisfaction)	+	Teaching vs. research (academic)	MORE4 (academic only)
Work intensity (share of working to tight deadlines)	-	Work intensity (deadlines)	EWCS
Work intensity (Workdays with more than 10 hours)	-	Work intensity (10 hour workdays)	EWCS
Economic		**Economic**	
Share of researchers without contract (academic sector)	-	Researchers without contract (academic)	MORE4 (academic only)
Share of R1 researchers without contract (academic sector)	-	R1 researchers without contract (academic)	MORE4 (academic only)
Level of yearly net salary in PPS (academic&private, across all career stages)	+	Yearly net salary	SES, Researcher Survey, Pay scales, Country experts, Job Boards

Indicator	Relationship Precarity - Indicator	Labels	Data source
Relation to average economy-wide salary, index		Relation to average economy-wide salary	
Level of yearly net salary, PPS (academic, career stages R1&2)	+	Yearly net salary (academic, R1&2)	
Level of yearly net salary, PPS (academic, career stages R3&4)	+	Yearly net salary (academic, R3&4)	
Level of yearly net salary, PPS (private, career stages R1&2)	+	Yearly net salary (private, R1&2)	
Level of yearly net salary, PPS (private, career stages R3&4)	+	Yearly net salary (private, R3&4)	
Possibility of additional income sources	+	Additional income sources	Researcher Survey
Perception of remuneration (neither well nor reasonably paid)	-	Perception of remuneration	MORE q33
Perception of remuneration: academic sector pays worse than private sector	-	Perception of remuneration (academic vs. private)	MORE q35
Dissatisfaction with remuneration (private sector)	-	Dissatisfaction with remuneration (private)	Researcher Survey (industry only)
Dissatisfaction with salary progression (private sector)	-	Dissatisfaction with salary progression (private)	Researcher Survey
Satisfaction with job security (academic sector)	+	Satisfaction with job security (academic)	MORE q32
Satisfaction with pension plan (academic sector)	+	Satisfaction with pension plan (academic)	
Satisfaction with social security (academic sector)	+	Satisfaction with social security (academic)	
Career		**Career**	
Satisfaction with quality of training and education (academic sector)	+	Quality of training and education (academic)	MORE q32
Dissatisfaction with opportunities for training and development (private sector)	-	Training and development (private - dissatis.)	Researcher Survey
Career progression – time it takes to career stage R3 (established researcher) (academic sector)	-	Career progression – time to R3 (academic)	MORE4 q14-q18
Satisfaction with career perspectives (academic sector)	+	Satisfaction with career perspectives (academic)	MORE q32
Career paths are transparent and clear-cut (perception)	+	Transparent and clear-cut career paths	MORE4 data q38
Career progression is sufficiently merit-based (perception)	+	Merit-based career progression	MORE4 data q38
Tenured contract based on merit only is common (perception)	+	Tenure based on merit	MORE4 data q38
Dissatisfaction with research assessment (private sector)	-	Research assessment (private, dissatisf.)	Researcher Survey
Confidence in career prospects (academic sector)	+	Confidence in career (academic)	MORE q47

Indicator	Relationship Precarity - Indicator	Labels	Data source
Forced international mobility because of no options for research	-	Forced international mobility	MORE q78
Shape of the pyramid: Share of early career stage positions (R1/R2) in total (academic sector)	-	Share of R1&R2 (academic) - shape of pyramid	MORE4 data
Social		**Social**	
Strictness of regulations on hiring fixed-term workers	.	Regulations on hiring fixed-term workers	OECD employment protection legislation database
Collective bargaining coverage	.	Collective bargaining coverage	OECD
Treated fairly at work (perception)	+	Treated fairly at work	ECWS
Dissatisfaction with protection against unacceptable social behaviour (private sector)	-	Protection against unacc. soc. behaviour (private)	Researcher Survey

6. SUMMARY OF MAIN FINDINGS

Through a survey of the literature, we identified as potentially vulnerable groups of researchers the following:

- PhD-students without employment contracts
- PhD-holders, either
    - on fixed-term contracts (post-docs), without a perspective for a permanent position (due to e.g. career structures, cohort effects, low funding, a lack of awareness of careers in other sectors etc.), or
    - on early permanent positions in higher education systems with unclear career paths or non-merit based career progression criteria such as unfair staff appraisal systems
- All researchers, including in firms, suffering from low pay or other contract features (low pensions, minimal healthcare etc.), which may also be specific to regions within a country
- All researchers, including in firms, suffering from potential socially unacceptable (such as bullying or harassment) or discriminatory behaviour (e.g., linked to age, gender, nationality, ethnic origin…)
- International researchers from outside the EU, who on top of potential discrimination may suffer from unclear migration rules and bureaucratic uncertainty with regard to remuneration and social security benefits

In practice, EU countries are very heterogeneous, meaning that different groups of researchers can face different levels of precarity across countries in the EU. We first present information according to the dimensions examined (context for careers, 5 contract dimensions), before we look at overarching findings. A summary table with colour coding visually presents the most important information from the analysis at the end of the section.

6.1. Main findings by dimension of analysis

- Context: R&D spending, researchers and PhDs

The EU27 is characterised by large differences when it comes to R&D spending – by one measure, the gap between the top and the bottom country is equivalent to a factor of 17, i.e. the top country in the EU (Sweden) spends 17 times as much per capita than the bottom country (Romania), after adjusting for differences in power purchasing parities. This has implications for the amount of jobs in research – the differences in spending translate into different probabilities for becoming a researcher. Relative to population, a job as a researcher is about 7 to 8 times more likely in countries such as Sweden or Denmark vs. Romania. On average, non-widening countries spend 3 times more per capita than widening countries, and have 50% more researchers relative to population. The public and private sectors also take on different shares of funding/spending: the business sector spends a bit more than 20% of total R&D spent in Latvia, while in Germany and Belgium it is close to 70%, with implications again for career choices in research. Satisfaction with research funding by academic researchers is also higher in non-widening countries.

An important determinant of precarious careers is the balance between demand for and supply of researchers. Differences in growth between the number of PhD graduates and R&D spending show that on average, R&D spending in many widening countries grows much faster than the number of PhD-graduates (or even the number of new PhD-students), which is actually declining on average. This development should lead to a stronger labour market for researchers, reducing precarious careers. It is out of the scope of this report to

analyse the reasons for declining PhD-graduates in widening countries – whether due to funding of PhD-granting institutions, asymmetric mobility of PhD-students to non-widening countries, demographic reasons, etc.

- Temporal dimension: fixed-term and part-time contracts

Fixed-term contracts without the perspective of an ensuing permanent contract are a main reason for precarious careers, although researchers on fixed-term contracts are on average more satisfied with their research autonomy and balance between time for teaching and time for research, presumably because they are grant-funded. Involuntary-part time may lead to salaries too low to make ends meet. On average, fixed-term contracts are more frequent in non-widening countries than in widening countries, by about 10pp (27 vs 17) across career stages. Below the age of 35, differences are even more pronounced, with academic researchers below 35 in non-widening countries twice as likely to be on fixed-term contracts than their counterparts in widening countries (86 vs. 43%). This difference arises also because some widening countries show high shares of fixed-term contracts at later career stages (e.g., Latvia, Lithuania and Slovakia), whereas fixed-term contracts in non-widening countries are mainly a feature of the PhD and post-doc stages (R1 and R2 career stages). There is a steep decrease in the share of fixed-term contracts from the career stage R3. Of course, this does not mean that all R2 researchers transition to a permanent contract – many will also exit the academic career. Over time, on average the share of researchers on a fixed-term contract has gone down in the EU, from 34% in 2012 to 20% in 2019.

It needs to be pointed out that the existing survey data on fixed-term contracts do not provide information on whether researchers have a perspective for a tenured contract, or whether their current fixed-term contract comes in addition to previous fixed-term contracts and how long their total time on a fixed-term contract has been.

Fixed-term contracts for researchers in the private sector are much less frequent as judging by data from the Structure of Earnings Survey and online job boards: according to SES, around 8% of researchers in the private sector are on a fixed-term contract (vs. over 40% for academic researchers on average in the EU). Part-time contracts are much less frequent than fixed-term contracts on average in the EU, at close to 9% for the academic sector, and the information on whether they are voluntary or not is unfortunately missing.

- Economic Dimension

A first important aspect of the economic dimension is having a contract at all (with corresponding remuneration, a pension and social security benefits). While most (98%) of academic researchers across career stages do have a contract, in the R1 stage (PhD students) this is often not the case, e.g. in some widening countries such as Poland (75%) or Slovakia (46%); on average, 28% of R1 researchers do not have a contract in the widening countries, vs. 6% in the non-widening countries.[32] According to the Charter for Researchers, all researchers above the Master level – so also PhD-students - should in principle be regarded as professionals and hence receive an employment position with a contract.

The information on salaries collected within this report leads to a relatively clear picture with regard to their levels: net salaries, adjusted for differences in purchasing power, are higher in most non-widening countries compared with widening countries (on average, on an index basis with EU=100, non-widening countries are at 124 and widening countries at 82 (difference of 42 index points). Interestingly, differences in the private sector are higher than in the academic sector (25 index points for later academic career stages R3 & 4, 36 for early academic career stages R1 & R2; 46 and 43 for the respective career stages in

[32] Data refer to responses on employment contracts. No information is available on stipends or fellowships, which may provide a contribution to living costs (but usually don't come with pension contributions etc.).

the private sector). Over time (4 years, 2014 vs. 2018) there is a slight convergence effect of 2 index points, which if trends continue, would mean that salary levels still have some way to go before they converge on average between non- and widening countries. Over 80% of researchers / employers in the EU state that there are minimum salary levels in their organisation.

A high share of 54% of academic researchers in widening countries perceive to be neither well nor reasonably paid, vs. 23 in non-widening countries: that means that more than half of researchers in widening countries perceives to be paid just sufficiently to make ends meet or to be badly paid. Researchers in the private sector in the widening countries more often are dissatisfied with their remuneration as well. More than 60% of employers in non-widening countries perceive their remuneration package to be competitive with the ones from high-income EU countries, vs. only slightly more than 20% of employers based in widening countries. Salaries in industry are on average higher in most countries (this is matched by perceptions of academic researchers in the MORE survey), and researcher salaries are higher than economy-wide average salaries (exception: Ireland). Without correction for purchasing power, differences are considerably higher and this may play a role when researchers compare their salary across countries. In general, as researcher salaries are on average higher than economy-wide salaries, cross-country differences in salaries may be less an issue of precarious researcher careers and more one of asymmetric mobility/brain drain.

Note though that the MORE surveys have over the years consistently found that academic researchers do not indicate salary as a main motive to become mobile, it is much rather differences in research conditions such as career progression, working with leading scientists and research autonomy which make researchers move. However, low salaries in combination with poor research conditions are certainly a combination which can incentivise asymmetric mobility of researchers.

Although salaries are lower in widening countries, researchers there have on average more additional income sources (59%) than researchers in non-widening countries (35%), related inter alia to bonus payments for winning grants, or higher salaries in the wake of grants, which e.g. Hungary practices. Such additional income can amount on average in the widening countries to 20% of the base salary, vs. 10% in the non-widening countries, it would hence not fully compensate for the differences in salary levels. Moreover, salaries are somewhat more often determined by pay scales in non-widening countries, giving more leeway for individual negotiations or specific salary provisions in grant funding schemes, to pay more according to performance, e.g. However, such additional non-standard income sources can also be difficult to predict and hence contribute to increased economic uncertainty.

The economic dimension also looked at the satisfaction of academic researchers with the security of their jobs, their pension plan and social security benefits. Across the EU, researchers are mostly satisfied with their job security at 87%. Satisfaction with pensions diverges much more across countries, mostly along the lines of widening vs. non-widening countries, (e.g. 56% of researchers in Croatia, 39% in Greece vs. 95% in Denmark are satisfied with their pension). Similar, but less pronounced differences can be seen in the perception of social security benefits.

- Career dimension

Interestingly, differences between widening and non-widening countries on the various (academic) career dimensions of contracts are not pronounced for several aspects. This points to differences which are not rooted in differences of economic development, but in structures of higher education systems.[33] However, if researchers are asked which one

[33] See for a discussion of the various „models" of higher education the MORE4 EU HEI survey, with e.g. the traditional German ‚Humboldtian' model, which is also roughly in place in some Eastern European countries,

aspect of their job they would improve if they could, 20% of researchers in the non-widening countries mention obtaining a tenured position, vs. only 6% in the widening countries (by contrast, about 22% of researchers in the widening countries would improve their salaries, vs. only 12% in non-widening countries).

Satisfaction with training is somewhat higher in both the academic and the private sector in the non-widening countries. By contrast, forced international mobility is higher in non-widening countries on average, although there are also widening countries with high values there (e.g., Slovenia, 45% of researchers with Slovenian citizenship who have become internationally mobile indicate that they had to do so for a lack of options). Moreover the share of early stage researchers in all researchers in the academic sector is higher in non-widening countries (30 vs. 23%), indicating a shape of the "pyramid" with more researchers beginning at the bottom and a lower share making it to the top or a permanent contract. This holds particularly for Belgium (44%), Luxemburg (51%) and Germany (41%).

The satisfaction with career perspectives in the academic sector is particularly low in Southern European countries/countries with state-centralised systems such as Portugal (45%), Italy (53%) and France (58%) and particularly high in some former transition countries (Czech Republic, Latvia and Slovenia 85-88%). Satisfaction with tenure or career progression based on merit is also particularly low in Portugal (45%), followed by Luxemburg, France, Italy and Austria. Overall confidence in the future career as an academic researcher is also comparatively low in Italy, Portugal and France, at 64-71%. Note that the overall career dimension for researchers needs to be assessed together with career opportunities in sectors outside academia. E.g., positions in research in industry are much more frequent in countries spending relatively more on business R&D.

- Organisational dimension

Satisfaction with the balance between the time for teaching and the time for research is substantially higher in the non-widening countries (76 vs. 60% in widening countries), and a little bit higher regarding research autonomy. A high share of teaching is also something less relevant for the precarity of careers, than for the attractiveness of conditions for research and hence more for brain drain of researchers towards institutions with better conditions for research. Work intensity as measured by the frequency of working to tight deadlines is similar between the countries, while the number working days with more than 10h seems to be higher on average in the non-widening countries (51 to 37%).

- Social Dimension

Regulation of hiring practices – e.g., rules on and enforcement of dismissal of fixed-term workers – is measured by OECD indices, indicating whether regulations are more or less strict (whether it is easier or more difficult to dismiss fixed-term workers, e.g.). However, these rules have to be seen in context with overall employment protection legislation and labour market flexibility. Countries with strict employment protection legislation for permanent contracts also need strict rules for fixed-term contracts, otherwise the latter would be used too much by employers. There is hence no easy "good vs. bad" and the report refrains from a normative assessment on matters of regulation.

As regards protection against discrimination, in principle it is legally enshrined in the Amsterdam Treaty and figures also in the European Charter for Researchers. In the European Working Conditions Survey, Science and Engineering Professionals do report having experienced various forms of discrimination or socially unacceptable behaviour, most often discrimination based on age and bullying or harassment (at about 5% of respondents). Gender-based discrimination follows behind at 2,6% on average in the EU.

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contrasting with more centralised Southern European systems, or again more hierarchically flatter and flexible systems in the Scandinavian countries or in the Netherlands.

Other forms are at or below 1% on average, such as discrimination linked to ethnic background, disability, sexual orientation etc. At the country level, particularly Romania and Luxemburg show higher levels in various forms; in the Netherlands 7,3% report discrimination linked to religion.

In general, close to 50% of respondents to the European Working Conditions Survey indicate that they are always treated fairly at work, the sum of always and most of the times is above 80% on average for the EU, with about 10-15% treated only sometimes fairly.

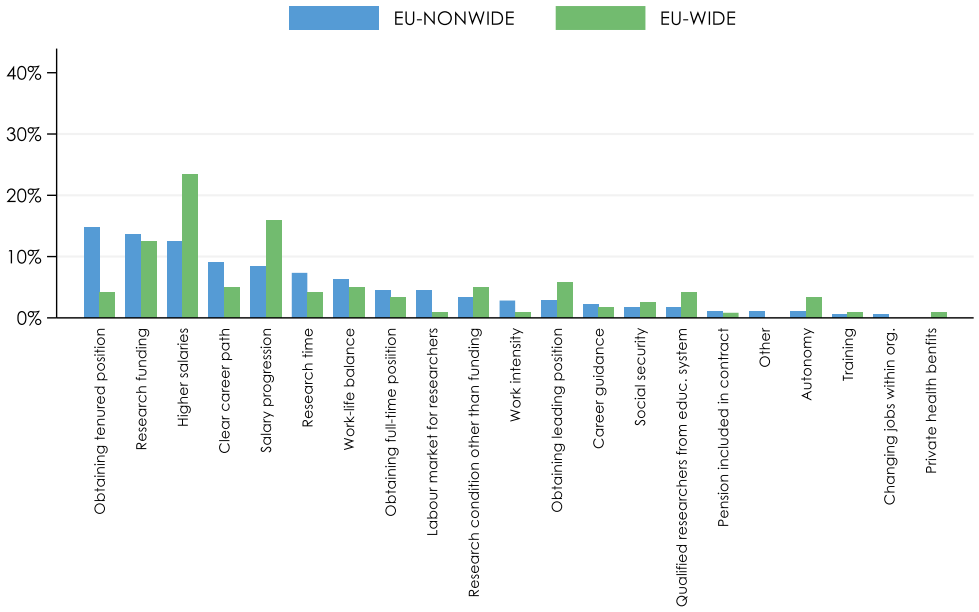
In the researcher survey, a similar share of about 22% indicate that they are dissatisfied with the level of protection against unacceptable social behaviour on average in the EU27, in the open text response options respondents complain about among others about the behaviour of supervisors, discrimination against non-nationals and age, although these statements are not very frequent.

6.2. Overarching findings

Overall, researchers in EU widening countries perceive more often less satisfaction with salaries, research funding, and the teaching-research balance, which is backed up by real data on salaries and research funding. By contrast, the main issues for researchers in non-widening countries are the higher share of fixed-term contracts in the early career stages, or the probability to obtain a tenured contract. This view is supported by employers of researchers[34], who cite remuneration and funding issues particularly in widening countries, and career issues particularly in non-widening countries as a reason not to find suitable candidates or as general problems of the research system in their countries. The figure below illustrates this finding with responses from employers on what would help them most with recruiting or retaining qualified researchers: employers in non-widening countries cite obtaining a tenured position and a clear career path much more often than employers in widening countries, for whom salaries and salary progression is the main issue. On average, employers from widening countries struggle more though to recruit or retain both junior and senior researchers.

[34] Note that the employer survey had lower response rates and for some countries there are no employers at all, the findings are however consistent with other data presented in the report (see section 8.2.2 on methodology).

Figure 99: Most useful solutions to help employers with recruiting or retaining researchers, 2021



Source: Employer survey (2021)
Notes:
- Based on question B9: "Which of the following solutions would be most useful to help your organisation in recruiting or retaining appropriately qualified researchers?"
- Only respondents who indicate that the organisation struggles to recruit or retain qualified researcher (Question B1&B5: "Does your organisation struggle to recruit or retain appropriately qualified junior/senior researchers for open positions in research?")
- EU-WIDE, EU-NONWIDE: average over available EU countries
- (2021: n=120; 177)

Researcher labour markets in the non-widening countries seem to be characterised by a more competitive setting, induced by higher supply (both domestic and from abroad) of researchers who compete for the tenured positions available. This is consistent with the data presented in the section on context, with higher number of researchers relative to the population size. There is a "thicker" labour market of researchers in non-widening countries, or a relatively higher supply relative to demand (a buyers' market), even though there is also a much higher demand for researchers in non-widening countries. This is a stylised finding for country averages; a detailed picture for every country is in the summary table below, or in the country fiches in section 5. E.g., countries such as Italy or Spain have a limited number of jobs at the junior level, leading researchers to go abroad (see the report from work package 8).

The restriction perceived most often which researchers perceive at close to 40% is that their **working conditions lead them to avoid engaging in high-risk research projects**, which is a worrisome finding for the European Union. Challenges such as the twin transition ask for high-risk, novel approaches to finding solutions. Precarity in careers is hence clearly linked to research productivity/performance, as confirmed by the literature (Petersen et al., 2012) – in particular, fixed-term contracts without the perspective of a permanent contract lead to risk aversion, as researchers have to have some publication output to be able to apply for the next position.

Precarity may also be linked with issues of brain drain, because a concentration of junior researchers in research-intensive countries can contribute to a higher number of precarious fixed-term contracts there for these researchers. A combination of low salaries and weak research conditions (e.g. low funding, too much teaching) can lead researchers abroad who may already leave at the Masters level to get training at institutions seen to be more prestigious. Data from the MORE survey cover PhD students/holders; for them, the top reasons for international mobility when asking about the most important one are working with leading scientists, career progression and research autonomy. Even in the

absence of salary differences, there would hence be international mobility towards institutions seen as providing good conditions for research (leading scientists, good career progression and high research autonomy).

On a more general note, however, the data collected in this report provide **a more nuanced assessment of precarity** in careers of researchers, in particular of academic researchers, than in other reports on the issue, e.g. as in the OECD (2021), which provide a very negative outlook for careers, in particular for post-docs and increasing fixed-term contracts. Fixed-term contracts in PhD-granting institutions have declined on average in the EU since 2012, according to the MORE surveys, although the level among younger researchers (PhD-holders) is still very high. There are also favourable trends in terms of R&D spending and the number of PhD-graduates in many countries in the EU, pointing to a better balance of supply and demand for researchers in the future, should current trends hold which will also be influenced by the demographic situation in many countries (smaller birth cohorts).

This is not to say that there are not many issues esp. for younger academic researchers, both PhD-students without a contract (and training in transferable skills) and badly paid post-docs without the perspective of a permanent contract or an alternative career option outside of academia.[35] 86% of academic researchers below 35 are on a fixed-term contract, at a time when their peers in industry may have been on a full open-ended employment contract for the past 10 years (assuming they started their position age 25). On average, according to SES data, 40% of academic researchers are on a fixed-term contract, vs. only 8% in industry. 10% of R1 researchers are without a contract, in spite of calls to recognise already PhD-students as professionals. 54% of researchers in non-widening, 23 in widening countries, indicate that they are paid just enough to make ends meet or paid badly. We may also simply not see many instances of precarity, because researchers have simply left research (including research in industry), so that they are not in the sample to be surveyed any more. There are also many differences between countries, so that the country-specific situation should always be examined.

Moreover, apart from the discussion on salaries & careers in widening vs. non-widening countries, the report also finds that potentially all researchers, not just young ones, can suffer from unacceptable social behaviour and discrimination, with around 20% of researchers indicating that they are dissatisfied with protection against such behaviour. A renewed attention on policies and institutional safeguards against such behaviour seems to be warranted.

Last, but not least, the report also finds that on average in the EU female researchers are more likely to be less well paid, on a fixed-term contract and in a part-time position, so that also here a renewed attention on policies and institutional measures to foster gender equality seems to be necessary.

[35] One interviewee asked the authors the following question: "What is the difference between a post-doc and a pizza? A pizza can feed four".

Table 44: Overview table of main findings (context analysis and contract mapping in 5 dimensions, temporal, organisational, economic, career and social)

	EU27	EU-WIDE	EU-NONWIDE	AT	BE	BG	HR	CY	CZ	DK	EE	FI	FR	DE
Contract context: Job availability														
R&D expenditure per inhabitant, PPS	568	243	769	1078	912	118	176	159	490	948	322	828	626	1050
Researchers per 1.000 of population	4.2	3.1	4.6	5.9	5.5	2.4	2.2	1.4	4.0	7.7	3.8	7.2	4.7	5.4
Satisfaction with research funding	53.6	45.9	56.4	68.1	52.6	45.3	34.2	47.1	64.7	66.1	37.0	57.4	37.6	71.6
Growth difference PhD graduates vs. R&D expenditures	2.9	10.7	3.6	3.1	5.4	7.0	15.9	-8.2	4.6	0.4	2.6	-0.2	1.7	3.5
Temporal														
Share of fixed-term contracts (academic sector)	24.4	16.8	27.2	29.5	41.9	13.1	16.4	24.7	20.1	32.7	23.8	27.4	19.5	35.0
Share of fixed-term contracts (private sector)	8.3	10.5	7.6	.	0.0	3.6	7.0	1.9	17.5	3.0	4.1	16.1	4.8	6.8
Share of fixed-term contracts below the age of 35 (academic sector)	79.5	43.1	85.8	80.7	87.1	28.3	54.7	81.4	44.5	89.8	43.1	61.1	79.6	91.3
Share of part-time contracts (academic sector)	8.8	7.2	9.4	12.1	7.6	5.7	3.0	8.7	19.0	7.0	21.0	7.7	2.5	15.9
Share of part-time contracts (private sector)	10.1	5.2	11.5	.	6.1	8.0	1.6	5.7	8.7	2.5	9.8	6.3	10.7	14.5
Organisational														
Satisfaction with research autonomy (academic sector)	90.5	87.0	91.8	92.8	95.4	88.4	86.1	86.7	92.9	92.6	88.1	89.5	89.6	94.9
Balance between teaching and research (satisfaction)	71.9	60.4	76.2	88.8	77.4	56.5	46.6	56.9	78.5	80.1	65.7	74.4	63.3	85.2
Work intensity (share of working to tight deadlines)	76.7	75.9	77.3	85.0	78.0	61.5	67.9	96.8	79.8	87.2	74.5	80.6	67.7	84.4
Work intensity (Workdays with more than 10 hours)	45.1	37.2	50.7	52.9	45.6	29.8	36.1	28.5	45.2	70.4	27.1	65.6	61.6	46.7
Economic														
Share of researchers without contract (academic sector)	2.1	3.6	1.6	0.4	1.9	1.7	0.9	2.2	4.2	0.6	1.1	2.8	2.9	0.7
Share of R1 researchers without contract (academic sector)	9.6	28.0	5.7	.	6.8	11.2	.	.	36.9	4.0	8.9	19.2	12.5	1.3
Level of yearly net salary in PPS (academic&private, across all career stages)	18,433	15,059	22,479	25,064	20,901	8,563	16,791	19,542	15,201	27,199	14,110	21,574	24,144	28,183
Relation to average economy-wide salary, index	131.1	142.3	118.2	113.0	110.4	153.6	166.9	145.0	132.4	128.2	128.1	112.3	141.9	132.7
Level of yearly net salary, PPS (academic, career stages R1&2)	16,818	14,078	20,128	24,105	17,257	8,266	15,977	21,175	14,115	23,508	14,946	18,202	19,341	22,508
Level of yearly net salary, PPS (academic, career stages R3&4)	24,952	22,023	28,084	32,969	28,136	10,480	22,888	44,962	17,615	27,694	23,617	25,101	26,643	36,337

	EU27	EU-WIDE	EU-NONWIDE	AT	BE	BG	HR	CY	CZ	DK	EE	FI	FR	DE
Level of yearly net salary, PPS (private, career stages R1&2)	19,841	16,195	24,061	23,838	27,959	9,301	18,094	18,593	15,736	29,888	17,334	26,923	27,657	29,573
Level of yearly net salary, PPS (private, career stages R3&4)	26,957	22,235	32,095	33,862	31,920	10,172	19,358	31,117	21,251	38,783	16,848	30,687	35,070	36,383
Possibility of additional income sources	42.41	59.43	34.68	41.67	34.48	86.67	43.75	50.00	61.54	41.67	66.67	20.00	43.96	25.77
Perception of remuneration (neither well nor reasonably paid)	31.6	53.7	23.4	16.8	11.4	51.7	39.0	38.6	43.4	15.3	56.2	21.5	37.1	8.3
Perception of remuneration: academic pays worse than private sector	55.6	53.1	56.5	55.2	59.9	45.7	40.8	34.6	44.8	46.1	52.8	44.4	85.5	42.9
Dissatisfaction with remuneration (private sector)	24.7	20.6	25.6	0.0	21.1	20.0	66.7	.	0.0	25.0	0.0	0.0	26.7	24.2
Dissatisfaction with salary progression (private sector)	28.3	26.5	28.7	9.1	42.1	0.0	66.7	.	0.0	25.0	0.0	0.0	28.6	16.1
Satisfaction with job security (academic sector)	87.2	82.9	88.8	87.3	86.3	82.3	89.9	78.2	92.0	78.2	76.7	86.5	90.5	89.3
Satisfaction with pension plan (academic sector)	79.1	63.6	84.8	89.5	82.7	64.1	56.2	61.6	80.0	94.9	58.1	91.7	77.0	91.4
Satisfaction with social security (academic sector)	87.5	77.7	91.1	95.3	92.5	78.4	86.1	73.3	87.3	93.5	82.4	94.2	91.0	90.4
Career														
Satisfaction with quality of training and education (academic sector)	87.1	82.7	88.7	91.8	92.8	79.2	73.4	80.4	90.6	92.8	89.4	93.7	87.6	89.6
Dissatisfaction with opportunities for training and development (private sector)	26.7	17.6	28.7	36.4	15.8	0.0	0.0	.	0.0	12.5	0.0	0.0	20.0	12.5
Career progression – time it takes to career stage R3 (established researcher) (academic sector)	10.2	10.4	10.2	14.1	10.8	10.1	9.7	10.3	11.2	10.0	9.4	10.2	9.0	10.2
Satisfaction with career perspectives (academic sector)	72.1	70.2	72.7	80.0	71.0	74.7	77.8	68.9	86.9	79.7	68.5	76.3	58.4	78.8
Career paths are transparent and clear-cut (perception)	74.7	75.5	74.4	69.9	77.2	76.0	70.2	70.8	86.3	71.5	77.1	66.9	74.0	80.7
Career progression is sufficiently merit-based (perception)	71.6	70.7	71.9	63.5	73.0	72.4	63.3	71.7	86.0	82.0	73.6	75.1	62.0	77.5
Tenured contract based on merit only is common (perception)	69.8	71.4	69.3	53.6	73.6	74.3	70.7	74.0	86.4	73.3	72.0	74.3	64.3	71.8
Dissatisfaction with research assessment (private sector)	25.9	12.5	28.8	33.3	21.1	0.0	0.0	.	0.0	12.5	0.0	.	26.7	13.8
Confidence in career prospects (academic sector)	81.4	80.3	81.9	92.5	81.0	83.8	88.2	85.2	90.1	87.1	73.0	88.1	71.3	89.2
Forced international mobility because of no options for research	15.9	12.0	17.2	21.9	17.2	11.3	6.4	3.5	16.8	12.6	30.8	14.7	21.8	13.8
Shape of the pyramid: Share of early career stage positions (R1/R2) in total (academic sector)	28.2	23.7	29.9	29.9	44.6	21.9	18.5	14.6	25.5	30.9	26.7	26.8	28.1	41.1

	EU27	EU-WIDE	EU-NONWIDE	AT	BE	BG	HR	CY	CZ	DK	EE	FI	FR	DE
Social														
Strictness of regulations on hiring fixed-term workers	.	0.89	0.97	0.88	0.38	.	.	.	0.50	1.13	1.63	1.00	1.38	0.38
Collective bargaining coverage	.	32.7	78.6	98.0	96.0	.	.	.	30.4	82.0	18.6	89.3	98.5	56.0
Treated fairly at work (perception)	46.4	44.7	47.8	58.9	43.4	50.4	42.3	20.8	53.4	41.9	30.1	50.4	41.0	44.5
Dissatisfaction with protection against unacceptable social behaviour	20.8	22.5	20.1	14.8	16.7	21.4	40.9	25.0	20.0	26.7	18.8	0.0	17.6	20.4

	EL	HU	IE	IT	LV	LT	LU	MT	NL	PL	PT	RO	SK	SI	ES	SE
Contract context: Job availability																
R&D expenditure per inhabitant, PPS	237	287	410	353	115	216	765	173	795	273	304	69	186	520	317	1151
Researchers per 1.000 of population	3.7	4.0	5.3	2.7	1.9	3.4	5.1	1.9	5.7	3.2	4.9	0.9	3.1	5.0	3.1	7.6
Satisfaction with research funding	27.7	46.7	43.4	27.0	41.8	47.2	89.7	49.6	73.6	59.8	34.4	26.6	52.1	58.4	52.5	50.4
Growth difference PhD graduates vs. R&D expenditures	5.9	2.3	-2.7	11.9	17.0	9.2	-26.4	-6.3	-1.3	10.3	5.8	24.0	9.6	13.4	4.2	3.3
Temporal																
Share of fixed-term contracts (academic sector)	10.4	12.4	15.1	16.1	35.8	49.8	36.1	7.8	20.0	8.6	15.6	3.0	53.8	17.3	21.8	23.9
Share of fixed-term contracts (private sector)	5.4	9.7	.	5.0	17.0	6.4	5.7	12.6	17.6	12.3	38.8	1.2	12.2	16.6	18.2	17.5
Share of fixed-term contracts below the age of 35 (academic sector)	17.5	47.2	67.0	82.8	19.5	60.0	75.6	11.2	72.6	28.1	62.9	25.9	56.8	63.4	83.7	91.2
Share of part-time contracts (academic sector)	2.8	12.0	4.1	2.2	26.2	24.6	8.0	8.9	10.3	3.0	4.4	6.8	5.4	9.0	6.5	9.9
Share of part-time contracts (private sector)	1.5	6.2	.	2.6	30.7	11.4	12.2	11.5	28.8	3.3	0.4	2.1	4.2	.	6.9	20.1
Organisational																
Satisfaction with research autonomy (academic sector)	90.4	86.7	93.0	91.2	90.9	92.0	95.1	90.4	95.6	86.4	83.5	78.5	86.7	90.4	86.6	89.0
Balance between teaching and research (satisfaction)	59.7	58.4	62.6	57.2	57.1	56.7	89.6	56.9	86.2	61.5	45.7	86.4	67.5	67.5	75.7	68.0
Work intensity (share of working to tight deadlines)	87.0	73.8	82.0	63.3	57.2	52.6	66.7	81.4	76.7	76.5	88.5	90.2	61.7	81.2	81.7	67.5
Work intensity (Workdays with more than 10 hours)	39.8	26.4	65.6	27.1	40.7	24.9	37.8	41.9	55.0	20.4	34.3	51.4	47.7	40.4	40.0	59.3

	EL	HU	IE	IT	LV	LT	LU	MT	NL	PL	PT	RO	SK	SI	ES	SE
Economic																
Share of researchers without contract (academic sector)	2.0	6.5	2.4	1.5	3.5	5.2	1.4	2.0	3.0	3.7	3.6	1.9	6.6	0.4	2.7	0.8
Share of R1 researchers without contract (academic sector)	28.1	25.3	4.7	27.4	9.4	5.6	2.8	16.6	5.3	75.0	4.5	22.0	46.4	2.4	6.0	5.9
Level of yearly net salary in PPS (academic&private, across all career stages)	16,340	11,893	15,215	19,073	11,392	11,809	25,716	22,463	22,993	15,711	20,798	13,032	11,617	16,624	20,914	20,827
Relation to average economy-wide salary, index	136.0	132.4	90.7	136.7	154.1	103.9	118.8	141.7	110.8	121.6	171.9	175.2	127.5	144.1	135.3	105.9
Level of yearly net salary, PPS (academic, career stages R1&2)	13,288	8,350	14,951	14,525	9,709	10,744	27,697	23,599	21,315	12,671	20,928	11,418	10,899	15,092	19,177	20,312
Level of yearly net salary, PPS (academic, career stages R3&4)	22,753	13,131	24,507	22,559	15,335	13,565	33,825	34,173	33,309	17,656	29,661	28,697	13,081	22,727	26,628	25,666
Level of yearly net salary, PPS (private, career stages R1&2)	20,096	16,496	19,589	18,917	16,052	13,383	23,275	19,887	26,310	18,260	16,967	13,362	13,382	15,989	21,503	17,342
Level of yearly net salary, PPS (private, career stages R3&4)	21,373	25,923	0	27,157	23,812	16,704	26,009	45,479	37,569	19,203	0	26,180	15,190	18,675	30,946	34,260
Possibility of additional income sources	63.64	100.00	31.25	40.00	80.00	88.89	40.00	0.00	25.00	72.50	35.53	68.42	60.00	75.00	38.84	52.00
Perception of remuneration (neither well nor reasonably paid)	76.5	52.8	17.3	43.0	46.7	59.5	7.7	38.1	10.1	54.8	52.1	19.2	61.5	32.2	44.4	19.7
Perception of remuneration: academic pays worse than private sector	60.6	57.3	44.2	72.6	40.3	42.3	46.3	46.4	45.7	54.4	62.9	30.9	49.3	34.7	57.9	48.8
Dissatisfaction with remuneration (private sector)	100.0	0.0	16.7	38.5	.	50.0	.	.	20.0	0.0	50.0	50.0	0.0	0.0	40.0	0.0
Dissatisfaction with salary progression (private sector)	0.0	25.0	0.0	40.0	.	50.0	.	.	30.0	0.0	50.0	66.7	66.7	0.0	42.3	16.7
Satisfaction with job security (academic sector)	83.3	77.8	86.9	88.6	81.3	68.6	87.7	94.5	93.3	82.6	80.9	94.7	77.6	93.2	89.7	87.6
Satisfaction with pension plan (academic sector)	38.6	64.5	86.3	65.5	66.1	55.1	93.1	63.6	96.6	70.4	59.6	80.4	65.8	82.5	76.1	89.6
Satisfaction with social security (academic sector)	54.9	71.0	91.0	84.0	73.8	73.1	98.5	75.8	96.2	80.9	82.8	88.0	74.7	91.0	91.8	94.9
Career																
Satisfaction with quality of training and education (academic sector)	76.6	78.7	87.2	86.2	83.7	79.0	88.3	91.0	92.7	82.0	86.5	91.1	77.6	90.8	84.2	90.1

	EL	HU	IE	IT	LV	LT	LU	MT	NL	PL	PT	RO	SK	SI	ES	SE
Dissatisfaction with opportunities for training and development (private sector)	100.0	0.0	33.3	52.0	.	0.0	.	.	20.0	0.0	100.0	66.7	0.0	50.0	54.2	0.0
Career progression – time it takes to career stage R3 (established researcher) (academic sector)	11.8	11.6	10.2	11.2	10.4	9.2	9.6	10.1	9.6	10.7	9.8	6.5	10.0	7.9	9.0	10.6
Satisfaction with career perspectives (academic sector)	68.3	69.3	68.7	53.1	84.9	68.4	61.5	81.3	81.5	76.8	45.7	82.9	77.3	88.4	76.3	78.3
Career paths are transparent and clear-cut (perception)	78.0	70.8	68.5	65.9	84.0	68.7	62.0	82.1	80.3	77.9	60.3	90.1	86.0	87.1	70.3	68.7
Career progression is sufficiently merit-based (perception)	66.6	69.0	63.0	60.9	83.7	76.3	58.4	78.6	83.7	80.2	45.3	86.7	76.9	80.5	70.6	79.3
Tenured contract based on merit only is common (perception)	67.2	64.5	69.7	58.8	81.4	78.4	57.9	80.8	83.5	81.5	45.2	88.0	77.4	81.2	69.3	77.8
Dissatisfaction with research assessment (private sector)	0.0	0.0	40.0	50.0	.	0.0	.	.	40.0	0.0	50.0	33.3	33.3	50.0	30.8	16.7
Confidence in career prospects (academic sector)	88.2	80.0	86.5	63.4	80.2	73.6	81.7	93.0	90.0	78.6	67.9	90.6	84.3	92.6	77.9	86.7
Forced international mobility because of no options for research	23.5	14.2	7.2	23.1	26.4	4.1	34.8	25.3	18.9	3.7	4.0	21.9	19.4	45.8	15.1	14.4
Shape of the pyramid: Share of early career stage positions (R1/R2) in total (academic sector)	7.2	22.3	24.3	11.0	27.4	29.1	51.8	17.3	29.8	23.6	29.4	28.8	32.5	34.4	16.7	25.7
Social																
Strictness of regulations on hiring fixed-term workers	1.50	0.88	0.38	1.63	0.63	0.88	2.00	.	0.75	0.38	0.88	.	0.75	0.88	1.38	0.38
Collective bargaining coverage	25.5	22.8	32.5	80.0	13.8	7.1	59.0	.	78.6	17.2	73.9	.	25.0	70.9	83.6	90.0
Treated fairly at work (perception)	72.6	37.5	72.6	50.1	30.3	48.7	53.8	58.3	42.4	29.0	48.4	60.3	17.5	53.5	47.2	42.0
Dissatisfaction with protection against unacceptable social behaviour	28.6	0.0	23.1	24.3	20.0	30.0	16.7	25.0	13.5	21.7	23.8	23.7	16.5	30.8	24.8	8.8

7. POLICY OPTIONS TO IMPROVE PRECARIOUS CAREERS IN RESEARCH

From our own data analysis and the literature, we develop an overarching framework for policy options to address the situation of vulnerable groups in research, or to improve precarious careers in (academic) research. The main approach is to balance the supply of qualified researchers with the demand for them, as well as to improve working conditions of the existing jobs, which may in turn affect the supply of and demand for researchers: better remuneration, e.g., may attract more people into research, but also decrease demand due to higher cost. Many of the policy options concern careers in academic research, as there e.g. the number of fixed-term contracts, or the share of researchers without a contract at all, is considerably higher than in the private sector, while salaries are usually lower. However, some options are also relevant for researchers in the private sector, as regards e.g. salaries, grant funding or better protection against discrimination.

In general, these policy options could contribute to a better balance between the supply of and demand for researchers, leading to less precarious careers and jobs and hence improved well-being of researchers. Very important side benefits however could be increased research performance in the EU as well as less asymmetric mobility / brain drain of researchers. Moreover, the policy options regarding a diversification of careers, and transferable skills training, could lead to i) improved skill match in jobs and hence more productive use of human resources and ii) to a higher use of advanced qualified researchers by industry in the EU, leading to increased competitiveness of EU firms, structural change towards more knowledge-intensive activities and hence a positive feedback loop for increased demand of researchers, with firms becoming more research-intensive or new research-intensive firms being set up. Overall, this would be both positive in economic terms, but also with respect to the EU's capability to contributing to more effective tackling of grand challenges.

In terms of **rationale for public policy interventions**, there are clear information asymmetries which may lead to coordination failures. PhD-students choose their PhD with regard to their subject interests and their competencies. They are usually not fully aware about the labour market for researchers, or what skills they will acquire in their PhD/post-doc stage and for which employers these skills could be useful (see on this also the work done in work package 6 of this project). It is difficult to take informed decisions about future careers without information on job market perspectives, awareness about the diversity of careers available and the transferability of skills. At the other side, public budgets for research are usually planned without regard to the future supply of researchers, as are firm-level budgets for research.

A less conceptual approach to legitimising public interventions with a view to reduce precarious careers in research would start with the simple observation that there is a "problem"[36], given the findings on fixed-term contracts, salaries, discrimination etc. This problem cannot be solved by private action alone, as it is difficult or counterproductive to privatise PhD-training or academic research careers, while there is plenty of room for public policies to work towards less precarity of careers, as this section will try to illustrate. The next subsection presents the overall framework and discusses policy options from a general point of view. This is followed by policy options specific for the EU-level and country-specific policy options.

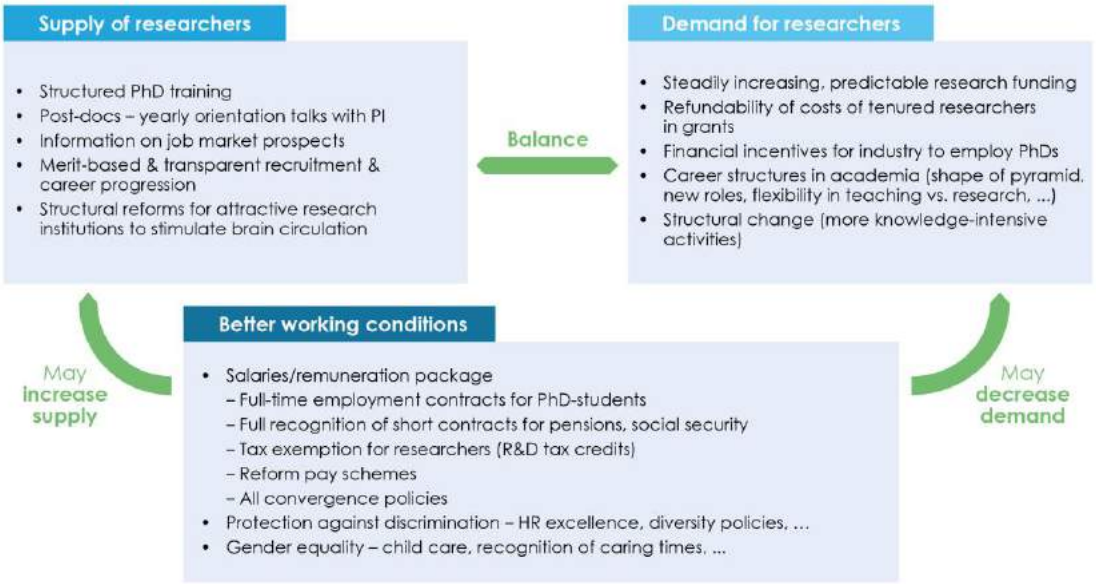
[36] See Edquist (2011) on the use of the term "problem" rather than the term "market failure" due to the lack of a definition for an optimal situation as a benchmark.

7.1. Overarching framework for policy options

The framework suggests options in three areas, the supply of researchers, the demand for researchers and working conditions. The options can take place at several levels, e.g. at the level of organisations, regulations, economy-wide policies etc.

The framework should be understood as balancing the supply of with the demand for researchers, and not unilaterally reduce the supply of, or increase the demand for researchers, as this could have negative consequences. Just reducing the supply of researchers is not in line with the demands of an economy becoming ever more knowledge-intensive. Just increasing supply of researchers without demand will lead to precarious careers.[37] The options for balancing the supply with demand are generally meant to improve training and information about all possible research careers. This could lead to a simple shift of researchers between fields in academia, or to more researchers going outside academia into industry or other sectors of activity, or to more researchers switching to new roles within academic research. Balancing the supply with demand may hence be fully compatible with stable or rising numbers of PhD graduates (which are currently decreasing in many Member States). Care should be taken to balance supply with demand over a longer-term perspective, or across cohorts: **significant improvements for one cohort of junior researchers**, e.g., due to a much higher share of permanent contracts, **could otherwise backfire for the next cohort**, should this cohort face very few job openings.

Figure 100: A policy framework to address precarious careers in research, with examples of potential policies

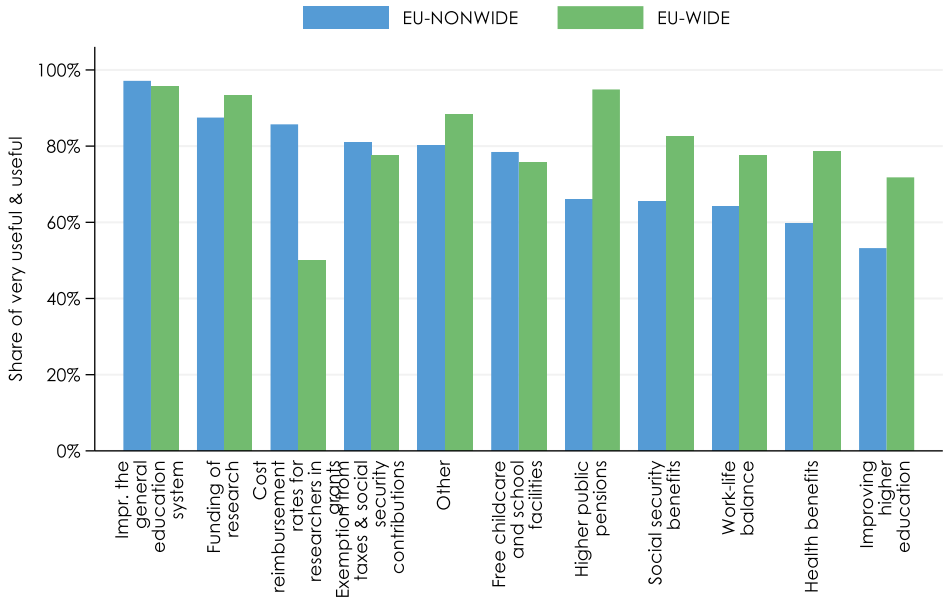


Source: Authors.

The framework does not cover all determinants of the balance between supply and demand of researchers. E.g., the figure below taken from the employer survey within this project illustrates that one way to help employers find researchers for their vacancies would be to improve the general education system before PhD training. The education system in general is certainly very important for the supply of researchers, but it is outside the scope of this report. We now discuss in turn the policy options in the three areas in more detail.

[37] In the workshop, the example of a special funding scheme for PhD-students in Romania was cited, which led to a strong increase in the number of PhD-students between 2007-2013. However, this influx of researchers was not matched by more positions in the academic sector or elsewhere, so that PhD-graduates migrated to other countries or other (non-research) jobs.

Figure 101: Useful public policies to improve employment contracts/positions for researchers, 2021

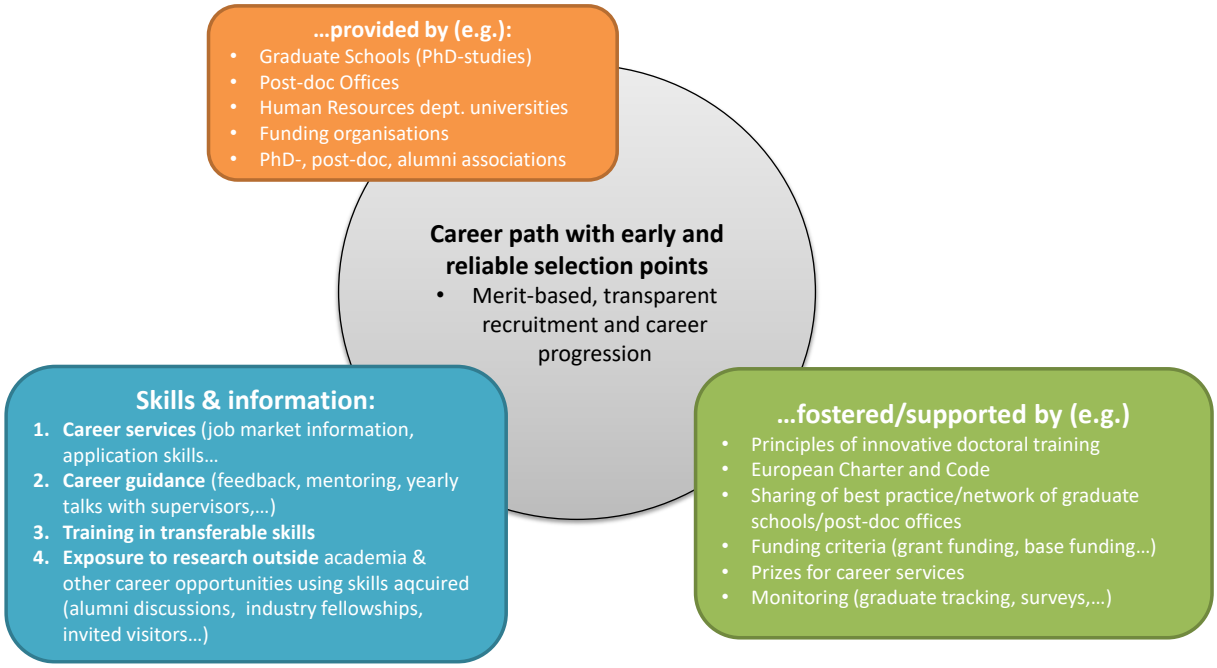


Source: Employer survey (2021)
Notes:
- Based on question B10: "Which type of public policies could be useful for your organisation to improve your employment contracts / positions for researchers, or to fill your open positions for researchers?"
- EU-WIDE, EU-NONWIDE: average over available EU countries
- (2021: n=2-70)

7.1.1. Supply of qualified researchers

To balance the supply of qualified researchers with demand, overarching key levers can be seen in a career path model with early and reliable selection points for researchers, career guidance/mentoring and more early information on job market prospects and activities which foster the diversification of careers, such as training in transferable skills, exposure to alumni working in different sectors, industry fellowships, etc. The next figure illustrates this interplay between i) skills and information needed for researchers to make informed career decisions about their future careers, or to be able to work in different sectors, either as a researcher or using the skills acquired through research training in non-research jobs with the ii) provision of these skills and this information by e.g. Graduate Schools, as well as with iii) ways to incentivise and fund the widespread use and provision of such services and activities. A iv) career path providing early and reliable selection points which lead to structured training stages enables a more widespread use of services and activities which prepare for careers in- and outside of academia.

Figure 102: Who can provide, incentivise and fund skills and information to ensure researchers can make informed career decisions and are prepared for a broad range of jobs



Source: Authors.

- **Career paths including early and reliable selection processes, training in transferable skills, job market information & career guidance**

  - The earlier and the more reliably formal, merit-based and transparent **selection processes** into academic careers take place, the less time is spent in uncertainty or on fixed-term contracts. Moreover, the more **transferable skills training and information about different careers in different sectors** (academic, government, industry, …) is integrated into the early career stages, the more early stage researchers can take informed decisions about their future careers. E.g., the Chamaleons project finds that 48% of PhD-students choose a PhD for career reasons, 66% want to stay in academia but less than 15% will actually stay in academia.[38]

  - Figure 103 below illustrates a **model career path** with a number of **potential selection points** – at which careers can take a different turn towards non-academic other research or non-research jobs, starting with the application for PhD-studies. Selection (recruitment or career progression) must be **merit-based and transparent**.[39] This is combined with the opportunities for providing information about the job market in- and outside academia, as well as career guidance and other career services helping PhD-applicants, -students, -graduates and post-docs to make informed decisions about their future careers in- or outside academia. Judging by MORE4 numbers on the prevalence of doctoral schools in the EU, there is a **large potential to increase selection processes as well as career support services at the PhD-stage, and to increase the share of tenure track positions, which come with two selection processes** (for the position and at the end, the tenure evaluation): in the EU, only 12% of PhD-; only every third PhD candidate in the EU (32%) agreed that the procedures for admission, supervision, evaluation and career development are transparent and accountable. The EU is far behind the US in the share

[38] https://www.chameleonsproject.eu/determining-the-gap

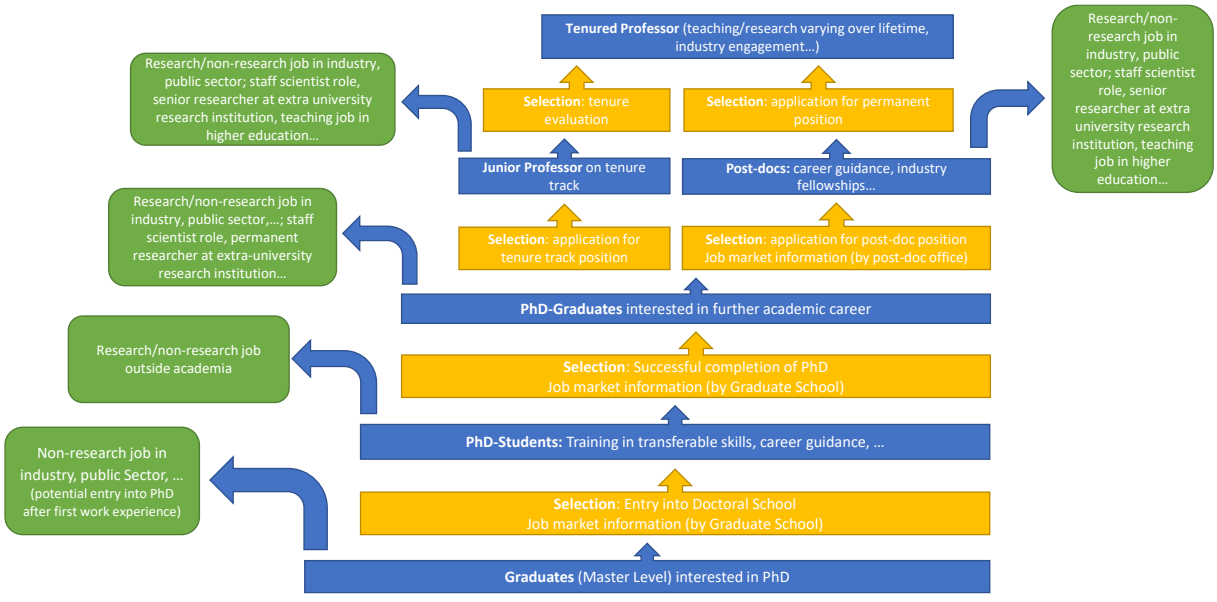
[39] E.g., in the workshop, non-transparent selection of PhDs in Slovakia was mentioned as an issue.

of PhD-students and recent PhD-holders training or trained in doctoral schools (12 vs 65%), according to MORE4 (2019). Only 32% of PhD-students got transferable skills training, while 86% of researchers (including later career stages) think that they are important for career progression. Only about 5% were trained in industry-co-funded doctorates. Only every third PhD candidate in the EU (32%) agreed that the procedures for admission, supervision, evaluation and career development are transparent and accountable. This contrasts with more than 80% satisfaction with transparent and merit-based recruitment in the EU on average.

- No information is available on the spread of post-doc offices and the nature of the services they offer. Note that for the sake of simplicity, the green boxes in the figure below do not show additional arrows back into academic careers – however, this is certainly an option (intersectoral mobility, from industry to academia e.g.).[40]

- Note that **more selection and job market information does not automatically entail a reduction of (academic) researcher candidates**: on the contrary, setting up doctoral schools with structured PhD training, coupled with full employment contracts (see below, working conditions), can be used to increase the supply of researchers. More generally, **job market information and career guidance will adjust as a function of the balance between supply and demand:** when the number of job openings in academia is high, these tools will lead to more, and not fewer, candidates for academic research roles. Future research could for each country establish the precise numbers for each of the areas in Figure 104, i.e. e.g. the pool of PhD-graduates, where they go after graduation, shares continuing in the academic career path vs. non-academic career path etc.

Figure 103: Supply of researchers : selection points and opportunities for job market information as well as career diversification potential away from the principal investigator/professor role



Source: Authors. Note that for the sake of simplicity, the green boxes do not show additional arrows back into academic careers, i.e. intersectoral mobility from outside academia back into academia.

[40] https://eos.org/opinions/reimagining-stem-workforce-development-as-a-braided-river#.YH70vxyy1I0.twitter

In the following, we outline more in detail the PhD- and the post-doc stage as two crucial early career stages relevant for the supply of researchers.

- **Options at the level of PhD-studies**
    - The **diversification of careers** can be fostered through the following mechanisms:
        - **Information** during the application and graduation stage on **job market prospects** (eg. % of alumni employed in which positions, salary levels,…) – this would also work against incentives to employ too many junior researchers due to their low cost and high productivity. Note that such **job market information should be the more general, the further the person concerned is away from the labour market** – job market information for PhD-applicants can only be quite general, as by the time they enter the labour market, circumstances could potentially have changed a lot. By contrast, job market information for last year PhD-graduates (or post-docs at the end of their fixed-term contract, see below) should get more detailed information.
        - **Transferable skills training**, although mentioned in the principles of innovative doctoral training, is still not widely practiced, but is seen as crucial by later stage researchers.[41] In workpackage 6 on a common competence framework, work is being carried out on defining such transferable skills and to make them visible for researchers and employers; another EU funded project develops "a range of interdisciplinary, inter-sectoral and international modules that are designed to broaden the skills of PhD graduates and improve their employability in academic and non-academic environments including career planning skills, boundary-spanning communication skills, extended networks, and advanced research skills."[42]
        - **Mentoring by the PhD supervisors**[43] should make clear that not continuing an academic career should not be seen as a failure[44], and this can be supported by discussions with alumni, role models… see next bullet; more generally, **career guidance/development services** (e.g. by the Graduate School) can be offered to PhD-students
        - **Discussions with alumni** (organised by PhD-school) from both industry and academia, exposure to role models both within and outside academia, contacts with industry…
        - **PhD-training in collaborative settings with industry**. Note that collaborative PhD-training needs to be well structured, with sufficient information both for the participating students and firms. There are however many potential best practice programmes which can be studied (e.g., also the EU industrial doctorates). In the workshop it

[41] According to MORE4 (2019), only 32% of PhD-students got transferable skills training (unchanged from 2016), while 86% of researchers think that they are important for career progression. The OECD has a publication on transferable skills training based on interviews and a questionnaire https://www.oecd.org/science/transferableskills.htm (OECD, 2012)

[42] https://www.chameleonsproject.eu/about

[43] Work package 6 within the knowledge ecosystems project also addresses mentoring skills within the European Competence Framework.

[44] See this account of the struggles of a PhD-holder in finding a job and perceiving herself to be a failure https://www.nature.com/articles/d41586-021-02215-0

was also suggested to motivate researchers to become their own employers, **to start up a company** and create research jobs – which would also be a policy relevant for increasing the demand for researchers.[45]

- Sauermann and Roach (2012) state that "Our results also suggest the need for mechanisms that provide PhD applicants with information that allows them to carefully weigh the costs and benefits of pursuing a PhD, as well as for mechanisms that complement the job market advice advisors give to their current students."[46]

- PhD-training could be organised more often in **structured doctoral training programmes, or more precisely, doctoral schools**: they involve the principles of application and selection, and hence feedback to applicants, whether they are suitable in principle for advanced research training (compared with the old master-apprentice-model of PhD-training, application procedures should be more transparent and competitive); second, it is easier to organise many aspects of diversified careers (see above) within doctoral schools, due to their better administrative support, such as providing job market information, institutionalised career/discussion fora with alumni etc.; they can also emphasize transferable skills training, to keep careers open and enable diversified research careers. Universities should get institutional funding from government for such graduate schools and not rely on grant income for this.

- Some institutions have already broad career development/PhD-support structures in place, which could serve **as best practice** – e.g. the graduate school of IST Austria offers career development services, with "regular career talks, skills training sessions, as well as visits from industry leaders, … [that] help[s] our students prepare for a career in academia, industry, and other sectors."[47] In the US, there is the Council of Graduate Schools, which offers benchmarking, best practices and public policy & advocacy on the topic of graduate education.[48]

- These options could also lead to a revision of the **Principles of innovative doctoral training**[49] from 2011. While they mention exposure to industry and other relevant employment sectors (through e.g. alumni networks) and transferable skills, there is no guidance with respect to providing information on job market prospects. Doctoral training principles are however not well known among PhD-students and recent -holders[50]

- **Options at the level of post-doc positions**

  - At the crucial post-doc stage, where career uncertainty is usually highest, **career guidance and feedback** is particularly important. Regular yearly career guidance could take place in the form of **mandatory employee orientation talks** between the principal investigator and the post-doc, also with respect to the suitability for a career in academic research. The principal investigator should not see a low probability for future employment in

[45] The EU funded project ProdPhD is currently working developing teaching modules for entrepreneurship programmes in PhD-programmes (https://cordis.europa.eu/project/id/101005985)

[46] https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0036307

[47] https://phd.pages.ist.ac.at/support-resources/

[48] https://cgsnet.org/

[49] https://cdn5.euraxess.org/sites/default/files/principles_for_innovative_doctoral_training.pdf

[50] In MORE4, 17% of R1 and 13% of R2 researchers indicate that they are aware of the principles.

academia as a "failure" for the post-doc, but rather point to other options[51]; as PIs usually know better academic careers, he or should be supported in this e.g., through institutional staff services which organise:

- Information on job market prospects (see above, more general the further away from entry into the labour market / contract end)
- Discussion fora (e.g. a yearly meeting) with alumni, previous post-docs, in various roles, both academic researchers, non-research positions at university, research positions in the private sector…
- A crucial role could be played here by **Human Resources Management in universities or research institutions**, which make sure that researchers receive regular feedback by supervisors, principal investigators, etc. The interviews carried out for the OECD's study on precarity (2021, p. 41) found that "institutions do not have enough capacity in terms of human resource management (HRM)". Principal investigators or research group leaders also need training to properly provide feedback or to be aware about the diversity of careers available.

"The postdoctoral phase should evolve from being a safety net for those waiting for an academic position to a period that proactively opens up other options." (OECD, 2021, p. 35)

- Both graduate schools and post-doc offices could organise or inform PhDs/post-docs about **(online) courses** designed to prepare them for the job market, including outside academia, in terms of identifying prospective employers, drafting a CV and describe skills valuable to employers. In the workshop it was also suggested to motivate researchers to become their own employers, **to start up a company** and create research jobs – which would also be a policy relevant for increasing the demand for researchers.
- Again, there are existing support and career development structures in research institutions, which could serve as a **best-practice model**. E.g., the Postdoc Office of the IST Austria[52] offers a mentoring programme, career services, an employee assistance programme, access to an occupational physician and a psychologist, so that post-docs have access to a wide range of services supporting them during this difficult time of uncertainty about the future in a hard working environment. The National Postdoctoral Association in the US has guidelines and recommendations for institutional postdoctoral policies and practices (see box below and full text in the annex, section 9.5.1).[53]

[51] See also the OECD (2021) on this point.

[52] https://postdoc.pages.ist.ac.at/

[53] https://www.nationalpostdoc.org/page/recommpostdocpolicy/NPA-Recommendations-for-Postdoctoral-Policies-and-Practices.htm ; see also http://books.nap.edu/html/postdoctoral_experience/

- In general, such regular career guidance (and support services) would be well anchored in the **European Charter for Researchers** in both the sections on career development[54] and on career advice[55].

- Another tool to increase selection, but also clarity and diversity of career perspectives, are **tenure track positions** (see also report from work package 6 in this project). Tenure track positions come with the promise of a permanent contract after a merit-based evaluation at the end of the tenure track, so that there are two points of selection, to enter into the position and to obtain the permanent contract. A best practice tenure track model could involve again the exposure to alternative careers, transferable skills training etc.

NPA Recommendations for Postdoctoral Policies and Practices

1) Establish a postdoctoral office/association that actively engages and represents postdoctoral scholars

- 1.1 Establish a Postdoctoral Office (PDO)
- 1.2 Establish a Postdoctoral Association (PDA)
- 1.3 Setup and maintain a postdoctoral listserv and social media outlets
- 1.4 Establish a Postdoctoral Advisory Committee
- 1.5 Ensure postdoctoral scholar representation on relevant institutional committees

2) Establish postdoctoral policies

- 2.1 Adopt a clear definition of "postdoc" and to ascribe to each postdoc the employment categorization that they occupy--whether that is fellow, employee, or scholar
- 2.2 Identify and establish policies to deal with issues concerning postdocs
- 2.3 Create and disseminate a postdoctoral handbook
- 2.4 Utilize a centralized appointment process
- 2.5 Establish policies that give postdocs access to university facilities such as the fitness center, library, as well as career and professional development resources and university events
- 2.6 Conduct an orientation program for new postdocs
- 2.7 Conduct an exit interview
- 2.8 Conduct an annual survey of postdocs
- 2.9 Provide professional development and advanced training for postdocs
- 2.10 Establish time frame for postdoctoral transition to independence
- 2.11 Facilitate effective mentoring and personal responsibility through career planning with an annual review
- 2.12 Provide career counseling and development services
- 2.13 Establish a minimum baseline salary/stipend, plus a salary/stipend scale

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[54] "Employers and/or funders of researchers should draw up … a specific career development strategy for researchers at all stages of their career, regardless of their contractual situation, including for researchers on fixed-term contracts. It should include the availability of mentors involved in providing support and guidance for the personal and professional development of researchers ..." https://euraxess.ec.europa.eu/jobs/charter/european-charter#custom-collapse-1-career-development

[55] "Employers and/or funders should ensure that career advice and job placement assistance, either in the institutions concerned, or through collaboration with other structures, is offered to researchers at all stages of their careers, regardless of their contractual situation" https://euraxess.ec.europa.eu/jobs/charter/european-charter#custom-collapse-1-access-to-career-advice

- 2.14 Provide a comprehensive, fair, and equitable benefits package to postdocs, comparable to that which is received by standard employees whether national or international at the same institution.
- 2.15 Extend family-friendly benefits to all postdocs
- 2.16 Allow matched contributions to a retirement program

3) Maintain an office for international scholar services

4) Establish a Diversity Office to ensure diversity and inclusion

- 4.1 Have formal recruitment mechanisms in place to ensure diversity of the postdoctoral population
- 4.2 Have support systems in place to ensure the retention and success of postdocs from under-represented and other non-traditional backgrounds

- **Merit-based, transparent recruitment and career progression**

  - Fair selection and promotion are crucial elements to attract talented researchers, or to keep research careers attractive, as there will usually be a higher number of applicants than open positions. Especially, if there will overall be more selection, at earlier stages, e.g. in the wake of more structured PhD-training in doctoral schools, or also in the wake of more tenure-track positions, merit-based and transparent recruitment become all the more important – selection also needs to be reliable, as Sybille Hinze pointed out in the workshop. In the academic sector, such recruitment has become more commonplace, but there is still country heterogeneity (see section 4.6.5).

  - Reforms in favour of more merit-based and transparent career progression should also make sure that reward systems are fair and comprehensive, e.g. make sure that researchers are given the resources (such as time for research) to meet the performance standards, and to value a broad set of contributions to research, such as mentoring, peer review, PhD supervision, etc., rather than just focussing on publication output.[56]

  - The European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers (C&C)[57] contain stipulations for merit-based, transparent recruitment and career progression; as of 15 May 2018, institutions that are willing to endorse the Charter and Code are also initiating the application for the "HR Excellence in Research Award"[58], which implies a long-term commitment. So far, 611 organisations have received this award, which based on an audit, publicly recognises "research institutions that have made progress in aligning their human resource policies with the principles set out in the "Charter & Code"

  - In the Code of Conduct for the Recruitment of Researchers, there is already a special paragraph on recruitment of postdoctoral researchers. The postdoctoral stage can be characterised by high uncertainty and a succession of fixed-term contracts. "Postdoctoral appointments: Clear rules and explicit guidelines for the recruitment and appointment of postdoctoral researchers, including the maximum duration and the objectives of such

[56] See also the OECD (2021) on this point.

[57] https://euraxess.ec.europa.eu/jobs/charter-code-researchers so far, 1287 organisations have endorsed the principles

[58] https://euraxess.ec.europa.eu/jobs/hrs4r

appointments, should be established by the institutions appointing postdoctoral researchers. Such guidelines should take into account time spent in prior postdoctoral appointments at other institutions and take into consideration that the postdoctoral status should be transitional, with the primary purpose of providing additional professional development opportunities for a research career in the context of long-term career prospects."[59]

- The MORE4 surveys point to increasing satisfaction with merit-based and transparent recruitment and career progression. However, in some countries higher shares of academic researchers disagree with the statement that such practices are standard (see section 4.6.5).

- **Regulatory options for limiting fixed-term contracts**

  - In some countries, there are limits on the total number of years a researcher can spend on fixed-term contracts (e.g. in Germany, via the Wissenschaftszeitvertragsgesetz).[60] Such legal limits are in general not appreciated by researchers, as they could force them out of their career, even though they feel that they have demonstrated their skills and are successful in research and/or teaching[61]. Measures like this have to be evaluated in the country-specific context, taking account of many factors, such as the prevalence of fixed-term contracts. Just limiting fixed-term contracts in a country with a high share of fixed-term contracts without considering accompanying changes to career structures in academia or to the demand for researchers, and diversification of careers, could potentially lead to a significant loss of human capital.

- **General institutional/structural reforms in widening countries to create strong research institutions/universities**

  - Brain circulation rather than brain drain avoids geographical concentration of junior researchers who then compete for few available positions, at a much higher risk of experiencing precarious careers. To strengthen brain circulation and indirectly prevent precarious careers, countries could formulate dedicated policies to either turn existing universities/research institutions into excellent research institutions or set up new ones, with support from the EU-level (see section 7.2.1.)[62].

7.1.2. Demand for researchers (new positions with permanent contracts)

Higher demand for (junior) researchers in all sectors, industry, academia, government, etc., can come mainly from higher funding for research, from changes to research grant design or allocation mechanisms, changing career structures, more diversified careers (industry-academia cooperation) and indirectly through structural change towards more knowledge-intensive activities (Figure 104). But note that "Additional funds going into the research system should not be concentrated on doctoral education and short-term postdoctoral positions – as is currently the case in many countries – but instead be spread

[59] https://euraxess.ec.europa.eu/jobs/charter/code#custom-collapse-0-postdoctoral-appointments

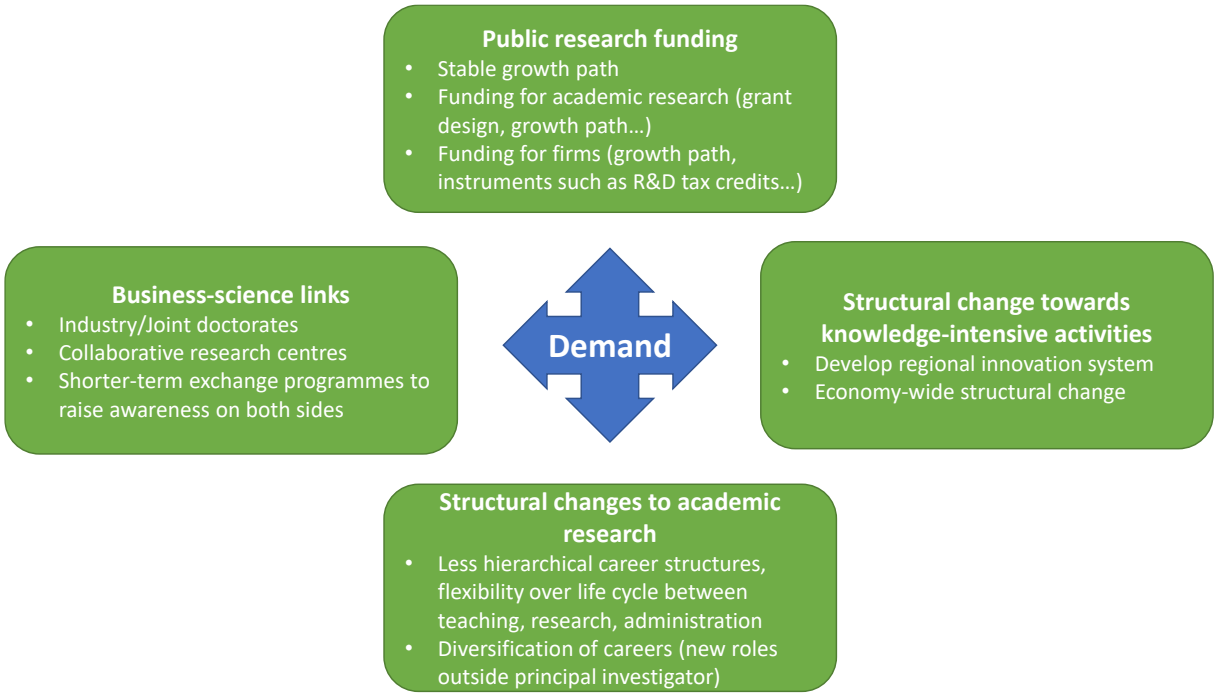
[60] Although the limits can be extended e.g., in the case of working for a third-party funded project.

[61] There is an intensive debate on Twitter about this under the hashtag #ichbinHannah, with many accounts of fixed-term researchers.

[62] See Janger, J., How to get brains circulating, In: Research Europe, February 20th 2020, p. 12. https://www.researchprofessionalnews.com/rr-news-europe-views-of-europe-2020-2-how-to-get-brains-circulating/ ; J.P. Bourguignon writes on Twitter: "If Europe does not pull itself together and rethink how it can take advantage of its scientific talent to keep its role in the world, it will face a major decline on the global arena" https://twitter.com/ERC_Research/status/1392197205449232386

across all career stages." (OECD, 2021, p. 34) as then a mismatch between supply and demand at later career stages would result. Moreover, simply creating more permanent positions for one cohort of researchers would backfire for the next cohort, as then the number of job openings would be much lower, unless the overall number of positions in research continues to rise in line with the influx of PhD graduates.

Figure 104: Main policy levers for fostering the demand for researchers (new positions)



Source: Authors.

- **Overall public research funding**

  - As a first rule, with respect to balancing supply with demand, **boom and bust cycles of public research budgets should be avoided**. Funding stability over business cycle through steadily increasing research budgets is supported by **multiannual budgeting frameworks** for research and prudent macro-economic policies, saving in good times to be able to spend in bad times. Steadily increasing budgets allow for a better planning of open positions, making careers in research more predictable.

  - To anchor steadily increasing budgets in national policy formulation, there are already the research spending targets within the European Semester. Commitment and strategies to try and reach these targets differ however widely across the EU countries, as do the current R&D spending levels (see section 4.1.1). Innovation and R&D could be declared central policy goals to ensure competitiveness in knowledge-based societies and tackle grand challenges such as the twin transition, with **clear increasing paths for public research budgets**, with the gradient of the budgetary path determined by the current level of spending as well as factors determining the absorptive capacity for increased R&D spending (such as industrial structure, supply of PhD-graduates etc.).

  - Over the next years, money from the investment and recovery plans will come in addition. Perversely, these funds could precisely create a **boom and bust mechanism**, when the programme ends and "only" the normal research funds will flow. The impact on researchers in EU

countries will depend a lot on the specific amount of the recovery plans going into R&D or innovation, on the evolution of national budgets for research etc., so that it is not a priori clear that such an effect will materialise in every country, but it is something **which should be monitored.**

- **Research funding for research institutions/universities**

  - Using grant funding to free up institutional resources: Often, tenured researchers have their salary secured by the core funding for their institution, while the salary or the position of early stage, fixed-term researchers depends on securing the next grant, i.e. on competitive success in proposal writing. **Allowing tenured researchers to have some of their salaries funded by grants (e.g., as in Sweden), could free up core funding which could then be used for fixed-term researchers/post-docs**: not necessarily to give them a permanent contract, but at least to extend the often very short time horizons attached to the duration of the project. E.g., funding the researcher for an additional two years, whereas the project already finished after four years, could provide the researchers with some crucial leeway to finish their publications or venture into more risky research, putting them into a better position to compete for the next job.
  - Funding organisations could generally be asked to provide longer-term grants for early stage researchers, as discussed in the workshop.

- **Public research funding for firms**

  - Overall, a **stable growth path of public research funding** for firms, as direct or indirect subsidies, will increase demand for researchers, similar to increasing overall research funding.

  - **R&D tax credits or incentives** could be used to reduce the wage taxes and social security contributions businesses have to pay on the wages of their employees working in R&D. Most R&D tax credits are designed to reduce corporate taxes and include all components of R&D spending, but some – as in the Netherlands and Germany – are designed so that taxes and social security contributions businesses have to pay for their researchers can be reduced, or allow mostly R&D wages and social security contributions to reduce corporate taxes.[63] Reduced costs for researchers incentivise firms to create more positions for researchers, strengthening demand for them. Reductions in social security and payroll taxes are also recommended by the OECD, so that R&D tax credits can be used by small and young firms, rather than contributing to fiscal arbitrage strategies by large, multinational firms.[64] R&D tax incentives have been shown to be effective in increasing business R&D intensity, in particular so for smaller firms.[65]

  - Research funding schemes which provide incentives to train and employ PhDs, such as **collaborative research centres or industry doctorates**, exist in many EU countries (e.g. in Hungary or Austria), but they are not widespread (see section 7.1.5). The question is more about the right size in terms of volume or share of PhD-students trained, which

[63] https://business.gov.nl/subsidy/wbso/ ; https://humboldt-innovation.de/en/research-service/funding-financing/federal-tax-research-incentive

[64] (Appelt et al., 2016); http://www.oecd-ilibrary.org/content/workingpaper/5jlr8fldqk7j-en

[65] (Appelt et al., 2020); https://voxeu.org/article/effectiveness-rd-tax-incentives-oecd-economies

needs country-specific evaluations. Such collaborative PhD programmes may also be more easily organised for the engineering sciences.

- What may be less practiced in EU countries, are **shorter term exchange programmes** which aim at both increasing the awareness of researchers for careers in industry and incentives for industry to employ researchers, by reducing their cost and hence enabling learning effects on what PhD-trained researchers can do. In 6-12 months, negative impact on publication performance or other relevant performance dimensions of academic researchers should be limited, on the contrary ideas could be gained when the researcher returns to academia; when he or she stays in industry, it is also a positive outcome. Ireland has recently introduced such a programme which is used well. [66]

- **Career structures in public sector institutions, coupled with performance-based funding/incentives for scientific productivity**
  - Universities or research institutions differ in how they organise research, with some featuring a higher share of permanent contracts in working units of universities/research institutions and others characterised by a single permanent researcher. A change of career structures towards **less hierarchical models** creates more demand for permanent positions (e.g., instead of one permanent professor at the top in the traditional German chair-based model, have several permanent senior researchers/full professors in flatter department-style organisational models, as in the US.
  - **Greater flexibility with respect to the share of tasks** (research, teaching, administration) over the life cycle of an academic career could also allow for more permanent positions– e.g. a switch to a higher share of teaching once research productivity or interest goes down, could create room for new research-intensive positions. This also requires more flexible assessment schemes, i.e. e.g. a decreasing importance of publication performance over the lifetime of a researcher.
  - More generally, **reaching tenure should not mean the end of incentives for scientific productivity**. E.g., there are a variety of mechanisms available to maintain incentives for scientific productivity over the lifetime of researchers, such as quantitative or qualitative requirements for third party funding (bring in a certain amount of third party funding of a certain type each year, e.g.), or ex-post evaluations of publication and other performance dimensions. Faced with such incentives, tenured researchers will be more flexible as regards the share of tasks in their overall time portfolio and it would also mean that not all the pressure is on the young early stage researchers who want to make it "in" (and can then drop their efforts, once they are tenured).
- **Diversification of careers – more positions outside the core principal investigator role**
  - In view of the changing, more team-based and functionally specialised research enterprise[67], **more permanent contracts for various research roles** within academic institutions could be made available – to recognise a wider range of roles necessary to accommodate the growing specialisation needs of academic research – e.g., data scientists, staff scientists, not just the principial investigator. How large this

[66] https://www.sfi.ie/funding/funding-calls/sfi-industry-fellowship-programme/

[67] See (Haeussler & Sauermann, 2016; Pavlidis et al., 2014; Petersen et al., 2014; Wuchty et al., 2007)

potential truly is, in terms of e.g. share of new or total positions in research, remains to be seen – this needs further studies.

- **Developing regional knowledge ecosystems or regional innovation systems**

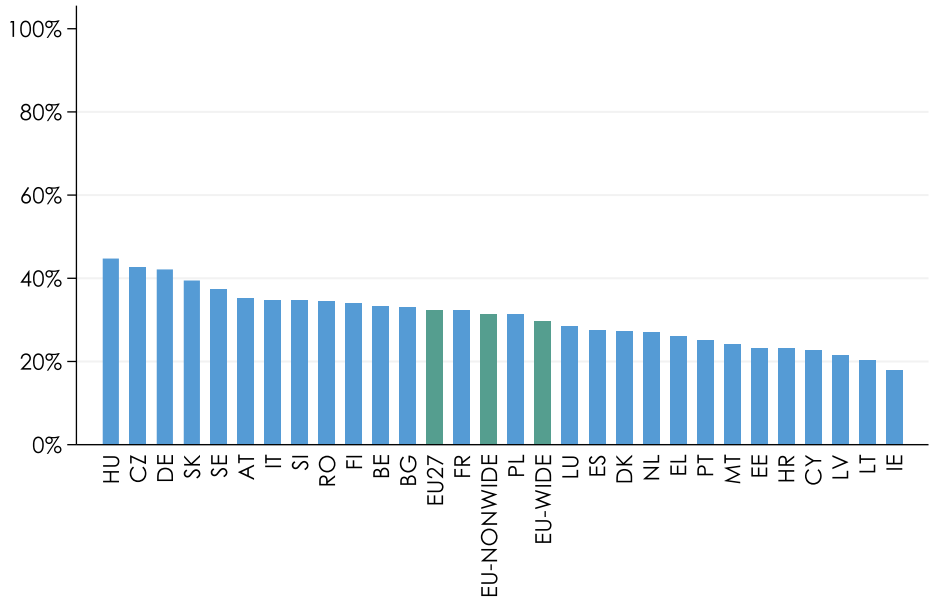
  - Smart specialisation strategies aim at developing the innovative potential of a region by connecting public and private innovation actors, e.g. through common research or innovation projects, collaborative PhD training, higher education teaching programmes with industry inputs, subsidies for intersectoral mobility, etc. These regional development initiatives lead to an intensification of innovative activities and are hence likely to create demand for researchers.

- **Structural change towards more knowledge-intensive business activities**

  - EU Member States differ in the **knowledge intensity of their economic specialisation**. Countries with high shares of innovation- or knowledge-intensive industry or services usually demand more researchers than those with low shares. The figure below illustrates this by using an industry taxonomy based on innovation intensity (Peneder, 2010). Some widening countries also show high shares of innovation-intensive industries. This is partly the effect of the international fragmentation of production, with e.g. R&I activity based in one country and assembly of the final product in another (lower income-)country. E.g., Hungary features large motor assembly plants which statistically count as high-tech. Figure 106 shows the R&D intensity of countries, correcting for their industrial structure. A country such as Hungary, e.g., should have much more R&D, given its industrial structure (this is also a policy recommendation in the RIO country report 2017 or the PSF peer review, that Hungary increases innovative intensity of its domestic enterprises).

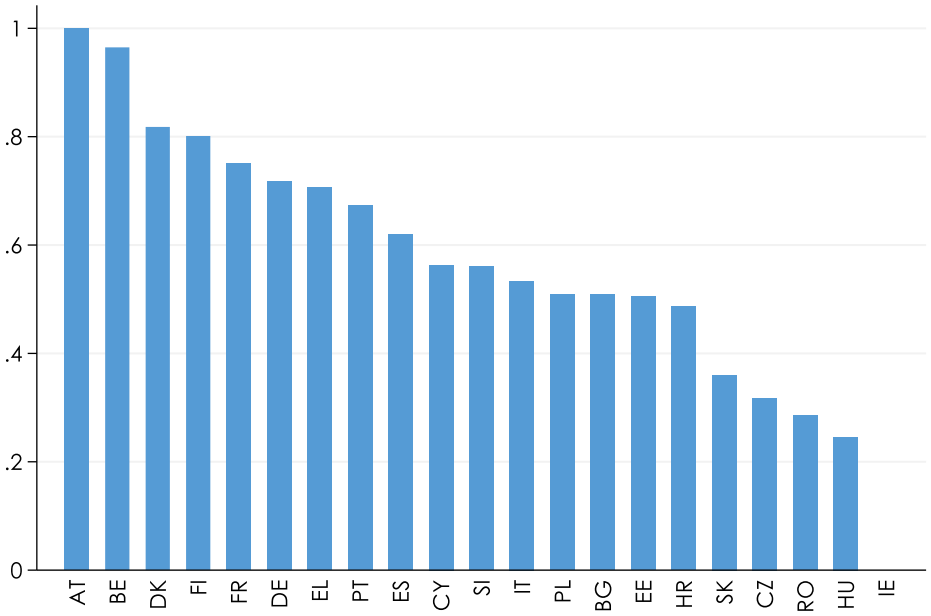
- **Many factors** contribute towards the growing importance of knowledge-intensive industries and services in total national output, e.g. **product and labour market regulation, education (quantity and quality), quantity and quality of R&D and innovation efforts, public procurement, conditions for growth of start-ups (e.g. availability of venture capital)**. See Janger et al. 2011 for a survey. As such, many EU-level initiatives play a role here, e.g. the efforts for a pan-European Venture Capital market, the Common market, the European Research Area, etc. Discussions in detail on these policy areas are outside the scope of this report.

Figure 105: Share of med-high and high innovation-intensive industries in manufacturing and services, 2018



Source: Eurostat Structural Business Statistics, WIFO-calculations. Based on Peneder (2010).

Figure 106: Structurally adjusted business R&D intensity, normalised data (0-1), 2017

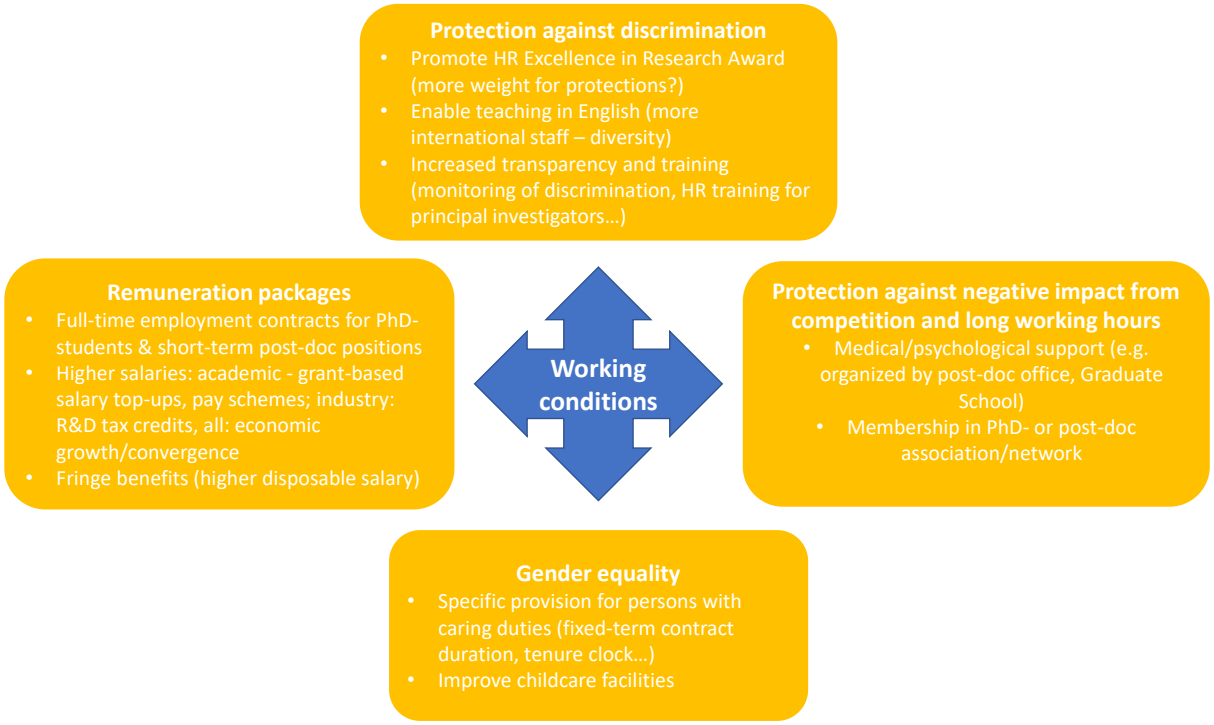


Source: OECD, Eurostat, WIFO-calculations.

7.1.3. Working Conditions

Improving working conditions consists of policy options in the area of salaries or remuneration packages, protection against discrimination, protection against the negative impact from competition and long working hours, as well as measures to boost gender equality. Improving working conditions can increase the supply of researchers, as it makes the profession more attractive, and decrease demand in case improved working conditions – e.g. higher salaries – lead to fewer job openings, should research budgets remain unchanged.

Figure 107: Policy levers to improve working conditions of researchers



Source: Authors.

- **Policy options for increasing salaries/improving remuneration packages**

  - As regards **standards, codes of conduct**, the European Charter for Researchers states that « All researchers engaged in a research career should be recognised as professionals and be treated accordingly. This should commence at the beginning of their careers, namely at postgraduate level, and should include all levels, regardless of their classification at national level (e.g. employee, postgraduate student, doctoral candidate, postdoctoral fellow, civil servants). »[68] « Professional » implies being engaged in a specified activity as one's main paid occupation rather than as a pastime, or « any person who earns a living from a specified professional activity »[69] Whether this means, or whether the institutions which have endorsed the Charter understand it like that, that **all researchers, including pre-docs, should be on a full-time contract**, with pension and social security benefits, remains somewhat unclear : in the section on

[68] https://euraxess.ec.europa.eu/jobs/charter/european-charter#custom-collapse-1-recognition-of-the-profession In spite of this clear definition, which means that PhD-students should be regarded as professionals and not students, e.g. in Slovakia or in Bulgaria there is no consensus on this issue, as discussed during the workshop.

[69] https://en.wikipedia.org/wiki/Professional

funding and salaries of the Charter[70], the requirement refers to « funding and/or salaries with … social security provisions… »

- The **Charter could in the wake of a consultation process be adapted** to the modern discussion on precarity. Note that proper full-time contracts for all researchers will almost certainly reduce demand for researchers, if budgets remain the same. A general case can be made however, that young professionals in academic research should not be penalised by comparison with their peers in the private sector, who will usually start with a proper employment contract providing entitlement to benefits, rather than e.g. a mere stipend or fellowship income.

- The principles of **innovative doctoral training** only mention very generally good working conditions in line with the Charter, but do not refer explicitly to full employment contracts (i.e. pay for 100% of working hours, rather than just part-time contracts, even though PhDs work full time), which can cover the cost of living, including pension and social security entitlements. The EU could here as well launch an evaluation of the principles, to better anchor guidance which prevents precarious academic careers.

- If proper employment contracts are introduced for PhDs and post-docs, care needs to be taken as to remain consistent with remuneration packages in later career stages, otherwise there incentives to stay longer than necessary in fixed-term training stages.[71]

- **Research grant funding schemes** (private or academic sector)

  - Even for short-term contracts of below 2 years, countries or funding agencies could examine **whether social security/pension entitlements actually accrue to researchers and are portable,** so that their time on fixed-term contracts is not lost for retirement, or for social security benefits, so that researchers in academic research don't lose against people employed in private sector; the "finding out"-process whether one is suited for a career in academia should not entail a significant penalty in terms of salary/pension/social security entitlement. One tool to enable pension contributions also for short-term contracts and to make sure that they are portable, is to use the EU-level RESAVER[72] scheme for occupational pensions.

  - Funding agencies could further examine, whether **higher cost refunding rates for researchers in grant funding schemes, covering also higher salaries for the grantees**, are possible. In some countries, the main funding agency does not include the salary of the principal (tenured) investigator in the eligible costs, so that first that would need to change. Salary increases related to grants are practiced in Hungary, e.g. (see WP8 of this project). However, any such policy changes to grants would limit the available budget for research, unless budgets are increased. This would imply lower success rates for R&D projects. Different salaries within the same institutions for researchers at the same level (one grantee, the other

[70] https://euraxess.ec.europa.eu/jobs/charter/european-charter#custom-collapse-1-funding-and-salaries

[71] In the workshop, the example of Romania was cited, where PhD students were earning almost more than lecturers in the wake of a special scheme to support PhD-training.

[72] https://www.resaver.eu/

not) may however also lead to tensions. Moreover, such a policy would not generally work against precarity, but improve working conditions for researchers who have managed to win a grant, so for a selection of researchers. Hence, this is also a policy potentially more relevant for the issue of brain drain.

- **Tax instruments**: R&D tax credits could be used to reduce the wage taxes and social security contributions businesses have to pay on the wages of their employees working in R&D (see above). To make an impact on working conditions, such schemes would however also have to lead to higher net salaries for researchers, and not just lower taxes for employers of researchers. [73] The loss of taxation revenues would have to be compensated for to balance overall public budgets.

- A reform of **pay schemes** – if existing – could quickly and selectively increase salaries of researchers, but is of course costly in terms of budget. Without a concomitant rise in research budgets, such a policy would lead to significantly lower demand for researchers. To effectively target a reduction in precarity, the focus should be on the lowest (entry) salaries, without compromising consistency with salaries in later career stages, e.g. through (increasing) **minimum salary levels** which may be easier to implement than full-blown pay schemes, in case the latter don't exist. However, more than 80% of researchers and employers surveyed for this project indicate that there are minimum salary levels in principle in their organisations.

- **Fringe benefits** as part of remuneration packages which leave researchers with more net salary, such as free housing, or housing subsidies, and free childcare, are also options which can increase disposable income of researchers. For additional occupational pensions, the EU-level **RESAVER pension** fund could be used, as it would be portable.

- All policies aiming at **accelerating economic development,** in particular in countries below average GDP per capita in the EU, can contribute to higher salaries. Salary levels and overall remuneration packages in a country significantly depend on overall economic development. While individual researchers can get higher salaries due to grants, e.g., all researchers benefit from rising salaries in the wake of economic development. A detailed discussion of all economic policies to accelerate economic development is however out of the scope of this report.

- **Protection against discrimination**

  - There are clear **both legal and voluntary code of conduct EU-level provisions against discrimination** based on race and ethnic origin, gender, disability, religion and age, as enshrined e.g. in the EU minimum requirements for labour law enshrined in the Amsterdam Treaty, or in the Charter for Researchers. Nevertheless, indications of discriminatory behaviour surface both in general surveys such as the European Working Conditions Survey and in the researcher specific survey undertaken within this project (see section 4.7).

  - It is hence mainly the enforcement of application of these provisions which is important, or actual policies/institutional policies on the ground which matter. The **HR excellence seal**[74] for aligning human resource policies of

[73] (Lokshin & Mohnen, 2013) find that the Dutch R&D incentive scheme increases wages of R&D employees, although this is an « involuntary » effect. https://www.sciencedirect.com/science/article/pii/S0048733313000024

[74] https://euraxess.ec.europa.eu/jobs/hrs4r

the organisation with the Charter for Researchers and the Code for Recruitment is a way for countries to see if their institutions adopt policies to make sure discrimination does not happen. However, it is not clear in practice which weight institutional mechanisms to protect against discrimination are carrying in the award of the HR excellence seal – a study could provide further insights.

- In the research employment context, with higher international workforce than in other professional areas, a more frequent complaint is that foreigners are discriminated against, e.g. in terms of perceived unfair recruitment/career progression, or in terms of rules which make it harder for foreigners, such as teaching in the domestic language. Allowing **teaching in English** would have many beneficial effects on top of less discrimination: it could contribute to enhanced staff diversity which by itself would work in favour of less discriminatory behaviour, but also significantly widen the pool of candidates for positions requiring teaching. This latter effect would strengthen research institutions' attractiveness and lead to more competition for jobs. In particular countries suffering from asymmetric mobility of researchers could hence benefit from such changes. Of course, students would need to be prepared already in the secondary education system in terms of a sufficient proficiency in English.

- Sometimes, **immigration regulations** for researchers from **outside the EU** add to this problem. On top of a burdensome immigration process or protracted waiting periods for benefit entitlement, non-EU researchers may be subject to specific rules on what they are allowed to do. E.g., in Slovakia, incoming researchers are restricted mainly to research and cannot teach. In such cases, countries need to examine their regulations to screen them for any undesired effect on precarious research careers, as in principle there is an EU 3rd country directive which should be transposed in national legislation.

- More generally, **increased transparency** and **training** can work in favour of protection against discrimination and cases of bullying or harassment. An initiative currently under way in the UK (7 principles to change the research culture in the UK)[75] suggests among others the following:

  - **Yearly reporting** by institutions and funders on complaints/cases of bullying, harassment and discrimination in a standardised format, including outcomes such as share of complaints upheld, rejected, unresolved, etc.)

  - All staff with teaching/managerial responsibility should receive an **annual HR performance review**

  - Recipients of research grants should get **training in** among others **tackling bullying and harassment**

- **Protection against negative impact from competition and long working hours**

  - In particular post-docs are often in work situations, where they are faced with intense competitive pressure and long working hours, leading to a bad work-life balance and potentially anxiety and depression.[76] **Graduate schools' and post-doc offices** can also in this regard provide free support

[75] https://docs.google.com/document/d/1Nqjhxxd9VoFFZiqrD0hRvyMo6DcZMyZVJjz9_2SzPZY/edit

[76] See e.g., https://www.nature.com/articles/d41586-021-02215-0

services, such as **medical/psychological advice**. Moreover, **membership in a PhD- or post-doc association** may help early career researchers during this difficult phase, by allowing for social interaction, exchange about the problems young researchers face etc. After PhD-graduation, staying in contact with others, e.g. through **alumni associations**, can help to withstand the stress from job rejections (see footnote above).

- **Gender equality**
    - The aim of a representative gender balance and working conditions to combine family and work are also clearly mentioned in the European Charter for Researchers, although from a quite general perspective. E.g., there are no details on **favourable conditions for people with caring duties on grants or on a tenure clock (e.g., extension of grants, or fixed-term contracts, or of the tenure stage, as a result of caring duties**). Countries, institutions and funding agencies could examine their policies, whether they sufficiently take account of the needs of people with caring duties.
    - Moreover, there is a large heterogeneity with respect to childcare facilities among the EU Member States, or with respect to the share of esp. smaller children below 3 in formal childcare (see section 6.2.3)

Finally, one policy option that works across many of the options mentioned, is to integrate these requirements (e.g., with respect to mandatory career guidance, or gender equality and diversity, post-doctoral support etc.) into **reporting requirements for research grant funding** (see also the OECD, 2021, on this point). Some funders already ask for more reporting, e.g. in Horizon Europe it will be mandatory to provide Gender Equality Reports. In Ireland, SFI plans within its new organizational strategy *Shaping Our Future* (p. 24) to "work with HEIs to ensure that all research team members can engage in appropriate career supports. This will include piloting an initiative to incentivise SFI award holders to ensure that their team members receive the necessary holistic training for their development."

7.1.4. Key policy levers and beneficial side effects

In this subsection, we summarise some potential key policy levers against the precarity of careers in research across the three main areas of intervention (supply, demand, working conditions), which were also presented at the validation workshop. The importance of these policy levers will depend on the specific situation of the individual EU countries.

- **Supply of researchers**
    - Within and across universities and research institutions, academic researchers should be able to follow a **career path with early and reliable selection points**, i.e. early, transparent and merit-based recruitment and career progression; and training stages where researchers get **four types of support**: i) career/**job market information**, ii) training in **transferable skills**, iii) regular **feedback** from supervisors/Research group leaders and iv) access/**exposure to former PhD-graduates or post-docs** working in different sectors in research and non-research roles. **Three main organisational units** in universities or research institutions could be involved in providing or organising these four types of support: **graduate or doctoral schools, post-doc offices** and **human resources departments/management in universities** (see Figure 108).
    - Key are particularly…

- …the **organisation of PhD-training in graduate schools**, which enable merit-based and transparent recruitment, training in transferable skills and career support services, … This can also benefit from the work done in work package 6 on a common competence framework for researchers.

- …and the establishment of **post-doc offices with career support services**, possibly along the lines recommended by the US National Post-Doc Association (NPA)

- **Demand for researchers**

  - Implementation of and commitment to a **stable, multi-annual growth path for public research budgets**, e.g. to reach the country targets for R&D spending

  - Funding and organisation of **industry academia research collaborations**, as well as of **joint doctorates**, and **shorter-term placements** of academic researchers in the private sector, in sufficient numbers

  - **Structural changes to academic research**, such as less hierarchical structures (the "department-" vs. the "chair-based" model), more flexibility with regards to the share of teaching and research over time coupled with incentives for scientific productivity and a diversification of researcher roles within academic research can help, among others

- **Working conditions**

  - **Full employment contracts with all benefits**, for all PhD-students. PhD-students should be regarded as professionals, as already made explicit in the European Charter for Researchers.[77] The same holds true for post-docs on short-term fixed term contracts. For them, the portability of benefits between employers or across borders is also key.

  - To effectively target a reduction in precarity, the focus of improving low pay of researchers should be on the lowest (entry) salaries, without compromising consistency with salaries in later career stages, e.g. through **minimum salary levels** which may be easier to implement than full-blown pay schemes, in case the latter don't exist.

  - **Increased transparency and training** to provide better protection against discrimination and cases of bullying or harassment, e.g. HR training for grant recipients or research group leaders, as well as institutional monitoring of relevant cases.

  - **Specific provisions** in contracts or in funding rules for **people with caring duties**, e.g. extending the "tenure clock"

To incentivise or implement such policies, they could be made part of research grant funding criteria, where relevant, or of performance-based block grant agreements between research institutions/universities and government. Moreover, as shown, there will typically be coordination problems between suppliers of research skills and demand for researchers. Establishing a **coordination platform or task force** which involves the relevant

[77] The European Charter for Researchers states that " All researchers engaged in a research career should be recognised as professionals and be treated accordingly. This should commence at the beginning of their careers, namely at postgraduate level, and should include all levels, regardless of their classification at national level (e.g. employee, postgraduate student, doctoral candidate, postdoctoral fellow, civil servants). "

ministries (e.g., the education, research and innovation, as well as finance ministries), funders of research, universities and research institutions, PhD- and post-doc associations, representatives of firms active in research and meets regularly could be a first step in overcoming such coordination failures. One element of such meetings could be the preparation of an analytical note on research budgets, open positions in research, trends in PhD-students/graduates etc. which could be discussed to gain a shared view on the outlook for careers in research. Such a coordination platform can also meet at the **regional level**, e.g. within smart specialisation strategies or knowledge hubs, and also at **EU-level**.

In terms of funding, depending on the situation of the country, a clear increase in funding for R&D may be necessary to implement the policies cited above. Several countries however spend very little on R&D, so that an increase would be welcome for future competitiveness in any regard. Some other countries who already spend a lot on R&D may be more challenged in changing the composition of spending, or in proceeding to structural reforms in the research sector. Graduate schools and post-doc offices, but also human resources management require appropriate funding to be able to recruit qualified administrative staff who provide the support services. Such **funding should be part of block grants** or base funding for universities or research institutions, as they should be standard components of any advanced research training.

- **Beneficial side effects**

The main objective of the intended actions is less precarity for researchers, or more well being of researchers, but there are many very **positive "side effects"** which would substantially **improve any cost benefit relationship of the measures taken**.

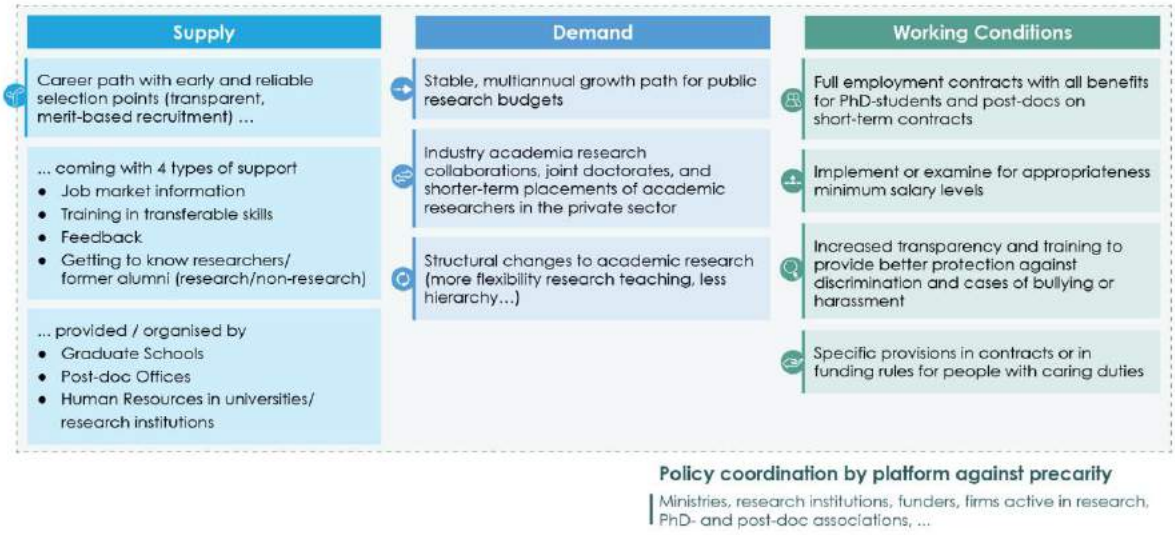
- Researchers indicated in the survey that their working conditions make them **less likely to engage in risky research** (as e.g. an extension of a fixed-term contract, or a new position, require publication output to show for, so that often the safe route to publishable output is chosen). This is supported by previous evidence. Risk-taking in research is however what is needed in the face of challenges such as climate change or digitalisation.

- Structured PhD-training, or graduate schools together with full employment contracts for PhD-Students would significantly increase the **international attractiveness** of the research institutions offering them, improve the attractiveness of careers in research itself as well as professionalise and modernise PhD-training. An improvement in research performance and excellence is likely to follow, which are **key pillars of tackling the twin transition (digital and climate) and knowledge-based competitiveness.** It would also work **against brain drain of researchers.**

- A diversification of researcher careers can contribute to an increasing **research intensity of the business sector,** thereby facilitating structural change towards knowledge intensive activities and better overall economic performance

- A stable growth path for public research funding would foster the **EU's competitiveness on the global stage**: EU performance in increasing research intensity has been poor on average over the past 20 years since the start of the Lisbon strategy. Since that time, China has caught up with the EU average, e.g.

Figure 108: Key policy levers



The next table summarises all the policy options outlined in this section.

Table 45: Summary table for policy options to improve precarious careers

Supply			
Model career path		Career path with early and reliable selection points, structured training in early career stages (transferable skills, …)	Integration into funding criteria, reporting requirements
PhD-Studies			
	Foster diversification of careers/career guidance	Information on job market prospects (e.g. by Graduate School)	
		Transferable skills training, including online courses e.g. for job search, but also firm creation	
		Career guidance by career development services, e.g. offered by Graduate School	
		Mentoring by PhD supervisors on career perspectives (a career outside academia is not a failure per se)	
		Discussions with alumni	
	Organisation of PhD-training in doctoral schools	Requires application and selection and hence provides opportunities for information and career guidance	
		Administrative support services can provide career guidance services etc.	
	Determine and diffuse best practice in PhD support services	E.g. analysis of best practice in Graduate Schools	
	Revision of principles of innovative doctoral training	Anchor job market information	
Post-doc positions			
	Foster diversification of careers/career guidance	Information on job market prospects (e.g. by post-doc office)	
		Career guidance by career development services, e.g. offered by post-doc office, including e.g. online courses for job search	
		Mentoring by principal investigators on career perspectives (a career outside academia is not a failure per se), e.g through mandatory yearly employee orientation talks; can also be organised by Human Resources Management	
		Discussion fora with alumni (e.g. organised by post-doc office)	

	Determine and diffuse best practice in post-doc support services	E.g. analysis of best practice of post-doc offices
	Revision of European Charter for Researchers	Anchor job market information, career guidance in sections on career development and career advice
	Increase share of tenure-track positions	e.g. based on an EU best practice model; selection at entry and at end (tenure evaluation)
Merit-based, transparent recruitment and career progression		
	HR Excellence in Research Award	Increased adoption of HR Excellence in Research Award
	OTM-R	Further improvement of merit-based, transparent recruitment, including respect of guidelines in Charter and Code on postdoctoral researchers
Excellent research institutions		
	Excellent research institutions	Reform of existing/creation of new excellent research institutions in widening countries can stimulate brain circulation and hence more even competition for job openings
Demand		
Public research funding		
	Stable growth path for public research budgets	Avoid boom and bust, introduce multiannual budgeting frameworks for research
		Increased commitment to R&D spending goals in national policy formulation - R&D and innovation as central pillars of knowledge-based societies
		Make sure investment and recovery plans don't lead to sugar rush in research positions
	Academic research funding	Stable growth path for academic research funding
		Change grant design so that wages of tenured researchers are eligible cost items - could free up base funding for fixed-term researchers, to give them longer contracts
		Extend funding duration for project grants (longer fixed-term grants)
	Funding for firms	Stable growth path for public research subsidies for firms (direct funding)
		Introduce/change R&D tax credits so that they mainly focus on reducing wage taxes and social security contributions of researchers
Industry-academic collaborative training and research		
		Collaborative research centres and industry doctorates
		Funding for shorter-term exchange programmes, industry fellowships
Structural changes in academic research		
	Career structures and performance-based funding in academic research	Less hierarchical organisation of working units in universities (department instead of chair model)
		Flexibility over lifetime with respect to teaching, research and administration, as a function of research productivity
		Incentives for scientific productivity over lifetime of academics - third party funding requirements, performance evaluation of tenured researchers
	Diversification of careers	More positions outside the role of principal investigator, such as staff scientists, data stewards etc.
Structural change towards knowledge-intensive activities		
	Develop regional knowledge ecosystem	Smart specialisation to foster intensity of innovative activities at regional level

	Economy-wide structural change	Result of many policies, such as R&D support, conditions for start-ups etc. - outside scope of report
Working conditions		
Improve salaries/remuneration packages		
	Revision of European Charter for Researchers	Make clearer provisions / guidance on type of employment contract for researchers (full-time, with full access to social security benefits, should be standard)
	Revision of principles of innovative doctoral training	Full-time (100%) employment contract with full access to social security benefits, including pension, should be the norm for young professionals (PhD-students)
	Full and portable benefits from short-term grants below 2 years	Examine whether social security/pension entitlements actually accrue to researchers and are portable
	Grant-based salary top-ups	May be more relevant for international attractiveness
	R&D tax credits	could be used to also increase net salaries for researchers, although this is normally not intended
	Reform of pay schemes	Will be costly for public budget
	Non-monetary fringe benefits	Free housing, childcare etc. can work to increase the net disposable income of researchers
	Economic growth	Faster convergence will push up salaries
Protection against discrimination		
	HR Excellence in Research Award	Examine weight/role of protection against discrimination mechanisms for award
	Enable teaching in English	Can lead to a more international staff, increasing diversity and reducing discriminatory behaviour (students' language skills need to be ready)
	Increased transparency and training	E.g., institutional monitoring of cases of bullying/harassment
		All staff with teaching or managerial responsibility can undergo a yearly HR performance review
		Training for recipients of research grants in how to tackle bullying or harassment
Protection against negative impact from competition and long working hours		
	Medical / psychological support	E.g., free access to such services provided by Graduate school, post-doc office
	Membership in PhD- or post-doc association	
Gender equality		
	Special provisions for women (all persons with caring duties)	E.g., extension of grants, or tenure clock, to account for caring duties
	Improve childcare facilities	

7.1.5. The cross-cutting challenge of diversifying careers

Some of the options above have suggested fostering the diversification of careers; this is particularly relevant for countries where many junior researchers compete for permanent positions in academia. Here we first summarise the policy options from above which are relevant for the diversification of careers.

Policy options affecting the supply of researchers relevant for diversifying careers

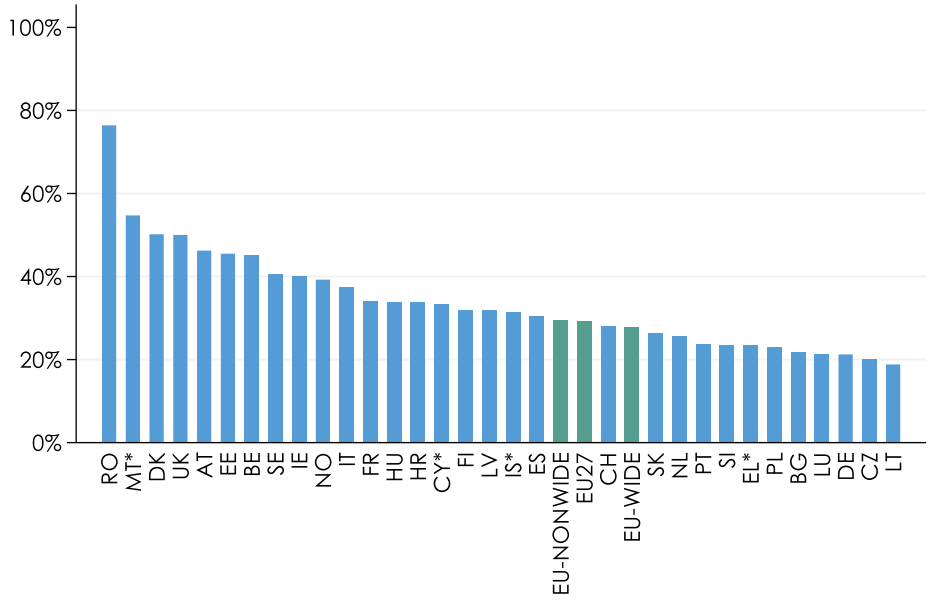
- Transferable skills
- Job market information
- Career guidance
- Mentoring, annual feedback talks
- Visits to/from industry and other sectors
- Contacts with alumni working in different sectors
- Non-academic career should not be seen as a failure by researchers/supervisors who mentor/guide junior researchers – but they need administrative support (e.g, organisation of talks with alumni by Graduate School, Post-doc office...

Demand

- Fostering and creating awareness about research positions in other sectors
- Industry academia research collaborations, centres /joint doctorates
- Funding for short-term industry fellowships
- Overall increase of research intensity in industry
- Alternative research positions in academia (e.g. Data steward, etc.)

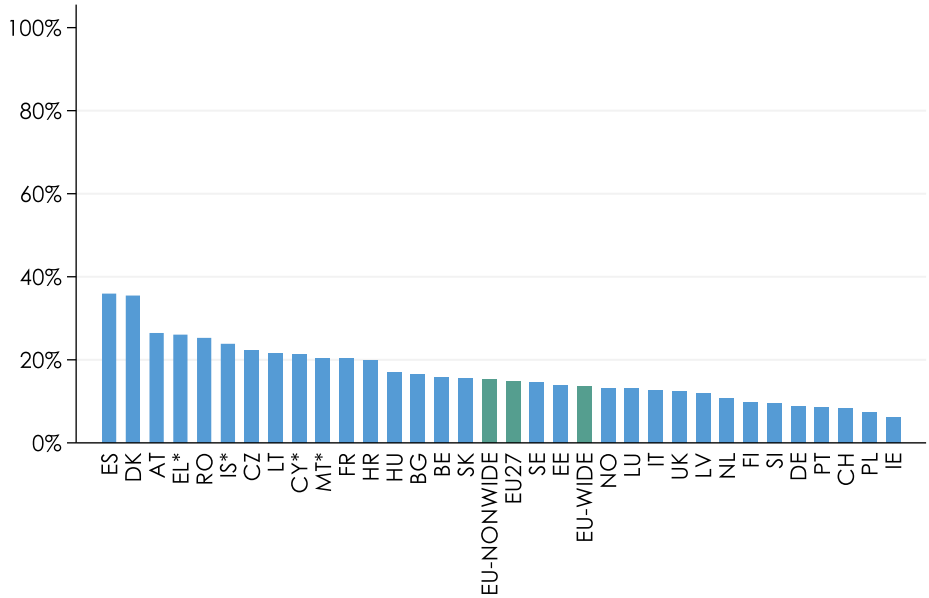
In the following, we also show some data illustrating the challenge of diversification of careers. Data from the MORE4 surveys (and the ones before) show that researchers value collaborations with industry, or placements outside the HEI (Figure 110), usually less than academic research centred experiences, such as international mobility within academia, for career progression or recruitment. The same pattern is also seen in the US. What researchers do perceive to be important is training in transferable skills, which more than 80% say is important for career progression, while only a bit less than a third actually receive such training, based on MORE4 data (see next figure). Intersectoral mobility among researchers who now work in higher education institutions is also rather low, at just above 20% on average in the EU27, with researchers from widening countries actually more often mobile on average. Shares of researchers having undertaken work placements in large firms or SMEs/start-ups are usually more in the single-digit range (Figure 112 and Figure 113).

Figure 109: Share of researchers receiving training in transferable skills per country, 2019



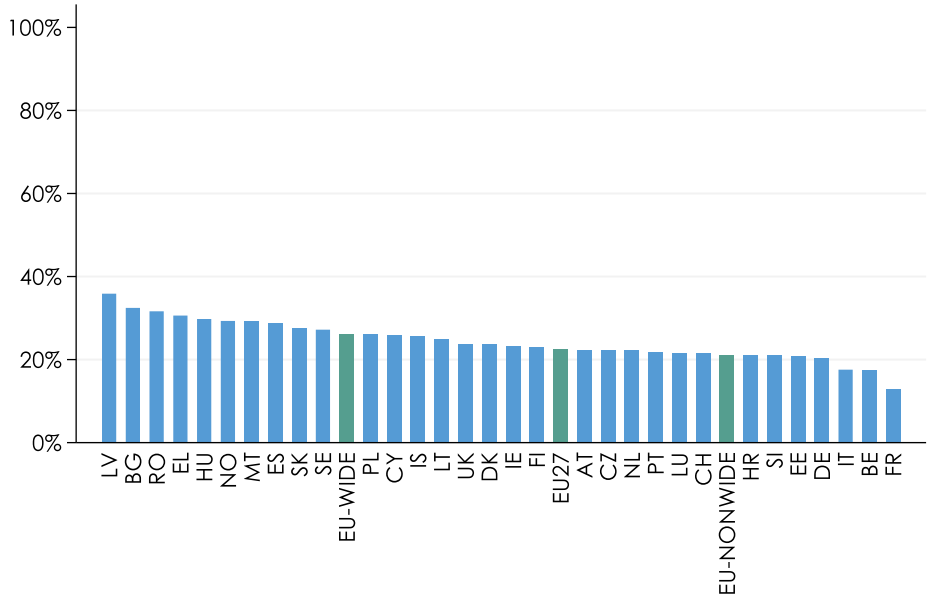
Source: MORE4 EU HE survey (2019)
Notes:
- Only R1 PhD candidates and R2 PhD holders.
- Share of researchers receiving training in transferable skills per country of PhD (i.e. the country where one obtained a PhD or is currently enrolled in a PhD programme).
- Based on question 50: "Which of the following statements are applicable to your PhD training?"
- *=less than 30 observations
- (2019: n=1,936)

Figure 110: Work placements during PhD-studies, 2019



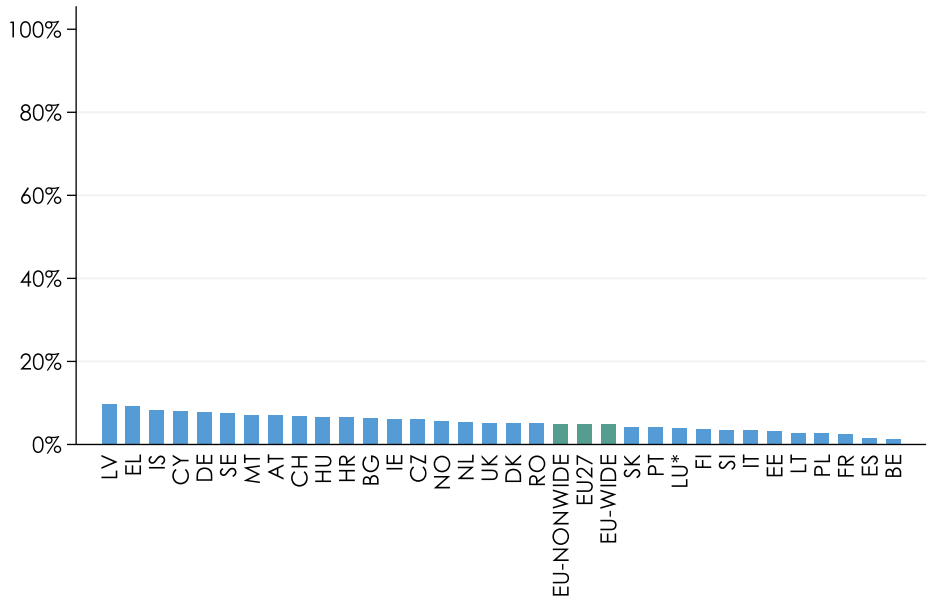
Source: MORE4 EU HE survey (2019)
Notes:
- Only R1 PhD candidates and R2 PhD holders.
- Based on question 50: "Which of the following statements are applicable to your PhD training?" – I undertook a work placement or internship outside the university or higher education institution for my PhD.
- *=less than 30 observations
- (2019: n=1,776)

Figure 111: Academic researchers with intersectoral mobility, 2019



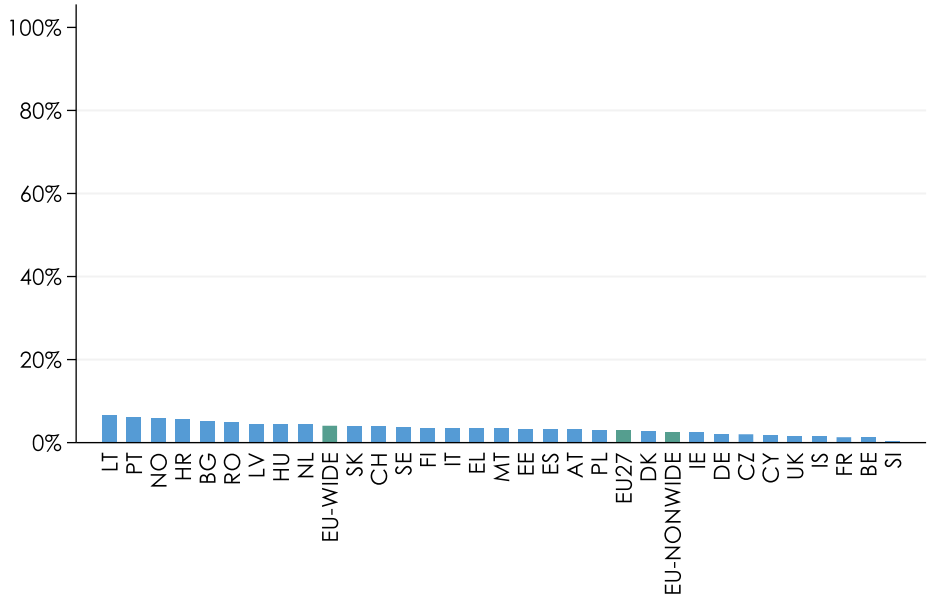
Source: MORE4 EU HE survey (2019)
Notes:
- Only for R2, R3 and R4 researchers.
- Based on question 86: "Have you ever worked as a researcher (excluding PhD) in the non-university/higher education sector (e.g. companies, NGOs, charities, non-university research institutes, governmental bodies/agencies)?"
- (2019: n=8,300)

Figure 112: Share of researchers who have worked in a large firm in private industry, 2019



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"
- *=less than 30 observations
- (n=8,300)

Figure 113: Share of researchers who have worked in a SME/start-up in private industry, 2019

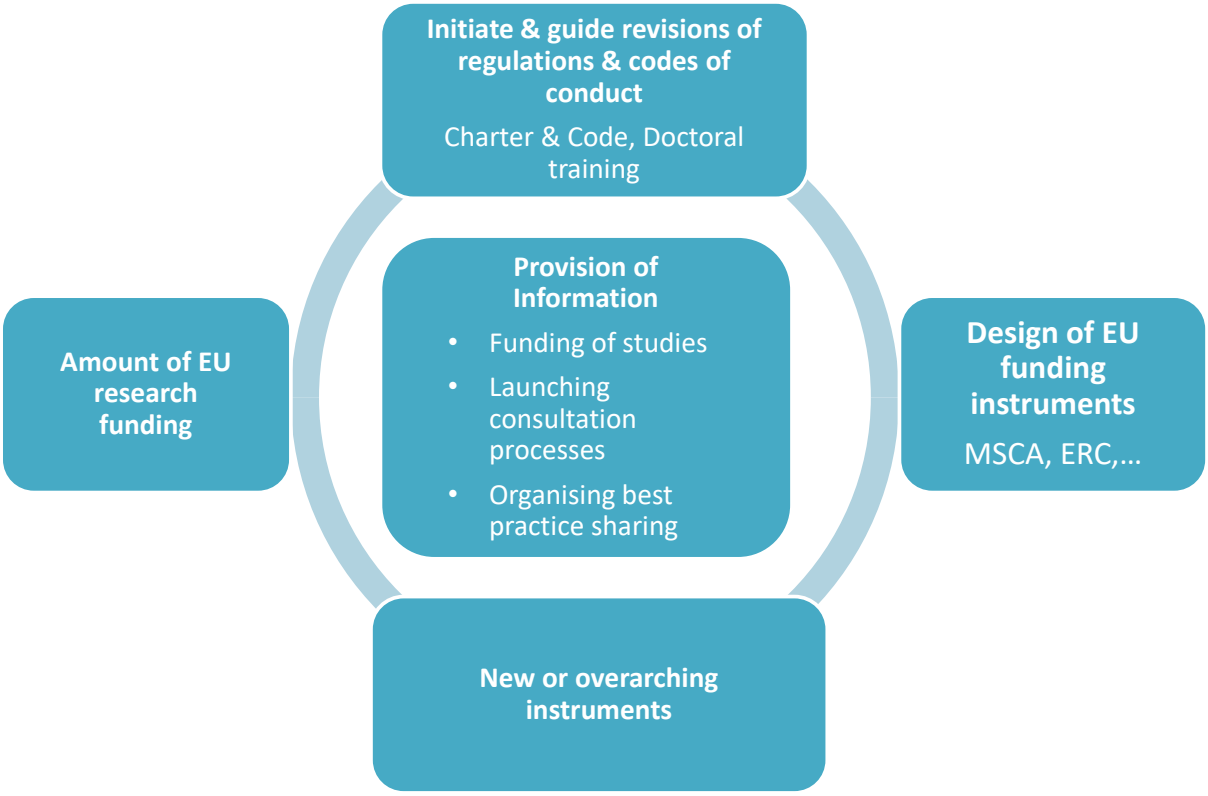


Source: MORE4 EU HE survey (2019)
Notes:
Only R2, R3 and R4 researcher
- Based on question 87: "Please indicate in which sector(s) you have worked that were not a university or higher education setting"
- (n=8,300)

7.2. EU-level

For a discussion of existing EU policies relevant for precarious careers or potentially new ones, we use the same overall supply-demand-working conditions structure as above. The figure below illustrates the main policy options by type of policy.

Figure 114: Key policy levers at the EU-level



Source: authors.

7.2.1. Supply of qualified researchers

To balance supply of qualified researchers, overarching levers can be seen in early or earlier selection of researchers, more early information on job market prospects and diversification of careers.

- As regards PhD-studies, there are several EU-level options:
    - Information/best-practice sharing: the EU could fund studies, or set up e.g. an MLE (Mutual Learning Exercise) on PhD-training with a focus on how PhD-students and applicants get information on job market prospects and on how they get in contact with industry/alternative careers, e.g. through yearly discussion fora with alumni, representatives from firms, government etc.[78] Also transferable skills training, although mentioned in the principles of innovative doctoral training, is still not widely practiced, but is seen as crucial by later stage researchers.[79] An EU funded project is currently developing "a range of interdisciplinary, inter-sectoral and international modules that are designed to broaden the skills of PhD graduates and improve their

[78] This could be done with stakeholders, e.g. the Council of Doctoral Education of the European University Association (EUA-CDE), and representatives for doctoral education from other university associations such as COIMBRA, LERU,..

[79] According to MORE4 (2019), only 32% of PhD-students got transferable skills training (unchanged from 2016), while 86% of researchers think that they are important for career progression.

employability in academic and non-academic environments including career planning skills, boundary-spanning communication skills, extended networks, and advanced research skills."[80] The Horizon-funded DocEnhance project works to enhance early-stage researchers' skills intelligence by developing transferable skills courses and integrating them into PhD programmes.[81] (see also the other EU funded projects aiming at developing training modules for transferable skills, in the section on EU policy options for both PhD- and post-doc stage).

- This information could then be used for best practice dissemination; another aspect would be more analytically, to conduct studies on which percentage of PhD-students is actually in **structured doctoral schools**[82], which selection procedures they use, what share of students has an employment contract etc. This information is partly collected by the MORE surveys, but could be complemented by doctoral schools and Ministries in charge of statistics on doctoral students. Such an analytical comparison can be useful for countries and PhD-granting institutions to change the framework conditions for PhD-studies. Providing information at the early stage and coordinating that information between students, PhD-associations, universities, etc. is crucial, as was pointed out during the workshop. Generally, it was mentioned at the workshop, that there is little coordination so far on training of researchers for careers outside academia, and this is something the ERA4you platform could do (the successor to Euraxess).

- Such analysis and best practice sharing can also lead to a revision of standards/codes of conduct, in this case the **Principles of innovative doctoral training**[83] from 2011 (see 6.2.1). Doctoral training principles are not well known among PhD-students and recent -holders[84], a survey of awareness (and application of them) among PhD-granting institutions could be useful here. Universities could be more explicitly asked to commit to their PhDs, as was discussed in the workshop.

- In principle, the European charter for Researchers refers to the EU Directive for Fixed-term work[85] under the header "stability and permanence of employment"[86]. However, the Directive only establishes that the maximum total duration of successive fixed-term employment contracts or the permitted number of renewals must be specified by the Member States, but does not fix limits itself; specifying duration and number of renewals may also not be necessary, when an objective reason for the renewal of the contract is given. But an EU-level decreed stronger limit on fixed-term contracts would be a difficult policy undertaking, as it would not only concern researchers, but all employees.

- Proposal-based researcher funding instruments: the **MSCA doctoral networks**[87] fund doctoral schools, industry and joint doctorates. They can

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[80] https://www.chameleonsproject.eu/about

[81] https://docenhance.eu/

[82] Institutional structures in "doctoral schools", organizational units with strategic responsibility for doctoral education, rather than « doctoral programmes », which are sets of selected courses.

[83] https://cdn5.euraxess.org/sites/default/files/principles_for_innovative_doctoral_training.pdf

[84] In MORE4, 17% of R1 and 13% of R2 researchers indicate that they are aware of the principles.

[85] https://ec.europa.eu/social/main.jsp?catId=706&langId=en&intPageId=199

[86] https://euraxess.ec.europa.eu/jobs/charter/european-charter : Employers and/or funders should ensure that the performance of researchers is not undermined by instability of employment contracts, and should therefore commit themselves as far as possible to improving the stability of employment conditions for researchers, thus implementing and abiding by the principles and terms laid down in the EU Directive on Fixed-Term Work.

[87] https://ec.europa.eu/research/mariecurieactions/actions/doctoral-networks

be used to apply some of the principles and ideas outlined, e.g. first the general principle of structured PhD-training; second, they could pioneer in Europe a new aspect of providing job market information, institutionalised career/discussion fora with alumni etc., as outlined above; third, they can also emphasize transferable skills training, to keep careers open and enable diversified research careers (which is a main goal of the industry doctorates already).[88] MSCA doctoral students already have to prepare their own development plan. The overall impact of the MSCA programme depends then on its overall budget, determining how many places can be funded (the aim should be an increasing share of total doctoral students trained according to the principles outlined above, otherwise supply would increase if funding increases)

- The **EU structural funds**, which are sometimes used for funding doctoral schools in lagging countries[89], could also require to adopt such practices as job market information and other details outlined above.

- **EU policy options at the post-doc stage**

  - In general, regular career guidance and other post-doc support services as outlined in section 6.2.1 would be well anchored in the European Charter for Researchers in both the sections on career development[90] and on career advice[91]. Here, again, the EU-level could organise/fund **an MLE, consultation processes**, with the objective of identifying and sharing best practice with respect to career guidance/employee orientation talks for post-docs, including information on and presentation of role models in alternative careers. More generally, **best-practice post-doc offices** could be identified through studies.

  - To promote **tenure tracks**, again best practice sharing could be implemented; note that ERC grants are often used to offer tenure track positions to candidates.

- **EU policy options for both PhD- and post-doc stage**

  - For both the PhD- and post-doc stage, the EU level could fund a **job market information / career online platform (e.g., the new ERA4you platform)**, which works e.g. as a repository of the existing studies that have previously been conducted at both the national and international level, provides

  - One element of such platforms could also be **(online) courses** to provide more practical career and job search how to dos, specifically tailored to the needs of PhD students/graduates and post-docs.

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[88] According to MORE4 data, 39% of MSCA funded early-stage researchers (R1-2) received training in transferable skills, relative to 31% on average in the EU.

[89] https://cdn5.euraxess.org/sites/default/files/principles_for_innovative_doctoral_training.pdf

[90] "Employers and/or funders of researchers should draw up … a specific career development strategy for researchers at all stages of their career, regardless of their contractual situation, including for researchers on fixed-term contracts. It should include the availability of mentors involved in providing support and guidance for the personal and professional development of researchers ..." https://euraxess.ec.europa.eu/jobs/charter/european-charter#custom-collapse-1-career-development

[91] "Employers and/or funders should ensure that career advice and job placement assistance, either in the institutions concerned, or through collaboration with other structures, is offered to researchers at all stages of their careers, regardless of their contractual situation" https://euraxess.ec.europa.eu/jobs/charter/european-charter#custom-collapse-1-access-to-career-advice

- The Chameleons and DocEnhance projects could both be relevant in this context.[92] There are also more field-specific projects: The Skies project wants to "provide PhD and 1st year postdoctoral researchers in the field of astronomy with a new set of skills integrating open science, innovation and entrepreneurship, thereby equipping them for a career that allows them to fulfil their potential and contribute to society and economy."[93] The InnEO_SpacePhD wants to foster innovation skills through earth observation.[94] Further EU funded projects aiming at providing training and courses for transferable skills are Enablecares, Versa, Discovery Learning, Opening Doors and ISPAS.

- Once the information from best-practice analysis is there, the EU level could also actively support a **network of Graduate schools and post-doc offices** with the aim of exchanging best practice information on how to provide job market information to PhD students and post-docs, how to increase awareness about careers outside academia etc. Within such a network, the EU level could also fund and award **prizes** to distinguished Graduate schools and post-doc offices, to motivate adoption of best practices.

- Moreover, to make voices of PhDs and post-docs heard in the policy formulating process, and to be able to gain information on the most pressing needs for them, the EU level can also support/fund **PhD and post-doc networks.** In the case of PhDs, there is already the organisation Eurodoc[95], but for post-docs, such an EU-wide association of post-doc associations seems to be missing.

- **Merit-based, transparent recruitment and career progression**

  - The MORE4 surveys point to increasing satisfaction with merit-based and transparent recruitment and career progression. However, in some countries higher shares of academic researchers disagree with the statement that such practices are standard. In those countries (see section 6.2.3), the EU-level could bring this up **in bilateral discussions with the Member States**, e.g. via the European Semester, or through dedicated **PSF peer reviews**, to contribute to awareness about the problem and to foster structural reform in academic research institutions.

- **General institutional/structural reforms in widening countries to create strong research institutions/universities**

  - The EU currently has some "soft" support mechanisms for countries looking to improve their research institutions, e.g. at the country level through **MLEs, or PSF peer reviews, or at the institutional level through twinning**. On their own, these instruments may not be enough to overcome entrenched interests; while funding instruments such as the ERC or Horizon Europe are designed to select the best among the competing researchers, rather than to provide incentives for institutions in need of reform to improve through structural reforms. While the portability of ERC grants can in principle be an incentive for institutions to reform, this may take time while the immediate effect of a switch to a country perceived to offer better conditions could be to increase competition for jobs there; of course, such

[92] https://docenhance.eu/ and https://www.chameleonsproject.eu/about

[93] https://cordis.europa.eu/project/id/101006212

[94] https://cordis.europa.eu/project/id/101006275

[95] http://www.eurodoc.net/

competition is good in principle for scientific productivity, but it also shows up in the data shown before on fixed-term contracts, careers etc.

- **A new instrument at the EU level, institutional rather than project-based funding**, could hence be discussed as one option to strengthen brain circulation and indirectly prevent precarious careers[96]. Such funding could be used together with conditionality, to reform existing universities or institutions, or also to set up new ones, based on organisational blue-prints from best-practice institutions, such as the IST Austria[97], which itself was modelled on the Israeli Weizmann Institute of Science[98]. A challenge with such new institutions is the chicken-and-egg problem – top researchers attract top researchers, leading to persistency in research performance at the institutional level. Organisational support by the EU could hence also be provided in the form of looking for such excellent researchers who would back new institutions and recruit the first cohort of researchers, something which could by administered by the ERC. In turn, such new institutions, using best practice models for careers, research organisation etc., will then work as an instigator for reforms in their countries, putting pressure on domestic institutions to reform in order to stay competitive.

7.2.2. Demand for researchers (new positions with permanent contracts)

Higher demand for (junior) researchers mainly can come from higher funding for research, from changes to research grant design or allocation mechanism, by changing career structures, more diversified careers and indirectly through structural change towards more knowledge-intensive activities.

- **Overall public research funding**

  - The general recommendation to avoid boom and bust cycles with public research budgets also holds for the **EU's research budgets**. There is of course a multi-annual budget framework, so that within the 7 years there is predictability of budgetary increases. As judged e.g. by success rates for EU funding, the increase in the Horizon Europe budget is definitely not as large as desired by some stakeholders[99]. The figure below indicates that employers of researchers see an increase of EU research funding as important (for junior researchers even more important) as national sources to help them recruit or retain researchers.

  - Over the next years, money from the investment and recovery plans will come in addition. Perversely, these funds could precisely create a **boom and bust mechanism**, when the programme ends and "only" the normal EU research funds will flow. The impact on researchers in EU countries will depend a lot on the specific amount of the recovery plans going into R&D or innovation, on the evolution of national budgets for research etc., so that it is not a priori clear that such an effect will materialise in every country, but it is something **which should be monitored** (see section 7.3).

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[96] See Janger, J., How to get brains circulating, In: Research Europe, February 20th 2020, p. 12. https://www.researchprofessionalnews.com/rr-news-europe-views-of-europe-2020-2-how-to-get-brains-circulating/ ; J.P. Bourguignon writes on Twitter: "If Europe does not pull itself together and rethink how it can take advantage of its scientific talent to keep its role in the world, it will face a major decline on the global arena" https://twitter.com/ERC_Research/status/1392197205449232386

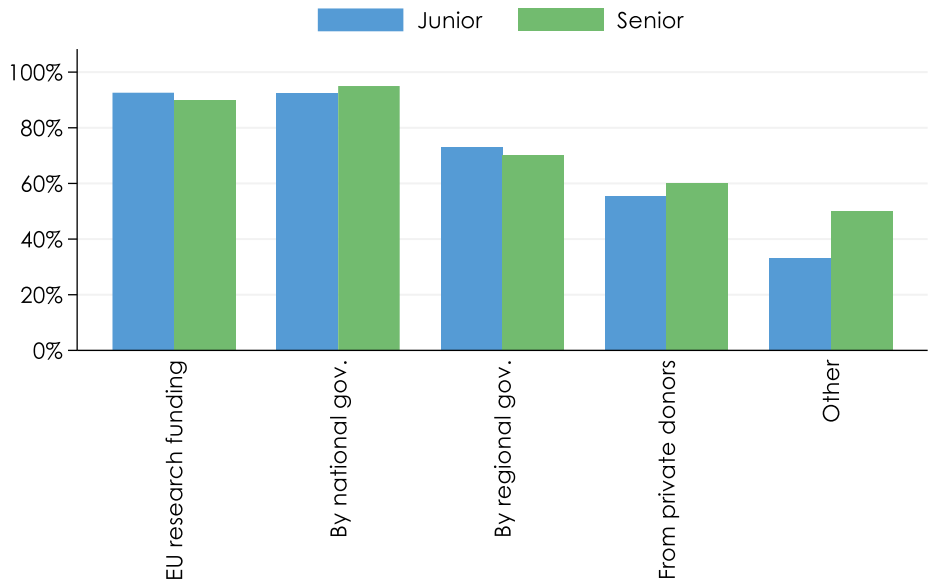
[97] https://ist.ac.at/en/home/

[98] https://www.weizmann.ac.il/pages/

[99] See e.g., https://www.nature.com/articles/d41586-020-03198-0 , research organisations were hoping for an additional 10 bn €.

Of course, the EU-level cannot just decide freely on budgets for research, but this is a matter of negotiation, of competing demands between various policy areas and between various countries (see section 7.3.2 for country specific recommendations on funding, with some Member States spending a fraction of the budgets in other countries)

Figure 115: Which external funding sources need to be increased, if research funding is a problem to recruit or retain junior/senior researchers, 2021



Source: Employer survey (2021)
Notes:
- Sum of shares of researchers declaring that it is very important or somewhat important that the respective external funding source should be increased.
- Based on question B4 & B8: "Which funding sources would be important for your organisation to increase?"
- Only respondents who indicate, that "not enough funding from outside" explain the low level of salary, which is a reason why the organisation struggles to recruit or retain appropriately qualified researchers Question B1/B5: "Does your organisation struggle to recruit or retain appropriately qualified junior researchers/senior researchers for open positions in research?"; question B2/B6: "Why do you think that your organisation struggles to recruit or retain appropriately qualified junior researchers/senior researchers?" and question B3/B7: "Which factors contribute to explaining the perception of a low level of salary?"
- (2021: Junior: n=12-27, Senior: n=8-20)

- **Research funding for research institutions/universities**
    - Using grant funding to free up institutional resources: In the EU, e.g. the ERC grants allow for putting salaries on the list of direct cost items, however the overall limit of 5 million Euros e.g. for starting grants will stay the same, limiting the pure research funding part of the grant. This is something which could be discussed at the level of the ERC, in conjunction with adapting salary levels to compensate for low levels in lower-income EU countries (see below, working conditions).
- **Research funding for firms**
    - In principle, all research funding programmes by the EU for firms create demand for researchers – the point is identical to overall research funding above.
    - Research funding schemes which provide incentives to train and employ PhDs, such as collaborative research centres or industry doctorates, exist at the EU level (see above, e.g. MSCA doctoral networks). The question is more about the right size in terms of volume, also taking account of the initiatives at national level – this needs an evaluation.

- What may be less practiced at EU level, are shorter term exchange programmes which aim at both increasing the awareness of researchers for careers in industry and incentives for industry to employ researchers, by reducing their cost and hence enabling learning effects on what PhD-trained researchers can do. In 6-12 months, any negative impact on publication performance should be limited, on the contrary ideas could be gained when the researcher returns to academia; when he or she stays in industry, it is also a positive outcome. Ireland has recently introduced such a programme which is used well; [100] the MSCA post-doctoral fellowships include the possibility of a non-academic placement at the end of the fellowship for up to 6 months. It could be evaluated how this works in practice.

- Another option suggested during the workshop concerns either EU funding or best-practice information for supporting technology transfer from academic research, or more precisely supporting the creation of start-ups by academic researchers, which would in turn create more demand for academic researchers. This is currently being pursued by the EU funded PRodPhD project, which develops entrepreneurship teaching modules for PhD-programmes.[101]

- **Career structures in public sector institutions**
  - At the EU-level, flatter career structures and greater flexibility with respect to the share of tasks could mostly be supported through collecting and organising **best practice-sharing**, unless there will be EU-level institutional funding for research institutions (see above)
- **Diversification of careers – more positions outside core academic research**
  - The EU-level could **commission studies** to investigate the potential for a wider range of permanent research positions more closely, given also the trend towards team science.
- **Structural change towards more knowledge-intensive business activities**
  - Many EU-level initiatives are relevant for structural change, e.g. the efforts for a pan-European Venture Capital market, the Common market, the European Research Area, etc. Discussions on increasing the component of EU activity which is relevant for structural change, are not necessarily research-related but involve a wider discussion of EU priorities which are outside the scope of this report.

7.2.3. Working Conditions

Improving working conditions consists of policy options in the area of salaries or remuneration packages, protection against discrimination and gender equality. Improving working conditions can increase the supply of researchers, as it makes the profession more attractive, and decrease demand in case improved working conditions – e.g. higher salaries – lead to fewer job openings, should research budgets remain unchanged.

- **Salaries/remuneration package**
  - As regards standards, codes of conduct, the **Charter could in the wake of a consultation process be adapted** to the modern discussion on precarity, on the initiative of the EU.

[100] https://www.sfi.ie/funding/funding-calls/sfi-industry-fellowship-programme/

[101] https://cordis.europa.eu/project/id/101005985

- The principles of **innovative doctoral training** only mention very generally good working conditions in line with the Charter, but do not refer explicitly to full employment contracts, which can cover the cost of living, including pension and social security entitlements. The EU could here as well launch an evaluation of the principles, to better anchor guidance which prevents precarious academic careers.

- Proposal-based researcher funding instruments: the **MSCA doctoral networks**[102] provide a living and mobility allowance, as well as family allowances for PhD-students. They could be screened at the individual level for the type of employment contract the beneficiary host institutions provide, e.g. whether standard pension and social security entitlements are included. The amount of the living allowance can be evaluated per country, how it relates to living costs in the country, whether it is possible to combine national stipends etc. At the institutional level, the collaboration mandate could be examined, whether more flexibility (i.e. single-institution proposals) could lead to support of doctoral researchers in poorer regions, without compromising quality. Increases of the cost per funded researcher would limit the number of places available, if the budget remained unchanged.

- Proposal-based researcher funding instruments: the **MSCA post-doctoral fellowships**[103] provide similar benefits to post-docs as the MSCA doctoral networks, a living allowance etc., for a rather short time (1-2 years for European postdoctoral fellowship, 2-3 for Global fellowships). This scheme could be examined according to whether i) it would make sense to extend the period for the fellowship and ii) whether, as above, MSCA-funded post-doctoral researchers actually receive a full employment contract from the institution they work with (how the MSCA funding relates to the institutional contract), making sure that even for the short fixed-term contract no social security/pension entitlements are lost; that may also depend on varying national regulations on minimum employment duration to receive benefits and would hence entail also bilateral EU-Member States negotiations. MSCA instruments can also be examined, whether they could be **linked up with RESAVER** to not just pay a living allowance, but also an occupational pension contribution.

- MSCA living allowances are the same across countries, but are corrected for differences in power purchasing standards through country correction coefficients.

- Proposal-based grant funding instruments: all EU grant funding instruments, such as collaborative funding within Horizon Europe, or ERC grants, could be examined for the following aspects: i) whether it is in principle possible to put the salary of researchers on the list of direct cost items, and ii) if yes, whether an **increase of salaries** on top of the national one is commendable, e.g. due to particularly low salaries (corrected for power purchasing standards) in some institutions/countries, e.g. as measured by the distance to the mean or median salary in the EU (cf. section 4.5). Esp. in the case of the ERC, this would not only improve material conditions for researchers, but also diminish incentives for talented researchers to switch countries for higher salaries, indirectly contributing towards balancing the supply of researchers in higher-income EU countries (see above). Salary increases related to grants are practiced in Hungary, e.g. (see WP8 of this project). In the case of the ERC, salary costs should also not count towards

[102] https://ec.europa.eu/research/mariecurieactions/actions/doctoral-networks

[103] https://ec.europa.eu/research/mariecurieactions/actions/postdoctoral-fellowships

the funding ceiling, as otherwise research funding would be higher as a share in higher-income countries, making a switch of country again favourable. However, any such policy changes to grants would limit the available budget for research, unless budgets are increased. This would imply lower success rates for R&D projects.

- All policies aiming at **accelerating convergence of GDP per capita** between EU Member States (poorer countries catching up faster). All EU-level policies relevant for convergence – e.g., structural funds – indirectly contribute to better working conditions for researchers. A detailed discussion is however out of the scope of this report.[104]

- **Protection against discrimination**

  - An **EU-funded study** could determine to what extent diversity policies, or policies to prevent discrimination, play a role in awarding the **HR excellence seal** and if the audit could place more emphasis on such anti-discriminatory rules.

  - Allowing teaching in English would have many beneficial effects on top of less discrimination. The EU-level could organise an **exchange of best practice, and a consultation process/data collection process, to identify the share of institutions where teaching in English is possible**.

- **Gender equality**

  - The aim of a representative gender balance and working conditions to combine family and work are also clearly mentioned in the European Charter for Researchers, although from a quite general perspective. E.g., there are no details on favourable conditions for people with caring needs on grants or on a tenure clock (e.g., extension of grants, or fixed-term contracts, or of the tenure stage, as a result of caring duties). The European Charter for Researchers could be screened, whether such more specific conditions should be included; **the EU-level could organise a best practice finding and sharing exercise,** leading inter alia to a revision or specification of the Charter.

Table 46: Summary of EU policy options to reduce precarious careers in research, by type of policy

	Supply	Demand	Working Conditions
Provision of information, best-practice sharing (MLE, PSF, funding of studies…)	Job market information, diversified career exchange for pre- and post-docs, including employability courses	Career structures of univ./research institutions (flatter structures - more permanent positions)	Consultation process of understanding of institutions of Charter provisions with respect to employment contracts
	Survey of doctoral schools (employment contracts, etc.)	Flexibility in tasks (research, teaching, admin.) over life cycle of researcher	Role of anti-discrimination policies for HR seal of excellence (role in audit)
	Career guidance/employee orientation talks for post-docs	Identification of potential for more permanent non-principal investigator roles in academic research	Identification of countries/institutions where teaching in English is possible

[104] Based on unfortunately data only up to 2015, Alcidi et al., 2018, conclude that while overall income convergence has taken place between 2000-2015, Southern European countries diverge (to the bottom) and also „champion regions" in the higher-income EU countries (to the top) https://www.ceps.eu/ceps-publications/income-convergence-eu-tale-two-speeds/

	Supply	Demand	Working Conditions
	Best practice of Graduate/Doctoral Schools, post-doc offices		
	Tenure track positions - frequency, design (transferable skills, diversified career exchange…)		
	Bilateral exchange with MS on recruitment/career-progression		
Changes to regulations or codes of conduct	Revision of principles for innovative doctoral training		Screening of Charter with respect to proper employment contracts and more specific provisions for researchers with caring duties
			Revision of principles for innovative doctoral training (employment contracts)
Changes to design of proposal-based researcher/ grant funding	MSCA doctoral networks - job market information, diversified career exchange	Examine not counting salary towards ERC grant ceiling to allow institutions to free up resources to fund fixed-term researchers for a longer time	Examine allowances of MSCA pre- and post-doc schemes - combination with national employment contracts, portability of social security
			Examine extension of MSCA post-doctoral fellowships
	Structural funds used for doctoral school funding - job market information etc.	Evaluate shorter-term MSCA industry placements	Examine salary increase in EU research grants for lower-salary research environments, in particular ERC grants
Research funding	MSCA doctoral networks	Overall increase of EU research funding	
		Monitoring of effect of investment and recovery plans on demand for researchers (avoid boom and bust)	
		Examine increased funding for MSCA industry doctorates	
New or overarching instruments	EU-level institutional funding for excellent research institutions to foster brain circulation Online career / job market information platform Prizes for distinguished Graduate schools/post-doc offices for job market information Support for networks of Graduate Schools/Post-doc offices, as well as for PhD and Post-doc associations Support, either financial or in terms of best practice information, on how to foster start-ups by academic researchers.	Strengthen structural change component of EU activities	Increase effectiveness of convergence policies

7.3. Country-specific policy options

In terms of suggesting country-specific policy options, we again use the structure of the overarching framework, but this time use policy indicators where available to flag any areas where countries could have a closer look to initiate new or strengthen existing policies against precarious careers in research. The indicator framework here is complimentary to the country fiches in section 5, which are more analytical. Areas with a question mark would need further studies and analysis, or simply more data to identify issues and monitor progress (see section 7.4 for key indicators). Note that in case of MORE data, the average of the 2016 and 2019 survey waves is taken to smooth any outliers. The first table summarises the information and colour codes the countries' individual indicator values, with a coding scheme that roughly divides countries in a top, medium and bottom group; although sometimes the numbers are such (either low or high) that only a few countries are green or red. This should just provide a quick glance to identify potentially problematic areas, or best practice countries. The second table specifies the colour coding and the source for the policy indicator. The following text lists per area of the policy framework the countries with a red colour code and specifies countries which appear more often per sub-area, as well as "best practice countries" which achieve green in all indicators of a subarea.

Overall, economically more developed non-widening countries' biggest issues with precarious careers are related to career aspects, such as obtaining tenure or a high share of fixed term contracts, while for former transition countries it is more related to remuneration, the lack of an employment contract for PhD-students. Note that individual countries have very different research and education systems in place, so that any policy initiative should not be taken in isolation, but against an analysis of the wider framework conditions and determinants of precarity in research careers. Country-specific factors such as a civil service status for tenured researchers may come on top of the general issues listed below, but are outside the scope of this report (e.g., civil service status for some may create a dual labour market with high entry barriers for aspiring researchers, as in Germany; see OECD, 2021). The report of the OECD on the precarity of careers of postdoctoral researchers contains more country-specific issues and policy examples (2021).

7.3.1. Supply of researchers

- **PhD-studies/Post-doc stage**
    - Countries with a low share of PhD-students in doctoral schools: Czech Republic, Greece, Lithuania, Luxemburg, Poland, Romania, Slovenia
    - Countries with a low share of researchers who received training in transferable skills: Austria, Bulgaria, Finland, France, Germany, Greece, Latvia, Lithuania, Poland, Portugal, Slovakia, Spain
    - Countries with a low share of researchers who experienced a placement outside their PhD-granting institution: Finland, Germany, Ireland, Poland, Portugal, Slovenia
    - Countries with 2-3 red out of 3 indicators, which at least judging from the data could benefit most from activities in the area of PhD-studies/post-docs: Finland, Germany, Greece, Ireland, Lithuania, Poland, Portugal, Slovenia
    - Best practice-Countries with 3 green out 3 indicators: Denmark, Hungary
- **Merit-based, transparent recruitment & career progression**
    - Recruitment: countries with a low share of vacancies being advertised, or where the recruitment process is perceived as being not transparent and

merit-based: Hungary (recruitment process is transparent) and Portugal (recruitment is merit-based)

- Countries with 3 green out of 3: Belgium, Czech Republic, Denmark, Estonia, Ireland, Latvia, Malta, Netherlands, Poland, Romania, Slovakia, Slovenia

- Countries with 3 orange out of 3: Bulgaria, Croatia, Cyprus, Italy, Portugal (1 red), Spain

- Recruitment - Selection process: countries where researchers perceive a lack of clear & transparent information on the selection process, or where feedback for applicants is not the norm

  - Most countries provide clear information on the selection process, but many do not provide feedback for all applicants at the same level, as perceived by researchers

- Career Progression – countries where researchers perceive career paths to be clear-cut, career progression to be merit-based and that tenure based on merit is common:

  - Countries with 3 red out of 3: Ireland, Italy, Luxemburg, Portugal

  - Countries with 3 green out of 3: Czech Republic, Netherlands, Romania, Slovenia

- Research quality, or presence of excellent research institutions to foster brain circulation: countries with low research quality (as measured by the share of publications among the top 10% most cited, in the European Innovation Scoreboard) are Bulgaria, Croatia, Czech Republic, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia

- **Across all areas of supply**

  - there is no country with green everywhere; but without red and mostly green: best practice Denmark, Netherlands, Malta

  - No green: Italy, Portugal; max. 2 green: Croatia, Lithuania, Spain

  - The indicators show that quality of recruitment/career progression in the academic research sector is often not correlated with markers of PhD training (such as doctoral schools and transferable skills)

7.3.2. Demand for researchers

- **Research funding**

  - Countries with a low level of public research funding (and hence the potential for a sustained high growth path over longer periods of time, to catch up to EU averages): Bulgaria, Croatia, Cyprus, Latvia, Lithuania, Malta, Romania, Slovakia

  - Countries with a low level of public research funding support for firms: Bulgaria, Croatia, Cyprus, Estonia, Latvia, Lithuania, Luxemburg, Romania, Slovakia

    - Countries with 2 out of 2 red: Bulgaria, Croatia, Cyprus, Latvia, Lithuania, Romania, Slovakia

        - Countries with 2 out of 2 green: Austria, France, Netherlands

    - Countries where the number of PhD-graduates grows faster than R&D spending: Cyprus, Finland, Ireland, Luxemburg, Malta, Netherlands

- **Diversification of careers**

    - Countries with a low share of PhD-students/graduates from industry co-funded PhDs: three countries green, Cyprus, Malta, Netherlands; five countries orange: Austria, Greece, Latvia, Romania, Sweden, all others red

    - Intersectoral mobility: 4 countries green: Austria, Bulgaria, Hungary, Latvia

        - Countries with 2 red out of 2: Belgium, Croatia, Estonia, Finland, France, Germany, Ireland, Italy, Lithuania, Portugal, Slovenia

        - Countries with 2 green out of 2: none

- **Career structures in academia**

    - Countries with a high share of early stage positions relative to later stage positions: Belgium, Denmark, Germany, Luxemburg, Slovakia, Slovenia

    - Countries with a high share of fixed-term contracts: Belgium, Denmark, Germany, Luxemburg, Slovakia

        - Countries with 2 red out of 2: Belgium, Denmark, Germany, Luxemburg, Slovakia

        - Countries with 2 green out of 2 (best practice): Croatia, Greece, Latvia, Malta. Note that these two policy indicators can also show a lack of junior positions in research, or a not very dynamic labour market for researchers, so this should be treated with caution.

7.3.3. Working conditions

- **Remuneration**

    - Countries with low salaries in the academic sector: Bulgaria, Czech Republic, Greece, Hungary, Latvia, Poland, Romania, Slovakia

    - Countries with low salaries in the private sector: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Portugal, Romania, Slovakia

    - Countries with a high share of academic researchers perceiving to be neither well nor reasonably paid: Bulgaria, Estonia, Greece, Hungary, Lithuania, Poland, Portugal, Slovakia

        - Countries with 3 red out of 3: Bulgaria, Hungary, Slovakia

        - Countries with both indicators on academic salaries red: Bulgaria, Greece, Hungary, Poland, Slovakia

    - Countries with a high share of R1 researchers / PhD students without employment contract: Czech Republic, Hungary, Poland, Slovakia

- **Discrimination/Gender Equality**
    - Countries where only a low share of researchers perceives that there are measures to foster representation of underrepresented groups in recruitment: Croatia, Cyprus, France, Greece, Hungary, Italy, Lithuania, Portugal, Spain
        - Green countries: Czech Republic, Germany, Malta, Netherlands, Romania, Slovenia
    - Countries where a high share of researchers indicates that not knowing the national language is a barrier for recruitment: Austria, Belgium, Bulgaria, Croatia, France, Greece, Hungary, Italy, Latvia
        - Countries with 2 red out of 2: Bulgaria, Croatia, France, Greece, Hungary, Italy
        - Countries with 2 green out of 2: Malta, Netherlands, Romania
    - Countries with a low share of children below the age of 3 in formal childcare: Czech Republic, Hungary, Poland, Romania, Slovakia

Table 47: Policy indicators for country-specific policy options

	EU27	EU-WIDE	EU-NONWIDE	AT	BE	BG	HR	CY	CZ	DK	EE	FI	FR	DE	EL
Supply of researchers															
PhD-studies/Post-doc stage															
Provision of information on job market prospects to PhD-applicants/graduates, Post-docs	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Regular/systematic exposure to/discussions with alumni/researchers outside academia	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Career guidance (post-docs) - employee orientation talks with principal investigator	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Share of PhD-training in doctoral schools	15	10	16	22	14	19	21	14	8	36	12	24	19	13	5
Training in transferable skills	30	28	31	27	45	30	39	57	39	51	37	35	32	24	31
Internship during PhD outside PhD-granting institution	15	14	15	26	16	17	20	21	22	35	14	10	20	9	26
There are specific guidelines for the employment of post-docs to avoid protracted periods of fixed-term contracts (e.g., prior post-doc appointments are taken into account)	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Share of tenure track positions among new job openings in academia outside project-/grant-related positions	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Merit-based & transparent recruitment & career progression															
Research job vacancies are sufficiently externally and publicly advertised	85	82	86	87	88	80	77	79	85	89	85	88	83	92	84
The recruitment process is sufficiently transparent	79	80	79	77	83	79	76	74	89	84	82	78	75	84	84
Recruitment is sufficiently merit-based	81	78	82	81	86	78	73	74	90	90	85	81	78	87	76
Clear and transparent information on the selection process	84	83	84	84	88	81	79	84	92	92	86	87	81	90	77
There is feedback to all candidates in the selection process	64	71	62	42	66	66	71	67	81	79	67	62	45	65	73
Career paths are transparent and clear-cut	75	76	74	70	77	76	70	71	86	71	77	67	74	81	78

	EU27	EU-WIDE	EU-NONWIDE	AT	BE	BG	HR	CY	CZ	DK	EE	FI	FR	DE	EL
Career progression is sufficiently merit-based	72	71	72	64	73	72	63	72	86	82	74	75	62	78	67
Tenured contract based on merit only is common	70	71	69	54	74	74	71	74	86	73	72	74	64	72	67
Attractive research institutions to foster brain circulation	84	56	119	108	126	16	32	95	43	141	88	124	88	106	87
Demand for researchers															
Research funding															
Public Research funding per inhabitant, at PPS	166	79	223	326	164	24	63	52	165	259	115	230	196	286	96
Government funding of firms' R&D, in % of GDP	0.17	0.08	0.16	0.27	0.24	0.01	0.01	0.01	0.13	0.06	0.03	0.05	0.40	0.07	0.04
Medium-term framework for steadily increasing public R&D funding					?	?	?	?	?	?	?	?	?		?
Growth difference R&D expenditures - PhD-Graduates (are R&D expenditures growing fast enough)	2.94	10.73	3.58	3.09	5.38	7.03	15.86	-8.20	4.64	0.42	2.61	-0.23	1.70	3.50	5.92
Salaries of tenured researchers are eligible for grant funding (main national research funding agency/ies)					?	?	?	?	?	?	?	?	?	?	?
Diversification of careers															
Share of PhD-students/graduates from industry co-funded PhD-programmes	6	5	6	13	4	5	2	17	5	9	2	5	6	4	11
Share of researchers having been intersectorally mobile	24	26	23	32	20	33	23	27	27	27	24	25	22	20	29
Existence of programmes for shorter-term placements in industry (industry fellowships)				?	?	?	?	?	?	?	?	?	?	?	?
Career structures in academia															
Shape of the pyramid: Share of early career stage positions (R1/R2) in total	28	24	30	30	45	22	19	15	25	31	27	27	28	41	7
Share of fixed-term contracts	24	17	27	29	42	13	16	25	20	33	24	27	20	35	10
Structural change towards knowledge-intensive activities															
Share of industries/services with high&med-high innovation intensity	32	30	31	35	33	33	23	23	43	27	23	34	32	42	26
Working Conditions															

	EU27	EU-WIDE	EU-NONWIDE	AT	BE	BG	HR	CY	CZ	DK	EE	FI	FR	DE	EL
Remuneration															
Perception of remuneration (neither well nor reasonably paid)	32	54	23	17	11	52	39	39	43	15	56	22	37	8	77
Level of yearly net salary, PPS (academic, career stages R1&2)	16,763	14,034	20,066	24,105	16,809	7,183	15,690	21,175	13,335	21,672	14,253	19,937	19,356	23,129	13,431
Level of yearly net salary, PPS (private, career stages R1&2)	18,833	14,962	23,390	23,838	24,455	6,747	14,487	18,205	13,909	28,052	13,615	26,571	26,847	28,701	19,021
Share of R1 researchers without contract (academic sector)	7	20	5	.	7	11	2	9	27	3	5	12	6	3	10
Discrimination/Gender Equality															
Academic recruitment: There are measures to foster representation of underrepresented groups	73	68	75	79	71	70	60	64	86	76	70	79	52	90	57
National language is not a barrier in the recruitment process	60	59	60	50	60	46	36	63	69	77	68	68	43	63	35
Research institutions take account of caring needs in assessing researchers (e.g. tenure track evaluation)	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Time frame in funding for researchers (mobility, careers,…) takes account of caring needs	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Share of children below 3 in formal childcare	35	23	48	21	55	15	20	31	6	68	27	40	51	31	21

	HU	IE	IT	LV	LT	LU	MT	NL	PL	PT	RO	SK	SI	ES	SE
Supply of researchers															
PhD-studies/Post-doc stage															
Provision of information on job market prospects to PhD-applicants/graduates, Post-docs	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Regular/systematic exposure to/discussions with alumni/researchers outside academia	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Career guidance (post-docs) - employee orientation talks with principal investigator	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Share of PhD-training in doctoral schools	31	6	20	10	7	9	.	17	7	16	9	10	10	22	20
Training in transferable skills	48	38	42	33	22	42	65	38	18	27	52	31	38	32	41

	HU	IE	IT	LV	LT	LU	MT	NL	PL	PT	RO	SK	SI	ES	SE
Internship during PhD outside PhD-granting institution	17	6	13	12	21	13	20	11	7	8	25	16	10	36	14
There are specific guidelines for the employment of post-docs to avoid protracted-periods of fixed-term contracts (e.g., prior post-doc appointments are taken into account)	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Share of tenure track positions among new job openings in academia outside project-/grant-related positions	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Merit-based & transparent recruitment & career progression															
Research job vacancies are sufficiently externally and publicly advertised	77	86	77	85	75	84	90	91	85	73	90	87	82	76	89
The recruitment process is sufficiently transparent	66	81	75	86	73	71	87	85	82	72	90	86	80	73	79
Recruitment is sufficiently merit-based	77	81	75	85	81	81	87	91	82	67	84	80	83	76	85
Clear and transparent information on the selection process	81	86	74	88	79	86	94	94	85	79	92	89	83	73	83
There is feedback to all candidates in the selection process	59	70	62	72	58	61	74	83	77	61	82	70	85	63	70
Career paths are transparent and clear-cut	71	68	66	84	69	62	82	80	78	60	90	86	87	70	69
Career progression is sufficiently merit-based	69	63	61	84	76	58	79	84	80	45	87	77	80	71	79
Tenured contract based on merit only is common	64	70	59	81	78	58	81	84	81	45	88	77	81	69	78
Attractive research institutions to foster brain circulation	49	115	112	39	41	127	60	156	44	88	40	42	74	91	131
Demand for researchers															
Research funding															
Public Research funding per inhabitant, at PPS	90	134	113	38	63	345	51	230	85	122	23	75	115	117	282
Government funding of firms' R&D, in % of GDP	0.25	0.15	0.23	0.01	0.03	0.04	0.04	0.23	0.12	0.21	0.04	0.04	0.19	0.09	0.12
Medium-term framework for steadily increasing public R&D funding	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Growth difference R&D expenditures - PhD-Graduates (are R&D expenditures growing fast enough)	2.26	-2.70	11.92	16.97	9.24	-26.38	-6.29	-1.29	10.29	5.77	23.99	9.58	13.42	4.21	3.33
Salaries of tenured researchers are eligible for grant funding (main national research funding agency/ies)	?	?	?	?	?	?	?	?	?	?	?	?	?	?	
Diversification of careers															

	HU	IE	IT	LV	LT	LU	MT	NL	PL	PT	RO	SK	SI	ES	SE
Share of PhD-students/graduates from industry co-funded PhD-programmes	6	6	6	14	5	0	17	17	4	2	13	6	7	0	11
Share of researchers having been intersectorally-mobile	30	23	20	37	22	28	27	23	26	18	29	29	21	28	27
Existence of programmes for shorter-term placements in industry (industry fellowships)	?		?	?	?	?	?	?	?	?	?	?	?	?	?
Career structures in academia															
Shape of the pyramid: Share of early career stage positions (R1/R2) in total	22	24	11	27	29	52	17	30	24	29	29	32	34	17	26
Share of fixed-term contracts	12	15	16	36	50	36	8	20	9	16	3	54	17	22	24
Structural change towards knowledge-intensive activities															
Share of industries/services with high&med-high innovation intensity	45	18	35	21	20	28	24	27	31	25	34	39	35	28	37
Working Conditions															
Remuneration															
Perception of remuneration (neither well nor reasonably paid)	53	17	43	47	60	8	38	10	55	52	19	61	32	44	20
Level of yearly net salary, PPS (academic, career stages R1&2)	7,637	14,839	14,525	8,680	16,150	27,697	23,599	20,905	12,576	21,077	10,833	10,091	14,794	19,173	19,942
Level of yearly net salary, PPS (private, career stages R1&2)	13,337	19,589	19,643	14,755	21,618	24,165	19,887	23,639	16,761	14,568	11,193	11,298	15,022	21,217	17,342
Share of R1 researchers without contract (academic sector)	22	6	17	7	9	2	17	3	46	4	10	44	2	6	7
Discrimination/Gender Equality															
Academic recruitment: There are measures to foster representation of underrepresented groups	59	78	55	73	67	72	81	88	70	59	82	74	85	66	77
National language is not a barrier in the recruitment process	52	68	44	59	71	80	86	88	62	63	83	64	70	65	67
Research institutions take account of caring needs in assessing researchers (e.g. tenure track evaluation)	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Time frame in funding for researchers (mobility, careers,…) takes account of caring needs	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Share of children below 3 in formal childcare	11	41	26	28	27	60	38	68	10	53	7	7	44	57	54

Table 48: Sources for policy indicators and colour coding

	Colour coding	Source
Supply of researchers		
PhD-studies/Post-doc stage		
Provision of information on job market prospects to PhD-applicants/graduates, Post-docs		
Regular/systematic exposure to/discussions with alumni/researchers outside academia		
Career guidance (post-docs) - employee orientation talks with principal investigator		
Share of PhD-training in doctoral schools	> 20% green, > 10% orange, <10% red	Average of MORE3&4 EU HEI Survey
Training in transferable skills	> 45% green, > 35% orange, <35% red	Average of MORE3&4 EU HEI Survey
Internship during PhD outside PhD-granting institution	> 15% green, > 10% orange, <10% red	Average of MORE3&4 EU HEI Survey
There are specific guidelines for the employment of post-docs to avoid protracted-periods of fixed-term contracts (e.g., prior post-doc appointments are taken into account)		
Share of tenure track positions among new job openings in academia outside project-/grant-related positions		
Merit-based & transparent recruitment & career progression		
Research job vacancies are sufficiently externally and publicly advertised	> 80% green, > 70% orange, <70% red	MORE4 EU HEI Survey
The recruitment process is sufficiently transparent	> 80% green, > 70% orange, <70% red	MORE4 EU HEI Survey
Recruitment is sufficiently merit-based	> 80% green, > 70% orange, <70% red	MORE4 EU HEI Survey
Clear and transparent information on the selection process	> 80% green, > 70% orange, <70% red	MORE4 EU HEI Survey
There is feedback to all candidates in the selection process	> 80% green, > 70% orange, <70% red	MORE4 EU HEI Survey
Career paths are transparent and clear-cut	> 80% green, > 70% orange, <70% red	MORE4 EU HEI Survey
Career progression is sufficiently merit-based	> 80% green, > 70% orange, <70% red	MORE4 EU HEI Survey
Tenured contract based on merit only is common	> 80% green, > 70% orange, <70% red	MORE4 EU HEI Survey
Attractive research institutions to foster brain circulation	Top third green, medium third orange, bottom third red	European Innovation Scoreboard
Demand for researchers		
Research funding		
Public Research funding per inhabitant, at PPS	Top third green, medium third orange, bottom third red	Eurostat
Government funding of firms' R&D, in % of GDP	Top third green, medium third orange, bottom third red	OECD
Medium-term framework for steadily increasing public R&D funding		

Growth difference R&D expenditures - PhD-Graduates (are R&D expenditures growing fast enough)	Difference > 3pp - green; < 3, > 0 pp orange; < 0 red	Eurostat
Salaries of tenured researchers are eligible for grant funding (main national research funding agency/ies)		
Diversification of careers		
Share of PhD-students/graduates from industry co-funded PhD-programmes	> 15% green, >10% orange, <10% red	MORE4 EU HEI Survey
Share of researchers having been intersectorally-mobile	> 30% green, > 25% orange, <25% red	MORE4 EU HEI Survey
Existence of programmes for shorter-term placements in industry (industry fellowships)		
Career structures in academia		
Shape of the pyramid: Share of early career stage positions (R1/R2) in total	< 20% green, > 20% orange, > 30% red	MORE4 EU HEI Survey
Share of fixed-term contracts	< 20% green, > 20% orange, > 30% red	MORE4 EU HEI Survey
Structural change towards knowledge-intensive activities		
Share of industries/services with high&med-high innovation intensity	Top third green, medium third orange, bottom third red	Eurostat SBS
Working Conditions		
Remuneration		
Perception of remuneration (neither well nor reasonably paid)	Top third red, medium third orange, bottom third green	MORE4 EU HEI Survey
Level of yearly net salary, PPS (academic, career stages R1&2)	Top third green, medium third orange, bottom third red	see section 8.2.5
Level of yearly net salary, PPS (private, career stages R1&2)	Top third green, medium third orange, bottom third red	see section 8.2.5
Share of R1 researchers without contract (academic sector)	< 10% green, > 10% orange, > 20% red	Average of MORE3&4 EU HEI Survey
Discrimination/Gender Equality		
Academic recruitment: There are measures to foster representation of underrepresented groups	> 80% green, > 70% orange, <70% red	MORE4 EU HEI Survey
National language is not a barrier in the recruitment process	> 70% green, > 60% orange, <60% red	MORE4 EU HEI Survey
Research institutions take account of caring needs in assessing researchers (e.g. tenure track evaluation)		
Time frame in funding for researchers (mobility, careers,…) takes account of caring needs		
Share of children below 3 in formal childcare	> 30% green, > 15% orange, <15% red	Eurostat

7.4. Suggestion for key indicators to monitor progress

In this section, based on our analytical findings and on pour policy analysis, we suggest several indicators which can form the core of a monitoring mechanism to measure the progress towards alleviating precarious employment conditions of researchers. The section also links to WP10 which develops a more comprehensive observatory for research careers. As a guiding principle, we focus on the researcher groups identified as particularly vulnerable by our analysis. Related to our analytical dimensions, we suggest the following indicator dimensions of the monitoring mechanism:

- Supply and Demand
- Type of contract
- Career & Training
- Remuneration
- Social & Organisational

For each indicator, we specify:

- what it measures
- whether it is related to a policy aiming at reducing precarious careers (e.g., share of PhD-students in a graduate school) or to an outcome (e.g., share of PhD-students with full employment contracts)
- its (potential) data source
- its overall relevance for precarious careers
- whether it is related to an existing indicator or would need to be built from scratch

As a general rule, several suggested indicators could be easily integrated in recurring surveys such as the MORE surveys. However, many countries also have full detailed statistics, based on registry data, e.g. on PhD-students. Linking these national data and making them comparable, or basing the indicators on national statistics, would however take more time. One way forward could be to start with more survey-based indicators for the monitoring mechanism, while starting work in the background to use more indicators based on the data of national statistical offices, possibly with the support and guidance from Eurostat. The data for several indicators could also be collected at the level of research institutions, who would have to implement the corresponding data collection mechanisms. Of great help could be using the ORCID identification number of researchers (see Costas et al., 2021)

The following table presents our suggested indicators.

Table 49: Policy indicators for country-specific policy options

	Intended measurement / specification of indicator	Policy or Outcome	Unit	Data source	Relevance	Ease of Implementation	Comment
Supply and Demand							
R&D Spending	Existence of multiannual budgeting framework with an increasing spending path for public R&D funding (yes/no)	Policy	Country	Tbc with Ecofin; otherwise survey of finance ministries	2	2	To improve predictability of research budgets and open positions
	Growth rate of public funding, year on year and average growth rate over the past 10 years	Policy	Country	Eurostat	1	1	
	Share of business in funding of R&D	Policy	Country	Eurostat	2	1	Important to screen potential for diversification of careers
Grant design	Salaries of tenured researchers are eligible for grant funding (main national research funding agency/ies)	Policy	Country	Survey among funders	1	3	Increase of grant funding does not just lead to more PhDs/post-docs, but also to growth of tenured positions for researchers
Flexibility of time for research	Share of researchers who (can) switch to other tasks in later career stages						Creates demand for research by early stage researchers
PhD-students, graduates and researchers	Growth of number of researchers in all sectors, full-time equivalents	Policy	Country	Eurostat	2	1	
	Growth of number of PhD-graduates	Policy	Country - Field	Eurostat	1	1	Narrower fields would require additional statistics
	New entrants into PhD-studies	Policy	Country	Eurostat	2	1	
	Growth difference R&D expenditures - PhD graduates	Policy	Country	Eurostat	2	1	
	Number/growth of job openings in research, by sector	Policy	Institutional-Field-Country	To be developed	1	3	Needs central platform where all job openings are registered
	Rate of applications to job openings in research, by sector	Outcome	Country - Field	To be developed	1	3	Needs central platform where all job openings and number of applications are registered

	Intended measurement / specification of indicator	Policy or Outcome	Unit	Data source	Relevance	Ease of Implementation	Comment
Type of contract							
Fixed-term contracts	Share of fixed-term contracts of PhD holders (academic sector)	Outcome	Country	MORE survey or national registries	3	1	
	Share of fixed-term contracts of PhD holders (private sector)	Outcome	Country	LFS / SES	3	1	
	Share of PhD holders on fixed-term contracts without perspective for a tenured contract, by career stage	Outcome	Country	Tbd - MORE survey	1	2	
	Share of PhD holders/post-docs on successive fixed-term contract, by career stage	Outcome	Country	Tbd - MORE survey or national registries	1	2	
	Average number of years of post-docs on fixed-term contracts	Outcome	Country	Tbd - MORE survey or national registries	1	2/3	
	Share of fixed-term contracts of PhD holders above the age of 35 (academic sector)	Outcome	Country	MORE survey or national registries	1	1	
Part-time contracts	Share of part-time contracts, by career stage & sector	Outcome	Country	MORE (acad.), SES / LFS (private)	3	1	
	Share of involuntary part-time, by career stage & sector & gender	Outcome	Country	Tbd - MORE survey, LFS	1	2	
Full employment contracts	Share of PhD-students on full employment contracts with social security benefits	Outcome	Country	Tbd - MORE survey	1	2	
	Share of PhD-holders on fixed-term contracts below 3 years with full employment contracts and social security benefits	Outcome	Country	Tbd - MORE survey	1	2	

	Intended measurement / specification of indicator	Policy or Outcome	Unit	Data source	Relevance	Ease of Implementation	Comment
Career & Training							
Institutional support for PhDs and post-docs	Share of PhD-granting universities/research institutions with graduate school	Policy	Country	Tbd - own institutional survey, e.g. with EUA	2	3	
	Share of PhD-graduates who trained in a Graduate/Doctoral school	Policy		MORE	2	1	
	Share of universities/research institutions with post-doc office	Policy	Country	Tbd - own institutional survey, e.g. with EUA	2	3	
	Share of post-docs who have access to post-doc offices with career and support services			Tbd - MORE survey, or institutional monitoring	1	2/3	
	Share of researchers on fixed-term contracts who receive career guidance and job market information (PhD-students / holders)	Policy	Country	Tbd - MORE survey, or institutional monitoring	1	2/3	
	Share of researchers on fixed-term contracts who receive regular feedback and appraisal from their supervisor/research group leaders (PhD-students / holders)	Policy	Country	Tbd - MORE survey, or institutional monitoring	1	2/3	
Diversification of careers	Share of PhD-students/graduates from industry co-funded PhD-programmes	Policy	Country	MORE survey or national registries	2	1	
	Share of PhD graduates who received transferable skills	Policy	Country	MORE survey or national registries	1	1	
	Share of PhD students/ holders on fixed-term contracts who indicate awareness about the diversity of careers available	Policy	Country	Tbd - MORE survey, or institutional monitoring	2	2	
	Share of researchers funded by programmes for shorter-term placements in industry (industry fellowships)	Policy	Country	MORE survey, survey among firms	2	2/3	Survey of private-sector researchers is difficult due to low response rates; could be done via alumni tracking (e.g. also with ORCID data)

	Intended measurement / specification of indicator	Policy or Outcome	Unit	Data source	Relevance	Ease of Implementation	Comment
	Share of researchers having been intersectorally-mobile	Policy	Country	MORE survey, survey among firms	2	2/3	Survey of private-sector researchers is difficult due to low response rates; could be done via alumni tracking (e.g., with ORCID)
	Internship during PhD outside PhD-granting institution	Policy	Country	MORE survey, or institutional survey	2	1	
Career structures, recruitment and career progression	Shape of the pyramid: Share of early career stage positions (R1/R2) in total	Policy	Country	MORE survey, national registries	2	1	
	Satisfaction with merit-based & transparent recruitment & career progression	Policy	Country	MORE survey	1	1	
	Career paths are transparent and clear-cut	Policy	Country	MORE survey	1	1	
	Tenured contract based on merit only is common	Policy	Country	MORE survey	2	1	
Remuneration							
	Perception of remuneration (neither well nor reasonably paid), academic sector	Outcome	Country	MORE survey	1	1	
	Share of researchers who need to take on additional job in spite of having a full-time job in academic research	Outcome	Country	Tbd - MORE survey	1	2	
	Relation of early stage researcher salaries to economy-wide salary, index	Outcome	Country	Needs analysis based on SES additional sources as in section 4	1	3	
	Relation of yearly net salary of academic early stage researchers to industry researchers	Outcome	Country	Needs analysis based on SES additional sources as in section 4	1	3	
	Perception of remuneration: academic pays worse than private sector	Outcome	Country	MORE survey	3	1	
	Satisfaction with pension plan (academic sector)	Outcome	Country	MORE survey	1	1	
	Satisfaction with social security (academic sector)	Outcome	Country	MORE survey	1	1	

	Intended measurement / specification of indicator	Policy or Outcome	Unit	Data source	Relevance	Ease of Implementation	Comment
Social & Organisational							
Protection against discrimination and unacceptable social behaviour	Academic recruitment: There are measures to foster representation of underrepresented groups	Policy	Country	MORE Survey	1	1	
	National language is not a barrier in the recruitment process	Policy	Country	MORE Survey	1	1	
	Satisfaction with protection against discrimination	Outcome	Country	Tbd - MORE Survey	1	2	
	Satisfaction with protection against unacceptable social behaviour	Outcome	Country	Tbd - MORE Survey	1	2	
	Number of cases of bullying & harassment relative to number of researchers	Outcome	Institution - Country	Needs institutional monitoring	1	3	
Gender equality / equality for people with caring duties	Research institutions take account of caring needs in assessing researchers (e.g. tenure track evaluation)	Policy	Institution - Country	Tbd - MORE Survey or institutional survey	1	2	
	Share of research institutions which have adopted a Gender Equality Plan (within Horizon Europe)	Policy	Country - Institutional	Tbd – Institutional Survey, or Horizon Europe funding information	1	3	
	Time frame in funding for researchers (mobility, careers,…) takes account of caring needs	Policy	Country	Tbd - MORE Survey or survey of funders	1	2	
	Share of children below 3 in formal childcare	Policy	Country	Eurostat	2	1	

Notes:
- Relevance 1: Key indicator to monitor precarious careers in research, 2: Relevant indicator 3: Indicator which is only indirectly relevant, but if easy to implement, better than no indicator
- Ease of implementation: 1: indicator is existing, 2: indicator has to be developed but can be added to existing data collection tools, 3: indicator requires new primary data collection mechanism

7.5. Further research

Several strands of research could shed more light on the identification of precarious careers and the effectiveness of policies to reduce precarity. Among them are the following:

- Studies of the elasticity of graduate enrolment to changing job prospects, i.e. how the number of PhD-applications varies as a function of information on job market prospects. In the US relative salaries and job prospects affect the attractiveness of a career in science and the choice of graduate programmes (see e.g., Stephan 2012 for an overview). This type of evidence is largely missing in the EU, in a nutshell, how PhD production reacts to job prospects.

- As regards the diversification of careers, even in the US there is a lack of "systematic evidence whether career preferences adjust over the course of the PhD training and to what extent advisors exacerbate imbalances by encouraging their students to pursue academic positions."[105] Sauermann and Roach (2012) find that "the attractiveness of academic careers decreases significantly over the course of the PhD program, despite the fact that advisors strongly encourage academic careers over non-academic careers."

- More generally, a full analysis of researchers' pathways into various careers, in- or outside academia, usually requires a combination of surveys and social security data, to track PhD-students from the beginning and how their labour market career evolves in which type of employer. In Austria, e.g. an analysis[106] showed that from a total of 3.931 researchers (pre-docs, post-docs, etc.) who started at university in 2010, 23,4% still were at a university in 2019, a bit less than half of them on a permanent contract. Many of those who started were project-funded temporary researchers. From close to 500 post docs who started in 2010, in 2019 24,9% were still employed at the university, but only 5,9% were employed on a defined research career position (tenure track, professor, associated professor etc.). From 614 pre-docs in 2010, only 2,4% are in a formal research career position. The analysis only covers universities, not public research organisations or teaching-intensive universities of applied sciences. This kind of information would be an important element to provide information on job market prospects. By combining it with social security data, it could track the researchers who leave academia and show the career paths there, and hence e.g. also show the share of PhD-holders working in industry or other non-academic sectors. Similar studies exist[107]. An overview of methods to track doctorate holders' careers was done by the EUA-CDE Thematic Peer Group.[108]

Otherwise, in terms of facilitating policies against precarity, as mentioned above, policy-makers could benefit from several best practice studies to guide policy efforts in terms of what works best.

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[105] See Sauermann & Roach (2012), https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0036307.

[106] https://www.oif.ac.at/fileadmin/user_upload/p_oif/Forschungsberichte/fb_38_wissenschaftliche_beschaeftigungsverlaeufe.pdf

[107] About 10 years ago, more than 50% of PhD-graduates in Germany, France and the UK went to jobs outside of academia, as cited in a report on doctoral training principles https://cdn5.euraxess.org/sites/default/files/principles_for_innovative_doctoral_training.pdf (The Royal Society U.K. 2010, The Scientific Century: Securing our future prosperity, p. 14; Statistisches Bundesamt, Hochqualifizierte in Deutschland. Erhebung zu Karriereverläufen und internationaler Mobilität von Hochqualifizierten in 2011, Wiesbaden 2013.https://www.destatis.de/DE/Publikationen/Thematisch/BildungForschungKultur/Hochschulen/HochqualifizierteDeutschland5217205139004.pdf?__blob=publicationFile , S. 44, Tab 4A; the French CEREQ survey http://www.cereq.fr/index.php/publications/Net.Doc/L-insertion-des-docteurs-Interrogation-en-2012-des-docteurs-diplomes-en-2007;)

[108] https://www.eua.eu/downloads/publications/eua-cde%20tpg_web.pdf

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9. ANNEX

9.1. Data coverage per country

Table 50: Data availability per country

Country	Iso-2	Structure of Earnings Survey (SES)	MORE-Database	OECD Employment Protection Database	European Working Conditions	Euraxess/Job portal analysis	Researcher survey	Employer survey	National experts
Austria	AT	-	x	x	x	x	x	(X)	x
Belgium	BE	x	x	x	x	x	x	(X)	x
Bulgaria	BG	x	x	-	x	x	(X)	(X)	x
Cyprus	CY	x	x	-	x	x	(X)		x
Czech Republic	CZ	x	x	x	x	x	X		x
Germany	DE	x	x	x	x	x	X	(X)	x
Denmark	DK	-	x	x	x	x	(X)	(X)	x
Estonia	EE	x	x	x	x	x	(X)		x
Greece	EL	x	x	x	x	x	X		x
Spain	ES	x	x	x	x	x	X		x
Finland	FI	x	x	x	x	x	(X)		x
France	FR	x	x	x	x	x	X		x
Croatia	HR	x	x	-	x	x	(X)	(X)	x
Hungary	HU	x	x	x	x	x	(X)	(X)	x
Ireland	IE	x	x	x	x	x	(X)	(X)	x
Italy	IT	x	x	x	x	x	X	X	x
Lithuania	LT	x	x	x	x	x	(X)		x
Luxembourg	LU	x	x	x	x	x	(X)	(X)	x
Latvia	LV	x	x	x	x	x	(X)	(X)	x
Malta	MT	x	x	-	x	x	(X)		x
Netherlands	NL	x	x	x	x	x	X	(X)	x
Poland	PL	x	x	x	x	x	X	x	x
Portugal	PT	x	x	x	x	x	X		x
Romania	RO	x	x	-	x	x	X		x
Sweden	SE	x	x	x	x	x	X		x
Slovakia	SK	x	x	x	x	x	X	(X)	x
Slovenia	SI	x	x	x	x	x	(X)		x

United Kingdom	UK	(x)	x	x	(x)	x

Table 51: Respondents of the researcher survey

Country	Respond-ents	Share of				Counts			
		Higher education	Private sector firm	NPO	Other	Higher education	Private sector firm	NPO	Other
AT	41	51	39	5	5	21	16	2	2
BE	81	63	26	7	4	51	21	6	3
BG	19	68	32	0	0	13	6	0	0
CY	6	100	0	0	0	6	0	0	0
CZ	38	87	5	8	0	33	2	3	0
DE	16	44	50	0	6	7	8	0	1
DE	459	87	9	2	2	400	42	8	7
EE	19	74	21	5	0	14	4	1	0
EL	36	83	6	6	6	30	2	2	2
ES	155	72	19	5	4	112	29	8	6
FI	11	64	18	18	0	7	2	2	0
FR	126	77	14	5	4	97	18	6	5
HR	25	64	16	4	16	16	4	1	4
HU	19	74	26	0	0	14	5	0	0
IE	28	71	21	4	4	20	6	1	1
IT	174	72	18	4	5	126	32	7	9
LT	15	53	27	7	7	8	4	1	1
LU	8	88	0	13	0	7	0	1	0
LV	5	100	0	0	0	5	0	0	0
MT	4	75	0	0	25	3	0	0	1
NL	40	68	25	5	3	27	10	2	1
PO	54	81	11	6	2	44	6	3	1
PT	102	83	2	8	6	85	2	8	6
RO	47	81	6	2	11	38	3	1	5
SE	40	78	20	0	3	31	8	0	1
SK	109	92	3	3	2	100	3	3	2
SV	15	73	13	0	13	11	2	0	2
EU27	2328	77	14	4	4	1787	334	99	102
EU-NONWIDE	1179	77	16	4	3	906	192	43	36
EU-WIDE	513	82	8	4	5	420	43	23	24

Table 52: Distribution of organisation types

	Share of Higher education institution		Share of Private sector firm institution			
	Private institution	Public institution	High-tech manufacturing	Other manufacturing	Knowledge-intensive services	Other Services
AT	0	100	44	19	25	13
BE	6	94	38	19	43	0
BG	0	100	17	17	17	50
CY	50	50	0	0	0	0
CZ	3	97	0	0	50	50
DE	0	100	50	13	38	0
DE	3	97	36	10	45	10
EE	0	100	0	0	100	0
EL	7	93	0	50	0	50
ES	12	88	17	28	45	10

FI	14	86	50	0	50	0
FR	13	87	28	22	39	11
HR	13	88	25	0	25	50
HU	7	93	0	0	60	40
IE	10	90	50	0	50	0
IT	7	93	34	16	34	16
LT	13	88	25	0	50	25
LU	0	100	0	0	0	0
LV	0	100	0	0	0	0
MT	0	100	0	0	0	0
NL	4	96	30	0	70	0
PO	5	95	17	50	0	33
PT	11	89	50	0	50	0
RO	5	95	0	0	67	33
SE	3	97	50	13	38	0
SK	0	100	0	33	33	33
SV	9	91	50	0	50	0
EU27	8	92	32	13	41	13
EU-NONWIDE	6	94	34	16	42	8
EU-WIDE	6	94	14	14	40	33

9.2. Methodological information

9.2.1. Job portal/board analysis

9.2.1.1. Selection of the Job Boards

In the first step each country experts have been asked which job portal is the most used concerning research jobs. Most experts responded that EURAXESS is the best source for research job offers, in some countries (for example BG) it is furthermore mandatory to publish public research job offers on EURAXESS. LinkedIn was also mentioned from some country experts and is the second most important international job portal for research jobs. Only in few countries, for example CZ with https://researchjobs.cz, a local research job portal has some importance.

9.2.1.2. Retrieving data of the Job Boards

All mentioned job-boards have been contacted to provide their current and past job profiles in a well formatted file. Only few reacted to our request, mentioning different concerns about providing data (for example EURES had concerns about data rights issues, other local platforms had concerns about the neglectable share of research profiles on their platforms).

We started scrapping LinkedIn Job profiles (https://www.linkedin.com/jobs) and Google Jobs.

As EURAXESS provided structured data on a huge amount of job profiles, we focused on that data source, because mixing different job portals would introduce different country/field specific selection biases.

9.2.1.3. EURAXESS Descriptives

The provided EURAXESS database consists of almost 300.000 entries from the years 2016-2021 (86% in the years 2017-2020). Among other it provides structured and clean[109] data

[109] Not error-prone free-text fields, which would have to be parsed and classified. Note, that still errors due to wrong entries by the user of the hiring organization are in the used data.

on the research profile, country, organization type, academic field, required degree, full/part time, temp/perm position.

Counts over research profile (note: multiple values per profile are allowed) and organization type:

Table 53: Distribution of job offers on job boards over career stages and academic vs. private sectors

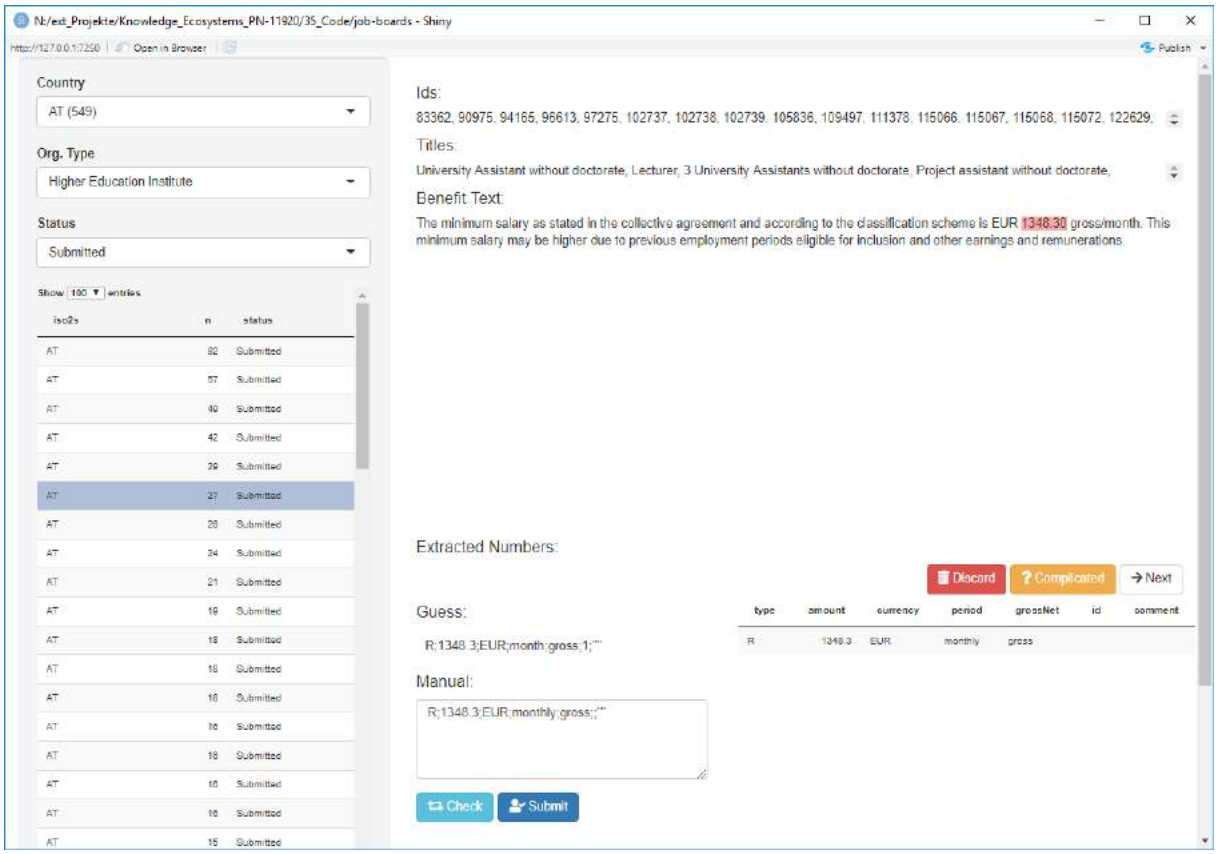
Country	First Stage Researcher (R1)	Recognised Researcher (R2)	Established Researcher (R3)	Leading Researcher (R4)		Academic	Private	Other
AT	6,734	3,624	1,928	1,429		9,508	137	973
BE	6,982	4,080	3,162	2,232		8,010	587	1,271
BG	138	96	67	23		243	24	6
CY	306	223	166	110		404	37	41
CZ	1,201	958	610	297		1,564	41	281
DE	26,406	23,841	23,239	19,881		11,248	1,005	19,850
DK	2,708	2,096	1,883	1,651		1,988	65	1,555
EE	174	149	197	220		520	12	20
ES	8,381	4,821	2,509	1,449		9,011	1,540	1,117
FI	2,433	1,850	1,494	614		4,982	24	288
FR	28,963	24,505	21,860	20,629		30,301	821	1,902
GB	29,813	17,635	12,290	10,837		27,601	348	10,545
GR	861	540	1,128	1,584		3,669	128	53
HR	6,816	3,537	2,546	1,871		13,348	165	129
HU	77	52	40	34		79	12	23
IE	5,933	3,235	1,703	1,062		6,548	155	931
IT	55,407	53,782	53,504	53,148		52,649	825	2,757
LT	46	46	30	19		78	9	9
LU	1,707	1,188	794	726		1,534	41	685
LV	204	98	71	56		284	12	17
MT	96	61	57	23		82	16	12
NL	12,221	11,838	9,361	9,160		12,666	2,137	4,673
PL	15,906	12,064	4,683	2,608		30,498	96	598
PT	1,341	734	336	217		1,242	386	321
RO	2,232	427	304	81		2,571	83	130
SE	7,323	4,696	2,889	2,331		8,865	76	1,888
SI	426	380	309	264		595	33	13
SK	156	84	46	31		216	9	14
Total	224,991	176,640	147,206	132,587		240,304	8,824	50,102

As it can be seen, most jobs are from the academic sphere. Still, over 8.800 entries are from the private sector, which is substantially more than we could get out of currently online profiles on any other job board (considering only research profiles).

Unfortunately, there is no structured data about the salary of the posted position. As there is a benefit "free-text" entry which often provides some salary information, we tried to carefully extract this information. Note, the EURAXESS sample with non-empty benefits texts shrinks to 50.000 entries. In the following chapter we explain the manual cleaning step.

9.2.1.4. Data Cleaning

Building on the automatically identified information on salary-relevant amounts, the research team manually checked the categorization of information. A self-developed tool was used, which already classified identified amounts of money. During the preparation of the tool, a guideline has been developed too. This guideline was used to verify that all members of the research team handled the data checking and cleaning in a consistent way.



For each observation (i.e. job posting), the tool showed the following information in tabular form:

- amount: the exact salary amount was mentioned in the respective job posting
- type: whether the amount is classified as 1) regular salary ("R"), 2) additional salary ("R+", a salary or grant which is added to the base regular salary), 3) fringe benefit which are not subject to conditions and are therefore granted to any applicant ("F"), 4) fringe benefit subject to conditions the employee has to fulfill ("F+").
- gross vs. net: whether the amount is subject to taxes or not
- period: whether the amount is paid monthly, yearly or either for the total duration of the contract or as a single allowance.

Each observation can in principle consist of several lines in the table. Each of these lines expresses a different salary-relevant amount. For instance, every observation might contain one or more regular salaries ("R")[110] indicating minimum, maximum or expected salaries, etc. In addition, if the job posting included information about fringe benefits (e.g. mobility allowance (classified as "F"), family allowance ("F+"), bonuses (either "F" or "F+"), additional allowances, etc. When manually reviewing the automatically detected mappings, the research team corrected incorrect mappings (e.g., when the algorithm incorrectly classified an amount as a monthly salary even though it is paid per year, e.g., "the gross annual salary is x€ (paid in 14 monthly instalments") and added or removed lines if necessary.

Most often, entries had to be adjusted with respect to period and type. The type was set to "R" (regular salary) by default but had to be manually changed to "F", "F+" etc. if necessary. Furthermore, sometimes the algorithm wrongly identified other numbers (e.g.

[110] Job postings which did not include a base salary have been dropped from the dataset.

phone numbers, project numbers or references to legal texts). These lines have been dropped.

During the manual checks, the research team also highlighted whether salaries were specified as ranges or as a single amount in the job postings. For instance, if a job posting mentioned varying amounts for each year of a PhD program, the amount of the first and last year have been considered as minimum and maximum for this job. The same logic has been applied for fringe benefits if these were specified in the form of bandwidths.

In order to 1) verify that the manual inputs or corrections were accurate and 2) to minimize the risk of typos, in a safety loop the tool offered a final table showing the observation as it was saved after completing the manual check. Each observation that has been marked as ok was saved afterwards.

After completing all manual checks for all available observations, the research team compiled the full dataset. Based on the full dataset, some consistency checks had to be applied. These consistency checks should verify that any data that seemed to be reasonable when looking on one job posting only still remained reasonable when comparing it across the full sample. During these consistency checks, dubious observations have been dropped. In some other cases, obvious typos in the job posting could be corrected. Sometimes, missing information from the job posting (e.g. whether the salaries are gross or net) has been added if other information could be used. For instance, in case of Dutch job postings, similar observations following national remuneration schemes could be used to complete the data, if necessary.

The cross-sample checks have also been used to verify that fringe benefits have been consistently classified by the various members of the research team doing the manual checks. While the guideline was important to guarantee consistency, some minor issues only came to light during editing. For instance, in the case of job postings in Poland, salaries are indicated either 1) including total employer's costs, 2) including employee's taxes and social security contributions (i.e. gross salary), or 3) as net salaries. During the consistency checks, the research team has ensured that these amounts are comparable.

Finally, the research team investigated outliers in more detail. In particular, very high and very low amounts were reviewed again. Furthermore, to avoid the problem of comparability between part-time and full-time salaries, only full-time job postings have been considered.

After completing the consistency checks, all salaries have been converted to annual net salaries in Euros. Monthly salaries have been aggregated to yearly amounts using country-specific conversion factors. These conversion factors were based on information provided by country experts as well as desk research. In case of stipends, grants (or similar) as well as monthly fringe benefits, monthly amounts have been multiplied by 12 to come up with yearly amounts. The conversion from annual gross to net salaries was based on a summary table provided by the OECD (see section 8.2.5).

As base salary the mean of 1. the minimum base salary and minimum fringe benefits and 2. the maximum base salary and maximum fringe benefits have been calculated.

9.2.2. Researcher and Employer Survey

9.2.2.1. Researcher Survey

The survey was not designed to be representative and 2328 responses were collected. A breakdown of the responses per country and organisational form can be found in

Table 51 The main contacts for the researcher survey were provided by the Directorate-General for Research and Innovation (DG R&I) in form of access to the Euraxess database.

27.000 addresses were extracted from Euraxess. The addresses consisted mainly of private addresses of researchers rather than institutional addresses of organisations. From these

27.000 addresses we estimate around 10% of addresses to have been outdated or not reachable in other form (due to full inboxes, rejection by the recipient server, outdated addresses or other reasons). These failures could not exactly be tracked because of limited personal resources. We calculate the response rate from Euraxess as 1374 completed interviews / 24.300 ~ 5,6%.

Another channel for addressing researchers in the EU used an open online survey that was copied from the initial closed survey. This open survey was distributed via social media channels and forwarded to selected individuals. The data were collected separately from the initial survey to ensure data quality and yielded 472 completed interviews.

A third channel for reaching more researches in the EU was opened when Technopolis provided WIFO with additional 1094 contacts of researchers in organisations and firms in the EU. The survey was closed and distributed via email like the Euraxess survey. A total of 21 completed interviews were collected through this survey leading to roughly 21 / 1094 ~ 2% response rate.

All channels yielded a total of 2328 responses. In each survey partially completed interviews could be used where the data was suited for analysis.

Euraxess: Initial invitations were sent in the time span from May 4th to May 7th 2021. Packages of 2000 E-Mails were sent every ~ 45 minutes to minimize the risk of spam classification on the recipient's servers. A reminder was sent on May 12th 2021.

Open survey: The initial invitations were sent on May 6th 2021 while reminders were sent around May 13th 2021.

Survey of researchers in firms: The initial invitations were sent on May 12th 2021, while reminders were sent around May 19th 2021.

All surveys were conducted via LimeSurvey and have been distributed with the use of customized URLs and short links.

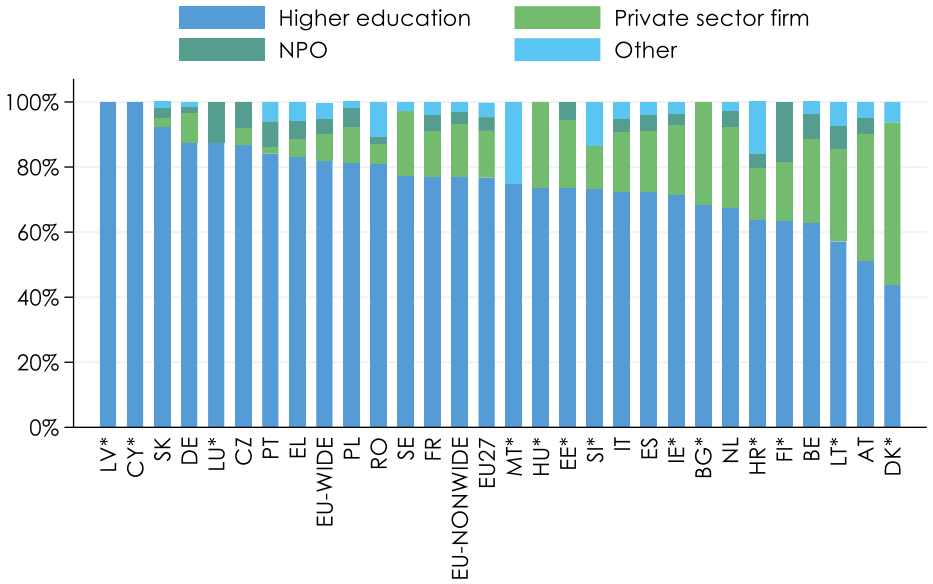
The Euraxess survey was delivered via https://euknowledge.wifo.ac.at/individualtoken while the open survey was reachable via https://eu-knowledge.wifo.ac.at. The third survey of researchers was delivered via https://euknowledge1.wifo.ac.at/individualtoken.

Table 54 shows the distribution of responses of researchers in Higher education institutions (1867) and private (459) organisations, 118 "other" type of organisations.

Table 54: Academic vs non-academic. Distribution of responses

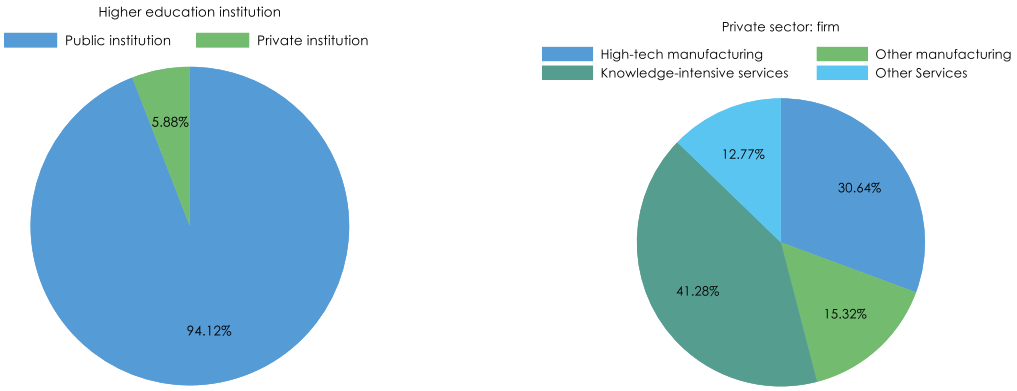
	Count
Public institution	1704
Private institution	163
High-tech manufacturing (computers, pha	114
Other manufacturing	44
Knowledge-intensive services (R&D, IT,	148
Other Services	49
Foundations, civil society organiations	104
Other	118
,	7
Total	2,451

Figure 116: Share of type of organisation per country, 2021



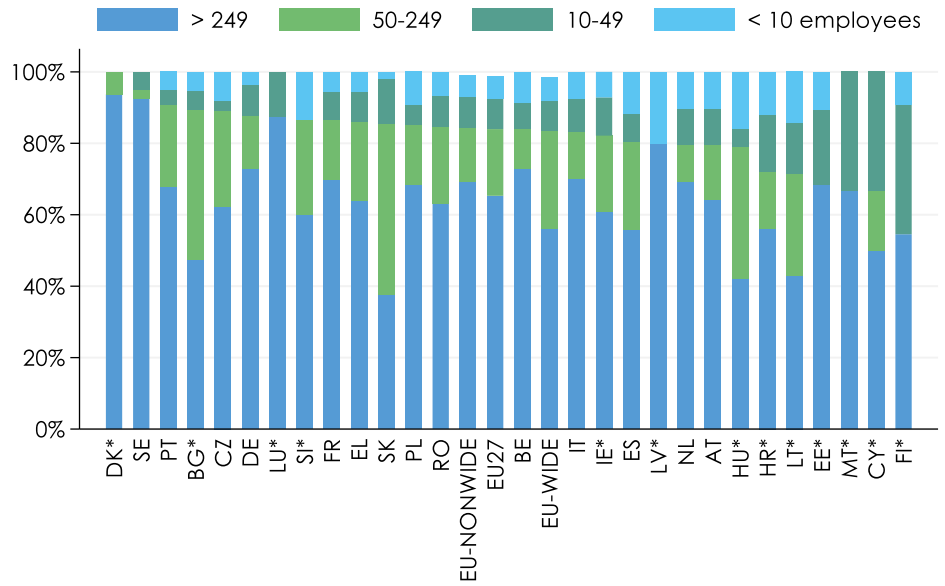
Source: Researcher survey (2021)
Notes:
- Based on question A2: "Which type of organisation do you work for?"
- *=less than 30 observations
-(2021: n=4-1,692)

Figure 117: Share of type of organisation in higher education and private sector – firm institution, 2021



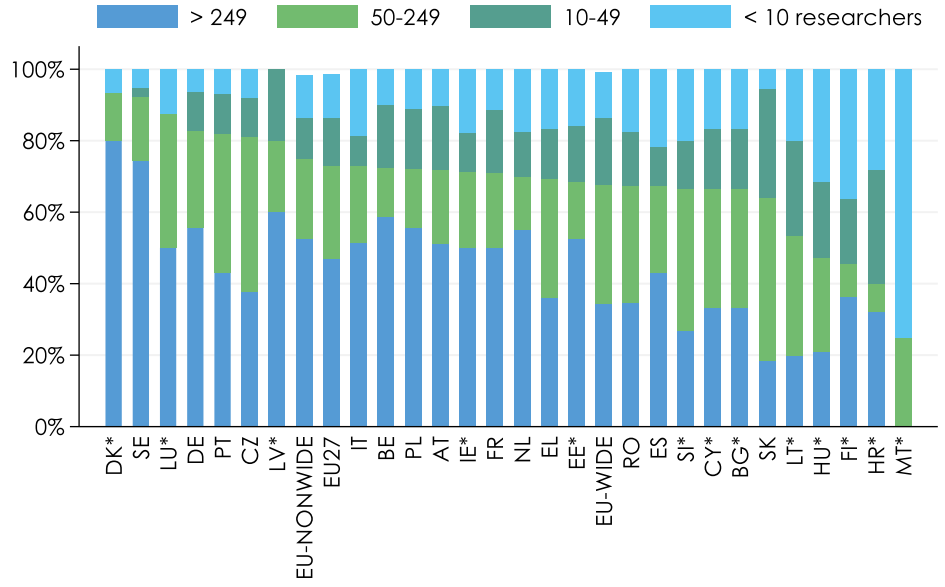
Source: Researcher survey (2021)
Notes:
- Based on question A02: "Which type of organisation do you work for?"
-(2021: n=235; 1,326)

Figure 118: Number of employees working in an organisation per country, 2021



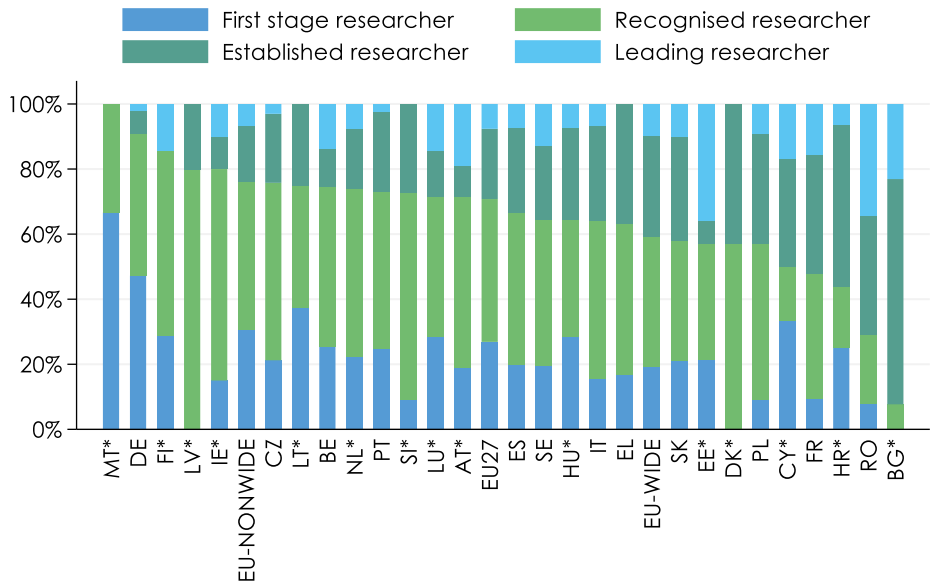
Source: Researcher survey (2021)
Notes:
- Based on question A3: "What is the number of employees working in your organisation?"
- *=less than 30 observations
-(2021: n=3-1,692)

Figure 119: Number of researchers working in an organisation per country, 2021



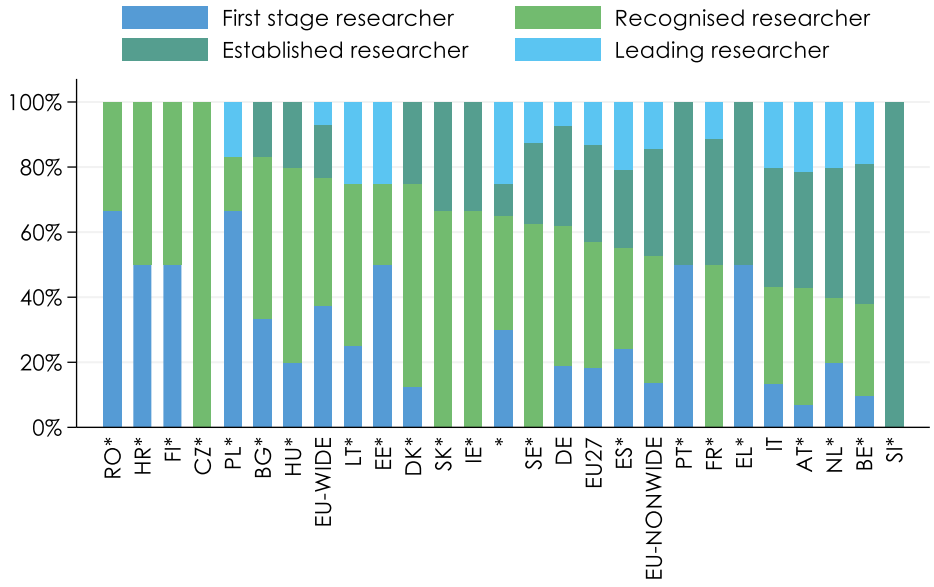
Source: Researcher survey (2021)
Notes:
- Based on question A4: "What is the number of researchers working in your organisation?
- *=less than 30 observations
-(2021: n=4-1,692)

Figure 120: Share of career stage in higher education institution per country, 2021



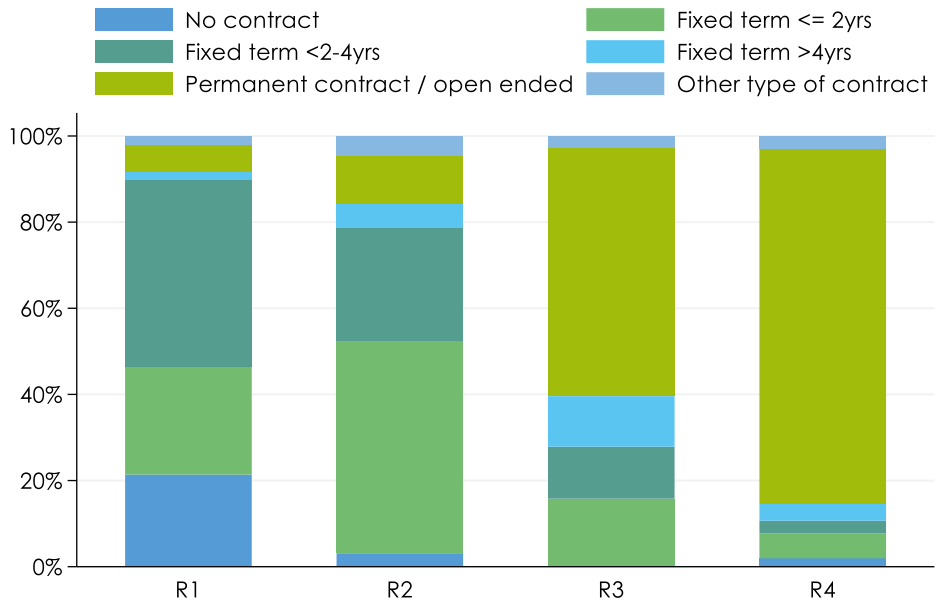
Source: Researcher survey (2021)
Notes:
- Based on question A8.1: "In which career stage would you currently situate yourself?"
- *=less than 30 observations
-(2021: n=3-1,321)

Figure 121: Share of career stage in private sector firm per country 2021



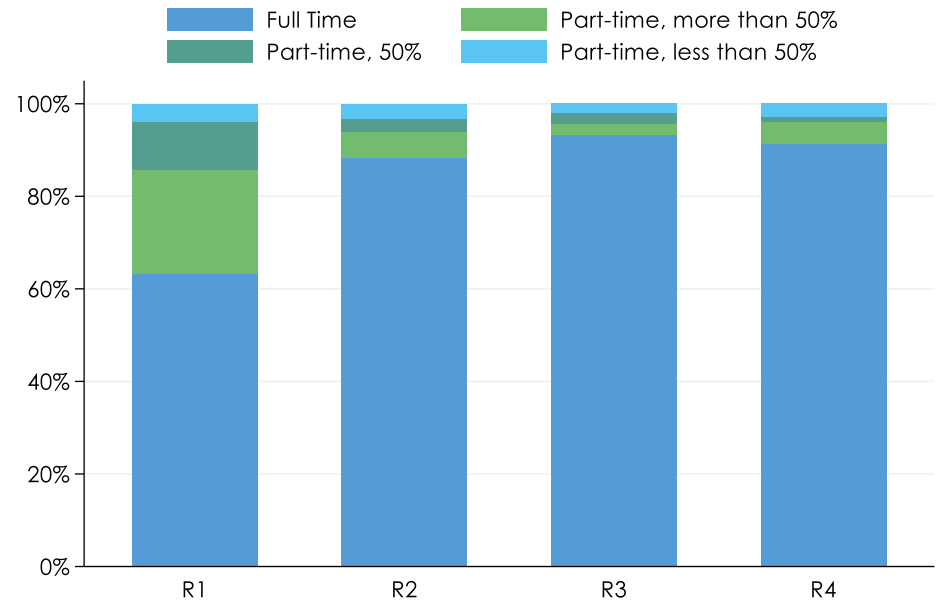
Source: Researcher survey (2021)
Notes:
- Based on question A8.2: "In which career stage would you currently situate yourself?"
- *=less than 30 observations
-(2021: n=2-231)

Figure 122: Share of employment contract in higher education institution by career stage, 2021



Source: Researcher survey (2021)
Notes:
- Based on question A9: "Is your current employment contract (in your main position) permanent or fixed-term?" and question A8.1: "In which career stage would you currently situate yourself?"
-(2021: n=103-606)

Figure 123: Share of position in higher education institution per career stage, 2021

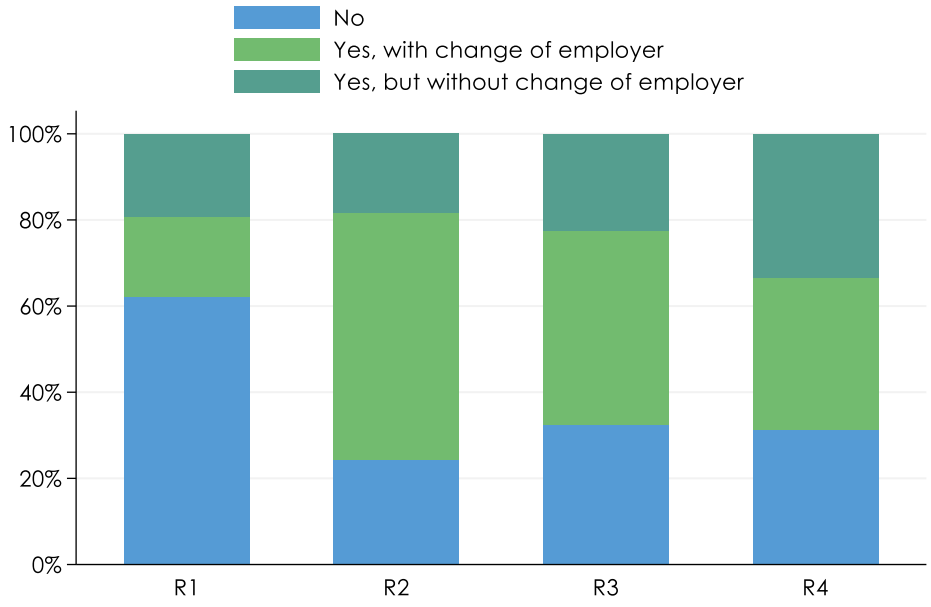


Source: Researcher survey (2021)
Notes:
- Based on question A10: "Is your current position full-time or part-time?" and question A8.1: "In which career stage would you currently situate yourself?"
-(2021: n=104-601)

Figure 124: Share of legal status in higher education institution per career stage, 2021

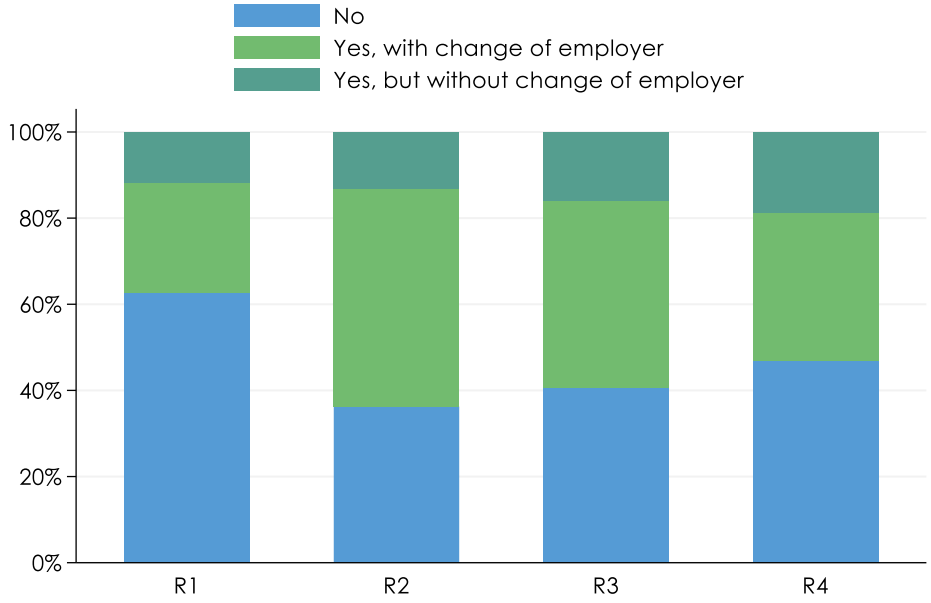
Source: Researcher survey (2021)
Notes:
- Based on question A11: "What is your legal status in your main position?" and question A8.1: "In which career stage would you currently situate yourself?"
-(2021: n=104-601)

Figure 125: Share of mobile researcher in higher education institution by career stage, 2021



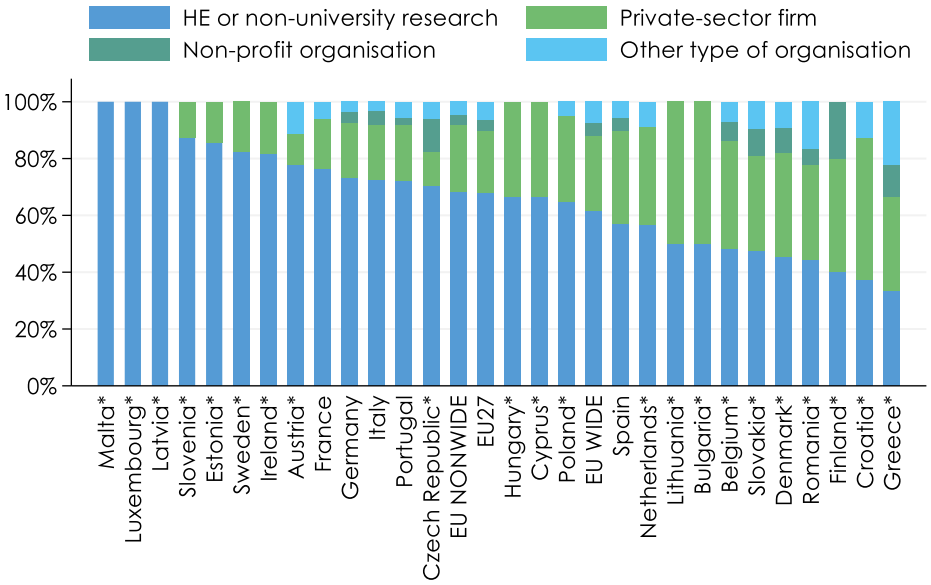
Source: Researcher survey (2021)
Notes:
- Based on question A12: "Have you been internationally mobile as a researcher for more than three months in the past ten years or are you currently mobile?" and question A08.1: "In which career stage would you currently situate yourself?"
-(2021: n=102-586)

Figure 126: Share of mobile researcher per career stage, in private sector firm



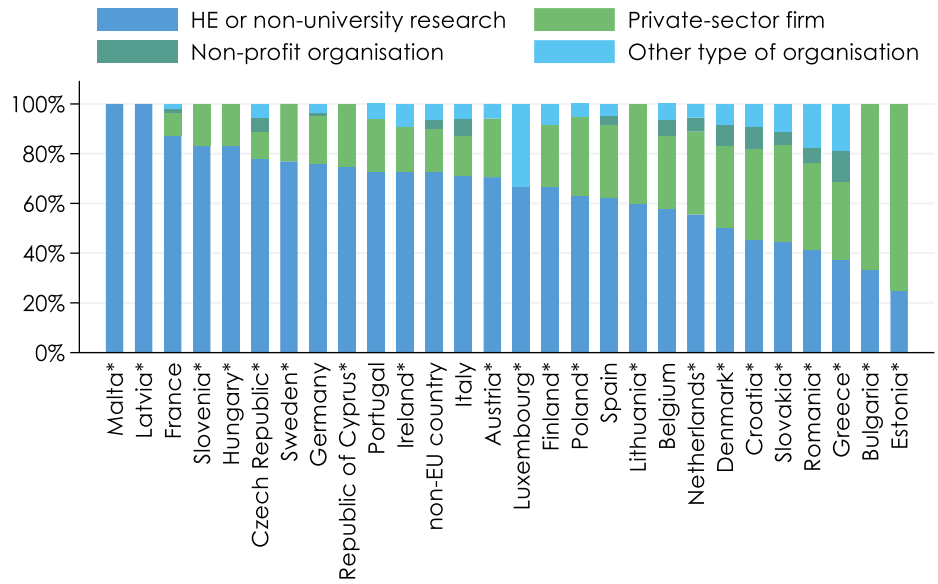
Source: Researcher survey (2021)
Notes:
- Based on question A12: "Have you been internationally mobile as a researcher for more than three months in the past ten years or are you currently mobile?" and question A8.2: "In which career stage would you currently situate yourself?"
-(2021: n=32-91)

Figure 127: Type of organisation of the former employer by country of current employment, 2021



Source: Researcher survey (2021)
Notes:
- Based on question B6: "What type of organisation did your former employer belong to?"
-(2021: n=1-625)

Figure 128: Type of organisation of the former employer by country of changed employer, 2021



Source: Researcher survey (2021)
Notes:
- Based on question B6: "What type of organisation did your former employer belong to?" and question B5:" In which EU country did you change your employer? [Or] Which EU country did you leave?"
- Only respondents who changed the employer (Question B4: "Did you change your employer at least once in the past 10 years, because your working conditions were not satisfactory")?
-(2021: n=1-161)

9.2.2.2. Employer Survey

From June 7th to June 23rd 2021 an open online survey on employers of researchers in the EU was conducted. Relevant research firms were mainly identified by desk research, e.g. from the EU industrial scoreboard; addresses or Linked-in profiles were collected and the team members approached contact people in the firms either through Linked-in or through e-mail. For academic institutions, networks of associations were used to share the survey, e.g. through the European University Association (EUA). Moreover, the survey was sent to all national Euraxess contact points, to share the survey among employers of researchers, both firms and academic institutions. The survey was conducted via LimeSurvey and routed via https://eu-employers.wifo.ac.at and led to 196 completed interviews and 155 partially completed interviews.

Table 55 shows the country distribution of the surveyed organisations. Table 56 shows the distribution of organisational types.

Table 55: Country distribution of the surveyed organisations

Country	Count	Share
AT	14	8,14
BE	27	15,70
BG	1	0,58
DE	2	1,16
DK	2	1,16
HR	2	1,16
HU	1	0,58
IE	12	6,98
IT	40	23,26
LU	2	1,16
LV	10	5,81
NL	1	0,58
PO	35	20,35
SK	23	13,37
Total	172	100,00

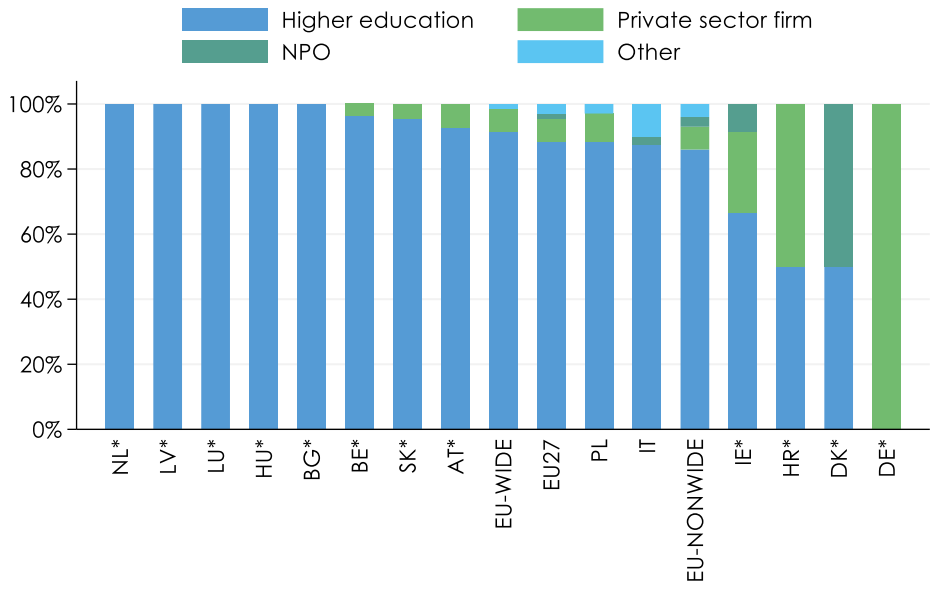
Source: Employer survey (2021)

Table 56: Distribution of organisational types

Type of Organisation	Count	Share
Public institution	139	79,89
Private institution	15	8,62
High-tech manufacturing	1	0,57
Other manufacturing	3	1,72
Knowledge-intensive services	4	2,30
Other Services	4	2,30
Foundations, civil society organisations	3	1,72
Other	5	2,87
Total	174	100,00

Source: Employer survey (2021)

Figure 129: Type of organisation by country, 2021



Source: Employer survey (2021)
Notes:
- Based on question A1: "Which type of organisation do you represent"
- *=less than 30 observations
- (2021: n=1-171)

Table 57: Number of employees working in the organization by Type of organization, 2021

Country	Number of employees	Count			
		Higher education	Private sector: firm	NPO	Other
AT	< 10 employees	-	-	-	-
	10-49	-	-	-	-
	50-249	-	-	-	-
	> 249	13	1	-	-
BE	< 10 employees	-	-	-	-
	10-49	-	-	-	-
	50-249	2	-	-	-
	> 249	24	1	-	-
BG	< 10 employees	-	-	-	-
	10-49	-	-	-	-
	50-249	-	-	-	-
	> 249	1	-	-	-
DK	< 10 employees	-	-	-	-
	10-49	-	-	-	-
	50-249	-	-	1	-
	> 249	1	-	-	-
DE	< 10 employees	-	-	-	-
	10-49	-	-	-	-
	50-249	-	-	-	-
	> 249	-	2	-	-
HR	< 10 employees	-	-	-	-
	10-49	-	1	-	-
	50-249	-	-	-	-
	> 249	1	-	-	-
HU	< 10 employees	-	-	-	-
	10-49	-	-	-	-
	50-249	-	-	-	-
	> 249	1	-	-	-
IE	< 10 employees	-	-	-	-

Country	Number of employees	Count			
		Higher education	Private sector: firm	NPO	Other
	10-49	-	1	-	-
	50-249	-	-	1	-
	> 249	8	2	-	-
IT	< 10 employees	-	-	-	-
	10-49	-	-	-	1
	50-249	9	-	1	1
	> 249	26	-	-	2
LU	< 10 employees	-	-	-	-
	10-49	-	-	-	-
	50-249	-	-	-	-
	> 249	2	-	-	-
LV	< 10 employees	-	-	-	-
	10-49	-	-	-	-
	50-249	7	-	-	-
	> 249	3	-	-	-
NL	< 10 employees	-	-	-	-
	10-49	-	-	-	-
	50-249	-	-	-	-
	> 249	1	-	-	-
PL	< 10 employees	-	-	-	-
	10-49	1	-	-	-
	50-249	4	2	-	-
	> 249	25	1	-	1
SK	< 10 employees	-	-	-	-
	10-49	5	-	-	-
	50-249	4	1	-	-
	> 249	13	-	-	-
EU	< 10 employees	-	-	-	-
	10-49	6	2	-	1
	50-249	26	3	3	1
	> 249	119	7	-	3
EU-NONWIDE	< 10 employees	-	-	-	-
	10-49	-	1	-	1
	50-249	11	-	3	1
	> 249	75	6	-	2
EU-WIDE	< 10 employees	-	-	-	-
	10-49	6	1	-	-
	50-249	15	3	-	-
	> 249	44	1	-	1

Source: Employer survey (2021)
Notes:
- Based on question A02: "What is the number of employees working in your organisation?"

Table 58: Number of researchers working in the organization by type of organization, 2021

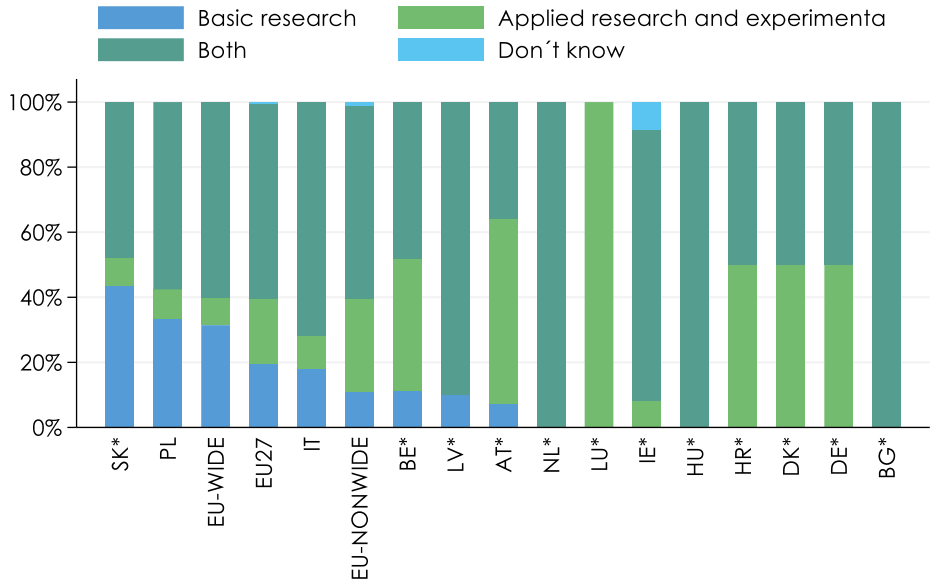
Country	Number of researchers	Count			
		Higher education	Private sector: firm	NPO	Other
AT	< 10 researchers	-	-	-	-
	10-49	1	-	-	-
	50-249	9	-	-	-
	> 249	2	1	-	-
BE	< 10 researchers	-	-	-	-
	10-49	1	-	-	-
	50-249	10	-	-	-
	> 249	14	1	-	-
BG	< 10 researchers	-	-	-	-
	10-49	-	-	-	-

Country	Number of researchers	Count			
		Higher education	Private sector: firm	NPO	Other
	50-249	-	-	-	-
	> 249	1	-	-	-
DE	< 10 researchers	-	-	-	-
	10-49	-	-	-	-
	50-249	-	2	-	-
	> 249	-	-	-	-
DK	< 10 researchers	-	-	-	-
	10-49	-	-	-	-
	50-249	-	-	1	-
	> 249	1	-	-	-
HR	< 10 researchers	-	-	-	-
	10-49	-	-	-	-
	50-249	-	-	-	-
	> 249	1	1	-	-
HU	< 10 researchers	-	-	-	-
	10-49	-	-	-	-
	50-249	-	-	-	-
	> 249	1	-	-	-
IE	< 10 researchers	-	-	-	-
	10-49	-	1	1	-
	50-249	3	-	-	-
	> 249	5	2	-	-
LV	< 10 researchers	-	-	-	-
	10-49	3	-	-	-
	50-249	7	-	-	-
	> 249	-	-	-	-
IT	< 10 researchers	1	-	-	-
	10-49	5	-	-	1
	50-249	8	-	1	2
	> 249	20	-	-	1
LU	< 10 researchers	-	-	-	-
	10-49	-	-	-	-
	50-249	-	-	-	-
	> 249	2	-	-	-
NL	< 10 researchers	-	-	-	-
	10-49	-	-	-	-
	50-249	-	-	-	-
	> 249	1	-	-	-
PL	< 10 researchers	1	-	-	-
	10-49	3	1	-	-
	50-249	7	2	-	-
	> 249	19	-	-	1
SK	< 10 researchers	-	-	-	-
	10-49	7	-	-	-
	50-249	6	1	-	-
	> 249	9	-	-	-
EU	< 10 researchers	2	-	-	-
	10-49	20	2	1	1
	50-249	50	5	2	2
	> 249	76	5	-	2
EU-NONWIDE	< 10 researchers	1	-	-	-
	10-49	7	1	1	1
	50-249	30	2	2	2
	> 249	45	4	-	1
EU-WIDE	< 10 researchers	1	-	-	-
	10-49	13	1	-	-
	50-249	20	3	-	-
	> 249	31	1	-	1

Source: Employer survey (2021)

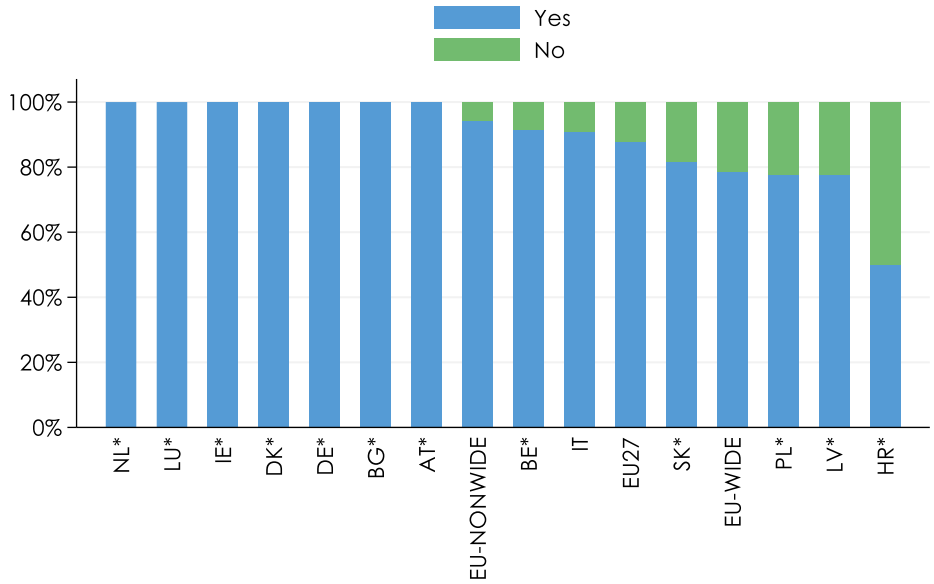
Notes:
- Based on question A03: "What is the number of researchers working in your organisation?"

Figure 130: Share of research type by country, 2021



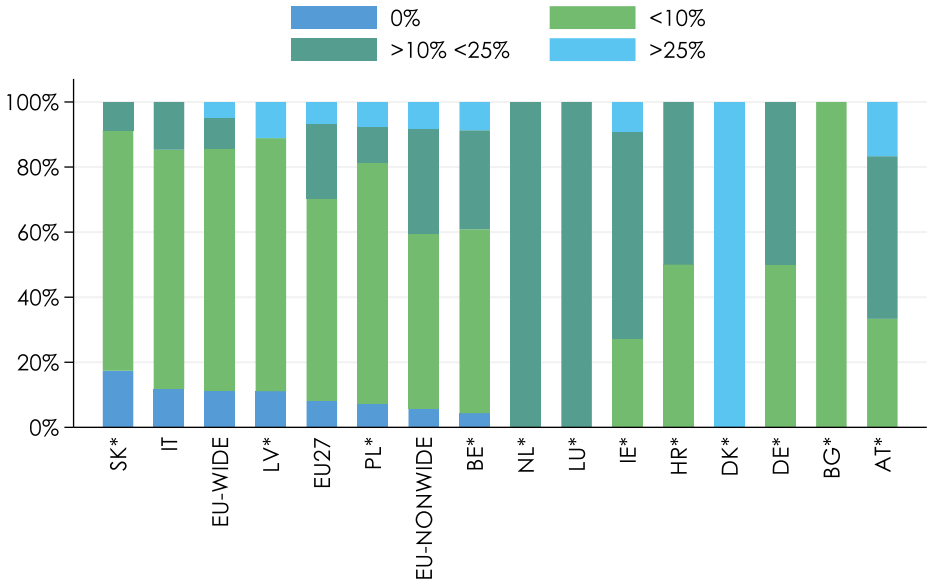
Source: Employer survey (2021)
Notes:
- Based on question A4: "What type of research does your organisation currently perform?"
- *=less than 30 observations
- (2021: n=1-169)

Figure 131: Share of respondents with researchers from other EU-countries by country, 2021



Source: Employer survey (2021)
Notes:
- Based on question A6: "Has your organisation employed researchers from other EU-countries, for more than three months in the past 10 years?"
- *=less than 30 observations
- (2021: n=1-148)

Figure 132: Share of foreign researchers with EU citizenship by country, 2021



Source: Employer survey (2021)
Notes:
- Based on question A7: "What is the percentage of foreign researchers with EU citizenship among all researchers in your organisation?"
- *=less than 30 observations
- (2021: n=1-148)

Table 59: Most useful solutions to help employers with recruiting or retaining researchers, in % of all responses per country, 2021

	AT	BE	BG*	DE*	DK*	HR*	IE*	IT	LV*	NL*	PL	SK	EU27	EU-NONWIDE	EU-WIDE
Autonomy	3	2	0	0	0	0	0	0	6	0	4	2	2	1	3
Career guidance	3	4	0	0	0	0	5	0	0	0	2	2	2	2	2
Changing jobs within org.	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0
Higher salaries	6	4	33	0	50	33	18	21	19	0	20	26	17	12	23
Labour market for researchers	3	10	0	0	0	0	0	3	0	0	2	0	3	5	1
Obtaining full-time position	3	4	0	0	0	0	5	6	6	0	0	6	4	5	3
Obtaining leading position	6	2	0	25	0	0	0	2	13	0	9	2	4	3	6
Obtaining tenured position	6	29	33	0	50	33	14	6	13	33	0	2	10	15	4
Pension included in contract	0	0	0	0	0	0	5	2	0	0	2	0	1	1	1
Private health benfits	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1
Qualified researchers from educ. system	0	6	0	0	0	0	0	0	0	0	4	6	3	2	4
Research condition other than funding	3	4	0	0	0	0	0	5	0	0	7	6	4	3	5
Research funding	13	12	0	0	0	33	9	19	13	0	11	13	13	14	13
Research time	16	6	0	0	0	0	5	6	6	0	2	6	6	7	4
Salary progression	10	2	33	25	0	0	14	11	13	0	13	19	11	8	16
Fringe benefits	0	0	0	0	0	0	0	5	0	0	2	4	2	2	3
Training	0	0	0	0	0	0	0	2	0	0	0	2	1	1	1
Work intensity	6	6	0	0	0	0	0	0	6	0	0	0	2	3	1
Work-life balance	13	4	0	0	0	0	9	3	0	33	13	0	6	6	5
Clear career path	6	4	0	50	0	0	14	10	6	33	4	6	7	9	5

Source: Employer survey (2021)
Notes:
- Based on question B9: "Which of the following solutions would be most useful to help your organisation in recruiting or retaining appropriately qualified researchers?"
- Only respondents who indicate that the organisation struggle to recruit or retain qualified researcher (Question B1 & B5: "Does your organisation struggle to recruit or retain appropriately qualified junior/senior researchers for open positions in research?")
- *=variables with more and with less than 30 observations
- EU27, EU-WIDE, EU-NONWIDE: average over available EU countries
- (2021: n=2-297)

9.2.3. Structure of Earnings Survey

For both the private and academic sectors we analyse micro-data from the Structure of Earnings Survey. For this version of the analytical Report, we used data from the 2014 wave as data for the 2018 wave is still not available (the release of the 2018 version was postponed from January to the second quarter 2021 according to the Eurostat release table; no data for Austria and Ireland). We analyse the occupation "2.1 Professionals in Science and Engineering" according to the ISCO-08 classification, with a PhD or master's degree, for all sectors and more specifically for the NACE rev. 2.0 sectors 85 education ("academic") and the sectors 21, 23, 24 25, 26, 27, 28, 33 ("private"). Due to data restrictions we added the additional sectors 21, 23, 24, 27 and 33 to the group of private sectors. Additionally, to acquire a bigger set of observations, we used all entries that were marked as employed for 40 weeks or more in the observation period and extrapolated salaries to a 52-week employment.

The Structure of Earnings Survey (SES) is the only harmonised data source that is available for most EU countries. It includes information on:

- Level of remuneration
- Individual characteristics of employees (sex, age, occupation, length of service, highest educational level attained, etc)
- and their employer (economic activity, size and location of the enterprise).

In detail the survey includes information on earnings and bonuses (hourly, monthly, and annual) in Euro/Purchasing Power Parties by e.g. collective pay agreement, employment contract (duration), and education attainment.

The data feeds into the following dimensions asked for the contract mapping, at national and regional level (NUTS-1 – 104 major socio-economic regions, i.e. e.g. the German federal states or the French regions, but smaller countries such as Denmark or Ireland are there only as a whole country), by sector of activity (to a level still possible with the sampling, see below), gender and seniority:

- Temporal (employment contract duration, fixed-term vs. tenured)
- Organisational (work intensity – number of overtime hours)
- Economic (gross earnings as well as taxes and social security contributions, so that net earnings can be calculated; salary progression according to length of service in enterprise, and difference between youngest age group and oldest age group)

Limitations are that researchers cannot be exactly defined but are assumed to have certain educational attainments (PhD and master's degree) in certain professions (Professionals in Science and Engineering e.g.) across all sectors and in specific research sectors, so that the data yields a proxy measure for researchers in market and higher education sectors of the economies. However, it still provides a rough approximation of salary levels across similar occupations across the EU. The survey is also not a full survey, but samples entities with more than 10 employees. Micro-data access was granted from Eurostat[111].

Table 60: Number of observations with increasing restriction in characteristics

Country	All	Highest Education	Selected Sectors	Researchers
BE	128,054	22,944	7,166	1,387
BG	162,273	35,886	9,263	684
CY	27,298	3,261	681	20
CZ	1,681,670	350,315	136,837	9,934
DE	917,079	201,004	57,985	2,895
DK	254,127	17,458	5,465	149
EE	101,489	29,145	10,198	310
ES	179,594	35,057	5,367	778
FI	280,905	50,733	19,293	1,547
FR	235,266	59,284	10,980	2,474
GR	33,473	2,165	854	26
HR	52,225	14,098	6,393	721
HU	882,373	127,774	56,360	4,987
IT	168,098	43,427	7,769	283
LT	36,659	8,066	1,346	127
LU	19,621	2,657	237	32

[111] https://ec.europa.eu/eurostat/de/web/microdata/structure-of-earnings-survey

Country	All	Highest Education	Selected Sectors	Researchers
LV	147,093	20,484	6,819	251
MT	44,448	3,567	1,787	14
NL	135,184	20,027	3,992	212
PL	677,063	225,645	79,621	2,944
PT	83,150	2,595	1,121	56
RO	271,529	22,997	3,637	354
SE	225,764	3,170	2,031	164
SI	232,954	46,237	10,132	932
SK	747,862	192,363	53,101	4,218
UK	148,466	14,815	4,014	256

Notes: "All" refers to all observations in the SES dataset that were marked as employed for 40 weeks or more. "Highest Education" refers to Group 4, observations with a master's or PhD degree. "Selected Sectors" refers to the Sectors 85, 21, 23, 24 25, 26, 27, 28, and 33. "Researchers" refer to "2.1 Professionals in Science and Engineering" according to the ISCO-08 classification.

9.2.4. Mobility of Researchers 4

Detailed information on the methodology of the MORE4 survey can be found in the MORE4 Higher Education Report, Annex 2[112]. In principle, the MORE4 survey is designed to be representative for the population of researchers in PhD-granting higher education institutions, with a margin of error of +/-5%.

9.2.5. Calculation of net salaries

To calculate net yearly salaries at power purchasing standards, we first collected information on the number of monthly salaries paid in the academic vs. private sector from our national experts network (section 8.4). Most of our sources provided either gross monthly (SES, job boards) or yearly salary information. We converted gross salaries to net by using the OECD tax benefit web calculator (see rates below). Net salaries were converted into PPS using official yearly Eurostat figures. Salaries from the job board Euraxess are pooled data from 2016-2021. Any time trend should in principle not be strong enough to significantly change the cross-country pattern, in which we are interested. SES data date back to 2014, so it can be expected that more recent data from the 2018 version will be higher; but that is again expected to lift the tide of all boats and not significantly reverse the cross-country patterns we are seeing.

[112] Support data collection and analysis concerning mobility patterns and career paths of researchers : survey on researchers in European higher education institutions : https://op.europa.eu/s/pkLZ

Table 61: Number of monthly salaries per year

Country	Private Sector	Academic Sector	Details
AT	14	14	
BE	13.92	13.92	
BG	12	12	
CY	13	13	The holiday allowance applies only occasionally and on a voluntary basis, not formalised for researchers.
CZ	13	13	Paid through bonuses.
DE	13	13	87% of tariff employees receive 13th salary, less in non-tariff fields.
DK	13	13	
EE	12	13	Paid through bonuses in the academic field.
ES	14	14	14 salaries are standard in private sector, but not compulsory.
FI	12.5	12.5	
FR	13	13	
GR	14	12	No 14th salary in the public sector, apply in private sector.
HR	12	12	400 EUR yearly holiday allowance in the public sector.
HU	13	13	
IE	12	12	
IT	14	13	Holiday allowances are paid in most industrial sectors.
LT	12	12	
LU	13	13	
LV	12	12	Holiday allowances are typically included in the monthly salary.
MT	12	12	
NL	14	14	In the private sector less common, differs between employers.
PL	12	13	
PT	13	13	
RO	12	12	
SE	13	13	
SI	13	13	Regulated in public sector, paid through bonuses in private sector.
SK	12	12	
UK	12	12	

Source: Country Experts.

Table 62: Purchasing power parities (EU27=1), Actual individual consumption

Country	2014	2015	2016	2017	2018	2019	2020
AT	1.14	1.14	1.15	1.16	1.17	1.18	1.20
BE	1.13	1.13	1.15	1.17	1.17	1.17	1.17
BG	0.87	0.88	0.88	0.91	0.93	0.96	1.00
CY	0.96	0.94	0.92	0.92	0.92	0.94	0.93
CZ	16.72	16.94	17.07	17.03	17.42	17.87	18.39
DE	1.06	1.07	1.07	1.06	1.06	1.08	1.09
DK	10.76	10.71	10.88	10.67	10.64	10.56	10.56
EE	0.73	0.73	0.75	0.77	0.80	0.82	0.81
GR	0.87	0.86	0.86	0.84	0.84	0.84	0.83
ES	0.97	0.96	0.96	0.96	0.97	0.97	0.96
EU27	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FI	1.28	1.27	1.28	1.26	1.26	1.26	1.28
FR	1.10	1.11	1.10	1.11	1.11	1.10	1.10
HR	4.97	4.91	4.85	4.85	4.90	4.96	4.91
HU	171.87	175.80	182.21	192.29	199.34	205.92	211.51
IT	1.07	1.07	1.05	1.05	1.04	1.03	1.03
LT	0.59	0.59	0.61	0.62	0.63	0.65	0.66
LU	1.41	1.41	1.42	1.43	1.44	1.47	1.53
LV	0.69	0.68	0.70	0.70	0.72	0.74	0.72
MT	0.84	0.85	0.85	0.87	0.87	0.87	0.89
NL	1.17	1.17	1.19	1.18	1.17	1.20	1.19
PL	2.29	2.28	2.31	2.37	2.40	2.46	2.50
PT	0.84	0.84	0.85	0.87	0.86	0.86	0.88
RO	2.20	2.23	2.19	2.27	2.36	2.40	2.43
SE	12.67	12.82	13.31	13.50	13.74	13.91	13.92
SI	0.85	0.85	0.86	0.85	0.86	0.86	0.86
SK	0.66	0.66	0.72	0.76	0.77	0.79	0.80
UK	1.04	1.04	1.06	1.07	1.07	1.08	1.11

Source: Eurostat.

Table 63: Selection of transition levels in local currency and tax and contribution ratios, in percent of average income, 2020

Country	60%	100%	140%	180%
AT	29,681 (27%)	49,145 (34%)	68,608 (38%)	88,071 (38%)
BE	29,109 (30%)	48,198 (40%)	67,286 (45%)	86,374 (49%)
BG	9,818 (22%)	16,256 (22%)	22,694 (22%)	29,132 (22%)
HR	63,144 (24%)	104,549 (31%)	145,955 (34%)	187,361 (36%)
CY	14,129 (8%)	23,394 (11%)	32,660 (16%)	41,925 (20%)
CZ	245,379 (22%)	406,284 (25%)	567,188 (27%)	728,093 (28%)
DE	266,627 (34%)	441,465 (36%)	616,302 (40%)	791,140 (43%)
EE	10,148 (13%)	16,803 (19%)	23,458 (23%)	30,112 (23%)
FI	27,888 (24%)	46,176 (32%)	64,464 (37%)	82,751 (40%)
FR	23,295 (22%)	38,570 (29%)	53,845 (31%)	69,120 (32%)
DE	31,783 (35%)	52,625 (40%)	73,466 (43%)	94,308 (43%)
GR	12,895 (20%)	21,351 (27%)	29,806 (32%)	38,262 (36%)
HU	3,057,070 (33%)	5,061,706 (34%)	7,066,342 (34%)	9,070,978 (34%)
IE	28,478 (17%)	47,152 (27%)	65,826 (33%)	84,500 (36%)
IT	18,442 (22%)	30,535 (33%)	42,628 (38%)	54,722 (41%)
LV	7,877 (24%)	13,042 (29%)	18,207 (29%)	23,372 (29%)
LT	10,020 (33%)	16,590 (36%)	23,160 (38%)	29,730 (39%)
LU	35,404 (22%)	58,620 (31%)	81,836 (36%)	105,052 (39%)
MT	15,800 (20%)	26,161 (24%)	36,522 (24%)	46,883 (25%)
NL	33,454 (30%)	55,391 (38%)	77,328 (43%)	99,266 (46%)
PL	37,158 (27%)	61,524 (28%)	85,890 (28%)	110,256 (29%)
PT	11,881 (23%)	19,673 (28%)	27,464 (32%)	35,255 (36%)
RO	39,740 (41%)	65,800 (41%)	91,859 (42%)	117,918 (42%)
SK	8,052 (21%)	13,332 (24%)	18,612 (26%)	23,893 (27%)
SI	12,459 (31%)	20,629 (35%)	28,798 (37%)	36,968 (38%)
ES	16,430 (16%)	27,204 (22%)	37,977 (25%)	48,751 (28%)
SE	284,118 (23%)	470,424 (26%)	656,731 (33%)	843,038 (38%)
UK	25,502 (20%)	42,225 (24%)	58,948 (28%)	75,671 (31%)

Source: OECD, Tax-benefit web calculator. Note: Tax and contribution ratios in parenthesis.

9.3. Additional information in the five contract dimensions

9.3.1. Analysis across dimenisons

Table 64: If respondents could improve one aspect of their current position, which one would it be (share of economic aspects as a percentage of all respondents to this question, per country), 2021

Country	Number of all aspects	All aspects are fine	Net salary	Job security	Salary progression	Pension plan	Social security	Other Fringe benefits	Additional private pension	Additional private health insurance
AT	32	6	13	16	3	0	0	0	0	0
BE	68	0	16	15	6	1	1	0	0	1
BG	18	0	33	0	17	11	0	0	0	0
CY	4	0	25	0	0	0	0	0	0	0
CZ	32	0	34	3	6	9	0	0	0	0
DE	385	4	10	14	4	1	1	2	1	0
DK	13	15	8	23	15	0	0	0	0	0
EE	17	0	18	24	6	0	0	0	0	0
EL	32	0	28	9	3	0	0	0	0	0
ES	143	0	18	9	7	1	0	0	2	0
FI	9	22	0	11	0	11	0	11	0	0
FR	110	5	21	5	5	1	0	0	1	0
HR	22	0	18	0	23	9	0	0	0	0
HU	10	0	30	0	30	0	0	0	0	0
IE	26	0	4	12	0	4	12	0	0	12
IT	150	5	11	7	4	3	1	1	0	0
LT	13	8	8	8	8	15	0	0	0	0
LU	6	0	0	17	0	0	0	0	0	0
LV	5	0	20	0	20	20	0	0	0	0
MT	4	0	50	25	0	0	0	0	0	0
NL	38	8	5	21	5	0	0	5	0	0
PL	50	4	30	6	6	4	0	0	0	4
PT	91	4	9	19	7	1	1	0	0	0
RO	44	5	18	5	2	7	0	0	2	0
SE	36	3	11	25	6	3	0	0	0	0

Country	Number of all aspects	All aspects are fine	Net salary	Job security	Salary progression	Pension plan	Social security	Other Fringe benefits	Additional private pension	Additional private health insurance
SI	15	0	0	13	0	0	0	0	7	0
SK	92	8	28	3	10	3	1	1	1	1
EU27	1,465	4	15	11	6	2	1	1	1	1
EU-NONWIDE	1,016	4	12	12	5	1	1	1	1	0
EU-WIDE	449	4	22	8	8	4	0	0	1	1

Source: Researcher survey (2021)
Notes:
- Based on question B2: ": If you could improve one aspect of your current position, which one would it be"

Table 65: If respondents could improve one aspect of their current position, which one would it be (share of career aspects as a percentage of all respondents to this question, per country), 2021

Country	Number of all aspects	All aspects are fine	Obtaining tenured position	Clear career path	Changing job outside organisation	Work intensity	Obtaining a leading position	Obtaining a full-time position	Research assessment	Career guidance	Training	Changing job within organisaton
AT	32	6	22	6	0	0	3	0	6	0	0	0
BE	68	0	19	7	4	6	4	1	0	1	0	0
BG	18	0	0	6	0	6	0	0	0	0	0	0
CY	4	0	0	0	0	25	0	25	0	0	0	0
CZ	32	0	16	13	0	0	3	3	0	3	0	0
DE	385	4	26	7	3	2	2	4	3	3	1	1
DK	13	15	0	0	0	0	0	0	0	15	0	0
EE	17	0	0	12	6	0	0	0	0	0	0	6
EL	32	0	13	9	0	0	0	3	6	3	6	0
ES	143	0	14	8	5	7	3	3	3	1	3	1
FI	9	22	22	11	0	0	0	0	0	0	0	0
FR	110	5	19	5	5	4	1	0	1	1	0	0
HR	22	0	5	9	9	5	0	0	5	0	0	0
HU	10	0	0	10	0	0	0	0	0	0	0	0
IE	26	0	4	0	8	0	8	0	4	4	4	0
IT	150	5	19	20	2	6	6	2	0	1	2	0
LT	13	8	8	8	8	8	0	0	0	8	8	0
LU	6	0	33	0	0	0	33	0	0	0	0	0
LV	5	0	0	20	0	0	0	0	0	0	0	0
MT	4	0	0	0	0	0	0	0	0	0	0	0
NL	38	8	13	8	3	3	0	0	0	0	3	3
PL	50	4	4	4	0	4	0	0	6	2	2	0
PT	91	4	16	10	2	1	5	2	0	0	1	0
RO	44	5	0	2	7	0	0	0	5	5	2	0
SE	36	3	14	6	3	3	3	0	0	3	0	0
SI	15	0	7	7	0	7	0	7	7	7	0	0
SK	92	8	3	2	4	0	1	1	3	1	2	0
EU27	1,465	4	16	8	3	3	3	2	2	2	1	0
EU-NONWIDE	1,016	4	20	9	3	3	3	3	2	2	1	1
EU-WIDE	449	4	7	7	3	2	2	2	3	2	2	0

Source: Researcher survey (2021)
Notes:
- Based on question B2: ": If you could improve one aspect of your current position, which one would it be"
- Obtaining tenured position: only respondents who don´t have a permanent contract
- Obtaining a full-time position: only respondents who don´t have a full-time position

Table 66: If respondents could improve one aspect of their current position, which one would it be (share of organisation and social aspects as a percentage of all respondents to this question, per country), 2021

Country	Number of all aspects	All aspects are fine	Research funding	Time for research	Resarch autonomy	Other research condition	Protection unacc. social behaviour
AT	32	6	3	16	0	6	0
BE	68	0	7	6	0	0	1
BG	18	0	17	6	6	0	0
CY	4	0	25	0	0	0	0
CZ	32	0	0	3	3	0	3
DE	385	4	3	3	1	1	3
DK	13	15	8	8	0	0	8
EE	17	0	29	0	0	0	0
EL	32	0	13	0	3	3	0
ES	143	0	6	3	3	1	1
FI	9	22	0	0	0	11	0
FR	110	5	13	10	1	2	1
HR	22	0	14	5	0	0	0
HU	10	0	20	10	0	0	0
IE	26	0	4	19	0	4	0
IT	150	5	7	2	1	1	0
LT	13	8	8	0	0	0	0
LU	6	0	17	0	0	0	0
LV	5	0	0	0	20	0	0
MT	4	0	0	0	25	0	0
NL	38	8	11	8	3	0	3
PL	50	4	14	6	0	2	2
PT	91	4	11	5	2	2	0
RO	44	5	25	9	2	5	0
SE	36	3	14	3	0	6	0
SI	15	0	7	13	7	13	0
SK	92	8	15	4	2	2	1
EU27	1465	4	9	5	2	2	1
EU-NONWIDE	1016	4	6	5	1	1	1
EU-WIDE	449	4	14	5	2	2	1

Source: Researcher survey (2021)
Notes:
- Based on question B2: ": If you could improve one aspect of your current position, which one would it be"

Table 67: Share of respondents who indicate that the working condition very restrict or restrict them, per country, 2021

Country	Research projects with a high risk profile	Build long-term relationships	Attraction in the research sector	Teaching activities	Research productivity	Social well-being	Explore new research areas	Engage with non-academic stakeholders	Research quality and impact	Domestic labour mobility	International labour mobility
AT*	24	19	30	27	29	25	23	20	19	30	17
BE	37	31	23	36	19	27	30	32	16	19	17
BG**	27	25	29	18	24	24	28	12	24	25	24
CY**	75	25	0	0	0	50	25	0	25	0	0
CZ	30	12	12	33	6	18	14	19	11	16	9
DE	34	27	30	27	21	30	25	34	19	20	19
DK**	14	21	21	27	7	21	15	33	7	15	15
EE**	31	29	29	31	24	24	24	25	24	19	29
EL*	43	28	41	33	38	25	31	26	34	36	37
ES	54	43	40	33	42	38	43	32	41	36	38
FI**	11	33	11	29	22	11	11	25	22	13	13
FR	37	35	30	32	38	21	33	24	29	18	24
HR**	45	35	40	25	24	33	29	15	29	43	48
HU**	14	0	0	14	0	0	14	0	0	0	14
IE**	27	31	17	23	44	28	22	13	23	12	17
IT	37	32	27	39	36	31	30	27	30	28	28
LT**	27	18	27	0	27	36	27	10	27	27	18
LU**	50	33	0	33	0	17	17	0	0	40	0
LV**	0	25	50	20	0	50	0	25	0	50	50
MT**	25	50	25	33	25	25	25	50	25	25	50
NL*	41	31	25	39	43	31	30	19	27	25	38
PL	40	27	29	33	22	38	20	24	22	28	23
PT	57	44	47	39	42	35	39	27	39	38	30
RO	38	30	29	21	32	24	16	24	32	20	22
SE*	44	43	37	38	47	26	35	33	38	29	27
SI**	64	43	50	30	43	69	50	33	50	46	21
SK	39	21	30	21	30	24	21	17	29	21	13
EU27	39	31	31	30	30	29	28	27	27	25	24
EU-NONWIDE	37	32	30	32	30	29	30	29	26	24	24
EU-WIDE	42	29	33	28	29	30	26	22	29	28	24

Source: Researcher survey (2021)
Notes:
- Based on question B3: "To which extent did or do working conditions in your position (such as salary, job security, research funding…) restrict or support your…"
-(2021: n=3-1,457)

Table 68: Reasons to switch employer, in % of responses, per country 2021

	AT	BE	BG	HR	CY	CZ	DK	EE	FI	FR	DE	GR	HR	IR	IT	LV	LT	LU	MT	NL	PL	PT	RO	SK	SV	ES	SE	non-EU
Number of all reasons	82	87	38	38	15	75	57	9	38	238	277	70	29	22	384	24	21	3	7	76	85	135	68	65	36	353	56	645
Net salary	10	6	11	11	7	13	5	22	5	12	8	10	14	18	11	8	14	0	14	5	16	13	15	12	0	12	9	9
Salary progression	7	9	8	8	7	12	2	11	5	8	4	6	10	14	9	4	5	0	0	9	11	9	7	8	3	8	7	8
Pension plan	0	2	5	3	13	3	2	0	0	1	1	1	0	0	2	4	5	0	0	1	4	1	3	3	0	2	0	3
Social security	1	3	3	3	7	3	2	0	3	1	2	1	3	9	4	4	0	0	0	1	5	3	4	5	0	2	0	6
Additional private pension	0	1	0	0	0	0	2	0	0	0	1	0	0	0	1	4	0	0	0	0	0	0	0	2	0	1	0	1
Additional private health insurance	1	2	0	0	0	1	2	0	0	0	1	1	0	0	1	4	0	0	0	0	0	1	0	2	0	1	0	2
Other Fringe benefits	0	1	0	0	7	0	5	0	0	1	1	1	3	9	2	4	0	0	0	0	0	1	0	3	0	2	0	2
Job security	11	8	8	5	7	7	11	11	13	5	9	9	7	14	8	4	5	0	14	9	4	7	9	6	8	8	9	9
Protection unacc. social behaviour	5	3	5	5	7	1	5	0	8	4	3	3	3	9	3	4	0	0	14	4	2	2	6	5	8	3	4	5
Clear career path	9	7	8	11	7	9	11	0	11	7	5	13	3	0	9	4	10	67	0	11	6	8	13	6	11	8	9	6
Obtaining tenured position	7	9	0	5	7	5	5	11	11	8	7	4	3	0	10	4	5	33	0	4	5	6	1	3	8	7	7	4
Obtaining a leading position	5	9	8	5	7	5	7	0	5	5	4	6	3	5	4	4	5	0	0	7	2	6	6	5	8	4	7	4

	AT	BE	BG	HR	CY	CZ	DK	EE	FI	FR	DE	GR	HR	IR	IT	LV	LT	LU	MT	NL	PL	PT	RO	SK	SV	ES	SE	non-EU
Obtaining a full-time position	4	1	0	0	0	1	4	11	3	3	3	1	0	0	3	4	5	0	0	1	4	2	0	2	6	3	2	2
Research assessment	5	3	11	5	0	1	5	0	8	7	9	6	14	0	4	4	14	0	0	8	6	5	7	8	8	3	5	6
Training	5	0	11	8	0	5	9	0	5	5	7	10	3	0	5	4	5	0	0	5	7	5	4	8	3	8	7	6
Career guidance	4	1	5	3	0	4	4	0	3	5	4	0	3	0	3	4	0	0	14	4	4	5	3	0	0	3	5	2
Changing job within organisaton	5	1	0	3	0	3	0	0	3	3	1	0	0	0	1	4	0	0	14	1	2	3	1	2	3	1	4	1
Work intensity	2	5	3	5	0	3	2	11	0	3	5	4	3	5	2	4	0	0	0	3	1	2	4	2	6	3	2	3
Resarch autonomy	5	7	3	3	7	5	5	11	3	4	6	6	3	5	5	4	10	0	0	5	5	3	7	5	6	4	7	4
Time for research	5	3	3	3	0	3	4	0	0	3	4	6	7	0	3	4	5	0	14	5	5	1	3	6	8	3	2	4
Research funding	4	3	5	5	7	8	2	0	11	5	4	7	3	0	7	4	0	0	14	4	6	4	1	2	6	6	5	5
Other research condition	4	2	3	5	7	4	4	0	0	4	5	3	3	0	3	4	10	0	0	3	2	4	1	5	3	4	4	4
Changing job outside organisation	0	1	0	3	0	0	2	0	0	0	1	0	3	0	1	4	5	0	0	3	1	3	0	3	0	2	0	1
None of the above	1	3	3	3	7	0	2	0	3	2	1	0	0	5	0	0	0	0	0	5	1	2	1	0	3	1	4	2
Other	1	6	0	0	0	3	2	11	3	2	3	1	3	9	1	0	0	0	0	1	2	2	0	2	3	2	2	3

Source: Researcher survey (2021)
Notes:
- Based on question B7: "Which of the following aspects of your working conditions / employment contract have contributed to the switch of employer?"
- Only respondents who changed the employer (Question B4: "Did you change your employer at least once in the past 10 years, because your working conditions were not satisfactory")?

Table 69: Dissatisfaction with conditions for jobs in research, per country, 2021

Country	Net salary	Salary progression	Pensions and social Security	Job security	Protection against unaccep. social	Average time next career stage	Obtaining tenured position	Obtaining a leading position	Obtaining a full-time position	Availability of research jobs in priv. sector	Availability of research hob in public/acad.	Work intensity	Research autonomy	Time for research	Research funding	Research assessment	Other research condition	Other
AT**	21	41	12	43	8	31	50	50	28	27	50	39	11	29	26	14	15	0
BE*	23	30	24	41	18	41	51	48	39	32	52	31	5	26	32	25	10	20
BG**	65	50	69	20	27	13	7	13	0	57	25	13	7	8	63	40	20	0
CY**	50	25	50	50	0	0	25	0	0	33	0	25	25	0	100	25	50	
CZ*	53	59	32	43	19	47	58	48	42	34	39	15	19	19	38	19	16	33
DE	20	29	17	52	20	49	69	60	54	39	49	32	14	24	25	23	11	26
DK**	7	23	14	23	21	15	38	42	31	29	43	29	21	29	43	21	14	33
EE**	50	54	36	50	21	50	50	43	50	64	57	21	31	36	64	23	21	
EL*	60	78	53	47	25	61	71	68	61	68	66	38	24	17	72	45	19	100
ES*	73	73	40	69	25	79	79	75	69	74	80	57	40	49	75	53	27	50
FI**	0	13	0	25	0	43	43	43	43	57	57	13	0	0	25	13	0	0
FR*	48	51	12	22	19	48	46	45	36	43	55	29	16	41	50	29	16	25
HR**	57	55	62	24	35	57	55	40	45	65	57	29	14	42	57	62	35	33
HU**	60	60	80	40	20	20	20	20	20	40	40	0	20	0	60	40	20	
IE**	22	23	39	48	13	43	57	52	57	33	52	48	27	57	50	27	25	0
IT*	60	69	59	56	36	77	80	81	78	73	74	39	30	42	66	50	30	60
LT**	56	60	50	22	30	30	30	40	40	44	44	30	0	29	50	44	33	
LU**	40	40	0	20	20	50	75	75	75	75	50	20	20	0	20	50	20	0
LV**	0	25	50	25	25	25	25	25	25	50	25	25	25	25	75	25	50	0
MT**	33	33	0	50	0	67	50	33	33	50	33	0	0	0	0	0	50	100
NL*	19	26	20	48	14	54	53	45	31	46	55	45	23	50	50	35	23	50
PL*	49	59	54	32	30	34	38	40	36	44	41	30	20	54	52	36	28	17
PT*	53	80	55	70	22	86	84	81	76	92	77	36	16	34	81	49	35	50
RO*	43	51	58	22	39	34	36	39	32	52	51	33	15	44	70	37	45	0

Country	Net salary	Salary progression	Pensions and social Security	Job security	Protection against unaccep. social	Average time next career stage	Obtaining tenured position	Obtaining a leading position	Obtaining a full-time position	Availability of research jobs in priv. sector	Availability of research hob in public/acad.	Work intensity	Research autonomy	Time for research	Research funding	Research assessment	Other research condition	Other
SE*	19	38	10	47	7	44	48	41	40	27	55	32	10	33	30	25	14	67
SI**	31	46	43	53	42	58	69	62	62	69	86	50	23	80	92	77	50	0
SK*	61	62	46	26	13	26	38	29	32	62	35	25	5	36	60	28	24	0
EU27	42	50	34	47	22	53	62	57	52	53	57	34	18	34	50	35	21	32
EU-NON WIDE	37	44	27	49	22	56	66	61	55	49	59	37	20	33	44	33	18	36
EU-WIDE	53	63	51	40	24	48	52	48	46	63	52	29	15	35	65	39	30	23

Source: Researcher survey (2021)
Notes:
- Based on question B10: "How satisfactory or dissatisfactory do you rate the following general conditions for research careers in your current sector of activity in your current country of employment?"
- *=variables with more and with less than 30 observations; **=all variables have less than 30 observations
- Time for research: only respondents who work in a public higher education institution or non-university research institute
-(2021: n=1-1,331)

Table 70 Dissatisfaction with conditions for jobs in research in the HE/NPO or other sector; per country, 2021

Country	Net salary	Salary progression	Pensions and social Security	Job security	Protection against unaccep. social behaviour	Average time next career stage	Obtaining tenured position	Obtaining a leading position	Obtaining a full-time position	Availability of research jobs in priv. sector	Availability of research hob in public/acad.	Work intensity	Research autonomy	Time for research	Research funding	Research assessment	Other research condition	Other
AT**	21	50	11	53	11	35	69	65	41	29	56	47	11	29	28	11	5	
BE*	25	37	30	54	23	46	64	59	51	40	63	33	4	26	41	29	7	0
BG**	67	50	58	17	18	17	8	8	0	60	17	0	8	8	67	42	17	0
CY**	50	25	50	50	0	0	25	0	0	33	0	25	25	0	100	25	50	
CZ*	52	61	33	41	19	45	57	46	40	32	37	13	19	19	39	19	16	33
DE*	20	30	18	55	20	50	72	62	57	40	50	32	13	24	25	24	12	28
DK**	0	17	14	33	29	17	67	80	50	43	43	43	14	29	57	29	14	100
EE**	58	64	33	58	25	42	50	42	58	58	50	25	27	36	67	27	25	
EL**	59	81	55	48	26	59	70	67	59	70	64	39	25	17	75	46	19	100
ES*	73	74	35	71	25	82	81	78	73	74	79	56	37	49	75	54	26	44
FI**	0	14	0	29	0	50	50	50	50	67	67	14	0	0	29	14	0	0
FR*	48	50	12	19	17	48	47	42	33	44	54	30	15	41	48	28	16	14
HR**	53	50	58	26	33	58	56	39	44	61	53	26	16	42	58	63	33	33
HU**	100	100	100	50	50	50	50	50	50	50	50	0	0	0	50	50	0	
IE**	22	29	39	56	17	50	67	61	67	38	65	50	22	57	56	29	26	0
IT*	62	73	61	57	39	81	85	85	83	75	76	39	29	42	69	50	29	73
LT**	71	75	67	29	25	38	38	50	50	57	57	38	0	29	63	57	43	
LU**	40	40	0	20	20	50	75	75	75	75	50	20	20	0	20	50	20	0
LV**	0	25	50	25	25	25	25	25	25	50	25	25	25	25	75	25	50	0
MT**	33	33	0	50	0	67	50	33	33	50	33	0	0	0	0	0	50	100
NL**	26	35	27	61	19	64	68	59	43	60	61	52	26	50	57	43	27	100
PL*	54	65	60	34	33	37	44	46	41	49	45	34	23	54	58	38	32	25
PT*	53	81	56	71	23	86	83	80	75	91	76	37	17	34	84	48	35	50
RO*	45	50	59	24	40	32	36	37	31	57	53	33	14	44	73	37	44	0

Country	Net salary	Salary progression	Pensions and social Security	Job security	Protection against unaccep. social behaviour	Average time next career stage	Obtaining tenured position	Obtaining a leading position	Obtaining a full-time position	Availability of research jobs in priv. sector	Availability of research hob in public/acad.	Work intensity	Research autonomy	Time for research	Research funding	Research assessment	Other research condition	Other
SE**	15	33	12	48	9	45	48	36	38	33	58	31	8	33	32	21	13	67
SI**	33	50	42	62	45	60	73	64	64	73	83	60	18	80	91	73	45	0
SK*	61	63	45	27	13	26	39	30	33	62	34	24	5	36	60	27	25	0
EU27	42	52	35	49	23	55	65	60	55	56	57	35	18	34	52	35	21	35
EU-NON WIDE	37	46	27	52	23	58	71	65	59	51	60	37	19	33	45	33	17	37
EU-WIDE*	54	65	52	42	25	49	54	49	47	65	52	30	15	35	67	39	30	28

Source: Researcher survey (2021)
Notes:
- Based on question B10: "How satisfactory or dissatisfactory do you rate the following general conditions for research careers in your current sector of activity in your current country of employment?"
- Time for research: only respondents who work in a public higher education institution or non-university research institute
- *=variables with more and with less than 30 observations; **=all variables have less than 30 observations
-(2021: n=1-1,162)

Table 71: Dissatisfaction with conditions for jobs in research in firms, in % of responses, per country 2021

Country	Net salary	Salary progression	Pensions and social Security	Job security	Protection against unaccep.	Average time next career stage	Obtaining tenured position	Obtaining a leading position	Obtaining a full-time position	Availability of research jobs in priv. sector	Availability of research hob in	Work intensity	Research autonomy	Research funding	Research assessment	Other research condition	Other
AT**	22	22	14	22	0	22	13	22	0	22	38	22	11	22	22	38	0
BE**	17	11	11	6	6	28	18	19	0	12	20	24	6	6	18	21	50
BG**	60	50	100	33	50	0	0	33	0	50	50	67	0	50	33	33	0
CZ**	100	0	0	100	0	100	100	100	100	100	100	100	0	0		0	
DE**	15	24	8	24	20	35	38	35	26	29	44	24	17	29	21	4	20
DK**	14	29	14	14	14	14	14	14	14	14	43	14	29	29	14	14	0
EE**	0	0	50	0	0	100	50	50	0	100	100	0	50	50	0	0	
EL**	100	0	0	0	0	100	100	100	100	0	100	0	0	0	0	0	
ES**	74	68	64	57	27	64	68	57	48	77	86	67	55	76	48	29	100
FI**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FR**	50	54	15	38	33	54	42	67	55	38	62	23	21	62	38	14	100
HR**	100	100	100	0	50	50	50	50	50	100	100	50	0	50	50	50	
HU**	33	33	67	33	0	0	0	0	0	33	33	0	33	67	33	33	
IE**	20	0	40	20	0	20	20	20	20	20	0	40	50	25	20	20	
IT**	55	45	48	50	20	55	50	60	50	60	67	42	37	44	48	32	25
LT**	0	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0	
NL**	0	0	0	13	0	17	13	0	0	13	38	25	13	29	13	13	0
PL**	17	17	17	17	0	17	0	0	0	17	17	0	0	17	17	0	0
PT**	50	50	0	0	0	100	100	100	100	100	100	0	0	0	100	50	
RO**	0	67	33	0	33	67	33	67	33	0	33	33	33	33	33	50	
SE**	40	60	0	40	0	40	50	60	50	0	40	40	20	20	50	20	
SI**	0	0	50	0	0	50	50	50	50	50	100	0	50	100	100	100	0
SK**	50	50	50	0	0	0	0	0	0	50	50	50	0	50	50	0	0
EU27*	36	35	29	28	17	40	36	39	29	38	52	31	24	38	32	20	23
EU-NON WIDE*	36	35	26	31	16	40	38	40	30	37	51	34	26	38	31	20	29
EU-WIDE*	38	34	43	14	18	38	28	34	25	43	53	21	14	37	36	22	0

Source: Researcher survey (2021)
Notes:
- Based on question B10: "How satisfactory or dissatisfactory do you rate the following general conditions for research careers in your current sector of activity in your current country of employment?"
- Time for research: only respondents who work in a public higher education institution or non-university research institute
- *=variables with more and with less than 30 observations; **=all variables have less than 30 observations
- CY, LU, LV, MT: no observation
-(2021: n=1-167)

9.3.2. Temporal dimension

Table 72: Share of permanent vs. fixed term contracts, 2019

Country	Permanent/open-ended contract	Fixed term contract	No contract/self employed
AT	70	29	0
BE	56	42	2
BG	85	13	2
CH	64	35	2
CY	73	25	2
CZ	76	20	4
DE	64	35	1
DK	67	33	1
EE	75	24	1
EL	88	10	2
ES	76	22	3
FI	70	27	3
FR	78	20	3
HR	83	16	1
HU	81	12	7
IE	83	15	2
IS	81	16	3
IT	82	16	1
LT	45	50	5
LU	63	36	1
LV	61	36	3
MT	90	8	2
NL	77	20	3
NO	73	27	0
PL	88	9	4
PT	81	16	4
RO	95	3	2
SE	75	24	1
SI	82	17	0
SK	40	54	7
UK	91	8	1
EU27	74	24	2
EU-NONWIDE	71	27	2
EU-WIDE	80	17	4

Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 28: "Type of contract
- (2019: n=9,321)

Table 73: Share of permanent/open-ended contracts by career stage, 2019

Country	R1	R2	R3	R4
AT	25	39	75	95
BE	7	25	81	95
BG*	45	77	92	88
CH	21	40	85	91
CY*	12	40	75	79
CZ	22	69	76	92
DE	11	44	77	97
DK	12	16	85	88
EE*	40	70	78	89
EL*	62	48	85	92
ES	10	27	77	84
FI*	30	49	73	84
FR	3	47	95	95
HR*	59	42	87	96
HU*	32	66	88	92
IE*	53	50	89	93
IS*	61	32	86	88
IT*	12	35	84	95
LT	36	33	51	45
LU*	17	50	89	95
LV*	49	60	65	55
MT*	67	91	93	88
NL	20	51	94	96
NO	22	48	82	91
PL		89	90	97
PT*	51	60	87	88
RO*	40	97	100	92
SE	8	43	89	90
SI	50	72	91	94
SK	10	31	39	66
UK*	45	67	93	97
EU27	2	11	48	38
EU-NONWIDE	2	10	48	40
EU-WIDE	3	15	49	33

Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 28: "Type of contract and question 13: "In which career stage would you currently situation yourself?"
- (2019: n=9,321)
- *=variables with more and with less than 30 observations

Table 74: Share of permanent/open-ended contracts by gender, 2019

Country	Male	Female
AT	81	54
BE	63	44
BG	86	85
CH	68	57
CY	76	67
CZ	76	76
DE	70	55
DK	76	51
EE	81	69
EL	89	85
ES	78	72
FI	73	66
FR	82	73
HR	85	81
HU	84	76
IE	86	77
IS	84	78
IT	83	82
LT	50	41
LU	67	54
LV	61	61
MT	93	85
NL	84	66
NO	77	67
PL	91	85
PT	88	75
RO	96	94
SE	75	76
SI	83	81
SK	36	44
UK	92	89
EU27	77	69
EU-NONWIDE	75	65
EU-WIDE	82	77

Source: MORE4 EU HE survey (2019)
Notes:
- Based on question 28: "Type of contract and question 2 "What is your gender?"
- (2019: n=9,321)
- *=variables with more and with less than 30 observations

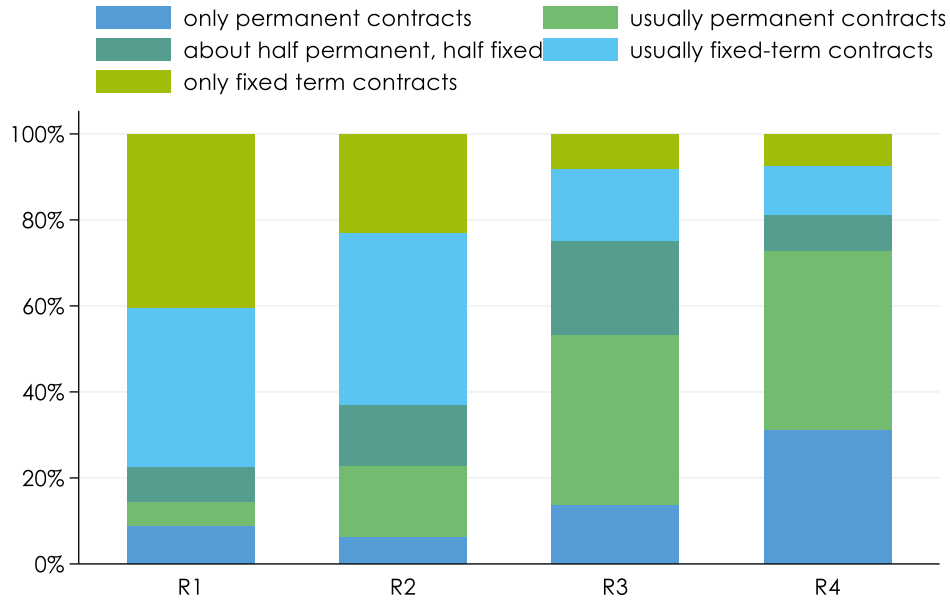
Table 75: Share of contract type in academic/non-university research institution, per career stage and country

		R1	R2	R3	R4
AT**	only permanent contracts	0.0	0.0	9.1	9.1
	usually permanent contracts	27.3	54.5	45.5	54.5
	about half permanent, half fixed term	9.1	9.1	18.2	18.2
	usually fixed-term contracts	36.4	18.2	9.1	0.0
	only fixed term contracts	27.3	18.2	18.2	18.2
BE**	only permanent contracts	0.0	0.0	0.0	34.8
	usually permanent contracts	4.3	8.7	56.5	60.9
	about half permanent, half fixed term	4.3	21.7	30.4	0.0
	usually fixed-term contracts	39.1	60.9	13.0	4.3
	only fixed term contracts	52.2	8.7	0.0	0.0
BG**	only permanent contracts	0.0	0.0	0.0	0.0
	usually permanent contracts	0.0	100.0	100.0	100.0
	about half permanent, half fixed term	0.0	0.0	0.0	0.0
	usually fixed-term contracts	100.0	0.0	0.0	0.0
	only fixed term contracts	0.0	0.0	0.0	0.0
DK**	only permanent contracts	100.0	100.0	0.0	0.0
	usually permanent contracts	0.0	0.0	100.0	100.0
	about half permanent, half fixed term	0.0	0.0	0.0	0.0
	usually fixed-term contracts	0.0	0.0	0.0	0.0
	only fixed term contracts	0.0	0.0	0.0	0.0
HR**	only permanent contracts	100.0	100.0	100.0	0.0
	usually permanent contracts	0.0	0.0	0.0	0.0
	about half permanent, half fixed term	0.0	0.0	0.0	0.0
	usually fixed-term contracts	0.0	0.0	0.0	0.0
	only fixed term contracts	0.0	0.0	0.0	0.0
IE**	only permanent contracts	0.0	0.0	0.0	14.3
	usually permanent contracts	0.0	0.0	28.6	42.9
	about half permanent, half fixed term	0.0	14.3	0.0	0.0
	usually fixed-term contracts	71.4	42.9	57.1	28.6
	only fixed term contracts	28.6	42.9	14.3	14.3
IT**	only permanent contracts	0.0	3.4	31.0	57.1
	usually permanent contracts	3.4	0.0	27.6	28.6
	about half permanent, half fixed term	0.0	6.9	31.0	7.1
	usually fixed-term contracts	27.6	48.3	10.3	7.1
	only fixed term contracts	69.0	41.4	0.0	0.0
LU**	only permanent contracts	0.0	0.0	0.0	0.0
	usually permanent contracts	0.0	0.0	100.0	100.0
	about half permanent, half fixed term	0.0	0.0	0.0	0.0
	usually fixed-term contracts	100.0	100.0	0.0	0.0
	only fixed term contracts	0.0	0.0	0.0	0.0
LV**	only permanent contracts	0.0	11.1	0.0	0.0
	usually permanent contracts	25.0	33.3	57.1	71.4
	about half permanent, half fixed term	37.5	22.2	14.3	14.3
	usually fixed-term contracts	37.5	22.2	14.3	14.3
	only fixed term contracts	0.0	11.1	14.3	0.0
NL**	only permanent contracts	0.0	0.0	0.0	100.0
	usually permanent contracts	0.0	0.0	100.0	0.0
	about half permanent, half fixed term	0.0	0.0	0.0	0.0
	usually fixed-term contracts	0.0	100.0	0.0	0.0
	only fixed term contracts	100.0	0.0	0.0	0.0
PL**	only permanent contracts	27.3	17.4	27.3	40.9
	usually permanent contracts	0.0	39.1	40.9	27.3
	about half permanent, half fixed term	22.7	26.1	18.2	18.2
	usually fixed-term contracts	40.9	13.0	9.1	9.1
	only fixed term contracts	9.1	4.3	4.5	4.5
SK**	only permanent contracts	15.8	0.0	0.0	10.0

		R1	R2	R3	R4
	usually permanent contracts	0.0	0.0	20.0	30.0
	about half permanent, half fixed term	0.0	5.0	20.0	5.0
	usually fixed-term contracts	31.6	55.0	35.0	30.0
	only fixed term contracts	52.6	40.0	25.0	25.0
EU27	only permanent contracts	8.9	6.3	13.7	31.1
	usually permanent contracts	5.6	16.5	39.5	41.8
	about half permanent, half fixed term	8.1	14.2	21.8	8.2
	usually fixed-term contracts	37.1	40.2	16.9	11.5
	only fixed term contracts	40.3	22.8	8.1	7.4
EU-NONWIDE	only permanent contracts	1.4	2.7	13.7	37.5
	usually permanent contracts	6.8	11.0	42.5	45.8
	about half permanent, half fixed term	2.7	12.3	24.7	5.6
	usually fixed-term contracts	37.0	47.9	15.1	6.9
	only fixed term contracts	52.1	26.0	4.1	4.2
EU-WIDE	only permanent contracts	19.6	11.1	13.7	22.0
	usually permanent contracts	3.9	24.1	35.3	36.0
	about half permanent, half fixed term	15.7	16.7	17.6	12.0
	usually fixed-term contracts	37.3	29.6	19.6	18.0
	only fixed term contracts	23.5	18.5	13.7	12.0

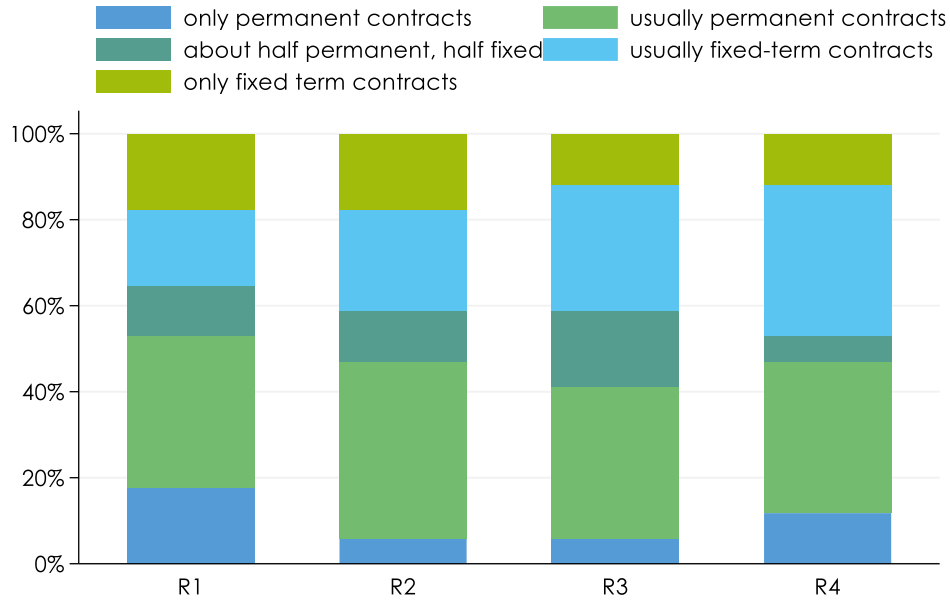
Source: Employer survey (2021)
Notes:
- Based on question A8.2: "What type of contract (permanent vs. fixed-term) is typical for researchers in your organisation? Please answer this question for each of the career stages that are mentioned below"
- *=variables with more and with less than 30 observations; **=all variables have less than 30 observations
- EU27, EU-NONWIDE, EU-WIDE: average over available countries

Figure 133: Share of typical employment contract in academic/non-university research organisation per career stage, 2021



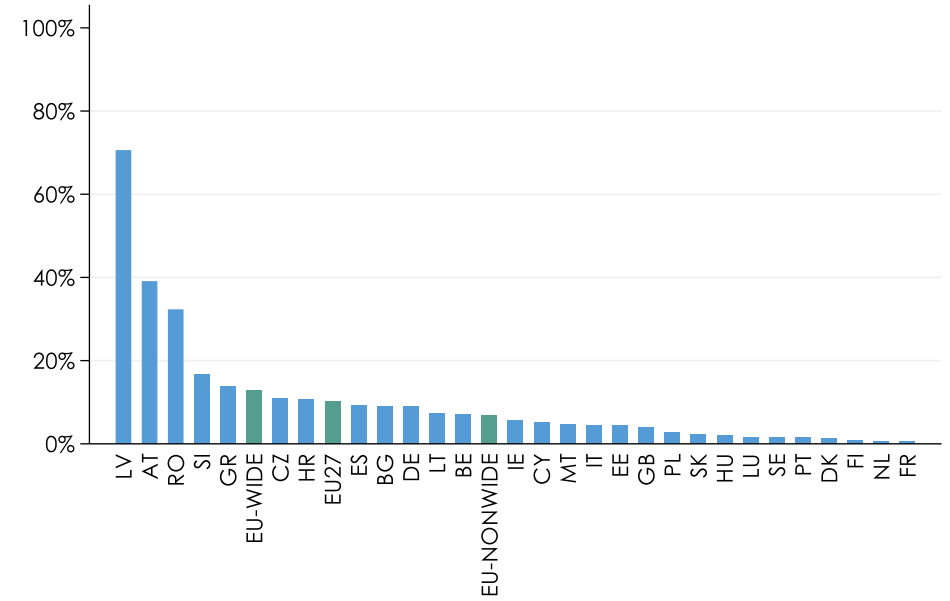
Source: Employer survey (2021)
Notes:
- Based on question A8.2: What type of contract (permanent vs. fixed-term) is typical for researchers in your organisation? Please answer this question for each of the career stages that are mentioned below"

Figure 134: Share of contract type in private sector - firm per career stage, 2021



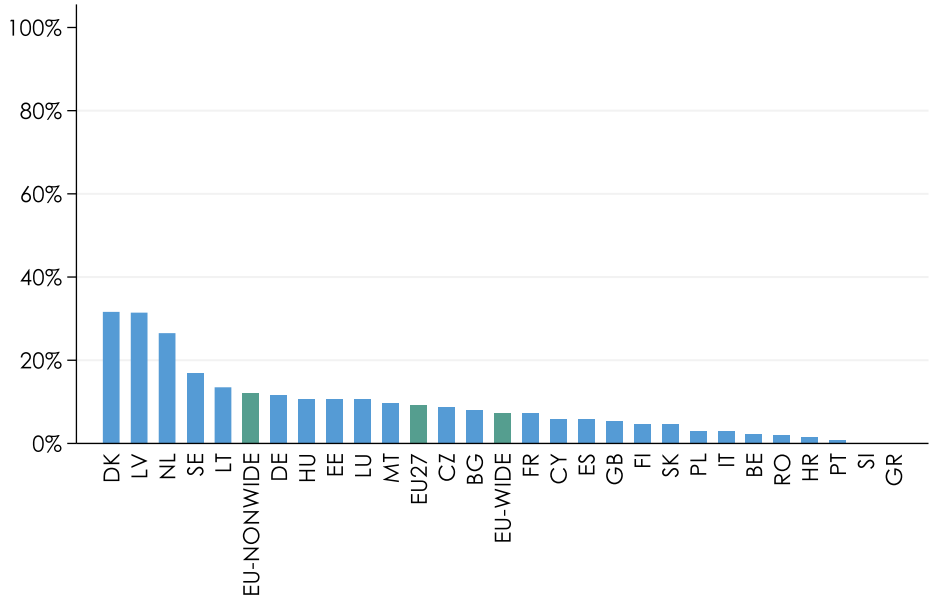
Source: Employer survey (2021)
Notes:
- Based on question A8.1: "What type of contract (permanent vs. fixed-term) is typical for researchers in your organisation? Please answer this question for each of the career stages that are mentioned below"
- *=variables with more and with less than 30 observations; **=all variables have less than 30 observations
- (2021: n=124-127)

Figure 135: Share of part-time contracts according to job portal analysis, 2016-2021



Source: Job board analysis (2021), see section 8.2.1
Notes:
- Share of part-term contracts among all online job board postings, in the academic (universities, public research institutions), private and other (NGO e.g.) sectors
- (2021: n=204,395)

Figure 136: Share of part-time contracts according to Structure of Earnings Survey, 2014



Source: SES (2014), see section 8.2.3
Notes:
- "2.1 Professionals in Science and Engineering" (ISCO-08), PhD or master's degree, for NACE rev. 2.0 sectors 85 education ("academic") and the sectors 21, 23, 24 25, 26, 27, 28, 33 ("private"). Due to data restrictions we added the sectors 21, 23, 24, 27 and 33 to "private" sectors. We used all entries that were marked as employed for 40 weeks or more in the observation period and extrapolated salaries to a 52-week employment.
- Share of part-term contracts among all observations in the Structure of Earnings Survey.
- (2014: n=159,896)

9.3.3. Organisational dimension

Table 76: Difference in satisfaction with autonomy between Male and Female researchers, 2019

Country	R1	R2	R3	R4
AT	10	3	6	1
BE	3	1	-6	0
BG	19	-6	0	-2
CH	0	-1	2	7
CY	13	-15	-6	4
CZ	0	9	-1	4
DE	10	-4	-2	1
DK	-2	8	3	5
EE	-15	5	1	-4
EL	-18	12	-1	15
ES	12	9	-3	6
FI	22	6	9	3
FR	-6	12	12	3
HR	-3	29	-8	6
HU	-14	14	-5	15
IE	7	-6	4	3
IS	0	19	2	0
IT	0	0	5	17
LT	3	9	7	0
LU	-5	3	-3	0
LV	10	23	-13	7
MT	-64	-18	8	16
NL	9	0	0	5
NO	-3	-13	1	1
PL	23	4	2	4

Country	R1	R2	R3	R4
PT	11	14	5	0
RO	1	6	14	19
SE	1	-8	-3	-2
SI	-14	3	-2	3
SK	21	17	7	2
UK	0	16	8	1
EU27	6	4	3	5
EU-NONWIDE	6	1	2	5
EU-WIDE	6	10	3	6

Source: MORE4 EU HE survey (2019)
Notes:
- Negative values indicate that a higher share of females compared with males is dissatisfied with autonomy.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=7,969-8,540)

Table 77: Dissatisfaction with various organisation related factors, researchers from higher education/NPO/other organisation vs. private sector – firm researchers, 2021

Country	Research assessment		Work intensity	
	HE/NPO/other	Firm	HE/NPO/other	Firm
AT**/**	24	33	32	0
BE/**	24	21	26	21
BG**/**	15	0	15	50
HR**/**	58	0	17	33
CY**	50		50	
CZ/**	24	0	24	0
DK**/**	43	13	43	13
EE**/**	43	0	14	0
FI**/**	25		25	0
FR/**	26	27	22	20
DE/*	26	14	28	26
EL/**	33	0	23	100
HU**/**	17	0	0	0
IE**/**	19	40	29	33
IT/**	34	50	32	27
LV**	20		40	
LT**/**	56	0	44	0
LU**	83		0	
MT**	25		25	
NL**/**	32	40	46	20
PL/**	41	0	30	0
PT/**	47	50	31	0
RO/**	35	33	33	33
SK/**	30	33	19	0
SI**/**	67	50	50	50
ES/**	45	31	47	50
SE*/**	34	17	27	50
EU27	33	26	29	26
EU-NONWIDE	30	29	31	27
EU-WIDE	38	13	26	18

Source: Researcher survey (2021)
Notes:
- Based on question B1: "Please indicate your satisfaction with each factor as it relates to your current position/employment" and question A2: "Which type of organisation do you work for?"
- *=variables with more and with less than 30 observations; **=all variables have less than 30 observations; Asterisk in front of the slash indicates the observation for the HE/NPO/other sector and behind the slash for private sector - firm

9.3.4. Economic Dimension

Table 78: Salaries in EUR, at PPS, average at first quintile (0.2-quantile)

Country	Level of yearly net salary in PPS (academic&private, across all career stages)	Level of yearly net salary, PPS (academic, career stages R1&2)	Level of yearly net salary, PPS (academic, career stages R3&4)	Level of yearly net salary, PPS (private, career stages R1&2)	Level of yearly net salary, PPS (private, career stages R3&4)
	Salary at 20th quantile	Salary at 20th quantile, R1&R2, academic sector	Salary at 20th quantile, R3&R4, academic sector	Salary at 20th quantile, R1&R2, private sector	Salary at 20th quantile, R3&R4, private sector
AT	25.064	24.105	32.969	23.838	33.862
BE	20.901	17.257	28.136	27.959	31.920
BG	8.563	8.266	10.480	9.301	10.172
HR	16.791	15.977	22.888	18.094	19.358
CY	19.542	21.175	44.962	18.593	31.117
CZ	15.201	14.115	17.615	15.736	21.251
DK	27.199	23.508	27.694	29.888	38.783
EE	14.110	14.946	23.617	17.334	16.848
FI	21.574	18.202	25.101	26.923	30.687
FR	24.144	19.341	26.643	27.657	35.070
DE	28.183	22.508	36.337	29.573	36.383
EL	16.340	13.288	22.753	20.096	21.373
HU	11.893	8.350	13.131	16.496	25.923
IE	15.215	14.951	24.507	19.589	0
IT	19.073	14.525	22.559	18.917	27.157
LV	11.392	9.709	15.335	16.052	23.812
LT	11.809	10.744	13.565	13.383	16.704
LU	25.716	27.697	33.825	23.275	26.009
MT	22.463	23.599	34.173	19.887	45.479
NL	22.993	21.315	33.309	26.310	37.569
PL	15.711	12.671	17.656	18.260	19.203
PT	20.798	20.928	29.661	16.967	0
RO	13.032	11.418	28.697	13.362	26.180
SK	11.617	10.899	13.081	13.382	15.190
SI	16.624	15.092	22.727	15.989	18.675
ES	20.914	19.177	26.628	21.503	30.946
SE	20.827	20.312	25.666	17.342	34.260
EU27	18.433	16.818	24.952	19.841	26.957
EU-WIDE	15.059	14.078	22.023	16.195	22.235
EU-NONWIDE	22.479	20.128	28.084	24.061	32.095

Source: Structure of Earnings Survey (data from 2018; details see section 8.2.3); online job boards (pooled data 2016-2021; details see section 8.2.1); researcher survey undertaken within this project (2021; details see section 8.2.2); information on salaries and pay scales per career stage and academic vs. private sector provided by national experts (see list in section 8.4)
Notes:
- Conversion into net salaries at PPS: see section 8.2.5. Circle size refers to the number of observations used. Only values from national experts/pay scales use a square symbol, as they refer to one number rather than an average of various observations.
- Country values (20th quantile, or first quintile in the distribution) are the result of an average of the salary information from national experts (pay scales) and the weighted mean of the three other sources (job boards, SES, researcher survey) which are weighted by the number of observations.

Table 79: Ratios of salary levels, in local currency

Country	Researchers vs. total economy	Academic to private sector (R1 and R2)	Academic to private sector (R3 and R4)
AT	113	101	97
BE	110	62	88
BG	154	89	103
CY	145	114	144
CZ	132	90	83
DE	133	76	100
DK	128	79	71
EE	128	86	140
ES	135	89	86
FI	112	68	82
FR	142	70	76
GB	100	.	.
EL	136	66	106
HR	167	88	118
HU	132	51	51
IE	91	76	.
IT	137	77	83
LT	104	80	81
LU	119	119	130
LV	154	60	64
MT	142	119	75
NL	111	81	89
PL	122	69	92
PT	172	123	.
RO	175	85	110
SE	106	117	75
SI	144	94	122
SK	127	81	86
EU27	131	85	93
EU-NONWIDE	118	84	88
EU-WIDE	142	87	99

Source: OECD for economy-wide net salaries (gross wages from tax and benefit calculator, net salaries calculated by WIFO using tax and social security levies at 100% of average salary), Structure of Earnings Survey (data from 2018; details see section 8.2.3); online job boards (pooled data 2016-2021; details see section 8.2.1); researcher survey undertaken within this project (2021; details see section 8.2.2); information on salaries and pay scales per career stage and academic vs. private sector provided by national experts (see list in section 8.4

Table 80: Satisfaction with remuneration, 2019

Country	Well paid	Paid a reasonable salary	Not badly sufficiently
AT	32	51	17
BE	47	42	11
BG	9	39	52
CH	58	32	10
CY	16	45	39
CZ	16	40	43
DE	38	54	8
DK	26	58	15
EE	10	34	56
EL	4	19	77
ES	19	36	44
FI	29	49	22
FR	15	48	37
HR	10	51	39
HU	12	35	53
IE	38	45	17
IS	12	50	38
IT	8	49	43
LT	6	35	60
LU	62	30	8
LV	12	41	47
MT	15	46	38
NL	33	56	10
NO	28	52	21
PL	12	33	55
PT	10	38	52
RO	12	68	19
SE	31	49	20
SI	12	56	32
SK	9	30	61
UK	20	56	24
EU27	23	45	32
EU-NONWIDE	28	49	23
EU-WIDE	10	36	54

Source: MORE4 EU HE survey (2019)
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)?"
- (2019: n=9,321)

Table 81: Satisfaction with remuneration by age groups, 2019

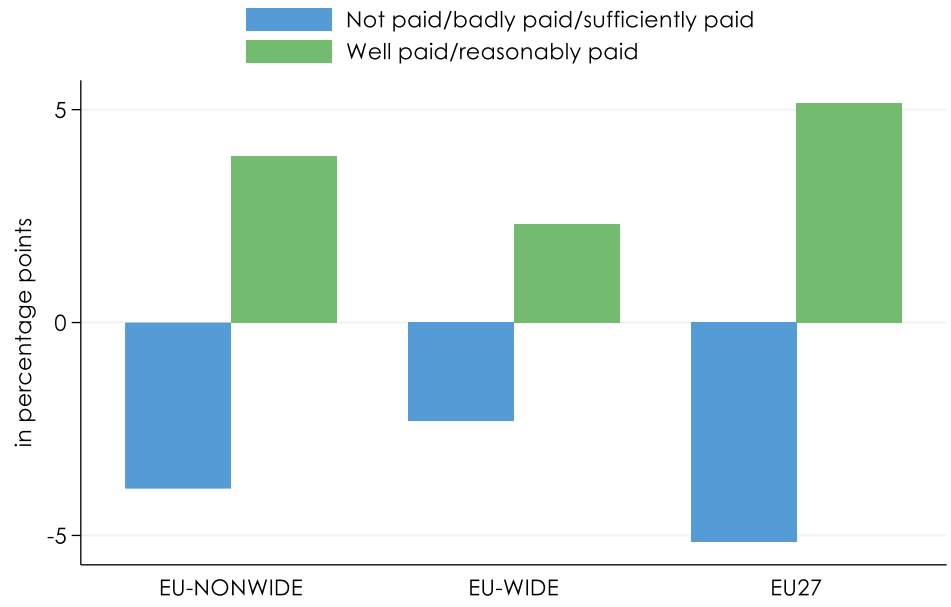
		Below 35	35 to 44	45-54	55-64
AT	Not, badly and sufficiently paid, to only make ends meet	23	21	16	10
AT	Paid a reasonable salary	48	53	48	56
AT	Well paid	29	25	36	34
BE	Not, badly and sufficiently paid, to only make ends meet	8	13	13	17
BE	Paid a reasonable salary	29	50	47	47
BE	Well paid	63	38	40	36
BG	Not, badly and sufficiently paid, to only make ends meet	61	53	50	52
BG	Paid a reasonable salary	32	42	35	39
BG	Well paid	7	6	14	9
CH	Not, badly and sufficiently paid, to only make ends meet	18	11	7	6
CH	Paid a reasonable salary	31	35	31	31
CH	Well paid	52	54	63	64
CY	Not, badly and sufficiently paid, to only make ends meet	0	40	45	33
CY	Paid a reasonable salary		54	31	49
CY	Well paid		6	24	18
CZ	Not, badly and sufficiently paid, to only make ends meet	63	44	44	29
CZ	Paid a reasonable salary	31	43	40	51
CZ	Well paid	6	13	15	20
DE	Not, badly and sufficiently paid, to only make ends meet	15	10	7	3
DE	Paid a reasonable salary	66	51	54	51
DE	Well paid	19	38	39	46
DK	Not, badly and sufficiently paid, to only make ends meet	13	16	14	25
DK	Paid a reasonable salary	55	68	69	39
DK	Well paid	32	16	17	36
EE	Not, badly and sufficiently paid, to only make ends meet	0	60	52	73
EE	Paid a reasonable salary		30	42	22
EE	Well paid		10	7	5
EL	Not, badly and sufficiently paid, to only make ends meet	0	72	83	75
EL	Paid a reasonable salary		21	14	20
EL	Well paid		7	3	5
ES	Not, badly and sufficiently paid, to only make ends meet	81	42	44	37
ES	Paid a reasonable salary	11	37	39	39
ES	Well paid	9	22	17	24
FI	Not, badly and sufficiently paid, to only make ends meet	0	21	15	19
FI	Paid a reasonable salary		51	54	54
FI	Well paid		28	30	27
FR	Not, badly and sufficiently paid, to only make ends meet	40	46	31	36
FR	Paid a reasonable salary	33	45	56	50
FR	Well paid	27	8	12	14
HR	Not, badly and sufficiently paid, to only make ends meet	0	44	36	30
HR	Paid a reasonable salary		48	52	57
HR	Well paid		9	12	13

		Below 35	35 to 44	45-54	55-64
HU	Not, badly and sufficiently paid, to only make ends meet	78	51	51	41
HU	Paid a reasonable salary	14	40	41	41
HU	Well paid	8	9	9	18
IE	Not, badly and sufficiently paid, to only make ends meet	0	28	11	9
IE	Paid a reasonable salary		38	49	44
IE	Well paid		34	40	46
IS	Not, badly and sufficiently paid, to only make ends meet	0	0	48	40
IS	Paid a reasonable salary			37	49
IS	Well paid			16	10
IT	Not, badly and sufficiently paid, to only make ends meet	0	32	51	43
IT	Paid a reasonable salary		56	44	47
IT	Well paid		12	6	10
LT	Not, badly and sufficiently paid, to only make ends meet	0	65	62	56
LT	Paid a reasonable salary		31	33	34
LT	Well paid		4	5	9
LU	Not, badly and sufficiently paid, to only make ends meet	15	6	0	0
LU	Paid a reasonable salary	40	31		
LU	Well paid	45	64		
LV	Not, badly and sufficiently paid, to only make ends meet	0	36	56	51
LV	Paid a reasonable salary		58	30	32
LV	Well paid		6	14	17
MT	Not, badly and sufficiently paid, to only make ends meet	0	50	41	33
MT	Paid a reasonable salary		36	43	55
MT	Well paid		14	16	12
NL	Not, badly and sufficiently paid, to only make ends meet	16	14	6	8
NL	Paid a reasonable salary	60	58	62	49
NL	Well paid	24	28	33	43
NO	Not, badly and sufficiently paid, to only make ends meet	44	18	22	15
NO	Paid a reasonable salary	39	53	51	57
NO	Well paid	17	29	27	28
PO	Not, badly and sufficiently paid, to only make ends meet	0	55	66	58
PO	Paid a reasonable salary		37	28	26
PO	Well paid		8	6	16
PT	Not, badly and sufficiently paid, to only make ends meet	0	54	54	55
PT	Paid a reasonable salary		39	40	35
PT	Well paid		7	6	10
RO	Not, badly and sufficiently paid, to only make ends meet	0	20	23	10
RO	Paid a reasonable salary		72	63	74
RO	Well paid		8	13	16
SE	Not, badly and sufficiently paid, to only make ends meet	13	22	20	17
SE	Paid a reasonable salary	50	42	58	53
SE	Well paid	37	36	22	30

		Below 35	35 to 44	45-54	55-64
SK	Not, badly and sufficiently paid, to only make ends meet	51	71	59	66
SK	Paid a reasonable salary	35	24	32	26
SK	Well paid	14	5	9	8
SV	Not, badly and sufficiently paid, to only make ends meet	0	37	28	27
SV	Paid a reasonable salary		56	60	59
SV	Well paid		6	13	13
UK	Not, badly and sufficiently paid, to only make ends meet	0	29	18	23
UK	Paid a reasonable salary		52	62	62
UK	Well paid		19	20	15
EU27	Not, badly and sufficiently paid, to only make ends meet	31	32	34	29
EU27	Paid a reasonable salary	46	46	46	45
EU27	Well paid	22	22	20	26
EU-NONWIDE	Not, badly and sufficiently paid, to only make ends meet	27	23	24	21
EU-NONWIDE	Paid a reasonable salary	48	49	51	48
EU-NONWIDE	Well paid	25	28	25	31
EU-WIDE	Not, badly and sufficiently paid, to only make ends meet	56	53	58	54
EU-WIDE	Paid a reasonable salary	34	39	34	34
EU-WIDE	Well paid	9	8	8	12

Source: MORE4 EU HE survey (2019)
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)?" and question 3 "Age"
- (2019: n=9,321)

Figure 137: Difference of shares of satisfaction with remuneration between male and female researchers, 2019



Source: MORE4 EU HE survey (2019)
Notes:
- Negative values indicate that a higher share of females compared with males is dissatisfied with pay
- 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=9,321)

Table 82: Share of satisfaction with pension by career stage, 2019

Country	R1	R2	R3	R4
AT	87	76	99	88
BE	74	72	91	86
BG*	56	61	65	66
CH	94	93	94	85
CY*	14	29	67	66
CZ*	60	76	80	87
DE	82	86	97	95
DK	98	94	98	90
EE*	76	56	55	58
EL*	56	44	38	38
ES*	69	44	81	77
FI*	84	91	93	93
FR	69	74	75	83
HR*	61	48	58	55
HU*	48	44	62	84
IE*	66	72	90	95
IS*	93	91	92	96
IT*	34	42	66	71
LT	38	66	52	62
LU*	97	91	95	87
LV*	55	72	74	59
MT*	63	92	61	58
NL	95	95	96	99
NO*	91	89	94	99
PL*	100	56	66	82
PT*	54	63	57	65
RO*	73	89	80	76
SE	88	90	89	91
SI*	80	81	82	85
SK*	73	64	62	74
UK*	100	70	78	69
EU27	77	76	79	82
EU-NONWIDE	80	80	86	87
EU-WIDE	62	63	62	67

Source: MORE4 EU HE survey (2019)
Notes:
- Share of researchers satisfied with the pension plan.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=9,019)

Table 83: Difference in satisfaction with job security between Male and female across career stages, 2019

Country	R1	R2	R3	R4
AT	12	0	10	2
BE	-7	14	8	10
BG	31	12	2	15
CH	10	-6	12	-4
CY		-12	5	-4
CZ	1	37	0	0
DE	13	10	1	0
DK	5	-13	-3	7
EE	35	-1	-3	-17
EL	-34	-4	7	7
ES	-2	-11	-3	3
FI	13	2	-2	-2
FR	32	14	5	-1
HR	18	45	-6	5
HU	-17	46	6	23
IE	3	-15	3	6
IS	4	31	-2	4
IT	11	-10	-1	6
LT	9	6	12	16
LU	7	-14	7	0
LV	-18	25	-11	2
MT	0	0	1	22
NL	8	1	1	0
NO	16	-6	-12	-3
PL	0	5	1	-2
PT	-16	30	10	-1
RO	23	9	7	1
SE	7	-6	-6	2
SI	9	-6	0	-8
SK	14	-3	15	3
UK	-15	26	5	-3
EU27	9	9	2	3
EU-NONWIDE	11	6	0	2
EU-WIDE	-4	15	5	2

Source: MORE4 EU HE survey (2019)
Notes:
- Share of researchers satisfied with job security.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position"
- (2019: n=9,019)

Table 84: Difference in satisfaction with pension between Male and female across career stages, 2019

Country	R1	R2	R3	R4
AT	-17	11	1	8
BE	12	10	-1	22
BG	49	-9	9	24
CH	13	-3	7	-8
CY		-41	10	18
CZ	1	28	8	18
DE	20	8	5	8
DK	-3	7	-1	19
EE	24	63	6	6
EL	30	-10	-4	21
ES	22	-6	1	4
FI	3	-1	-5	-7
FR	10	0	9	8
HR	-34	28	3	1
HU	-9	-3	13	11
IE	22	-19	3	15
IS	-5	-18	7	1
IT		-19	19	15
LT	7	3	12	21
LU	-6	-1	4	-14
LV	35	33	-2	30
MT	-34	-12	10	23
NL	2	-10	-6	3
NO	7	8	-7	-1
PL	0	-5	14	10
PT	8	41	-4	6
RO	47	16	14	-9
SE	8	1	-7	-8
SI	11	-16	7	-13
SK	-1	-10	14	1
UK	0	-2	8	18
EU27	13	8	8	10
EU-NONWIDE	14	4	7	8
EU-WIDE	2	15	7	9

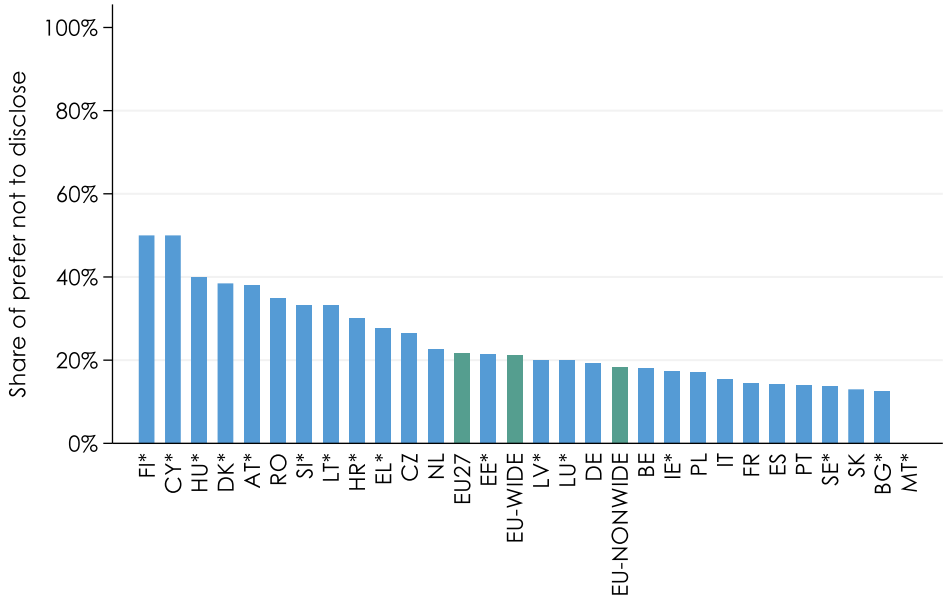
Source: MORE4 EU HE survey (2019)
Notes:
- Share of researchers satisfied with the pension plan.
- Based on question 32: "Please indicate your satisfaction with each factor as it relates to your current position" and question 2 "What is your gender?"
- (2019: n=9,019)

Table 85: Dissatisfaction with selected economic aspects of employment contracts, Higher education/NPO/other organisation vs. firms, 2021

Country	Salary progression		Additional private pension		Additional private health insurance	
	HE/NPO/other	Firm	HE/NPO/other	Firm	HE/NPO/other	Firm
AT**/**	24	9	22	25	25	33
BE/**	30	42	32	12	35	12
BG**/**	31	0	30	25	40	25
HR**/**	58	67	92	50	69	50
CY**	33		50		50	
CZ*/**	48	0	69	100	37	100
DK**/**	29	25	25	13	50	38
EE**/**	43	0	80	0	100	0
FI**/**	25	0			0	0
FR/**	42	29	27	36	24	8
DE/*	32	16	28	18	26	17
EL**/**	48	0	75		56	
HU**/**	67	25	0	0	0	0
IE**/**	42	0	25	40	67	60
IT/**	55	40	64	36	61	38
LV**	20		25		50	
LT**/**	63	50	33	0	33	0
LU**	20		33		33	
MT**	25		100		33	
NL**/**	50	30	31	22	67	50
PL*/**	49	0	54	20	54	20
PT/**	70	50	79		64	0
RO*/**	28	67	43	100	71	50
SK/**	57	67	50	50	51	50
SI**/**	25	0	43	0	33	0
ES/**	54	42	68	62	52	62
SE**/**	36	17	31	0	42	0
EU27	44	28	43	28	44	29
EU-NONWIDE	40	29	37	28	38	30
EU-WIDE	52	26	58	30	55	24

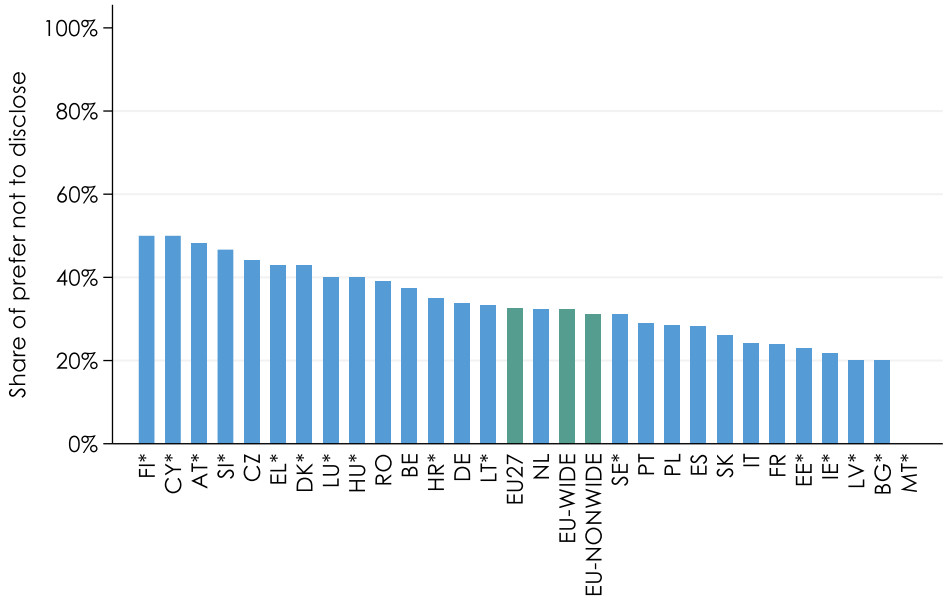
Source: Researcher survey (2021)
Notes:
- Based on question B1: "Please indicate your satisfaction with each factor as it relates to your current position/employment" and question A2: "Which type of organisation do you work for?"
- *=variables with more and with less than 30 observations; **=all variables have less than 30 observations; Asterisk in front of the slash indicates the observation for the HE/NPO/other sector and behind the slash for private sector – firm

Figure 138: Share of respondents not wanting to disclose salary, 2021



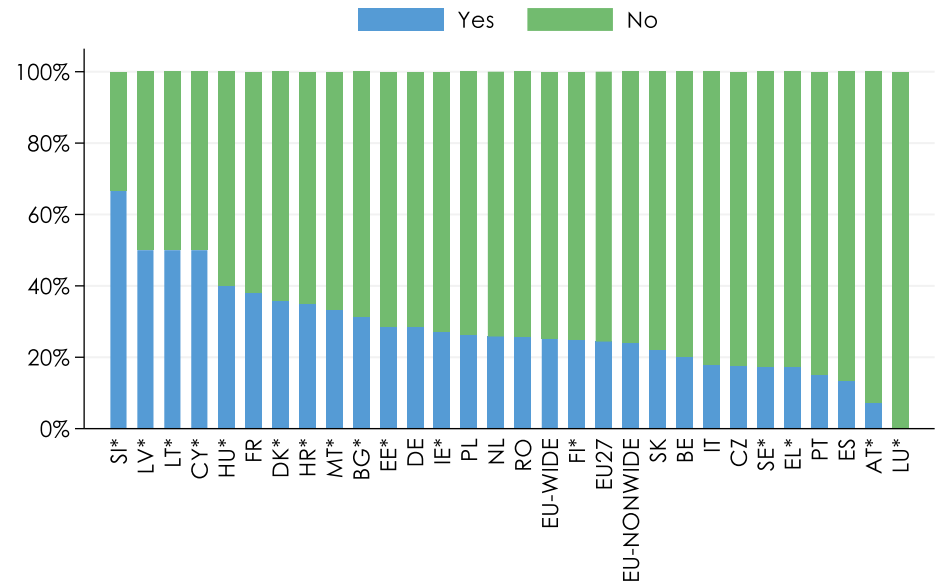
Source: Researcher survey (2021)
Notes:
- Based on question C00: "What is your typical (average) monthly net salary for your current employment position in local currency?"
- *=less than 30 observations
- (2021: n=3-1,308)

Figure 139: Share of respondents not wanting to disclose salary, 2021



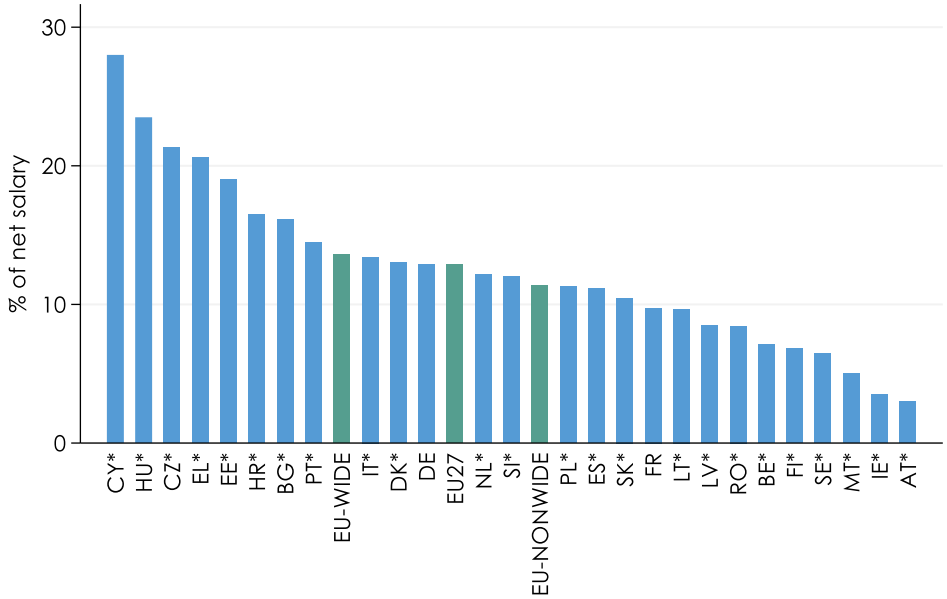
Source: Researcher survey (2021)
Notes:
- Based on question C01: "What is your typical (average) yearly net salary for your current employment position in local currency?"
- *=less than 30 observations
- (2021: n=3-1,303)

Figure 140: Compulsory private pension and/or private social security, 2021



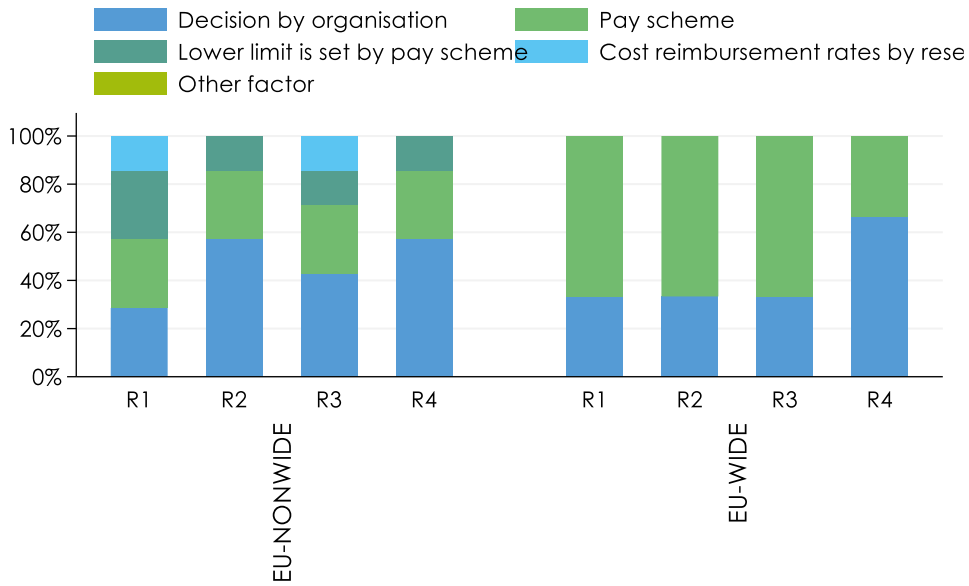
Source: Researcher survey (2021)
Notes:
- Based on question C2: "Do you have to take out compulsory private pension and/or private social security from your net salary?"
- *=less than 30 observations
- (2021: n=3-1,304)

Figure 141: Compulsory private pension and/or private social security by country, as a % of net salary, 2021



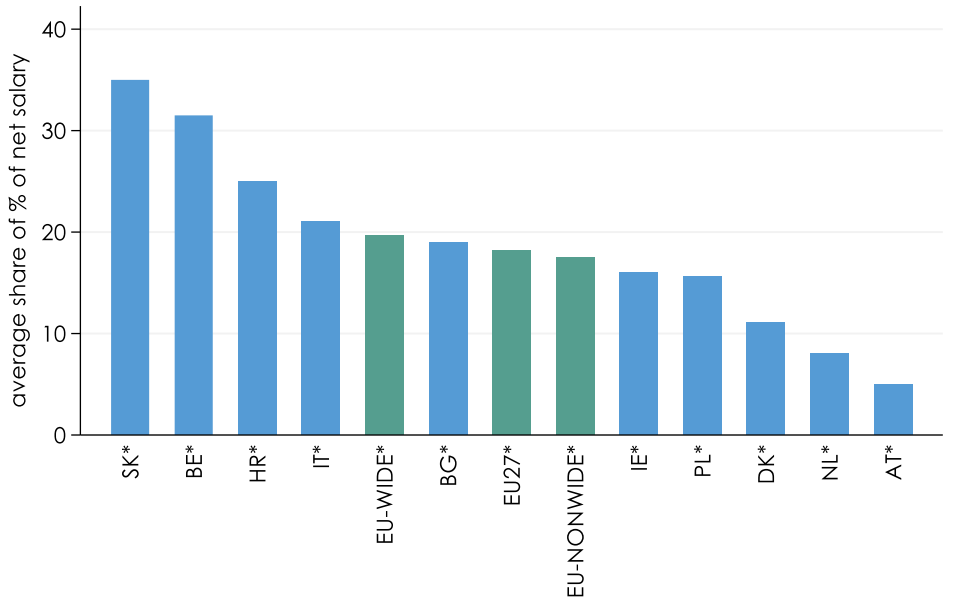
Source: Researcher survey (2021)
Notes:
- Based on question C3: "Which percentage of your net salary do you take out to cover compulsory private pension and/or private social security?"
- *=less than 30 observations
- (2021: n=3-421)

Figure 142: Determination of entry salaries in firms, 2021



Source: Employer survey (2021)
Notes:
- Based on question C2.1: "Are these salary levels determined by…"
- EU-NONWIDE, EU-WIDE: average over available countries
- (2021: n=3, 7)

Figure 143: Average percentage of net salary for private pension and/or private social security



Source: Employer survey (2021)
Notes:
- Based on question C6: "Which percentage of their net salary do researchers in your organisation have to take out to cover compulsory private pension and/or private social security?
- *=less than 30 observations
- (2021: n=1-24)

9.4. List of contributors

9.4.1. National Experts

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9.4.2. Euraxess Country Officers

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Belgium (French speaking community)	Morgane Sassi
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Bulgaria	Marieta TZVETKOVA
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Estonia	Ülle Raud
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Luxembourg	Aliénor Didier
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9.4.3. Validation workshop participants

About 50 national experts from almost all EU countries participated in a validation workshop on the main findings and the policy options on Sep. 15th, 2021.

9.5. Additional policy information

9.5.1. NPA Recommendations for postdoctoral policies and practices[113]

"The National Postdoctoral Association (NPA) believes that appropriate training of the next generation of independent scientists requires that institutions set policies to encourage individual responsibility, foster effective mentoring, and recognize the value and contributions of postdoctoral scholars. This commitment to better preparation must be made at the highest levels, with institutional leaders providing: incentives and programs that promote good mentoring, an atmosphere that fosters diversity of ideas and experiences, professional development opportunities, including education on the myriad career options available to them upon graduation, appropriate recognition and compensation for postdoctoral fellows.

After considering the recommendations of stakeholders, most notably the Committee for Science, Engineering and Public Policy (COSEPUP)[1], and collecting data from over 100 institutions, the NPA recommends implementation of the following institutional policies and practices for postdoctoral training.

1) Establish a postdoctoral office/association that actively engages and represents postdoctoral scholars

1.1 Establish a Postdoctoral Office (PDO)

1.2 Establish a Postdoctoral Association (PDA)

The presence of both a postdoctoral office (PDO), staffed by permanent employees and a postdoctoral association (PDA), run by the postdocs themselves, provides an excellent mechanism to facilitate open lines of communication with the administration and gives postdocs an independent and accessible avenue to provide input to the administration. PDO's and PDA's have different roles, functions and scope The NPA provides online toolkits developed in collaboration with AAMC/GREAT to assist in the formation of PDAs, and PDOs (please visit the NPA website at http://www.npacommunity.org/?page=toolkits_home for more information). If creating a postdoctoral office is not feasible (i.e., if your institution has too few postdocs to warrant such an office), an existing academic department should be given the responsibility of overseeing postdoctoral researchers, i.e. Vice-Provost for Research or Division of Graduate Studies. If the establishment of a postdoctoral association is not feasible, the appropriate office should establish defined policies to keep postdoctoral scholars engaged in planning and executing programs designed for their benefit. Additionally, the postdoctoral Office and the postdoctoral Association should strive to accomplish the goal of implementing the recommendations outlined in this document.

1.3 Setup and maintain a postdoctoral listserv and social media outlets

The postdoctoral office (PDO) should establish a listserv to communicate important information to the postdocs within each institution. Additionally, the PDO should use social media outlets such as LinkedIn, Facebook and Twitter to disseminate information to current and past postdocs.

1.4 Establish a Postdoctoral Advisory Committee

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113 https://www.nationalpostdoc.org/page/recommpostdocpolicy/NPA-Recommendations-for-Postdoctoral-Policies-and-Practices.htm

The postdoctoral office activities and postdoctoral policies should be directed by a Postdoctoral Advisory Committee. This Committee should consist of directors of postdoctoral office/training/research programs, faculty. Administrators from the postdoctoral office, human resources, grant management, international/diversity office, and most importantly postdoctoral scholars (elected by the postdoctoral scholar community) should be included.

1.5 Ensure postdoctoral scholar representation on relevant institutional committees

The postdoctoral office activities and postdoctoral policies should be directed by a Postdoctoral Advisory Committee. This Committee should consist of directors of postdoctoral office/training/research programs, faculty. Administrators from the postdoctoral office, human resources, grant management, international/diversity office, and most importantly postdoctoral scholars (elected by the postdoctoral scholar community) should be included.

Postdoctoral scholars should be represented (representatives should most preferably be chosen/elected postdoctoral scholars) on institutional committees that have operational or governance oversight of issues pertinent to the postdoctoral community.

2) Establish postdoctoral policies

An institution must recognize that its postdoctoral population has unique needs and concerns that differ substantially from those of other subsets of the university/institute population and create and implement policies that pertain specifically to postdoctoral scholars.

Postdoc-specific policies that should be clearly delineated include:

Administrative Policies

2.1 Adopt a clear definition of "postdoc" and to ascribe to each postdoc the employment categorization that they occupy--whether that is fellow, employee, or scholar

The National Institutes of Health (NIH) and the National Science Foundation (NSF) have agreed to the following definition of a postdoc:

A postdoctoral scholar ("postdoc") is an individual holding a doctoral degree who is engaged in a temporary period of mentored research and/or scholarly training for the purpose of acquiring the professional skills needed to pursue a career path of his or her choosing.

The institution should have straightforward policies detailing whether postdocs are treated as employees in all cases or only in certain cases (e.g. based on source of funding). The appointment process should be uniform and ensure that postdocs are aware of the terms of their employment and that sufficient funds are available to provide financial support for the duration of their appointments. It is not necessary to create new policies for every circumstance, but institutions should clearly define which existing policies apply or do not apply to postdocs.

2.2 Identify and establish policies to deal with issues concerning postdocs

Institutions should have policies outlined regarding misconduct, grievances, authorship disputes, and concerns with regards to intellectual property. Policies should incorporate international and diversity postdoc issues and be easily accessible.

2.3 Create and disseminate a postdoctoral handbook

A handbook that includes important policy information, as well as local information, is an indispensable reference and resource for postdocs. Ideally, this handbook would be produced as a collaborative effort between the postdoctoral office, the postdoctoral association, the international scholar's office, and the human resources office. Among other resources, the handbook should contain information on the implications of funding support from training grants (individual and institutional) versus research grants; authorship and intellectual property policies; and an overview of conflict resolution and misconduct policies, with contact information for the appropriate ombudsman office. Postdocs should be provided with a hard copy of this document at the start of their training. Additionally, this document should be easily accessible online for future reference.

2.4 Utilize a centralized appointment process

A specific process for appointing postdocs should be adopted. This process will enable an institution to accurately know how many postdocs work at their institution and to evaluate the working conditions of their postdoctoral scholars. An appointment letter detailing terms of the appointment, verifying the existence of sufficient funds for the duration of employment, delineating conditions for re-appointment, detailing stipend information, and explaining benefits should be part of this process. The letter should be filed with the postdoctoral affairs office, if such an office exists, in addition to the department chair or dean.

2.5 Establish policies that give postdocs access to university facilities such as the fitness center, library, as well as career and professional development resources and university events

Providing such access is a low to no-cost way of making postdocs feel part of the community.

2.6 Conduct an orientation program for new postdocs

Providing an orientation program for new postdocs within three months of starting allows an institution to get a better understanding of the demographics of the postdocs and to ensure postdocs understand expectations, are aware of services, programs, benefits available to them, so postdocs can make the most of their appointments.

2.7 Conduct an exit interview

An exit questionnaire provides feedback regarding the success of the postdoctoral program at the institution and enables the institution to track the career pursuits of the postdocs. Maintaining such outcome data over time would inform the institution about the effectiveness of their training programs, help establish an alumni network, and enable policy decisions to be driven by data. Additionally, information from several institutions would provide valuable data regarding the scientific workforce. These interviews would ideally be conducted by the administrative body overseeing postdoctoral research at an institution but, regardless, should be conducted by an impartial entity and in such a way as to encourage honest feedback without fear of reprisal.

2.8 Conduct an annual survey of postdocs

Utilizing an annual survey provides PDAs and PDOs with valuable information regarding the needs and concerns of their postdoctoral population. The information obtained from the survey should be used to aid in determining the specific issues that are important to postdocs on an institution-specific basis.

Training policies

2.9 Provide professional development and advanced training for postdocs

The NPA has established six core competencies to offer guidance on relevant training for to postdocs. These competencies are meant to serve primarily as: (1) a basis for self-evaluation by postdoctoral scholars and (2) a basis for developing training opportunities that can be evaluated by mentors, institutions, and other advisors.

Given that the expressed purpose of the postdoctoral position is to receive additional advanced training in preparation for an independent career, institutions should provide guidelines and standards for this training and resources to support this training. The institution should consider that, in an era of increasing complexity for the research enterprise, postdoctoral scholars pursue professional opportunities not only in academia but also in industry, government, nonprofits, and entrepreneurship. The variety of career options available today demands a diverse array of skills, such as writing grant proposals and mastering the principles of effective resource management, that are often neglected during doctoral study and postdoctoral research. The postdoctoral experience will be more relevant to career and professional development if the scholar is offered opportunities to acquire, develop, or improve these professional skills.

2.10 Establish time frame for postdoctoral transition to independence

Institutions should define the maximum length of time an individual may be classified as a postdoc, after which they should be moved into a permanent employee position. This total should take into account the number of years previously spent at other institutions in a postdoctoral position. In cases involving family leave and other extenuating circumstances, extensions to this limit may become appropriate.

2.11 Facilitate effective mentoring and personal responsibility through career planning with an annual review

Establishing good communication between postdocs and mentors is critical for a successful relationship. The NPA recommends the use of the individual development plan (IDP), adapted as appropriate for different fields of study and to reflect any institutional guidelines. (See http://myidp.sciencecareers.org/ for more information). The IDP opens communication, identifies expectations, establishes objective criteria for success, recognizes the importance of training and service, and should be flexible to allow new opportunities to be pursued when they appear. The IDP should include defined time and resources devoted to research and career development activities independent of the mentor’s research. The entrance questionnaire is an excellent opportunity to introduce the IDP and discuss particular aspects that should be included, and the exit questionnaire could be used to determine perceived and actual benefits of an IDP. An annual review of the plan and the progress made is needed to ensure that the expectations of both parties are being met and that appropriate modifications of the plan or the approach to the plan are made.

2.12 Provide career counseling and development services

Postdocs today face enormous competition and diverse career options. Mentors are unlikely to be able to provide all the necessary information and tools to facilitate transition to independence without institutional assistance. Institutions that provide career development programs and resources recognize their role and responsibility to their postdocs and help them make the most of their time at the institution. Resources could include career counseling, career exploration and panels, mentoring, lab management resources, internships or teaching opportunities, grant writing classes, access to relevant Web-based resources and small, competitive career-enhancement awards.

Benefits Policies

2.13 Establish a minimum baseline salary/stipend, plus a salary/stipend scale

Many institutions adopt the NIH National Research Service Award (NRSA) stipend scale as a minimum for departments funded through the NIH. The NRSA scale provides a baseline stipend for postdocs who have recently graduated and adjusts upwards based on the number of years of experience. While adopting this scale may be a realistic starting point for many institutions, the NPA strongly recommends a minimum baseline salary/stipend of $50,000 for a postdoc who is less than 1 year from receiving her/his Ph.D. Equal salaries should be paid to national and international postdocs.

Institutions should also provide some mechanism to ensure that guidelines recognize regional costs of living and are followed, whether through department heads, postdoctoral offices, or offices of grants and contracts administration.

2.14 Provide a comprehensive, fair, and equitable benefits package to postdocs, comparable to that which is received by standard employees whether national or international at the same institution.

Institutions should provide postdocs with a benefits package that is equitable when compared with other full-time employees at the institution. This benefits package should minimally include health and dental insurance plans for postdocs. Additionally, institutions should provide policies for vacation and sick days allowed for postdocs, as well as for family leave benefits.

2.15 Extend family-friendly benefits to all postdocs

Institutions should recognize that many postdocs are at a stage of life when establishing a family is as important as their professional development. Therefore they should extend benefits to all postdocs that are reflective of the institution’s commitment to other employees. These benefits should include: adherence to the family and medical leave act for non-employees, maternity/paternity leave, access to on-site child care and/or subsidies, access to dependent coverage for health insurance, support programs for foreign spouses, and part-time status for postdocs.

2.16 Allow matched contributions to a retirement program

Given the increasing age of postdocs and length of time spent as a postdoc, the opportunity to contribute to retirement accounts is an important resource. Recognizing the temporary nature of the postdoctoral position, institutions may establish special rules for vesting by postdocs and for allowing employer-matched contributions.

3) Maintain an office for international scholar services

Postdocs who are non-U.S. citizens face unique challenges that their mentors may not be able to meet without additional assistance from elsewhere in the institution. A dedicated office for international scholars is a critical resource for both prospective scholars and those who are already at the institution. The postdoctoral office (PDO) should work closely with the office for international scholar services to ensure that the particular needs of international postdocs are being addressed. Programs to support international postdocs could include offering legal seminars or International Coffee Hours for example.

4) Establish a Diversity Office to ensure diversity and inclusion

Institutions should seek to promote diversity and ensure equal opportunity, inclusion, leadership, and activities for all postdocs, regardless of race, ethnicity, sex, disability, country of origin, field of research, socio-economic status, religion, age, marital status, sexual orientation, or gender identity.

Specifically, institutions should also:

4.1 Have formal recruitment mechanisms in place to ensure diversity of the postdoctoral population

4.2 Have support systems in place to ensure the retention and success of postdocs from under-represented and other non-traditional backgrounds “